

# ArmorBuffa™

MASH TL3 Temporary End Treatment

## *Product Manual*

Australian State Road Authority approved for use in speed zones up to 80km/h

**MASH TL3 COMPLIANT**



Release 11/21

[www.ingalcivil.com.au](http://www.ingalcivil.com.au)

## 1.0 Introduction

The ArmorBuffa™ is a non-redirective, gating, crash cushion designed to meet the latest test standards defined in the Manual for Assessing Safety Hardware (MASH), Second Edition, 2016. The ArmorBuffa™ system utilises a Transition, water-filled Elements and a Nose Piece to absorb kinetic energy and safely contain or control the penetration trajectory of impacting vehicles.

The system is comprised of a Nose Piece, water-filled Elements, Pins, a Transition and mechanical anchors. All Elements are always filled with water.

The system has a nominal 1100mm height, 460mm width, and an effective length of 9,313mm for TL-3 when installed on a temporary concrete barrier.

ArmorBuffa™ is designed to protect the end of an unanchored temporary F-Type concrete barrier.

## 2.0 Recommended Tools

NOTE: The list of tools, safety equipment, and traffic control is a general recommendation and should not be considered a comprehensive list. Depending on the specific characteristics of the job site and the complexity of the repair or assembly, more or less tools may be necessary.

### Required Tools

- Tape Measure
- Chalk Line
- Marking Paint
- Rotary Hammer
- Masonry Bit
- 1/2" Drive Torque Wrench  
5 ft-lbf [8 N-m] to 100 ft-lbf [135 N-m]
- Compressed Air
- 3/4" Diameter Brush
- 1/2" Drive Deep Sockets  
M20, M16, M36
- Impact Wrench  
(pneumatic or electric)

**NOTE: Water source with a flexible hose (maximum 76mm diameter) and a minimum 2800L capacity is required for the 4 element, TL-3 system.**

### Safety Equipment



Gloves



Hard Hat



Steel-Capped Footwear



Safety Vest



Safety Glasses



Dust Mask



Hearing Protection

### Traffic Control

- Traffic Control Equipment
- Traffic Control Plan



## 3.0 Parts Identification

### 3.1 ArmorBuffa MASH TL3 Identification and Installation



Use only Ingal Civil Products parts that are specified by Ingal Civil Products for use with the ArmorBuffa™ System. The use of unspecified parts is prohibited and could result in severe personal injury or death.

PART #	DESCRIPTION	CONCRETE KIT
10200320	ArmorBuffa Transition F-Type Concrete	1
10200322	ArmorBuffa Element - Orange	1
10200323	ArmorBuffa Element - Yellow	3
10200324	ArmorBuffa Steel Nose Assembly	1
10200325	ArmorBuffa Nose Cover	1
10200326	ArmorBuffa Cable	1
10200327	ArmorBuffa Nose Pin	1
10200328	ArmorBuffa Asymmetric Pin	1
10200204	ArmorZone Pin	3
10200329	ArmorBuffa Transition F-Type Concrete Fixing Bolt Kit	1
10200045	ArmorBuffa MASH TL3 F-Type Concrete Kit - Complete	
10200200	Drainage Bung	
10200202	Bung Spanner	



## 3.0 Parts Identification (continued)



**10200320**  
ArmorBuffa Transition F-Type Concrete  
Concrete Kit: 1



**10200322**  
ArmorBuffa Element - Orange  
Concrete Kit: 1



**10200323**  
ArmorBuffa Element - Yellow  
Concrete Kit: 3



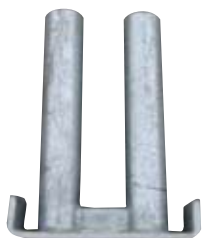
**10200324**  
ArmorBuffa Steel Nose Assembly  
Concrete Kit: 1



**10200325**  
ArmorBuffa Nose Cover  
Concrete Kit: 1



**10200326**  
ArmorBuffa Cable  
Concrete Kit: 1



**10200327**  
ArmorBuffa Nose Pin  
Concrete Kit: 1



**10200328**  
ArmorBuffa Asymmetric Pin  
Concrete Kit: 1



**10200204**  
ArmorZone Pin  
Concrete Kit: 3



10200329  
ArmorBuffa Transition F-Type  
Concrete Fixing Bolt Kit  
Concrete Kit: 1



10200045  
ArmorBuffa MASH TL3 F-Type Concrete Kit



10200200  
Drainage Bung



10200202  
Bung Spanner

## 4.0 Preparation

### 4.1 Foundation

The ArmorBuffa™ system is designed to perform on a variety of foundations including concrete, asphalt, and any other surfaces capable of bearing the weight of the system.

Uneven surfaces should be flattened, and large debris removed from the foundation prior to installation.

Cross slopes of up to 8% (5° or 1:12 slope) can be accommodated with the standard hardware and the instructions provided in this manual. For slopes in excess of 8%, contact Ingal Civil Products.

### 4.2 Transition

ArmorBuffa™ is designed to accommodate a temporary F-Type concrete barrier.

Placement and installation of the ArmorBuffa™ system must be accomplished in accordance with the Austroads Design Guide and ASBAP and other state and local standards.

Before installing the ArmorBuffa™ system, ensure that all the materials required for the system are on site and have been identified.

## 5.0 Documentation

Prior to installation and assembly of the ArmorBuffa™ system, ensure you have read and understand the installation and assembly instructions. The following items should be reviewed and understood prior to installation.

- Installation and Assembly Manual (check for current revision posted at [www.ingalcivil.com.au](http://www.ingalcivil.com.au)).
- System Drawings (check [www.ingalcivil.com.au](http://www.ingalcivil.com.au) for current revision, located in installation manual).

## 6.0 Important Notes

- Sign Convention
  - The term Front = At the Nose Plate
  - The term Rear = At the Transition
- This manual follows installation steps for a complete ArmorBuffa™ system that is installed on site or relocated to another location.

See Page 16 for water filling instructions.



**In regions where the water filled elements could become frozen, appropriate anti-freeze solutions should be used.**

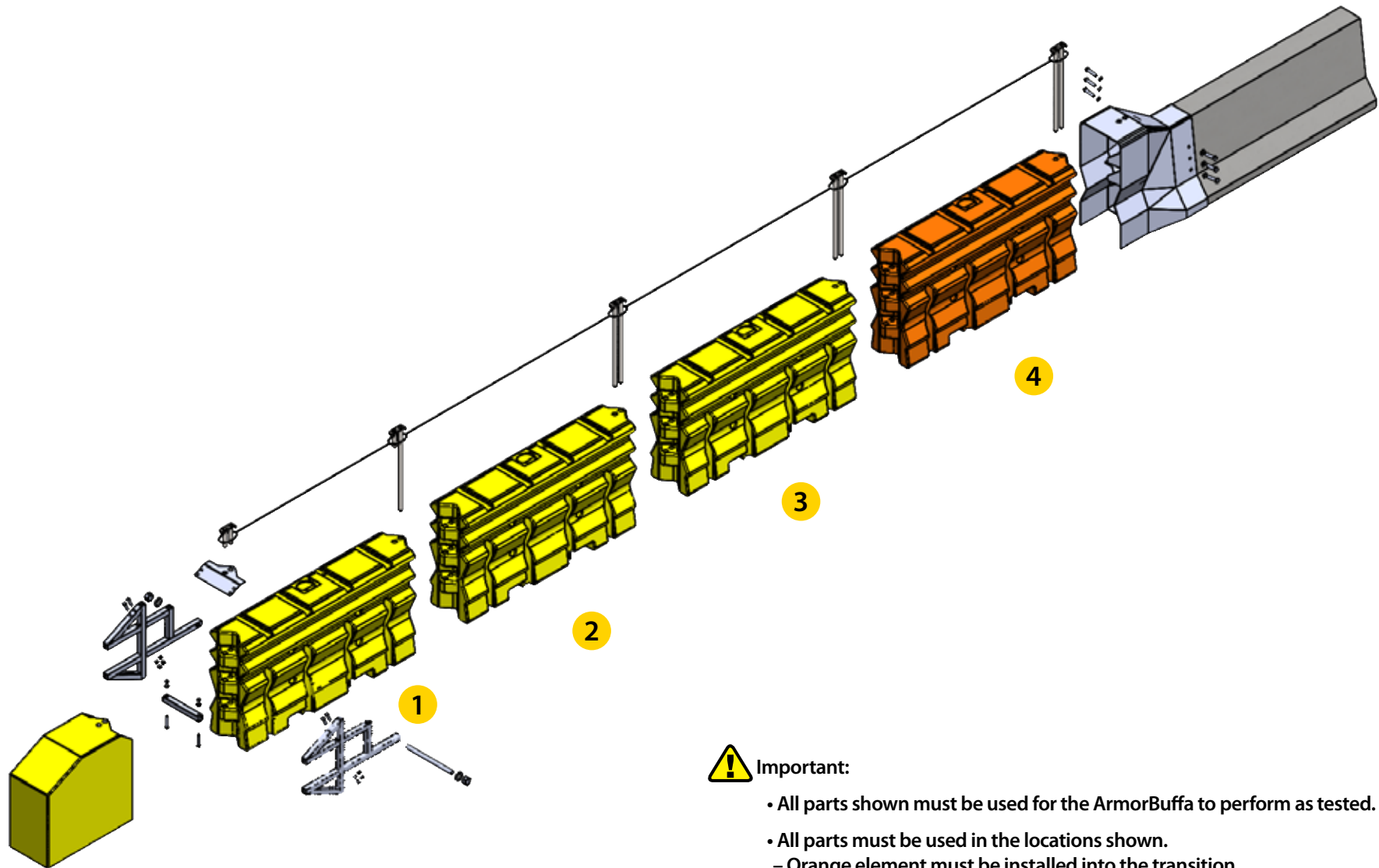
**Failure to do so will result in improper performance of the system and may cause serious bodily injury.**

Care should be taken to ensure that appropriate Anti-Freeze solutions are used in accordance with federal, state, and local requirements.

## 7.0 Anchoring Specifications

The ArmorBuffa™ system uses chemical set M20 8.8 grade threaded rod for anchoring to temporary concrete barrier.

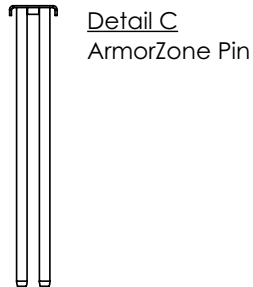
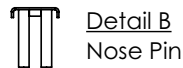
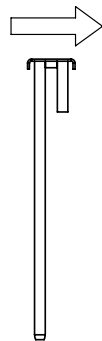
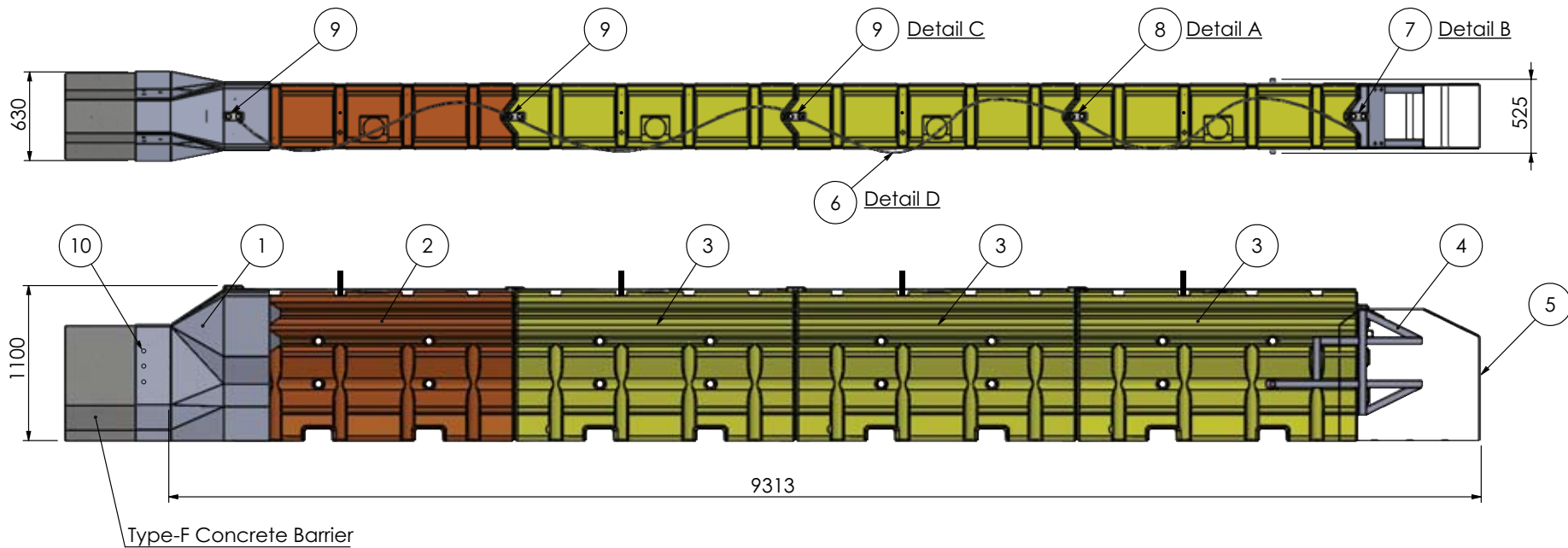
## 8.0 ArmorBuffa Exploded Assembly Overview



### Important:

- All parts shown must be used for the ArmorBuffa to perform as tested.
- All parts must be used in the locations shown.
  - Orange element must be installed into the transition.
  - The 3 types of connector pins must be installed in the locations shown.
- All elements must be completely filled with water.

## 8.1 ArmorBuffa MASH TL3 F-Type Concrete Kit



ID	Description	Part No.	Qty
1	ArmorBuffa Transition F-Type Concrete	10200320	1
2	ArmorBuffa Element - Orange	10200322	1
3	ArmorBuffa Element - Yellow	10200323	3
4	ArmorBuffa Steel Nose Assembly	10200324	1
5	ArmorBuffa Nose Cover	10200325	1
6	ArmorBuffa Cable	10200326	1
7	ArmorBuffa Nose Pin	10200327	1
8	ArmorBuffa Asymmetric Pin	10200328	1
9	ArmorZone Pin	10200204	3
10	ArmorBuffa Transition F-Type Concrete Fixing Bolt Kit	10200329	1

REV	DESCRIPTION	APPD	DATE
	ORIGINAL ISSUE - 23.10.2020		

**valmont**

HIGHWAY

**Valmont Highway Technology**

Level 3, Building A, 11 Talavera Road  
Macquarie Park, NSW 2113, Australia  
T: +612 9814 1777 www.valmonthighway.com

TOLERANCES

Whole Numbers :

One Decimal Place :

Bend Angle :

Straightness :

Scale:

CLIENT
MATERIAL
FINISH

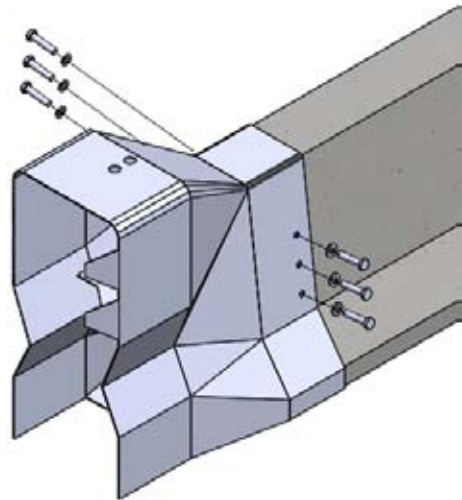
ITEM		
ArmorBuffa MASH TL3 F-Type Concrete KIT		
DRAWING NUMBER		
10200045		
DRAWN	CHECKED	APPROVED
VB	JA	LB

FOLDER:\Engineering\3. CURRENT DRAWINGS\COMPONENT DRAWINGS\SLDDRWs\10200045 - ArmorBuffa MASH TL3 F-Type Concrete Kit



## 9.0 INSTALLATION PROCEDURE

### STEP 1A Transition Fixing to Concrete F-Type



### INSTRUCTIONS

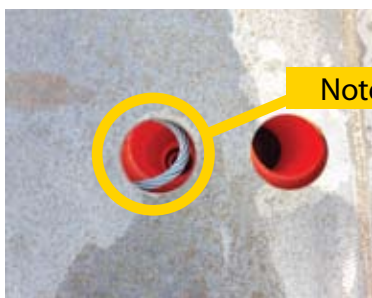
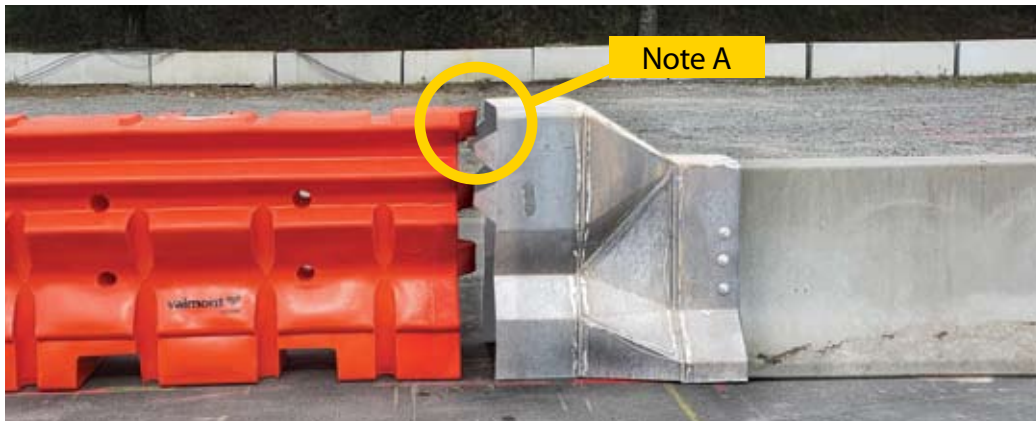
1. Slide transition over the end of the temporary concrete barrier, ensuring it is pushed on as far as possible.
2. Drill 3 x 22mm holes approx 150mm deep per side. Remove loose dust and debris from holes with compressed air or a brush. Inject Chemset into each hole then insert the threaded rod.
3. After the Chemset has cured place nut and washer onto threaded rod and tighten to 50Nm.



Wear proper PPE when clearing debris. This operation produces concrete dust.

## STEP 2

## Attachment to ArmorBuffa Elements

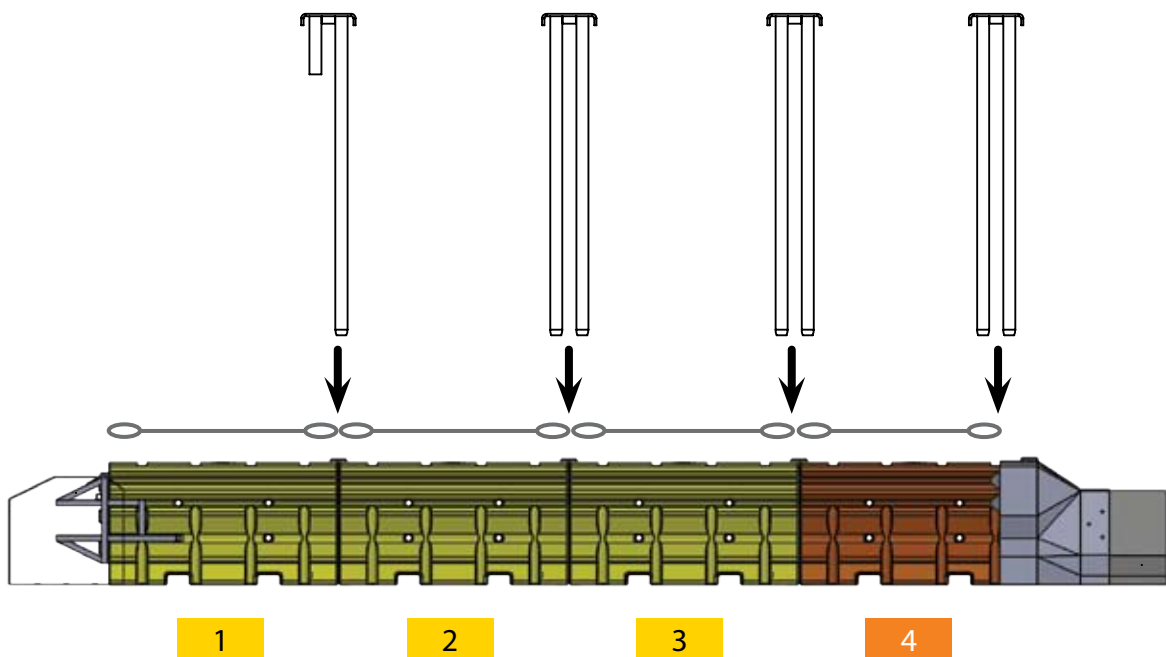


### INSTRUCTIONS

1. Slide the orange element into the transition ensuring the element is orientated as shown in Note A with the element end with the highest connector lug inserted.
2. Insert standard twin pin into the transition holes, coupling the orange element and steel cable together, as shown in Note B.
3. Slide the 3 yellow elements into position.

## STEP 3

## Adding ArmorBuffa Elements

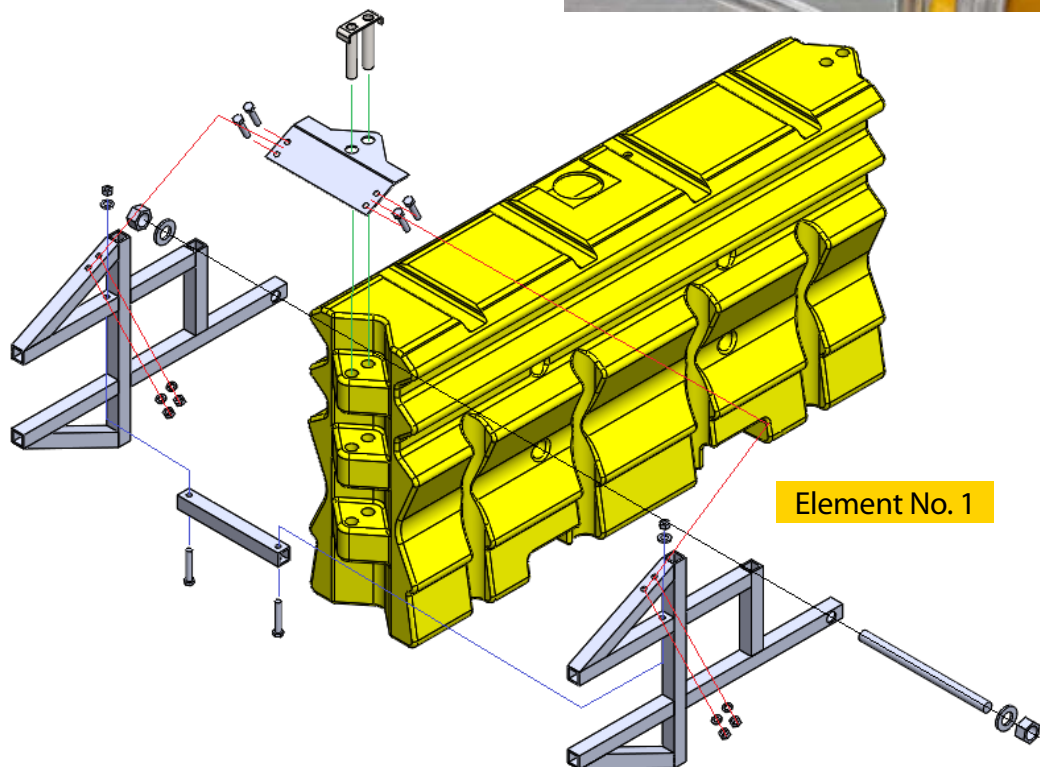


### INSTRUCTIONS

1. Pin the 3 yellow elements with the pins as shown, engaging the steel cable.
2. The the asymmetric pin must be used to connect the yellow elements 1 and 2.

## STEP 4

## ArmorBuffa Nose Plate Assembly



### INSTRUCTIONS

1. Bolt the steel nose onto the exposed end of yellow element No. 1, as shown above.
2. Tighten nuts and bolts to 50Nm.

## STEP 5

## ArmorBuffa Steel Nose Assembly

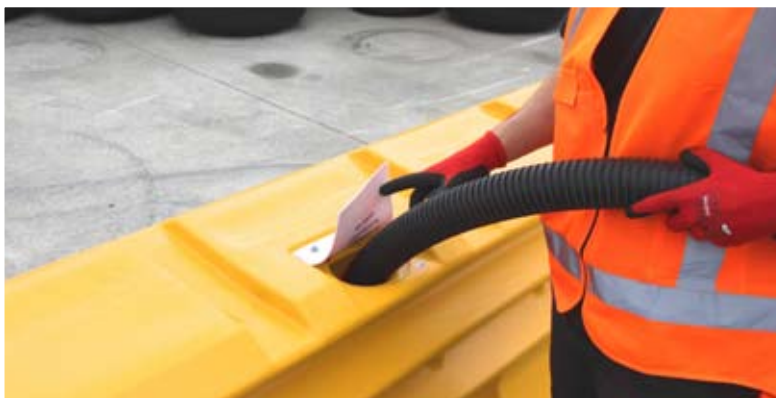


### INSTRUCTIONS

1. Fit the cable through the nose pin as shown in Note A.
2. Slide the yellow plastic nose cover into position and insert the nose pin through the nose cover into the steel nose assembly as shown in Note B. Ensuring the pin engages the cable loop.

## STEP 6

## Final Inspection and Filling of Elements

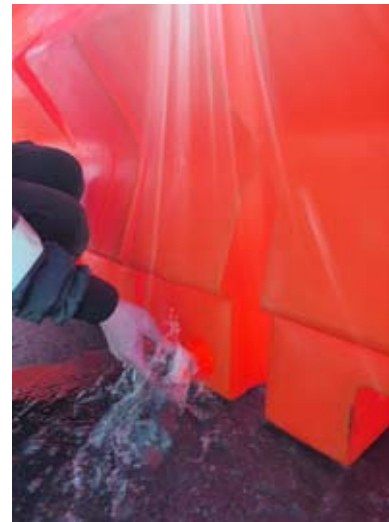
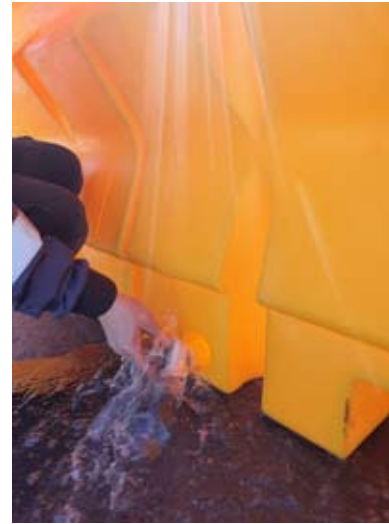


### INSTRUCTIONS

1. Inspect installed system ensuring the correct pins are in the correct locations and that the steel cable is engaged through each pin.
2. Fill all 4 elements (1 x orange and 3 x yellow) with water to capacity (within 25mm of the top) using the filling port, 700 litres per element.
3. Ensure the Water Fill Level Indicators are raised above the top of the element, indicating the element is full of water.

## STEP 7

## Disassembly and Relocation



### INSTRUCTIONS

1. Drain elements by removing the bungs and then disassemble in the reverse order of assembly.



Do not stack full elements.

Note: The transition can be left on the end of the temporary barrier for transportation and relocation, as can the steel nose assembly be left on the plastic Element No. 1.

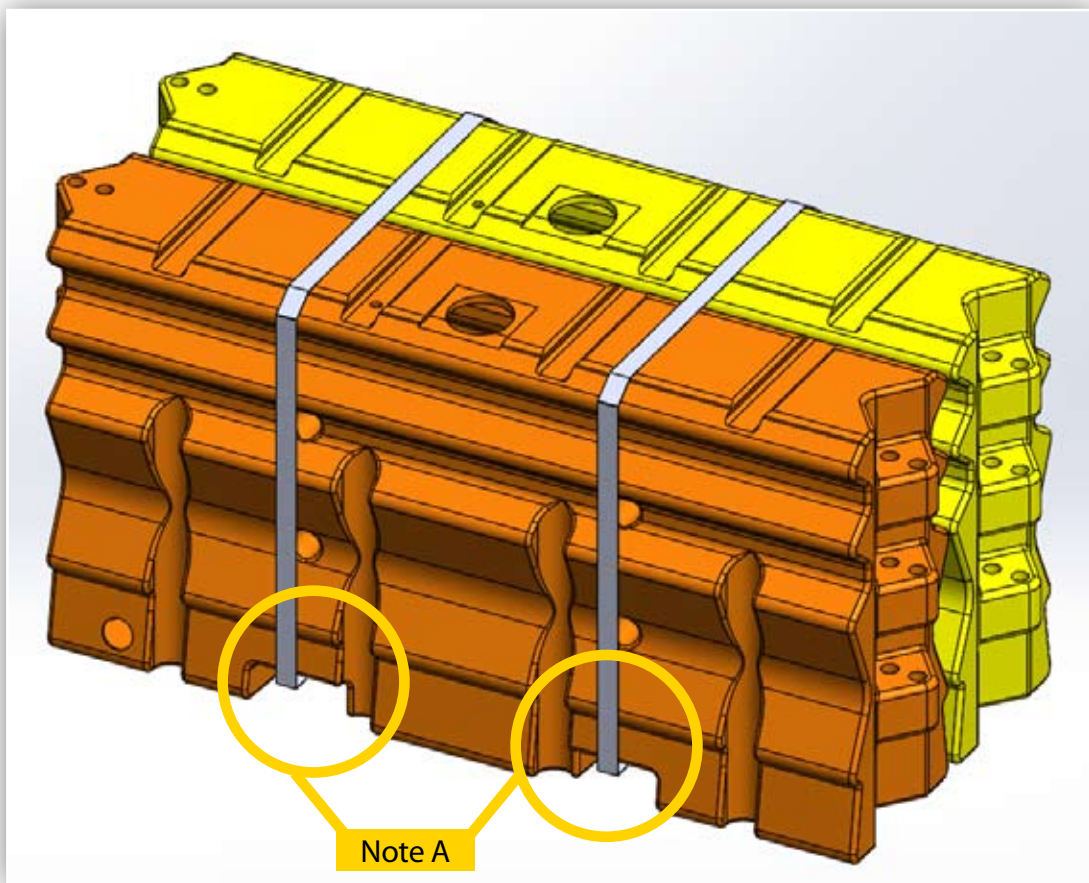
## 10.0 ArmorBuffa Element Capacity

Liquid Capacity L
700 Litres

## 11.0 Transportation and Storage

When empty, Elements are designed to be transported and stored in strapped bundles of 2, as shown below, and can be lifted via the forklift pockets shown in Note A.

The Transition Piece, Steel Nose Assembly and Nose Cover are to be strapped to pallets for transportation.



**WARNING:** Elements must be emptied before being moved or transported.



## 12.0 Inspector Checklist

Confirm all items in the checklist have been properly completed and hardware installed properly.

### Installation Checklist

Item	Date	Initial
Nose Piece is firmly attached to Element No. 1.		
The cable assembly is linked through each of the five (5) connector pins.		
All Elements and Nose Cover are connected with the correct pin (refer to diagrams on pages 7, 8 and 9).		
Transition is secured to the Transition Barrier with three (3) M20 Anchors on each side		
Anchors torqued to 50 Nm.		
All Element(s) full of water and the Water Fill Level Indicators are raised above the top of the element.		
Plug at drain ports fully seated and secure with no sign of leakage.		

Inspector signature: \_\_\_\_\_

Date: \_\_\_\_\_

## 13.0 Maintenance Inspection

Crash cushions, like all roadside safety hardware, require inspection to ensure they are in acceptable working condition. Regular inspections of the ArmorBuffa™ system is recommended and shall be made by the local highway authority. Frequency of the inspections shall be made based on site conditions, traffic volumes, and crash history. The water level in all elements must be checked regularly. This can be done by checking that the Water Fill Level Indicators are raised above the top of the elements. Please follow the Local guidelines for frequency of inspections to ensure adequate repairs are made to the system. Walk-up inspections are recommended at least twice a year.

## 14.0 Walk-Up Inspections

### Recommended Frequency – Twice a Year

Before performing walk-up inspections, ensure traffic control is deployed in accordance with local guidelines.

Check for:

- Water level is within 25mm of the top of the Element's fill ports (verified by the Water Fill Level Indicators being raised above the top of the elements).
- Damage caused by vehicle impacts
- Damage caused by impacts from roadside maintenance equipment
- Misalignment
- Missing components
- Vandalism
- Clear and dispose of any debris in and around the system

After inspection is complete, ensure all items identified during the inspection process are corrected. The ArmorBuffa™ system shall be returned to proper condition as outlined in the installation instructions.

### Walk-Up Inspection

Item	Comment
Water level is within 25mm of the top (check the Water Fill Level Indicators are raised above the top of the element).	
Damage caused by vehicle impacts	
Minor damage caused by impacts from roadside maintenance equipment	
Misalignment	
Missing components	
Vandalism	
Clear and dispose of any debris in and around the system	
Grading around system	
Fill Lids are fully seated. (Step 6, Page 16)	

Inspector Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Print Name: \_\_\_\_\_ Location: \_\_\_\_\_

## 15.0 Design Life

The design life of the ArmorBuffa MASH TL3 End Treatment is 20 years. This is based on the properties and performance of the UV stabilised HDPE and MDPE plastic and also the hot dip galvanizing of the connector pins, steel transition and steel nose assembly. Please note each plastic element has a unique serial number to enable manufacturing traceability.

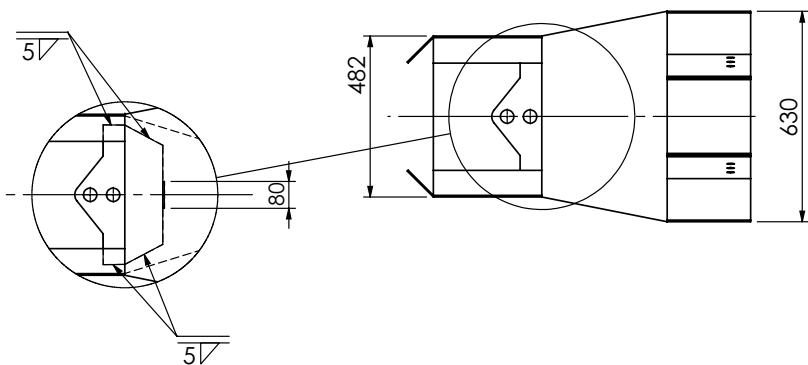
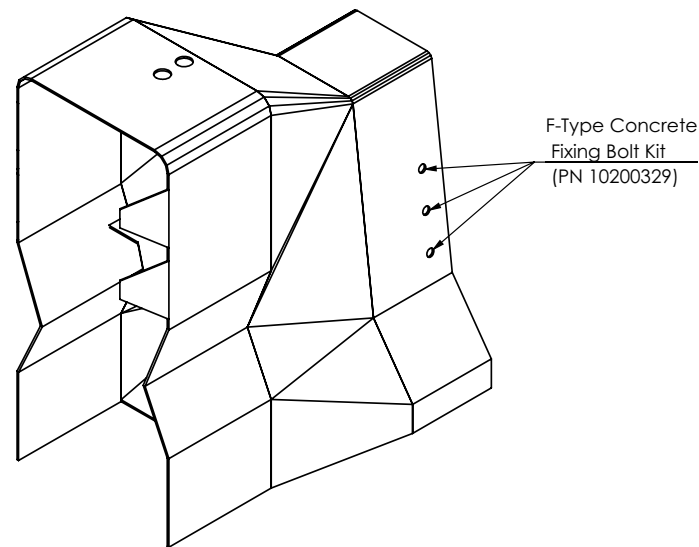
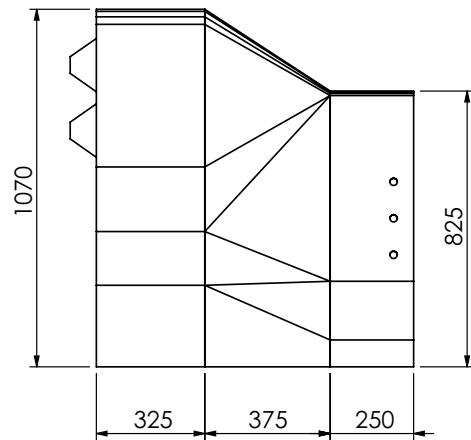
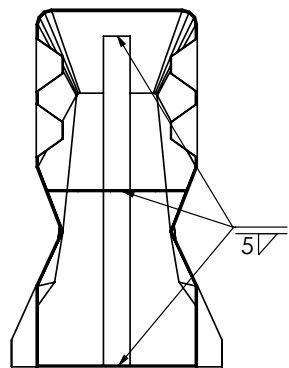
## 16.0 Maintenance

ArmorBuffa™ MASH TL3 is a maintenance free system but it is recommended that inspections are carried out periodically to ensure that the system is installed as required.

Over a long period of time in extreme conditions it may be possible for evaporation to take place and it is imperative that all the elements remain filled to the correct level.

## 17.0 Recycling

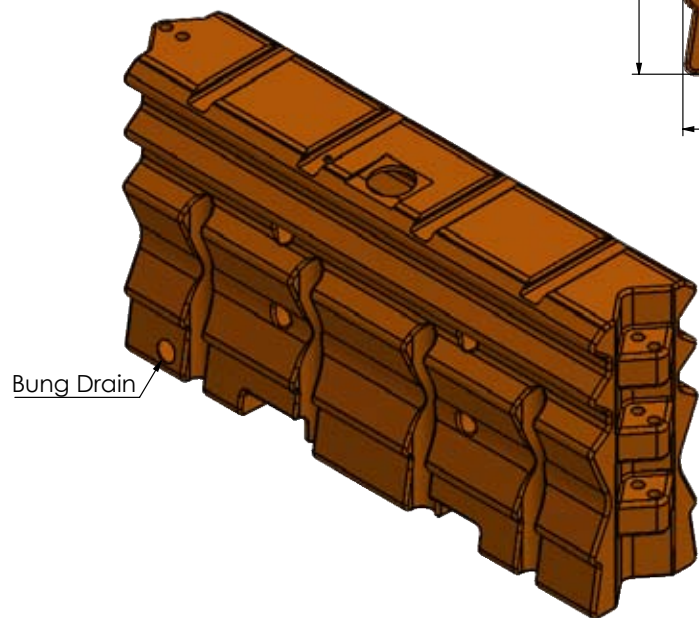
The ArmorBuffa™ MASH TL3 End Treatment is manufactured from UV stabilised HDPE and MDPE and therefore the material in any units damaged beyond repair can be recycled. The connector pins, nosepiece and transition are manufactured from steel and can also be recycled.



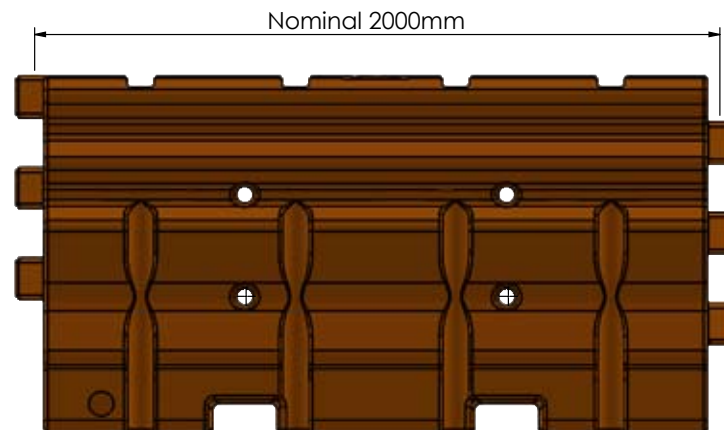
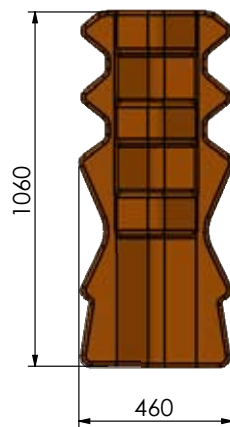
Notes:  
Finish = HDGalv AS/NZS 4680

					TOLERANCES		CLIENT		ITEM	
					Whole Numbers :				ArmorBuffa Transition F-Type Concrete	
				One Decimal Place :		MATERIAL		DRAWING NUMBER		
				Bend Angle :		5mm BMT G250		10200320		
				Straightness :		FINISH		DRAWN		
				Scale:		HDGalv		CHECKED		
								APPROVED		
1	HOLES FOR FIXING BOLTS UPDATED	JA	29/10/20	<b>Valmont Highway Technology</b> Level 3, Building A, 11 Talavera Road Macquarie Park, NSW 2113, Australia T: +612 9814 1777 www.valmonthighway.com				VB		
0	ORIGINAL ISSUE - 23.10.2020							JA		LB
REV	DESCRIPTION	APPD	DATE							

FOLDER: Engineering\3. CURRENT DRAWINGS\COMPONENT DRAWINGS\SLDDRWs\10200320 - ArmorBuffa Transition F-Type Concrete



Bung Drain



- Notes:**
- Weight = 63kg (empty)  
= 763kg (full)
  - Water per unit = 700 litres

REV	DESCRIPTION	APPD	DATE
1	Notes added, bung drain added.	JA	02/11/20

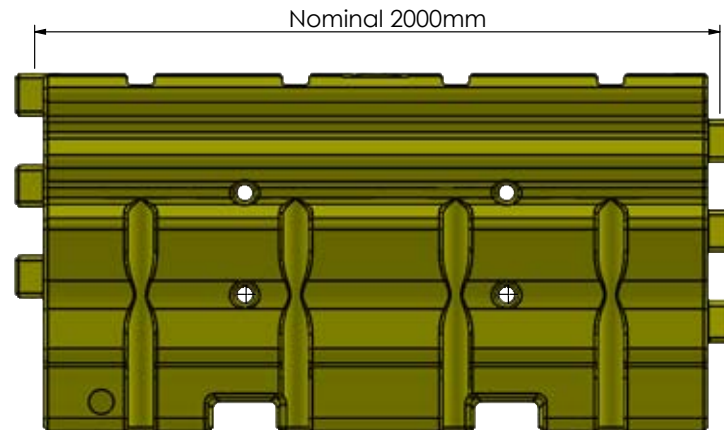
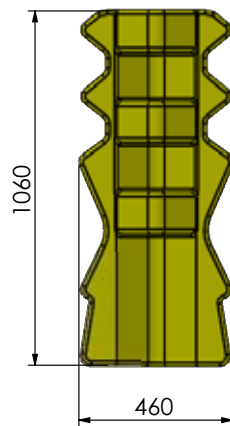
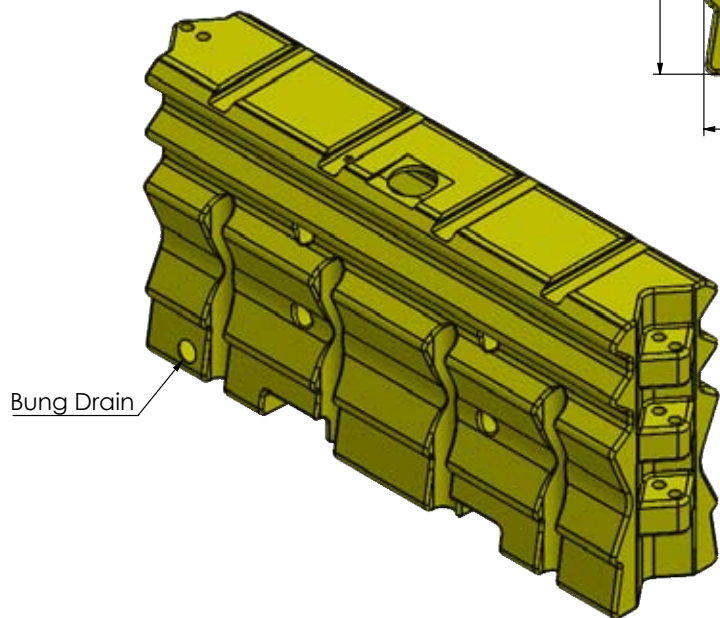
**valmont**   
 HIGHWAY  
 Valmont Highway Technology  
 Level 3, Building A, 11 Talavera Road  
 Macquarie Park, NSW 2113, Australia  
 T: +612 9814 1777 www.valmonthighway.com

TOLERANCES  
 Whole Numbers :  
 One Decimal Place :  
 Bend Angle :  
 Straightness :  
 Scale:

CLIENT  
 MATERIAL  
 FINISH

ITEM	ArmorBuffa Element Orange		
DRAWING NUMBER	10200322		
DRAWN	CHECKED	APPROVED	
VB	JA	LB	

FOLDER F:\Engineering\3 - CURRENT DRAWINGS\COMPONENT DRAWINGS\SLDDRWs\10200322 - ArmorBuffa Element - Orange\



- Notes:**
1. Weight = 50kg (empty)  
= 750kg (full)
  2. Water per unit = 700 litres

REV	DESCRIPTION	APPD	DATE
1	Notes updated, bung drain added.	JA	02/11/20

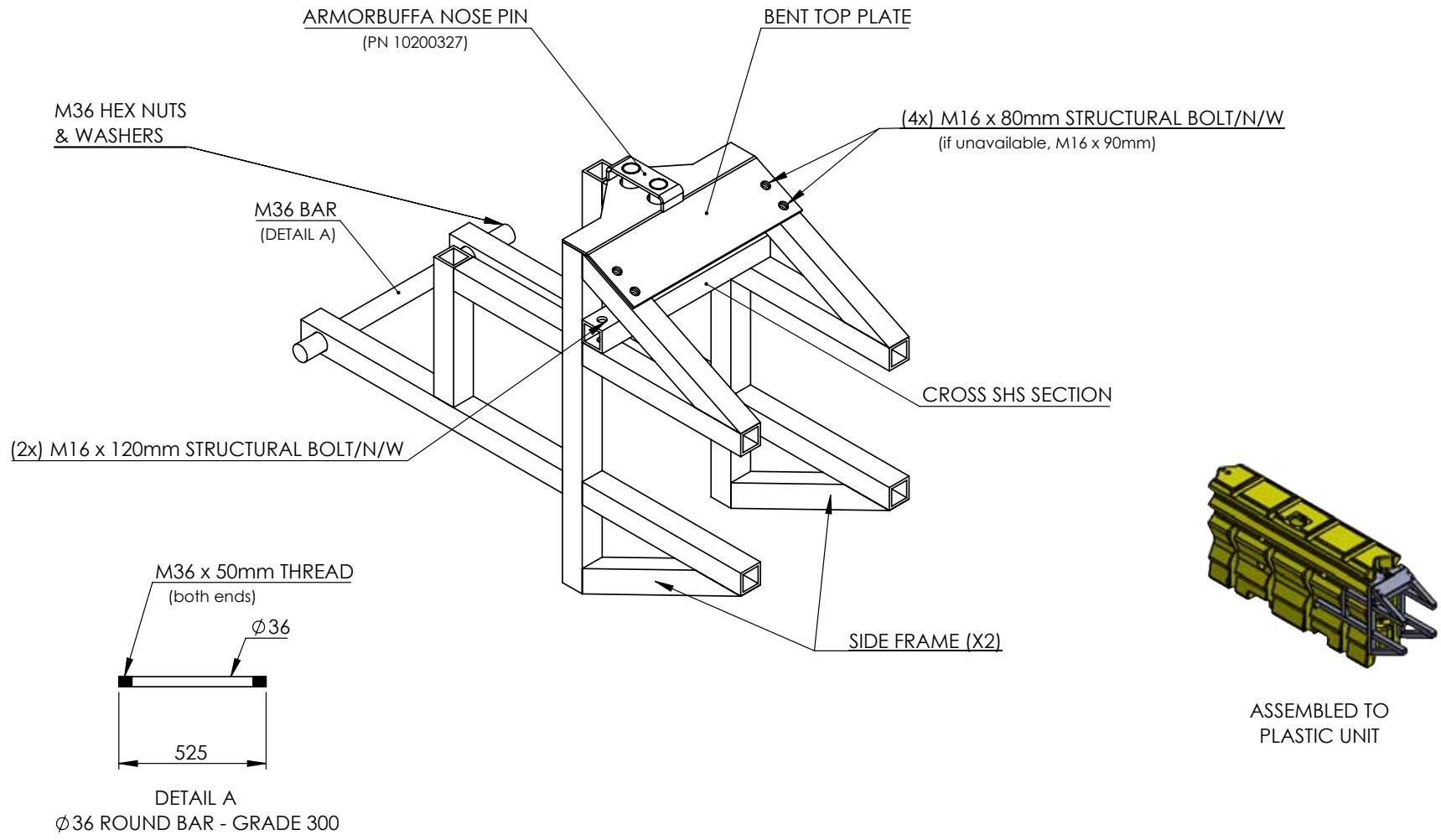
**valmont**   
 HIGHWAY  
 Valmont Highway Technology  
 Level 3, Building A, 11 Talavera Road  
 Macquarie Park, NSW 2113, Australia  
 T: +612 9814 1777 www.valmonthighway.com

TOLERANCES
Whole Numbers :
One Decimal Place :
Bend Angle :
Straightness :
Scale:

CLIENT
MATERIAL
FINISH

ITEM	ArmorBuffa Element Yellow		
DRAWING NUMBER	10200323		
DRAWN	CHECKED	APPROVED	
VB	JA	LB	

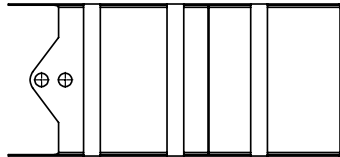
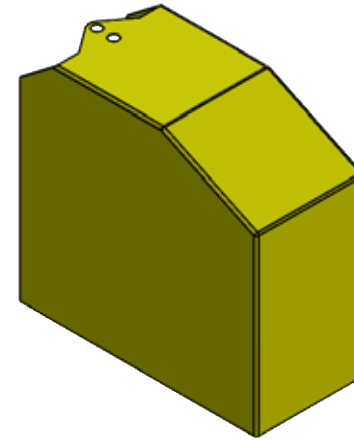
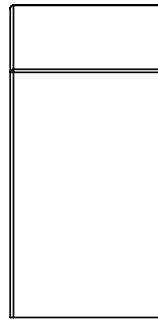
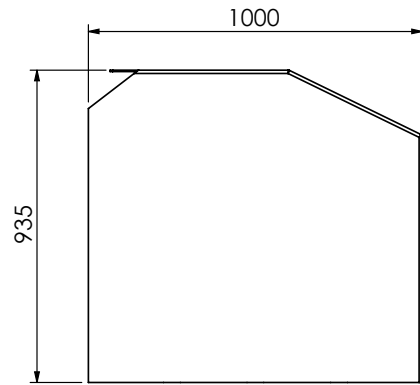
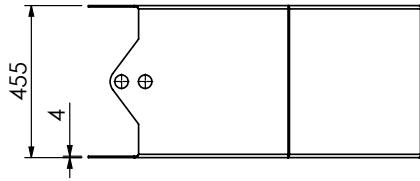
FOLDER F:\Engineering\3 - CURRENT DRAWINGS\COMPONENT DRAWINGS\SLDDRWs\10200323 - ArmorBuffa Element - Yellow



ASSEMBLED TO PLASTIC UNIT

				<p><b>Valmont Highway Technology</b> Level 3, Building A, 11 Talavera Road Macquarie Park, NSW 2113, Australia T: +612 9814 1777 www.valmonthighway.com</p>	TOLERANCES		CLIENT		ITEM	
					Whole Numbers :		MATERIAL		ArmorBuffa Steel Nose Assembly	
					One Decimal Place :		FINISH		DRAWING NUMBER	
					Bend Angle :		HDGalv		10200324	
				Straightness :		Scale:		DRAWN		
								CHECKED		
								APPROVED		
REV	DESCRIPTION	APPD	DATE					VB		
	ORIGINAL ISSUE - 23.10.2020							JA		
								LB		

FOLDER F:\Engineering\3. CURRENT DRAWINGS\COMPONENT DRAWINGS\SLDDRWs\10200324 - ArmorBuffa Steel Nose Assembly



**Valmont Highway Technology**  
 Level 3, Building A, 11 Talavera Road  
 Macquarie Park, NSW 2113, Australia  
 T: +612 9814 1777 www.valmonthighway.com

**TOLERANCES**  
 Whole Numbers :  
 One Decimal Place :  
 Bend Angle :  
 Straightness :  
 Scale:

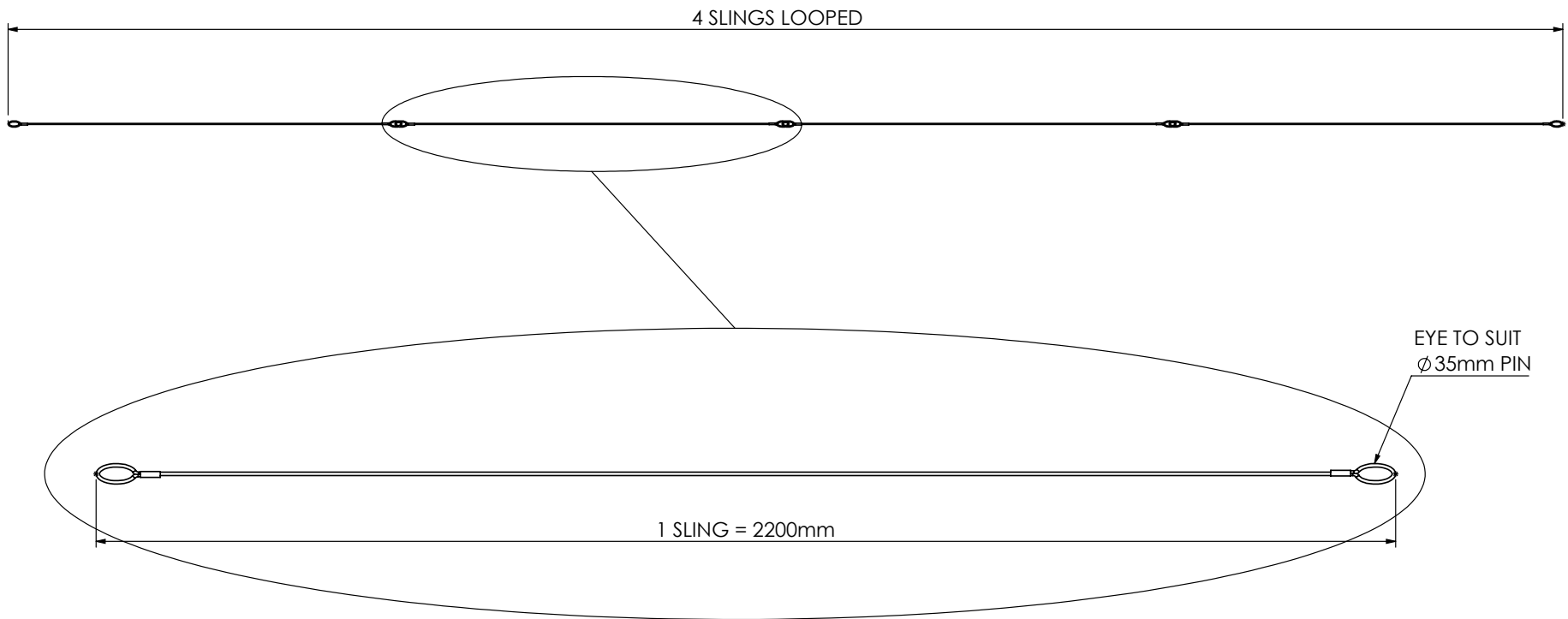
**CLIENT**  
**MATERIAL**  
**FINISH**

**ITEM**  
 ArmorBuffa Nose Cover  
**DRAWING NUMBER**  
 10200325  
**DRAWN** VB **CHECKED** JA **APPROVED** LB


REV	DESCRIPTION	APPD	DATE
	ORIGINAL ISSUE - 23.10.2020		

FOLDER F:\Engineering\3. CURRENT DRAWINGS\COMPONENT DRAWINGS\SLDDRWs\10200325 - ArmorBuffa Nose Cover\

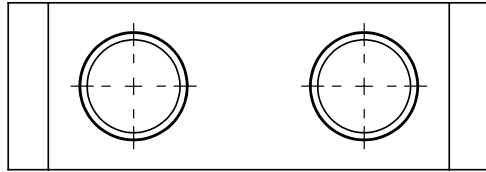




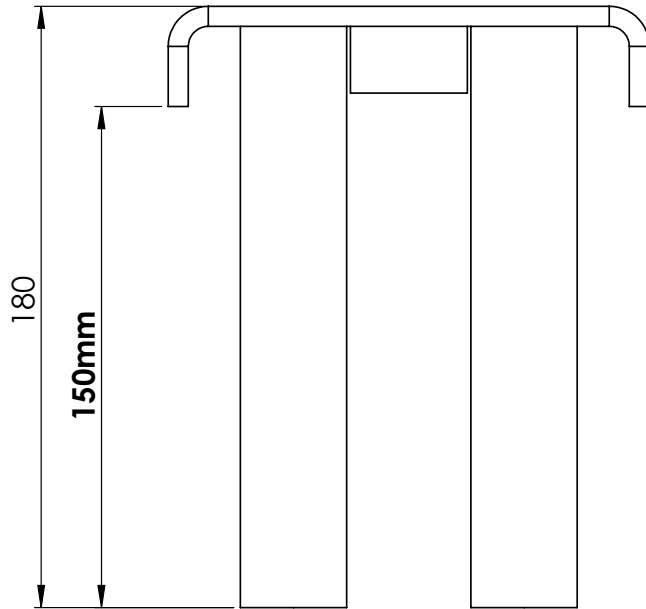
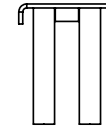
Wire Rope Info:  
 Diameter:  $\phi$  6mm  
 Construction: 7/19 IWRC  
 Grade: 2070  
 AS 1666.1-2009


				 <b>Valmont Highway Technology</b> Level 3, Building A, 11 Talavera Road Macquarie Park, NSW 2113, Australia T: +612 9814 1777 www.valmonthighway.com	TOLERANCES Whole Numbers : One Decimal Place : Bend Angle : Straightness : Scale:		CLIENT  MATERIAL  FINISH	ITEM ArmorBuffa Cable  DRAWING NUMBER <h1>10200326</h1>	
REV	DESCRIPTION	APPD	DATE				DRAWN	CHECKED	APPROVED
	ORIGINAL ISSUE - 26.10.2020					VB	JA	LB	

FOLDER F:\Engineering\3 - CURRENT DRAWINGS\COMPONENT DRAWINGS\SLDRWs\10200326 - ArmorBuffa Cable\

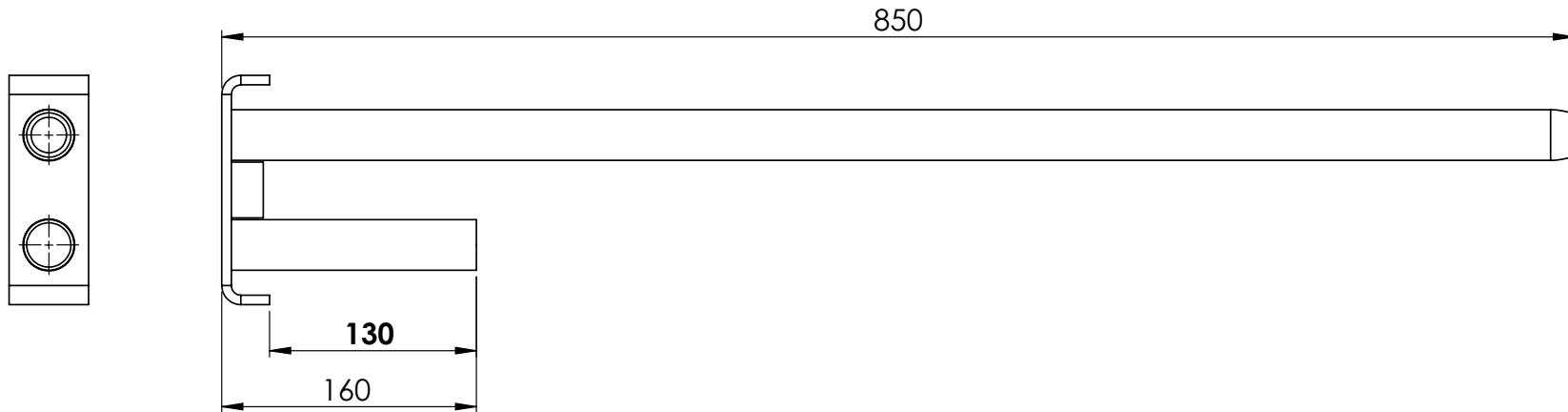


Short 150mm  
Twin Pin

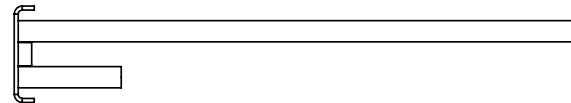



				 <b>valmont</b> HIGHWAY Valmont Highway Technology Level 3, Building A, 11 Talavera Road Macquarie Park, NSW 2113, Australia T: +612 9814 1777 www.valmonthighway.com	TOLERANCES Whole Numbers : One Decimal Place : Bend Angle : Straightness : Scale:	CLIENT  MATERIAL  FINISH	ITEM ArmorBuffa Nose Pin  DRAWING NUMBER <b>10200327</b>	
REV	DESCRIPTION	APPD	DATE		ORIGINAL ISSUE - 23.10.2020   		DRAWN VB	CHECKED JA

FOLDER F:\Engineering\3. CURRENT DRAWINGS\COMPONENT DRAWINGS\SLDDRWs\10200327 - ArmorBuffa Nose Pin

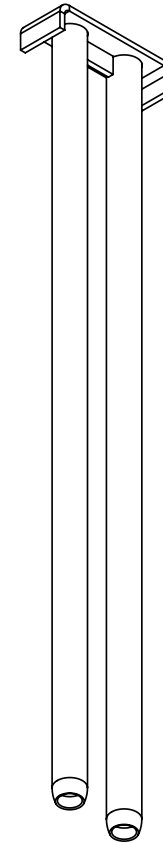
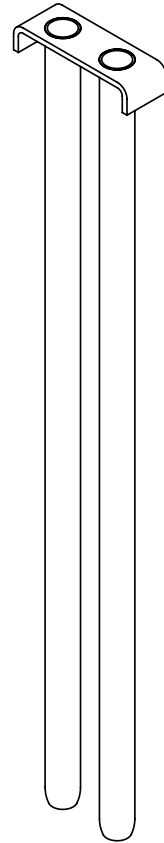
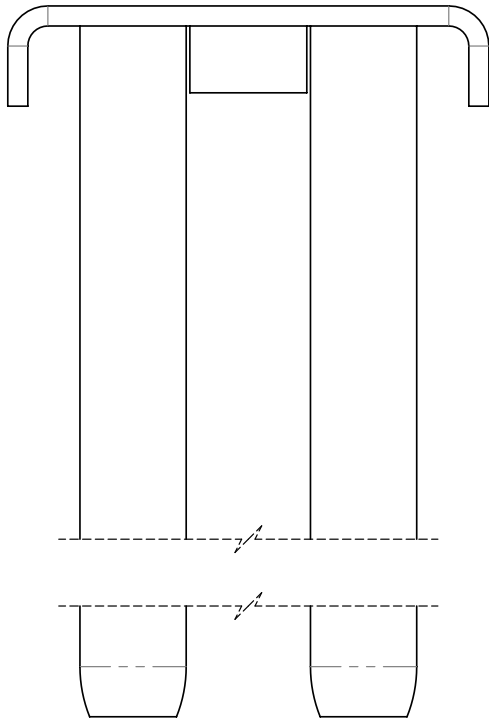
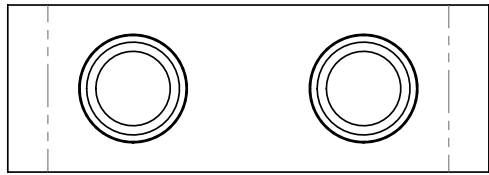


Asymmetric  
Twin Pin



				 <b>Valmont Highway Technology</b> Level 3, Building A, 11 Talavera Road Macquarie Park, NSW 2113, Australia T: +612 9814 1777 www.valmonthighway.com	TOLERANCES Whole Numbers : One Decimal Place : Bend Angle : Straightness : Scale:	CLIENT  MATERIAL  FINISH	ITEM ArmorBuffa Asymmetric Pin  DRAWING NUMBER <b>10200328</b>	DRAWN VB	CHECKED JA	APPROVED LB
	ORIGINAL ISSUE - 23.10.2020									
REV	DESCRIPTION	APPD	DATE							

FOLDER F:\Engineering\3. CURRENT DRAWINGS\COMPONENT DRAWINGS\SLDDRWs\10200328 - ArmorBuffa Asymmetric Pin\



NOTE:  
HOT DIP GALVANIZED

The information hereon is proprietary to Valmont Highway Distribution Ltd. and shall not be disclosed, duplicated or used otherwise without the express written approval of Valmont Highway Distribution Ltd.

© 2014 Valmont Highway Distribution Ltd.

REV.	CHANGES	DATE
2	ADD SPACER	17/03/2016
1	INITIAL ISSUE	28/03/2012

SCALE: 1:2		
	DATE	INIT.
DRAWN BY	17/03/2016	LW
APPR'D BY	17/03/2016	BM

### Twin Pin for ArmorZone

		12 Offenhauser Dr East Tamaki New Zealand +64 9 215 5231 info@valmonthighway.com	
		SHEET	DRAWING NUMBER
1 OF 1		10200204	2

Notes:



A series of horizontal dashed lines for writing notes.



*For more information*

contact us on the web

[www.ingalcivil.com.au](http://www.ingalcivil.com.au)

**Head Office: Sydney**

57-65 Airds Road, Minto, NSW 2566

Ph: +61 2 9827 3333

Fax: +61 2 9827 3300

Local call (within Australia):

1300 446 425

Email: [sales@ingalcivil.com.au](mailto:sales@ingalcivil.com.au)

**Our Locations:**

• Adelaide/NT • Brisbane

• Melbourne • Newcastle

• Perth • Sydney • Wagga

• Auckland • Christchurch