

BALMORAL TANKS

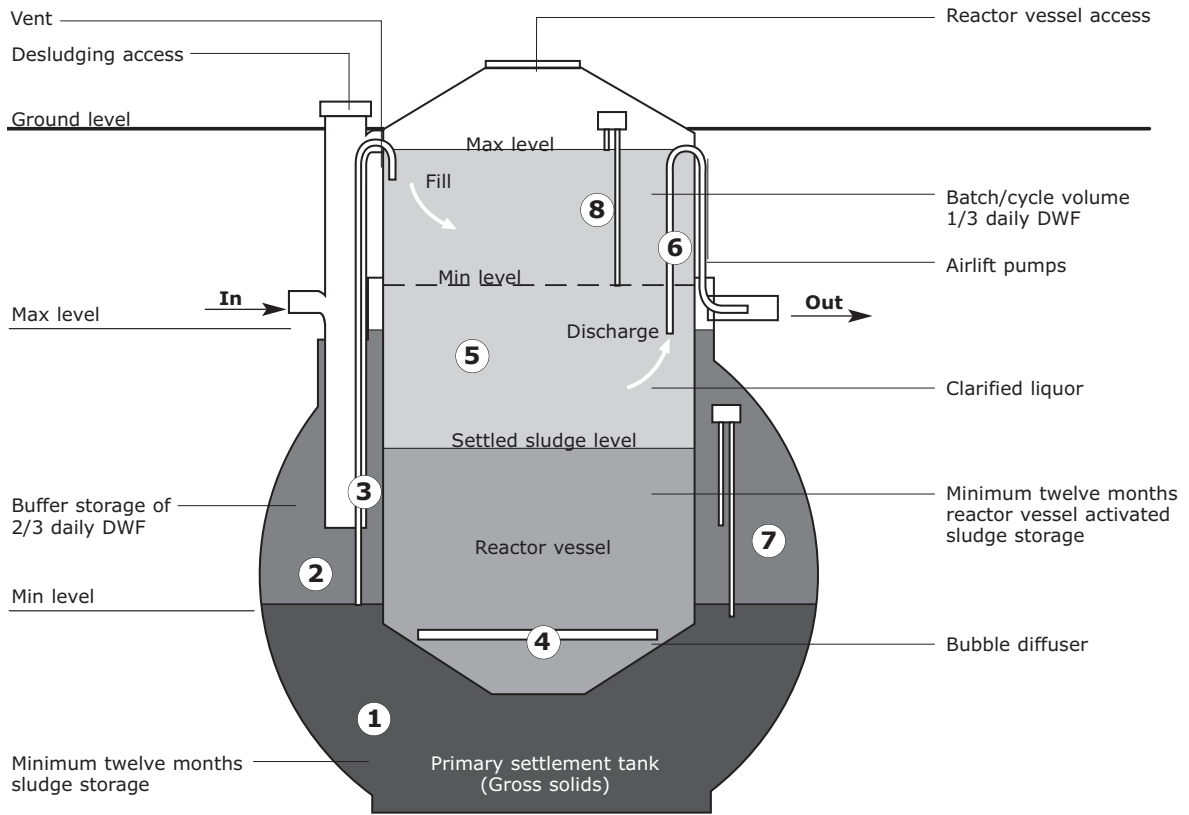
Installation and operating instructions

Sequential Batch Reactor (SBR) sewage treatment plant



Figure 1 - SBR diagram

General layout - SBR6 and SBR12



- 1 Primary settlement tank
- 2 Buffer storage vessel
- 3 Airlift pump (fill)
- 4 Bubble diffuser
- 5 Clarified/settled effluent
- 6 Airlift pump (discharge)
- 7 Sensor 1
- 8 Sensor 2

- Gross solids
- Settled liquor (Buffer storage)
- Activated sludge (Bottom 1/3 of reactor vessel)
- Batch/cycle volume (Top 1/3 of reactor vessel)
- Clarified liquor (Final effluent)

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Applications/uses

A biological sewage treatment plant is designed to provide full treatment to crude sewage produced in a normal domestic environment.

These units are normally installed in situations where there is no public sewer and where a simple septic tank is not environmentally acceptable.

For instance:

- Where soil conditions are unsuitable for a septic tank and soakaway system
- Where the size and cost of a septic tank soakaway becomes prohibitive
- Where there is no ground available for a soakaway, ie, water course discharge
- Where a higher quality of effluent is required to meet pollution control authority requirements
- Where the population served is too large for a soakaway system

Each installation should be carefully surveyed by the installer and individually sized so that it has adequate capacity to treat the largest possible population, taking into account maximum peak loadings. Sizings should be performed using the British Water 'Flows and Loads' document.

The Balmoral Sequential Batch Reactor (SBR) treats the effluent to a very high standard (normally to 15mg/litre suspended solids and 10mg/litre BOD) which is then suitable for discharging directly into a watercourse, although in all cases advice should be sought from the Environmental Agency (EA - England and Wales), the Scottish Environment Protection Agency (SEPA - Scotland) or the appropriate authority.

Process description (Figure 1)

The Balmoral SBR uses the activated sludge biological treatment method. This process has been refined and developed by Balmoral in conjunction with The University of Abertay Dundee - Waste Water Technology Centre, who carried out extensive field trials. Extensive R&D has shown that the Balmoral SBR produces a consistently high quality of effluent even when subjected to extreme variations of loading and influent conditions.

There are three stages to the treatment process. These are:

- The Primary Settlement - Where the crude sewage settles and is partially broken down by anaerobic bacteria
- The Biological Stage - Where the liquor from the primary settlement stage is broken down further by the more active aerobic bacteria
- The Final Settlement - Where the light "humus" is allowed to settle out leaving only the clear "effluent" to pass out into the drain

Crude sewage flows through the inlet drain into the primary settlement tank (1) where gross solids are allowed to settle out. One batch, approximately one third of the volume of the daily flow, is then transferred by airlift pump (3) into the reactor vessel for treatment. Buffer storage volume (2) is always available within the primary settlement tank to cope with any shock loadings and peak surges.

When the reactor vessel is filled, the air supply from the compressor is diverted to the air bubble diffuser (4) at the bottom of the reactor vessel where aeration and mixing continues for four hours.

During this biological process the air (oxygen) bubbles nourish the natural bacteria which feed on the organic matter in the sewage liquor.

After the aeration phase there is a two hour settlement period which allows the bacteria, which have now consumed most of the organic pollution, to sink to the bottom of the reactor vessel leaving the clarified effluent behind.

The clarified effluent (5) is then discharged into the outlet drain by diverting the air supply to a second airlift pump (6). The cycle then starts at the beginning again.

The 6 and 12 person Balmoral SBR units (SBR 6 and SBR 12) are combined into one tank making them compact and easy to install. See figures 1 and 3.

The larger 18, 24, 36 and 48 population units are modular in construction having a separate primary settlement tank and reactor vessel (see Appendix 1).

Note: Refer to do's and don'ts guide for correct use of the system.

Holiday mode

If no sewage enters the primary settlement tank in the time taken to complete a cycle – when the sensor in the primary settlement tank does not detect any flow – the unit alternately switches between two hours aeration followed by a two hour settlement period. This cycle continues until the sensor in the primary settlement tank detects sufficient volume to supply one batch at which time it will revert to the normal fill, aerate and discharge cycles.

Holiday mode is designed to keep the bacteria as healthy as possible under zero flow conditions while ensuring the compressor is not running needlessly and wasting energy.

Some of the unique features and advantages of the Balmoral design are:

- Very high quality of final effluent
- Ability to balance out extreme fluctuations in flow loadings and produce consistent effluent quality
- Mechanically reliable - no moving parts within unit
- Very safe - no electric motors or pumps within unit
- Low maintenance costs - all functions operated by an air compressor

- Robust polyethylene moulded body with high impact resistance for ease of installation and long term durability
- Lower sludge generation and longer desludging intervals

SBR construction

The Balmoral SBR is rotationally moulded in one-piece from an advanced high density polyethylene material, which offers exceptional durability and impact resistance.

The air compressor unit is an oil free diaphragm (6 and 12 pop) or a rotary vane type (18 pop upwards). The electronic controller uses the latest solid state technology and is pre-programmed to the required cycle times.

The only parts which require maintenance are:

- Air filter on compressor
- Rotary vanes on compressor
- Solenoid valve actuators
- Air bubble diffuser
- Level sensors

To ensure that your SBR continues to operate at optimum levels, it is a condition of the plant warranty that it is commissioned and maintained by Balmoral engineers and should be desludged at the frequency given in table 1 below.

Table 1 – Treatment plant data chart

Model	Pop. served	Max. drain inlet invert depth (mm)	Head loss through unit (mm)	Tank dimensions		Nominal tank volume		Max. desludging interval (months)	Maintenance service visit (months)
				Primary settlement (mm)	Reactor vessel (mm)	Primary settlement (litres)	Reactor vessel (litres)		
SBR6	6	1000	30	Ø2060	N/A	2120	2000	12	12
SBR12	12	1000	30	Ø2380	N/A	4300	3600	12	12
SBR18	18	1000	80	Ø2380	Ø2380	6000	6000	12	6
SBR24	24	1000	80	Ø2380	Ø2380	6000	6000	6	6
SBR36	36	1000	80	Ø2250 x 2950 long	Ø2380	8000	6000	6	6
SBR48	48	1000	80	Ø2250 x 2950 long	Ø2250 x 2950 long	8000	8000	6	6

Note: It is recommended that the air filter for the SBR 6 and 12 is checked and cleaned every six months

Control/compressor kiosk

All the functions within the tanks, ie, level sensors, airlift pumps, bubble diffuser and timing, etc, are controlled by a solid state Programmable Logic Controller (PLC) and electrically operated solenoid valves within the control kiosk. The air supply is generated either by a diaphragm type or an oil free rotary vane compressor depending on the model.

The waterproof moulded polyester resin kiosk is mounted on a pre-cast concrete base which ensures rigid, vibration free operation and allows rapid site installation. Sound insulation foam is fitted to all internal surfaces of the kiosk.

The compressor and the level sensor relays are fully protected by overload circuit breakers.

The kiosks are provided with low level ventilation grills and large models are fitted with cooling fans to prevent overheating in warm weather.

The kiosk door can only be opened when the isolating switch is at the "off" position (marked "O"). The door is fitted with twin barrel locks for maximum security and safety.

All components within the kiosk are designed to operate continuously between service intervals with no attention or maintenance once successfully commissioned by Balmoral engineers.

There are three warning lights on the front of the control kiosk door which provide information on the status of the plant.

Plant selection Unit sizing/specification

The Balmoral SBR sewage treatment plant is manufactured in a range of sizes from 6 to 48 persons (ie, population equivalent) based on a daily flow of 200 litres and a BOD load of 60 grams per day per person.

It should be noted, however, that this load is for domestic house residents only and that treatment plant for commercial premises (eg, hotels and

nursing homes) must be sized individually for each installation.

A detailed Balmoral "Loadings Sheet" must be completed by the customer or Balmoral staff before the correct size of unit can be specified.

Drain invert depths

The Balmoral SBR range is built to cater for a drain invert depth of approximately 1m deep.

Siting

BS6297 states that sewage treatment works serving more than one building should be situated a minimum of 25m from any habitable buildings and as far away as possible. Some local authorities will permit them to be installed considerably closer for single house installations, however this may vary from area to area. Balmoral recommends a minimum distance of 15m for single houses.

The direction of the prevailing wind should also be taken into account when considering the siting of the tank as there may be some odour when the sewage treatment plant is being desludged or during maintenance. The tank should not be situated close to a driveway, roadway, or anywhere there is a risk of it being subjected to additional superimposed loads. Approval for the tank position should always be sought from the controlling authority at an early stage.

Good access to within approximately 30m must be provided for the sludge emptying tanker.

Ensure that there is room on the site to allow an excavator to operate, and for the removal of soil and delivery of concrete, gravel, etc.

Note: It is the end user's responsibility to ensure that water table/groundwater conditions do not result in water levels rising above the height of the outlet of the tank. Checks should be made before installation by the end user or installer on the local area history regarding water table levels.

Installation details

Storage before installation

Tanks should be set on a smooth level base and securely tied or propped to prevent them from overturning and causing damage or injury.

Handling and craneage during transportation/installation

The SBR should be handled using the lifting eyes provided, by crane or other suitable equipment (lift only when empty).

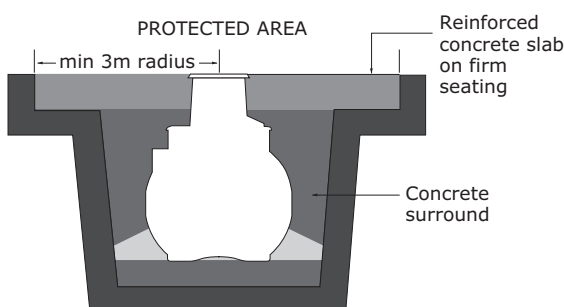
Carefully lift the plant and visually inspect all surfaces for damage prior to installation. If in doubt, please contact Balmoral Site Services

Superimposed loads/protected areas

No superimposed loads, such as vehicles, should be allowed within 3m of the tank unless a concrete surround or reinforced concrete slab, designed by a qualified civil/structural engineer, is in place so that no loads are transmitted directly onto the tank (See Figure 2). For deeper installations using turret extensions a full concrete backfill is required.

Note: If a reinforced concrete slab is not provided for vehicle superimposed loads then the area of the tank should be fenced off so that no vehicles can come within 3m of any tank.

Figure 2
Protected areas



Failure to follow the appropriate guidance may result in the plant warranty being withdrawn.

Tank installation

Dry ground conditions

A site is deemed as being "dry" when at no time does ground water rise above the base of the tank.

Excavation should allow for a minimum of 150mm space all round and 150mm below the tank.

Where difficult ground conditions are encountered, ie, in unstable ground or shrinking clay, etc, an additional depth of 250mm should be excavated to allow for hardcore and sand blinding which provides a firm base for the concrete bed.

Checks should be made before installation by the end user or installer on the local area history regarding water table levels. If in doubt, concrete backfill should be used. See 'Wet ground conditions'.

Installation procedure

- Place wet concrete (slump test 30mm, strength 25N/mm²) in base of excavation, grade and level to within 20mm. Lower tank carefully onto concrete and check tank is true and level

* Fill inner chamber with water until 50% full before filling outer chamber to the same level, ie, the water levels are at the same height. This prevents excessive pressure on inner chamber

- Place and consolidate additional concrete around the base of the tank - haunching up to support the lower section
- Continue to fill the RV and primary tanks with water whilst simultaneously backfilling around the tank with 12-15mm gravel in 150mm thick layers, ensuring the level of water in the tank is maintained at approximately 200mm higher than the level of backfill. This will maintain equal pressure inside and outside the tank and will prevent flotation during installation. When the tank is full of water continue to cover the tank with a 200mm layer of gravel backfill

- Finally, complete backfilling up to ground level with earth or reinforced ground slab as required

Gravel specification

Backfill material must be:

- Pea gravel or crushed aggregate of uniform particle size 12-15mm
- Chemically inert, washed clean and free of contaminants

* This stage refers only to the SBR6 and SBR12 which have an integral RV. All other sizes have separate primary settlement tanks and RV's.

Wet ground conditions

A site is deemed as "wet" when ground water rises above the base of the tank.

Excavation should allow for a minimum of 200mm space all round the tank and 150mm below the tank.

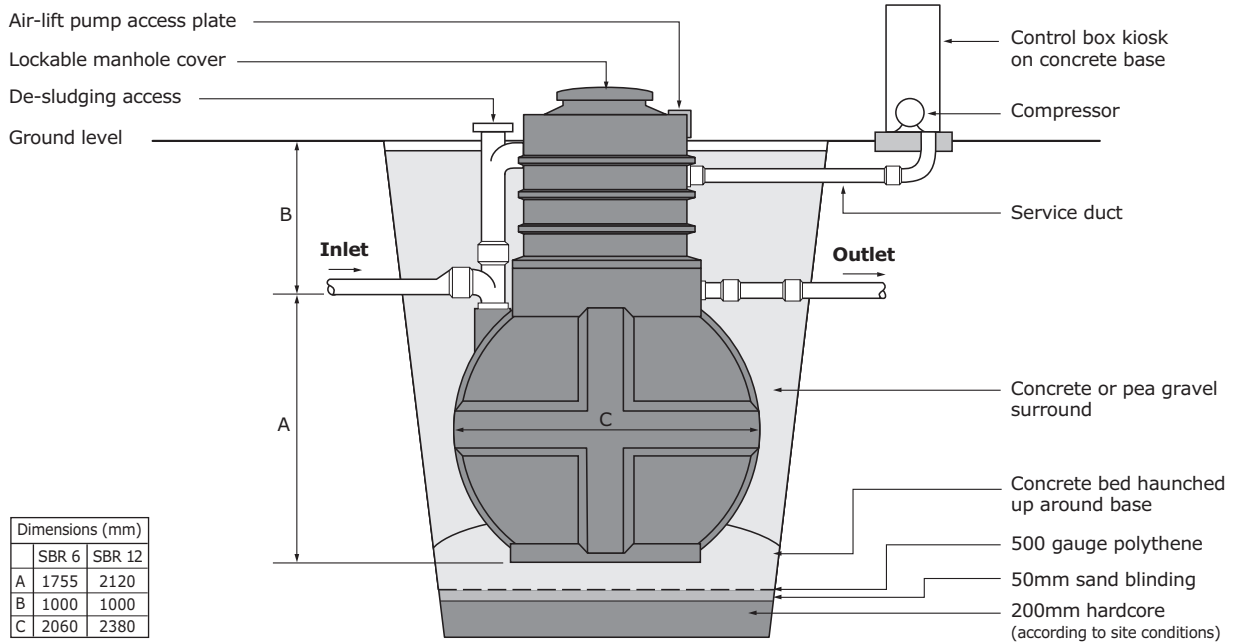
Where difficult ground conditions are encountered, ie, in unstable ground or shrinking clay, etc, additional excavation should take place, as deemed necessary by the supervising engineer, to allow for hardcore and sand blinding which provides a firm base for the concrete bed.

In poor soil conditions it is essential to make substantial provision for planking, strutting and temporary shuttering. Adequate pumps should be provided to keep the excavation free from ground water at all times during the course of the work. Provision should also be made for temporary covers and fencing around the excavation site to comply with statutory health & safety requirements.

Installation procedure

- Place wet concrete (slump test 30mm, strength 25N/mm²) in base of excavation, grade and level to within 20mm. Lower tank carefully onto concrete and check tank is true and level

Figure 3
Site installation diagram



Note: Failure to adhere strictly to the written installation instructions will render any warranty null and void.

* Fill inner chamber with water until 50% full before filling outer chamber to the same level, ie, the water levels are at the same height. This prevents excessive pressure on inner chamber

- Place and consolidate additional concrete carefully under tank. Thereafter, haunch concrete up and around the bottom third of of tank circumference.
- Continue to fill the RV and primary tank with water and carefully place concrete around the tank in 150mm thick layers, ensuring that there are no voids remaining around the tank, and that the level of water inside the tank is maintained at a level approximately 450mm higher than that of the concrete backfill.
- Do not use a vibrating poker.
- The neck can only be surrounded in concrete after the concrete around the tank has hardened (approx 24 hrs).

Continue to backfill up to ground level (or fit reinforced concrete slab) only after concrete around tank has been allowed to harden for 24 hours.

* This stage refers only to the SBR6 and SBR12 which have an integral RV. All other sizes have separate primary settlement tanks and RV's.

Ventilation

An air vent must be provided by the installer at the inlet drain to allow the system to freely vent and disperse odour. This should be achieved through the installation of a soil stack running to the top ridge of the dwelling - not venting at the tank.

A 110mm dia uPVC pipe connection is fitted in the access shaft to allow ventilation of the tank from all chambers to the inlet pipe work.

Alternatively, a remote vent may be installed in an appropriate location.

Installation of control kiosk

- Carefully select a site for the kiosk within 2m of the tank and within view of the SBR manhole lid. Ensure the kiosk is positioned free from flooding and there is suitable access for desludging, etc
- Be sure to leave a good paved working area in front of the kiosk
- Excavate a small trench approximately 450mm deep x 300mm wide from the airline outlet point on the SBR to the site of the kiosk, and lay a length of 110mm diameter uPVC drain in the trench (preferably on a gravel bed) inserting the end into the grommet provided at the SBR

Note: Thread a thin rope through the duct with which to pull through the air lines and sensor cables at a later stage.

- Fit a 90° bend at the kiosk end. Fit a short length of vertical pipe so that the ducting projects vertically up to finished ground level
- Lay a 100mm thick concrete sub-base to finish flush with ground level and set the kiosk on this over the service duct
- Check that the ventilators in each side of the kiosk are free from obstruction. Do not install any structure around the kiosk which will obstruct air flow to the ventilators

Connecting the plant and kiosk Electric power connection

The electrical supply cable should be taken through the service duct in the base of the kiosk or alternatively through the side of the kiosk using a watertight gland. The power supply is then connected into the door isolating switch. The power supply must have an isolating switch at the supply end of the cable.

All electrical work must be carried out by a qualified electrician.

Power requirement is a 240 volt single phase supply cable connected to an earth leakage circuit breaker at the origin of the circuit and rated to suit the appropriate compressor.

Continued...

6&12pop - running current 0.32amps - start up 1.6amps
 18+pop - running current 6.5amps - start up 27amps

Other connections

The only other connections required are the sensor cables which are already fitted to the tank. These are run inside the service duct and connected via two terminal plugs inside the kiosk. The plugs are 3 and 4 pin to avoid any confusion.

The airline pipes run inside the service duct and are connected to the bottom of the solenoids which are colour coded to match the pipes for ease of connection.

All connections will be checked at time of commissioning.

- Following installation of the kiosk, service duct(s) and airlines, the services duct(s) **MUST** be completely sealed with expanding foam. This is necessary to prevent fumes/gases from the plant, that are extremely corrosive, entering the kiosk and damaging the electrical and electronic equipment contained therein. The damage is immediate and permanent. Failure to completely seal the service duct(s) prior to the plant becoming operational may affect the tank warranty
- The kiosk is not designed to be immersed in water. Care must be taken when cleaning the area with water after installation

Disposal of effluent

Although the treated effluent from the SBR will in most cases discharge directly into a watercourse, there will be instances where it is necessary to distribute the effluent into an underground soakaway system.

A sampling chamber should be provided at the outlet from the SBR approximately 2m downstream to fully comply with the sampling requirements of the Environment Agency (EA - England & Wales), Scottish Environment Protection Agency (SEPA - Scotland) and the Environment Protection Agency (EPA - Ireland). This is required when no accessible sampling point is available.

Balmoral's sampling chamber has the additional function of a rodding/access point and has multiple inlet/outlet drain positions for site convenience.

Where it is necessary to discharge to a soakaway system it should be noted that the distribution area of a soakaway system can be reduced by 20% where it is accepting fully treated effluent (ie, 30mg/litre ss and 20mg/litre BOD or less) (BS6297).

Commissioning

In order to qualify for the full Balmoral warranty it is a requirement that the product is established as having been supplied in accordance with the sales order and Balmoral's terms and conditions. In order to obtain Balmoral's warranty, the plant and elements of the installation **MUST** be checked and commissioned by Balmoral (or it's agents). Please contact Balmoral Site Services for details.

Maintenance

As with any treatment plant it is extremely important that the SBR is serviced and desludged at the prescribed intervals so that the maximum working life of the components are obtained and that effluent quality does not deteriorate.

A detailed maintenance schedule is given in Appendix 2, however table 1 shows desludging and servicing intervals for each size of SBR. It is essential, and a condition of the extended warranty, that regular servicing visits are undertaken by Balmoral Engineers at the frequencies given in table 1.

Servicing at the intervals shown would normally cover:

- Checking of airlift pumps and airlines
- Checking and cleaning of level sensor probes
- Checking and/or replacement of compressor air filter and diaphragm or carbon vanes
- Checking of air bubble diffuser and airline
- Checking operation of solenoid valves
- Cleaning interior and exterior of control kiosk

Faultfinding

We recommend a Balmoral engineer is called whenever a fault is suspected. Prior to contacting Balmoral, please make a note of the condition of the fault lighting displayed.

Potential fault diagnosis:

Green light on or off

Fault light (yellow) continuous or flashing

Trip light (red) continuous or flashing

Health and safety

The following guidelines should always be strictly adhered to in relation to the operation and maintenance of any sewage treatment plant:

- The site should preferably be fenced off to prevent unauthorised access, particularly by small children
- The electrical control kiosk should be kept locked at all times
- The screw-down manhole cover should never be removed and left unattended, even during maintenance visits. An optional safety grille can be supplied
- The kiosk contains electrical circuits operating at 240V - misuse can lead to serious injury and damage to the plant. Only a qualified electrician or approved engineer should carry out electrical work
- Protective clothing and gloves should be worn at all times and careful attention paid to personal hygiene

Warning: Wastewater treatment produces hazardous gas concentrations even when fully drained. Never enter the vessel without appropriate training.

Balmoral Site Services

Balmoral Site Services offers a nationwide service to cover all aspects of maintenance on the company's environmental product range. Services can be tailored to suit your requirements from basic annual maintenance contracts to on-going support and advice.

Balmoral Site Services benefits:

- National coverage
- Fully qualified and experienced staff
- Advice and support on installation and maintenance
- Advice and support on environmental & local authority guidelines and legislation
- Cost effective support to ensure your tank always meets effluent standards - preventing pollution of rivers and watercourses

Advisory service and maintenance contracts

For technical advice or to arrange a visit by one of Balmoral's technical representatives, please contact Balmoral Site Services on the following numbers:

Product registration and maintenance

Tel	+44 (0)1224 859100
Fax	+44 (0)1224 859123
Email	siteservices@balmoral.co.uk

Appendix 1 - Diagrams

Diagram 1
SBR 18 and 24

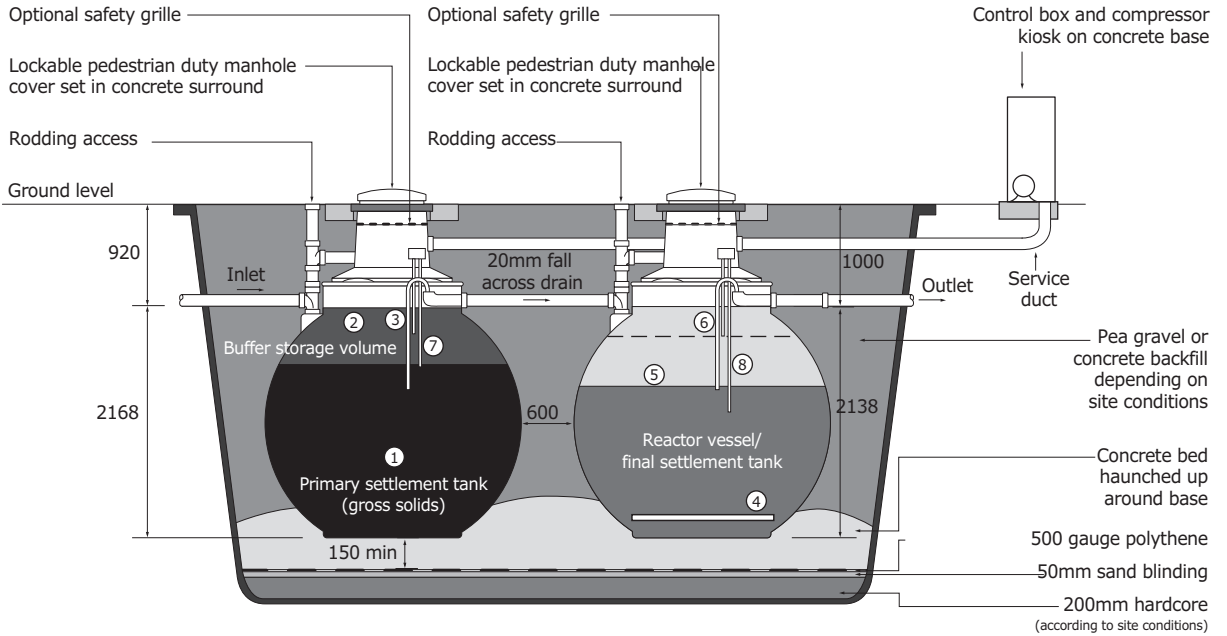
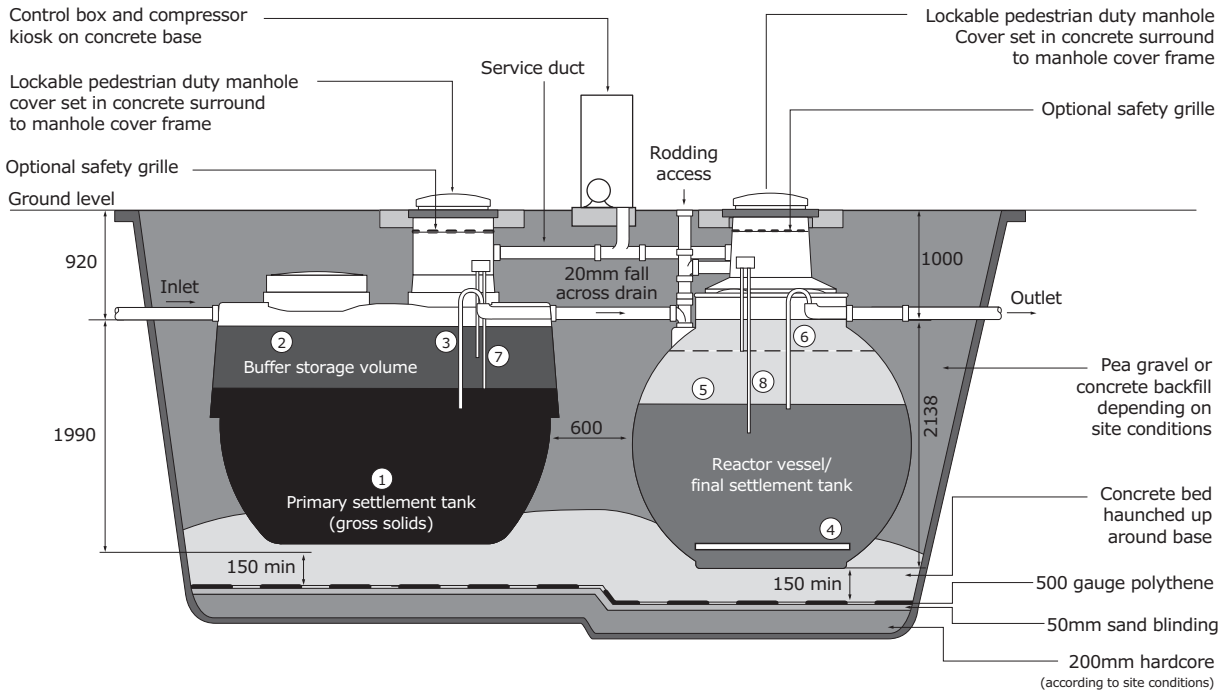


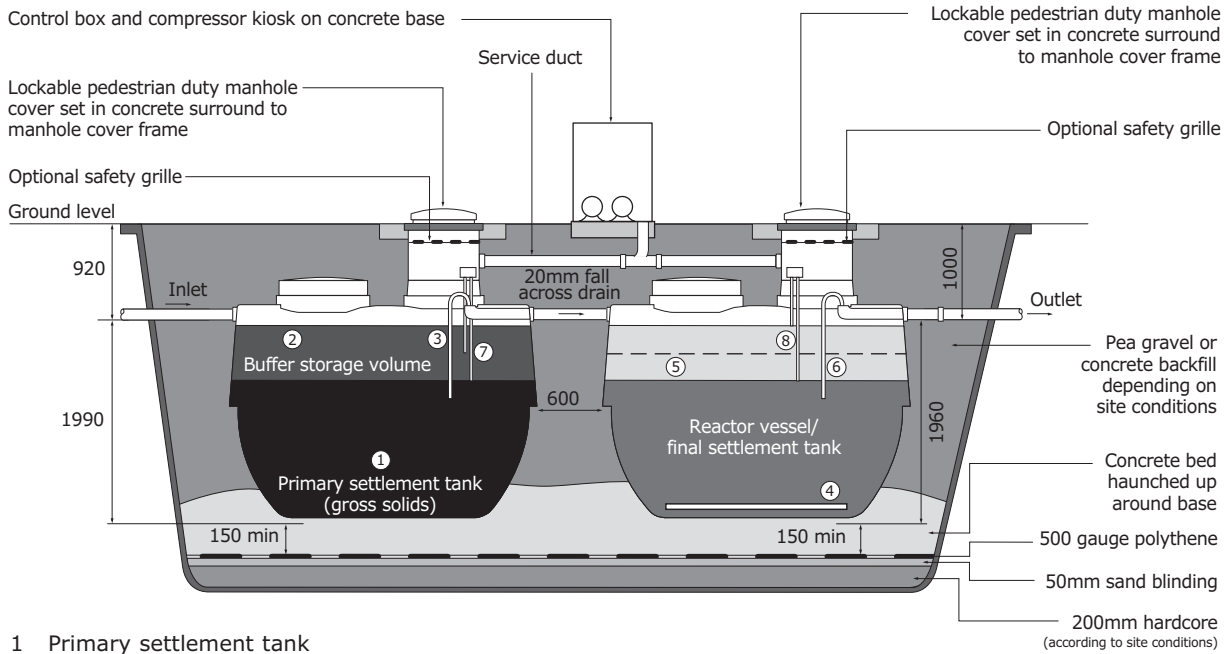
Diagram 2
SBR 36



- 1 Primary settlement tank
- 2 Buffer storage volume
- 3 Airlift pump (fill)
- 4 Bubble diffuser
- 5 Clarified/settled effluent
- 6 Airlift pump (discharge)
- 7 Sensor 1
- 8 Sensor 2

Diagram 3

SBR 48



- 1 Primary settlement tank
- 2 Buffer storage volume
- 3 Airlift pump (fill)
- 4 Bubble diffuser
- 5 Clarified/settled effluent
- 6 Airlift pump (discharge)
- 7 Sensor 1
- 8 Sensor 2

Appendix 2 - SBR maintenance and desludging schedules

Maintenance schedule and contract requirements for SBR 6 and SBR 12

Annual desludging

Desludging of the primary settlement tank and the reactor vessel must be carried out every 12 months otherwise effluent quality will deteriorate.

Access to the primary settlement tank is obtained via the Ø160mm desludging pipe at the inlet side of the SBR. Access to the reactor vessel is obtained by removing the Ø550mm manhole cover from the centre of the reactor vessel chamber.

Note: The primary settlement tank must be emptied before the reactor vessel otherwise severe structural damage may be caused to the reactor vessel by the differential head of water between the primary settlement tank and reactor vessel.

Do not empty the reactor vessel completely but retain a 300mm layer of activated sludge in the base so that a colony of bacteria is retained.

Care must be taken to avoid damage to the rubber air bubble diffuser at the bottom of the reactor vessel while desludging.

The primary settlement tank should be emptied completely.

Note: The reactor vessel should be filled 3/4 full with clean water immediately after desludging. The primary vessel should not be left empty for a prolonged period of time.

Annual maintenance

Reactor vessel

- Remove the manhole cover from the reactor vessel and withdraw the air bubble diffuser by means of the nylon rope. Check condition of diffuser tube and nylon airline and replace if necessary
- Withdraw the level sensor probes, accessed through the airlift pump chamber, check and clean as necessary

Airlift pump chamber

- Check operation of airlift pumps by running them through the "manual" cycle at the control cabinet

Sensor probes

- Unscrew bracket and withdraw level sensor probes serving primary settlement tank and check and clean as necessary

Control/compressor cabinet

- Check electrical door isolating switch for correct operation
- Check cabinet door locks for correct operation
- Clean any dust/debris away from the inside of the cabinet with soft brush
- Ensure cabinet ventilators are free from dust and blockages
- Visually check air output from compressor
- Remove and visually check condition of compressor air filter - replace if necessary
- Remove and inspect the rubber diaphragm(s) and replace as necessary
- Check operation of solenoid valves by running them through the cycles on "manual" mode
- Listen for any leaks at the air lines

Note: Compressor diaphragm life is expected to be 25,000 hours of continuous running time but should be replaced more frequently if found to be badly worn or cracked.

Maintenance schedule and contract requirements for SBR 18

Desludging

Desludging of the primary settlement tank and the reactor vessel must be carried out every 12 months otherwise effluent quality will deteriorate.

Access to the primary settlement tank and reactor vessel is obtained by removing the Ø550mm manhole covers from the tank access shafts.

Do not empty the reactor vessel completely but retain a 300mm layer of activated sludge in the base so that a colony of bacteria is retained.

Care must be taken to avoid damage to the rubber air bubble diffuser at the bottom of the reactor vessel while desludging.

The primary settlement tank should be emptied completely.

Note: Both vessels should be filled 3/4 full with clean water immediately after desludging.

Every six months

Reactor vessel

- Remove the manhole cover from the reactor vessel and withdraw the air bubble diffuser by means of the nylon rope. Check condition of diffuser tube and nylon airline and replace if necessary
- Withdraw the level sensor probes, accessed through the manhole cover, and check and clean as necessary

Airlift pumps

- Check operation of airlift pumps by running them through the "manual" cycle at the control cabinet

Sensor probes

- Unscrew brackets and withdraw level sensor probes serving primary settlement tank and reactor vessel, check and clean as necessary

Control/compressor cabinet

- Check electrical door isolating switch for correct operation
- Check cabinet door locks for correct operation
- Clean any dust/debris away from the inside of the cabinet with soft brush
- Ensure cabinet ventilators are free from dust and blockages
- Check operation of cooling fan
- Visually check air output from compressor
- Remove and inspect the carbon compressor vanes and air filters and replace as necessary
- Check operation of solenoid valves by running them through the cycles on "manual" mode
- Listen for any leaks at the air lines

Note: Compressor vane life is expected to be three years but should be replaced more frequently if found to be badly worn or cracked.

Maintenance schedule and contract requirements for SBR 24, SBR 36 and SBR 48

Desludging

Desludging of the primary settlement tank and the

reactor vessel must be carried out every six months otherwise effluent quality will deteriorate.

Access to the primary settlement tank and reactor vessel is obtained by removing the Ø550mm manhole covers from the tank access shafts.

Do not empty the reactor vessel completely but retain a 300mm layer of activated sludge in the base so that a colony of bacteria is retained.

Care must be taken to avoid damage to the rubber air bubble diffuser at the bottom of the reactor vessel while desludging.

The primary settlement tank should be emptied completely.

Note: Both vessels should be filled 3/4 full with clean water immediately after desludging.

Every six months

Reactor vessel

- Remove the manhole cover from the reactor vessel and withdraw the air bubble diffuser using the nylon rope. Check condition of diffuser tube and nylon airline and replace if necessary
- Withdraw the level sensor probes, accessed through the manhole cover, and check and clean as necessary

Airlift pumps

- Check operation of airlift pumps by running them through the "manual" cycle at the control cabinet

Sensor probes

- Unscrew brackets and withdraw level sensor probes serving primary settlement tank and reactor vessel, check and clean as necessary

Control/compressor cabinet

- Check electrical door isolating switch for correct operation
- Check cabinet door locks for correct operation
- Clean any dust/debris away from the inside of the cabinet with soft brush
- Ensure cabinet ventilators are free from dust and blockages
- Check operation of cooling fan
- Visually check air output from compressor.
- Remove and visually check condition of compressor air filter

Appendix 2 - SBR maintenance and desludging schedules *cont...*

- Remove and inspect the carbon compressor vanes and air filters and replace as necessary
- Check operation of solenoid valves by running them through the cycles on "manual" mode
- Listen for any leaks at the airlines

Note: Compressor vane life is expected to be three years but should be replaced more frequently if found to be badly worn or cracked.

Maintenance log

Plant purchase date: _____ Plant commission date: _____
 Comments about installation (with recommendations of remedial work): _____

Service date	Maintenance undertaken	Major spares used	Signature
	(Service/call out/desludge)	(Warranty/chargeable)	(Balmoral engineer or authorised agent)
Date of desludge:	Name of waste disposal co:	Amount of sludge removed:	
Date of desludge:	Name of waste disposal co:	Amount of sludge removed:	
Date of desludge:	Name of waste disposal co:	Amount of sludge removed:	
Date of desludge:	Name of waste disposal co:	Amount of sludge removed:	
Date of desludge:	Name of waste disposal co:	Amount of sludge removed:	
Date of desludge:	Name of waste disposal co:	Amount of sludge removed:	
Date of desludge:	Name of waste disposal co:	Amount of sludge removed:	

BALMORAL TANKS

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