



***SMARTRAFT***<sup>®</sup>  
MODULAR HIGHWAY SOLUTIONS

**INNOVATION**

AND

**Performance you can depend on**

# **SMARTRAFT**<sup>®</sup>

MODULAR HIGHWAY SOLUTIONS

Work Smarter, Not Harder with Smarcraft<sup>®</sup>



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## Work Smarter Not Harder with Smarcraft®

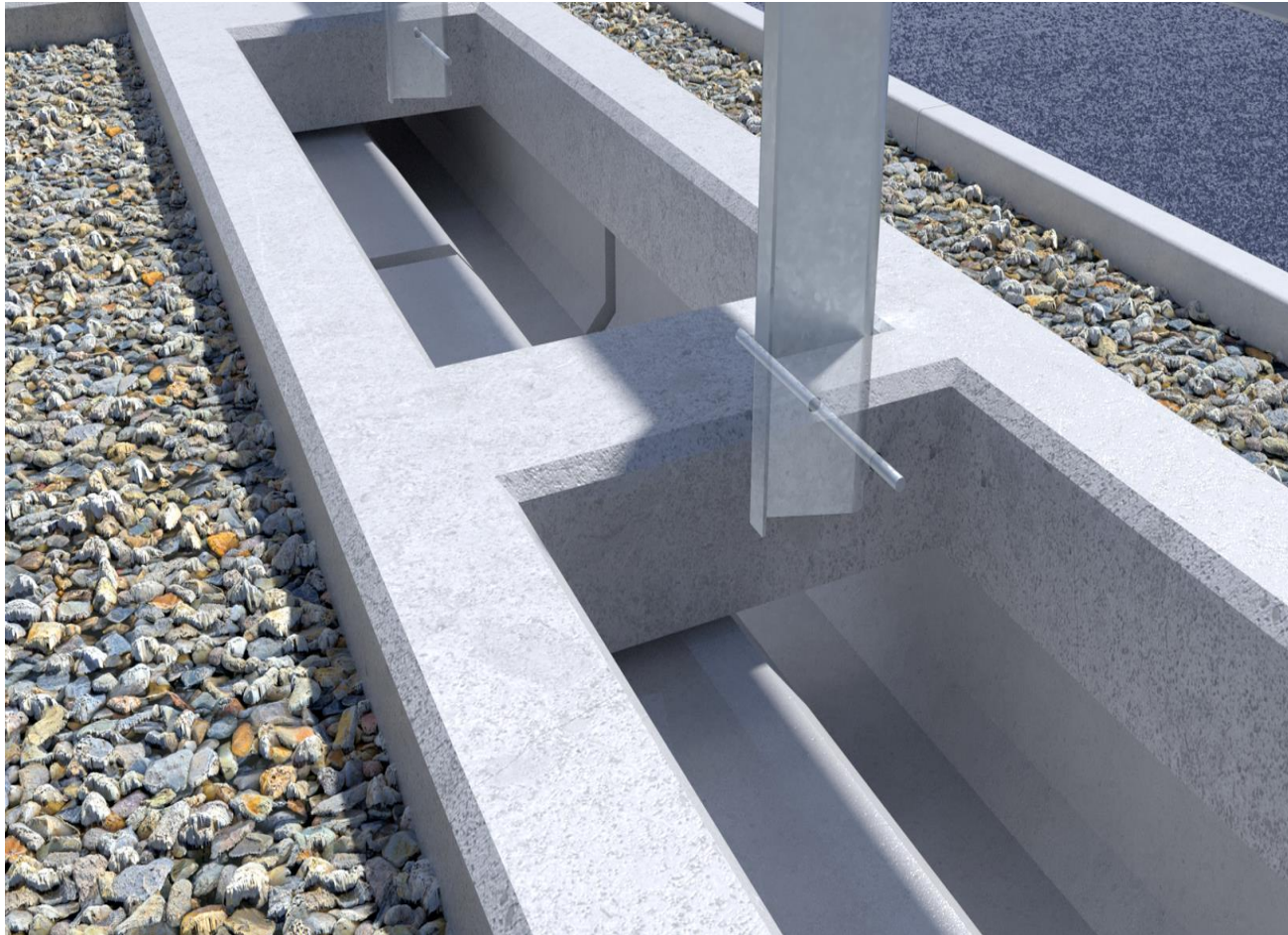


- Smarcraft® is an off-site pre-fabricated, modular concrete foundation to allow for a safe, quick, efficient barrier installation.
- There is no requirement for pre-site ground testing as offsite testing has proven results. Designed off site
- Foundation depth required for installation of Smarcraft® is just 200mm so problematic services, underground structures other ground obstructions can all be overcome with this one simple solution.
- Smarcraft® can be installed in any standard highway ground conditions. On new build projects the ground can be left 200mm low ready for installation removing the risk of excavating completely.
- On prepared ground, installation outputs of 75m+ per hour can be achieved and is up to 20 times quicker than traditional installation methods reducing the time spent on site, the number of mobilisations and traffic management required.

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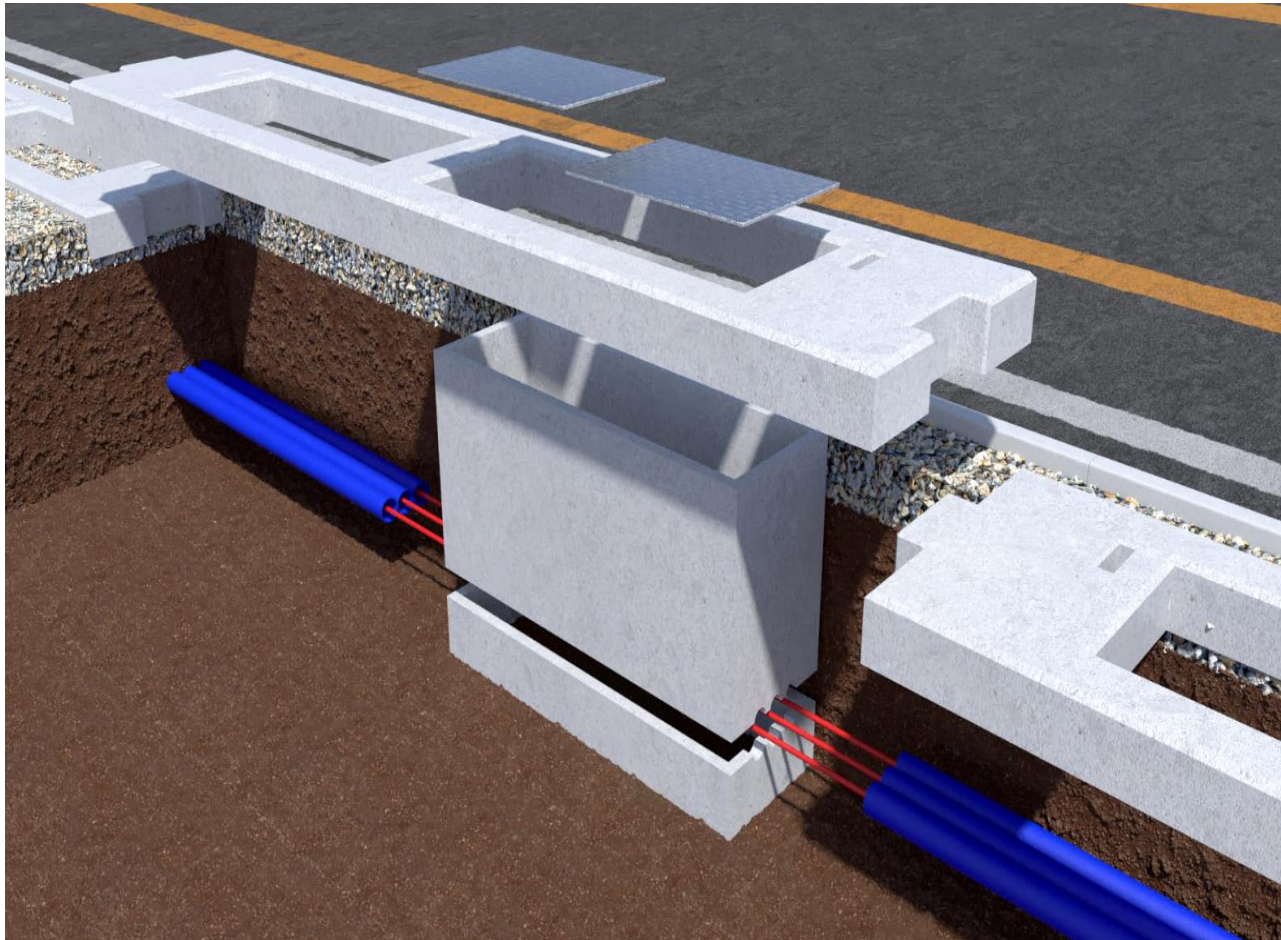
- Working closely with Hill and Smith standard system posts have been modified to suit the Smarcraft<sup>®</sup> shallow foundation detail.
- VRS system post are installed in to a pre-formed concrete socket ensuring easy maintenance following impact.
- Conventional post sockets can collect and retain water, whereas Smarcraft<sup>®</sup> socket positions have drain holes to help keep the post dry and maximise the effective design life of the system.
- The 'retaining' pin detail ensures the unique short post system cannot leave the socket during or after impact.



# SMARTRAFT®

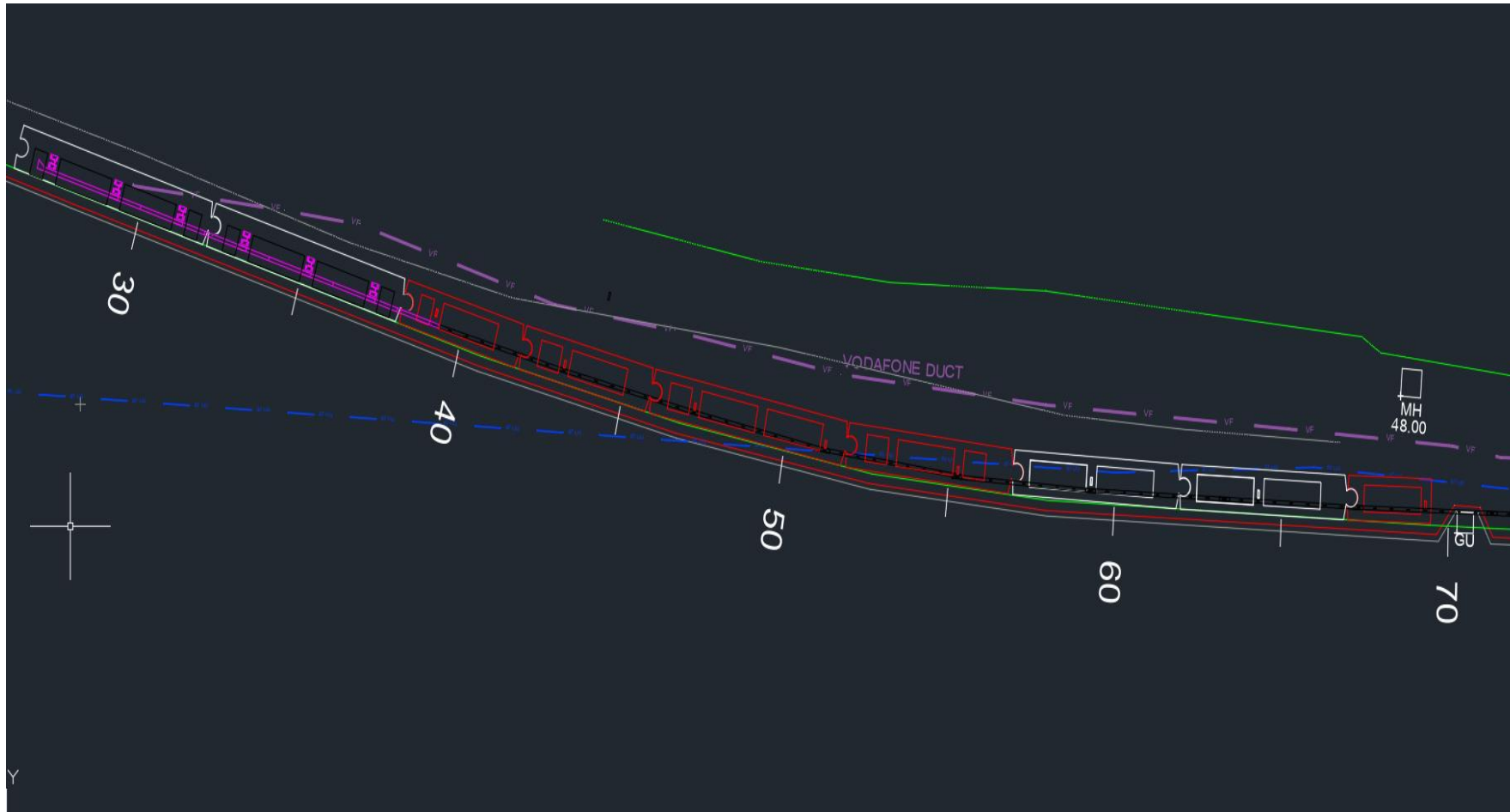
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- Smarcraft® can be designed and safely installed in and around underground services.
- The presence of the underground services and their apparatus can be incorporated in to the design allowing Smarcraft® to be installed with specific access units if required.
- This allows for the inclusion of service boxes as shown.
- Smarcraft® also allows for any future access to the apparatus present underneath through the standard perforations or by simply removing the Smarcraft® section and replacing it after access works have been completed.

## Work Smarter Not Harder with Smartraft®



- Modular System
- BIM compatible
- Multiple applications/solutions
- Designed off site
- Manufactured off-site
- Programme certainty
- Design/risk mitigation
- Radius available

Work Smarter Not Harder with Smartcraft<sup>®</sup>

## Test on site on the A14IDT

- 9kn test load undertaken.
- Maximum allowable post displacement for this test is 150mm Risk reduction.
- The subject post moved only 46mm with no movement at all from the raft itself.
- The system was passed and certified Reduced manual handling.
- Working with Hill and Smith dynamic testing has also taken place at Mira Test Centre.



**VRS Post Foundation Insitu Load Test Result Sheet**

Foundation load testing is currently a requirement of the highways specifications to ensure the system meets testing requirements of TD1905 & BS EN 1317.

**ARBUS LIMITED**  
arbus.co.uk

Project Number: **AR05** / **10000**  
 Project Name: **A14 Huntingdon to Cambridge** Date: **3rd May 2022**  
 Location on Site: **Section 4** Test Start Time (24hrs): **10:00 hrs**  
 Challenge: **AR05 - 10** Test End Time (24hrs): **10:10 hrs**  
 Contractor: **A14 IDT** Night / Weekend: **Day/Weekend**

Test No.	Details of Post / Foundation & Location (Wedge / Centre Rest)	I x J / P Applicable	Test Mode (Full/Part)	Incremental Loading Value (kN)	Deflection (mm)	Remarks	Pass / Fail (I x J / P Applicable)
	Wedge		Full	1000	620 mm	Load Height	
	Centre Rest		Full	2000	610 mm	140 mm	
	Standard Driven		Full	3000	610 mm		
	Long Driven		Full	4000	610 mm	Pass Load Required	
	Extra Long Driven		Full	5000	610 mm	12.16 kN	
	Concrete Foundation		Full	6000	608 mm		
	I x J x P (AR05)		Full	7000	608 mm	Start (mm)	
	6th Test		Full	8000	603 mm	626 mm	
	6th Test		Full	9000	606 mm		
	Teasing Only		Full	10000	608 mm	Final (mm)	
	Teasing and Continue Installation		Full	11000	601 mm	677 mm	
	Teasing until to condition		Full	12000	601 mm		
	Insert Design Number below:		Full	13000	614 mm	Return (mm)	
			Full	14000	620 mm		
			Full	15000	620 mm	Movement (mm)	
			Full	16000	620 mm		
			Full	17000	620 mm	46 mm	
			Full	18000	620 mm		

**Notes:**  
SMARTRAFT 6th test on site at the A14 section 4 vega run

**Loading Height - Calculation Table \*Load Required = 6000/Load Height in mm**

Load Height (mm)	Load Required (kN)	Load Required (kN)	Load Required (kN)	Load Required (kN)	Load Required (kN)	Load Required (kN)	Load Required (kN)	Load Required (kN)	Load Required (kN)	Load Required (kN)
100	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
110	5455	5455	5455	5455	5455	5455	5455	5455	5455	5455
120	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000
130	4615	4615	4615	4615	4615	4615	4615	4615	4615	4615
140	4286	4286	4286	4286	4286	4286	4286	4286	4286	4286
150	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
160	3750	3750	3750	3750	3750	3750	3750	3750	3750	3750
170	3529	3529	3529	3529	3529	3529	3529	3529	3529	3529
180	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333
190	3158	3158	3158	3158	3158	3158	3158	3158	3158	3158
200	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
210	2857	2857	2857	2857	2857	2857	2857	2857	2857	2857
220	2727	2727	2727	2727	2727	2727	2727	2727	2727	2727
230	2609	2609	2609	2609	2609	2609	2609	2609	2609	2609
240	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
250	2400	2400	2400	2400	2400	2400	2400	2400	2400	2400
260	2308	2308	2308	2308	2308	2308	2308	2308	2308	2308
270	2222	2222	2222	2222	2222	2222	2222	2222	2222	2222
280	2143	2143	2143	2143	2143	2143	2143	2143	2143	2143
290	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070
300	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000

**Loading Height - Calculation Table \*Load Required = 9000/Load Height in mm**

Load Height (mm)	Load Required (kN)	Load Required (kN)	Load Required (kN)	Load Required (kN)	Load Required (kN)	Load Required (kN)	Load Required (kN)	Load Required (kN)	Load Required (kN)	Load Required (kN)
100	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000
110	8182	8182	8182	8182	8182	8182	8182	8182	8182	8182
120	7500	7500	7500	7500	7500	7500	7500	7500	7500	7500
130	6923	6923	6923	6923	6923	6923	6923	6923	6923	6923
140	6429	6429	6429	6429	6429	6429	6429	6429	6429	6429
150	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
160	5625	5625	5625	5625	5625	5625	5625	5625	5625	5625
170	5294	5294	5294	5294	5294	5294	5294	5294	5294	5294
180	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000
190	4737	4737	4737	4737	4737	4737	4737	4737	4737	4737
200	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500
210	4286	4286	4286	4286	4286	4286	4286	4286	4286	4286
220	4091	4091	4091	4091	4091	4091	4091	4091	4091	4091
230	3913	3913	3913	3913	3913	3913	3913	3913	3913	3913
240	3750	3750	3750	3750	3750	3750	3750	3750	3750	3750
250	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
260	3462	3462	3462	3462	3462	3462	3462	3462	3462	3462
270	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333
280	3214	3214	3214	3214	3214	3214	3214	3214	3214	3214
290	3103	3103	3103	3103	3103	3103	3103	3103	3103	3103
300	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000

In this a VERBAL INSTRUCTION request?  Yes  No Instructed by / name: \_\_\_\_\_

Received By (print name): \_\_\_\_\_ Signature: \_\_\_\_\_  
 Arbus Lead Installer

See Contract & Bill of Materials

Site Contact Name: **Alexander Brown** Telephone: **20626**

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# SMARTRAFT®

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Work Smarter Not Harder with Smarcraft®



- Smarcraft® can be installed quickly and efficiently with minimal excavation or muck away.
- Once a 200mm deep trench is excavated, Smarcraft® is lifted directly into place, with the VRS crew installing the barrier system closely behind.
- Smarcraft® will have already reached the required concrete curing strength before its installed, so the system can be commissioned immediately after installation has been completed.

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# SMARTRAFT®

Shallow Concrete Foundations

Work Smarter Not Harder with Smartraft®



- Smartraft® can be installed quickly and efficiently with minimal excavation or muck away.
- Once a 200mm deep trench is excavated, Smartraft® is lifted directly into place, with the VRS crew installing the barrier system closely behind.
- Smartraft® will have already reached the required concrete curing strength before its installed, so the system can be commissioned immediately after installation has been completed.

## Work Smarter Not Harder with Smarcraft®

### Case Study

**Balfour Beatty**  
Living Places

#### - Carbon Savings

	Traditional method	Smarcraft
Concrete Used (m <sup>3</sup> )	12	7.25
CO <sub>2</sub> emission (C25 – 215Kg/m <sup>3</sup> )	2.5 tonnes	1.5 tonnes
<b>Total CO<sub>2</sub> savings</b>		<b>1 tonne</b>

According to the DEFRA website, "The average UK citizen is responsible for the creation of over 11.1 tonnes of Carbon Dioxide Equivalent (CO<sub>2</sub>e) per year". The government's target is to cut this by 80% by 2050. That must mean just over 2 tonnes of CO<sub>2</sub>e per citizen per year. This is less than 6kg of CO<sub>2</sub>e per day per person

#### - Man Hours

	Traditional method (Hrs)	Smarcraft (Hrs)
Gang	168	32
Lorry Driver, Concrete wagon and driver	30	6
<b>Total</b>	<b>198</b>	<b>38</b>

#### - Cost benefit

	Traditional method (£)	Smarcraft (£)
Installation	8,557.79	12,995.99
TM	7000	2000
Pre-site testing	1700	0
<b>Total</b>	<b>17,257.70</b>	<b>14,995.99</b>
Future maintenance	6,845	2,599

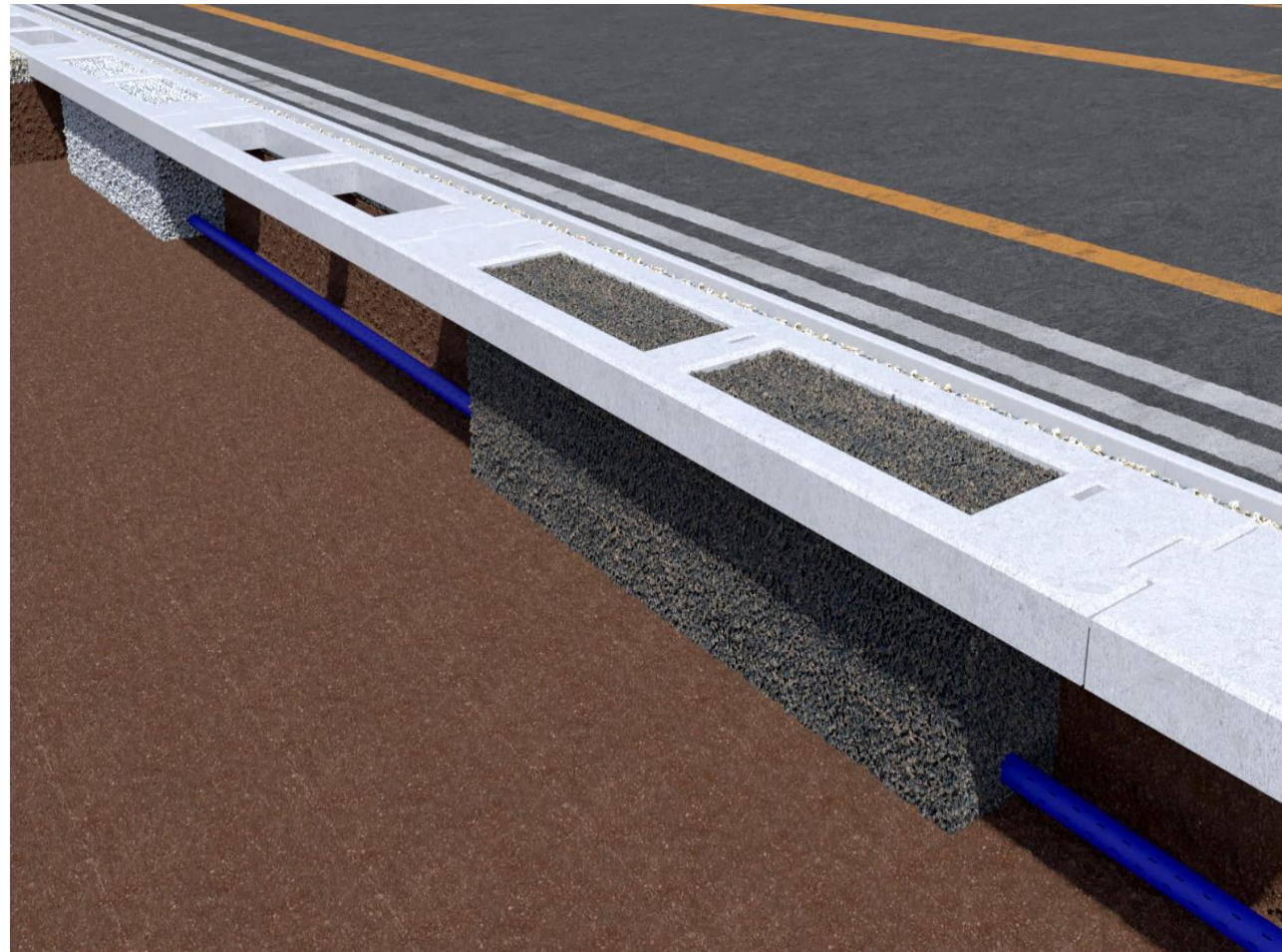
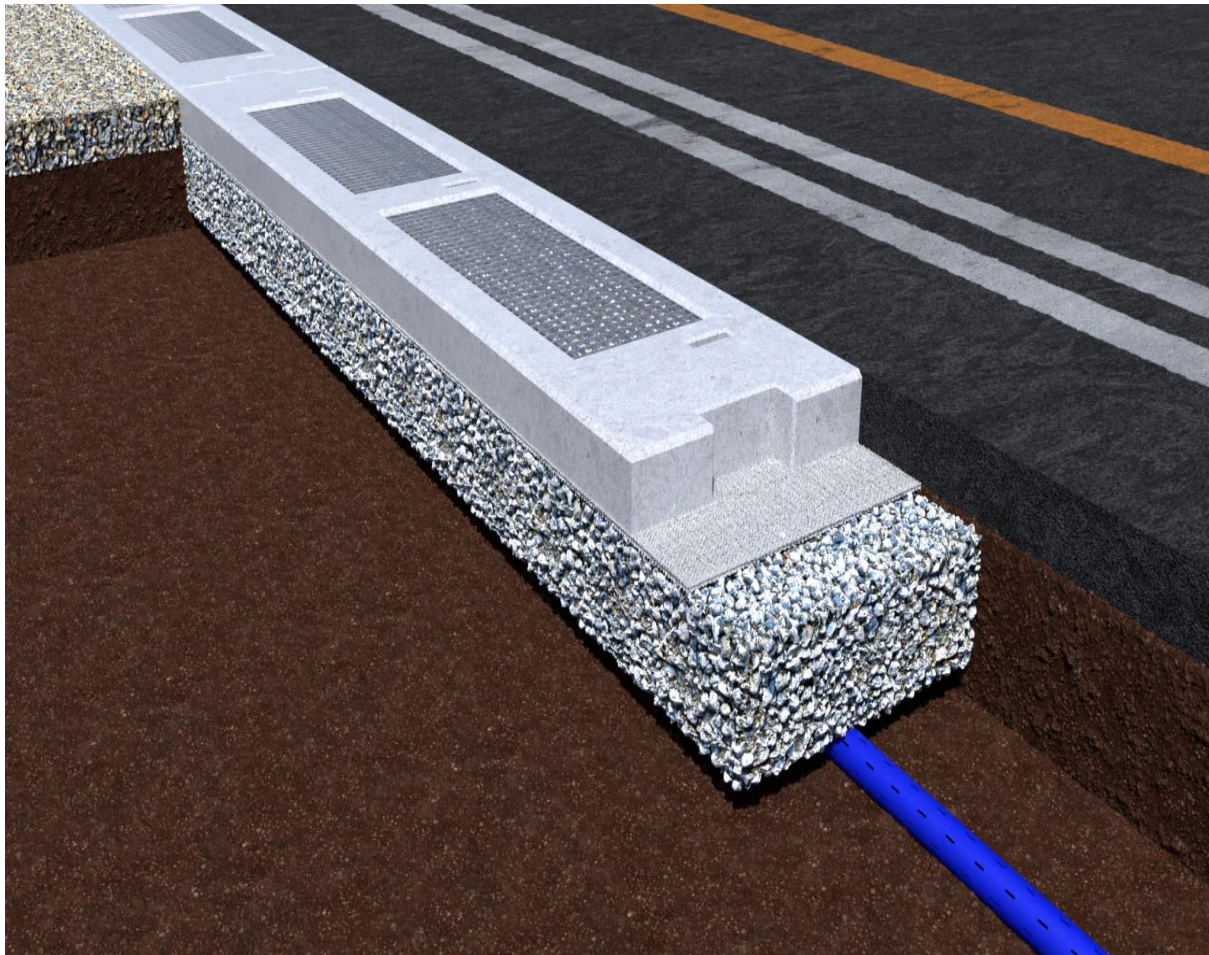
- Balfour Beatty undertook a case study for a recently completed scheme where Smarcraft® was used for the installation BIM compatible.
- The details given in this case study show the savings in carbon, TM, site occupancy, man hours and future maintenance costs for a 60m barrier, run with two terminals.



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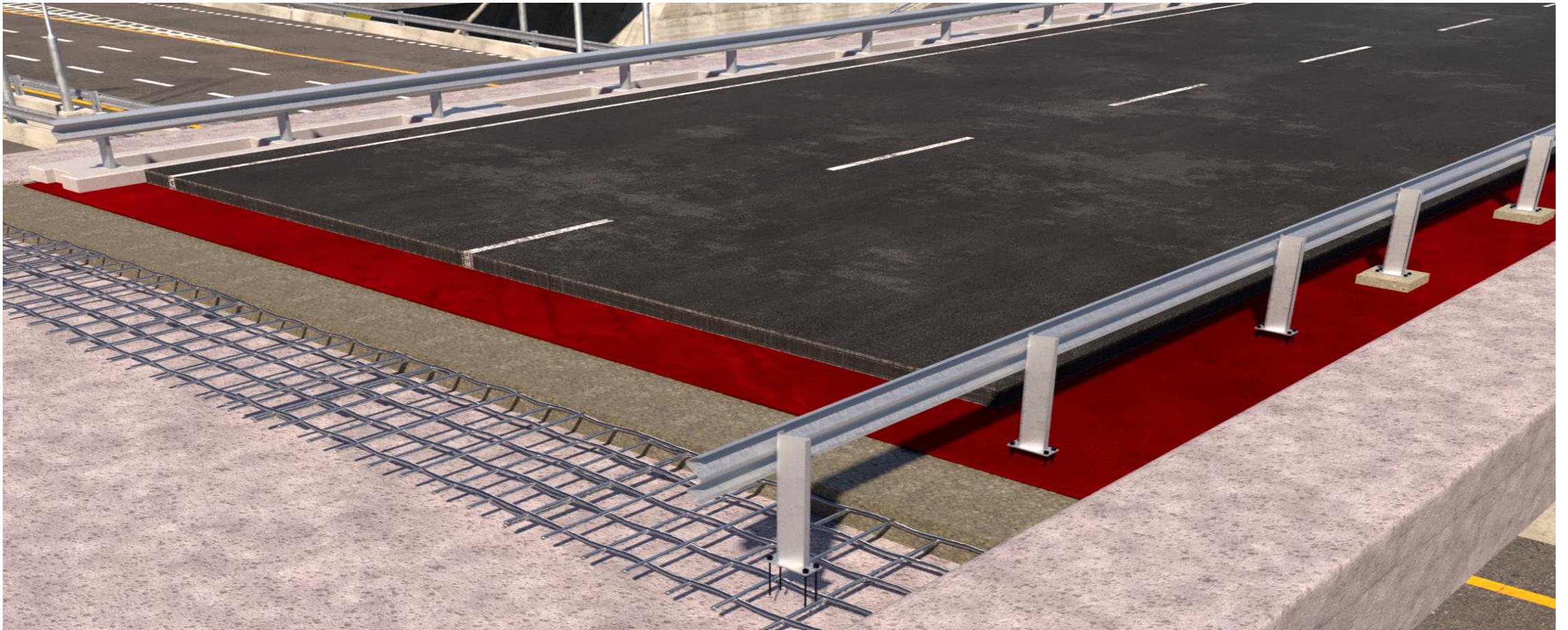
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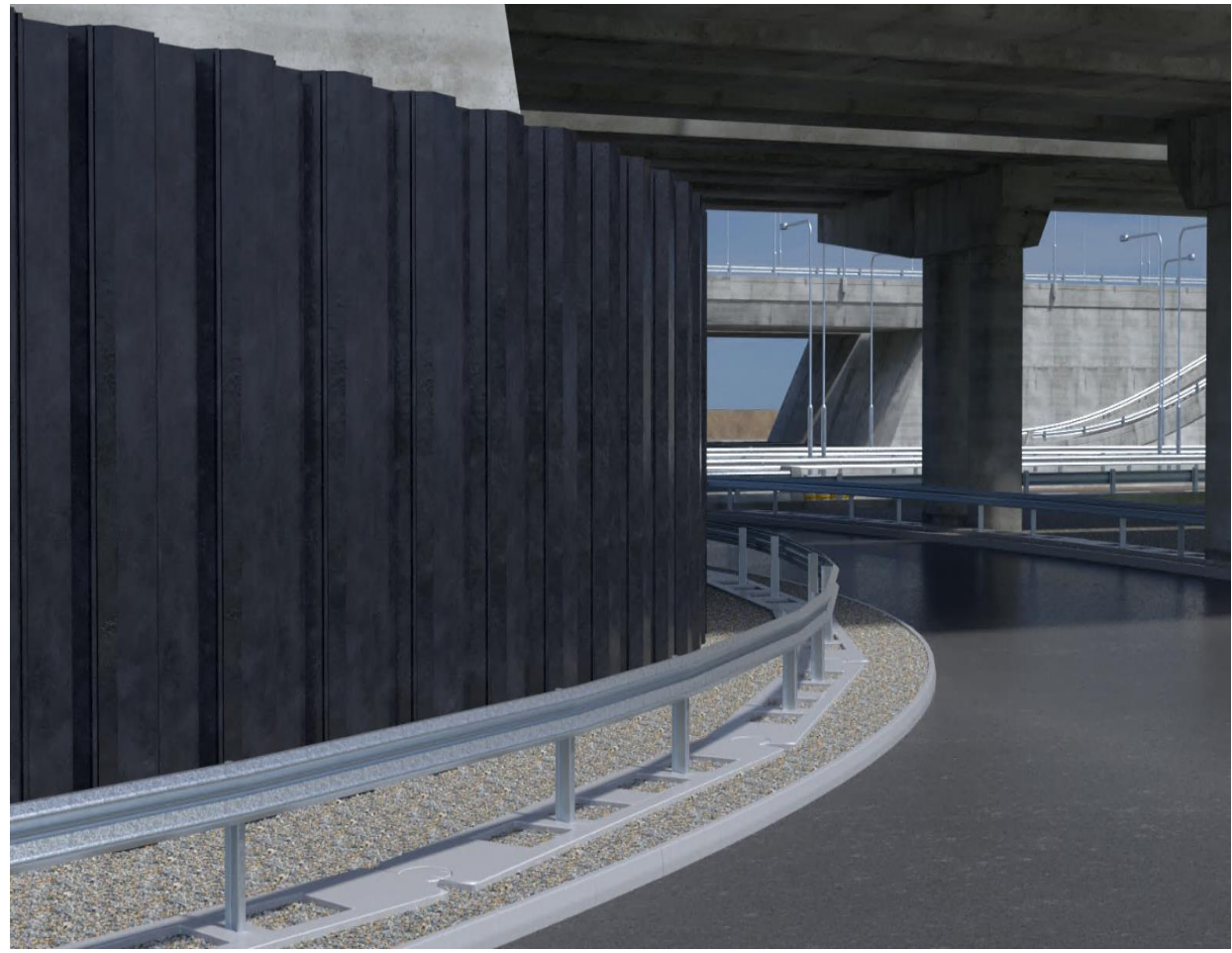
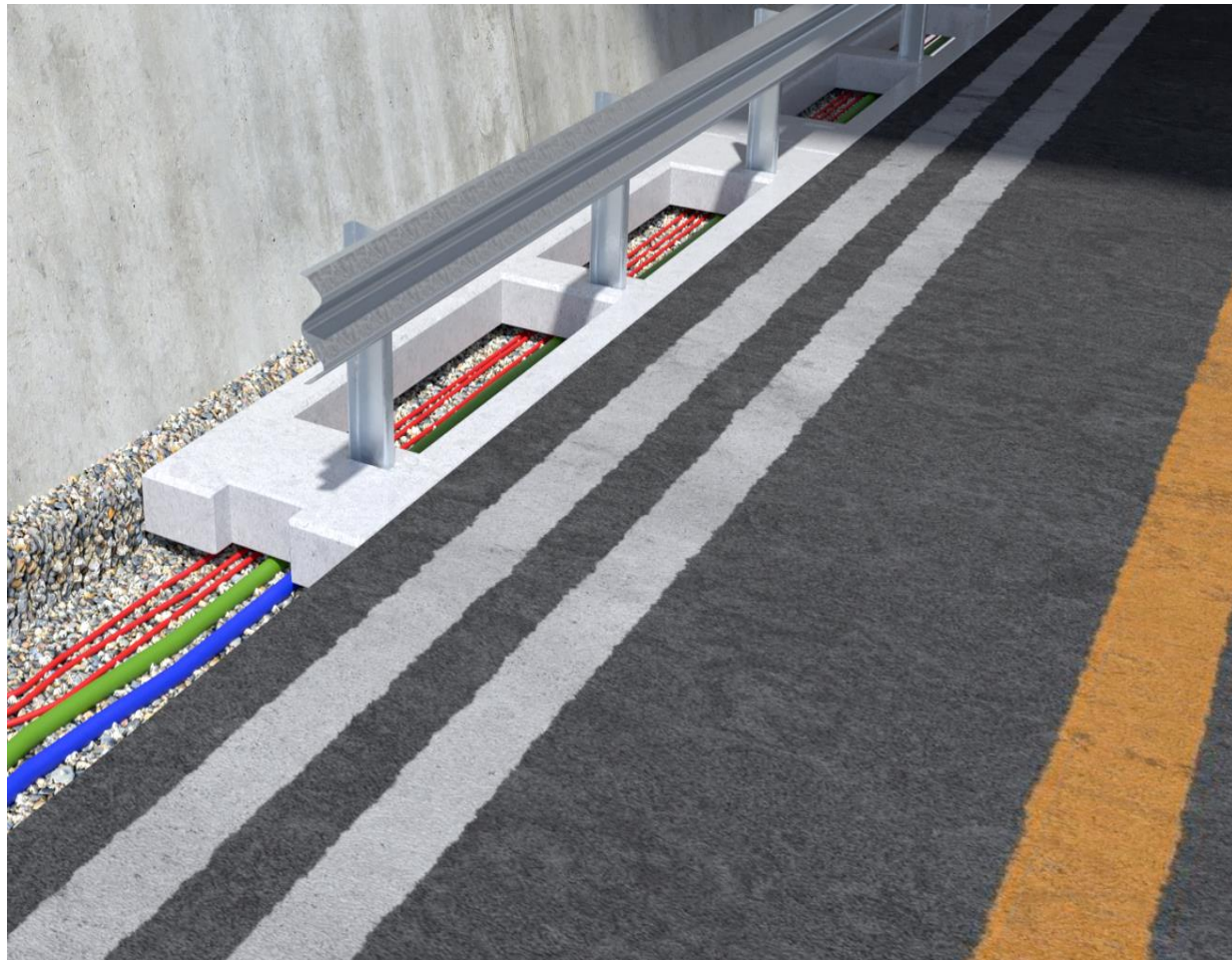
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## UNDERBRIDGES



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Modular design, the  
future of Highway  
construction.



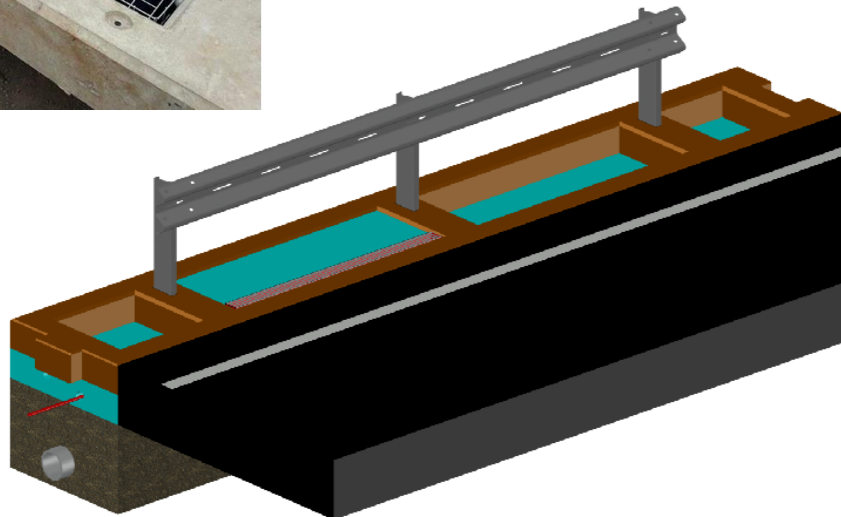
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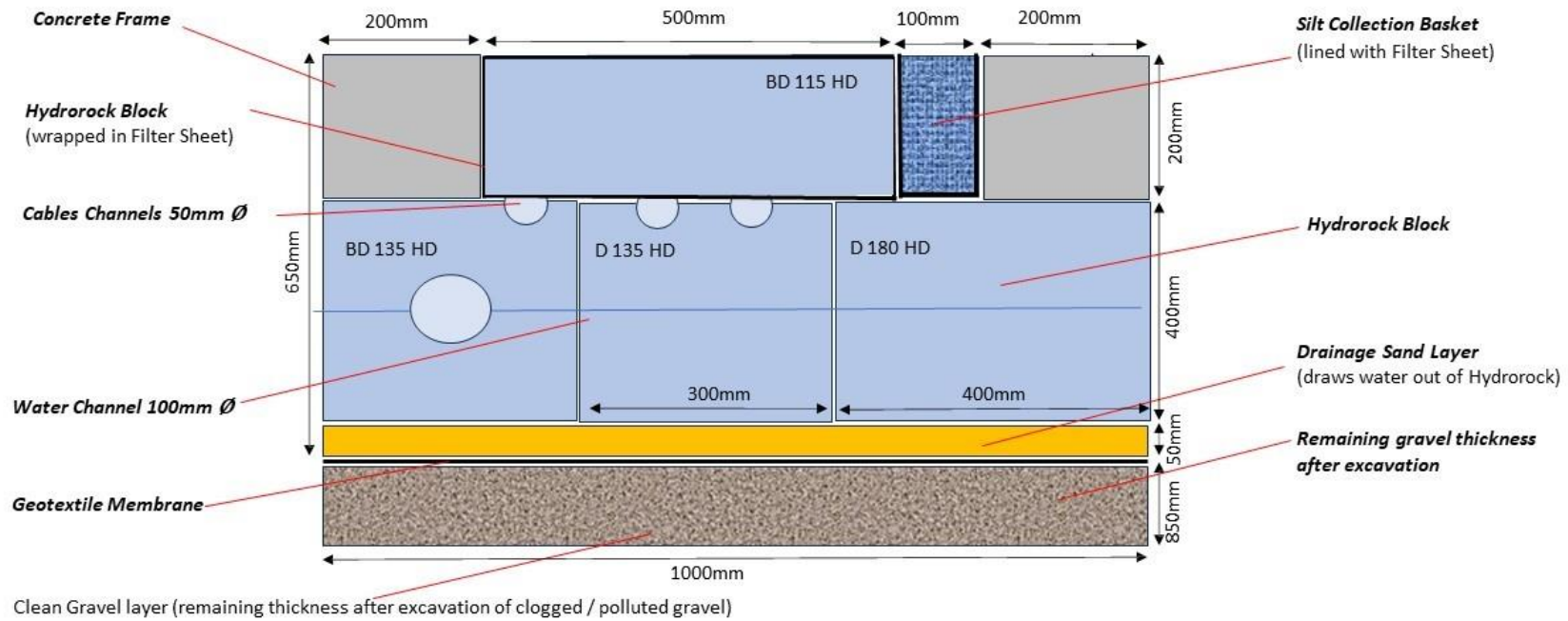


- Further innovation of the Smarcraft® system incorporates Hydrorock to introduce a drainage solution changing the norm from standard systems specified
- Hydrorcraft can be used with or without VRS, giving a far superior drainage performance on the highway.



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Section View of VRS HydroRaft (4.0m Long)



High Density Hydrorock (120kg/m<sup>3</sup>) Blocks:  
 Static Compressive Strength 8 tons / m<sup>2</sup>

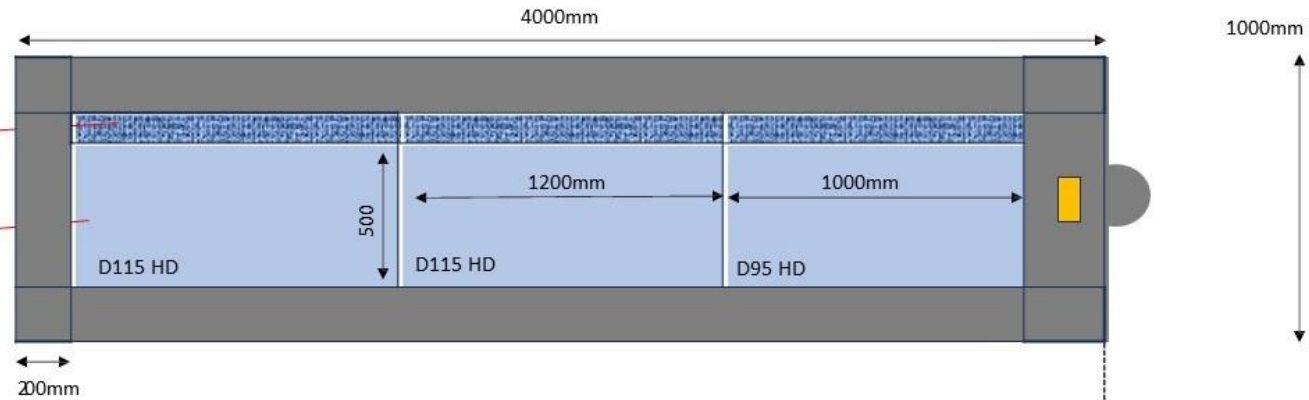
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### Plan View of VRS HydroRaft (4.0m Long)

#### Window Layer

**Silt Collection Baskets**  
(Lined with Filter Sheet)  
@ 100% void = 75L Storage  
1200 L x 100mm W x 200mm H

**Hydrorock Blocks**  
(Wrapped In Filter Sheet)  
@ 95% void = 325L Storage



#### Base Layer

**Hydrorock Blocks**  
@ 95% void = 1,500 Storage

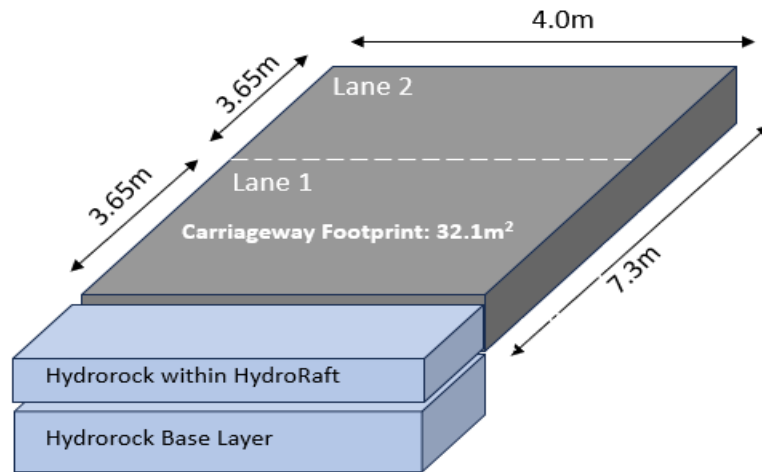
D 135 HD	D 135 HD	D 135 HD	45L	D 135 HD
BD 135 HD	BD 135 HD	BD 135 HD	45L	BD 135 HD
D 180 HD	D 180 HD	D 180 HD	60L	D 180 HD



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## Drainage Performance of HydroRaft + Hydrorock (Infill & Base Layer)

1 in 30 year Rain Event totaling 50mm / m<sup>2</sup> from a 2 lane carriageway: 1,460L (1.46m<sup>3</sup>) runoff from 4 linear metres



- Silt Basket Storage Capacity: 75L / 4.0 linear metres
- Hydrorock Storage Capacity: 1,011 / 4.0 linear metres
- Total System Storage Capacity: 1,086L / 4.0 linear metres  
320L (0.32m<sup>3</sup>) / linear metre
- \* **System Storage Capacity Deficit: 374L / 4.0 linear metres**  
93L (0.093m<sup>3</sup>) / linear metre

\* Water entering the system (per hour) in excess of the HydroRaft system storage capacity will freely percolate down into the gravel layer beneath – if the gravel layer cannot receive all the water, the excess will leave system via overflow pipe

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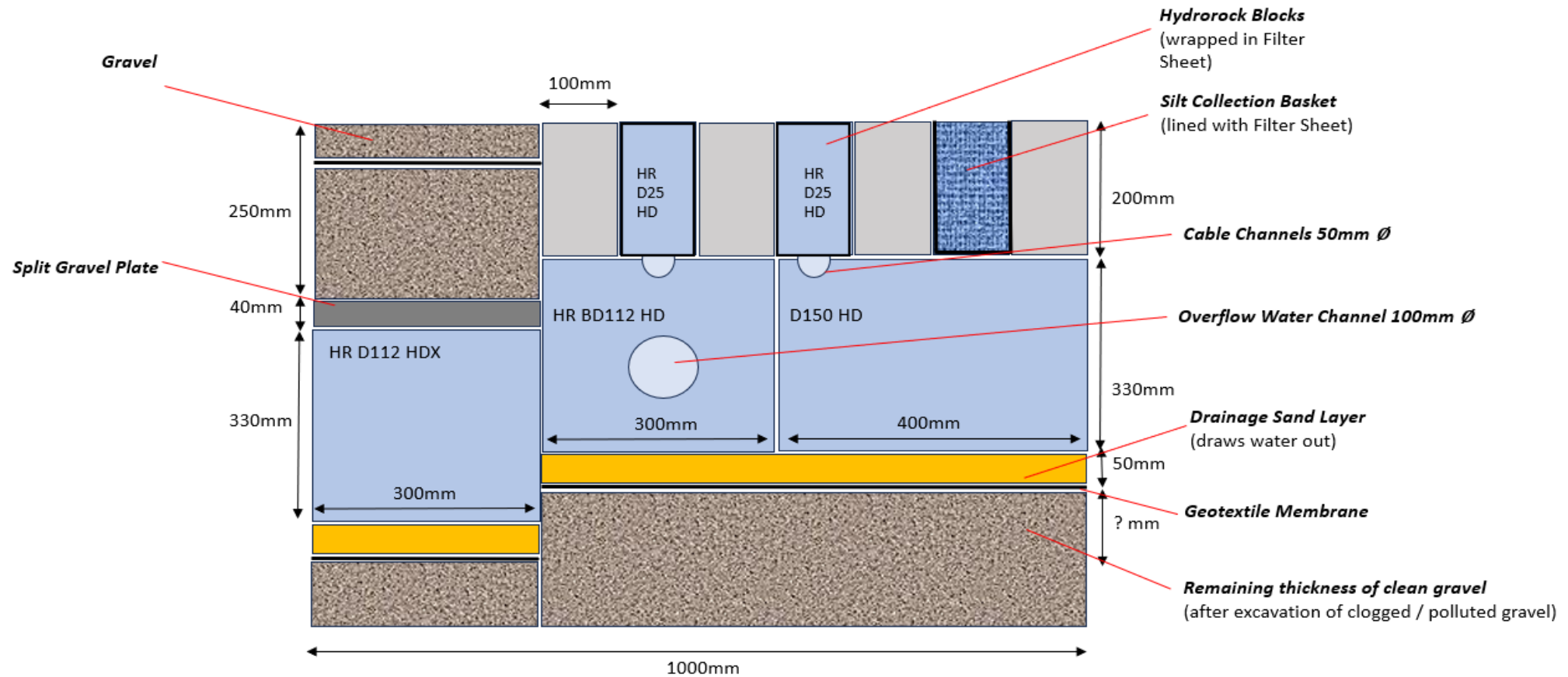
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- The benefits of Hydroraft® are-
  - Double the water storage capacity compared with gravel
  - 15% less soil excavation (by volume and weight)
  - 60% less infill weight (far fewer vehicle loads required with Hydrorock)
  - 33% bigger infiltration surface area (much more efficient than gravel system)
  - Up to 70-year life span
  - Uniquely high absorption to volume ratio (94%)
  - 100% natural product
  - Recyclable

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## Section View of HydroRaft + Hydorrock (Infill & Extended Base Layer)



## Work Smarter Not Harder with Smarcraft<sup>®</sup>

### Plan View of HydroRaft + Hydrorock (Infill & Extended Base Layer)

#### Top Layer

**Silt Collection Baskets**  
(Lined with Filter Sheet)  
@ 100% void = Total 75L Storage

**Hydrorock Blocks HR D25 HD**  
(Wrapped In Filter Sheet)  
@ 95% void = Total 138L Storage

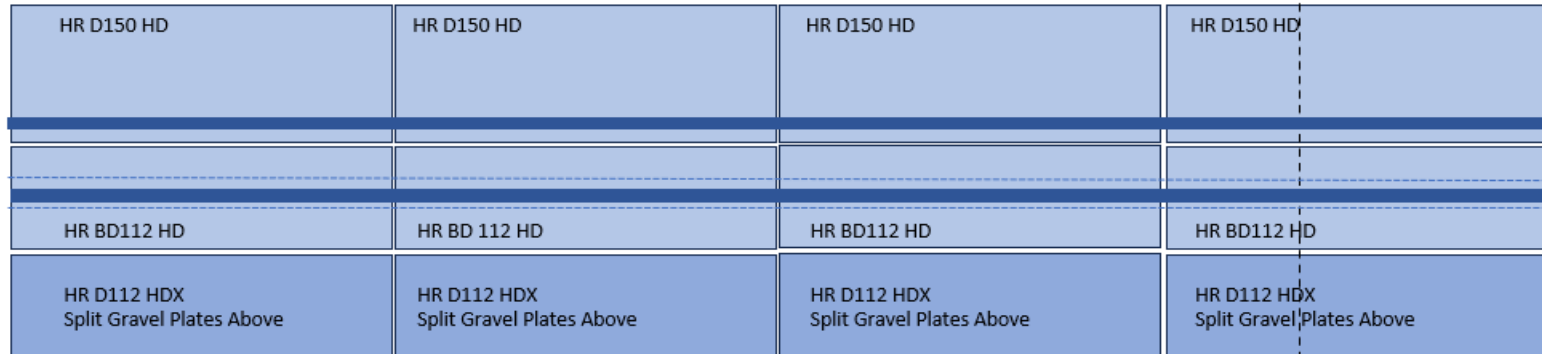


#### Base Layer

**Hydrorock Blocks HR D150 HD**  
@ 95% void = Total 500L Storage

**Hydrorock Blocks HR BD112 HD**  
@ 95% void = Total 373L Storage

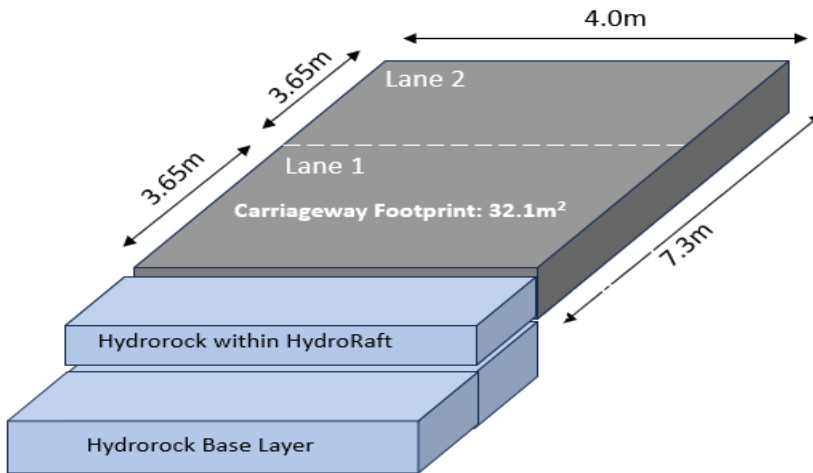
**Hydrorock Blocks HR D112 HDX**  
@ 95% void = Total 373L Storage



Work Smarter Not Harder with Smarcraft<sup>®</sup>

## Drainage Performance of Hydroraft + Hydrorock (Infill & Extended Base Layer)

1 in 30 year Rain Event totaling 50mm / m<sup>2</sup> from a 2 lane carriageway: 1,460L (1.46m<sup>3</sup>) runoff from 4 linear metres



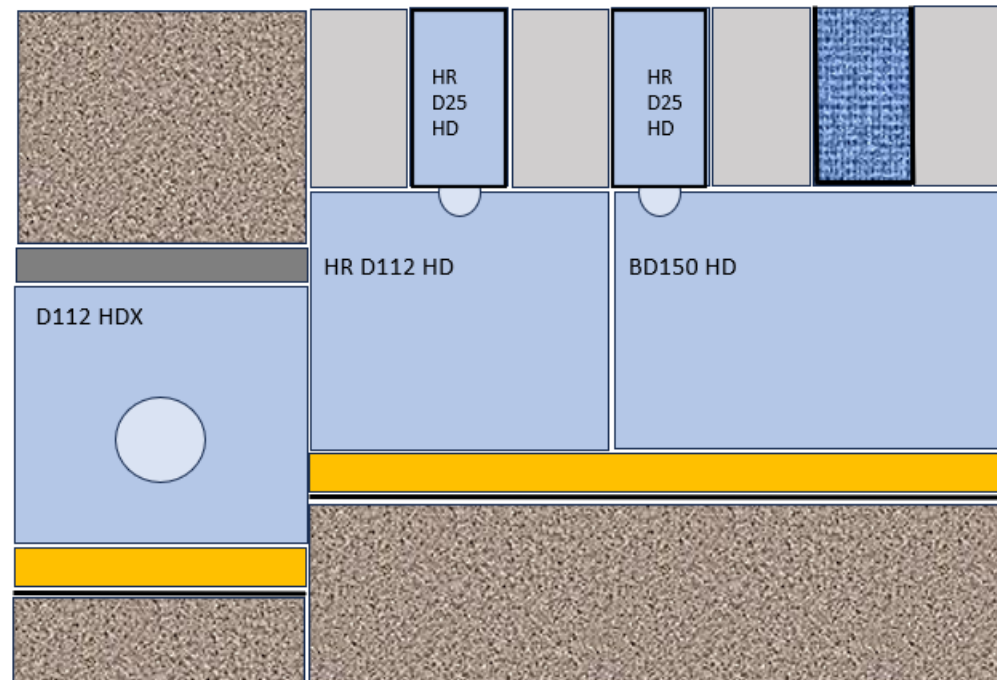
- Silt Basket Storage Capacity: 75L / 4.0 linear metres
- Hydrorock Storage Capacity: 1,384 / 4.0 linear metres
- Total System Storage Capacity: 1,459L / 4.0 linear metres  
365L (0.36m<sup>3</sup>) / linear metre

\* Water entering the system (per hour) in excess of the HydroRaft system storage capacity will freely percolate down into the gravel layer beneath – if the gravel layer cannot receive all the water, the excess will leave system via overflow pipe



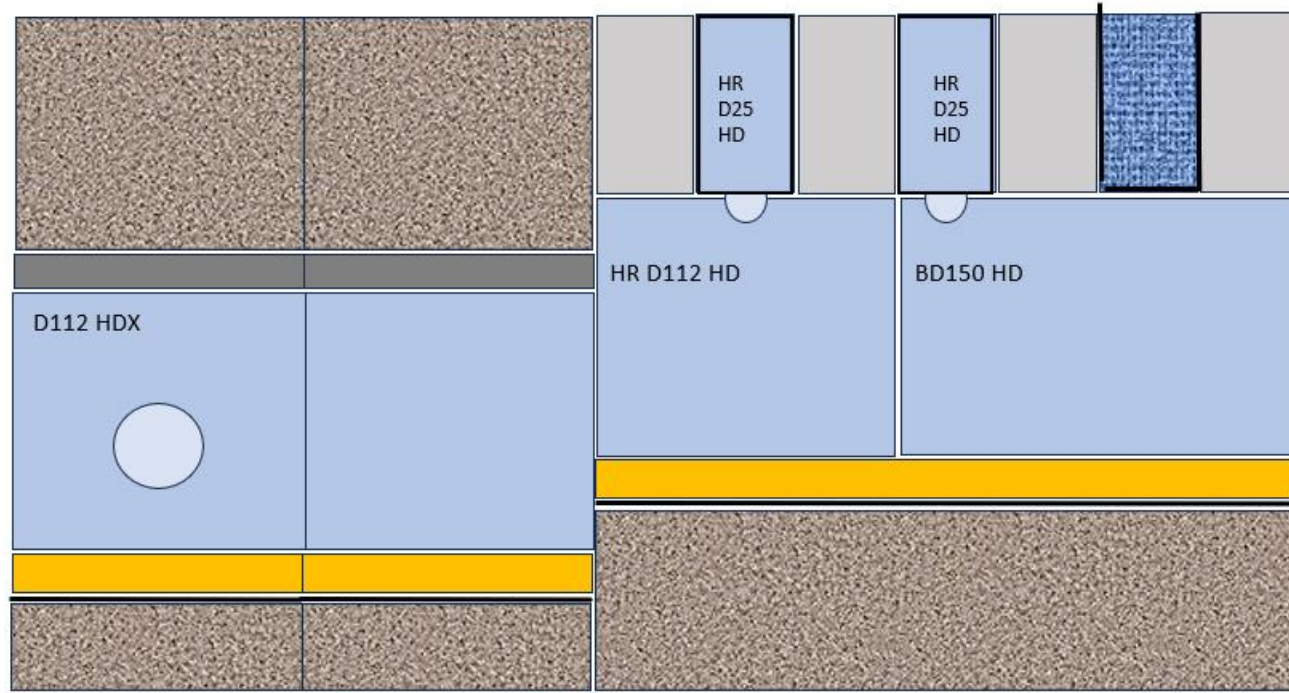
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## HydroRaft With Drainage Overflow Channel in Extended Base



## Work Smarter Not Harder with Smarcraft<sup>®</sup>

### HydroRaft With Double Extended Base



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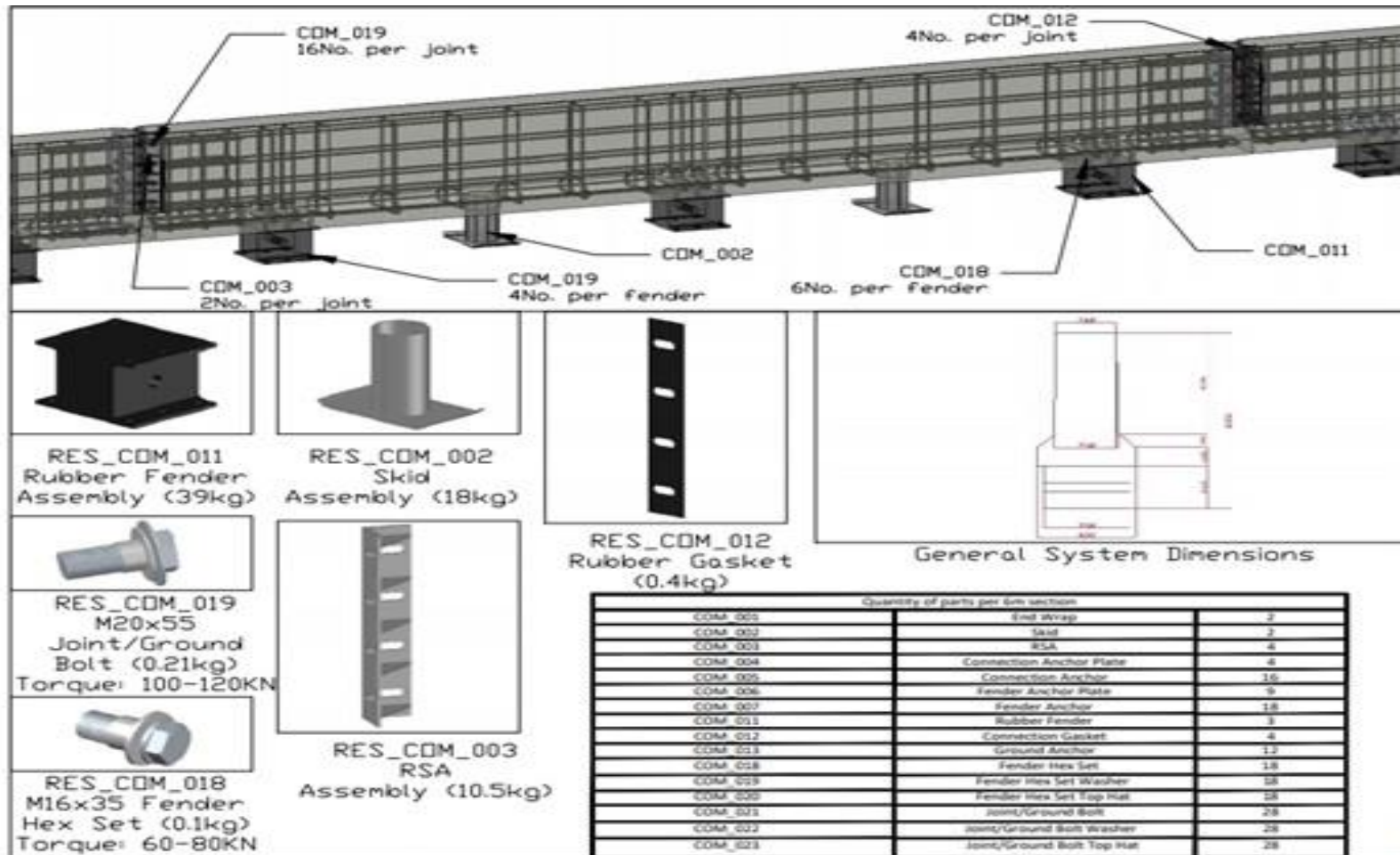
# RESTORE

Deformable Maintenance Free Concrete Vehicle Restraint System



# RESTORE

## Deformable Maintenance Free Concrete Vehicle Restraint System



- H2W2 (vi4) & H1W2 (Vi5) UKCA Marked
- Deformable concrete barrier
- Slower vehicle exit speed following impact
- Improved vehicle occupant safety on impact
- Maintenance Free
- Does not collect debris
- Wildlife crossing friendly
- Can be adapted for contraflow / gates / lane closures

# RESTORE

## Restore on Smarcraft®



- Can be installed on Smarcraft®
- Facilitates re-use of existing drainage
- Drainage collects / flows underneath
- Allows soft centre reserve design
- Safer more efficient installation
- Removable and reusable

# RESTORE

## Dynamic Performance Testing at Mira



RESTORE.CO.UK

# RESTORE

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Any Questions?