LG QuantumFlux™ MBR/Submerged UF Membrane

Technical Service Bulletin 803

MBR & Submerged UF Skid & Module Assembly

Skid Assembly

WARNING: The protective solution, 30% Calcium Chloride (CaCl2), can cause serious eye irritation. Wear protective gloves, appropriate skin protection, and eye protection when handling. IF IN EYES: Rinse cautiously with water for several minutes.

CAUTION: The protective solution, 30% Calcium Chloride (CaCl2), can corrode metals. Should the metal pipes or skids come into contact with the protective solution, water should be used to clean the affected area immediately to prevent corrosion. Protective solution should be discharged according to local requirements.

CAUTION: After removing the protective solution, skid installation should be completed as soon as possible to prevent the membrane fibers from drying out. Once the membrane fibers become dry, the filtration performance of the module may deteriorate or even be totally lost.

CAUTION: Use scissors or paper cutter to open the adhesive tape and open the outer carton and individual boxes.

CAUTION: When cutting the module bags with a tool, only cut near the plastic filtrate pipe end. Do not use any sharp objects near the membrane fibers.

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S-Series Skid Components

- Submerged membrane modules: including membrane hollow fibers, water collection pipes, seals etc.
- Water collection system: including permeate mains, water collection pipes, etc.
- Aeration system: including air supply mains, Air box or Air pipes, etc.
- Membrane skid: single or double layer.
- Spreader: could be multiple structures such as double hook spreader and tie rod spreader.
- Guiding Slot: U-shaped guiding and positioning slot at both ends of the membrane device.
- Assembly parts: including various plastic assembly parts, splints and bolt fasteners.

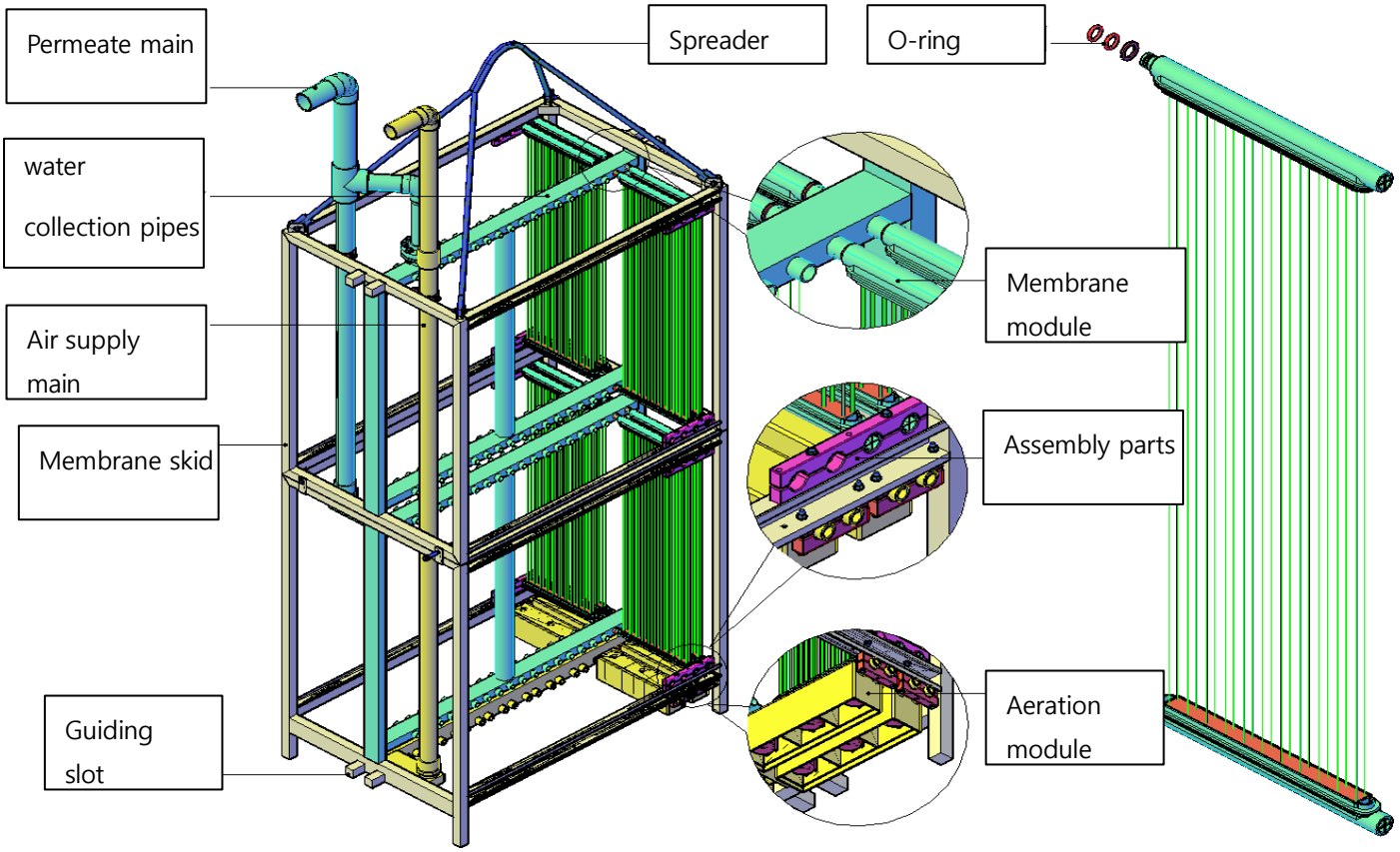

Figure 1: S Series Skid components

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Membrane Device Assembly and Testing

Corresponding preparations must be made before assembling the membrane device, including passing the air tightness test of the membrane skid frame, preparing the site, trained personnel, and complete accessories and tools.

Site Preparation

- Assemble the module indoors to avoid direct sunlight, keep the room ventilated and clean.
- Indoor headroom height and door size should meet the requirements.
- Stabilized power supply available.
- Having a crane for easy loading and unloading is recommended.
- The installation site is divided into module storage area, accessories storage area, module installation area and membrane device inspection area.

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Preparation of Accessories and Tools

The accessories required when assembling the membrane device are shown in Table 1. For specific quantities, refer to the project specific membrane drawings and BOM table

Table 1 : List of Accessories

S/N	Item	Spec（mm）（L*W*H）	MOC	Legend		Remarks
1	Module (with accessories)	571×45×****	PVDF	1. 	2. 	Height of module depends on model
2	Flat Seal	D38×φ27×3.0	Nitrile rubber			Already mounted on the membrane module
3	O-Ring	D28×φ4	Silicon rubber	3 	4 	Already mounted on the membrane module
4	Module Splint (type D) (4 module position & 5 bolt holes)	296x33x25	ABS			For Membrane Module Fixing
5	Air Scouring Box/aeration module	180×30×30	ABS	5. 	6. 	
6	Module Splint (type B) 2 module position & 3 bolt holes)	150x33x25	ABS			For Air Scouring Box Fixing
7	Hex Bolt, Nut, Flat Washer, Lock Washer	M8×90	SS304/SS316			For splint and Air Scouring Box
8	Hex Bolt, Nut, (2) Flat Washer, Lock Washer	M12×60	SS304/SS316			For skid
9	Hex Bolt, Nut, (2) Flat Washer, Lock Washer	M12×80	SS304/SS316			For spreader
10	Skid		SS304/SS316			

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The tools required when assembling the membrane device are shown in Table 2.

Table 2 : List of Tools

paper cutter	Scissors	Open-end and Flat Wrenches	Adjustable Wrenches
			
Rubber Mallet	**Ladder**	**mobile scaffolding**	**spirit level**
			
Thread Locker			
			

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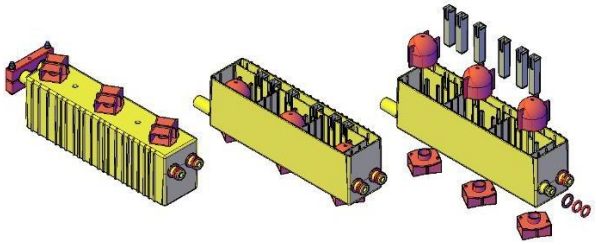
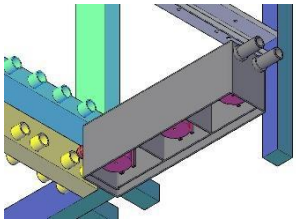
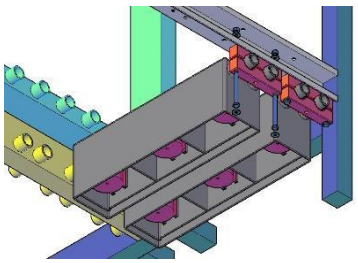
Air Box Installation (where applicable)

The installation procedure of the air box is as shown in Table 3.

Table 3 : Air Box Installation Process Table

Process	Figure	Notes
1		**Air box inspection:** Check whether the flat washer and O-ring on the air box are installed in place; Check whether the internal plug-in and water sealing box have been bonded well.
2		**Air box insert:** Insert the air inlet end of the air box parallel to the joint of the air pipe and insert evenly with a rubber hammer. Water can be applied to the sealing ring of the air box to lubricate it, if needed. The other end of the air box must be temporarily lifted before the splint is attached. Do not leave the other end in a suspended state, which will result in breaking the air inlet of the aeration box.
3		**Air box fixed:** Use a two-position splint to fix the air box, and use a wrench to tighten the bolts, being careful not to overtighten, which may cause the splint to be significantly deformed. Bolts to be tightened properly with flat and spring washers. Below are options generally used to seal bolts. Option 1 - The bolts should be coated with thread lock compound. Option 2 – Self-Locking bolts can be used to prevent loosening and will be in client scope. Each bolt is equipped with two flat washers, one spring washer and one nut. Each aeration box is required to be installed horizontally and at the same height.

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Membrane Module Installation

The membrane module installation procedures are shown below.

Table 4 : Membrane Module Installation Process Table

Process	Figure	Notes
1	 	**Open the outer carton:** Use scissors or a paper cutter to cut the tape and open the outer carton. Be careful not to scratch the membrane fiber. Then open the carton of the membrane module.
2	 	**Take out the membrane module:** After opening the outer carton, lay the membrane module flat on a flat workbench. Use scissors or a paper cutter to open the plastic packaging bag from one end of the membrane module. **Note:** When using a knife, it is required to cut at the membrane water collecting pipe end. It is strictly prohibited to use sharp tools such as knives near to the membrane fibers, which may cause membrane fiber damage.
3	 	**Check the accessories:** Open and remove the plastic wrap (one person holds the collection pipe while the other person removes the plastic wrap). Check the number of seals on the filtrate outlet, it should include membrane modules, O-rings, flat seals.
4	 	**Transporting membrane components:** When transporting the membrane modules, two people should hold both ends of the membrane module and let the membrane fibers hang down naturally. **Note:** Do not tighten or touch the membrane fiber.

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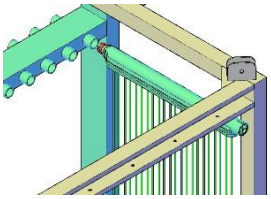
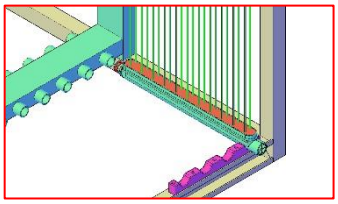
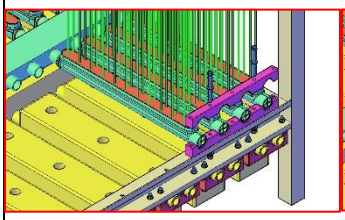
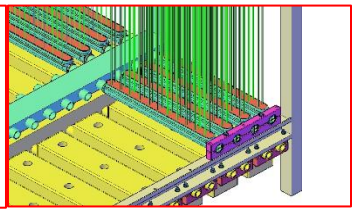
Process	Figure	Notes
5	  	**Insert membrane module:** Insert the filtrate outlets at the upper and lower ends into the water collecting pipe interface of the membrane skid respectively. (Insert the upper interface first, then the lower interface.) The upper water collection pipe of the membrane module must be temporarily lifted before being fixed by the splint. It cannot be left in a suspended state to avoid breaking the outlet of the membrane module. Note: Do not tighten or touch the membrane fiber. Add water to the opening of the tube to lubricate it for assembly and rotate it for insertion.
6	     	**Fixed membrane modules:** Straighten the membrane module, then tap one end of the membrane module with a rubber mallet to insert it into place, and finally tighten the splint with bolts. Bolts to be tightened properly with proper flat and spring washers. Below are options generally used to seal bolts. Option 1 - The bolts should be coated with thread lock compound. Option 2 – Self-Locking bolts can be used to prevent loosening and will be in client scope. Each bolt is equipped with two flat washers, one spring washer and one nut. **Notice:** When tightening the bolts, be careful not to over-tighten the bolts, which may deform the splint or break the water collection box of the membrane module.

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Repeat steps 1-6 until all the modules are installed in the skid.
Note the module serial number engraved on the module pipe & location of the modules in the skid.

On-site Assembly of Membrane Skids

⚠ **CAUTION**: Only qualified personnel should operate machinery required to lift skids into the membrane tank.

⚠ **CAUTION**: Use Personal Protective Equipment (PPE), including but not limited to a hard hat, safety vest, etc.

Double-layer membrane skids are divided into integrated and split types. The upper and lower layers of the integrated double-layer membrane skid are connected together and do not require on-site assembly. The upper and lower layers of the split double-layer membrane skid are separated during transportation and then assembled on site.

Site Requirements

A spacious site must be prepared for the assembly of the double-layer membrane skid, with sufficient space around the membrane skid to set up an operating platform. The ground of the venue should be flat and solid.

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Membrane Skid Assembly Materials and Tools

The materials required for membrane skid assembly are shown in Table 5.

Table 5 : Materials Required for Membrane Skid

S/N	Item	Spec (mm) (L*W*H)	MOC	Legend		Remarks
1	Pipe gasket	Refer to drawings or BOM	ABS	1 	2 	On-site procurement and installation
2	Male straight joint		UPVC			
3	Straight pipe		UPVC	3 	4 	
4	Elbow		UPVC			
5	Flange		UPVC	5 	6 	
6	Gasket		Nitrile rubber			
7	DN100 pipe		UPVC	7 	8 	
8	DN100 elbow		UPVC			
9	DN100 tee		UPVC	9 	10 	
10	DN80-100 core filling		UPVC			
11	Hexagon bolt set	M12×60	SS304/SS316	11-13 		Connect the upper and lower skid
12	Hexagon bolt set	M12×80	SS304/SS316			For lifting lugs
13	Hexagon bolt set	M16×80	SS304/SS316			For flange
14	Pipe connector	Refer to drawings or BOM	SS304	14 		

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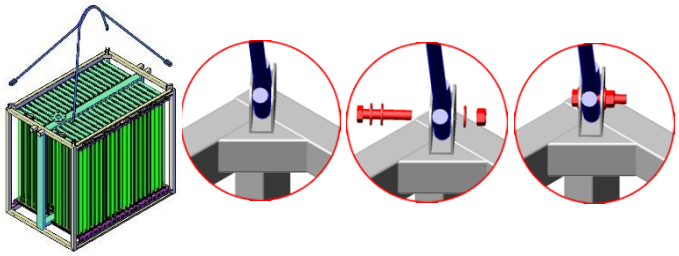
The tools required for membrane skid assembly are shown in Table 6.

Table 6 : Membrane Skid Assembly Tool List

Ladder or platform	Adjustable wrench	Socket wrench	Cutter
			
Sandpaper	**Rag**	**PVC glue (PVC711)**	**Crane**
			

Membrane Skid Assembly Steps

Table 7 : Membrane Skid Assembly Steps

1		**Spreader installation:** Place the lifting sling in the four lifting lugs of the upper membrane skid and fix it with M12×60 bolts. 1 bolt with 1 nut, 2 flat washers and 1 spring washer, a total of four sets. Bolts to be tightened properly with proper flat and spring washers. Below are options generally used to seal bolts. Option 1 - The bolts should be coated with thread lock compound. Option 2 – Self-locking bolts can be used to prevent loosening and will be in client scope.

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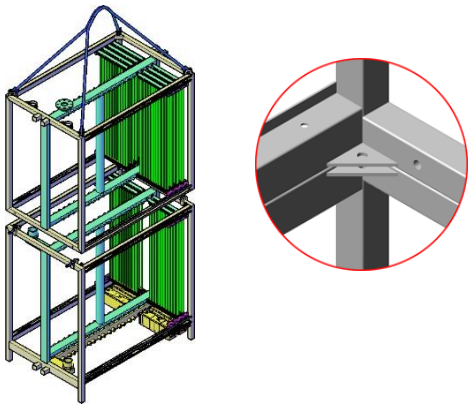
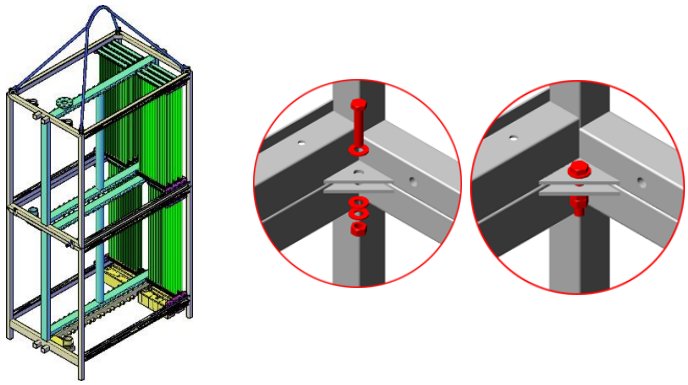
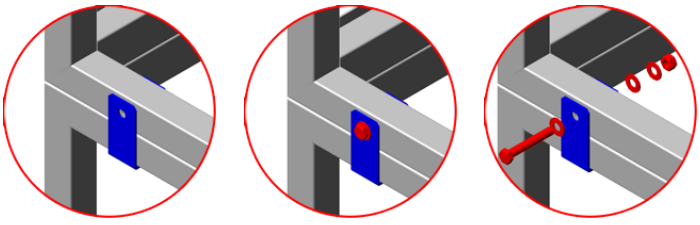
2		**Alignment of upper and lower membrane skid:** Before aligning the upper and lower membrane skids, first check whether the numbers of the upper and lower membrane skids correspond. Use a crane to place the upper membrane skids on the lower membrane skids and align the holes. At this time, be careful not to touch the DN100 male straight joint on the lower membrane skids directly and protect the membrane.
3		**Fix the upper and lower membrane skid 1:** Use M12×60 bolts to fasten the membrane skid through the fixing pieces of the upper and lower membrane skid. 1 bolt with 1 nut, 2 flat washers and 1 spring washer, 4 sets in total. Bolts to be tightened properly with proper flat and spring washers. Below are options generally used to seal bolts. Option 1 - The bolts should be coated with thread lock compound. Option 2 – Self-locking bolts can be used to prevent loosening and will be in client scope.
4		**Fix the upper and lower film frames 2:** Put the lifting lugs into the lower membrane skid and use M12×80 bolts to pass through the holes of the lifting lugs and the upper membrane skid to fix it. 1 bolt with 1 nut, 2 flat washers and 1 spring washer, 4 sets in total. Bolts to be tightened properly with proper flat and spring washers. Below are options generally used to seal bolts. Option 1 - The bolts should be coated with thread lock compound. Option 2 – Self-locking bolts can be used to prevent loosening and will be in client scope.

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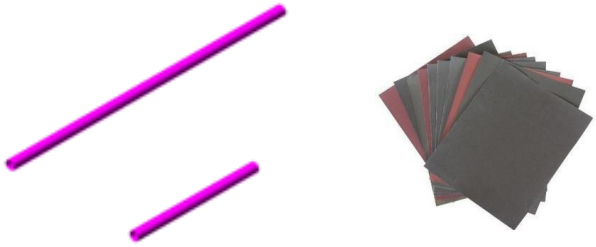
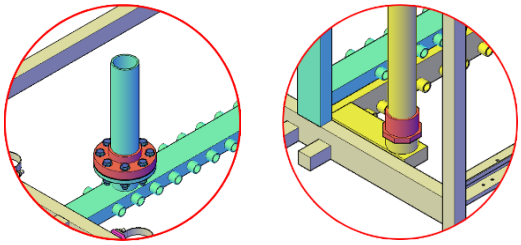
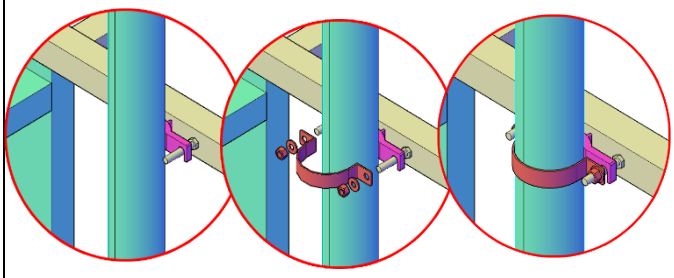
5		**Cut the pipe:** Use a cutting machine to cut the pipe to the appropriate length, and chamfer each end to facilitate assembly to the fittings.
6		**Grinding pipes:** Use sandpaper to polish the outer surfaces of both ends of the pipe to ensure a firm bond. The length is about 50-80MM.
7		**Pipe bonding:** Use PVC cement to directly bond the PVC pipe to the flange and male straight coupling. Wipe off excess glue with a rag. Do not touch the membrane fibers during this operation!
8		**Fixed pipe:** Install the pipe gasket. Use a wrench to secure the stainless steel pipe clamp with an M10 nut.

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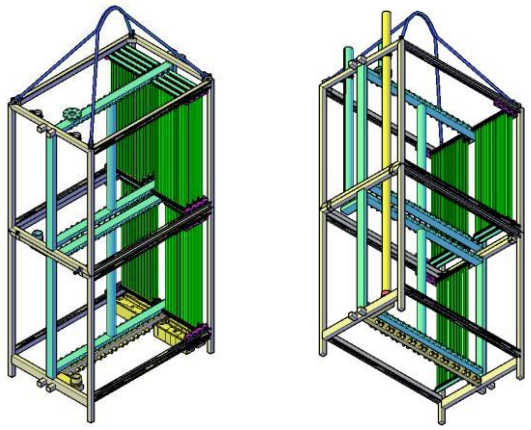
9		**Examine:** After the pipeline installation is completed, check the bolt assembly again, and finally use a crane to lift the membrane device into the membrane tank.

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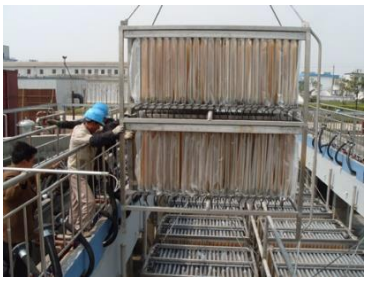
Membrane Skid Installation

Before installing the membrane skid, it is necessary to determine whether the conditions are met. The prerequisites for the installation of the membrane device include: the membrane tank has been cleaned, the anti-corrosion lining of the membrane tank has been completed, the leveling brackets and guide rails in the membrane tank have been installed, the filtrate pipes and air pipes in the membrane tank pipe gallery have been installed, and the front and rear gates of the membrane tank have been installed. After the installation is completed, there must be a clean water source that can enter the membrane tank for purposes of commissioning.

The membrane device installation steps are shown in Table 8.

Table 8 : Membrane Skid Installation Steps

S/N	Figure	Notes
1		**Move the membrane device into the membrane tank:** The outer packaging of the membrane device must be removed before being placed in the membrane tank. Use a forklift or crane to move the membrane device to a lifting position near the membrane tank. Use a crane to lift the membrane skid into the membrane tank along the guide rails. **Note:** Make sure the forklift does not touch the aeration box.
2	 	**Pipe connection:** After the membrane device is in place in the membrane tank, measure the length of the required connecting pipes, and then cut and connect them. **Notice:** Construction workers cannot step directly on the water collecting pipe of the membrane module. A hard plate can be placed above the membrane skid, and construction workers can step on the hard plate for construction purposes to prevent the membrane module from being stepped on. Do not carry out welding, metal cutting and other work in or above the membrane tank to avoid damage to the membrane fiber by flying sparks. If not preventable, the membrane within the scope of construction influence must be shielded and protected.

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3	 	**Membrane tank water filling:** After the membrane device connecting pipe is installed, any fallen debris in the membrane tank must be cleaned again. After cleaning, the membrane tank will be immediately filled with water. **Note:** After installation, keeping the membranes dry for an extended period may lead to irreversible loss of performance.

Guide Rail System (not supplied by LG Chem)

Guide rails make it possible to lift the MBR skid in and out of the MBR tank without draining the tank contents. Prior to removal of the skid it is necessary to:

1. Isolate the air supply line to the skid and disconnect the section of pipe connecting the air pipe to the skid.
2. Isolate the filtrate line of the skid from the filtrate manifold and disconnect the section of pipe/hose connecting the filtrate manifold to the skid.

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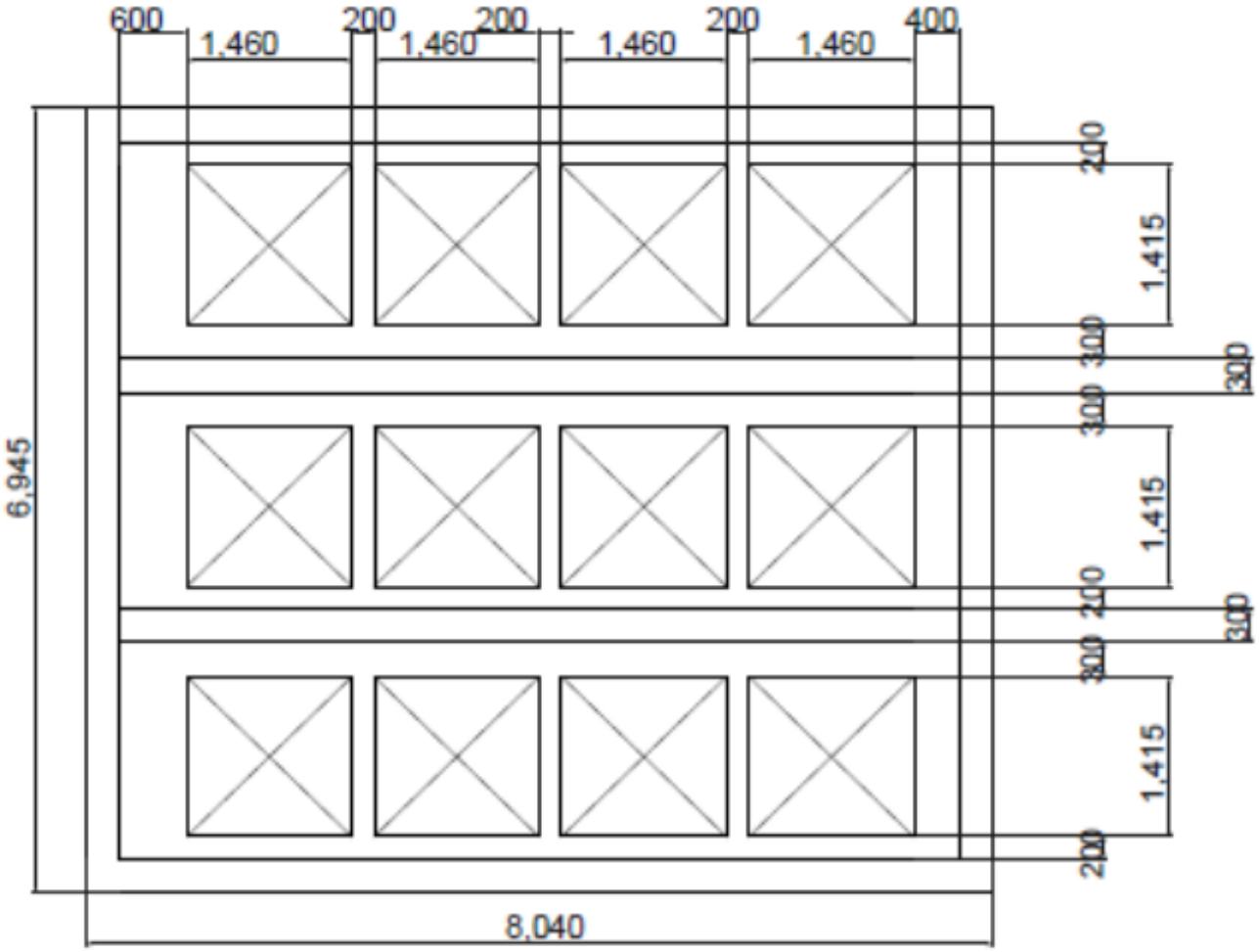
Skid to Wall Spacing Recommendations



System Integrity Testing

After the assembly of the membrane device is completed, gas tightness testing should be carried out to check whether the installation of the membrane module is tight and whether the membrane module is complete. The testing process is shown in TSB 806.