ENVIRONMENTAL SUSTAINABLE SOLUTIONS LTD

# GENERAL GUIDELINES / SEQUENCE OF WORKS FOR INSTALLING ECO-CELL MODULAR UNITS

## MATERIALS

The materials required are to be delivered directly by Alderburgh Ltd. 48 hours notification of any deliveries due can be given on request if required. Alderburgh Ltd deliveries are made on articulated curtain sided vehicles; goods are palletised and shrink wrapped for ease of handling. Offloading is to be carried out using a machine equipped with forks (e.g. Telehandler or similar) to be provided by others. Sufficient access will be required to facilitate safe offloading and distribution as required.

## EXCAVATION OF WORKING SURFACE

Main or Ground-Works Contractor to have set out, dug and prepared the sub-base area to the required plan dimensions and level, ensuring that the excavation orientation will allow easy installation of encapsulation materials and ESS Eco-Cell modular units. Prepared excavation to have safe battered sides to prevent operatives from loose, falling material and provide sufficient working space **(minimum 500mm ideally 750 mm)**. Sub-base should be a **smooth, level, firm, flat** surface, which complies with the specification detailed by the engineer, including geo-technical information (e.g., CBR, ground water table, etc). Ensure that the ground bearing capacity at the formation level is sufficient for the proposed operational loads. The base of excavation should have a **3-5% CBR**, should the CBR be tested and found to be less than 3% then the engineer shall be notified. The base of the excavation should be free of large stones and any soft spots. Any soft spots should be excavated and replaced with suitable compacted granular material.

The work area is to be left in a clean and tidy condition prior to commencement and any other materials removed by the main contractor.

A clear working space of **500-750mm** to be provided on all areas including around the installed tanks footprint to allow safe access for operatives during installation and sufficient clearance for the safe operation a pedestrian controlled compaction device to suitably compact the backfilling materials during the backfill/re-instatement process.

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**Base Preparation**

1 The attenuation tanks requires the sub base to have CBR 3 to 5% , should the CBR be tested and found to be less than 3% then the engineer shall be notified. Also, any soft spots found at the formation level shall be reported to the engineer and replaced with suitable material to make the sub-base **smooth, level, firm, flat**, as the manufacture we recommend/suggest a 100 mm lean mix concrete base to achieve this**, Sub-base should be free from any undulation to prevent modules tilting and to provide adequate support to the installed tank.** Attenuation tanks require the modular units to be wrapped with an impermeable Geo-membrane in case of. A heavy duty puncture resistant Geotextile should be laid to line the excavation prior to the placement of the impermeable geomembrane.

**It is recommended attenuation structures to be encapsulated in Geo-Membrane are installed by an Alderburgh/ESS accredited installer; this is to ensure that the tank is fully sealed and watertight. The only method that can be reliably used to create this watertight seal is the specialist heat welding of all laps using a twin wedge welder to provide a pressure testable joint. If the option of installation is taken up it will fall under a separate sub-contract order between the approved installer and the employing contractor. This will be distinct from the supply only order for the modules which should be raised in favour of Alderburgh Ltd, under no circumstances will Alderburgh Ltd accept the application of a "retention" to this supply only order.**

Prior to backfilling the Geo-Membrane is to be protected using a heavy duty puncture resistant Geotextile laid over and around the tank using lapped joints. Attenuation tanks require ventilation pipes to ensure proper hydraulic performance. The number of vent pipes depends on the size of the attenuation tank (contact manufacturer for vent unit details).

2 Flatness/Surface Regularity: where appropriate in relation of the geometry of the surface, the variation in gap under a 3 m straightedge (with feet) placed anywhere on the surface to be not more than +/-6mm

3 These items are provided during the installation of a sealed structure by the main contractor to our installers.

**INSTALLATION** [1]

Permeable Geotextile Filter Fabric is installed by rolling out on top of the compacted **100 mm** thick bedding layer of **compacted coarse sand (for soakaway construction only**. Refer **notes** for Attenuation tank sub-base preparation and installation details).

**Sub-base should be free from any undulation to prevent modules tilting and to provide adequate support to the installed tank.**

Nominated operatives are to position the geotextile filter fabric within the 'foot print' as set out in the engineer's construction drawings. The geotextile filter fabric is to be laid lengthways and widthways to form a complete layer of base liner material, allowing sufficient excess material to wrap the entire tank structure with the minimum number of laps.

All laps are to then to be suitably secured, weighted down or stapled in order to minimise the ingress of deleterious materials.

Once the base of the installation has been suitably prepared ESS Eco-Cell Modular units are placed in accordance with the construction drawings and connection details **(refer to document; Eco-Cell construction guidelines)**.

It is advisable to use a "brick line" to be able to form a straight edge along one or two of the structures axis.

The placing and securing of the modular units is to commence with the orientation of the modular units as follows:-

- The modular units are to be **orientated** as per the design drawings **(410 mm wide units** to the required depth in units of **450 mm, 900 mm, 1300 mm, and etc).** (Contact ESS for greater depths)

Once the modular units are placed they are then wrapped with the geotextile filter fabric, which is brought up around the sides and lapped over the top of the structure. Should any gaps in the encapsulation material be evident additional fabric can be cut and placed over these areas.

The Main Contractor is to indicate outside pipe diameters and the position of all inlet and outlet pipes. Generally pipes need to be no larger than 375 mm while using a **450 mm deep modular unit** (contact manufacturer for information while using other sizes of modular units). Pipes should be positioned at $90^0$ to the tank structure.

**INLETS / VENTS INSTALLATION**

Any inlets, etc, should be installed flush (i.e. 'butted up') to the tank and are to be surrounded in concrete to the specification of the engineer. The geotextile filter fabric shall be cut to enable hydraulic continuity at the inlet and outlets and secured around the pipe using a suitable coupling prior to the application or the concrete surround to ensure a secure seal. A similar procedure shall occur in respect to the venting pipes.

Installed Tanks require ventilation units to ensure proper hydraulic performance. The number of vent pipes depends on the size of the tank (contact manufacturer for details). Vents are generally installed using $90^0$ elbows with PVC pipe into a soft landscaped area with 'u' bend or venting bollard to inhibit the ingress of debris, vermin, etc and secured using suitable solvent bonded or mechanical couplings.

Alternatively a ground level concrete steel cover can be fixed to suit.

**RESTORATION**

During backfilling it is imperative that the material is placed carefully around the sides and above the modules, in order to minimise any damage to the structure. This material shall be laid in compliance with the manufactures compaction requirements of the particular piece of equipment proposed. The compaction process should not allow the machinery to come into contact with the modules and ideally should maintain a nominal 200 mm clearance.

Layers of material shall be placed carefully (with a $360^0$ machine or similar approved), from beside the excavation layers then spread and compacted using a pedestrian controlled compaction device. This process should be executed all around the structure in layers, continuing to the top level of the modular structure.

The backfill material should include comprehensive testing methodology such as provided by the utilisation of a nuclear density gauge or similar testing protocols to ensure correct compaction has been achieved.

Backfill around the sides of the modular units for 100mm min thickness using either. Selective suitable **As-Dug material** or course sand or class 6H selected granular material immediately adjacent to the units.
Remaining excavation areas around the modular units should be filled with Selective Suitable **As-Dug material** or class 6N or 6P selected granular materials in accordance with MCHW Volume 1 or similarly approved specification.

Backfill above the modular units for 100mm min. thickness (lightly compacted ) using either Selective Suitable **As-Dug material** course sand or class 6H selected granular materials (with 100mm passing through a 5mm sieve granular in accordance with MCHW Volume 1 series 600.

The backfill material that lies within 300 mm above the modular units should be free from particles exceeding 40 mm in diameter, in accordance with class 8 material to series 600, Volume 1, MCHW. Final backfilling up to finished ground level may be achieved using selected as-dug material if deemed suitable by the site engineer. Backfill material should be placed and compacted in layers no greater than 300 mm, or in compliance with the approved specification.

Material will be placed in front of any machinery (i.e. pushed out). The width shall nominally be 5m wide in order to accommodate an excavator ($360^0$ e.g. caterpillar 319 or similar approved). Particular reference to this can be found contained in 'table 1' in the plant ground pressure guidance document. The excavator will then redistribute and place the material gently working backwards placing the material onto the adjacent un-covered areas either side. Any machinery should not attempt to cross the structure until at least 500 – 600 mm of backfill cover has been achieved, then ensuring that turning or manoeuvring should be avoided.

Usually depending on the material good compaction is often achieved during the covering process so minimal additional work is required. Subsequent layers to be installed in the same manner as above will be subjected to the same installation methodology. More compactive effort (more passes with the pedestrian device) can be used in the filling of subsequent layers of material.

**POST INSTALLATION**

During and after any installation no other trades may traffic the tank until the installation process is fully completed. Careful backfilling with fencing off around the structure with additional clearance around the footprint is advisable to minimise any plant movements, material storage, etc. Furthermore fencing minimises the risk of materials (concrete pipes, bricks, spoil, etc) being stored above the installed tank, potentially imposing greater loads than allowed for in the design. Should cranes or other large plant be needed to access the area suitable 'matting' or surface protection needs to be used. Again this assessment is the responsibility of the engineer, Site personnel, etc.

**HEALTH AND SAFETY**

Installation procedures should be carried out in accordance with health and safety at work etc ACT (1974) and any other relevant legislation. Special attention should be paid to temporary work requirements in excavations.

**MAIN CONTRACTOR IS TO PROVIDE [2]**

In addition to, and by way of reminder to the above the main contractor is to provide the following:-

- Fork equipped material handling equipment to offload deliveries of and to distribute materials
- De-watering
- Copies of all relevant working drawings.
- The Main Contractor is responsible for all setting out and the dimensions of the excavation.
- The Main Contractor is to indicate outside pipe diameters and the position of all inlet and outlet pipes.

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**OTHER**

**DISTRIBUTION OF GOODS**

It is solely the responsibility of the main contractor to distribute the Eco-Cell and lining materials to an area directly next to or if necessary into the prepared excavation.

**DE-WATERING OF PREPARED AREA**

It is the responsibility of the Main Contractor to ensure the area is de-watered at all times during the installation.

**CONTROL / MONITORING ARRANGEMENTS**

It is possible to arrange for a technical representative to visit the site on a regular basis to inspect and report on the quality of the installation. Project specific arrangements can be arranged if this service is required.

**ENVIRONMENTAL PROTECTION CONTROLS**

None of the wastage from the materials to be installed requires any special environmental disposal procedures other than adherence to the 'duty of care' waste management regulations, which require that all waste be disposed of to a suitably licensed waste management facility, where practicable Alderburgh Ltd will arrange for the collection of empty undamaged pallets for re-use, please advise if this service will be required.

**SAFETY/PERSONNEL PROTECTION EQUIPMENT**

All operatives will possess hard hats, high visibility waistcoats, safety footwear, gloves and eye protection. Adequate access in terms of clearance all around the structure needs to be ensured (minimum 500, ideally 750mm depending on depths, etc).