RAINBOX C+

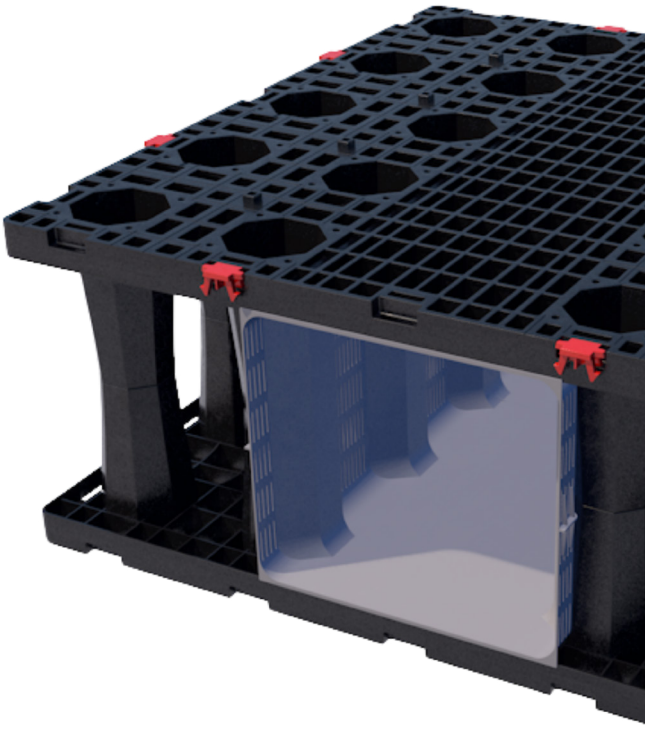
STORMWATER ATTENUATION & SOAKAWAY CRATES

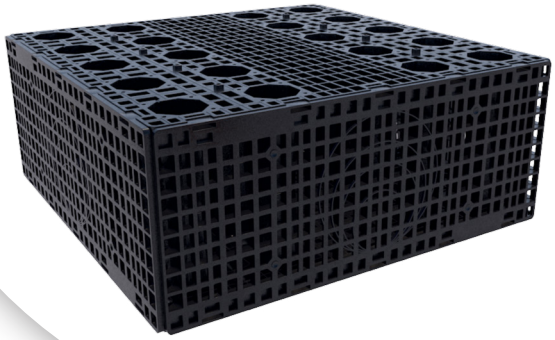
Product Installation & Technical Overview

JDP Nature's Network

rainbox®
attenuation solutions

Content





INTRODUCTION TO THE NEW

RAINBOX C+

In a world marked by an intensification of urban development, more and more land is being allocated to construction. This increases the impervious surface area of our towns and cities at the cost of a substantial decrease in the natural capacity for rainwater infiltration.

That's why JDP contributes to supporting stormwater management with a complete range of innovative solutions. Working with DYKA, the Rainbox C+ opens up new design and construction perspectives for rainwater attenuation and soak-away drainage in the urban environment.

The Rainbox C+ has been specifically designed for the modern construction industry, where sustainability is a growing priority. Made from 100% recycled Polypropylene and engineered for highly efficient pallet stacking, these heavy-duty crates are 100% recyclable and space-saving, both on-site and during transport, helping to reduce CO2 emissions.

Features & Benefits

- 100% recycled PP heavy-duty crate
- HGV loading capable
- Unique sedimentation channel
- Space-efficient design minimises transport space and on-site storage
- Efficient pallet stacking reduces CO2 emissions during transport
- 100% recyclable
- JDP provides technical support for project sizing and optimisation (hydraulic, mechanical, footprint, depth, layout, integration).

Applications

Due to its high vertical and lateral strength values, the Rainbox C+ system can be used across a multitude of light and heavy-duty applications, including:

Garden & Landscape Areas

Driveways

Car Parks

Commercial Yards

Access Roads

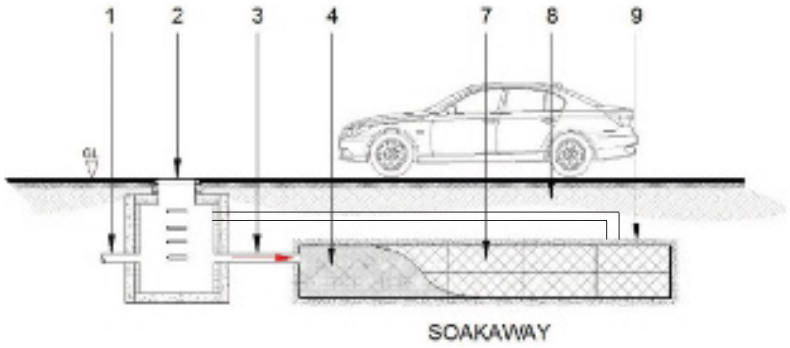
Operating Principle of the System

The Rainbox C+ can be used to improve surface water drainage and prevent flooding in both soakaway and attenuation systems with only minor changes to the installation process.

1. Pipe Inlet
2. Inspection chamber / Catchpit
3. Tank Structure Inlet
4. 125g/m2 non-woven geotextile
5. 300g/m2 non-woven protection
6. 1mm thick impermeable membrane
7. Rainbox C+ crate
8. Vent pipe
9. 100mm sand
10. Flow control chamber

Soakaway Tank

For a soakaway installation, the Rainbox C+ tank structure is wrapped in a permeable, non-woven geotextile to allow the infiltration of groundwater while preventing any intrusion of material, especially from backfill. Rainwater then infiltrates into the tank through the ground or can be fed directly through an inlet pipe from other surface water drainage systems. The structure temporarily stores the excess water and gradually releases it back into the surrounding soil over time.

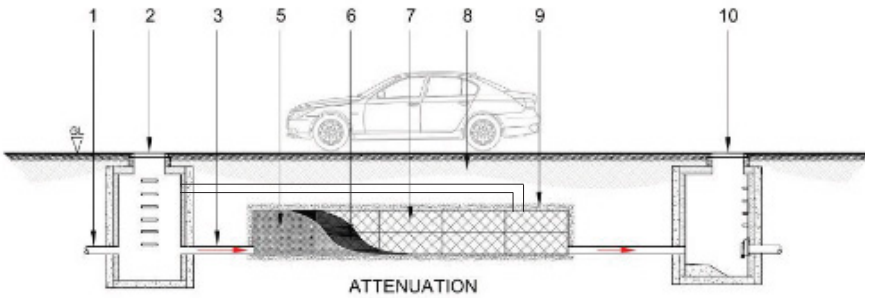


SOAKAWAY

Attenuation Tank

For an attenuation installation, the Rainbox C+ tank structure is first wrapped in an impermeable geomembrane to make it watertight and then in a permeable, non-woven geotextile protection fleece to protect it from material intrusion. Rainwater is fed directly into the tank via an inlet pipe, where it is temporarily stored to allow for a controlled discharge towards an existing watercourse or sewer network through an outlet pipe. This can be regulated with the addition of a flow control device downstream from the outlet.

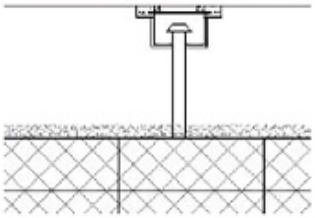
For this type of system, the risk of flotation must be anticipated and calculated if the water table is too close, i.e. higher than the lowest part of the structure.



ATTENUATION

Ventilation

Every Rainbox C+ tank structure should be equipped with a vent to ensure the balance of internal and external pressures. The vent pipe should be connected to the top of the tank and directed towards the upstream/ downstream inspection chambers or brought up to surface level.



Tank Operation

With Rainbox C+, DYKA innovates by making each crate unit potentially inspectable. Sedimentation inserts can be added to line the passage in the middle of each main Rainbox C+ unit, making them inspectable and hydro-cleanable up to 120 bar.

The walls of the sedimentation inserts are filled with gradual perforations for optimal diffusion of rainwater while retaining mud and fine suspended particles.

This allows for the containment of solid particles in the channel, which reduces the risk of clogging and provides a single point of inspection. Subject to periodic maintenance, this can help guarantee the hydraulic performance of the structure and its net volume.

Reduced Environmental Impact

Choosing a Rainbox C+ system aids in the reduction of construction costs and environmental impact of a project, thanks to a number of unique features:

- The lightness of the parts - makes them easy to manage.
- The snap-on components - require no external elements, increasing installation speed.
- The stackable design - reduces the on-site storage space required and optimises truck loading for transport.

Installation Limits

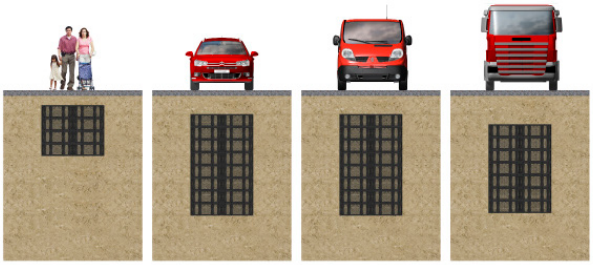
When installed, the crate structure is affected in two ways:

- Vertically, by the accumulation of backfill loads and operating loads (rolling or storage loads).
- Horizontally, by the thrust of the earth.

The two types of installation constraints that result from this are:

- The minimum and maximum coverage height.
- The maximum burial depth.

*294m^3 per truck

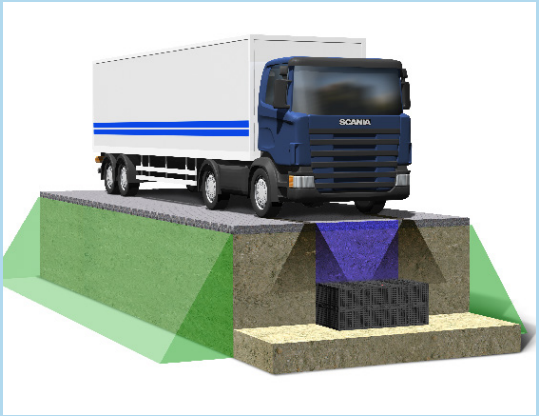


Load Resistance

Once installed, the Rainbox C+ structure will be subjected to very significant loads. Each correctly constructed unit, however, is specifically designed to respond perfectly to extreme mechanical stresses. The diagram adjacent provides a visual representation of the forces that will apply to the structure.

These loads can be grouped into two categories:

- Permanent - weight and lateral pressure of the earth and permanent storage loads.
- Temporary - weight and lateral pressure of rolling loads and material storage loads, in the construction phase, that are transferred by the ground towards the buried basin.



The exceptional resistance to these load types is achieved by combining several parameters:

- The alignment of the crate unit's studs (legs) ensures a perfect descent of static and dynamic loads on the entire structure.
- The geometry of the Rainbox C+ crate is the ideal compromise between void index and a homogeneous distribution of loads.

The crates are connected together vertically through built-in centring studs and horizontally via connection clickers (clips) to ensure the structure's cohesion. This design advantageously replaces the masonry wall assembly technique.

Installation Loadings

	Load (GVW)						
	Pedestrians	Up to 3T	12T	16T	30T	44T*	60T**
Min Coverage	0.25	0.5	0.6	0.6	0.75	1.0	0.8

*Full HA loading for main roads
**Low speed under 15mph

Near a building, the minimum horizontal distance between the construction and the tank will be equal to 1.5x the depth to the base of the structure. In infiltration, this distance will be at least 5 m (unless a specific study recommends a shorter distance).

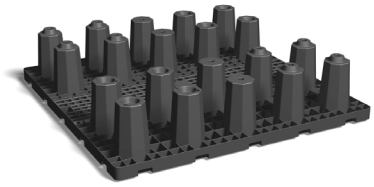
JDP will provide technical support for each project to verify the hydraulic/mechanical sizing and optimise the footprint, depth, layout, integration, etc.

Technical Characteristics

Rainbox C+ Components

Rainbox C+ 1/2 Module

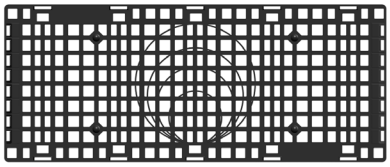
Each Rainbox C+ crate is made up of two crate modules that connect in bilateral symmetry and create a 95% Void Ratio.



PRODUCT NUMBER	MATERIAL	USEFUL VOLUME (L)	WEIGHT (KG)	LENGTH (MM)	WIDTH (MM)	HEIGHT (MM)
112020056913	PP	105	4.7	800	800	165

Side Plate

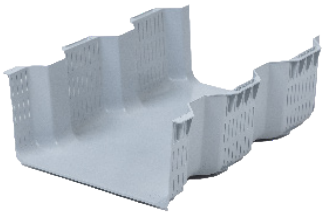
Used to close off any open sides of the tank structure and strengthen its mechanical resistance.



PRODUCT NUMBER	MATERIAL	WEIGHT (KG)	LENGTH (MM)	WIDTH (MM)	CONNECTION
112020056918	PP	1.55	800	330	ø110 to ø250

Sedimentation Insert

Four inserts per crate are used to create a sedimentation channel along the inspectable run.



PRODUCT NUMBER	MATERIAL	WEIGHT (KG)	SIZE LIMITS	PACKAGING
112020057082	PP	0.289	max ø250	per piece depending on the quantities required *4 per crate*

Connection Clickers

Used to connect adjacent crates and maintain the structure's cohesion over time.

PRODUCT NUMBER	MATERIAL	WEIGHT (KG)	PACKAGING
112020057081	PP	0.036	50 pieces/bag

Additional System Components

Connecting Plate
Used to enable connections to Ø 315 & 400mm pipes.

PRODUCT NUMBER	TYPE	WEIGHT (KG)	LENGTH (MM)	WIDTH (MM)	HEIGHT (MM)
112020057712	DN 315	6.8	655	790	152
112020057720	DN 400	8.6	655	790	182

Soakaway Geotextile
These products are resistant to all naturally occurring soil alkalis and acids, as well as fungal attacks. They are also UV-stabilised and will not rot.

125g/m2 Non-Woven Geotextile

PRODUCT NUMBER	SIZES AVAILABLE	AVAILABLE
1601NW2020	4.5M X 100M	ROLLS
1601NWR10X4.5	4.5M X 10M	PACKS

Heavier duty geotextiles may be required under HGV loading

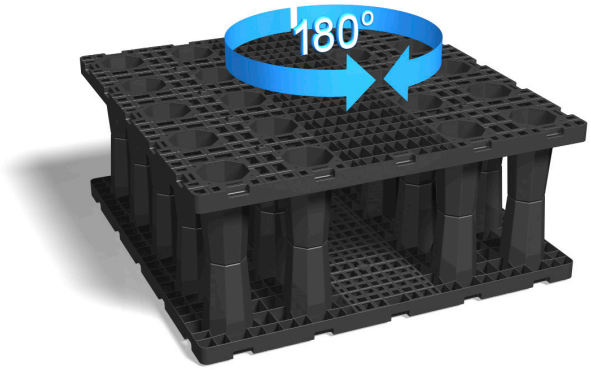
Attenuation Geotextile & Impermeable Membrane

- 300g/m2 Non-Woven Geotextile Protection Fleece
- 0.75 – 1 mm Thick LLDPE Impermeable Membrane Liner Available in rolls or as a shoebox Style.

Note: These items will be in partnership with suppliers.
Please ask our technical support team for more details.

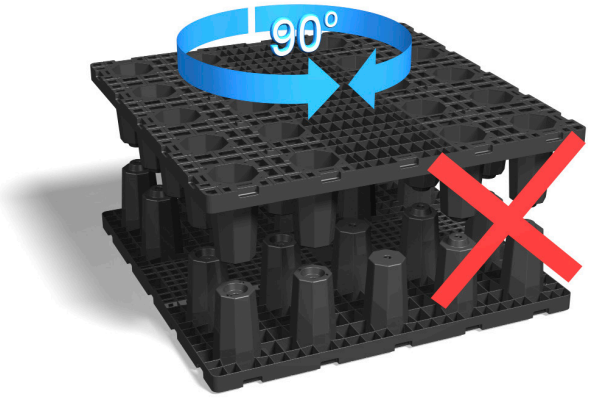
Constructing the Rainbox C+ crate units

The Rainbox C+ crate units should be installed in accordance with the layout plan established during the site preparation phase. This plan should specify, in particular, the overall tank structure's width, length and height, the number of layers required, and the direction of implementation.



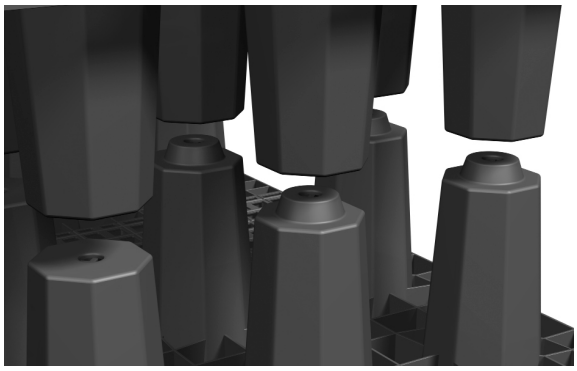
Each Rainbox C+ crate module has 20 studs (legs) evenly distributed on either side of a central void space that forms an inspection channel in the constructed crate. This allows for easier inspection of the structure.

The crate modules are designed to easily interlock and form a single unit that is 800mm wide, 800mm long, and 330mm high..



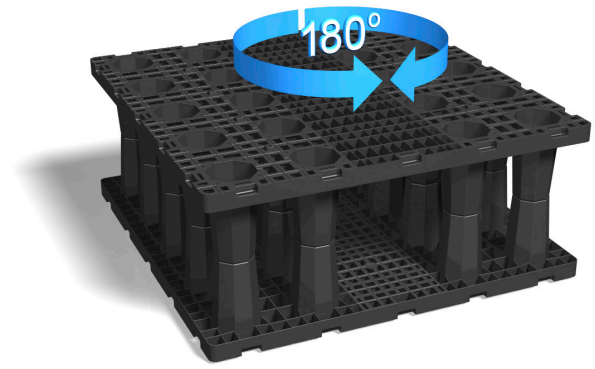
Care must be taken to ensure that the inspection channel spaces between the studs on the top and bottom modules are aligned. Otherwise, a horizontal rotation of one of the modules will be necessary during installation.

The top of each stud on the Rainbox C+ is equipped with either a male, female or neutral connection feature that serves as an alignment key.



Each side has four male struts, two neutral struts, and four female struts that are a flipped mirror image of each other, i.e. the four male struts on the left side sit opposite the four female struts on the right, etc.

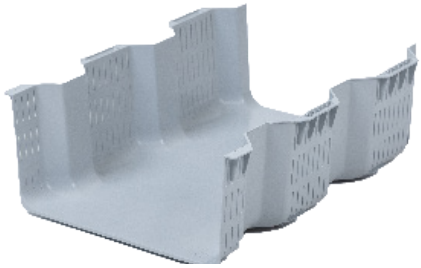
The interlocking of two crate modules is only possible if they are correctly positioned to allow the male struts from the top module to nest into the female struts on the bottom module and vice versa.



Due to the inspection channel running directly through the centre of each crate unit, care must be taken to correctly orient them from the start to match the structure's inlets/outlets.

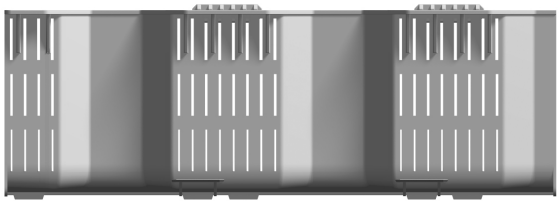
All crates in the tank structure should be oriented in the same direction to establish continuity.

Installing the optional sedimentation channel

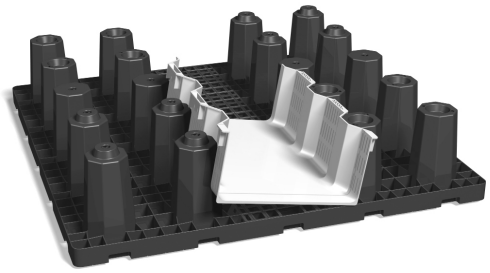


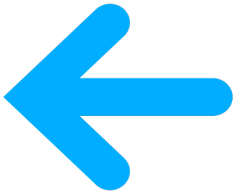
Unique to the Rainbox C+ are the light grey sedimentation inserts designed by DYKA Group to provide better visibility and brightness during camera inspections.

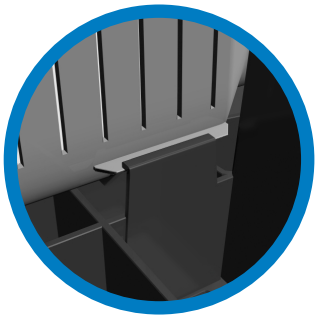
When fitted into the inspection channel space on both halves of a crate unit, these sedimentation inserts also help retain any sediment carried in by rainwater entering the tank.



This is achieved through a grid of narrow slots on each side of the inserts, purposefully sized and positioned to allow the water to spread throughout the structure while retaining the sediments.

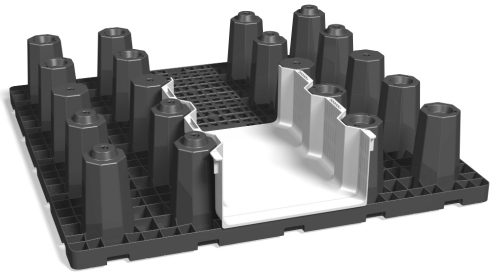






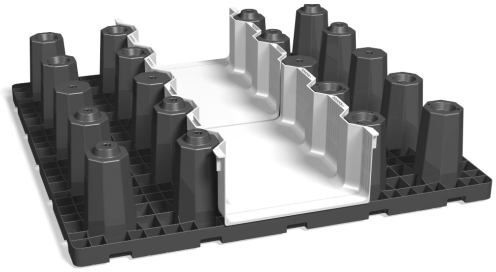
The shape of each insert is designed to perfectly fit the geometry of the studs bordering the inspection channel of each module, maximising the filtration surface without significantly reducing the void space of the channel.

They can be easily assembled on-site with a manual push until securely gripped by the crate's built-in clips.



The inserts should only be installed in crates along the inspectable run in line with the tank's inlet/outlet pipework.

If the inlet and outlet pipes are on different levels, rows of crates fitted with the sedimentation channels may need to be installed on multiple layers of the tank.



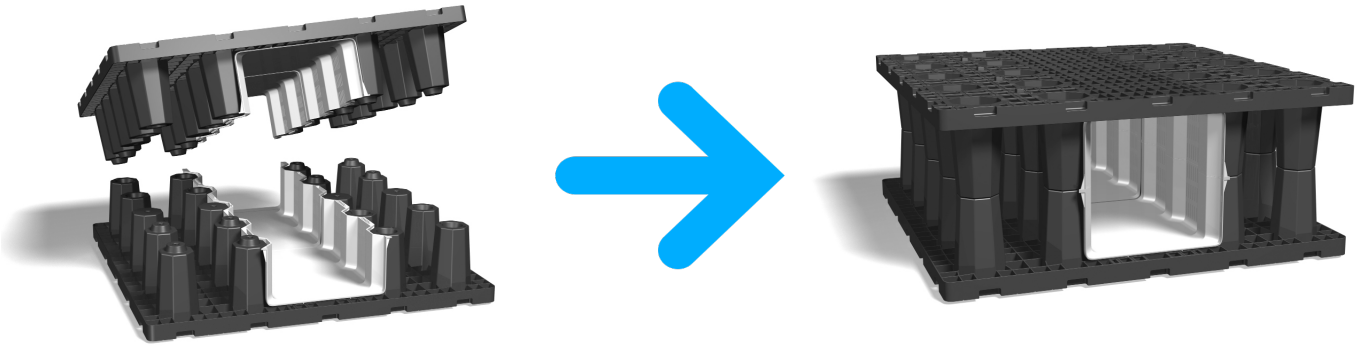
Each insert is 400mm long, so two inserts laid end-to-end per crate module are required to create the sedimentation channel.

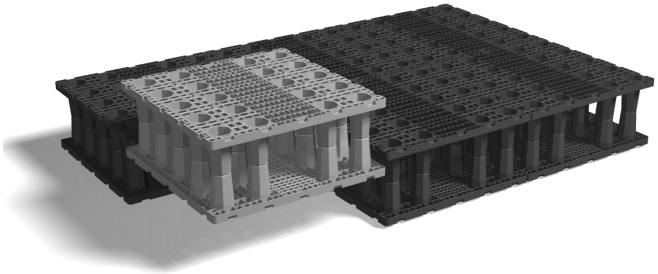
Having a full row of Rainbox C+ crates fitted with a sedimentation channel run across the entire structure between the inlet and outlet makes it possible to remove silt and sediments by hydro-cleaning.

At each end of the inspectable run, the outward-facing end of the last sedimentation insert at the top and bottom of each crate module must be manually trimmed on-site with a suitable cutting tool.

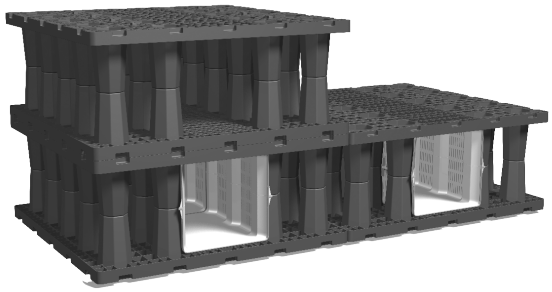
This is necessary to free up space for the fitting of a side plate to close the structure.

The sedimentation inserts must be fitted into the Rainbox C+ crate modules before the modules themselves are assembled by interlocking the struts.





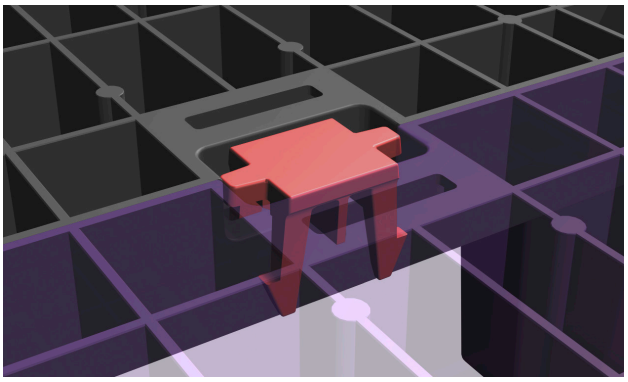
The installation of each 330mm deep layer of Rainbox C+ crates is done by tightly nesting them together with the inspection channels all aligned in the same direction.



Depending on the configuration of the Rainbox C+ tank and the technical study carried out during the planning stages, it is possible that installing several sedimentation channels could be necessary.

For tanks that require this, the sedimentation channel runs can be aligned either horizontally or vertically.

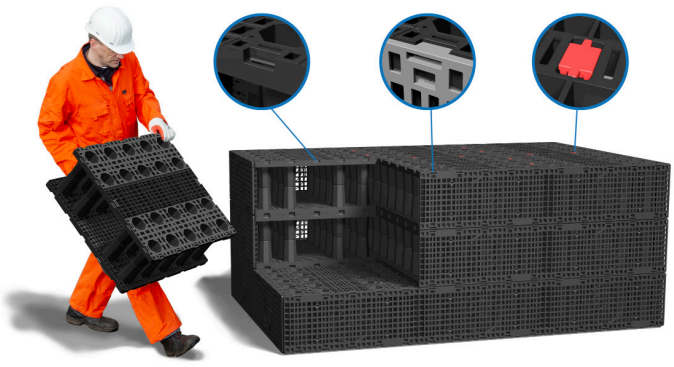
Joining crates with fixing clips



Red fixing clips should be used on every side connecting to an adjacent crate. For a good connection, two clips per side are needed. This will help to maintain the tank's cohesion over time.

The clips are easy to install, requiring only a manual push into one of the five "clip holes" formed when two crates are correctly aligned beside each other.

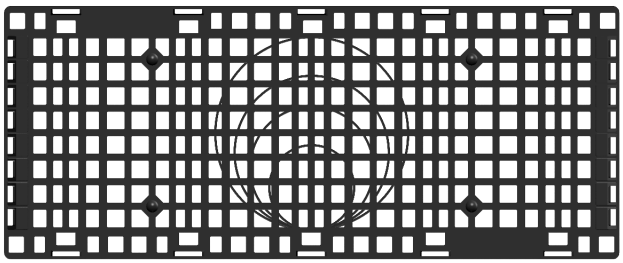
The underside of each clip has four prongs, two of which will clip into each crate, straddling the join line.



Depending on its position in the tank structure, each crate installed on the chosen layer will need to be equipped with either eight clips (for a crate in the centre), six clips (for a crate on an outer edge), or four clips (for a corner module).

The installation of clips does not in any way hinder the installation of Rainbox C+ side panels on any layer of the tank.

Installing side plates

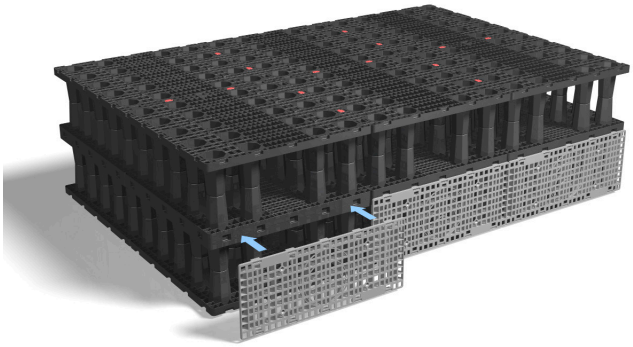


Once the crate units have been correctly aligned, connected, and layered to build up the planned Rainbox C+ tank, each crate with one or more exterior-facing sides on all levels needs to be fitted with an equal number of side plates to close them off.

These panels measure 800mm wide and 330mm high and are designed to perfectly align with the dimensions of a full crate unit.

They fit easily onto any side of the crates with a manual push-fit clip system.

Each plate is also equipped with a saw-cutting matrix to aid the connection of standard drainage pipes from ø110 to ø250 in size.



When installed, these side plates contribute to the vertical mechanical resistance of the tank and also work to prevent the surrounding soil from pushing the geotextile or geomembrane layer(s) inward once the backfilling is done..

Different technical possibilities for connecting to the tank

Connecting standard drainage pipes from Ø 110 to Ø 250 is aided by the saw-cutting matrix on the Rainbox side plates.
These pre-tracings in the form of concentric circles centred downwards are easy to cut out with a jigsaw and thus facilitate manual cutting on-site.

Cutting out the required connection hole following the most suitable pre-tracing will be enough to insert the pipe into the tank. Due to the wall thickness of the pipe, a slight break in the water flow can be noticed between the sedimentation insert and the inlet/outlet pipe.

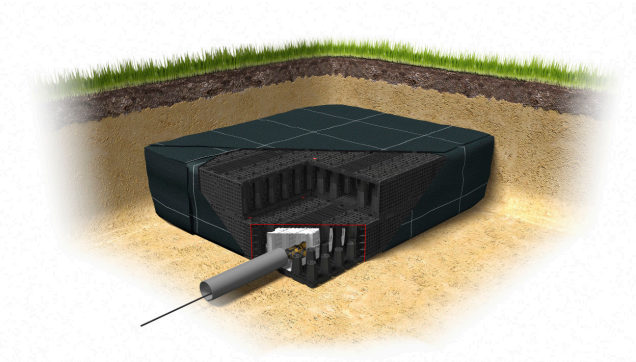
If the Rainbox C+ tank is to be equipped with a sedimentation channel, the inlet and outlet connections to the tank should always be located in line with the crates equipped with sedimentation inserts.

Where the use of sedimentation inserts is present, the drainage pipes should never exceed Ø 250 per connection. Larger connections would result in some of the rainwater spilling into the tank, bypassing the sedimentation channel, which would not prevent the diffusion of water throughout the structure and would not allow all the sediments contained in the water to be retained.

Connecting using a manifold

In cases where a single Ø 250 inlet pipe is not sufficient in terms of flow, it is possible to connect two or three smaller pipes in adjacent crates that can match the flow rate using a manifold approach. In this case, the installer can use a catchpit manhole with a multi-outlet base to split the incoming drainage pipe into the required number of inlet pipes for the tank. This manhole should usually be located upstream of the structure, but not adjacent to it. The JDP technical team can indicate the number of connections to be made and their Ø, leaving it up to the company that does the installation to define them and provide the necessary accessories (pipes and fittings).

This manifold system can also be used to connect larger diameter pipes to the Rainbox C+ tank while still enabling the use of the sediment inserts, i.e., splitting a Ø 315 or Ø 400 drainage pipe into multiple smaller pipes that can connect to the tank without the need for a connection plate. In this instance, however, the split would also have to be reversed if the system has an outlet, i.e., having three Ø250 outlet pipes connected to the tank that join back up into a single Ø315 or Ø400 pipe through a manhole chamber base.

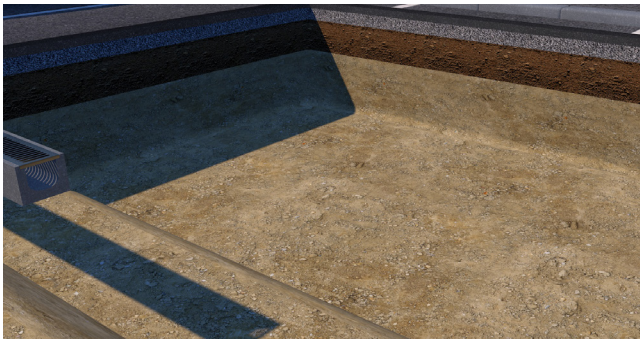


Connection by Ø 315 or Ø 400 connector plate

For all standard Rainbox C+ tanks without the sedimentation option, it is possible to directly connect a ø 315 or 400 pipe with a connection plate. In this case, the connector plate is directly attached to the tank in place of two vertically aligned side plates at the required location. The inlet pipe bringing the rainwater will then be fitted into the female part of the connector plate.

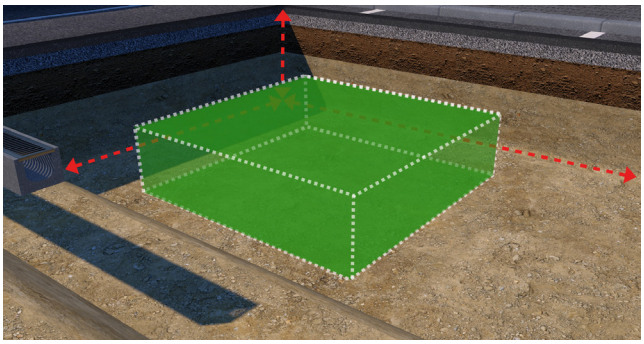
Installation Advice & Backfilling

The various installation operations should be carried out in accordance with the guidance provided in the technical guide CIRIA C680.
A typical installation of a Rainbox C+ tank is given in the example below.



Excavation - Base Shape

Excavate the ground to suit the size of your planned soakaway tank. Follow the recommended installation depth and coverage instructions provided in the technical documentation for the correct loading type. Oversize the base and slope the embankments to allow extra room for safe working practices.

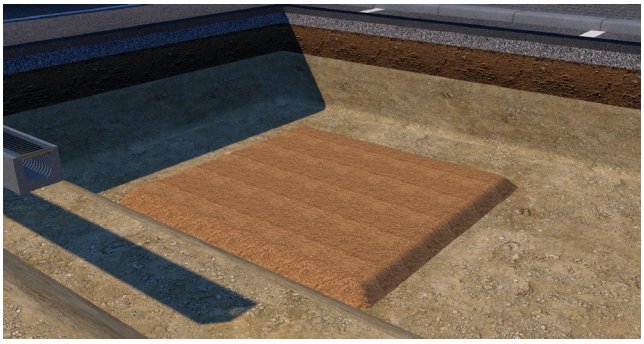


Base level adjustments:

- For infiltration (soakaway) installations, a horizontal level should be maintained.
- For retention (attenuation) installations, the base should be sloped between 0.5 and 1% down towards the discharge point. On linear structures, partitioning may be necessary.

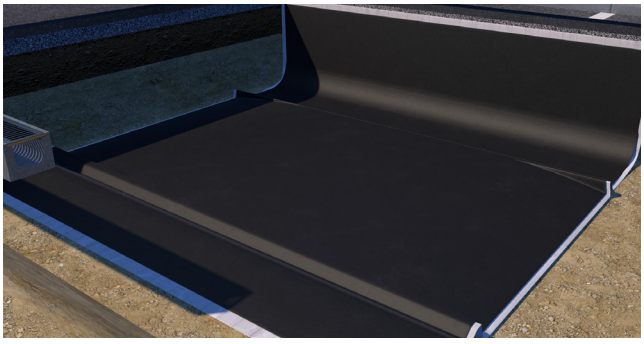
Bedding

A 100 mm bedding layer of clean stone or sand should be added and adjusted according to the same provisions as for the base shape (see paragraph above).



Geotextile - Geomembrane

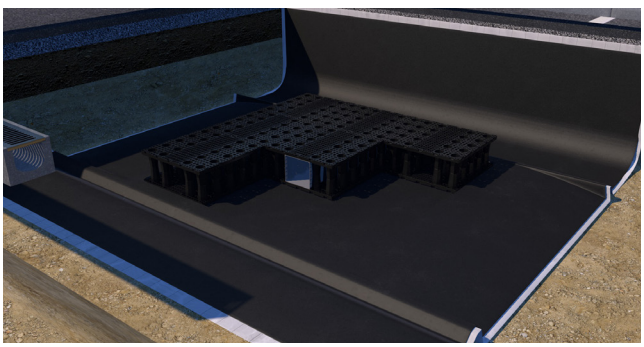
Line the basin with a geotextile membrane large enough to wrap the planned tank structure. The installation should be carried out using industry best practice techniques, particularly by allowing an overlap of at least 0.5m between geotextile strips to prevent any material intrusion into the structure.



The nature of the geosynthetic material depends on the application. Where drainage and filtration are the primary aims, thermally bonded non-woven geotextiles (fibre geotextiles) are ideal for the project. For attenuation projects, an additional impermeable membrane liner will be required.

Tank Construction

Lay your constructed Rainbox C+ crates on top of the geotextile in straight runs until the tank's planned footprint has been achieved. Ensure the inspection channels all run in the same direction, in line with the planned pipework connections.



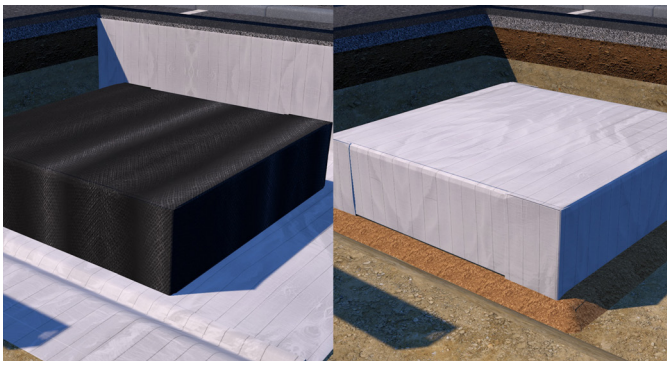
Connect the crates together with the red clickers - two per side, adjacent to another crate. Close off all external-facing sides of the tank with side plates. Repeat this process for all additional layers of crates needed to complete your planned tank structure.

Wrapping of the structure

Once all the crates are installed, completely wrap the structure with the geotextile, making sure that any seams and joints are sufficiently overlapped.

Holes will need to be cut in the membrane to allow connection of the inlets/outlets, vents, and/or ensure access to inspection channels.

If an impermeable geotextile is being used for an attenuation tank installation, any seams or overlaps in the geomembrane will need to be glued or welded to make them watertight. A seal will also be required around the inlet and outlet pipes.

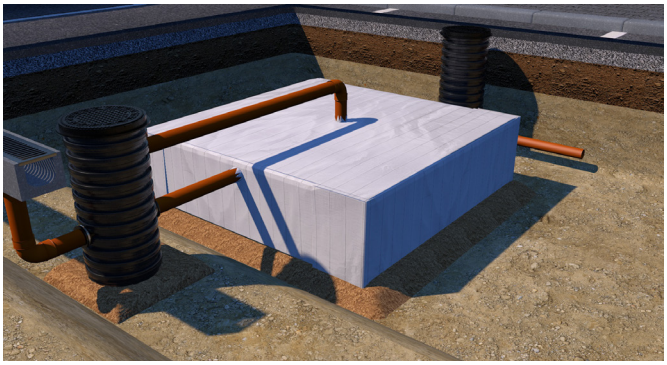


Attenuation Soakaway

Connecting pipes

For any pipe connection up to ø 400, please refer to the "Different technical possibilities to connect to the tank" section in this documentation.

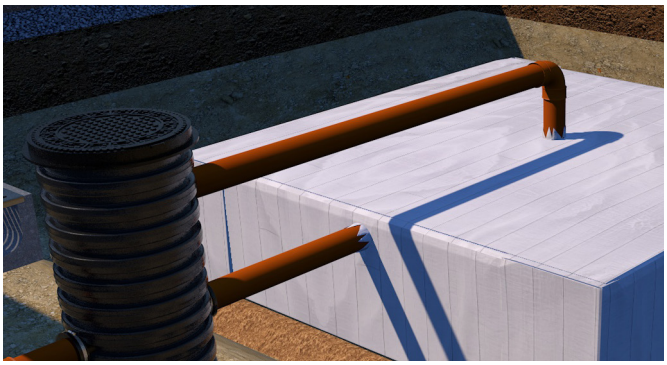
For ø > 400, the inlet pipe can be connected to the tank via a manifold from a suitable manhole.



Vents

The regulation of the structure's internal pressure and ventilation will be achieved through vent pipes.

Depending on the tank configuration, the vents may open either into the manholes or inspection chambers annexed to the system, which will themselves be ventilated, or through dedicated pipes at surface level.

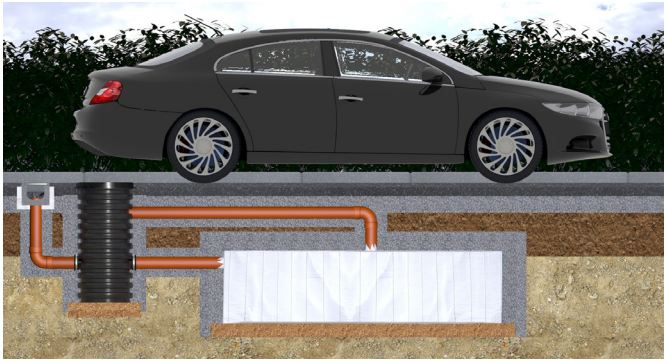


Backfilling

The backfilling will be carried out in accordance with good practice for material selection and compaction.

- Lateral backfill: to be carried out in homogeneous peripheral layers to avoid any displacement of the structure.
- Upper backfill: a protective layer over the geosynthetic material will be applied to the entire basin with a minimum thickness of 10 cm.

Further backfill layers will need to be added, either in topsoil or road materials, depending on the installation location. When implementing successive backfill layers, a minimum cover of 50 cm should be applied before any heavy compaction.



A variety of construction machinery can be used to aid with backfilling the excavation, but only once a safe level of cover has been established over the structure. Compactors, whether vibrating or not, should not be driven directly on the crates due to the additional dynamic loads that will be exerted. A minimum level of backfill is required before machinery can be used as per below table.

Below are the minimum levels of cover required for different machines, with a backfill having an internal friction angle of ≥ 40°.

Minimum Layer of Cover Material	Permitted Machinery
100mm	Hand compactor, vibrating plate Total weight: approx. 700kg Distributed: evenly over axle Dimensions: 900 x 700mm
200mm	Light compactor Total weight: approx. 2.5 tonnes Distributed: evenly over axle Dimensions: 1,200 x 3,200mm
500mm	Articulated compactor, excavator Total weight: approx. 12 tonnes Distributed: evenly over axle Dimensions: 5,900 x 2,300mm
900mm	Trucks up to 60 tonnes

Technical Information Regarding the Implementation of Rainbox C+

Our technical application advice, whether written or verbal, is based on our experience and best knowledge. It is, however, provided without any commitment on our part. Working conditions beyond our control and other application conditions exclude any liability on our part. We recommend that you verify the suitability of the DYKA product for its intended use.

As the application, use, and implementation of our products occur outside our control, they are solely the responsibility of the user. If, notwithstanding this, our liability were to be questioned, it would be limited only to the value of the goods we have supplied and that you have used. Our warranty guarantees the consistent quality of our products in accordance with our specifications and general terms of delivery and payment. All purchases will be subject to our standard terms and conditions which are available at www.jdpipes.co.uk

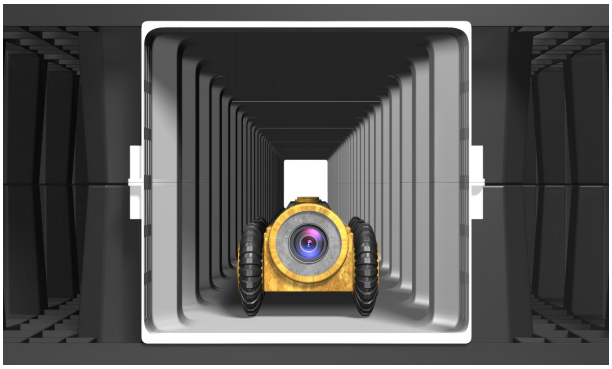
All orders for Rainbox C+ systems must be approved by JDP Technical Support to ensure the components are supplied for the intended design and loading requirements.

Maintenance & Inspection

The pretreatment system guarantees the longevity of the structure; as such, it is necessary to ensure its regular maintenance and cleaning:

- Cleaning of pretreatment devices,
- Dredging of sludge,
- Replacement of filters,
- Sweeping of roads.

Similarly, a video inspection after particular events (rain of exceptional occurrence, work near the basin, etc.) is recommended to verify the tank's structural and functional integrity.



Inspectability & Cleaning

The shape of the Rainbox C+ crate allows camera access for inspection. The type of camera that can be used could be, for example, a "6-wheel drive" type. The machine's mobile head is equipped with a high-definition camera and a lighting system, enabling comprehensive inspection of the structure.

The complete operation can be followed on the surface from control monitors. Access to the inspection channels will be through inspection manholes external to it.

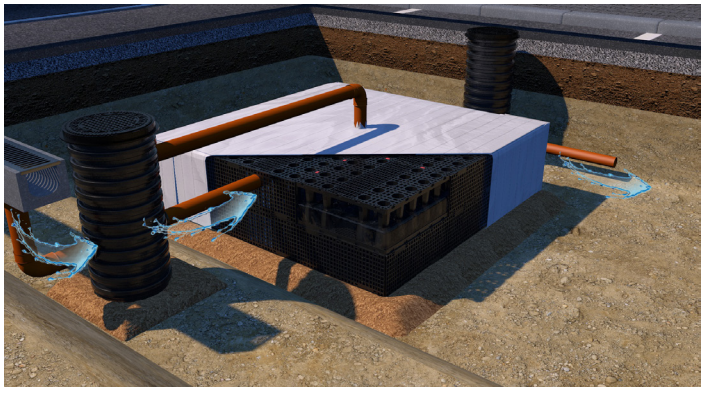
The inspection of the structure should be carried out at the lower level, which is the area closest to any silt build-up.

The Rainbox C+ crate design has been tested to withstand the use of a 120-bar pressure hydro-jet. The hydro-cleaning pressure must also be adapted to the characteristics of the geotextile immediately under the crate.

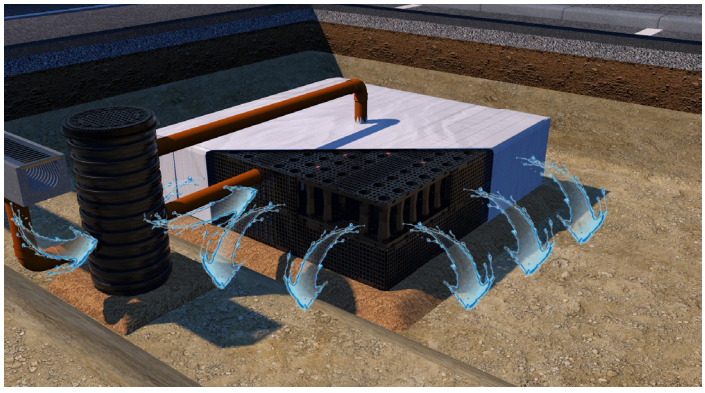
Note: This feature does not eliminate the importance of upstream pre-treatment works, which allow the collection of floating or suspended elements and subsequently avoid clogging the structure.

Possible implementations:

With traditional inspection chambers



Attenuation



Soakaway

Delivery, Offloading & Handling

RAINBOX C+ crates are specially designed to prioritise high-density transport, easy offloading, and low-impact manual handling. These features help improve site safety and lessen environmental impact by optimising delivery cycles.

Transport & Storage Efficiency

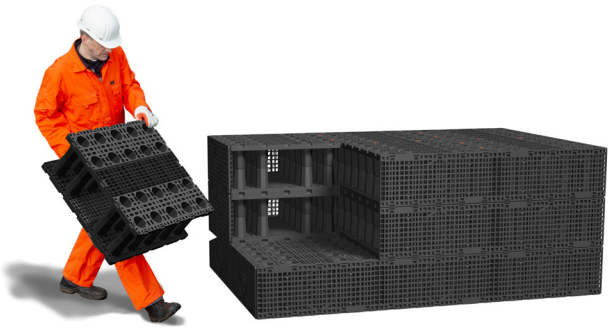
The geometry of RAINBOX C+ crates allows for precision stacking and nesting, maximising pallet density without compromising structural integrity.

- **Pallet Configuration:** the half crates are arranged in two stacks of 29, with 28 units facing upwards, and the final unit is turned over to form a full crate. This creates a flat surface at the top of each stack, preventing the crate's structural legs from being damaged and allowing banding to be secured more easily.
- **Pallet Capacity:** Each pallet can hold a total of 58 units, which equates to 29 full RAINBOX C+ crates when constructed. Vertical Stacking: The "interlocking" design that allows for a flat surface at the top of each stack also facilitates vertical stacking of pallets during transit or storage, without risk of compression damage to the underlying units.
- **Delivery Capacity:** A single wagon load can accommodate 48 pallets, delivering a total of 2,784 half crate units/1,392 full RAINBOX C+ crates.

Offloading & Assembly Logistics

To simplify site deliveries, the RAINBOX C+ is supplied as a complete system. Each pallet holds 29 crates, along with all essential components and accessories (such as side plates and connection clips) needed for the full assembly of an attenuation or soakaway tank.

- **Mechanical Handling:** Pallets are configured for standard forklift offloading, allowing for quick transfers from the vehicle to designated storage areas.
- **Consolidated Components:** By housing all associated accessories within the pallet footprint, the risk of missing components during the offloading phase is eliminated.



Manual Handling & Installation

The RAINBOX C+ is engineered for mechanical-free placement once unpacked.

- **Unit Weight:** At a mass of 4.7kg per half unit, the RAINBOX C+ falls well within standard manual handling guidelines.
- **Tool-Free Manoeuvrability:** Crates can be manually unpacked, assembled, and positioned easily by hand.
- **Site Safety:** The lightweight design of the crates eliminates the need for specialised lifting machinery or heavy plant equipment during the final placement phase, thereby reducing on-site risk factors.

Sustainability & Environmental Impact

The high-density transport capability of the RAINBOX C+ directly correlates to project sustainability goals. By maximising the number of units per delivery, the total number of vehicle movements required for large-scale projects is significantly reduced, resulting in a lower cumulative carbon footprint.