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Excellent Treatment

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INSTALLATION GUIDELINES FOR BIODISC® UNITS BJ,BK,BL,NJ,NK & NL (With Primary Settlement Tank and Optional Pump Station)



HEALTH AND SAFETY

These warnings are provided in the interest of safety. You must read them carefully before installing or using the equipment.

It is important that this document is retained with the equipment for future reference. Should the equipment be transferred to a new owner, always ensure that all relevant documents are supplied in order that the new owner can be acquainted with the functioning of the equipment and the relevant warnings.

Installation should only be carried out by a suitably experienced contractor, following the Guide-Lines supplied with the equipment.

We recommend the use of a dust mask and gloves when cutting GRP components.

Electrical work should be carried out by a qualified electrician.

Sewage and sewage effluent can carry micro-organisms harmful to human health. Any person carrying out maintenance on the equipment should wear suitable protective clothing, including gloves. Good hygiene practice should also be observed.

Covers must be kept locked.

Observe all hazard labels and take appropriate action to avoid exposure to the risks indicated.

The correct ongoing maintenance is essential for the proper operation of the equipment. Klargester offer a range of maintenance contracts, details on request.

Should you wish to inspect the operation of the equipment, please observe all necessary precautions, including those listed below, which apply to maintenance procedures.

BioDisc units contain rotating machinery and associated drive chains or belts.

Ensure that you are familiar with the safe working areas and accesses.

Ensure that the working area is adequately lit.

The power supply to the equipment must be isolated at the control panel(s) before lifting the covers. Where a specific maintenance procedure requires the equipment to be running with the covers off, all care must be taken to avoid contact with moving parts and electrical components or conductors. Drive guards must be replaced and secured if removed during maintenance.

Once power has been isolated, the control panel must be kept locked shut to avoid accidental re-connection whilst work or inspection is being carried out.

Use only the designated access walkways. Do not walk on the cover or deep well safety mesh(es). Desludge port covers must be replaced if removed.

Take care to maintain correct posture, particularly when lifting. Use appropriate lifting equipment when necessary. Keep proper footing and balance at all times. Avoid any sharp edges.

Desludging should be carried out by a contractor holding the relevant permits to transport and dispose of sewage sludge. The contractor must refer to the desludge instructions in the Operating Manual, a copy of which is fastened under the covers.

DECLARATION OF CONFORMITY

Description of Machine	B Range BioDisc Sewage Treatment Plant
Model
Serial Number (see cover label)
Year of Manufacture
Name of Manufacturer	KLARGESTER E.E. LTD, COLLEGE ROAD,ASTON CLINTON, AYLESBURY, BUCKS, HP22 5EW.
<u>EUROPEAN DIRECTIVES:</u>	Machinery Directive 89/392/EEC Low Voltage Directive 73/23/EEC Electromagnetic Compatible Directive 89/336/EEC

We declare that the equipment covered in this manual conforms with the essential Health and Safety requirements.

Alison Anderson

PRODUCT MANAGER WASTE WATER 1 JUNE 1997



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1.0 Introduction

These Guidelines represent Best Practice for the installation of these Klargester BioDisc Units. Many years of specialist experience has led to the successful installation of thousands of BioDisc units. It must be noted, however, that these Guidelines are necessarily of a general nature. It is the responsibility of others to verify that they are appropriate for the specific ground conditions and in-service loads of each installation. Similarly, any information or advice given by employees or agents of Klargester regarding the design of an installation must be verified by a qualified specialist (e.g. Civil engineering consultant).

2.0 Handling & Storage

- 2.1. Care must be taken to ensure that units are not damaged during delivery and handling on site.
- 2.2. The design requirements of Klargester products will frequently mean that the centre of gravity of the unit is "offset". Care must therefore be taken to ensure that the unit is stable when lifting. Rainwater may also collect inside units, particularly if they have been stored on site prior to installation, adding weight and increasing instability. Check units before lifting and pump out any excess water.
- 2.3. When lifting units, use webbing slings of a suitable specification. When lifting BioDisc units the slings must be passed through the outer two channels in the base of the unit.
- 2.4. A suitable spreader bar should be used to ensure that units are stable and that loads are evenly distributed during lifting. When lifting Primary Settlement Tanks a spreader bar should be used where the slings would otherwise be at an angle greater than 30 degrees to the vertical. When lifting BioDisc units the spreader bar length should be equal to the width of the BioDisc to avoid compression damage to the sides of the unit.
- 2.5. Do not use chains. Do not use the U-bolts or horizontal beams on the BioDisc case for lifting.
- 2.6. Lifting equipment should be selected by taking into account the unit weight, length and the distance of lift required on site.

- 2.7. Klargester Environmental Engineering Limited accept no responsibility for the selection of lifting equipment.
- 2.8. Whenever Klargester units are stored or moved on site, ensure that the storage location is free of rock, debris and any sharp objects which may damage the unit. The units must be placed on ground which is flat and level to evenly support the base of the unit. Do not roll Primary Settlement tanks.

3.0 Site Planning

The following points should be considered before installation of the equipment:

- 3.1. The discharge must have the consent of the relevant Environmental Regulator.
- 3.2. The installation should have Planning and Building Control approval.
- 3.3. Ground conditions and water table level should be assessed. If the water table will be above the base of the units at any time of the year, adequate concrete backfill must be provided to avoid flotation. In poorly draining ground, consideration should also be given to the likelihood of flotation due to surface water collecting in the backfill.
- 3.4. If discharge is to a soakaway, a porosity test should be carried out in accordance with BS 6297 to ensure adequate sub-soil drainage.
- 3.5. The BioDisc system must be installed at a level which will allow connection to the incoming drain and a free discharge at the system outlet.
- 3.6. The BioDisc unit should be installed so that the bottom lip of the cover is 65mm or more above local ground level. If the unit has to be recessed, measures must be taken to ensure that it cannot be flooded by surface water run-off.
- 3.7. There must be at least 1 metre of clear, level ground all around the BioDisc unit and the Primary Settlement Tank access covers to allow for routine servicing.
- 3.8. The unit should be installed as far as possible from any habitable building. Many Local Authorities will insist on a minimum distance of 15 metres.
- 3.9. Adequate access must be provided for routine de-sludging and maintenance, including crane access. Vehicles should not be permitted within a distance equal to the depth of the unit, unless suitable structural protection is provided to the installation.
- 3.10. BioDisc covers are not suitable for walking on. Where necessary the BioDisc should be fenced off or otherwise protected. Maintenance access must be maintained as above.
- 3.11. An adequate electrical supply must be provided, complying with current electrical regulations. The electrical details in Section 6.2.6. will enable selection of suitable cable and current overload protection, taking into account the distance from the power source to the control panel and any other relevant factors. In most cases steel wire armoured (S.W.A.) cable, minimum 1.5sq mm will be suitable, but this is a minimum recommendation and selection is the responsibility of the installing electrician. Although not obligatory for an installation of this type, RCD protection is suggested as an extra precaution.
- 3.12. Pump stations or any other associated equipment should have a separate power supply.
- 3.13. Proximity to a mains water hosepipe connection point is recommended, for maintenance purposes. Such a supply should be connected in accordance with water bylaws and regulations.
Never leave a hose connected and immersed in sewage.
- 3.14. Installation should only be carried out by suitably qualified and experienced contractors in accordance with the Health and Safety at Work Act. Electrical work should be carried out by a qualified electrician, working to the latest edition of IEE.

4.0 Installation - General

- 4.1. When units are installed in unstable ground conditions where movement of the surrounding material and/or unit may occur, the connecting pipework should be designed to minimise the risk of damage from differential movement of the unit(s) and/or surrounding material.

- 4.2. For Primary Settlement Tanks with burial depths greater than 1000mm from cover level to the top of the unit, specific site conditions should be taken into consideration and the backfill designed to bear any loads which may be applied during and after installation to prevent the tank being subjected to these loads.
- 4.3. For Primary Settlement Tanks the excavation must be deep enough to provide bedding and cover depth as determined by the type of surface pavement and loading. Asphalt and concrete pads should extend a minimum of 300mm horizontally beyond the unit in all directions.
- 4.4. In situations where the excavation will not maintain a vertical wall, it will be necessary to shore up the side walls of the excavation with suitable trench sheets and bracing systems to maintain a vertical wall from the bottom to the top of the excavation. DO NOT completely remove the shoring system until the backfilling is complete, but before the concrete fully hardens.
- 4.5. In areas where the water table is above the bottom of the excavation and/or the excavation is liable to flood, the excavation should be de-watered, using suitable pumping equipment, until the installation is complete. In such conditions it may be advisable to line the excavation with polythene sheeting, to prevent cement being washed out of the concrete surround/base.
- 4.6. During installation care must be taken to ensure that the body of any unit is uniformly supported so that point loads through the unit are avoided.
- 4.7. Refer to the drawings attached for dimensions of units.
- 4.8. Installations with gravity connection between the Primary Settlement Tank and the BioDisc (i.e. without the optional pump station), must be installed as shown in the appropriate general arrangement drawing, with the bases of the Primary Settlement Tank and BioDisc at the same level.
- 4.9. Concrete Specification SK296 is a *general* specification. It is not a site specific installation design.

CONCRETE SPECIFICATION SK296 IN ACCORDANCE WITH BS 5328 PARTS 1,2,3 AND 4	
TYPE OF MIX	DESIGN
PERMITTED TYPE OF CEMENT	BS 12 (OPC); BS 12 (RHPC); BS 4027 (SRPC)
PERMITTED TYPE OF AGGREGATE (coarse & fine)	BS 882
NOMINAL MAXIMUM SIZE OF AGGREGATE	20 mm
GRADES: C30 (30 N/mm ²) C30 (30 N/mm ²) C20 (20 N/mm ²)	REINFORCED & ABOVE GROUND WITH HOLDING DOWN BOLTS REINFORCED (EG. FOR HIGH WATER TABLE) UNREINFORCED (NORMAL CONDITIONS)
MINIMUM CEMENT CONTENT	C30 C20 270 - 280 Kg/M ³ 220 - 230 Kg/M ³
SLUMP (NOT IN ACCORDANCE WITH BS 5328)	25mm
RATE OF SAMPLING	READY MIX CONCRETE SHOULD BE SUPPLIED COMPLETE WITH APPROPRIATE DELIVERY TICKET IN ACCORDANCE WITH BS 5328 PART 3
NOTE: STANDARD MIXES SHOULD NOT BE USED WHERE SULPHATES OR OTHER AGGRESSIVE CHEMICALS EXIST IN GROUND WATER	

5.0 Primary Settlement Tank Installation

- 5.1. Excavate a hole of sufficient length and width to accommodate the tank and a minimum 225mm concrete surround and to a depth which allows for the burial depth of the unit plus concrete base slab.
- 5.2. Construct a suitable concrete base slab appropriate to site conditions. In wet or unstable ground conditions it may be necessary to lay a hard-core sub-base (see notes 3.3 & 4.5).
- 5.3. Ensure that the slab is flat and level.

- 5.4. When the concrete base slab has set enough to support the installed load, lower the unit onto the slab using suitable webbing slings and lifting equipment.
- 5.5. Pour no more than 400mm depth of clean water into the unit, avoiding shock loads.
- 5.6. Place concrete backfill to approximately 300mm depth under and to the sides of the tank ensuring good compaction to remove voids. **DO NOT use vibrating pokers.** Note: Concrete specification SK296 is a *general* specification for installations up to 1000mm burial depth in different ground conditions. It is **not** a site specific installation design.
- 5.7. Continue adding concrete backfill, simultaneously keeping the internal water level approximately 300mm above the backfill level at all times, until the backfill is just below the underside of the outlet drain giving sufficient room to connect the inlet and outlet pipework.
- 5.8. Connect inlet and outlet drains when safe access to the backfill can be gained.
- 5.9. Continue backfilling with concrete over the tank body to the required level. Temporarily strut the access shafts to avoid distortion.
- 5.10. In traffic areas a suitable top slab must be constructed. The top slab should bear on a suitable foundation to prevent superimposed loads being transmitted to the unit and access shafts.
- 5.11. Loads applied to covers and frames must bear on the top slab, not the access shaft.
- 5.12. If units are installed shallower than the invert supplied, the GRP access shafts can be trimmed with a fine toothed saw.
- 5.13. The unit should be filled with clean water up to the invert level of the outlet pipe. It is now ready for use.

6.0 Optional Pump Station Installation

- 6.1. Remove any parts stored inside the pump chamber during delivery and place carefully on one side for later fitting.
- 6.2. Excavate a hole of suitable dimensions to accommodate the pump chamber and a minimum 150mm concrete surround and base. Note that the top flange should be 50mm above ground level.
- 6.3. Lay a concrete slump at the base of the excavation to provide an adequate foundation. In wet or unstable ground conditions it may be necessary to lay a hard-core sub-base (see notes 3.3 & 4.5).
- 6.4. Lower the unit onto the slump at the base of the excavation and bed onto the concrete. Check that the inlet is correctly orientated and at the correct level for connection to the inlet pipe. Ensure that the unit is vertical, and support it in position.
- 6.5. Ballast the pump chamber with water to a level approximately 500mm above the base. Re-check it's position, paying particular attention to invert level and orientation.
- 6.6. Backfill with concrete up to the inlet invert level leaving sufficient room to connect the inlet pipe. Keep the internal water level approximately 300mm above the backfill level at all times, and compact the concrete to eliminate voids. **(DO NOT use vibrating pokers).**
- 6.7. Connect the inlet drain.
- 6.8. Continue backfilling with concrete up to the outlet connector.
- 6.9. Connect the outlet pipe.
- 6.10. Drill a 40mm hole in the pump chamber to accept the control panel cable; 250mm below ground level and in appropriate orientation for the control panel
- 6.11. Erect the control panel as described in Section 8.0.
- 6.12. Continue to backfill with concrete up to ground level.
- 6.13. Refer to the attached drawing and assemble the pumps and associated pipework. The pumps should sit squarely in the base of the pump chamber. Check that the gate valve is open.
- 6.14. Fit the float switch by securing it's cable to the support bar at the top of the pump chamber, using the cable ties provided. It should be set so that the bottom edge of the weight is 160mm below the Primary Settlement Tank inlet invert level and there is 100mm of cable between the weight and the float. Ensure that the float cannot become tangled with any cables or pipes.
- 6.15. Refer to Section 8.2. for details of pump and float cable connection.

7.0 BioDisc Installation

- 7.1. Excavate a hole of sufficient length and width to accommodate the unit and a minimum of 150mm concrete surround and to a depth which allows for the burial depth of the unit plus a minimum 300mm thick concrete base. Note that the bottom lip of the cover should be 65mm above ground level.
- 7.2. Construct a suitable concrete base slab, a minimum of 300mm thick, appropriate to site conditions. In wet or unstable ground conditions it may be necessary to lay a hard-core sub-base (see notes 3.3 & 4.5). Ensure that the slab is flat and level. Allow the slab to set sufficiently to support the installed load.
- 7.3. Ensure that the slab is free of any stones or other material which could damage the unit. Lower the unit onto the slab using suitable webbing slings and lifting equipment.
- 7.4. Remove the package tied to one of the cover handles. This contains a copy of the Installation Guidelines and a cover key.
- 7.5. Remove the covers by undoing the locks and folding the end covers back over the inner covers before lifting them off. Then unlock and remove the centre cover.
- 7.6. Remove the Control Panel and Owners Pack from the walkway inside the unit.
- 7.7. Check that the inlet and outlet orientation is correct and that the unit is level.
It is essential that the unit is installed in a level plane to avoid undue stress on the bearings. The rotor shaft must be level end to end, to within $\pm 3\text{mm}$, measured at the bearing caps or directly on the shaft.
The unit must also be level to within $\pm 5\text{mm}$ from side to side, measured at the GRP walkway on either side of the rotor.
If necessary, lift the unit off the base and apply further concrete as needed to level up.
Note : The top flange of the BioDisc should not be used for levelling as manufacturing tolerances may result in it not being parallel with the rotor shaft.
- 7.8. It is essential that the unit levels are checked regularly throughout the installation process. Should the unit become out of level, immediate remedial action is advised, to maintain the unit within the levels stated in section 7.7.
- 7.9. Pour no more than 1 metre depth of water into both primary (inlet) chambers and the final (outlet) chamber ensuring that there is never more than 250mm difference in water level between any of the sections.
- 7.10. Place concrete backfill to approximately 500mm depth around the unit ensuring good compaction to avoid voids. **DO NOT use vibrating pokers.**
- 7.11. Continue backfilling with concrete up to the level of the inlet. Keep the concrete at an even level all round the unit, compacting in layers. As backfilling progresses keep the ballast water level inside the unit 250-500mm above the concrete backfill level, but do not attempt to fill the unit with water above the outlet level.
- 7.12. Connect the inlet pipework when safe access can be gained. Short lengths of "rocker" pipe with flexible joints should be used adjacent to the unit to allow for any minor differential movement.
- 7.13. Continue backfilling with concrete up to the level of the outlet and connect the outlet pipework when safe access can be gained.
- 7.14. Drill three 40mm holes in the BioDisc case, to accept the Control Panel cables, 100mm below ground level and adjacent to one end of the interior walkway.
- 7.15. Erect the Control Panel as described in Section 8.0.
- 7.16. Continue to backfill, with concrete or free flowing granular material, up to ground level. **DO NOT use sand.** The finished surface should be 65 mm minimum lower than the lip of the cover
- 7.17. **Important : Read section 10.3 regarding delayed electrical installation.**

8.0 Control Panel Installation

8.1 General Installation

- 8.1.1. Control panels should be positioned adjacent to their respective unit(s), so that:
 - a) They do not interfere with cover removal.
 - b) They are convenient for the incoming power supply.
 - c) They cannot be reached by someone standing in or on the BioDisc unit or Pump Chamber, if fitted.
 - d) They are close enough to enable the electrical connections to be made to their respective units.
This usually indicates a panel position about 2 metres distance from the unit; and in the case of the BioDisc, adjacent to the inlet or outlet.
- 8.1.1. Set the panel legs in a concrete base, minimum 250mm thick and prop the panel to prevent movement until the concrete has set. Allow 350mm minimum clearance from ground level to the bottom of the panel.
- 8.1.2. Control panels are supplied with pre-fitted steel wire armoured (s.w.a.) cable(s), complete with grommets and glands. Lay the cable(s) in a 500mm deep trench and bed them on a layer of sand or similar soft material.
- 8.1.3. Insert the cables through the hole(s) in the casing of their respective unit(s), using the grommets supplied. Leave the cable(s) temporarily secured above water level pending electrical installation.
- 8.1.4. Cover the cable(s) with a layer of sand or similar soft material and warning tape. Backfill the cable trench with graded spoil, free of large stones or any other material which might damage the cable(s).
- 8.1.5. The Control Panel Key is inside the protective bag at the cable end.

8.2 Electrical Installation - Optional Pump Control Panel

- 8.2.1. Insert the pre-fitted s.w.a. cable into the junction box inside the pump chamber and fit the gland provided.
- 8.2.2. Insert the pump and float cables into the junction box and fit the glands provided.
- 8.2.3. Refer to the wiring diagram attached and connect the pump and float cables to the Control Panel cable using the terminal block provided.
- 8.2.4. Ensure that all excess cable is secured to the support bar at the top of the chamber and that there are no potential tangles, particularly in respect of the float.
- 8.2.5. Replace the pump chamber cover.
- 8.2.6. Connect the incoming power supply to the Control Panel, using suitable cable and current overload protection. (See sections 3.11 and 3.12.) Ensure that the panel is securely closed.

	FLC Per Pump (Amps)	FLC Total (Amps)
Optional Pump Station 240 Volt 1 phase	2.1	4.2

8.3 Electrical Installation - BioDisc Control Panel

- 8.3.1. The BioDisc Control Panel is fitted with s.w.a. cables for the motor/gearbox, sludge return pump and loss of rotation alarm.
- 8.3.2. Refer to the wiring diagram attached and connect the cables to the appropriate electrical junctions in the BioDisc, fitting the glands supplied.
The cables can be identified by their numbered end connectors which correspond to connection points in the BioDisc. The end numbers on the motor/gearbox cable correspond with the numbered terminals in the motor/gearbox terminal box.
- 8.3.3. Ensure that cables inside the BioDisc are securely tied to the structure, clear of the drive arrangement and do not present a trip hazard.

	Connection Point	Connector Type	End Numbers
Motor/Gearbox	Motor/Gearbox	Spade	Three Phase : U, V, W, Earth
	Terminal Box		Single Phase : U1, U2, Earth
Sludge Return Pump	Junction Box fixed inside BioDisc Case	Pin	L1, N1, Earth
Loss of Rotation Alarm	Junction Box fixed to Motor Support Beam	Pin	7, Earth

- 8.3.4. Connect the incoming power supply to the Control Panel, using suitable cable and current overload protection. (See section 3.11) Ensure that the panel is securely closed.

		Full Load Current (Amps)		
		BJ/NJ	BK/NK	BL/NL
Motor	240 volt single phase	2.1	4.0	4.0
	415 volt three phase	0.96	1.84	1.84
Sludge return pump	240 volt single phase only	2.2	2.2	2.2

8.4 Electrical Installation - Optional Remote Slave Alarms

8.4.1. Optional Remote Slave Alarm for BioDisc Loss of Rotation.

This is available as a Beacon (amber), an Audible Unit or a Combined Beacon/Audible Unit. All options are weather proof and supplied loose for wall mounting. Interconnecting cable must be minimum 1.5mm² S.W.A. (240 Volt) and should enter the panel through the entry point provided, using a suitable gland. Where Klargestar interconnecting cable is supplied it is complete with glands and fitted end connectors. Connect to terminals 2 and 9 of the terminal strip in the BioDisc Control Panel.

8.4.2. Optional Remote Slave Alarm for Pump Station.

Generally as the BioDisc Alarm, (see 8.4.1.) except that the beacon is red. Connect to terminals 4 and 12 of the terminal strip in the Pump Control Panel. It may be necessary to drill an entry hole in the bottom of the panel case.

9.0 Ancillary Equipment

- 9.1. Other ancillary items should be installed in accordance with the Installation Guide supplied e.g.
- Crude Sewage Pump Station
 - Effluent Pump Station
 - Effluent Sample Chamber
 - Grease Trap

10.0 Start Up

- 10.1. Refer to the Owners Handbook for details of the Start Up Procedure.
- 10.2. Units may be fitted with a Transit Lock, which immobilises the rotor.
The lock must be removed before the unit is started.
- 10.3. Once the unit has been installed it should be left filled with water. Please switch on the motor, following the procedure in the Owners Handbook and leave the unit running, even if there is no sewage being fed into the plant. If the unit has been installed with no operational power supply, then remove the motor/gearbox unit and drive chain and store in a dry or heated environment until such time as the unit is ready for permanent operation.

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