

# Ovivo Membrane Unit Operation & Maintenance Manual OV200<sup>®</sup>, OV208<sup>®</sup>, OV300<sup>®</sup>, OV312<sup>®</sup>, OV400<sup>®</sup>, OV416<sup>®</sup> OV480<sup>®</sup>

---



OV400

# Read all warnings and safety information before continuing.

---

- Never lay membrane modules flat on the ground. This can cause permanent distortion of the membrane sheet.
- **Do Not** allow the membranes to become dry once they have been wetted in service.
- Membranes must not be stored at temperatures below 41°F and above 104°F.
- Membranes must be stored without exposure to the sun.
- **Do Not** weld, grind or otherwise generate sparks while working near membranes.
- **Do Not** use a knife to remove the bubble wrap to avoid diffuser damage.
- **Do Not** lift or move membranes except as described in this manual.

## Rules for Handling and Storage

### Contact with membranes

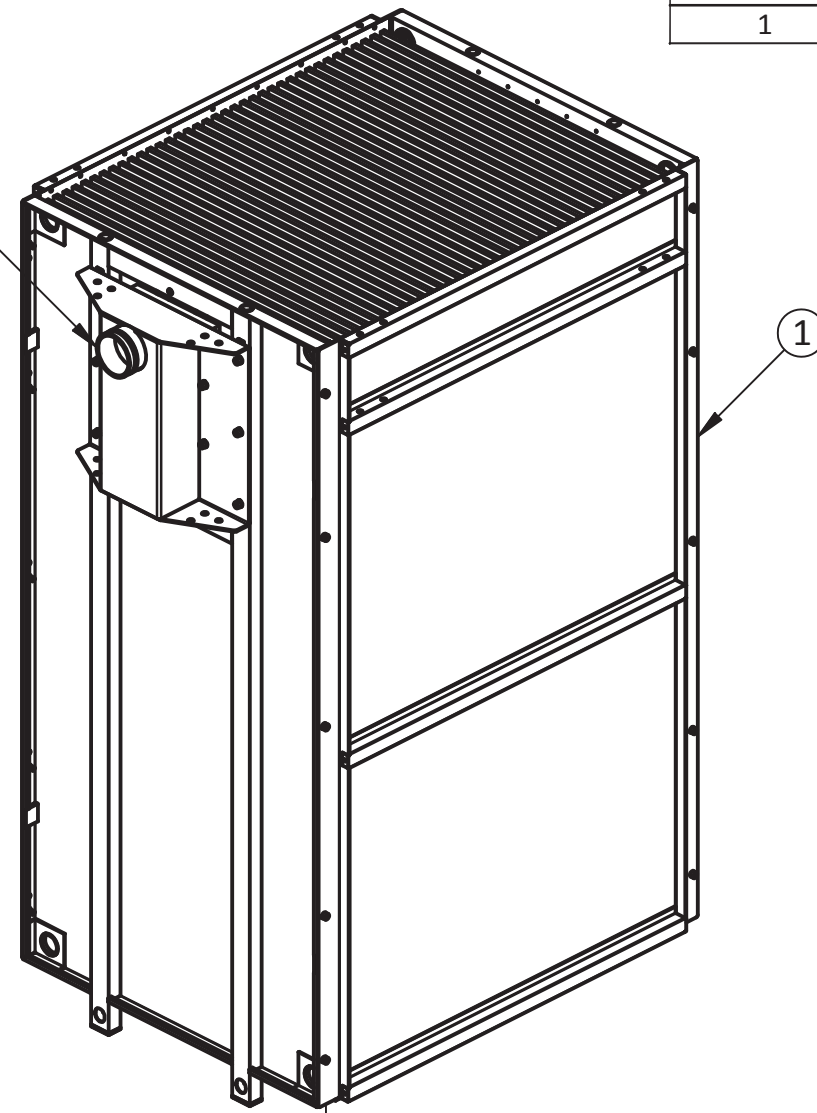
- In general no contact with the membranes is allowed.
- All membranes are 100% quality tested and ready for operation.
- Make sure that nothing can damage the membrane during assembly and installation.

### Wet membranes

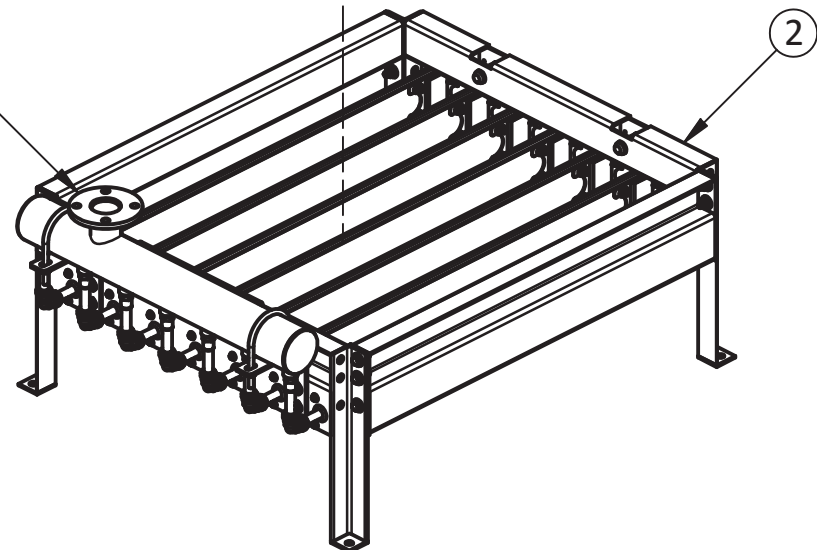
- The membranes are stabilized with a glycerin solution for delivery.
- Once the glycerin solution is removed or the membranes become wet from improper storage, the membrane must not dry out again.
- If the membrane must be removed from the basin, it is important they remain wet. This will help prevent them from becoming hydrophobic.
- In the event the membranes are wetted and allowed to dry, contact Ovivo for direction. EquipTech Hotline 512-652-5848.

| ITEM | QTY | DESCRIPTION           | MATERIAL |
|------|-----|-----------------------|----------|
| 2    | 1   | OV480 CASSETTE        | MISC.    |
| 1    | 1   | OV480 DIFFUSER MODULE | MISC.    |

PERMEATE CONNECTION  
VARIES BY PROJECT  
(FRONT 4" VICTAULIC SHOWN)



AIR CONNECTION  
(2 1/2" FLANGE)



OV480  
MEMBRANE  
UNIT

The Max "wet weight" of the proposed membrane unit OV480 is 4 Tons. That should take care of any "worst-case scenario" where sludging occurred on the Membranes and a completely dirty unit needed to be lifted out of the tank (also includes lift tool)

The "dry weight" is approx. 975 lbs.

**NOTES:**

- MEMBRANE UNIT TO BE FULLY ASSEMBLED PRIOR TO INSTALLATION.
- MEMBRANE UNIT(S) TO BE INSTALLED LEVEL. SEE O&M MANUAL.
- DUE TO AERATION, MEMBRANE UNIT MOVEMENT IS POSSIBLE. INSTALLATION OF UNIVERSAL MOUNTING KIT IS REQUIRED.
- CAPACITY OF LIFTING FACILITIES MUST BE MORE THAN "WET" MASS OF MEMBRANE UNIT PLUS MASS OF THE LIFTING TOOL.
- MINIMUM REQUIRED LIFTING CLEARANCE: 11'-0"

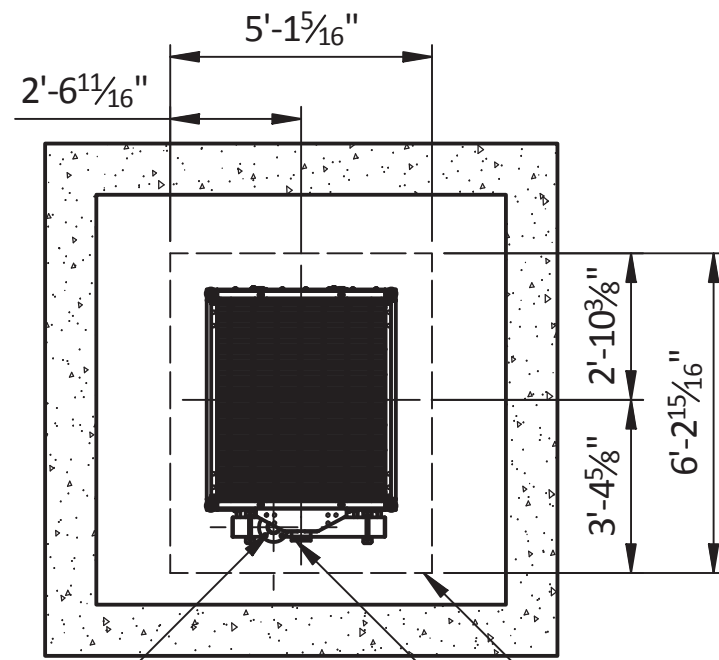
**\*NOTE:** LIFTING HEIGHT DEPENDENT ON MOUNTING SYSTEM & PLANT DESIGN. SEE SUBMITTAL DRAWINGS FOR ACTUAL REQUIREMENTS.

|                      |        |    |         |      |     |
|----------------------|--------|----|---------|------|-----|
| INITIAL RELEASE      | 3891   | DH | GTT     | 9/15 | B   |
| PRE-RELEASE CONCEPT  | -      | -  | -       | -    | A   |
| REVISION DESCRIPTION | EN/ECO | BY | CHECK'D | DATE | REV |

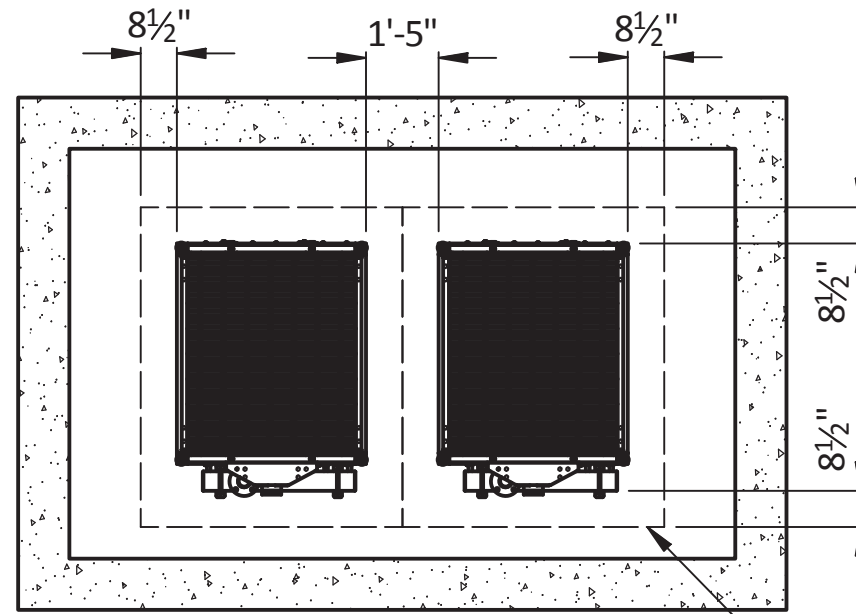
|   |           |   |  |                            |                 |
|---|-----------|---|--|----------------------------|-----------------|
| <b>B</b>  |           | <br>THIRD ANGLE PROJECTION              |  | <br>Bringing water to life |                 |
| <small>THIS DRAWING CONTAINS CONFIDENTIAL PROPRIETARY INFORMATION OF OVIVO, AND ITS AFFILIATES, AND IS NOT TO BE DISCLOSED NOR TO BE USED EXCEPT FOR EVALUATING PROPOSALS OF OVIVO OR INSTALLING, OPERATING OR MAINTAINING OVIVO EQUIPMENT. UNLESS OTHERWISE AUTHORIZED IN WRITING BY OVIVO. UNCONTROLLED COPY IF PRINTED</small> |           |   |  |                            |                 |
| REF. FROM   |           | DO NOT SCALE PRINTS                     |  | DWG NO.                    | SHEET<br>1 OF 2 |
| DATE  | 6/11/2015 | WORKMANSHIP STANDARD WS-7501-01 APPLIES |  |                            |                 |
| DRAWN   | DV        | ORIGINAL S.O.                           |  |                            |                 |
| CHECK'D   | GTT       |   |  |                            |                 |

**NOTES:**

1. DIMENSIONS ARE GENERAL RECOMMENDATIONS ONLY. FOR PROJECT SPECIFIC DIMENSIONS, SEE PROJECT PLAN AND RELATED DRAWINGS.
2. SPACING BETWEEN UNITS MAY NEED TO BE INCREASED TO ACCOMMODATE IN BASIN PIPING.



PLAN VIEW  
(SINGLE UNIT)



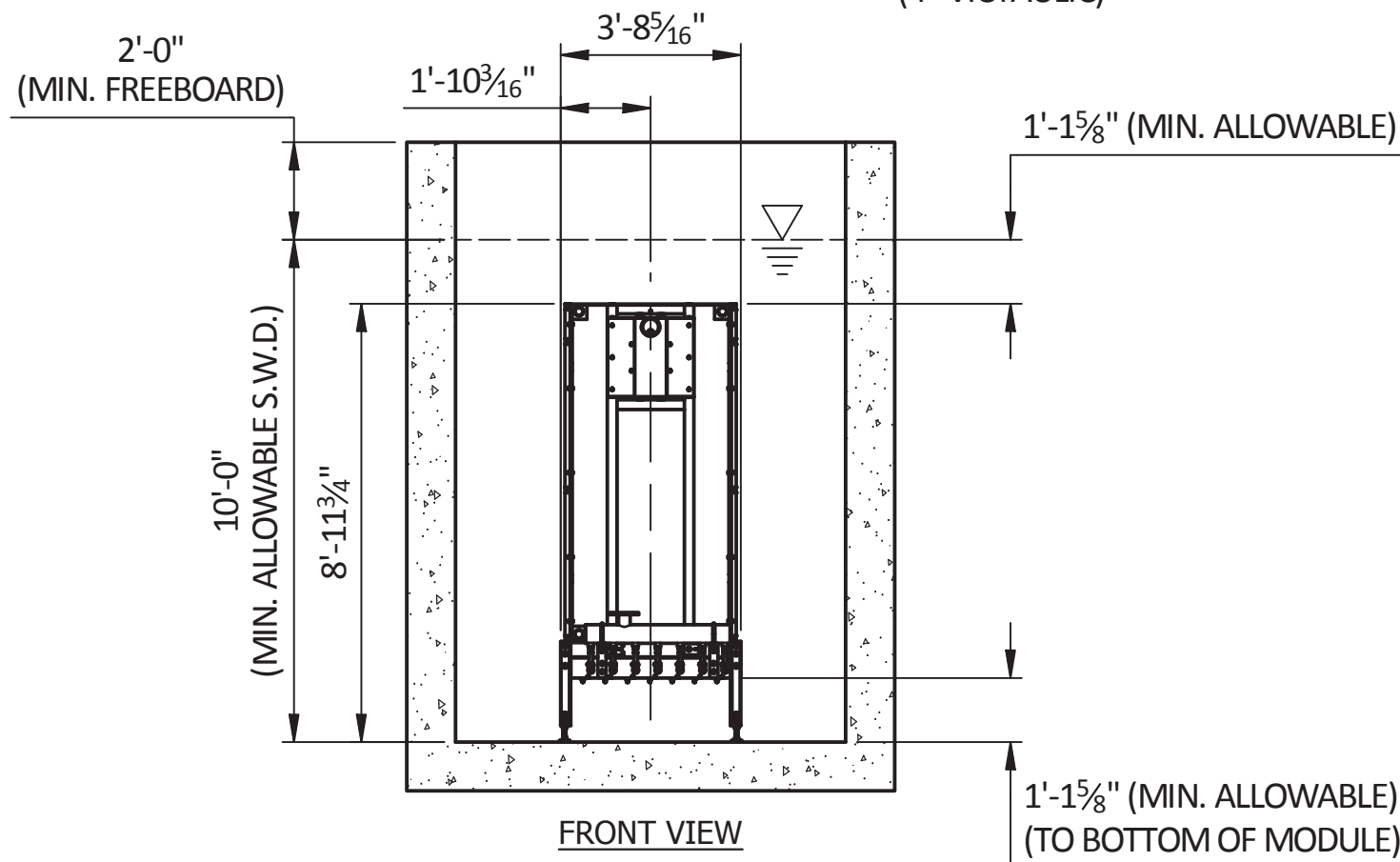
PLAN VIEW  
(MULTIPLE UNITS)

AIR CONNECTION  
(2 1/2" FLANGE)

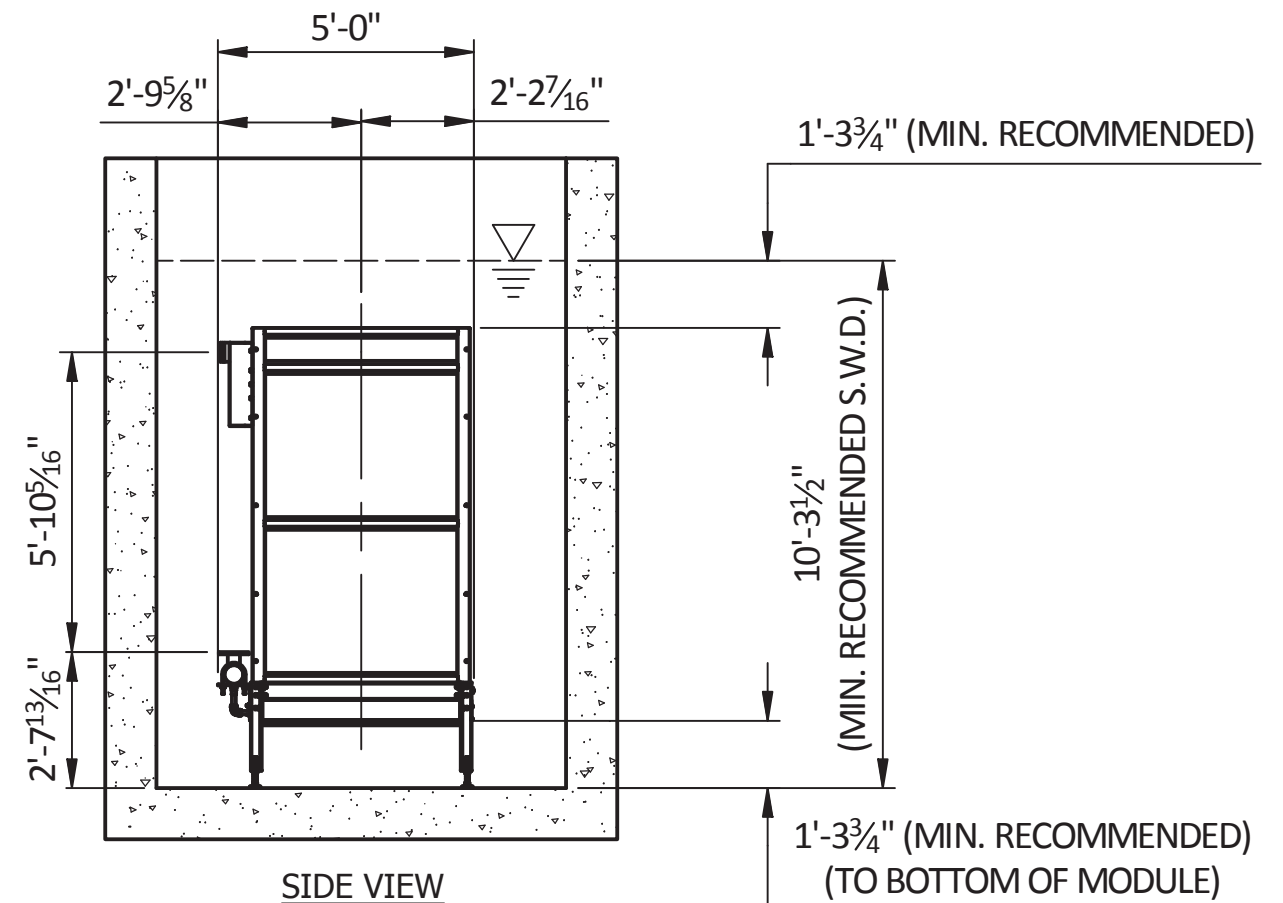
MIN. HYDRAULIC WINDOW

PERMEATE CONNECTION  
(4" VICTAULIC)

MIN. HYDRAULIC WINDOW



FRONT VIEW



SIDE VIEW

THIS DRAWING CONTAINS CONFIDENTIAL PROPRIETARY INFORMATION OF OVIVO, AND ITS AFFILIATES, AND IS NOT TO BE DISCLOSED NOR TO BE USED EXCEPT FOR EVALUATING PROPOSALS OF OVIVO OR INSTALLING, OPERATING OR MAINTAINING OVIVO EQUIPMENT. UNLESS OTHERWISE AUTHORIZED IN WRITING BY OVIVO. UNCONTROLLED COPY IF PRINTED

DO NOT SCALE PRINTS

WORKMANSHIP STANDARD WI-7501-01 APPLIES

**B**  
©COPYRIGHT 2010 BY GLV  
ALL RIGHTS RESERVED - REV E



DWG. NO.

**OVIVO**  
Bringing water to life

OV480 INSTALL

SHEET  
2 OF 2

REV  
**B**

Table of contents

- 1. Introduction .....3
- 2. General Rules for Handling ..... 4
- 3. The Ovivo Membrane Unit: OV200, OV208, OV300, OV312, OV400, OV416 and OV480 .....5
  - 3.1 OMU Subunits (Modules) ..... 6
- 4. OMU Sub-Components ..... 8
- 5. Cleaning Chemicals..... 12
- 6. OMU Transportation ..... 13
- 7. Storage and Preservation of Units ..... 14

## 1. Introduction

This manual provides an overview of the qualities and parameters specific to the OV200®, OV208®, OV300®, OV312®, OV400®, OV416® and OV480® Ovivo Membrane Units (OMU), and the conditions that must be maintained in order to ensure their effective operation.

This manual provides basic information only. Please completely read this manual before handling Ovivo Membrane Units. Follow all the instructions and operate each unit type only under required operating conditions. Mishandling can irreversibly compromise performance or even destroy the unit. If questions or problems occur, please contact Ovivo at the EQuipTech Hotline 512-652-5848, by email at [equiptech@ovivowater.com](mailto:equiptech@ovivowater.com) or at [EQVue.com](http://EQVue.com)

The use of advanced technology and the high quality standard of our membranes is the result of continuous development. Consequently, this may result in some differences between this operating manual and your OMU. If in doubt, please contact the above. The warranty of product quality is given in our General Conditions for Purchase and Sale.

## 2. General Rules for Handling

Proper handling of the Ovivo Membrane Units is essential to maintain chemical and mechanical stability. The following guidelines must be followed when handling the units:

Ensure there is no direct contact with the unit itself. The product is 100% quality tested and ready for operation. Ensure nothing can damage the unit during assembly and installation.

The membranes are stabilized with a glycerin solution when delivered. Once the glycerin solution is removed or the membranes become wet (e.g. inappropriate storage) the membrane must NOT dry out again. When removing the membrane units from the treatment stream the membrane must remain wet or be preserved, following the preservation steps outlined in section 5.4.3 of this manual.

In rare cases, membrane sheets within the unit may become attached to each other. The sheets must NOT be pulled apart by hand as they may be damaged. The attached sheets will separate in water (mixed liquor).

Membranes must NOT be stored at temperatures below 5°C and above 40°C and at a relative humidity less than 70%. To avoid exposure and heat damage to PVC components, do NOT store units in direct sunlight.

The shelf life of a unit - as long as it is stored under the above conditions - is maximum 12 months after delivery.

Every unit must be checked for damage that may have occurred during transportation. Damage must be reported and documented to the freight forwarding company and Ovivo.

An Ovivo Membrane Unit can be lifted e.g. with a crane. Use the Ovivo Lifting Tool to attach the load-carrying cables to the four ends of the steel bars directly at the cassette walls. Lift and lower the units only, do not slide or push the units from the side.

Take care not to damage units with tools, forklift, etc.

### 3. The Ovivo Membrane Unit: OV200, OV208, OV300, OV312, OV400, OV416 and OV480

Developed specifically for MBR wastewater applications, Ovivo Membrane Units are designed to be both chemically and mechanically stable in operation. The polyether sulfone (PES) membrane, designed with a pore size of 0.04  $\mu\text{m}$  (ultrafiltration), effectively removes all solids from the permeate, including bacteria and most viruses, resulting in superior effluent quality that is suitable for both water reuse and direct discharge.

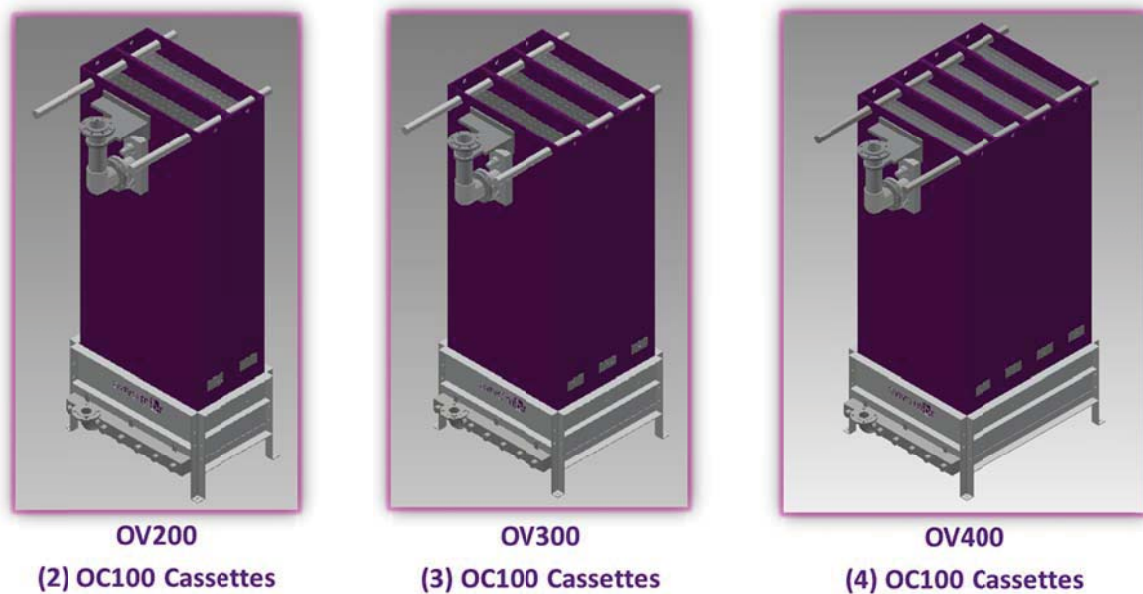


Figure 1: Fully dimensions drawings and part detail for each OMU can be found in the Appendix.

The revolutionary fusion process that merges the membranes sheets to form a permeate drainage layer, produces a rigid, yet pliable 2 mm thin membrane sheet to maximize packing density.

And with Ovivo Bulletproof™ technology, membrane fouling potential decreases: turbidity shall recover to specified limits within 10 minutes of a cut or abrasion less than 4" in total length.

OMU A-Type air scour diffuser systems are engineered to be non-clogging, medium bubble, manufactured from polyurethane (PE) strips and provide a minimum of 1.3%/ft OTE.



The OV200, OV208, OV300, OV312, OV400, OV416 and OV480 Membrane Units, all using the UP-150 membrane, are conditionally accepted by the California Department of Public Health (CDPH) under the California Recycling Water Criteria (Title 22 of the California Code of Regulations).

### 3.1 OMU Subunits (Modules)

The OV200, OV208, OV300, OV312, OV400, OV416 and OV480 membrane units are each composed of two primary subunits: a permeate module and a diffuser module.

#### Permeate Module

The Permeate Module consists of the Permeate Module Assembly Kit and membrane cassettes. The OV200 (2 cassettes), OV300 (3 cassettes), and OV400 (4 cassettes) membrane units all utilize the OC100 Cassette type. The OV208 (2 cassettes), OV312 (3 cassettes), and the OV 416 (4 cassettes) membrane unit utilize OC 104 Cassette type. The OV 480 (1 cassette) membrane unit utilize the OC480 Cassette type.

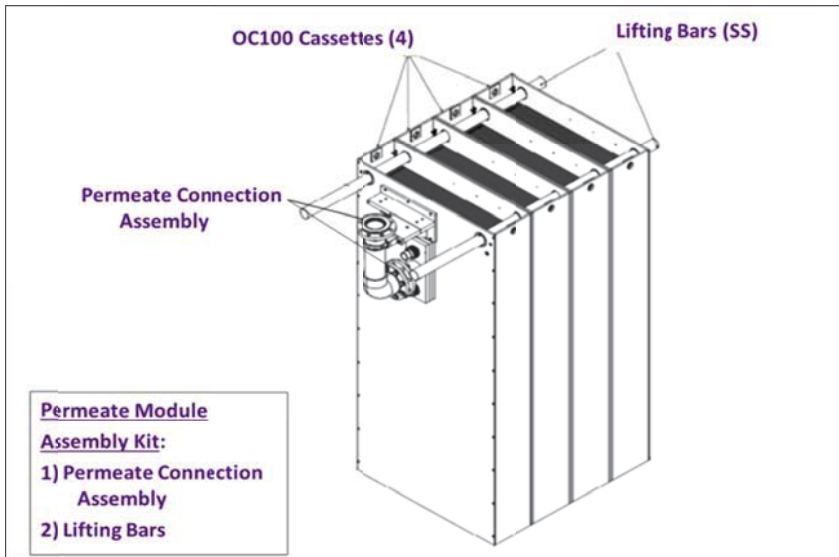


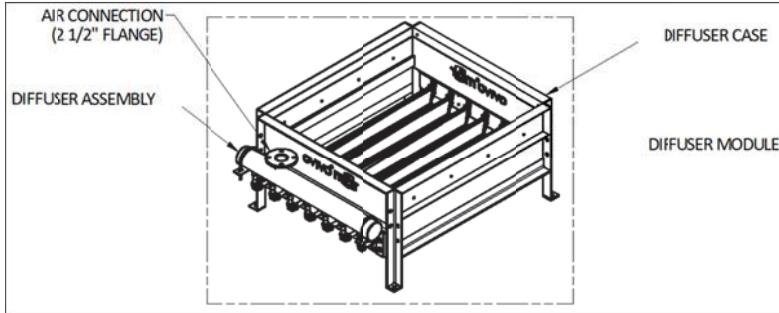
Figure 2: OV400 Permeate Module



Figure 3: Cassette OC100

**Diffuser Module**

The Diffuser Module consists of the Diffuser Case and Diffuser Assembly. Optional Diffuser Assemblies include diffusers options for A-Type (polyurethane, medium bubble diffusers), CF-



Type (SS, coarse bubble), or TT-Type Diffusers (EPDM, medium bubble). Diffuser assembly type is an independent selection from unit model type and may vary from system to system, per MBR design objectives.

**Figure 4: OV400 Diffuser Module**

#### 4. OMU Sub-Components

Table 1 includes a list of OMU sub-components for the OV200, OV208, OV300, OV312, OV400, OV416 and OV480 membrane units. Each component is assigned a number which will be used to refer to the part in the attached drawings at the back of this manual. It is important to ensure that all of the required parts are identified and located prior to installation. Table 3 is a list of operational parameters for the OV200, OV208, OV300, OV312, OV400, OV416 and OV480 membrane units, and Table 2 lists physical/mechanical attributes.

| Description   | Quantity per OMU Type |           |           |           |           | Item Number |
|---|-----------------------|-----------|-----------|-----------|-----------|-------------|
|   | OV200/08              | OV300/12  | OV400     | OV416     | OV480     |             |
| Diffuser Case (specific)                            | 1 (OV2xx)             | 1 (OV3xx) | 1 (OV4xx) | 1 (OV4xx) | 1 (OV480) | 1           |
| Permeate Module (Cassettes + Assembly Kit)          | 1                     | 1         | 1         | 1         | 1         | 2           |
| Aeration Diffuser Assembly (CF-Type)                | 5                     | 5         | 5         | 5         | 5         | 3           |
| Aeration Diffuser Assembly (A-Type)                 | 7                     | 7         | 7         | 7         | 7         | 3           |
| Aeration Diffuser Assembly (TT-Type)                | 7                     | 7         | 7         | 7         | 7         | 3           |
| OC100 Cassettes                                     | 2/0                   | 3/0       | 4         | --        | --        | 4           |
| OC104 Cassettes                                     | 0/2                   | 0/3       | --        | 4         | --        | --          |
| OC480 Cassettes                                     | --                    | --        | --        | --        | 1         | --          |
| Number of Sheets per OC100                          | 25/0                  | 25/0      | 25        | --        | --        | --          |
| Number of Sheets per OC104                          | 0/26                  | 0/26      | --        | 26        | --        | --          |
| Number of Sheets per OC480                          | --                    | --        | --        | --        | 120       | --          |
| Diffuser Module (Diffuser Case + Diffuser Assembly) | 1                     | 1         | 1         | 1         | 1         | 4           |

Table 1: Materials list for OV2xx, OV3xx, OV400, OV416 and OV480 membrane unit assembly

| Description  | Nominal Operational Parameters per OMU Type |           |           |           |           |
|--|---|-----------|-----------|-----------|-----------|
|  | OV2xx                                       | OV3xx     | OV400     | OV416     | OV480     |
| Air Scour Rate (m <sup>3</sup> /h / scfm)                    | 70 / 38                                     | 105 / 57  | 140 / 76  | 140 / 76  | 140 / 76  |
| A-Type Bubble Diffuser Pressure Loss (mbar / psi)            | 55 / 0.8                                    | 55 / 0.8  | 55 / 0.8  | 55 / 0.8  | 55 / 0.8  |
| TT-Type Bubble Diffuser Pressure Loss (mbar / psi)           | 95 / 1.4                                    | 95 / 1.4  | 95 / 1.4  | 95 / 1.4  | 95 / 1.4  |
| CF-Type Diffuser Pressure Loss (mbar / psi)                  | 35 / 0.5                                    | 35 / 0.5  | 35 / 0.5  | 35 / 0.5  | 35 / 0.5  |
| Max Transmembrane Pressure (TMP) Loss (mbar / psi)           | 400 / 5.8                                   | 400 / 5.8 | 400 / 5.8 | 400 / 5.8 | 400 / 5.8 |
| Max Backpressure during backwash, if applicable (mbar / psi) | 150 / 2.2                                   | 150 / 2.2 | 150 / 2.2 | 150 / 2.2 | 150 / 2.2 |

**Table 2: Nominal Operational Parameters for OV2xx, OV3xx, OV400, OV416 and OV480 membrane units**

| Description   | Mechanical Attributes per OMU Type     |  |                         |                         |                         |
|---|--|--|-------------------------|-------------------------|-------------------------|
|   | OV2xx                                  | OV3xx                                  | OV400                   | OV416                   | OV480                   |
| Unit Length w/o Lifting Bars (m/ft)                     | ≤ 1.2 / 3.9                            | ≤ 1.5 / 4.9                            | ≤ 1.8 / 5.9             | ≤ 1.8 / 5.9             | ≤ 1.8 / 5.9             |
| Unit Width (m / ft)                                     | 1.15 / 3.8                             | 1.15 / 3.8                             | 1.15 / 3.8              | 1.15 / 3.8              | 1.15 / 3.8              |
| Height (m / ft)   | 2.9 / 9.5                              | 2.9 / 9.5                              | 2.9 / 9.5               | 2.9 / 9.5               | 2.9 / 9.5               |
| Nominal / Effective Pore Size (µm)                      | < 0.04 / 0.01                          | < 0.04 / 0.01                          | < 0.04 / 0.01           | < 0.04 / 0.01           | < 0.04 / 0.01           |
| Active Membrane Material                                | Polyether Sulfone (PES)                | Polyether Sulfone (PES)                | Polyether Sulfone (PES) | Polyether Sulfone (PES) | Polyether Sulfone (PES) |
| Membrane Sheet Thickness (mm)                           | 2                                      | 2                                      | 2                       | 2                       | 2                       |
| Distance Between Sheets (mm)                            | 8                                      | 8                                      | 8                       | 8                       | 8                       |
| Area per Sheet (m <sup>2</sup> / ft <sup>2</sup> )      | 4 / 43                                 | 4 / 43                                 | 4 / 43                  | 4 / 43                  | 4 / 43                  |
| Total Membrane Area (m <sup>2</sup> / ft <sup>2</sup> ) | OV200: 200 / 2152<br>OV208: 208 / 2238 | OV300: 300 / 3228<br>OV312: 312 / 3357 | 400 / 4304              | 416 / 4476              | 480 / 5164              |
| Non-Membrane Cassette Material                          | PVC / SS / ABS                         | PVC / SS / ABS                         | PVC / SS / ABS          | PVC / SS / ABS          | PVC / SS / ABS          |
| O-Rings, Seals  | EPDM                                   | EPDM                                   | EPDM                    | EPDM                    | EPDM                    |
| Lifting Bars length (m / ft)                            | ≤ 1.8 / 3.9                            | ≤ 1.5 / 4.9                            | ≤ 1.2 / 5.9             | ≤ 1.2 / 5.9             | ≤ 1.2 / 5.9             |
| Lifting Bars material                                   | SS 304L                                | SS 304L                                | SS 304L                 | SS 304L                 | SS 304L                 |
| Permeate Connection size (in)                           | 4                                      | 4                                      | 4                       | 4                       | 4                       |
| Air Scour Connection Size (in)                          | 2.5                                    | 2.5                                    | 2.5                     | 2.5                     | 2.5                     |
| Diffuser Case material                                  | SS 304L                                | SS 304L                                | SS 304L                 | SS 304L                 | SS 304L                 |
| Aeration Diffuser Type (Variable)                       | Coarse / Medium                        | Coarse / Medium                        | Coarse / Medium         | Coarse / Medium         | Coarse / Medium         |
| Aeration Diffuser materials                             | SS 304L / Polyurethane                 | SS 304L / Polyurethane                 | SS 304L / Polyurethane  | SS 304L / Polyurethane  | SS 304L / Polyurethane  |
| Max operating / storage temperature (°C / °F)           | 40 / 104                               | 40 / 104                               | 40 / 104                | 40 / 104                | 40 / 104                |
| Min Operating / Storage Temperature (°C / °F)           | 5 / 41                                 | 5 / 41                                 | 5 / 41                  | 5 / 41                  | 5 / 41                  |
| pH range  | 2 - 11                                 | 2 - 11                                 | 2 - 11                  | 2 - 11                  | 2 - 11                  |

**Table 3: Physical/Mechanical Attributes for OV200, OV208, OV300, OV312, OV400, OV416 and OV480 membrane units**

## 5. Cleaning Chemicals

It is recommended that sodium hypochlorite (NaOCl) is used to remove bio-fouling at a concentration of 250 ppm to 1000 ppm (active chlorine) with a residence time of several hours (depending on the fouling). The pH-value must be between 10 – 11 (by adding NaOH). Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) may be used as an alternative to NaOCl. Start with a 0.5% H<sub>2</sub>O<sub>2</sub> solution concentration until there is more experience. Any deviating concentrations need to be agreed upon with OVIVO in writing. Most commercial cleaning solutions are based on sodium hypochlorite. However, a written release by OVIVO needs to be secured before using any commercial cleaning solution.

To remove inorganic scaling on an as needed basis, Ovivo recommends, acid solution (e.g. citric acid 0.5%, for several hours - alternatives may be formic acid and acetic acid). The membrane units must be washed sufficiently prior to and after the chemical cleaning with either permeate or water.

### Additional Information:

Please note that the **pH should not be lower than 2 or higher than 11** to avoid unit damage.

Store the chemicals properly, follow all safety regulations.

Dispose of the cleaning solutions properly; often they can be discharged into the biological stage of the system. Take care for a slow dosing, and also check to meet legal effluent requirements in terms of AOX concentrations.

The exact description of the cleaning procedure (used quantity of chemicals, chemical concentration, application time, etc.) must be documented and maintained by the treatment plant. It may be necessary to make changes in the cleaning procedure as operational experience increases.

Some cleaning chemicals at high concentrations can attack the membrane, the drainage layer and the support layer which may make the unit age prematurely. Consult with Ovivo before using in new or unfamiliar chemical cleaners.

## 6. OMU Transportation

### Lifting modules with a crane

A crane can be used to lift a complete OMU to a desired location.

The unit must be completely lifted off of the ground and must never slide across the floor.

OVIVO has also developed a spreader bar known as the Universal Mounting Kit Lifting Tool to assist in the transport of OV2xx, OV3xx, OV4xx units. The UMKLT attaches to the steel support bars located at the top of the unit to ensure safe transport. See Figure 6.

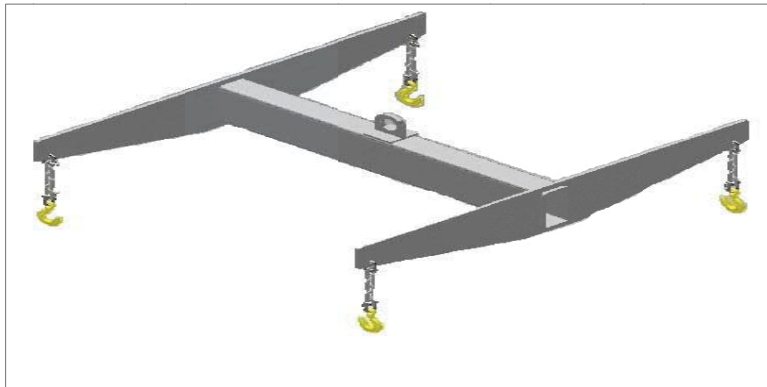


Figure 6: Ovivo Universal Mounting Kit Lifting Tool

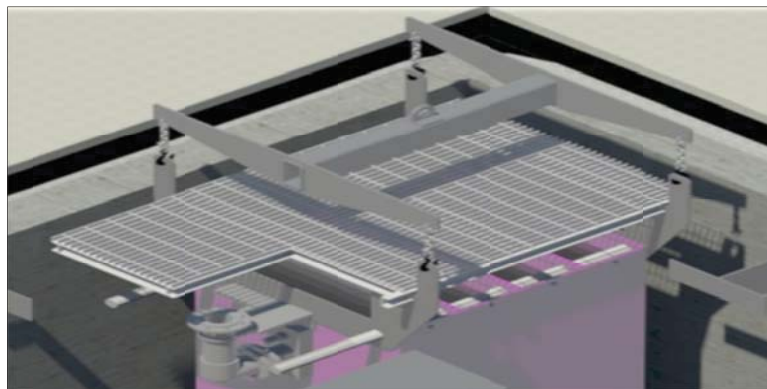


Figure 7: Proper attachment location and lifting technique for transportation with a crane and Lifting Tool.

## 7. Storage and Preservation of Units

### Submerged storage:

If the system is not used for a period of more than a month, units should be cleaned before being preserved and stored. A preservative must be added to prevent biological fouling. After an intensive cleaning store the membrane in a tank with an aqueous solution of sodium bisulfite (0.5 – 1.0%) or an aqueous solution of benzoic acid (0.5%).

### Dry storage:

If the units are going to be stored externally (maximum 6 months) the units must be submerged in following preservative for more than 10 minutes:

78 % Deionized water (conductivity < 2  $\mu\text{S}/\text{cm}$ )

20 % Glycerin

2 % Ecolab Ultrasil 73

The preservative has a density of about 1,045 g/cm<sup>3</sup>. During longer storage periods the concentration of the preservative must be controlled or the solution has to be replaced at regular intervals of about 6 months. All the pores of the membrane need to be completely filled with the solution. This can be achieved by a short filtration run. During preservation be careful with the operational safety (protection of skin and eyes, acidic solution of about pH 2.2) of the operators.