



CHIEF EXECUTIVE APPROVAL 25/2015
Plumbing and Drainage Act 2002, part 5.

Approval

1. The **Magnesium Domestic Membrane System (DMS 15 EP)** ("the system") described in the Specifications and Drawings in the attached Schedule and manufactured by **Taylex Industries Pty Ltd** (ABN 35 113 453 091) ("the manufacturer") and supplied by **Magnesium Tech Pty Ltd** (ABN 25 098 336 399) ("the supplier") has been assessed in accordance with the Queensland Plumbing and Wastewater Code (QPW Code) dated 15 January 2013.
2. Approval is granted for the advanced secondary quality wastewater treatment system with nutrient reduction, subject to compliance by the manufacturer/supplier with the requirements of the *Plumbing and Drainage Act 2002*, part 5 and the conditions of approval detailed below.
3. This approval, the conditions of approval and the Schedule comprise the entire Chief Executive Approval document.
4. Any modification by the manufacturer/supplier to the design, drawings or specifications scheduled to this approval must be approved by the Chief Executive.

Conditions of approval

5. The manufacture, installation, operation, service and maintenance of the systems must be in conformity with the conditions of this Chief Executive Approval.
6. The advanced secondary quality wastewater treatment system with nutrient reduction, which is an example of the approved systems, may only be used on premises that generate per day:
 - (a) a maximum hydraulic loading of 2,250 litres; and
 - (b) a maximum organic loading of 1000 grams BOD₅.
7. The system must continue to meet the requirements of an advanced secondary quality wastewater treatment system with nutrient reduction, producing the following effluent quality:
 - (a) 90% of the samples taken must have a BOD₅ less than or equal to 10 g/m³ with no sample greater than 20 g/m³.
 - (b) 90% of the samples taken must have total suspended solids less than or equal to 10g/m³ with no sample greater than 20g/m³.
 - (c) 90% of the samples taken must have a thermotolerant coliform count not exceeding 10 organisms per 100 mL with no sample exceeding 200 organisms per 100 mL.
8. The manufacturer has included nitrogen and phosphorus reduction in the treatment process, the effluent compliance criteria must continue to meet, in addition to the above, the following nutrient criteria:
 - (a) 90% of the samples taken, with 95% confidence limits shall have a total nitrogen concentration less than or equal to 10mg/L; and

(b) 90% of the samples taken, with 95% confidence limits shall have a total phosphorus concentration less than or equal to 0.5mg/L.

9. Each system must be serviced in accordance with the details supplied in the owner's service and maintenance manuals.
10. Each system must be supplied with —
 - (a) a copy of this Chief Executive Approval document;
 - (b) details of the system;
 - (c) instructions for authorised persons for its installation;
 - (d) a copy of the owner's manual to be given to the owner at the time of installation; and
 - (e) detailed instructions for authorised service personal for its operation and maintenance.
11. This approval does not extend, apply to, or include the land application system used in conjunction with an approved system installed on premises.
12. The Chief Executive may, by written notice, cancel this approval if the manufacturer/supplier fails —to comply with one or more of the conditions of approval; or within 30 days, to remedy a breach, for which a written notice been given by the Chief Executive.
13. At each anniversary of the Chief Executive Approval date, the supplier must submit to the Chief Executive a list of all systems installed in Queensland during the previous 12 months. Where the Chief Executive is notified of any system failures the Chief Executive may randomly select a number of installed systems for audit. The Chief Executive will notify the supplier's nominated NATA accredited laboratory which systems are to be audited for BOD5 and TSS. The sampling and testing of the selected systems, if required, is to be done at the supplier's expense. The following results must be reported to the Chief Executive;
 - (a) Address of premises;
 - (b) Date inspected and sampled;
 - (c) Sample identification number;
 - (d) BODs for influent and effluent; and
 - (e) TSS for influent and effluent.
14. This approval may only be assigned with the prior written consent of the Chief Executive.
15. This approval expires on 11 September 2020 unless cancelled earlier in accordance with paragraph 11 above.



Lindsay Walker
Director
Plumbing, Drainage and Special Projects
Date approved: 11 September 2015

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CHIEF EXECUTIVE APPROVAL No. 25/2015
Plumbing and Drainage Act 2002, part 5, division 1, section 93

SCHEDULE

Attachment 1

Specifications for the
Magnesium Domestic Membrane System (DMS 15 EP)

Department of Housing and Public Works	
Chief Executive Approval	
Approval No:	<u>25/2015</u>
Date of Issue:	<u>11/9/15</u>
Delegate Signature:	<u>[Signature]</u>
Building Codes Queensland	

GENERAL DESCRIPTION

The Magnesium D.M S (Domestic Membrane System) is a single tank, aerated wastewater treatment system, which utilises the fundamental principles of septic pre treatment, biological treatment through activated sludge and enhanced mechanical treatment via ultra filtration or membrane separation.

The design specifications of the Magnesium D.M.S are in accordance with the domestic wastewater treatment requirements of 10EP. The modular design and connection of the Siclaro (or equivalent) membrane module, allows for very high versatility in application and loading capacities.

DESIGN CAPACITY AND LOADING

Design Flows

(in accordance with AS/NZS 1546.3:2008)

- (a) A minimum daily flow of 150 litres per person
- (b) Average daily bod5 – 70 grams per person
- (c) Average daily total suspended solids – 70 grams per person
- (d) Average daily total nitrogen – 15 grams per person
- (e) Average daily total phosphorous – 2.5 grams per person

MAXIMUM DESIGN LOADING

- (a) A maximum daily flow of 2,250 litres per day
- (b) Maximum organic load of 1,000 grams per day bod5

EFFLUENT COMPLIANCE CRITERIA

(in accordance with AS/NZS 1546.3:2008 and AS/NZS 1547:2000)

1. Biological Oxygen demand (BOD5) \leq 10 mg/L
2. Suspended solids (SS) \leq 10 mg/L
3. Thermo tolerant Coli forms (TC) \leq 10 Organisms per 100 ml
4. Total Nitrogen (TN) \leq 10 mg/L
5. Total Phosphorous (TP) \leq 5 mg/L

COMPONENT LIST AND SPECIFICATIONS

1. Primary Tank
2. Membrane Filter
3. Membrane Module
4. Filtrate Pump
5. Air Compressor
6. Irrigation Pump
7. Sludge Recirculation System
8. Control Module
9. Cover Box
10. Alarm System
11. UV Light

Department of Housing and Public Works	
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1. Tank

Material: Pre-cast reinforced concrete or polyethylene in accordance with AS/NZS1546.3
Height: 2350mm
Diameter: 2450mm
Approx Volume (T): 8100L

2. Membrane Filter

Material: Polypropylene structure / organic polymer membrane fabric
Effective surface filter area: 6.2m²
Height: 510mm
Length: 310mm
Width: 210mm
Weight: 4kg
Mean Pore Diameter: 0.000035mm or 35nm (Ultrafiltration)

For the siClaro or equivalent filter synthetic, polymeric flat membranes with a cut point of 35nm from the ultra filtration field are used. Therefore all particles bigger than the membrane pore size are held back. The siClaro or equivalent ultra-filtration membrane constitutes an absolute barrier for bacteria and large viruses.

The filtration proceeds from the outside-in. The biologically purified wastewater (the filtrate) is transported across the membranes under pressure.

Through a drainage system, the filtrate is carried and exhausted to a collective duct. The single membrane plates are connected together non-detachably to filter modules with a central permeate exhaust.

The 6mm space between the plates and the constructional design effectively prevent any clogging in the module.

The siClaro or equivalent can be made of one module or of two parallel and in several ranges consecutively and up to a maximum of 3 modules, in that way a maximum of 36 modules can be connected with a filter surface of 223.2m².

The membrane aerators generate a turbulent air-water-mixture which ascends transverse to the membrane surface. This streaming removes the accumulating particles from the membrane surface and thus prevents a formation of a filtration-inhibiting covering (air-scouring); this mode of operation is also called cross-flow-operation.

The membrane aerators incorporated in a tube are placed below, and connected to the filter module. Besides the supply of oxygen, the air is also used to clean the membrane surfaces thus allowing an optimum use of the aeration energy.

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3. Membrane Module

Type: siClaro or equivalent
Material: Stainless steel or Polyethylene
Height: 835mm
Length: 423mm
Width: 285mm
Weight: 14kg

The module includes the membrane filter, filtrate pump, filtrate line, air line and assembly. A plug-in stainless steel or polyethylene frame is used as with clamping strips, mounting base for filtrate pump, mounting material, and an angle bracket for filter guide.

4. Filtrate Pump

Material: Aluminium/Nylon
Capacity: ≤840 L/hr
Head: ≤ 2.2m
Motor Power: 12 Watt
Power Source: 230V / 50Hz AC
Height: 46mm
Length: 56mm
Width: 35mm

5. Air Compressor

Material: Alloy / Plastic
Capacity: 120L/ min
Pressure: 180 mbar
Motor Power: 140 Watt
Power Source: 230V / 50Hz AC
Length: 408mm
Width: 210mm
Height: 232mm

In addition to supplying the micro organisms in the bioreactor with oxygen, the air compressor is also used to effectively clean the membrane surfaces (air-scouring). The compressor also acts as the source of vertical friction used for the Venturi sludge recirculation system. The air compressor is controlled depending on the bioreactor filling level in accordance with parameterized on and off times.

Department of Housing and Public Works	
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Approval No:	<u>25/2015</u>
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6. Irrigation Pump

Capacity:	≤200L/min
Head:	9m max
Motor Power:	250 Watt
Power Source:	230V / 50Hz AC
Height:	370mm
Diameter:	225mm
Weight:	9kg

The irrigation pump is self controlled via a ball-bearing activated float switch. When the according volume is reached in the pump chamber, the ball bearing in the float moves and creates an active connection. The treated effluent is pumped to the approved dispersal zone, as the chamber reaches minimum volume, the float drops and de-activates the pump. The type and capacity of pump will be in accordance with land application requirements.

7. Sludge Recirculation System

Operation:	Air venturi or 230V Pump
Material:	PVC

This is a typical set up for the trans-location of fluids using "Venturi Principle". Air is injected toward the base of a vertical open ended PVC conduit. Continuous displacement occurs as the air moves vertically to the liquid, drawing liquid through the bottom of the conduit. The air/liquid mixture reaches a vertical maximum where it then moves through a 90° bend into the primary chamber. The conduit is arranged in the base of the MBR so that the residual sludge constitutes the main vacuum target.

8. Control Unit

Power Source:	230V / 50Hz AC
Digital Inputs:	8
Digital Outputs:	4
Programming:	In-situ / Remote (Optional modem connection)
Height:	90mm
Length:	55mm
Width:	72mm

Programmable control of submersible pumps, compressors, alarms, LCD display of functional operation of siClaro or equivalent MBR with optional mobile / modem connection allows for remote real-time control and adjustment, and malfunction alert. Active switching allows for sampling function of effluent, power failure indication and restoration, and circuit breaking protection. Also incorporates power saving function and alarm testing sequence.

Department of Housing and Public Works	
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Approval No:	<u>25/2015</u>
Date of Issue:	<u>4/9/15</u>
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9. Cover Box

Material: HD polyethylene
Height: 300mm
Length: 510mm
Width: 330mm

10. Alarm System

Material: PVC
Trigger: PLC/Sensor switch in tank
Activators: High water / Low water/ Low air
Visual: 4 x LED
Audible: Micro-buzzer ≤ 10dB
Height: 120mm
Length: 15mm
Width: 80mm

11. UV Light

The light bulbs shall:

- (a) Emit UV light in the range of 250 to 270nm to effectively inactivate micro-organisms.
- (b) Be replaced in accordance with the manufacturer's recommendations.
- (c) Not overheat the disinfection apparatus.
- (d) Have easy access for cleaning and maintenance.

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PROCESS FLOW

The system comprises a mechanical pre- treatment (separation of coarse matter and simultaneous sludge storage) and an activation stage with submerged sciClaro filter or equivalent.

The excess sludge that is produced is re-circulated through the primary stage. After membrane filtration the treated sewage is dispersed to spray or shallow sub-surface irrigation zones as determined by Council regulation and licensed / certified site and soil evaluation or hydraulic design.

The plant is controlled via a programmable logic controller (PLC).

DESCRIPTION OF THE PROCESS

The domestic waste water enters the mechanical pre-treatment through a waste water channel. The job of the mechanical treatment stage is to hold back the un-dissolved organic and inorganic sewage constituents through sedimentation (settling due to gravitation) and flotation (through buoyancy).

The mechanically cleaned sewage then flows into the membrane biology reactor via an overflow. The sciClaro or equivalent, filter module is located in this unit.

Micro-organisms do the actual cleaning work in the membrane bioreactor. They live on the high-energy organic sewage constituents. For this purpose they need alternating conditions with an oxygen supply and absence of oxygen. An air compressor introduces the air that is vital for the micro-organisms into the membrane bioreactor. Micro-bubble tube membrane aerators distribute the air and generate the turbulences that are necessary to keep the micro-organisms in suspension.

The tube membrane aerators are located in a blower foot and connected to the filter module. In addition to supplying oxygen the air is also used to clean the membrane surfaces, thus ensuring an optimum use of the energy. The varying ON / OFF cycle of the sciClaro or equivalent MBR accounts for the typical fluctuations in input (i.e. peak bathing / washing times in the household) and allows for economical membrane operation.

The ONN / OFF cycle of the aeration also contributes to the effective nitrification / de-nitrification processes necessary to achieve effluent quality parameters. The submerged ultra-filtration membranes separate the micro-organisms extremely efficiently from the biologically cleaned sewage and thus ensure the desired disinfection of the sewage.

The diameters of the membrane pores are chosen so that their average size is only one thirty five millionth of a millimetre (0.000035mm) In comparison, the diameter of enteric bacteria (E-coli) is around one thousandth of a millimetre (0.001mm) so that the sciClaro or equivalent membrane is an insurmountable obstacle for these bacteria.

Volumes of the MBR are maintained using liquid level sensors, these sensors work in co operation with the PLC module to correctly control processes. Sensors determine the activation of the aeration, filtrate pump and irrigation pump. They ensure that MBR central chamber does not recede (via filtrate pump-out) below the maximum height of the membrane unit so as to keep the fabric saturated. Also, the sensors ensure that alarms

are activated should the liquid level exceed maximum set level in any part of the tank.

Finally, the sensors and PLC maintain that aeration on / off occurs only within set liquid level and time phase parameters.

Once again, the extracted filtrate is transferred to the pump well for dispersal to the irrigation zone.

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CONTROL

The plant is controlled via a timer which has been parameterized in the factory. Faults are signalled both visually via the timer display and acoustically via an alarm mounted down on the system. The control system is equipped with a mains-independent power failure monitor function.

POWER SAVING MODE

The control system automatically switches over to the power saving mode if no sewage flows into the plant over a longer period (at night, holidays etc) In the power saving mode, the aeration time is reduced to the minimum necessary for supplying the micro-organisms with sufficient oxygen.

SLUDGE REMOVAL

Sludge deposit removal is to be scheduled 1 time per three years or as determined necessary by a licensed Priority Wastewater Systems technician or the client or due to mechanical failure.

SERVICING

Routine maintenance servicing of the siClaro or equivalent MBR is to be scheduled a minimum of twice yearly or as determined necessary by an approved Magnesium Tech technician or due to mechanical failure. Refer to Field Service Report sheet for testing requirements.

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SCHEDULE

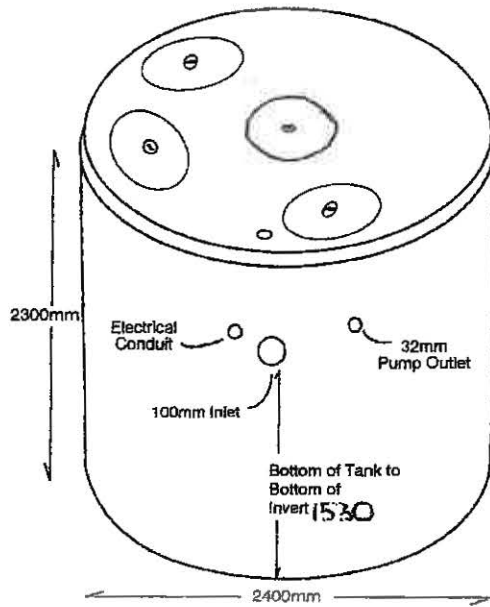
Attachment 2

Drawings for the

Magnesium Domestic Membrane System (DMS 15 EP)

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EXCAVATION DETAILS

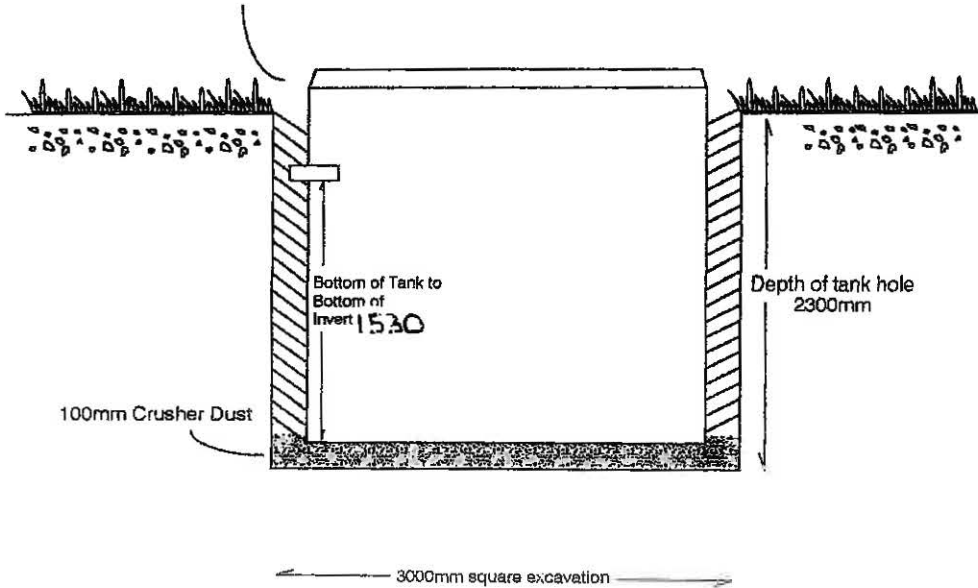


ELECTRICIAN
 Separate 10Amp Circuit Breaker
 NOT Hooked into Earth Leakage

TRUCK ACCESS
 Unloading of tank via back of truck
 NOT SIDE.
 Ensure BACK of truck has a clear level
 6m wide access to edge of hole

1. Dig Hole 3000mm square
2300mm deep
2. Ensure 1/60 fall in inlet pipe to tank
3. Cover base of hole with 100mm
crusher dust ensuring finished surface
is perfectly level
4. Ensure top of crusher dust to bottom
of invert is 1830mm
5. Back fill with soil/sand NOT ROCK
6. To prevent flotation, fill with 5000lt water
immediately through centre hole

Top of tank to be a Minimum
 of 100mm above landscaped ground level



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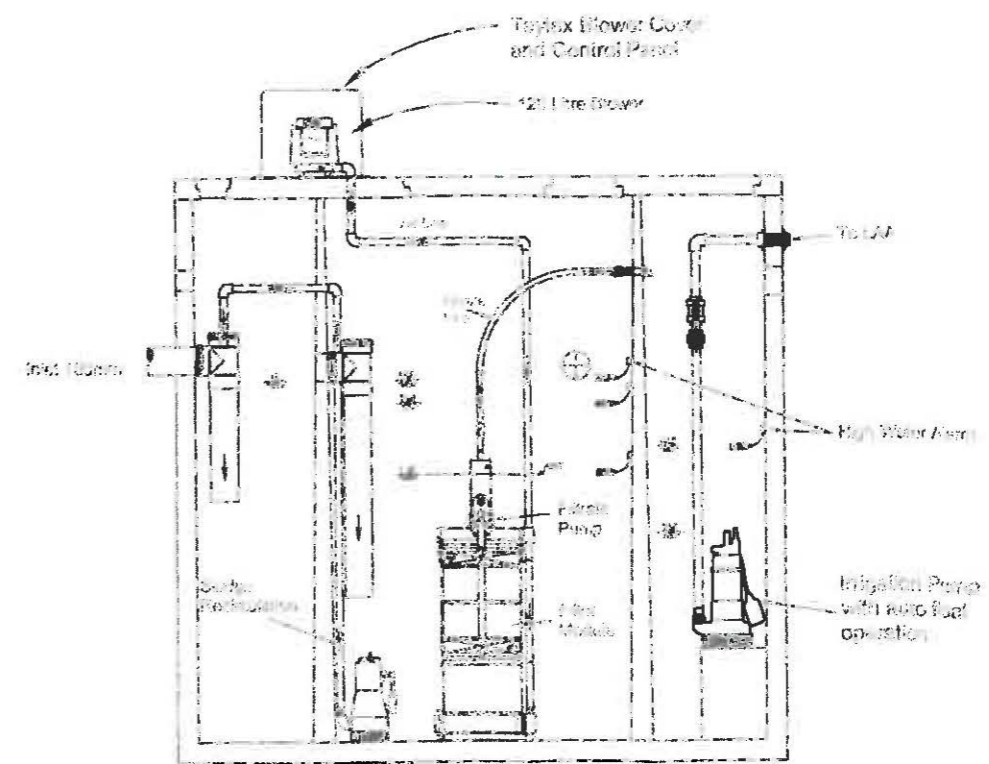
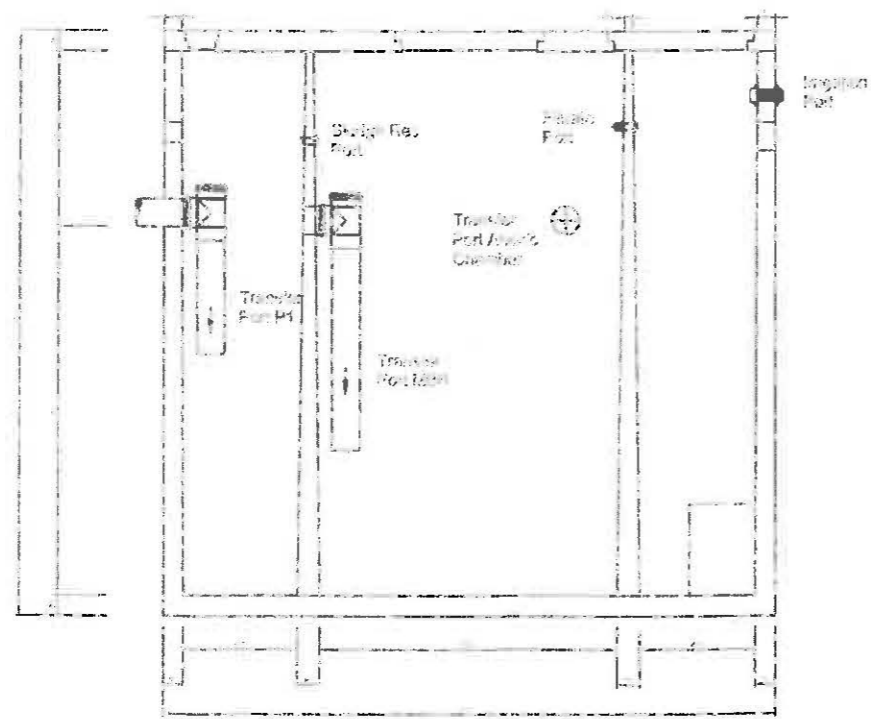
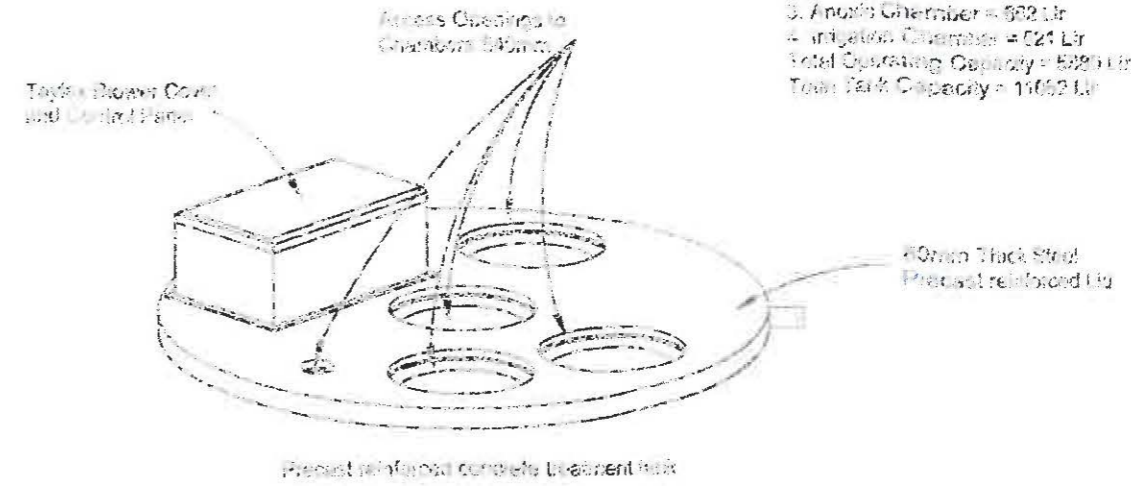
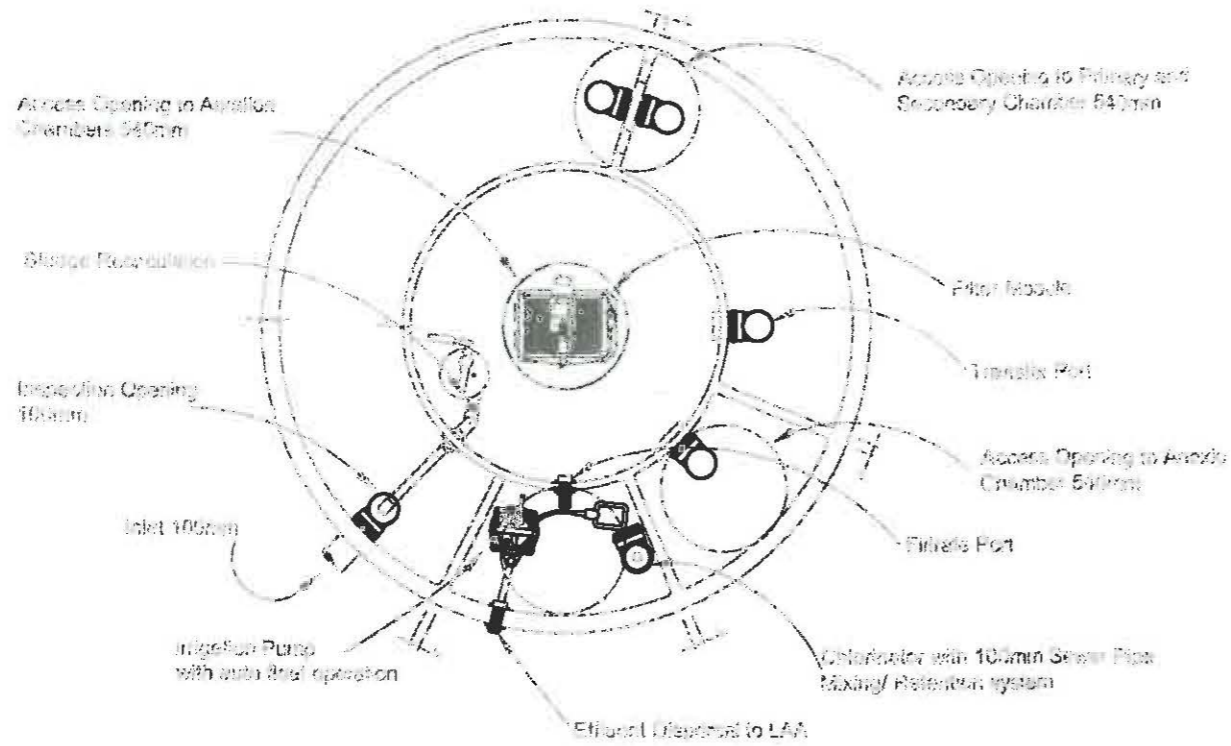
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Date of Issue: 11/9/15

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- 1. Boundary - Pre Treatment Chamber = 842 Ltr
- 2. MBR Chamber = 2071 Ltr
- 3. Anoxic Chamber = 932 Ltr
- 4. Irrigation Chamber = 421 Ltr
- Total Operating Capacity = 5266 Ltr
- Total Tank Capacity = 10652 Ltr



PROJECT - Domestic Membrane System (DMS)

MAGNESIUM TECH PTY LTD

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DRAWN	V. GH	TITLE	SCHMATIC/SECTIONAL VIEW	DRAWING No.	A3/01
DESIGN	V. GH		DMS		
SCALE	1:1		DOMESTIC MEMBRANE SYSTEM		
DATE	01-09-2015				