

ARMORBUFFA™

Product Manual

For Installation on Temporary Concrete Barrier or Temporary Steel Barrier

Release 06/23

International Version



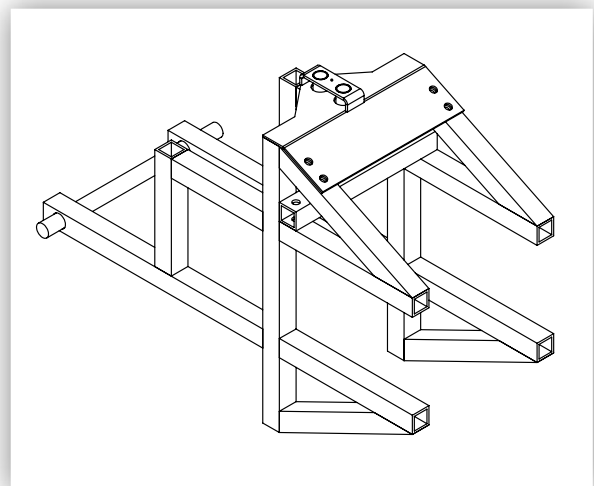
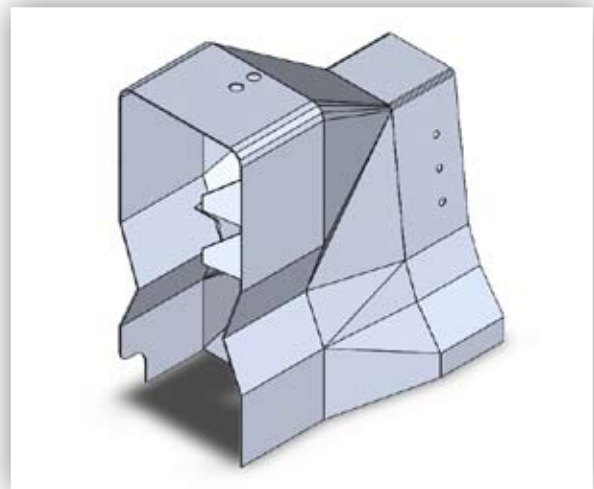
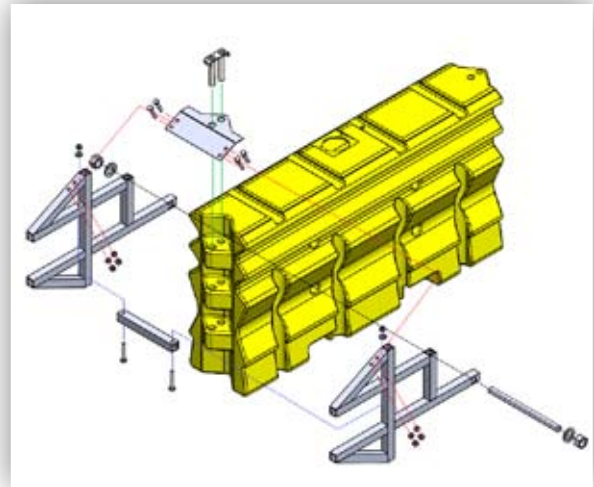
MASH TL2/TL3 Temporary End Treatment

TABLE OF CONTENTS

| | | |
|------|---|----|
| 1.0 | ArmorBuffa TL3 Introduction..... | 3 |
| 2.0 | Recommended Tools..... | 3 |
| 3.0 | Parts Identification | 4 |
| 4.0 | Preparation | 7 |
| 5.0 | Documentation | 7 |
| 6.0 | Important Notes..... | 7 |
| 7.0 | Anchoring Specifications | 7 |
| 8.0 | ArmorBuffa MASH TL-3 Exploded Assembly Overview ... | 8 |
| 8.1 | ArmorBuffa MASH TL-3 Concrete Kit..... | 9 |
| 8.2 | ArmorBuffa MASH TL-3 Temporary Steel Barrier Kit | 10 |
| 9.0 | Installation Procedure..... | 12 |
| 10.0 | ArmorBuffa Element Capacity..... | 19 |
| 11.0 | Transportation and Storage..... | 19 |
| 12.0 | Inspector Checklist | 20 |
| 13.0 | Maintenance Inspection | 20 |
| 14.0 | Walk-Up Inspections..... | 21 |
| 15.0 | Design Life | 21 |
| 16.0 | Maintenance..... | 22 |
| 17.0 | Recycling | 22 |
| 18.0 | Anti-Freeze Solutions..... | 22 |

APPENDIX – TECHNICAL DRAWINGS

| | | |
|------|---|----|
| 18.0 | 10200320: ArmorBuffa Transition TL3 Concrete..... | 23 |
| 19.0 | 10200343: ArmorBuffa Transition Temporary Steel Barrier | 24 |
| 20.0 | 10200322: ArmorBuffa Element Orange | 25 |
| 21.0 | 10200323: ArmorBuffa Element Yellow..... | 26 |
| 22.0 | 10200324: ArmorBuffa Steel Nose Assembly..... | 27 |
| 23.0 | 10200325: ArmorBuffa Nose Cover | 28 |
| 24.0 | 10200326: ArmorBuffa Cable..... | 29 |
| 25.0 | 10200327: ArmorBuffa Nose Pin | 30 |
| 26.0 | 10200328: ArmorBuffa Asymmetric Pin | 31 |
| 27.0 | 10200204: Twin Pin for ArmorZone | 32 |
| 28.0 | MET-16082021: ArmorBuffa to Temporary Steel Barrier Test Assembly..... | 33 |



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 utilizes 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.

ArmorBuffa is available in 2 configurations:

- **TL2** for speed zones up to 70km/h (1 yellow and 1 orange element)
- **TL3** for speed zones up to 100km/h (3 yellow and 1 orange element)

The system has a nominal 1100mm height, 525mm width, and an effective length of 5,316mm for TL-2 or 9,313mm for TL-3 when installed on a temporary concrete barrier or temporary steel barrier.

ArmorBuffa™ is designed to protect the end of an unanchored temporary concrete barrier and temporary steel 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
- Steel Drill Bit
- Torque Wrench
- Electric Drill
- Compressed Air
- 3/4" Diameter Brush
- 1/2" Drive Deep Sockets M16, M36
- Impact Wrench (pneumatic or electric)
- 16mm x 150mm (For concrete barrier installation)
- 18mm (For temporary steel barrier installation)

NOTE: Water source with a flexible hose (maximum 76mm diameter) and a minimum 1,400L capacity for the 2-element TL-2 system or 2,800L capacity is required for the 4 element TL-3 system.

For cold weather regions, a few typical Anti-Freeze agents are listed in Section 18.0.

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

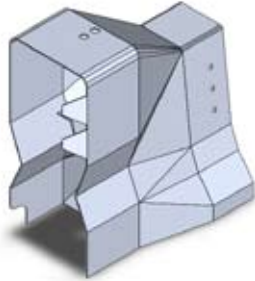


Use only Valmont Highway parts that are specified by Valmont Highway for use with the ArmorBuffa™ System. The use of unspecified parts is prohibited and could result in severe personal injury or death.

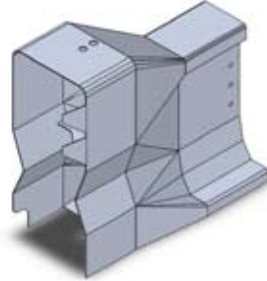
| Part # | Description | Concrete Kit | Temporary Steel Barrier Kit |
|----------|---|--------------|-----------------------------|
| 10200320 | ArmorBuffa Transition TL3 Concrete | 1 | 0 |
| 10200343 | ArmorBuffa Temporary Steel Barrier Transition | 0 | 1 |
| 10200322 | ArmorBuffa Element - Orange | 1 | 1 |
| 10200323 | ArmorBuffa Element - Yellow | 3 | 3 |
| 10200324 | ArmorBuffa Steel Nose Assembly | 1 | 1 |
| 10200325 | ArmorBuffa Nose Cover | 1 | 1 |
| 10200326 | ArmorBuffa Cable | 1 | 1 |
| 10200327 | ArmorBuffa Nose Pin | 1 | 1 |
| 10200328 | ArmorBuffa Asymmetric Pin | 1 | 1 |
| 10200204 | ArmorZone Pin | 3 | 3 |
| 10200329 | ArmorBuffa Transition TL3 Concrete Fixing Bolt Kit | 1 | 0 |
| | ArmorBuffa Transition Temporary Steel Barrier Fixing Bolt Kit | 0 | 1 |
| 10200045 | ArmorBuffa MASH TL3 Concrete Kit - Complete | 1 | 0 |
| 10200052 | ArmorBuffa MASH TL2 Concrete Kit - Complete | 1 | 0 |
| 10200046 | ArmorBuffa MASH TL3 Temporary Steel Barrier Kit - Complete | 0 | 1 |
| 10200200 | Drainage Bung | 1 | 1 |
| 10200202 | Bung Spanner | 1 | 1 |



3.0 PARTS IDENTIFICATION (CONTINUED)



10200320
ArmorBuffa Transition TL3
Concrete
Concrete Kit: 1
Temporary Steel Barrier Kit: 0



10200343
ArmorBuffa Transition
Temporary Steel Barrier
Concrete Kit: 0
Temporary Steel Barrier Kit: 1



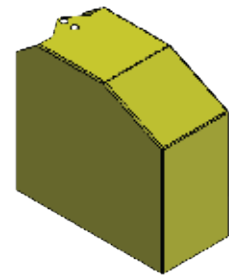
10200322
ArmorBuffa Element - Orange
Concrete Kit: 1
Temporary Steel Barrier Kit: 1



10200323
ArmorBuffa Element - Yellow
Concrete Kit: 3
Temporary Steel Barrier Kit: 3



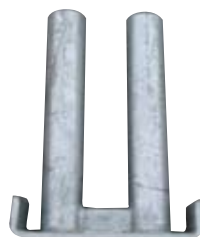
10200324
ArmorBuffa Steel Nose Assembly
Concrete Kit: 1
Temporary Steel Barrier Kit: 1



10200325
ArmorBuffa Nose Cover
Concrete Kit: 1
Temporary Steel Barrier Kit: 1



10200326
ArmorBuffa Cable
Concrete Kit: 1
Temporary Steel Barrier Kit: 1



10200327
ArmorBuffa Nose Pin
Concrete Kit: 1
Temporary Steel Barrier Kit: 1



10200328
ArmorBuffa Asymmetric Pin
Concrete Kit: 1
Temporary Steel Barrier Kit: 1

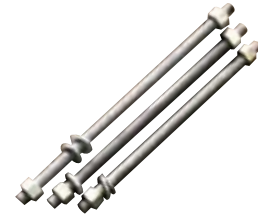
3.0 PARTS IDENTIFICATION (CONTINUED)



10200204
ArmorZone Pin
Concrete Kit: TL-3 3
Temporary Steel Barrier Kit:
TL-3 3



10200329
ArmorBuffa Transition TL3
Concrete Fixing Bolt Kit
Concrete Kit: 1
Temporary Steel Barrier Kit: 0



ArmorBuffa Transition
Temporary Steel Barrier
Fixing Bolt Kit
Concrete Kit: 0
Temporary Steel Barrier Kit: 1



10200045
ArmorBuffa MASH TL3
TL3 Concrete Kit



10200052
ArmorBuffa MASH TL2
TL2 Concrete Kit



10200046
ArmorBuffa MASH TL3
Temporary Steel Barrier 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 Valmont Highway.

4.2 Transition

ArmorBuffa™ is designed to accommodate a temporary concrete barrier and temporary steel barrier.

Placement and installation of the ArmorBuffa™ system must be accomplished in accordance with the local Road Authority Design Guide 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 as described in this product manual.

- ArmorBuffa Product Manual (check for current revision posted at www.valmonthighway.com).
- System Drawings (check www.valmonthighway.com 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 19 for water filling instructions.



If soil conditions on site do not meet or exceed the required strength detailed in this manual, site specific foundations must be designed by a local geotechnical engineer.

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. A few typical Anti-Freeze solutions are listed in section 17.0.

7.0 ANCHORING SPECIFICATIONS

The ArmorBuffa™ system uses M16 x 150mm Excalibur™ Screw Bolts or equivalent for anchoring to temporary concrete barrier. 3 x M16 8.8 threaded rod is used to attach the transition to a temporary steel barrier.



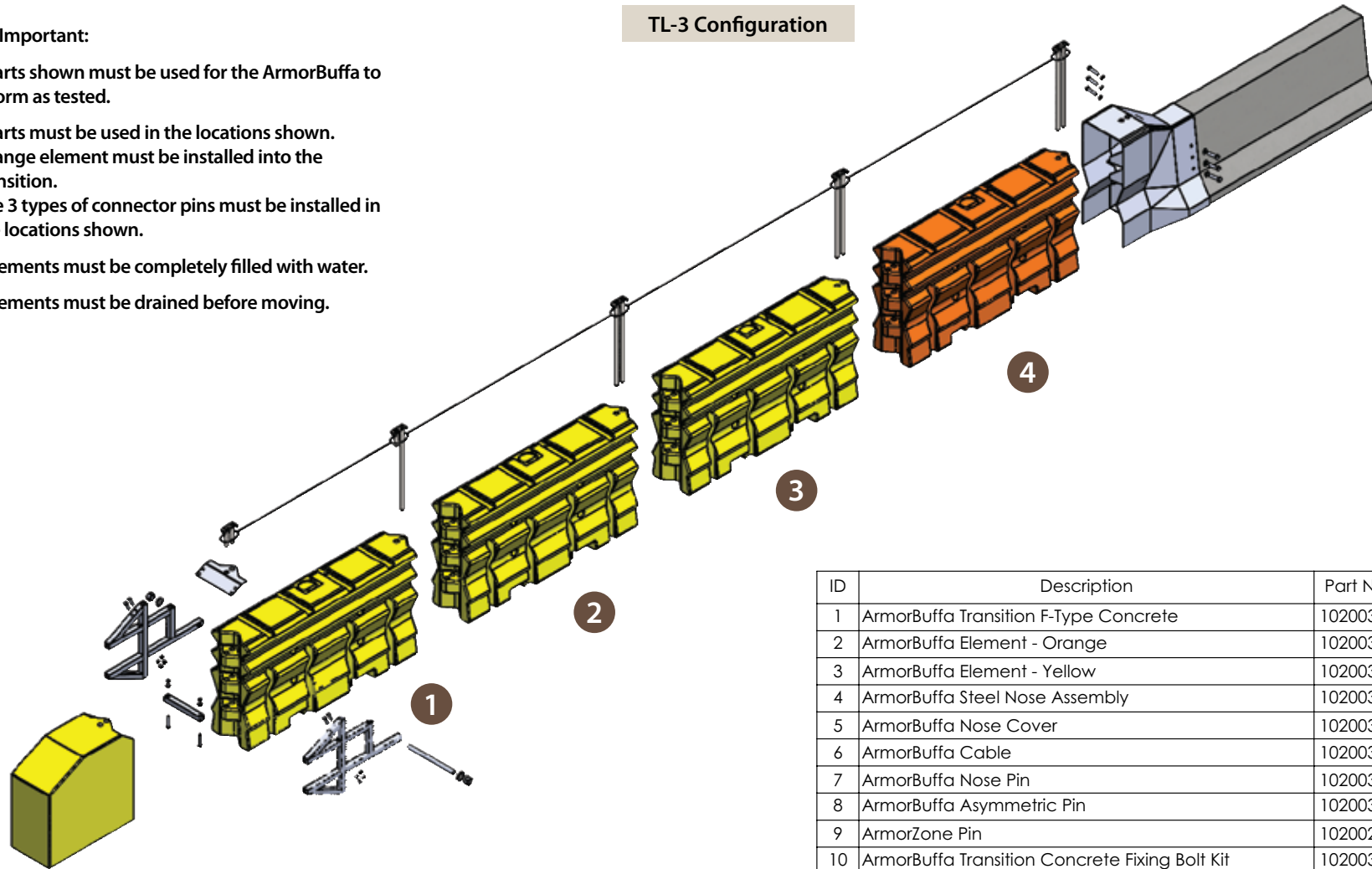
8.0 ARMORBUFFA MASH TL-3 EXPLODED ASSEMBLY OVERVIEW



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.
- All elements must be drained before moving.

TL-3 Configuration



| 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 Concrete Fixing Bolt Kit | 10200329 | 1 |

| REV | DESCRIPTION | APPD | DATE |
|-----|-----------------------------|------|------|
| | ORIGINAL ISSUE - 01.10.2021 | | |

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

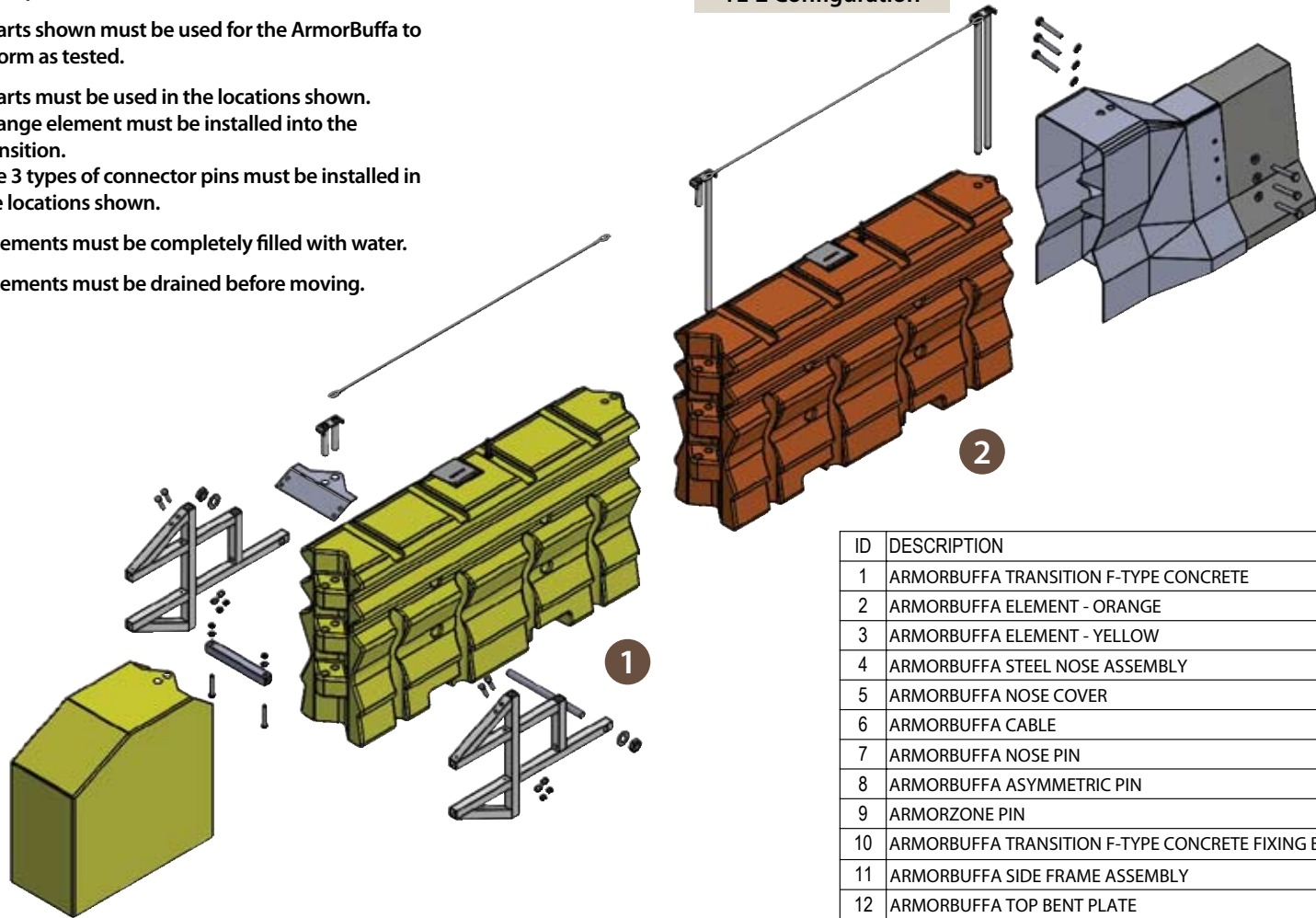
| | | |
|---|---------------|----------------|
| ITEM ArmorBuffa to Concrete Temporary End Treatment | | |
| DRAWING NUMBER ARMB-JJH-01 | | |
| DRAWN VB | CHECKED JA | APPROVED LB |

8.1 ARMORBUFFA MASH TL-2 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.
- All elements must be drained before moving.

TL-2 Configuration



| ID | DESCRIPTION | PART NO. | QTY |
|----|---|----------|-----|
| 1 | ARMORBUFFA TRANSITION F-TYPE CONCRETE | 10200320 | 1 |
| 2 | ARMORBUFFA ELEMENT - ORANGE | 10200322 | 1 |
| 3 | ARMORBUFFA ELEMENT - YELLOW | 10200323 | 1 |
| 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 | 1 |
| 10 | ARMORBUFFA TRANSITION F-TYPE CONCRETE FIXING BOLT KIT | 10200329 | 1 |
| 11 | ARMORBUFFA SIDE FRAME ASSEMBLY | 10200332 | 2 |
| 12 | ARMORBUFFA TOP BENT PLATE | 10200336 | 1 |
| 13 | M16 X 150MM EXCALIBUR SCREWBOLT | 10009164 | 6 |
| 14 | M16 STRUCTURAL WASHER GALV | 10009527 | 6 |

| | | | |
|-----|-------------------------------|------|------|
| | | | |
| | | | |
| | | | |
| | | | |
| 0 | ORINGINAL ISSUED - 23.10.2020 | | |
| REV | DESCRIPTION | APPD | DATE |

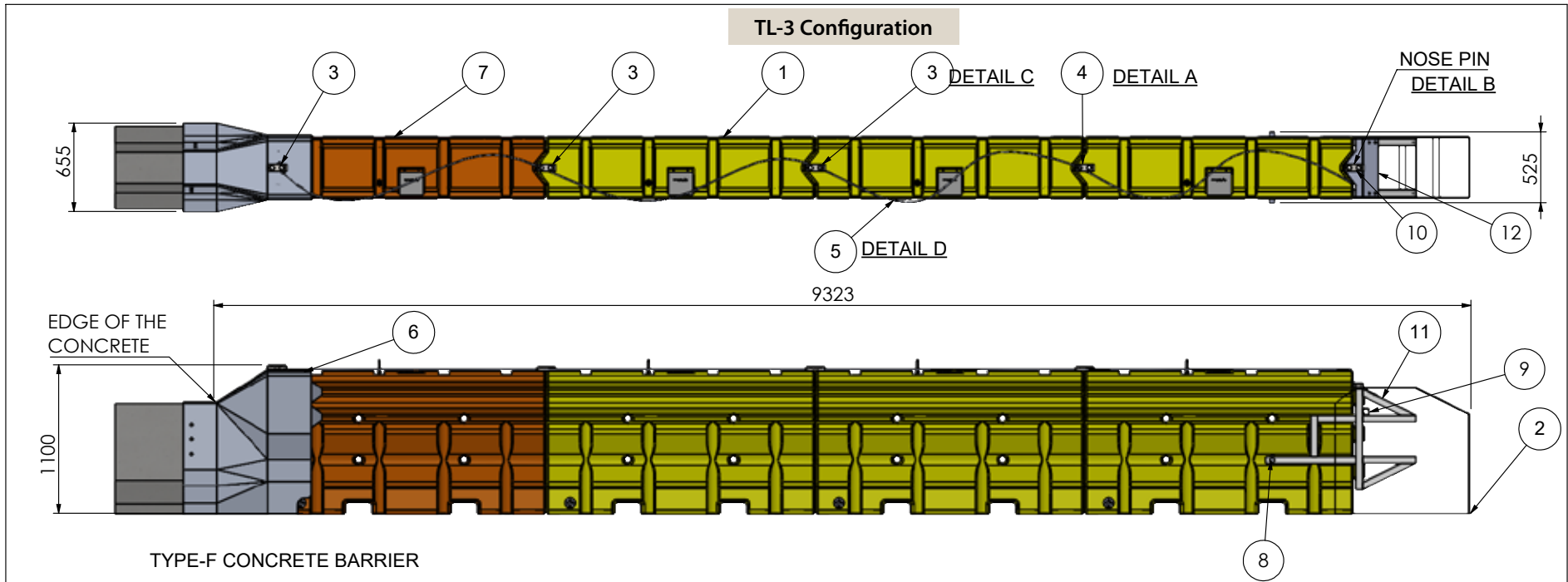
valmont 
 HIGHWAY
 Valmont Highway Technology
 Level 3, Building A, 11 Talavera Road
 Macquarie Park, NSW 2113, Australia
 T: +612 9814 1777 www.valmonthighway.com

TOLERANCES
 Whole Numbers :
 One Decimal Place :
 Bend Angle :
 Straightness :
 Scale: 1:30

CLIENT
 -
 MATERIAL
 NA
 FINISH
 -

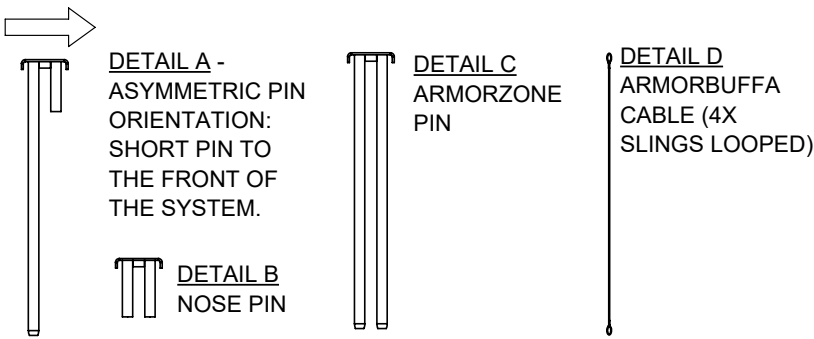
ITEM
ARMORBUFFA MASH TL2
 DRAWING NUMBER
 DRAWN
 KZ
 CHECKED
 -
 APPROVED
 -

8.2 ARMORBUFFA MASH TL-3 CONCRETE KIT



TL-3 Configuration

TYPE-F CONCRETE BARRIER



| ID | DESCRIPTION | PART NO. | QTY. |
|----|---------------------------------------|----------|------|
| 1 | ARMORBUFFA ELEMENT - YELLOW | 10200323 | 3 |
| 2 | ARMORBUFFA NOSE COVER | 10200325 | 1 |
| 3 | ARMORZONE PIN | 10200204 | 3 |
| 4 | ARMORBUFFA ASYMMETRIC PIN | 10200328 | 1 |
| 5 | ARMORBUFFA CABLE | 10200326 | 1 |
| 6 | ARMORBUFFA TRANSITION F-TYPE CONCRETE | 10200320 | 1 |
| 7 | ARMORBUFFA ELEMENT - ORANGE | 10200322 | 1 |
| 8 | ARMORBUFFA M36 X 525MM THREADED ROD | 10200337 | 1 |
| 9 | ARMORBUFFA CROSS SHS | 10200334 | 1 |
| 10 | ARMORBUFFA NOSE PIN | 10200327 | 1 |
| 11 | ARMORBUFFA SIDE FRAME - ASSEMBLY | 10200332 | 2 |
| 12 | ARMORBUFFA TOP BENT PLATE | 10200336 | 1 |

| REV | DESCRIPTION | APPD | DATE |
|-----|-------------------------------|------|------------|
| 2 | UPDATED CABLE QTY | JA | 20-02-2023 |
| 1 | UPDATED CABLE QTY AND BOM | JA | 17-11-2022 |
| 0 | ORINGINAL ISSUED - 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

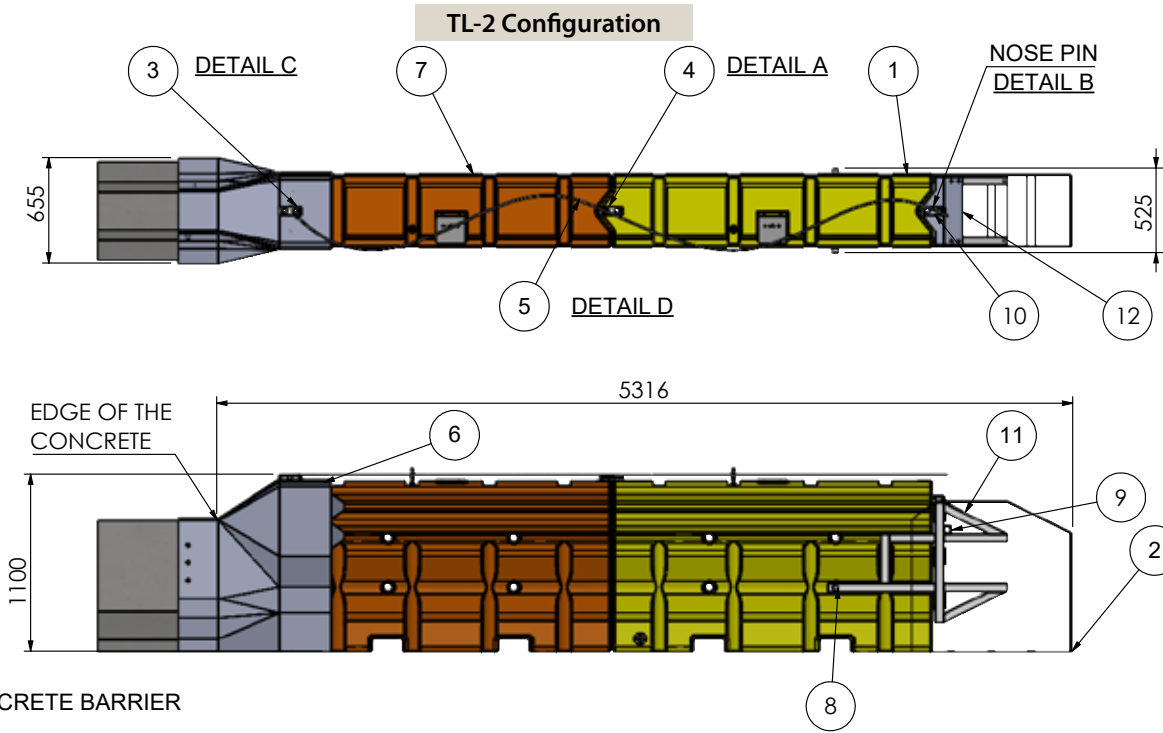
TOLERANCES
Whole Numbers :
One Decimal Place :
Bend Angle :
Straightness :
Scale: 1:100

CLIENT
-
MATERIAL
NA
FINISH
-

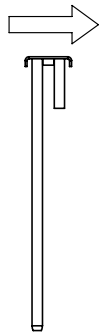
ITEM
**ARMORBUFFA MASH TL3
F-TYPE CONCRETE KIT**
DRAWING NUMBER
10200045
DRAWN
KZ
CHECKED
LG
APPROVED
LG

FOLDER F:\Engineering\3. CURRENT DRAWINGS\COMPONENT DRAWINGS\CLDDRWs\Solid Model\ArmorBuffer - Concrete kit - BG800 - Highway Guard\1_Current Model\Model Files - V2

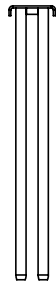
8.3 ARMORBUFFA MASH TL-2 CONCRETE KIT



TYPE-F CONCRETE BARRIER



DETAIL A -
ASYMMETRIC PIN
ORIENTATION:
SHORT PIN TO
THE FRONT OF
THE SYSTEM.



DETAIL C
ARMORZONE
PIN



DETAIL D
ARMORBUFFA
CABLE (2X
SLINGS LOOPED)



DETAIL B
NOSE PIN

| ID | DESCRIPTION | PART NO. | QTY. |
|----|---------------------------------------|----------|------|
| 1 | ARMORBUFFA ELEMENT - YELLOW | 10200323 | 1 |
| 2 | ARMORBUFFA NOSE COVER | 10200325 | 1 |
| 3 | ARMORZONE PIN | 10200204 | 1 |
| 4 | ARMORBUFFA ASYMMETRIC PIN | 10200328 | 1 |
| 5 | ARMORBUFFA CABLE | 10200326 | 1 |
| 6 | ARMORBUFFA TRANSITION F-TYPE CONCRETE | 10200320 | 1 |
| 7 | ARMORBUFFA ELEMENT - ORANGE | 10200322 | 1 |
| 8 | ARMORBUFFA M36 X 525MM THREADED ROD | 10200337 | 1 |
| 9 | ARMORBUFFA CROSS SHS | 10200334 | 1 |
| 10 | ARMORBUFFA NOSE PIN | 10200327 | 1 |
| 11 | ARMORBUFFA SIDE FRAME - ASSEMBLY | 10200332 | 2 |
| 12 | ARMORBUFFA TOP BENT PLATE | 10200336 | 1 |

| REV | DESCRIPTION | APPD | DATE |
|-----|-------------------------------|------|------|
| 0 | ORINGINAL ISSUED - 17-11-2022 | | |

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

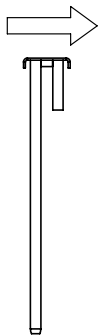
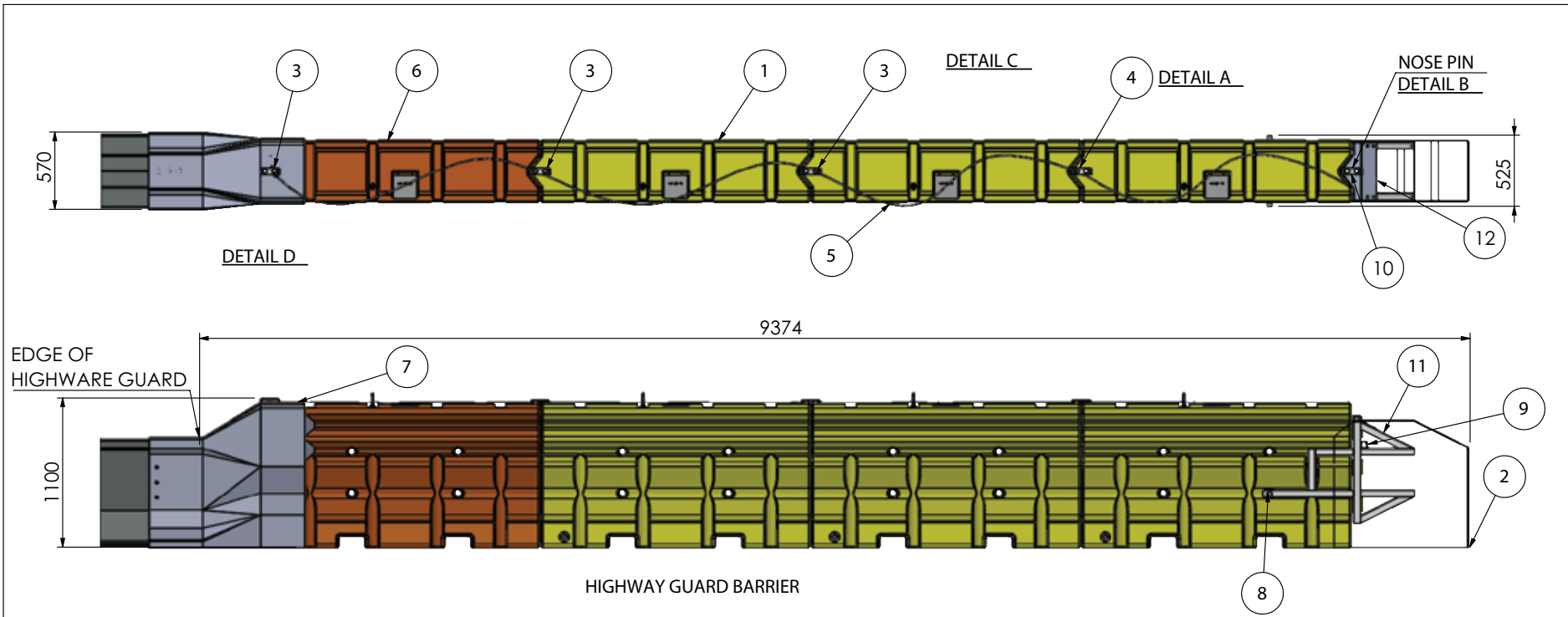
TOLERANCES
Whole Numbers :
One Decimal Place :
Bend Angle :
Straightness :
Scale: 1:100

CLIENT
-
MATERIAL
NA
FINISH
-

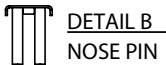
ITEM
**ARMORBUFFA MASH TL2
F-TYPE CONCRETE KIT**
DRAWING NUMBER
10200052
DRAWN
KZ
CHECKED
JA
APPROVED
JA

FOLDER F:\Engineering\3. CURRENT DRAWINGS\COMPONENT DRAWINGS\SLDRWs_Concrete kit - BG800 - Highway Guard\1_Current Model\Model Files - V2

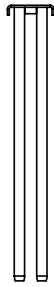
8.4 ARMORBUFFA MASH TL-3 TEMPORARY STEEL BARRIER KIT



DETAIL A -
ASYMMETRIC PIN
ORIENTATION:
SHORT PIN TO
THE FRONT OF
THE SYSTEM.



DETAIL B -
NOSE PIN



DETAIL C -
ARMORZONE
PIN



DETAIL D -
ARMORBUFFA
CABLE (4X
SLINGS LOOPED)

| ID | DESCRIPTION | PART NO. | QTY. |
|----|---------------------------------------|----------|------|
| 1 | ARMORBUFFA ELEMENT - YELLOW | 10200323 | 3 |
| 2 | ARMORBUFFA NOSE COVER | 10200325 | 1 |
| 3 | ARMORZONE PIN | 10200204 | 3 |
| 4 | ARMORBUFFA ASYMMETRIC PIN | 10200328 | 1 |
| 5 | ARMORBUFFA CABLE | 10200326 | 1 |
| 6 | ARMORBUFFA ELEMENT - ORANGE | 10200322 | 1 |
| 7 | ARMORBUFFA TRANSITION - HIGHWAY GUARD | 10200343 | 1 |
| 8 | ARMORBUFFA M36 X 525MM THREADED ROD | 10200337 | 1 |
| 9 | ARMORBUFFA CROSS SHS | 10200334 | 1 |
| 10 | ARMORBUFFA NOSE PIN | 10200327 | 1 |
| 11 | ARMORBUFFA SIDE FRAME - ASSEMBLY | 10200332 | 2 |
| 12 | ARMORBUFFA TOP BENT PLATE | 10200336 | 1 |

| REV | DESCRIPTION | APPD | DATE |
|-----|-------------------------------|------|------------|
| 1 | UPDATED BOM | JA | 22-11-2022 |
| 0 | ORINGINAL ISSUED - 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: 1:100

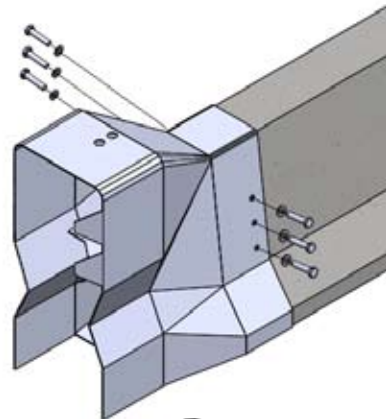
CLIENT
-
MATERIAL
NA
FINISH
-

ITEM
**ARMORBUFFA MASH
HIGHWAY GUARD KIT**
DRAWING NUMBER
10200047
DRAWN KZ
CHECKED LG
APPROVED LG

9.0 INSTALLATION PROCEDURE

STEP 1A

Transition Fixing to Concrete Barrier



Dust Mask



Safety Glasses



Gloves



Hearing Protection

INSTRUCTIONS

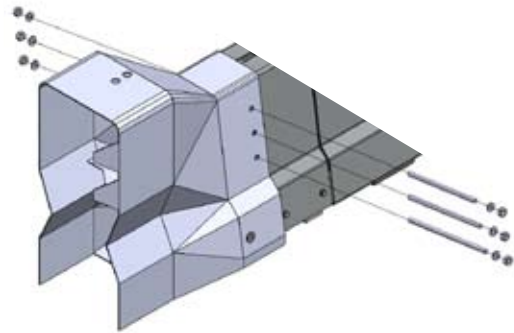
1. Slide transition over the end of the temporary concrete barrier, ensuring it is pushed on as far as possible flush up against the end of the barrier. Then mark the location of the 6 holes.
2. Remove the transition and drill 6 x 0.25" (16mm) x 6" (150mm) holes as marked. If a hole cannot be drilled due to encountering rebar, then the use of 2 screw bolts per side is permitted.
3. Slide the transition back into place and then screw in the 3 Excalibur™ bolts per side, firmly fastening the transition to the barrier.



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

STEP 1B

Transition Fixing to Temporary Steel Barrier

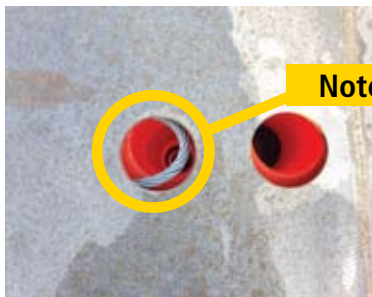
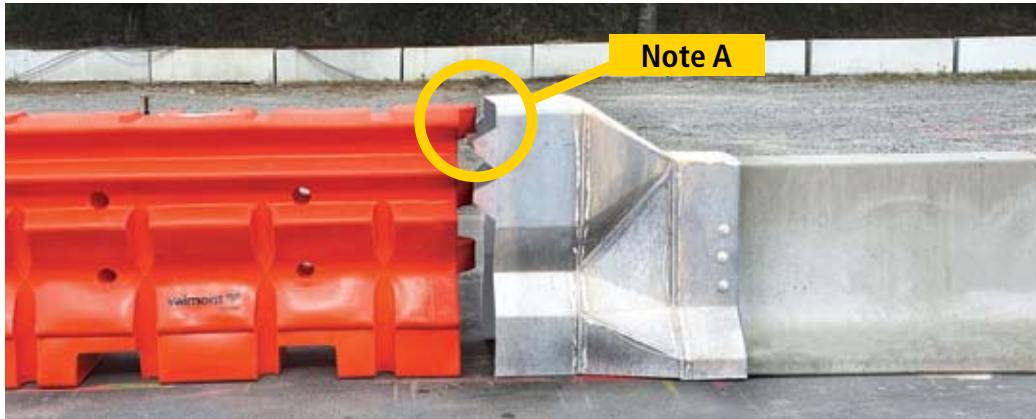


INSTRUCTIONS

1. Slide temporary steel barrier transition over the anchored temporary steel barrier terminal end.
2. Mark the location of the 6 fixing holes on the temporary steel barrier (3 on either side), then remove the transition.
3. Drill 6 x 0.7" (18mm) holes into the temporary steel barrier barrier as marked.
4. Slide the temporary steel barrier transition onto the end of the temporary steel barrier barrier and insert the M16 threaded rod through each hole, add nuts and washers as shown.
5. Tighten the 6 nuts to 36.9 ft-lbf (50Nm).


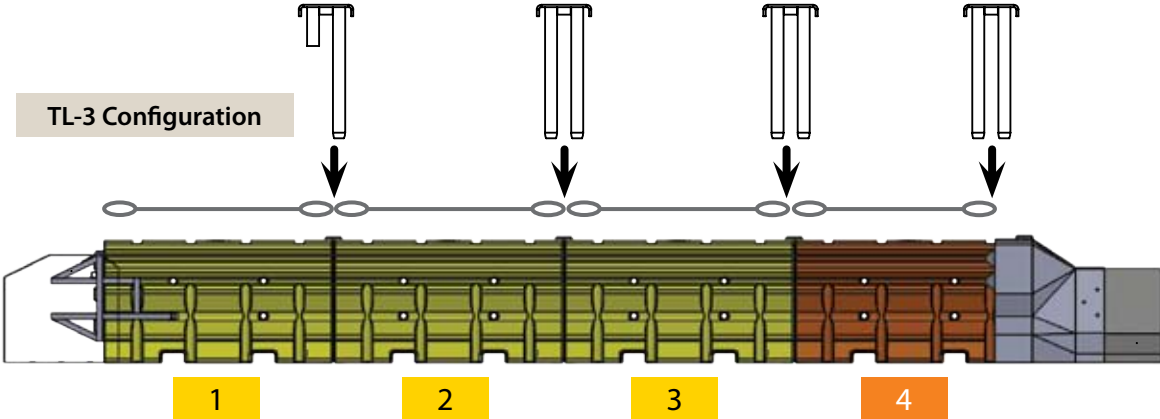
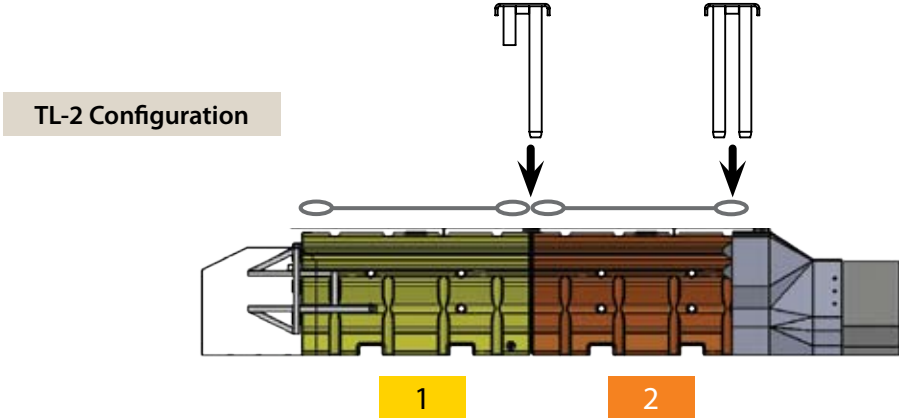
STEP 2

Attachment to ArmorBuffa Elements



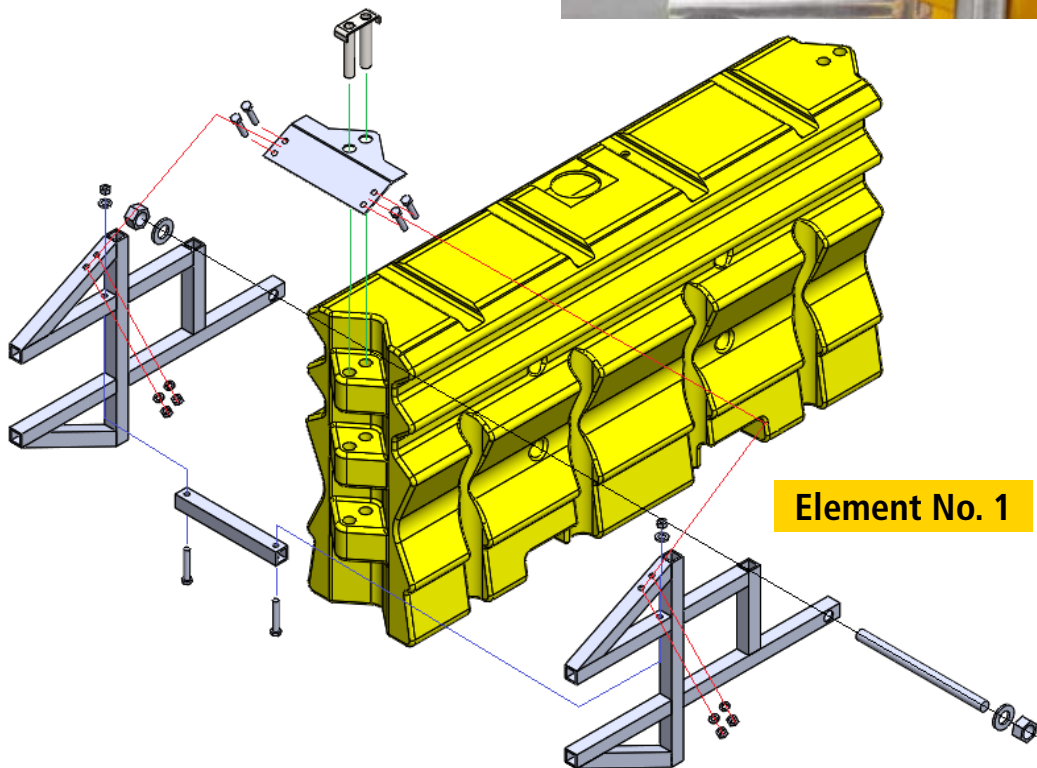
INSTRUCTIONS

1. Check the drain bung is tight so it will not leak.
2. 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.
3. Insert standard twin pin into the transition holes, coupling the orange element and steel cable together, as shown in Note B.
4. Slide the 3 yellow elements into position.

| STEP 3 | Adding ArmorBuffa Elements |
|---|----------------------------|
|  | |
|  <p>TL-3 Configuration</p> | |
|  <p>TL-2 Configuration</p> | |
| INSTRUCTIONS | |
| <ol style="list-style-type: none"> 1. Pin the 3 yellow elements (for TL-3 configuration, or 1 yellow element for TL-2 configuration) 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 36.9 ft-lbf (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 for TL-3 configuration, or for a TL-2 configuration both elements, 1 x orange and 1 x yellow) with water to capacity (within 25mm of the top) using the filling port, 184.9 US Gallons (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.
4. Check there are no leaks in the elements or around the drain bungs.



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. A few typical Anti-Freeze solutions are listed in section 17.0.

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! Do not lift or move 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.

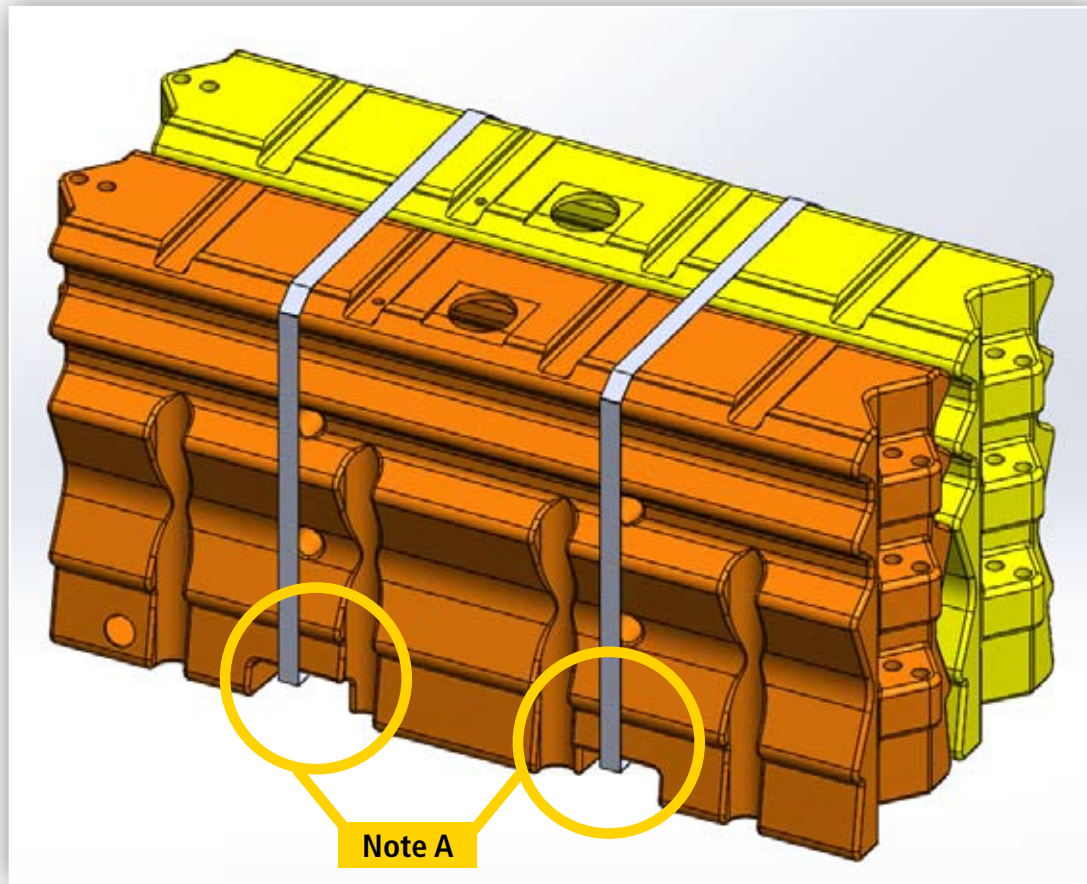
10.0 ARMORBUFFA ELEMENT CAPACITY

| Liquid Capacity US Gallons | Liquid Capacity Litres |
|----------------------------|------------------------|
| 184.9 US Gallons | 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 for TL3 configuration, or three (3) connector pins for TL2 configuration. | | |
| All Elements and Nose Cover are connected with the correct pin (refer to diagrams on pages 8 thru 12). | | |
| Concrete transition is secured to the Transition Barrier with three (3) M16 Anchors on each side, or for temporary steel barriers three (3) M16 threaded rods. | | |
| Anchors torqued to 36.9 ft-lbf (50Nm). | | |
| All Element(s) full of water, or suitable anti-freeze solution 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. | | |
| Cold Weather Applications Only | | |
| Anti-Freeze solution applied in accordance with manufacturer's specifications. | | |

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 1.0" (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 1.0" (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 19) | |

Inspector Signature: _____ Date: _____

Print Name: _____ Location: _____

15.0 DESIGN LIFE

The design life of the ArmorBuffa MASH TL2/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 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 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.

18.0 ANTI-FREEZE SOLUTIONS

In regions where the water filled ArmorBuffa Element(s) could become frozen, proper Anti-Freeze agents should be used. Care should be taken to ensure that proper Anti-Freeze agents are used in accordance with local regulations, environmental concerns and ensuring that any post impact liquid on the road surface does not constitute an undue hazard to adjacent motorists.

The information outlined in this document is intended to provide a general guide to choosing, calculating, and applying Anti-Freeze solutions. The actual method and implementation of an Anti-Freezing solution should be determined by federal, state and local standards and in accordance with the specific manufacturer's instructions.

Considerations for choosing an Anti-Freeze should include environmental impact on local vegetation and waterways, corrosion of existing structures, and the effect on concrete or asphalt roadways. Transportation, installation, and handling of the material should also be considered. The examples listed below are products commonly used on highways as de-icing road and bridge conditioners and for dust control. Specific information pertaining to these products regarding said considerations should be readily available from the product supplier or manufacturer.

The correct mixture of Anti-Freeze and water is critical to insure proper ice prevention and performance of the ArmorBuffa crash cushion. The freezing capacity depends on the particular chemical and the solution concentrate by percent weight of the solution.

Both too little and too much solution will result in diminished freezing capacity. The ideal solution concentration for maximum capacity is specific to the chemical chosen. It may be desirable to reduce the concentration for cost savings if the maximum capacity is not necessary.

Depending on the form the chemical is provided; such as a fluid, powder, or pellet; the actual amount of the desired chemical may not constitute 100% of the material by weight.

It is important to account for the actual weight of the deicing chemical when mixing the solution.

Typical solution concentrations are listed in the table below. Some of the following are available as a fluid solution of definite concentration or pellets and flakes in various sized bags. If purchased in flake or pellet form, care must be taken in dissolving it in water.

Also, the concentrate must be calculated from the actual Anti-Freeze agent content. For example, if the flake/pellet agent purchased has a Calcium Chloride content of 80% and a 29% solution by weight is desired, the quantity added must account for the impurity of the agent. These principles apply to many various Anti-Freezing chemicals.

18.1 Table of Typical Anti-Freeze Solutions

| Anti-Freeze Agent | Concentration % | Operating Temp, °F (°C) |
|---|-----------------|-------------------------|
| Calcium Chloride (CaCl ₂) | 29% | -51°F (-60°C) |
| Liquid CMA (Calcium Magnesium Acetate) | 33% | -28°F (-18°C) |
| Magnesium Chloride (MgCl ₂) | 22% | -33°F (-28°C) |
| Sodium Chloride (NaCl) | 23% | -21°F (-6°C) |
| Liquid Potassium Acetate (KAc) | 49% | -60°F (-76°C) |

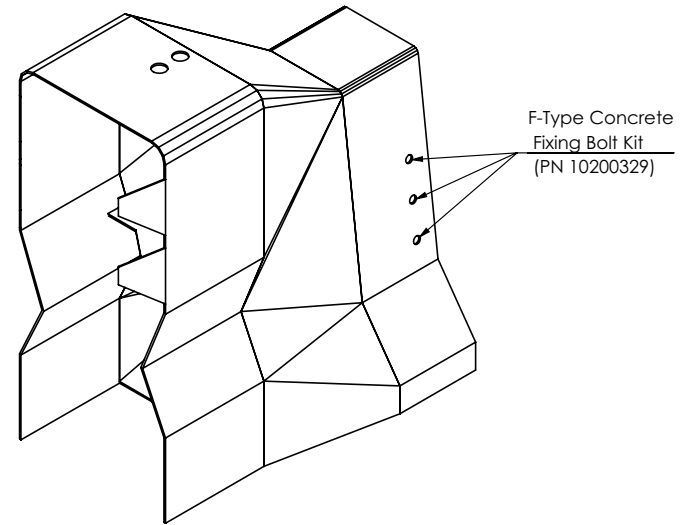
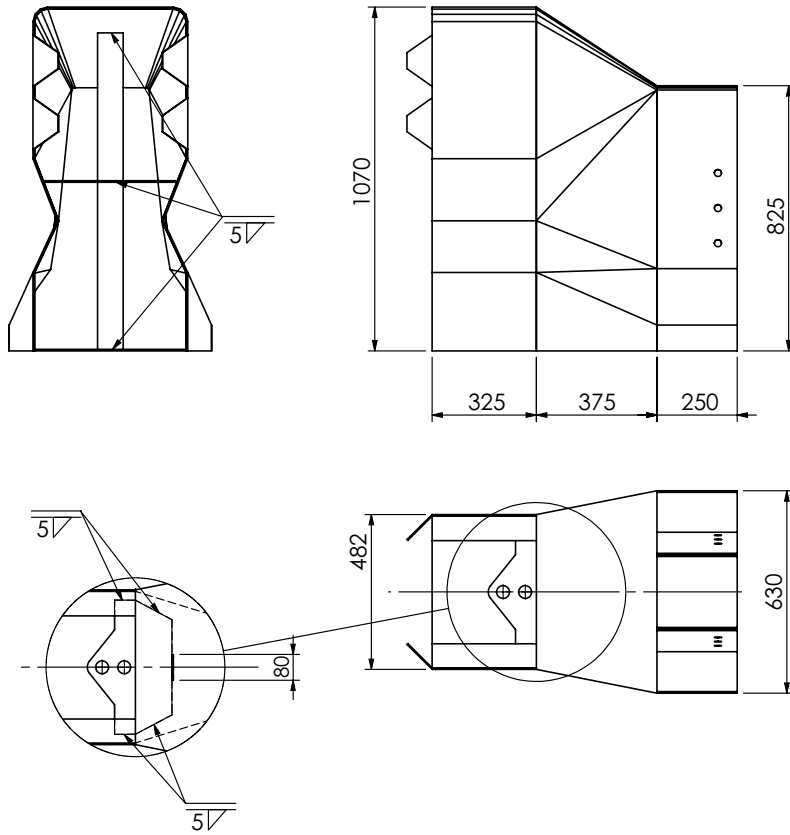
18.2 Single Element Capacity

| Liquid Capacity, US Gal (L) | Water Weight, lb (Kg) |
|-----------------------------|-----------------------|
| 184.9 (700 L) | 1,543 (946 Kg) |

18.3 Anti-Freeze Chemical Companies

The following companies are manufacturers of deicing chemicals. These are just a few examples. These companies or their local distributors should be able to supply further information and options for your application.

- Dow Chemical Company
USA or Canada (800)-447-4369
Worldwide (989)-832-1466
www.dow.com
- Cargill Salt
(888)-385-7258
Highway and Specialty Deicing Customer Service (800)-600-7258
www.cargillsalt.com
- Cryotech Deicing Technology
Main Office and Plant – Iowa (800)-346-7237
www.cryotech.com



Notes:
Finish = HDGalv AS/NZS 4680

| REV | DESCRIPTION | APPD | DATE |
|-----|--------------------------------|------|----------|
| 1 | HOLES FOR FIXING BOLTS UPDATED | JA | 29/10/20 |
| 0 | ORIGINAL ISSUE - 23.10.2020 | | |

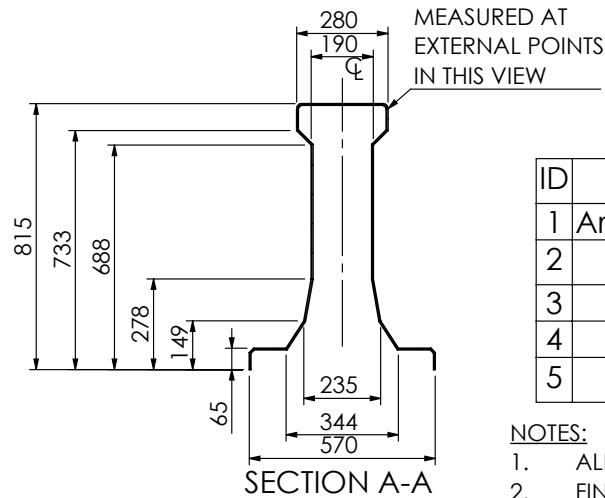
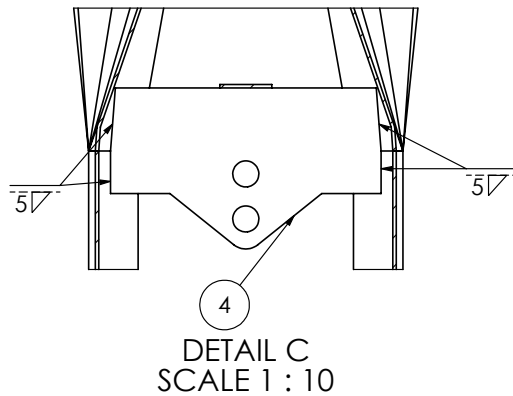
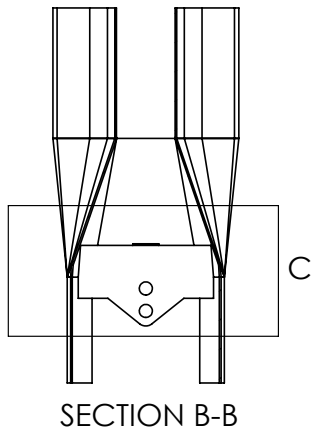
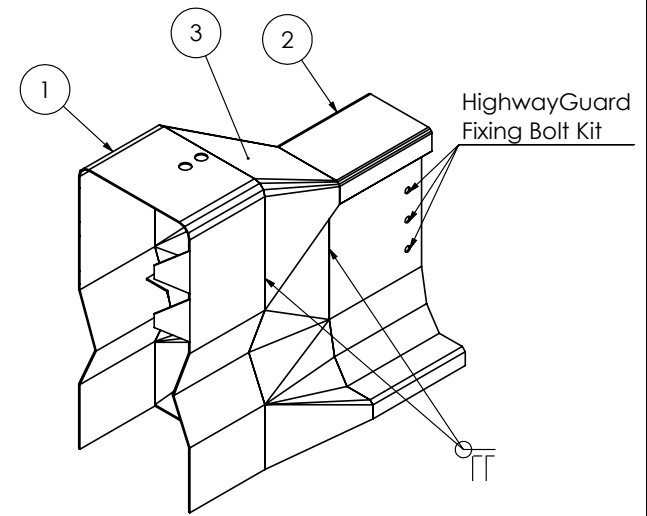
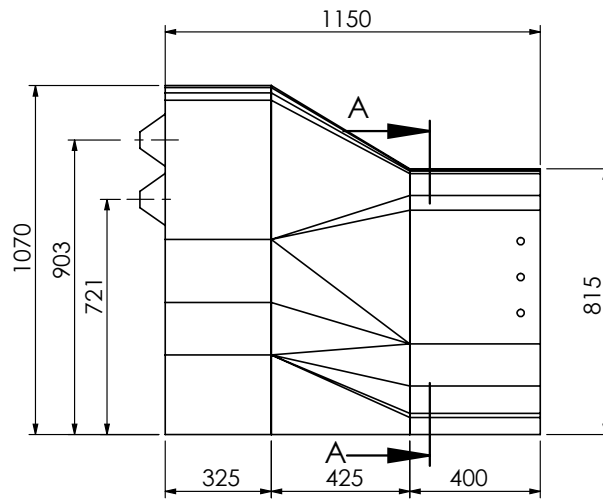
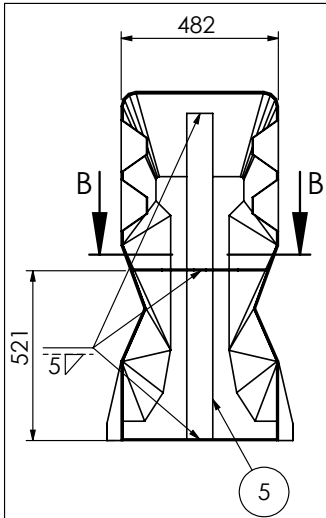
valmont 
HIGHWAY
Valmont Highway Technology
Level 3, Building A, 11 Talavera Road
Macquarie Park, NSW 2113, Australia
T: +612 9814 1777 www.valmonthighway.com

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

| |
|--------------|
| CLIENT |
| MATERIAL |
| 5mm BMT G250 |
| FINISH |
| HDGalv |

| | | | | | |
|----------------|---------|----------|--|--|--|
| ITEM | | | ArmorBuffa Transition F-Type Concrete | | |
| DRAWING NUMBER | | | 10200320 | | |
| DRAWN | CHECKED | APPROVED | | | |
| VB | JA | LB | | | |

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



| ID | Description |
|----|--------------------------|
| 1 | ArmorBuffa Element Cover |
| 2 | HighwayGuard Cover |
| 3 | Transition Section |
| 4 | Connector Plate |
| 5 | Support Plate |

NOTES:

- ALL SHEETS = 5mm BMT GRADE 250.
- FINISH = H.D.GALV. AS/NZS 4680.
- BLACK PART NO. :10200344

| REV | DESCRIPTION | APPD | DATE |
|-----|--|------|----------|
| 1 | UPDATED FITING CLEARANCE, 10mm AROUND HG | JA | 30-09-22 |
| 0 | ORINGINAL ISSUED - 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: 1:20

CLIENT

MATERIAL
5mm BMT G250

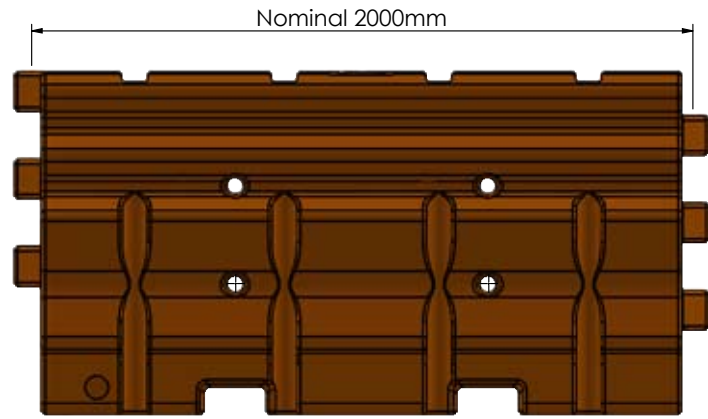
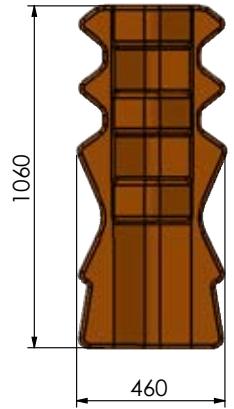
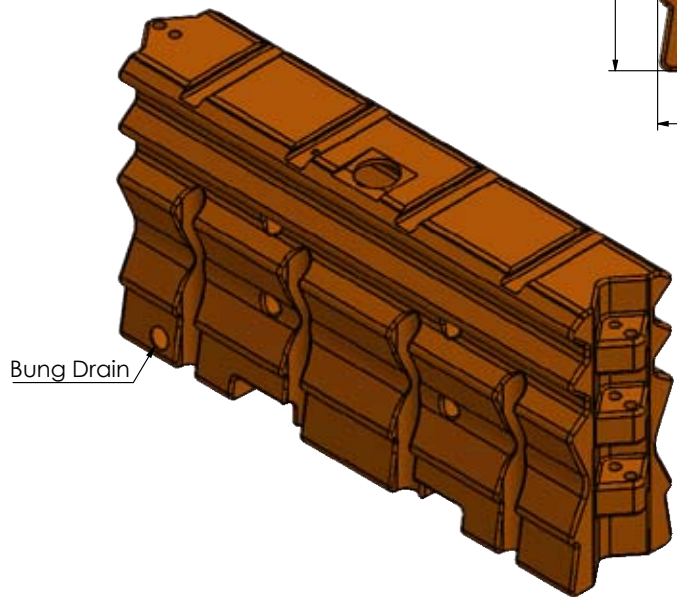
FINISH
HDGALV

ITEM
**ARMORBUFFA TRANSITION
- HIGHWAY GUARD**

DRAWING NUMBER
10200343

| | | |
|--------------------|----------------------|-----------------------|
| DRAWN VB | CHECKED JA | APPROVED LB |
|--------------------|----------------------|-----------------------|

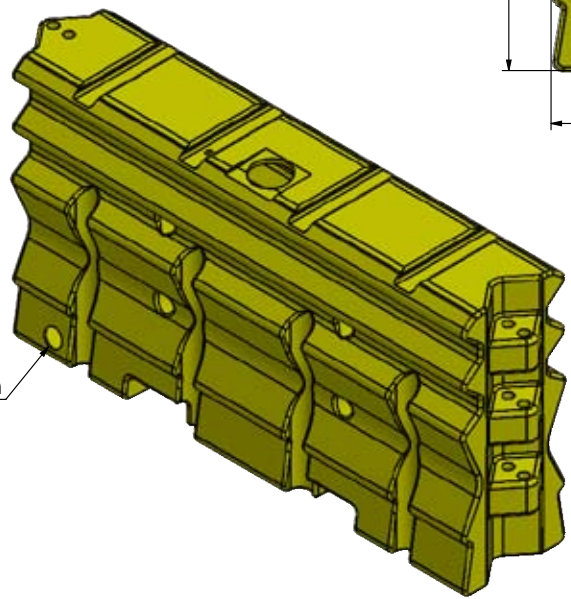
FOLDER F:\Engineering\3. CURRENT DRAWINGS\COMPONENT DRAWINGS\SLDDRWs\Solid Model\ArmorBuffa - Concrete kit - B6800 - Highway Guard\1_Current Model\Model Files - V2



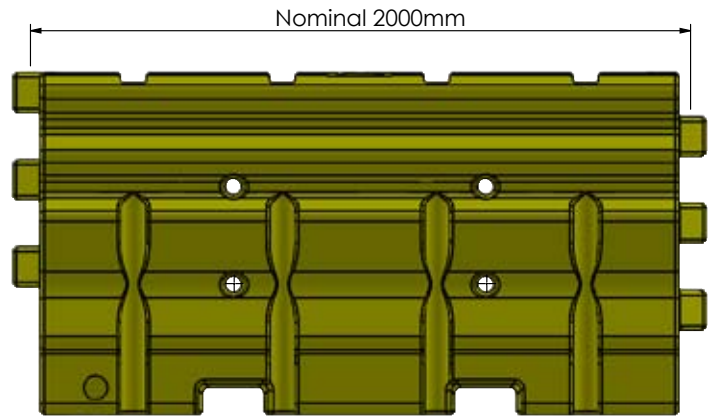
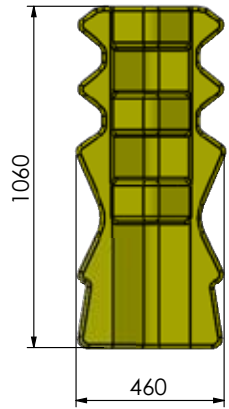
- Notes:**
1. Weight = 63kg (empty)
= 763kg (full)
 2. Water per unit = 700 litres

| | | | | | | | | |
|-----|--------------------------------|------|----------|---|-----------------|----------|--------------------------------------|----------|
| | | | | <p>Valmont Highway Technology Level 3, Building A, 11 Talavera Road Macquarie Park, NSW 2113, Australia T: +612 9814 1777 www.valmonthighway.com</p> | TOLERANCES | CLIENT | ITEM ArmorBuffa Element Orange | |
| | | | | | Whole Numbers : | MATERIAL | DRAWING NUMBER 10200322 | |
| | | | | One Decimal Place : | FINISH | DRAWN | CHECKED | APPROVED |
| | | | | Bend Angle : | | VB | JA | LB |
| | | | | Straightness : | | | | |
| 1 | Notes added, bung drain added. | JA | 02/11/20 | Scale: | | | | |
| REV | DESCRIPTION | APPD | DATE | | | | | |

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



Bung Drain

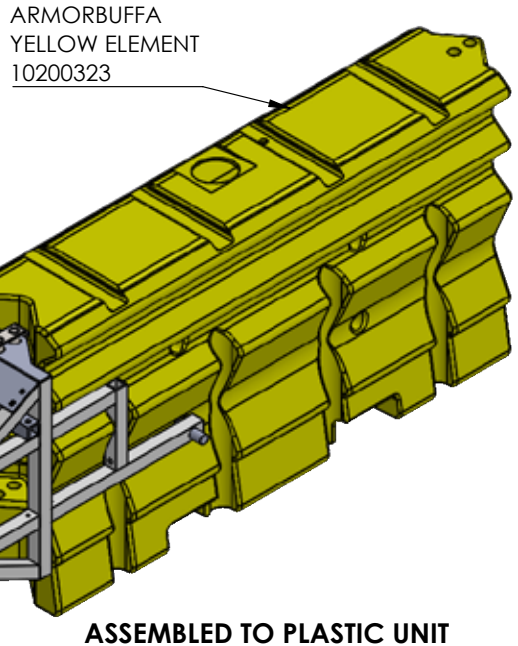
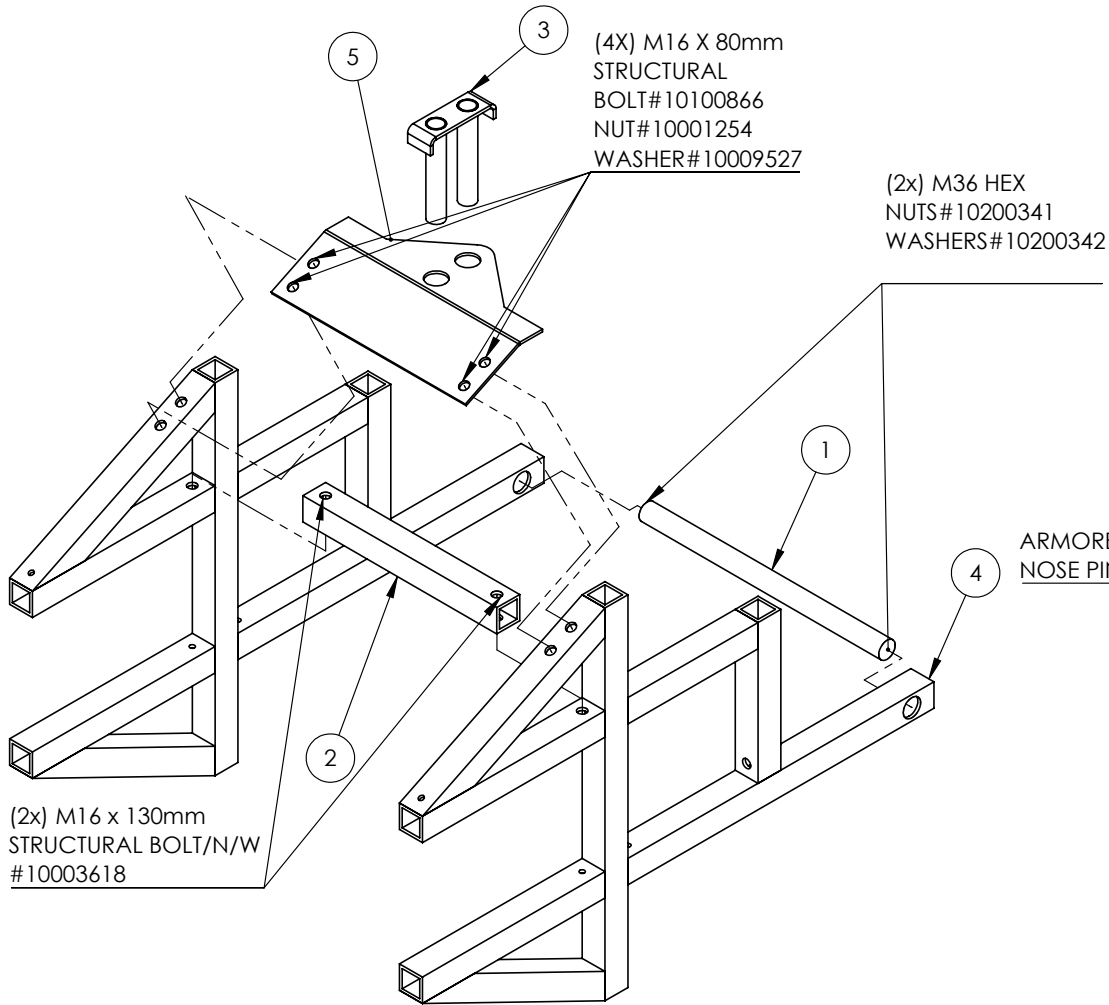


- Notes:
- Weight = 50kg (empty)
= 750kg (full)
 - Water per unit = 700 litres

| | | | | | | | |
|-----|----------------------------------|------|----------|---|--|--------------------------------------|--|
| | | | | <p>Valmont Highway Technology Level 3, Building A, 11 Talavera Road Macquarie Park, NSW 2113, Australia T: +612 9814 1777 www.valmonthighway.com</p> | TOLERANCES Whole Numbers : One Decimal Place : Bend Angle : Straightness : Scale: | CLIENT MATERIAL FINISH | ITEM ArmorBuffa Element Yellow DRAWING NUMBER 10200323 |
| 1 | Notes updated, bung drain added. | JA | 02/11/20 | | DRAWN VB | CHECKED JA | APPROVED LB |
| REV | DESCRIPTION | APPD | DATE | | | | |

F:\Engineering\3. CURRENT DRAWINGS\COMPONENT DRAWINGS\SLIDERS\10200323 - ArmorBuffa Element - Yellow

| ID | Description | Part No. | QTY. |
|----|-------------------------------------|----------|------|
| 1 | Armorbuffa M36 X 525MM THREADED ROD | 10200337 | 1 |
| 2 | ARMORBUFFA CROSS SHS | 10200334 | 1 |
| 3 | ARMORBUFFA NOSE PIN | 10200327 | 1 |
| 4 | Armorbuffa side frame - assembly | 10200332 | 2 |
| 5 | ArmorBuffa Top Bent Plate | 10200336 | 1 |



| REV | DESCRIPTION | APPD | DATE |
|-----|------------------|------|------|
| 0 | ORINGINAL ISSUED | | |

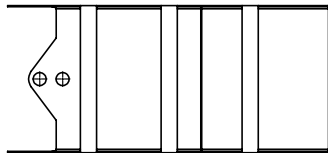
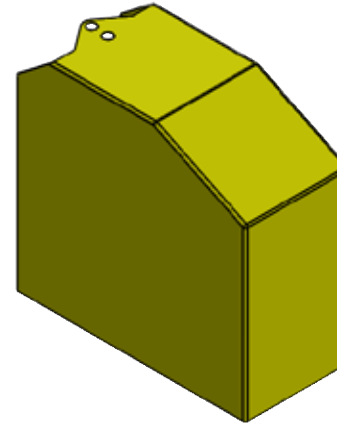
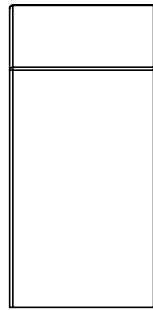
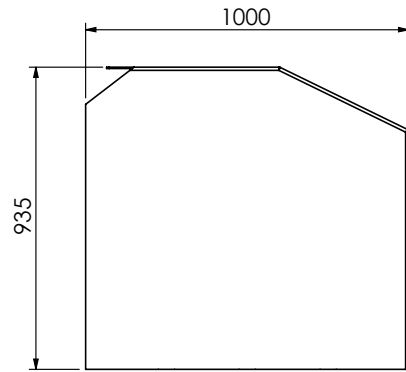
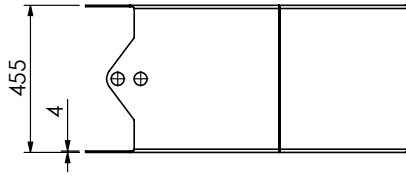
valmont 
 HIGHWAY
 Valmont Highway Technology
 Level 3, Building A, 11 Talavera Road
 Macquarie Park, NSW 2113, Australia
 T: +612 9814 1777 www.valmonthighway.com

TOLERANCES
 Whole Numbers :
 One Decimal Place :
 Bend Angle :
 Straightness :
 Scale: 1:20

CLIENT
 MATERIAL
 NA
 FINISH
 HDGALV

ITEM
ARMORBUFFA STEEL NOSE ASSEMBLY
 DRAWING NUMBER
10200324
 DRAWN KZ
 CHECKED LG
 APPROVED LG

FOLDER F:\Engineering\3. CURRENT DRAWINGS\COMPONENT DRAWINGS\LDDRWs_Solid Model\ArmorBuffa - Concrete kit - BG800 - Highway Guard\Current Model\Model Files - V2



Valmont Highway Technology

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

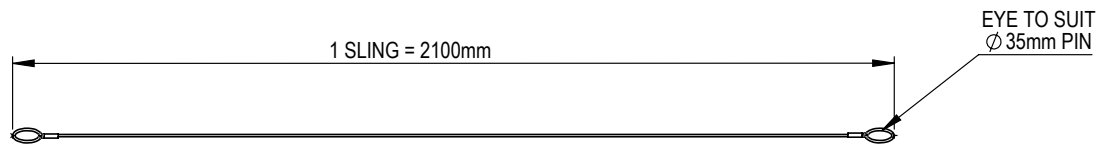
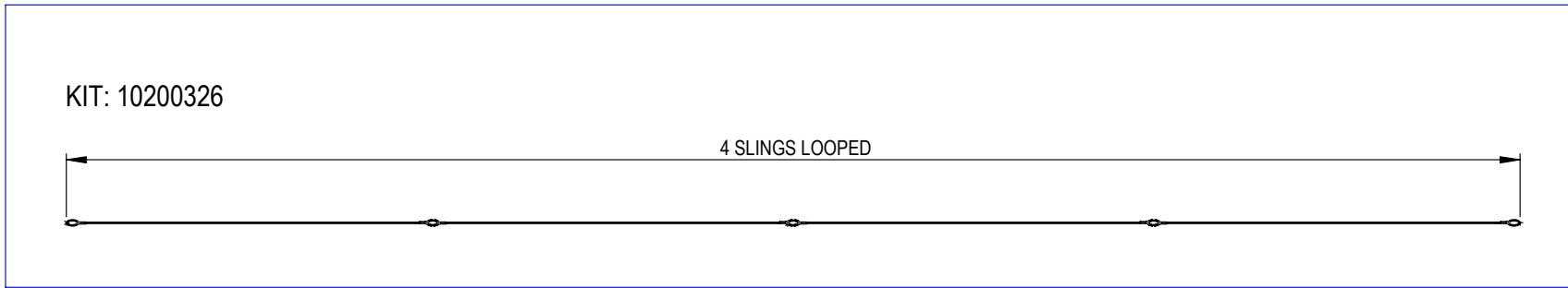
TOLERANCES
 Whole Numbers :
 One Decimal Place :
 Bend Angle :
 Straightness :
 Scale:

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 \varnothing 6mm
 CONSTRUCTION: 7/19 IWRC
 GRADE 2070
 AS 1666.1-2009

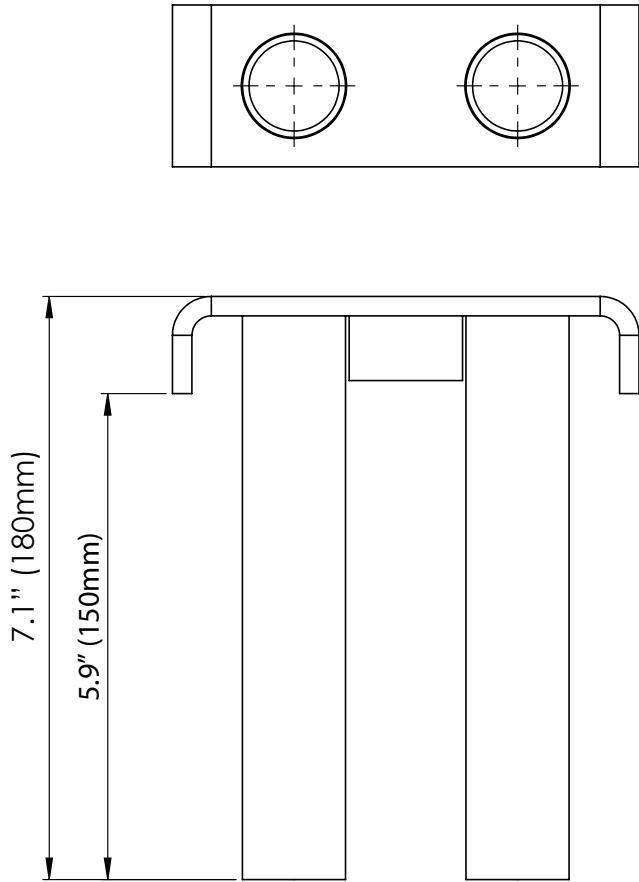
| | | | |
|-----|----------------------------------|------|------------|
| 2 | UPDATED NUMBER OF SLINGS PER KIT | JA | 20-02-2023 |
| 1 | UPDATED KIT NUMBER DEFINITION | JA | 17-11-2022 |
| 0 | ORINGINAL ISSUED - 26.10.2020 | | |
| REV | DESCRIPTION | APPD | DATE |

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

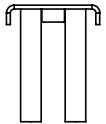
TOLERANCES
 Whole Numbers :
 One Decimal Place :
 Bend Angle :
 Straightness :
 Scale: 1:35

| |
|----------------------------------|
| CLIENT |
| MATERIAL 7/19 IWRC GRADE 2070 |
| FINISH |

| | | |
|----------------------------|---------------|----------------|
| ITEM ARMORBUFFA CABLE | | |
| DRAWING NUMBER 10200326 | | |
| DRAWN VB | CHECKED JA | APPROVED LB |



Short 5.9" 150mm
Twin Pin



| | | | |
|-----|-----------------------------|------|------|
| REV | DESCRIPTION | APPD | DATE |
| | ORIGINAL ISSUE - 23.10.2020 | | |

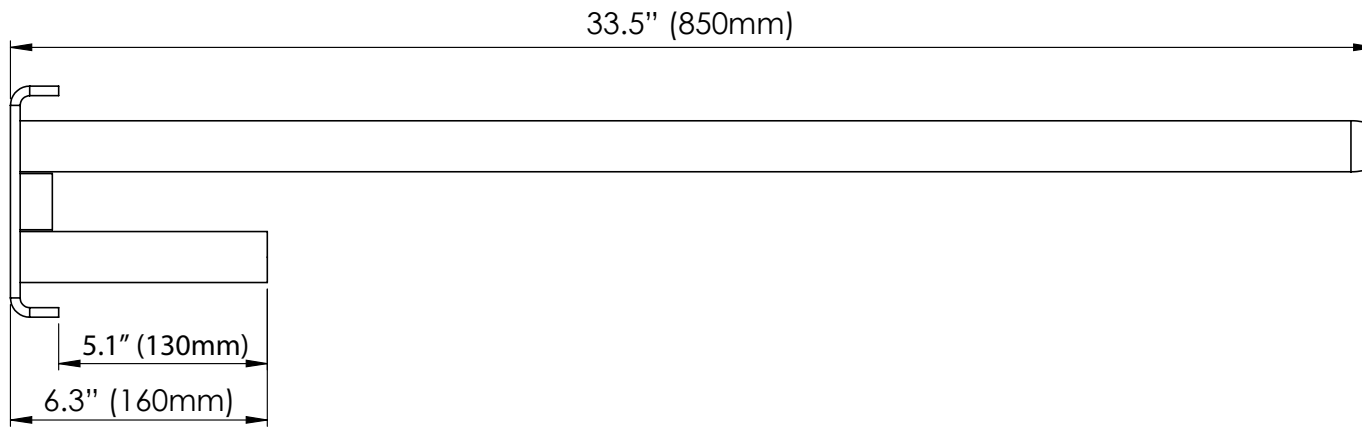
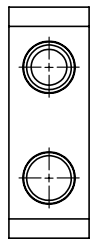
valmont 
 HIGHWAY
 Valmont Highway Technology
 Level 3, Building A, 11 Talavera Road
 Macquarie Park, NSW 2113, Australia
 T: +612 9814 1777 www.valmonthighway.com

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

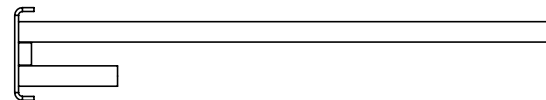
| |
|----------|
| CLIENT |
| MATERIAL |
| FINISH |

| | | |
|-----------------------------|---------------|----------------|
| ITEM ArmorBuffa Nose Pin | | |
| DRAWING NUMBER 10200327 | | |
| DRAWN VB | CHECKED JA | APPROVED LB |

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

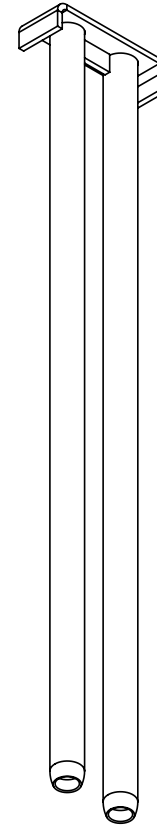
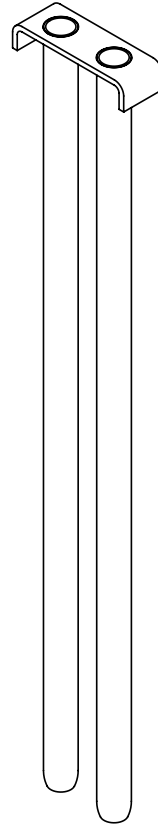
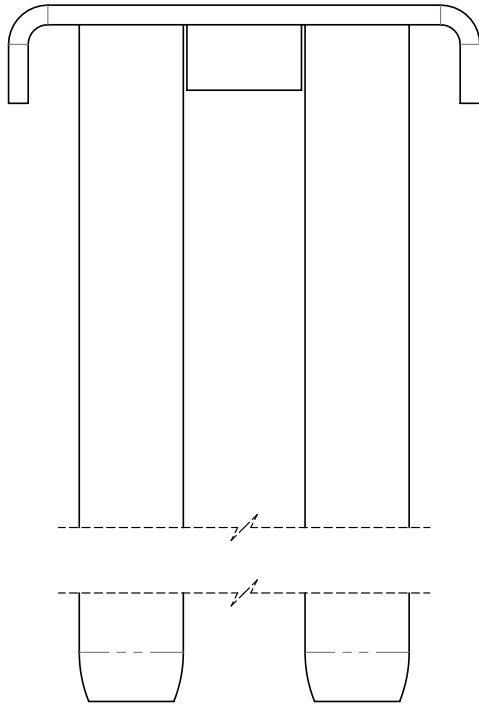
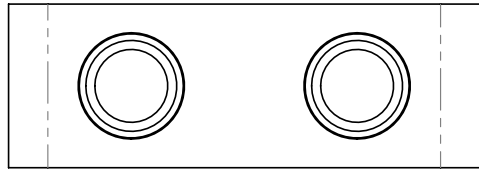


Asymmetric
Twin Pin



| | | | | | | | | | | |
|-----|-------------|------|------|--|---|-------|---|----------|--|----|
| | | | | <p>valmont HIGHWAY</p> <p>Valmont Highway Technology Level 3, Building A, 11 Talavera Road Macquarie Park, NSW 2113, Australia T: +612 9814 1777 www.valmonthighway.com</p> | TOLERANCES Whole Numbers : One Decimal Place : Bend Angle : Straightness : Scale: | | CLIENT MATERIAL FINISH | | ITEM ArmorBuffa Asymmetric Pin DRAWING NUMBER <p style="text-align: center; font-size: 1.2em;">10200328</p> | |
| REV | DESCRIPTION | APPD | DATE | | ORIGINAL ISSUE - 23.10.2020 | DRAWN | CHECKED | APPROVED | VB | JA |

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



NOTE:
HOT DIP GALVANIZED

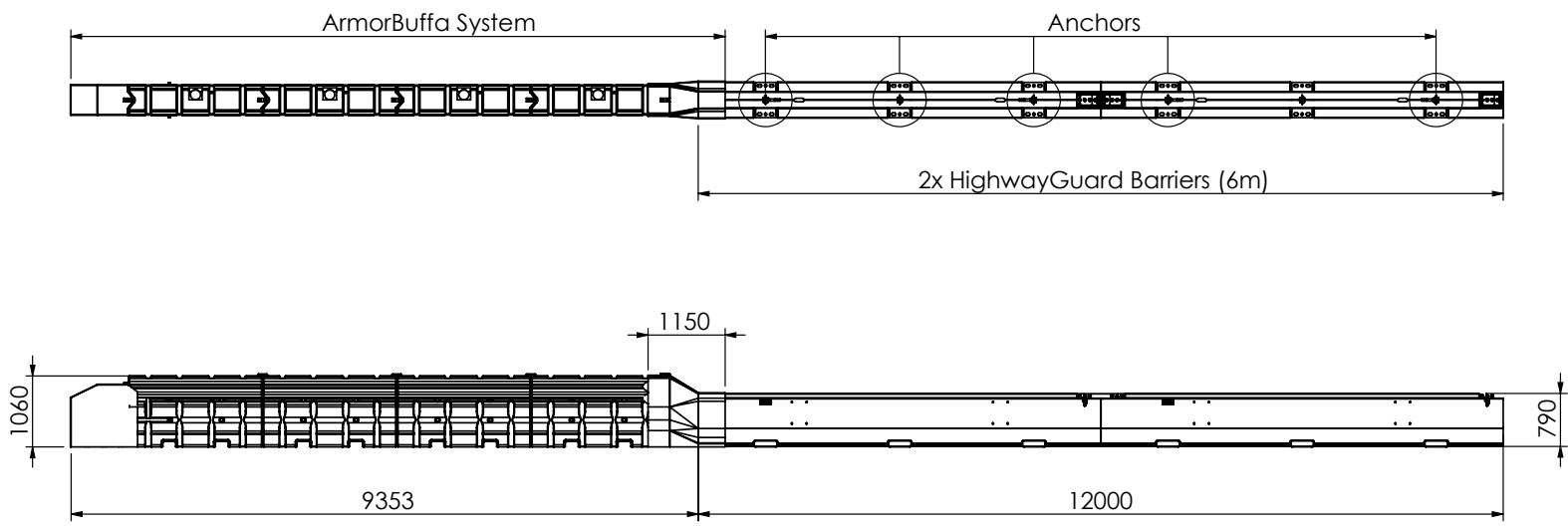
The information hereon is proprietary to Valmont Highway Distribution Ltd. and shall not be disclosed, duplicated or used otherwise without the express written approval of Valmont Highway Distribution Ltd.


© 2014 Valmont Highway Distribution Ltd.

| | | | | | |
|------|---------------|------------|------------------------|------------|-------|
| | | | SCALE: 1:2 | | |
| | | | | DATE | INIT. |
| | | | DRAWN BY | 17/03/2016 | LW |
| 2 | ADD SPACER | 17/03/2016 | APPR'D BY | 17/03/2016 | BM |
| 1 | INITIAL ISSUE | 28/03/2012 | | | |
| REV. | CHANGES | DATE | Twin Pin for ArmorZone | | |

valmont 
 12 Offenhauser Dr
 East Tamaki
 New Zealand
 +64 9 215 5231
 info@valmonthighway.com
 HIGHWAY

| | | |
|--------|----------------|------|
| SHEET | DRAWING NUMBER | REV. |
| 1 OF 1 | 10200204 | 2 |



| REV | DATE | DESCRIPTION | DRAWN | CHECKED | APPROVED | DRAWING NUMBER | REFERENCE DRAWINGS | NAME | DATE |  DRAWING AND CONTENTS ARE COPYRIGHT TO INGAL CIVIL PRODUCTS AND CAN ONLY BE USED WITH PRIOR WRITTEN CONSENT FROM INGAL CIVIL PRODUCTS 57-45 AVONDS ROAD MINTO, N.S.W. 2566 PH: +61 2 9827 3333 www.ingalcivil.com.au | PROJECT | INGAL CIVIL PRODUCTS PART No. | |
|-----|------|-------------|-------|---------|----------|----------------|--------------------|----------|------|--|--|-------------------------------|----------|
| | | | | | | | | DRAWN | VB | | 16/08/2021 | Holmes Crash Test - Aug 2021 | 10000000 |
| | | | | | | | | CHECKED | | | | | |
| | | | | | | | | APPROVED | | | | | |
| | | | | | | | | | | | TITLE | DRAWING No. | |
| | | | | | | | | | | | ArmorBuffa to HighwayGuard Test Assembly | MET-16082021 | |
| | | | | | | | | | | | Rev. 0 | | |

F:\BUSINESS DEVELOPMENT\TECHNICAL LIBRARY\VALMONT HIGHWAY\METHANE\DRAWINGS\METHANE DRAWINGS (WIP-VITOR)HIGHWAYGUARD TRANSITION 2021

valmont

HIGHWAY



Design and Development of Highway Safety Innovations

www.valmonthighway.com