



RAINSMART®

INSTALLATION GUIDE

G 015 001 | SEPTEMBER 2021 | VERSION 2



0800 CIRTEX (247 839) | WWW.CIRTEX.CO.NZ

PRE-CONSTRUCTION CHECKLIST

TOOLS YOU WILL NEED

- Laser level
- Measuring tape (long enough to mark RainSmart system footprint)
- Knife
- Screw driver
- String line
- Spray paint
- Reciprocating saw (to cut in inspection & maintenance ports)

If you're assembling RainSmart modules:

- Rubber mallet
- Work tables or smooth, hard surface such as concrete or plywood.



MATERIALS YOU WILL NEED

- RainSmart plates
- DuraForce® geotextile (typically AS410 for soakage systems & AS440 for lined systems)
- DuraGrid X geogrid (only for load bearing applications)
- Impermeable liner (only for stormwater retention/recycling applications)
- Clean bedding & backfill material compactable to a minimum of 95% MDD, angular free draining stone/sand with a max particle size of 20mm)
- Pipe Boot Kits (if not using kits, you'll need duct tape and a stainless steel band clamp for each inlet and outlet pipe)
- Metallic tape to mark system edges, to allow for system location post-construction
- Cover soil to meet the site specific requirements, as per the engineers specification

Inspection and maintenance ports (if required)

- Pipe for inspection & maintenance ports (typically 150mm and 300mm PVC pipe, respectively)
- Ring, collar & cap (to fit each port)
- Pipe Boot Kits (fabric pipe boot, duct tape, stainless steel band clamp for each inspection and maintenance port)
- Traffic load rated ring, cover and frame, where required

EQUIPMENT YOU WILL NEED

- Forklift and other equipment/tools needed to unload curtain-sider truck
- Walk-behind trench roller/plate compactor
- Tracked skid steer or suitable loader, as per table on page 16
- Roller (2-3 tonne smooth drum)



Note: This list does not include equipment or tools needed to excavate or level the floor of the excavation.



If any questions or concerns are not covered by these instructions please contact Cirtex on **0800 247 839** or email **sales@cirtex.co.nz**

BEFORE YOU TURN THE FIRST SOD

- 1** Be sure to contact your Cirtex representative at least two weeks prior to installation. We can provide the necessary support to facilitate your installation.
- 2** All pictures, illustrations and instructions have been included to guide you through a typical installation. The approved engineering drawings should ALWAYS take precedence over these instructions.
- 3** Coordinate the installation of the RainSmart system at the end of the construction activities to minimise the construction traffic over the system. If the installation is completed during construction activities then the system MUST be roped off and construction traffic routed around the system. The installation contractor is responsible for all loads placed or driven over the RainSmart system during the construction process (including excavators, loaders, dump trucks, forklifts, concrete trucks, material delivery trucks and cranes). Rope off the area to prevent unauthorised traffic from driving over the RainSmart system. If sequencing of the project makes this impossible, a construction road or pad may be constructed over the RainSmart system. Consult the project engineer and/or Cirtex for assistance before allowing construction traffic on the system. **(For additional information see Step 12: Secure the installation, page 18)**
- 4** After installation of the RainSmart system, stormwater should not be allowed to enter the system until the site is completely stabilised and all pretreatment systems (designed to remove debris and heavy sediment) are active. Otherwise, the RainSmart system may become prematurely contaminated with sediment from the project.

IMPORTANT INFORMATION

Throughout this document you will see three types of notes:



TIP

Ideas to improve your profitability on the installation.



IMPORTANT

Steps that require extra attention.



WARNING

Critical issues that MUST be handled correctly to ensure a successful installation.

1. EXCAVATION

The excavation limits and the location of the RainSmart system should be staked out. The design drawings should be used to determine these locations. If the excavation limits are not shown on the plans, then add 500mm- 600mm on each side of the RainSmart system to determine the limits. Excavate the designated surveyed area according to plans, following all relevant regulations. Typical excavations should include:

- 500mm-600mm perimeter around RainSmart system to allow for proper compaction of backfill.
- Enough depth to accommodate 50mm-100mm of bedding material below the RainSmart modules if required.
- Enough depth to allow for a minimum of 600mm of cover material or as per engineer plans.

Level the bottom of the excavation (Fig. 1) as shown on plans. Most excavations have a flat base, however a slight fall towards an outlet is allowable.

Prepare the subgrade according to plans. Base of excavation shall be smooth, level and free of debris. Compact to at least 95% Standard Proctor Density (or as required by engineer) unless infiltration of stormwater into subgrade is desired. A thin layer, 100mm of material, is recommended to establish a level working platform (may not be needed in areas with sandy soils). A CBR > 5% must be achieved prior to beginning installation of RainSmart modules.

If the subgrade is heaving or appears excessively soft, the design engineer should be consulted for advice. In many cases a layer of GridTex 40/40 and 190mm-300mm of compactable material, that drains well will be sufficient to amend the bearing capacity of the soil.



Fig. 1
Excavate according to plans, following all relevant regulations



IMPORTANT

For trafficable applications - minimum cover of 600mm and maximum cover of 2m is required. Non-trafficable applications (inaccessible by vehicles) require minimum cover of 300mm and maximum cover of 2m.



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2. ASSEMBLE RAINSMART MODULES

RainSmart modules are supplied flat packed and will need to be assembled on site. Building the modules should take 2-3 minutes per module layer. This is a conservative estimate used to approximate the total man hours needed for assembly.

MODULES	TIME
Half	2-3 Minutes
Single	2-3 Minutes
Double	4-6 Minutes
Triple	6-9 Minutes
Quad	8-12 Minutes
Penta	10-15 Minutes



WARNING

Times relate to assembly only. Placement time frames will be dependent on site accessibility and layout.

Assembly Instructions - following the drawings in Fig. 2 and Fig. 3: Connect five small plates onto one large panel using the short pegs (not the long pegs). Attach small plates onto the large panel at the locations marked in red on Fig. 2. Only use these peg locations marked in yellow on Fig. 2 if you are building a 7-plate module. Use 7-plate modules for installation with more than 2m of cover and for installations beneath traffic loads with less than 600mm of cover. Please note, the RainSmart plate configuration shall be specifically designed by the project engineer for installations with >2m of cover or <600mm of cover.

Next, working from one end to the other, attach a second large plate on the opposite side of the first. Once the top and bottom large plates are attached, two more larger side plates are attached to complete the sides of the module. This is a single RainSmart module.

Completed RainSmart modules should be staged as close to the installation area as possible. Some projects may require 7 plate modules.

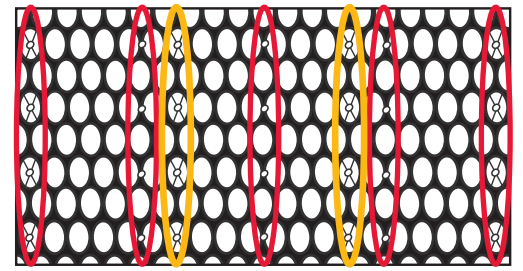


Fig. 2

For standard 5-plate installations, attach small plates at locations circled in red such that all small and large pegs are on same side.

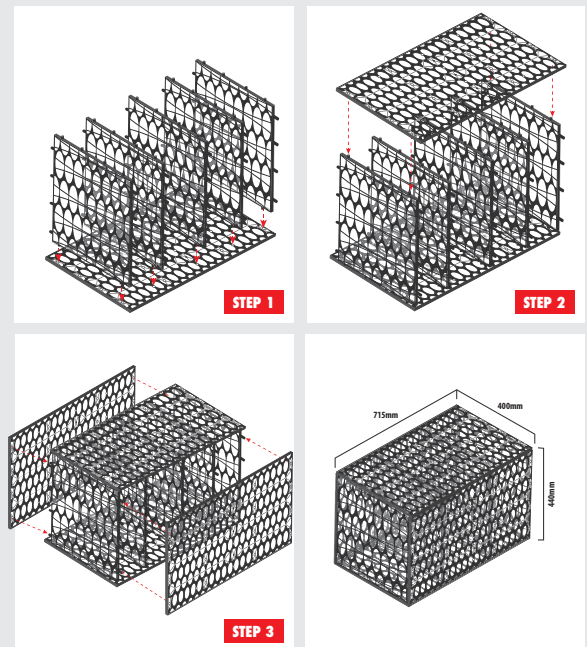


Fig. 3

Follow these steps to assemble a standard RainSmart 5 Plate Single module.



IMPORTANT

To build a DOUBLE module (or larger) follow the directions above, starting at "Assembly Instructions" using the top of the existing module as the base large plate for the next layer up.

3. PREPARE BASE

Examine prepared excavation and conditions for smoothness, compaction and level. Do not start RainSmart system installation until unsatisfactory conditions are corrected. Check for presence of high water table, which must be kept at levels below the bottom of the RainSmart system structure at all times. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance. If existing conditions are found unsatisfactory, contact project manager for resolution.

Standing water in the excavation will prevent proper base preparation and must be removed, if present.

Grade and level base as shown on plans with no more than 10mm variance.
Base must be free of debris and large rocks.



Fig. 5
Base must be smooth to ensure modules fit together without gaps.

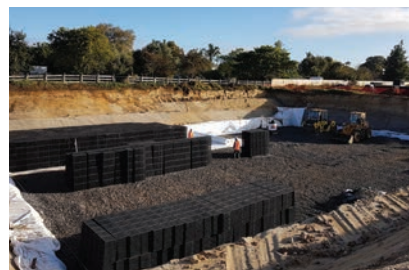


Fig. 4
Preassembled modules can be placed in the excavation or installation can be sped up by assembling the modules in the excavation.

BASE MATERIAL MUST BE:

Compaction	To 95% MDD minimum
Shape	Angular
Size	Not larger than 20mm in diameter
Consistency	Free of lumps, debris and sharp objects that could puncture the geotextile
Applicability	Stone or sand is acceptable if it meets these requirements. In NO case shall clays be used



TIP

In regions with sandy soils meeting the requirements noted and where the subgrade elevation is above the ground water table, imported backfill materials may not be needed.

Creating a smooth, level platform will allow for faster installation of RainSmart modules, as they will fit together evenly, eliminating detail work that can delay your progress (Fig. 5).



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4. PLACE GEOTEXTILE

DuraForce AS410 geotextile will be required below the RainSmart system on most projects, but not all. Check your plans to confirm that geotextile is to be placed between the base and the RainSmart system.

Cut full-width strips of geotextile to the proper length and place them over the base, covering the floor of the excavation. The geotextile should extend at least the height of the module plus 1m beyond the edge of the RainSmart system footprint. This will enable the whole module to be wrapped to the dimensions required. All overlaps are then to be suitably secured, weighted down, taped or stapled in order to minimise the ingress of unwanted materials.



Fig. 6
Pull wrinkles out of geotextile so material lays flat



Fig. 7
Overlap geotextile by a minimum of 300mm

Adjacent panels of geotextile should be overlapped by 300mm or more, as shown on the plans (Fig. 7). Use pins, staples, sandbags or other ballast to hold the DuraForce geotextile in place, preventing it from blowing or sliding out of position. Patch any holes made in the DuraForce geotextile by placing a patch of fabric over the damaged area. The patch must be large enough to cover the damaged area with at least 300mm of overlap on undamaged fabric.

If an impermeable liner and/or additional geotextile is required per plans, install these now as shown on the project plans.



TIP

Some contractors choose to cut the geotextile strips long enough to wrap up the sides and over the top of the RainSmart module in a single piece (Fig. 6). If space allows and the folded flaps of geotextile will not slow your progress, you may want to consider doing this. If a liner is required on your project, this method should be used to protect the liner.

5. INSTALL RAINSMART MODULES

Determine the starting location. It is often helpful to use an inlet or outlet pipe to guide you. Using a string line, establish two adjacent edges of the RainSmart modules footprint. Ensure that your corner is square. Mark these two edges with spray paint and remove the string line (Fig. 8 and Fig. 8a)

Begin placing RainSmart modules in the corner of the marked area. DO NOT place modules on their sides, as this will void the warranty. Check your plans to ensure correct orientation of the RainSmart modules (Fig. 9).

Check the plans to ensure the RainSmart modules are running in the correct direction (North/South vs. East/West) to match the footprint shown.

- RainSmart modules width - 400mm
- RainSmart modules length - 715mm



Fig. 8
Use a string line & marking paint to square the system footprint.



Fig. 8a

RainSmart modules should fit together evenly. Minor gaps between modules <10mm or variations in the height of the modules <10mm are acceptable (Fig. 10), but reasonable efforts should be made to minimise these variations. Minor gaps will be eliminated during compaction of side backfill material. No lateral connections between adjacent RainSmart modules are required, but modules can be cable tied as a housekeeping measure.

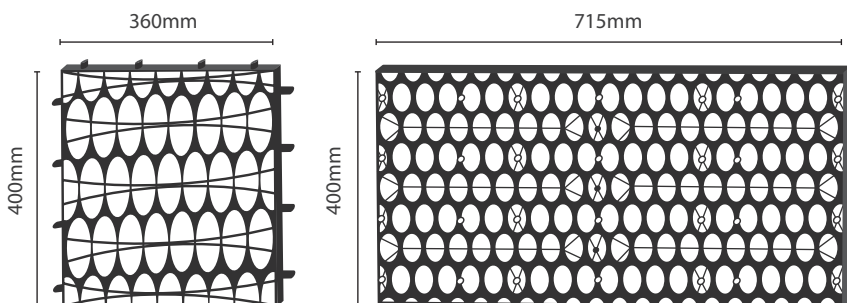


Fig. 9
Make sure the modules are oriented properly and in the correct way in the excavation.



Fig. 10
Minor variations (less than 10mm) in height are acceptable.



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After placement of the RainSmart modules, wrap with geotextile which is brought up around the sides and lapped over the top of the full structure. Should any gaps be evident additional fabric can be cut and placed over any of these areas. Fold excess fabric at corners to lay flat against sides of structure, securing folds and seams with staples or similar methods.

Identify locations of inlet, outlet, inspection ports, and any other penetrations. All pipes should be positioned at 90 degree to the module structure. Any inlets, outlets etc should be installed using the RainSmart 160mm or 300mm access plates where the geotextile fabric shall be cut to enable hydraulic continuity at the pipe penetrations and must be secured around the pipe using a suitable coupling or a stainless steel clamp prior to backfilling.

Cutting of the modules to accommodate pipework may be acceptable, if required. However, will need to be approved by the engineer.



Modules require ventilation for proper hydraulic performance. The number of pipes and vents will depend on the size of the system and are to be stipulated by the project engineer.

Vents are often installed using 90 degree elbows with PVC pipe into soft landscape areas with 'U' bend or venting bollard to inhibit the ingress of debris, alternatively a ground level concrete steel cover can be fixed to suit. If the manhole/catch pit connected to the RainSmart system is unsealed, vent connections back to the manhole can be used.



IMPORTANT

If using a liner, be careful not to puncture it with stakes or pins while placing your string line.



WARNING

Do not place the modules on their sides as this will void warranty.



TIP

Moving RainSmart modules into the excavation quickly is essential to a successful installation. Many contractors fabricate a platform that can be lifted by their forklift to quickly move a large number of modules with each trip.



TIP

RainSmart modules should be constructed around any pipe joints as the joint collars will typically not feed through the 160mm or 300mm access plates.

6. INSTALL INSPECTION/MAINTENANCE PORTS [IF REQUIRED]

If required by the design engineer, all ports should be made from pipe long enough to extend from the bottom of the RainSmart system to finished grade. They are typically PVC pipe, but can be formed from other types of pipe, as well.

Identify the location of all ports and remove the RainSmart module from each location.

Inspection ports:

Typically made from 150mm PVC pipe, cut the pipe to length, leaving enough excess to trim the top when final grade is reached (Fig. 11).

If the pipe is not already perforated, drill several holes in the pipe starting at the bottom. Perforations should extend as high as the height of the RainSmart module units being used. No perforations should be visible above the top of the RainSmart module once the port is in place.

Using your reciprocating saw, cut the horizontal RainSmart module plates (Fig. 12) in the centre, between the two internal plates, to accommodate the port. If the pipe will not fit between the two interior plates, one or both plates may be moved to the outer connection locations on the large plate (Fig. 13). All horizontally oriented plates will need to be cut EXCEPT FOR THE BOTTOM PLATE.

In total you will need to cut:

MODULES	PLATES
Single	1 Plate
Double	2 Plates
Triple	3 Plates
Quad	4 Plates
Penta	5 Plates



IMPORTANT

Do not over-cut the RainSmart module plates, minimise the gaps between the pipe and the RainSmart module plates. This is particularly important with the top plate.



TIP

If the location of inspection ports is not shown on your plans, use a single inspection port located in the middle of the RainSmart system.

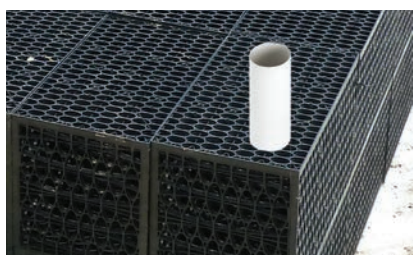


Fig. 11
Installed inspection port.



Fig. 12
Cut the horizontal plates to accommodate all ports.



Fig. 13
Additional space for port can be created by moving the internal plates towards the ends



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For all systems deeper than a single module, you will need to disassemble the RainSmart module in order to cut the interior plates. Reassemble the RainSmart module when cutting is completed, and replace the RainSmart module into the proper location. (Fig. 15)

Install the pipe into the RainSmart module (Fig. 16)

Seal the opening on top of the pipe with a cap or temporary lid to prevent debris from entering the system.

Maintenance ports

Typically made from 300mm PVC pipe (check plans for actual type and size of pipe), cut the pipe to length, leaving enough excess to trim the top when final grade is reached.

Using your reciprocating saw, cut several 200mm notches into the bottom of the pipe as shown on plans (Fig. 14).



Fig. 14
Cut 200mm notches into the bottom of maintenance port.



Fig. 15
If after adjusting the internal plates, the pipe will not fit, the top plate can be cut off centre and one of the internal plates can be removed.



TIP

If using prefabricated pipe boot kits, install them onto the pipe now, leaving the band clamps loose so that final adjustments may be made in Step 7.



TIP

If the location of maintenance ports is not shown on your plans, include a port within 3m of all inlet and outlet pipes (a single maintenance port can cover multiple pipe connections), and include additional maintenance ports, as needed, to prevent the distance between ports from exceeding 20m.



IMPORTANT

Do not over-cut the RainSmart module plates, minimise the gaps between the pipe and the RainSmart module plates. This is particularly important with the top plate.

Using your reciprocating saw, cut the horizontal plates in the centre, between the two internal plates, to accommodate the port. If the pipe will not fit between the two interior plates, one or both plates may be moved to the outer connection locations on the large plate (Fig. 13). All horizontally oriented plates will need to be cut EXCEPT FOR THE BOTTOM PLATE.

In total you will need to cut:

MODULES	CUT	MOVE
Half	1 Large Plate	2 Small Plates
Single	1 Large Plate	2 Small Plates
Double	2 Large Plates	4 Small Plates
Triple	3 Large Plates	6 Small Plates
Quad	4 Large Plates	8 Small Plates
Penta	5 Large Plates	10 Small Plates

For all modules you will need to disassemble the RainSmart module in order to cut and/ or move the interior plates.

Reassemble the RainSmart module when cutting is completed. Remember to insert the non-corrosive anti-scour pad in the bottom of the RainSmart module (should fit directly below the maintenance port), and replace the RainSmart module into the proper location (Fig. 15).

Install the pipe into the RainSmart module (Fig. 17) and seal the opening on top of the pipe with a cap or temporary lid to prevent debris from entering the system.



TIP

If using Prefabricated Pipe Boot Kits, install them onto the pipe now, leaving the band clamps loose so that final adjustments may be made in Step 7.



Fig. 16
Installed maintenance port



Fig. 17
Install port into RainSmart System



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7. WRAP RAINSMART SYSTEM WITH GEOTEXTILE

Clean off any debris that may be lying on top of the exposed geotextile around the perimeter of the RainSmart system.

Cut strips of geotextile to fit over the top and down both sides of the RainSmart system with at least 600mm of excess material on each side of the system. This 600mm flap should overlay the geotextile placed below the RainSmart modules, creating a clean 600mm overlap to wrap the system.

Adjacent strips of geotextile should overlap at least 300mm or as shown on plans. Use duct tape, sand bags or other ballast to temporarily secure overlaps.

Fold geotextile for outside corners similar to sheets on a bed, and lay excess material flat against RainSmart system. Leave corners loose to avoid creating weak spots in the material. Temporarily secure excess fabric with duct tape. Ensure geotextile is flush against RainSmart system.



IMPORTANT

Take special care with inside corners on the footprint of the system. Cut geotextile as needed to ensure that it lays flat against the RainSmart system. Use additional pieces of geotextile to seal the corner and any cuts that are made. Allow for 300mm overlap.



Fig. 18
Encapsulate RainSmart system with geotextile

Connect inlet & outlet pipes

Where the inlet and outlet pipes connect to the RainSmart system, cut an "X" into the geotextile. Pull the flaps of the "X" over the pipe so that the flaps of the "X" point AWAY from the RainSmart module. Use a stainless steel band clamp to seal the flaps to the pipe.

If used, adjust all pipe boots so that the fabric lays snug against the RainSmart system. Tighten the band clamps with a screw driver. Use duct tape to secure the boot flap to the outside of the geotextile envelope.



Fig. 21



WARNING

Inlet and outlet pipes must enter the RainSmart module allowing water to flow directly into or out of the system without filtering through the geotextile or module side wall. Failing to correctly connect pipes to the RainSmart module, will void the warranty. Where possible, use RainSmart 160mm or 300mm access plates.



TIP

If using prefabricated pipe boot kits, install them onto the inlet and outlet pipes, leaving the band clamps loose so that final adjustments may be made.



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8. BACKFILL SIDES

Place backfill material (same as bedding materials in Step 3) around perimeter of the RainSmart system, distributing the material evenly to prevent shoving of the RainSmart modules.

Use a trench roller or plate compactor to compact backfill in 300mm lifts.

Continue placing and compacting backfill in 300mm lifts until the material reaches the top of the RainSmart modules.

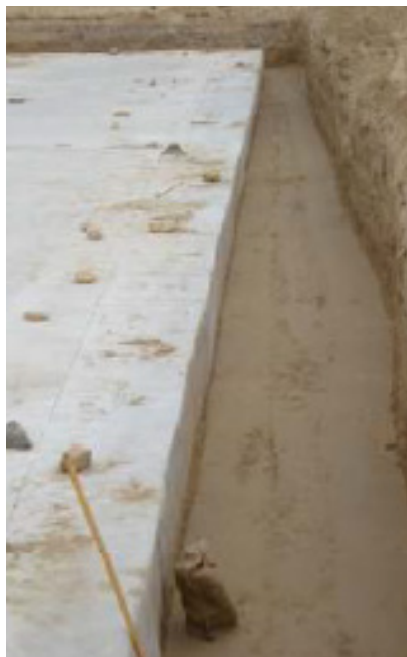
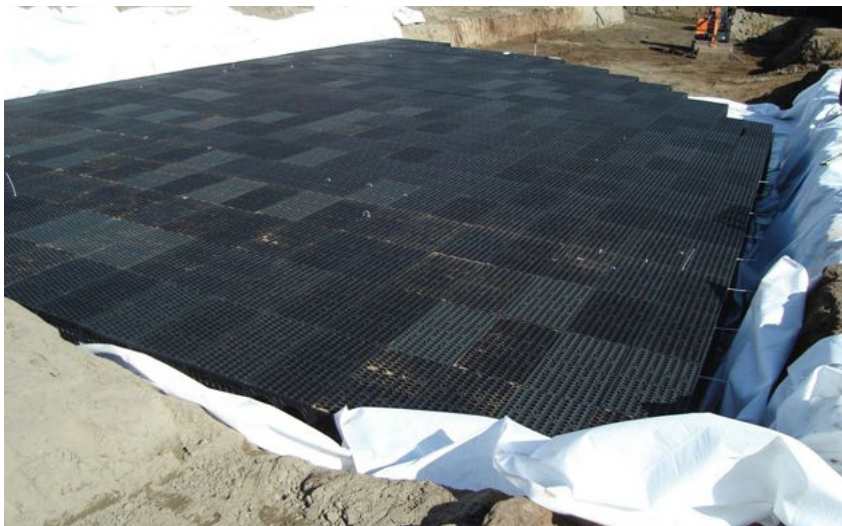


Fig. 22
Vibratory compaction of side backfill is always required , regardless of what backfill material is used.



WARNING

Care should be taken to NOT damage the geotextile or liner during backfill placement and compaction.



IMPORTANT

Vibratory compaction of the side backfill (Fig. 22) is a critical step that both compacts the backfill and eliminates the minor gaps between individual RainSmart modules. While some backfill materials will yield a 95% proctor density without compaction, **vibratory compaction of the material must be completed to ensure the stability of the system.** Skipping this step will void the manufacturer's warranty.

9. BACKFILL TOP

Dump backfill material adjacent to the RainSmart system and, using your skid-steer or dozer, place the material over the RainSmart system (Fig. 23). Install 100mm of clean backfill over the RainSmart system and compact backfill layer with walk-behind plate compactor (max 450kg). Place site specified cover material, over backfill layer, in no more than 300mm lifts. Continue compacting backfill material with a walk behind plate compactor until 450mm cover is achieved. Once 450mm cover is achieved, compact cover material using a 2-3 tonne smooth drum roller.

Largest track dozers that can be used with 450mm of cover over the RainSmart system:

MACHINE	OPERATING WEIGHT	TRACK DIMENSIONS	GROUND PRESSURE
Case 850K LGP	9.38 t	0.70m x 2.35m = 1.67 m ²	2.80 t/m ²
Caterpillar D5K LGP	9.68 t	0.66m x 2.31m = 1.52 m ²	3.17 t/m ²
John Deere 550J LGP	8.27 t	0.61m x 2.18m = 1.33 m ²	2.95 t/m ²
Komatsu D39PX-21	8.90 t	0.63m x 2.36m = 1.49 m ²	3.00 t/m ²
New Holland D95 LGP	9.38 t	0.71m x 2.36m = 1.68 m ²	2.81 t/m ²

** This list is not intended to be all inclusive, but representative.

If your machine is not listed, you'll need to find your vehicle's operating weight and measure the area where the tracks contact the ground. Take these dimensions and multiply them (length x width), then multiply by 2 (since the machine has two tracks), then divide the operating weight by the total sqm of contact area to determine the contact pressure of the machine. If the contact pressure is less than 4.8t and the operating weight is less than 9.0t the machine will work with 450mm of cover.



Fig. 23
Use skid-steer to place backfill over RainSmart modules.



TIP

When placing backfill over RainSmart modules, work in the direction of the geotextile overlap to avoid pushing material between the fabric layers.



WARNING

Dump trucks should not drive over or dump material on top of the RainSmart system, until pavement construction is fully complete.



WARNING

Some materials will compact significantly while others may shove excessively as you work. Never allow your lift thickness to compact to less than 300mm without adding more material.



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10. PLACE GEOGRID

Geogrid is required for all load-bearing applications (Fig. 24), such as systems placed beneath parking lots and roads. It is not required above systems used in open space where traffic is prohibited, such as sport fields or natural areas. Typically DuraGrid X 30/30 is used in this application.

Geogrid must be placed 300mm above the RainSmart system. Overlap adjacent panels by 300mm minimum or as specified in plans. Roll out geogrid over the top of the system, with the edges of the grid extending 1.5m from RainSmart system footprint or 1m from edge of excavation or more as show on plans.



Fig. 24
Overlap geogrid 300mm or as required by plans.

11. PLACE ADDITIONAL COVER MATERIAL AS NEEDED

If additional cover or pavement base is required by the plans, begin placing and compacting material in the same manner as discussed in Step 9. Push cover material parallel to the geogrid for best results.

Maximum cover for RainSmart modules is 2m with 5 internal plates. If your system exceeds these limits contact a Cirtex representative.



TIP

To achieve proper compaction requirements, it may be beneficial to begin placing material in 150mm lifts.

12. SECURE THE INSTALLATION

The contractor is to ensure the RainSmart system is protected from contamination during the construction phase of the project.

The RainSmart system should also be secured to prevent damage from construction equipment once it has been installed.

Rope off area (preferred method)

Use warning tape or temporary fencing to prevent unauthorised traffic from driving over the RainSmart system.

Regardless of which method is selected to secure the installation, it must remain in place until one of the following conditions is met:

- Pavement has been placed
- Construction activity at the site has been completed.



Fig. 25
Secure RainSmart system installation using barriers.



IMPORTANT

Some projects require the use of cranes above the RainSmart system. While it is advisable to avoid this scenario, it may be feasible to utilise a crane over the RainSmart system based on the depth of the RainSmart system installation and the size and weight of the crane. Please consult the project engineer or Cirtex for assistance prior to allowing a crane to drive over the RainSmart system.

13. INSTALLING PRETREATMENT DEVICES

If required by the engineer, install pre-treatment devices prior to activating the RainSmart system to keep debris from entering the system.



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