



NOVUS™ 100

PRODUCT MANUAL



PN 119616

JULY 2024

NOVUS™ 100

The NOVUS™ 100 system has been tested pursuant to American Association of State Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (MASH) specifications. The NOVUS™ 100 system has been submitted for Federal-aid reimbursement eligibility on the National Highway System to the Federal Highway Administration (FHWA).

Product Manual



15601 Dallas Parkway
Suite 525
Addison, Texas 75001



The local highway authority, distributors, owners, contractors, lessors, and lessees are **RESPONSIBLE** for the assembly, maintenance, and repair of the NOVUS™ 100 system. Failure to fulfill these **RESPONSIBILITIES** with respect to the proper assembly, maintenance, and repair of the NOVUS™ 100 system could result in serious injury and/or death.



These instructions are for standard assembly specified by the appropriate highway authority. In the event the specified system assembly, maintenance, or repair would require a deviation from standard assembly parameters, contact a Valtir representative.

This manual must be available to the worker(s) overseeing and/or assembling the product at all times. For additional copies, contact Valtir at (888) 323-6374 or visit www.Valtir.com.

The instructions contained in the manual supersede all previous information and manuals. All information, illustrations, and specifications in this manual are based on the latest NOVUS™ 100 system information available to Valtir at the time of printing. Valtir reserves the right to make changes at any time. Please contact Valtir to confirm that you are referring to the most current instructions.

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Customer Service Contacts

Valtir is committed to the highest level of customer service. Feedback regarding the NOVUS™ 100 system assembly procedures, supporting documentation, and performance is always welcome. Additional information can be obtained from the contacts below:

Valtir

Telephone:

(888) 323-6374 (USA)

+1 214 589 8140 (International)

Internet:

www.Valtir.com/contact

Abbreviations and Definitions

AASHTO American Association of State Highway and Transportation Officials

FHWA Federal Highway Administration

MASH Manual for Assessing Safety Hardware

MUTCD Manual on Uniform Traffic Control Devices

PPE Personal Protective Equipment

Safety Symbols

This section describes safety symbols that may appear in this product manual. Read this manual for complete safety, assembly, operating, maintenance, repair, and service information.



Indicates Danger or Warning. Failure to read and follow this warning could result in serious injury or death to the workers and/or bystanders.



Indicates Caution or High Importance. Failure to follow this warning can result in improper performance, failure of operation, to serious injury or death in the event of a vehicle impact with the system.



Indicates Notifications or Reference. These denote important items but will not cause system damage or serious injury.



Indicates importance of reading instructions. Failure to follow all steps can result in improper performance, system failure, and/or serious injury or death in the event of a vehicle impact with the system.

Safety Rules for Assembly

This manual must be kept in a location where it is readily available to persons who are skilled and experienced in the proper assembly, maintenance, or repair of the NOVUS™ 100 system. Additional copies of this manual are available from Valtir. Please contact Valtir if you have any questions concerning the information in this manual.



It is the responsibility of the installer to use proper safety precautions when operating power equipment and when moving heavy equipment or system components. Hand, eye, foot, and back protection is recommended.



Ensure that all of the Danger, Warning, Caution, and Important statements within this product manual are completely followed. Failure to follow this warning could result in serious injury or death in the event of a collision.

Important Introductory Notes

Proper assembly of the NOVUS™ 100 is critical to achieve performance. The NOVUS™ 100 has been submitted for eligibility to the FHWA per AASHTO MASH criteria. These instructions should be read in their entirety and understood before assembling the system. These instructions are to be used only in conjunction with the assembly of the system and are for standard assemblies only as specified by the applicable highway authority. If you need additional information, or have questions about the system, please contact Valtir's Customer Service Department. This product must be assembled in the location specified by the appropriate highway authority. If there are deviations, alterations, or departures from the assembly protocol specified in this manual, the device may not perform as tested.



DO NOT use any component part that has not been specified and/or approved for this system during assembly or repair.

This product has been specified for use by the appropriate highway authority and has been provided to that user who has unique knowledge of how this system is to be assembled. No person should be permitted to assist in the assembly, maintenance, or repair of this system that does not possess the unique knowledge described herein. These instructions are intended for an individual qualified to both read and accurately interpret them as written. These instructions are intended only for an individual experience and skilled in the assembly of highway products that are specified and selected by the highway authority. A manufacturer's drawing package will be supplied by Valtir upon request. Each system will be supplied with a specific drawing package unique to that system. Such drawings take precedence over information in this manual and shall be studied thoroughly by a qualified individual who is skilled in interpreting them before the start of any product assembly.

Limitations and Warnings

Valtir contracts with FHWA approved testing facilities to perform crash tests, evaluation of tests, and submission of results to the FHWA for review.

The NOVUS™ 100 system was tested to meet the impact criteria, requirements, and guidelines of MASH. These tests, specifically set forth by the FHWA, evaluate product performance defined by AASHTO involving lightweight cars (approx. 2420 lb. [1100 kg]) and full-size pickup trucks (approx. 5000 lb. [2270 kg]). A product can be certified for multiple test levels. This system is certified to the test level(s) shown below:

Test Level 3 (TL-3): 62 mph [100 km/h]

These FHWA directed tests are not intended to represent the performance of systems when impacted by every vehicle type or every impact condition existing on the roadway. This system is tested to the test matrix criteria of MASH as approved by FHWA.

Valtir expressly disclaims any warranty or liability fro injury or damage to persons or property resulting from any impact, collision or harmful contact with products were assembled in consultation with Valtir or by third parties.

The NOVUS™ 100 is intended to be assembled and maintained in accordance with specific state and federal guidelines. Valtir offers a reflective delineator panel and has reflective tape for the NOVUS™ 100. However, the material is only intended to supplement delineation required by the US Department of Transportation's MUTCD or local jurisdiction. The appropriate highway authority approved engineer should be careful to properly select, assemble, and maintain the product. Careful evaluation of site layout, traffic speed/type, direction, and visibility are some of the elements that require evaluation by the highway authority in the selection of a highway product. For example, curbs could cause an untested effect on an impacting vehicle.

After an impact occurs, the debris from the impact should be removed from the area immediately and the specified highway product should be evaluated and restored to its original specified condition or replaced as the highway authority determines as soon as possible.



Do not assemble, maintain, or repair this system until you have read this manual thoroughly and completely understand it. Ensure that all Danger, Warning, Caution, and Important statements within the manual are completely followed. Please call Valtir at (888) 323-6374 if you do not understand these instructions or have questions.



Do not modify this system in any way.



It is the sole responsibility of the project engineer and/or local highway authority and its engineer to ensure that this system and delineation used meet all federal, state, specifying agency, and local specifications.



It is the sole responsibility of the project engineer and/or local highway authority and its engineer to ensure that the assembly meets all appropriate Manual on Uniform Traffic Control Devices (MUTCD) and local standards.

System Overview

The NOVUS™ 100 system is a re-directive crash cushion for roadside features up to 635 mm [26"] width. Whether the system is reusable after an impact is left to the sound discretion of the highway authority specifying the use of the system.

How to Determine Left/Right

To determine left from right when ordering transitions, stand in front of the system facing the roadside feature. Your left is the system's left and your right is the system's right.

Defining the Bays

Each bay is a repeated section of a diaphragm and 4 side panels. Each diaphragm will have rail guides attached at the base of the track.

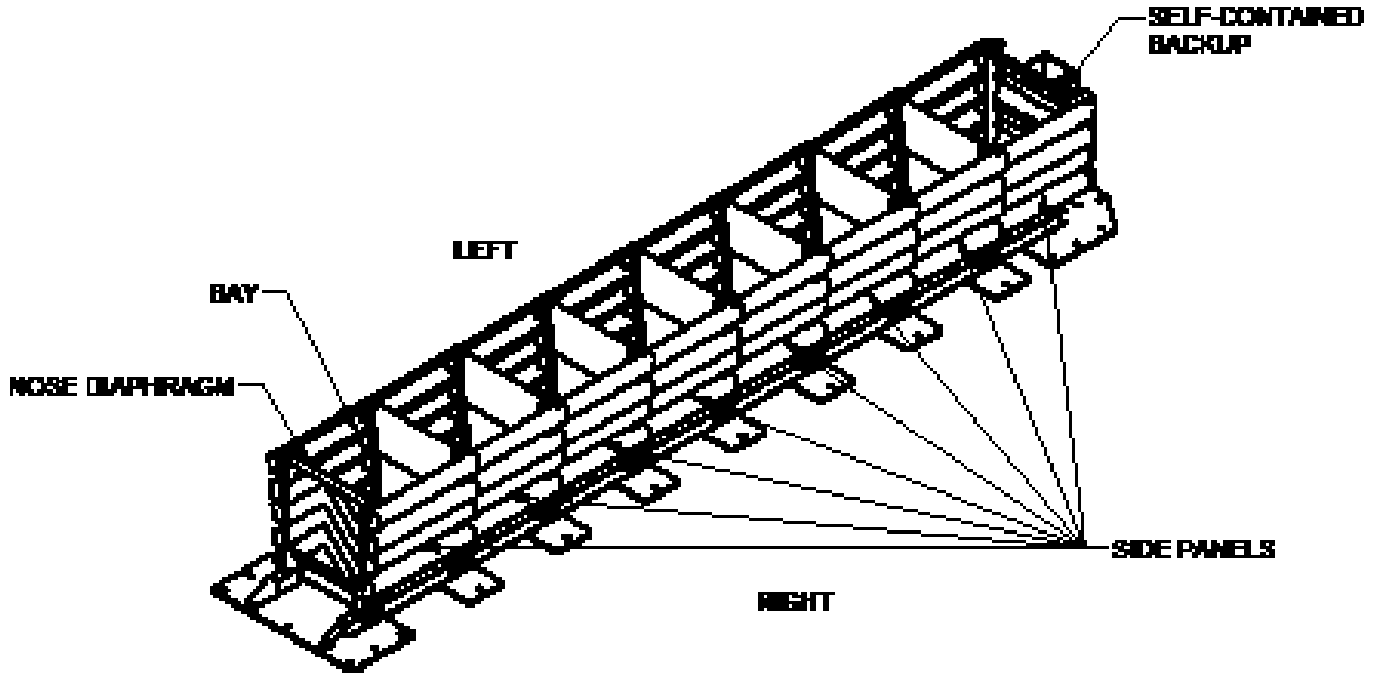


Figure 1

Location Requirements

Unidirectional Application

Assembly of a NOVUS™ 100 system and its backup connections of transitions depends on the traffic pattern and the road feature at the particular location. Unidirectional traffic (one side or both) requires no transition (Figures 2 and 3), only a connection to a backup structure. Call Customer Service at (888) 323-6374 or your local Valtir representative with questions regarding this and other types of assembly.

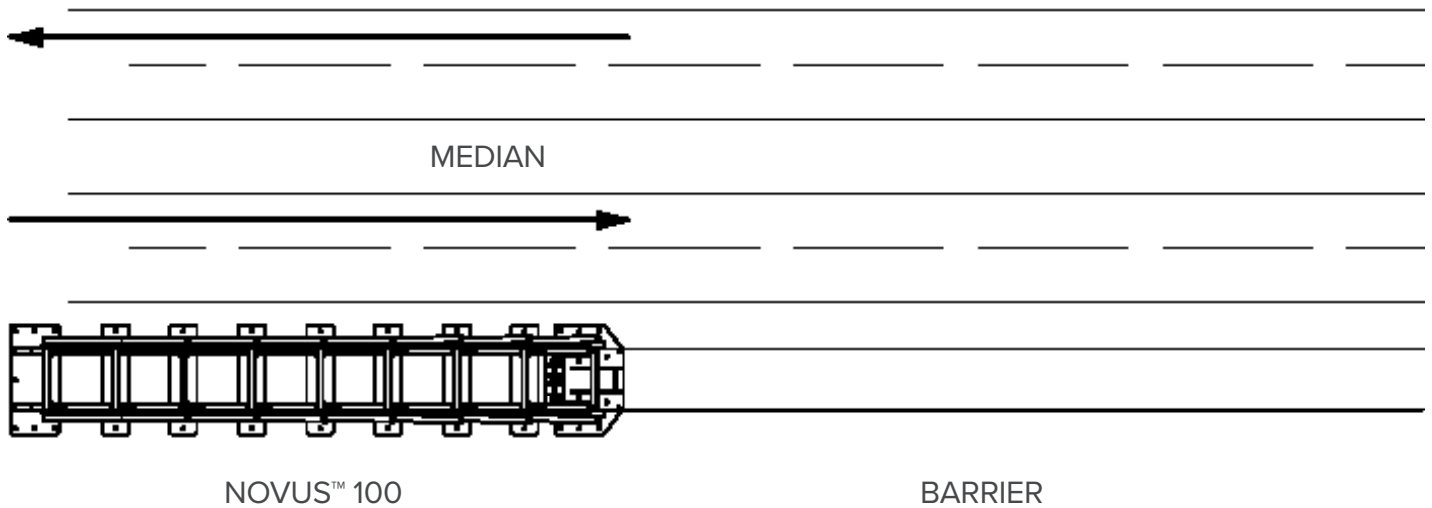


Figure 2 - Unidirectional Traffic Flow - One Side Requires No Transition

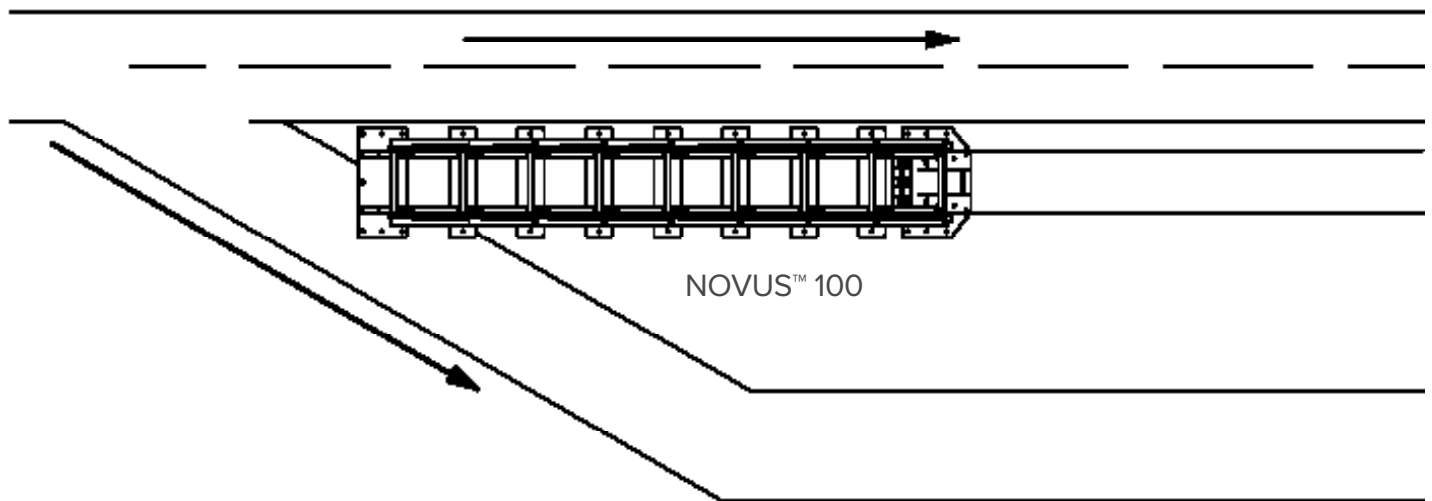


Figure 3 - Unidirectional Traffic Flow - Both Sides Requires No Transition

Bidirectional Application

See Figure 4 for assemblies that face oncoming traffic from the reverse direction. Appropriate transitions must be applied to the end of the backup structure. Valtir can provide transitions for a variety of concrete barrier or guardrail profiles.

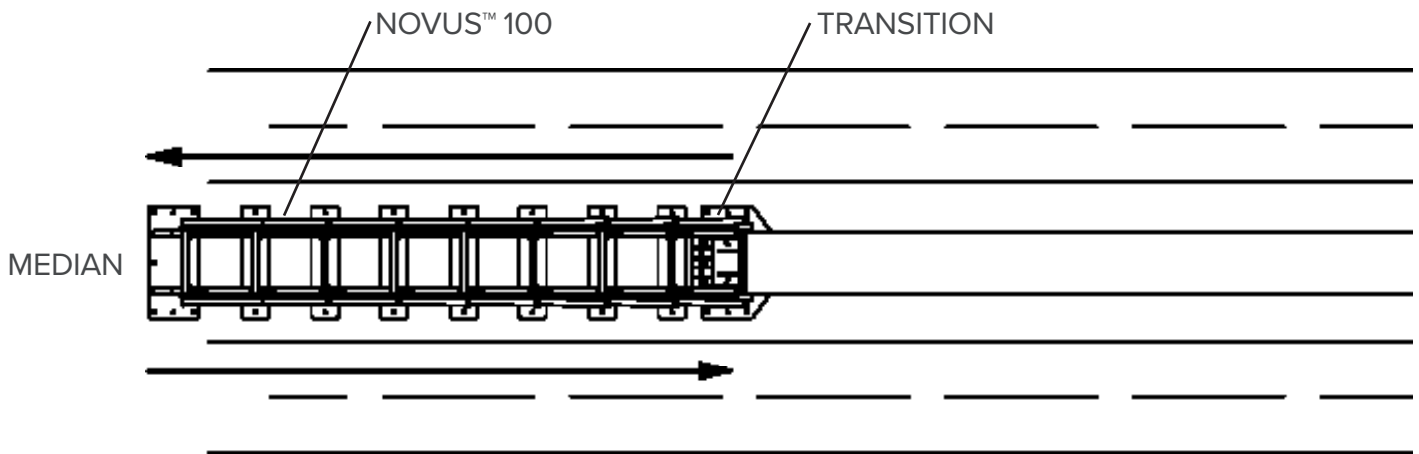


Figure 4 - Bidirectional Traffic Flow - Requires Transition on One Side

Approach Zone and Clear Zone

The AASHTO Roadside Design Guide states the NOVUS™ 100 should not be placed directly behind a raised curb. The approach area in front of the system in the direction of traffic flow should slope at a rate of no greater than 10% (6 degrees or 10:1) from the surrounding area. The cross-slope should differ from the surrounding area by no more than 8% (5 degrees or 12:1). The clear zone behind the NOVUS™ 100 should be consistent with the area behind the downstream Length-of-Need (“LON”) of the barrier. The entire length of the NOVUS™ 100 can be used in LON calculations as it is fully redirecting.

Downstream Zone

The NOVUS™ 100 system should be assembled so that a 1524 mm [30”] clear space will exist on both sides of the road feature for the Fender Panels to retract during an end-on impact (Figure 5)

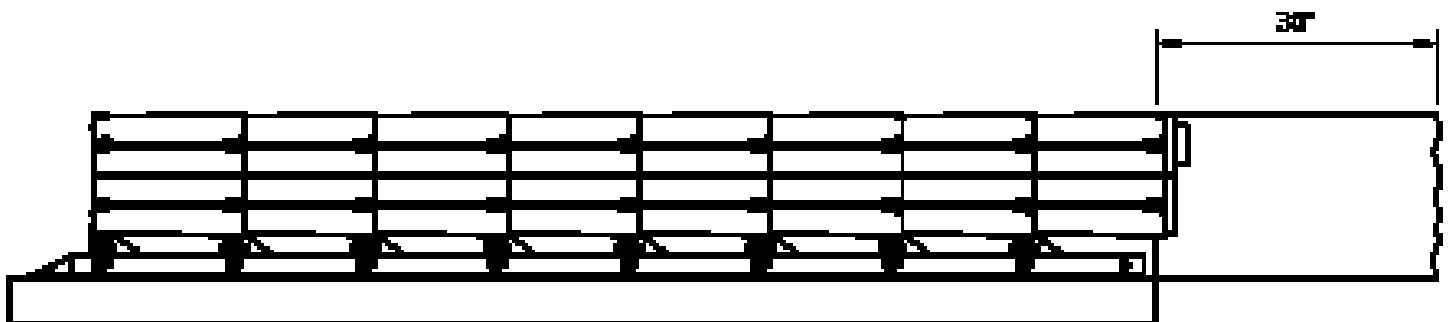
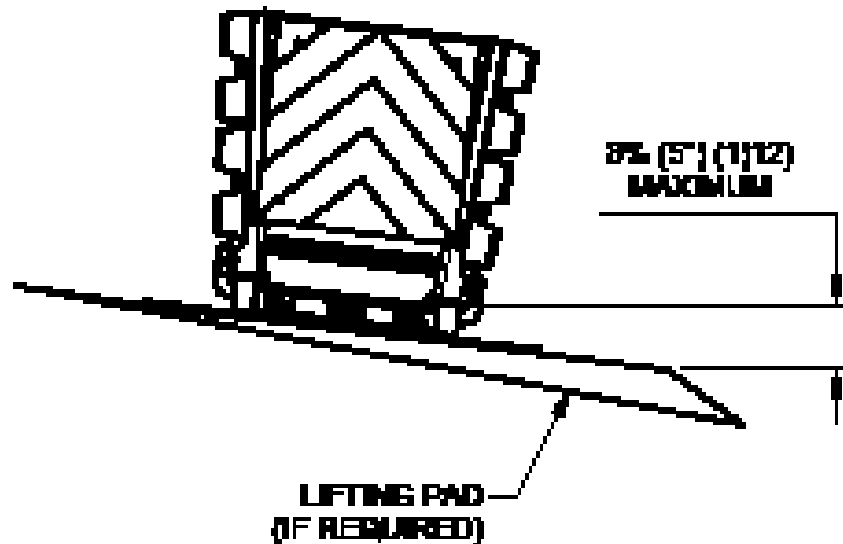


Figure 5 - Clear Space for Panel Retraction

Site Preparation

The NOVUS™ 100 must be assembled on an existing foundation of freshly placed and cured concrete foundation (4000 psi [28 MPa] minimum), or on a foundation of 6" Asphalt over compacted sub-base. Location and orientation of the concrete foundation and attenuator must comply with project plans or as otherwise determined by the local highway authority.



Foundation/Anchoring



It is the responsibility of the installer to ensure the foundation conforms to the AASHTO Roadside Design Guide.

The NOVUS™ 100 may be installed on any of the following foundations using the specified anchorage:

Valtir Approved Adhesive Anchoring System

A Valtir approved adhesive anchoring system is required to securely anchor crash cushions. Each approved adhesive kit contains adhesive, studs, nuts and washers. Vertical assemblies may be mounted using an approved adhesive anchoring system. Horizontal assemblies are possible using an approved adhesive anchoring system.

Foundation A: Reinforced Concrete Pad or Roadway

Foundation: 6" [152 mm] minimum depth 28 MPa [4000 psi] P.C.C.

Anchorage: Approved adhesive with 7" [180 mm] studs 5 1/2" [140 mm] embedment

Foundation B: Unreinforced Concrete Pad or Roadway

Foundation: 8" [152 mm] minimum depth 28 MPa [4000 psi] P.C.C. Pad.

BLOCK IS NOT REQUIRED WHEN USING 203 mm [8"] CONCRETE PAD INSTALLED AGAINST ANIMMOVABLE STRUCTURE SUCH AS A CONCRETE WALL OR ABUTMENT. CONCRETE ROADWAY, MEASURING AT LEAST 3.66 m [12'-0"] WIDE BY 15.24 m [50'-0"] LONG. ANCHOR

Anchorage: Approved adhesive with 7" [180 mm] studs 5 1/2" [140 mm] embedment

Foundation C: Asphalt over P.C.C.

Foundation: 3" [76 mm] minimum asphalt concrete (A.C.) over 3" [76 mm] minimum P.C.C.

Anchorage: Length of anchor required is 18" [460 mm] and embedment of 16 1/2" [420 mm]

Foundation D: Asphalt over Subbase

Foundation: 6" [152 mm] minimum A.C. over 6" [152 mm] minimum Compacted Subbase (C.S.)

Anchorage: Approved adhesive with 18" [460 mm] studs 16 1/2" [420 mm] embedment

Foundation E: Asphalt Only

Foundation: 8" [200 mm] minimum A.C.

Anchorage: Approved adhesive with 18" [460 mm] studs - 16 1/2" [420 mm] embedment

Vertical Anchors



It is the responsibility of the installer to ensure the foundation conforms to the AASHTO Roadside Design Guide.

1. The anchors used to secure the NOVUS™ 100 backup and base track to the concrete foundation must be those shipped in the kit. These studs must be set in minimum 4000 psi [28 MPa] concrete. Allow the concrete to cure a minimum of seven days before applying anchoring adhesive.
2. Use the part that is to be anchored as a drilling template. Use a rotary hammer to Drill the boreholes 7/8" [22 mm] diameter to the recommended depth. See the approved adhesive instructions provided with your kit. Check to ensure each borehole is drilled to the proper depth as shown below and aligned with the part to be anchored per the anchoring information below.

Anchoring Information, Concrete Installation			
Stud Size	Concrete Bit Size	Minimum Depth	Recommended Torque
3/4" x 7 1/2"	7/8" [22 mm]	6" [152 mm]	see adhesive specification
3/4" x 18 1/2"	7/8" [22 mm]	16" [419 mm]	consult adhesive kit spec

3. Blow the concrete dust from the borehole using oil-free compressed air. Thoroughly brush it with a 7/8" [22 mm] diameter steel bristle tube brush and then blow it out again. If the borehole is wet, completely flush it with water while brushing and then blow it clean to remove all water. Alternatively, a hollow concrete drill bit with an approved vacuum system may be used to prepare and clean the boreholes.
4. Fill the borehole to the top of the pavement surface. Fill from the bottom-up to prevent air pockets.
5. Place a flat washer onto the stud then thread a nut onto the stud until the end of the stud is flush with the top of the nut.
6. Push the stud down through the part to be anchored and into the boreholes.
7. Once the adhesive has fully cured, torque the nut to the adhesive manufacturer's specification.

Anchor Assembly Cautions

If steel rebar is encountered while drilling an anchor borehole, apply one of the following solutions:

- A. Use a rebar drill bit for the rebar only and then switch back to the concrete bit to finish drilling into the underlying concrete until the proper borehole depth is reached



Do not drill through rebar without first obtaining permission to do so from the project engineer.

- B. Drill a new borehole down at an angle past the rebar to the proper depth. Anchor the stud by completely filling both boreholes with an approved adhesive

Rebar

Per the project engineer's recommendation, if rebar is encountered while drilling a borehole, the rebar may be drilled through or the borehole may be drilled at an angle. If drilled at an angle, both holes are to be filled with anchor adhesive.

Transitions

The NOVUS™ 100 can be used in unidirectional and bidirectional applications. Transition panels must be added to any side exposed to traffic if there is potential of vehicle interaction on the impacting face or end of roadside obstacle. The proper transition panel to use will depend on the direction of traffic and what type of barrier or roadside obstacle the NOVUS™ 100 is shielding. Contact the Customer Service Department for additional information.



The system backup must not become a roadside obstacle to reverse direction traffic. A system placed with traffic approaching from the rear may require transition hardware.

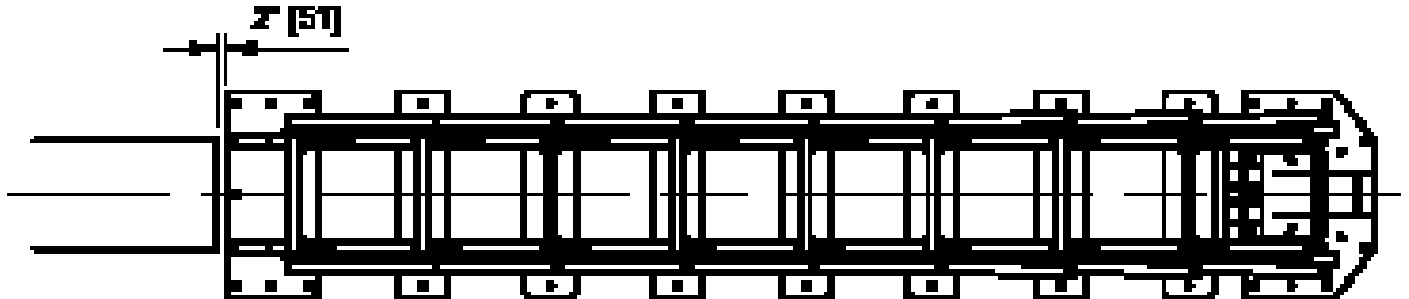
Horizontal Anchors, Mechanical Fasteners

Valtir approved horizontal anchors are required for anchoring transition panels to concrete abutments and barriers. The anchors used are Hex Head Concrete Screws.

Anchoring Information			
Stud Size	Concrete Bit Size	Minimum Depth	Recommended Torque
3/4" x 5"	3/4" [19 mm]	5 1/2" [140 mm]	N/A
3/4" x 5 1/2"	3/4" [19 mm]	6" [229 mm]	N/A

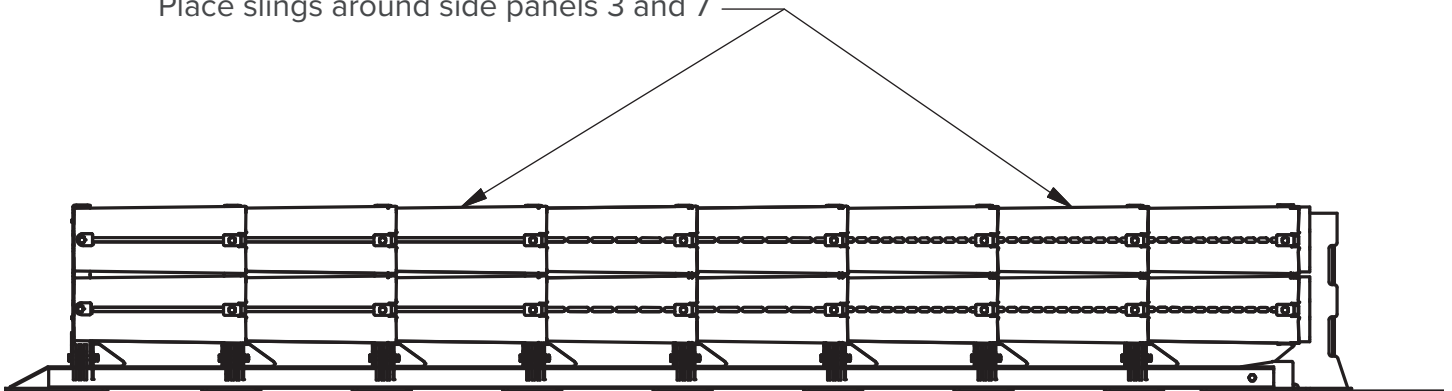
System Installation

1. Typically the base point of the NOVUS™ 100 will be the midpoint of the roadside obstacle at its front face. This may change depending on obstacle width or if bidirectional traffic is present (refer to the provided drawing package for details). Mark a centerline from the base point, perpendicular to the roadside obstacle face, or as determined by project engineer, to a distance greater than the maximum length of the NOVUS™ 100.



2. Use single slings (QTY 4) with a 4,000 lb. [1814 kg] minimum lift capacity. Place a single loop in the back just rear of the last diaphragm, and a double loop in the forward position just ahead of the third diaphragm. slings must wrap around the outside of the side panels for maximum stability during placement. Care should be taken to ensure that the system can be handled safely prior to and during any move.

Place slings around side panels 3 and 7



DO NOT lift the system using the side panels. All lifting must be under the base track rails.

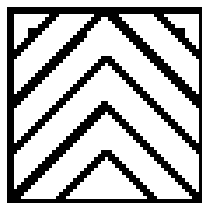
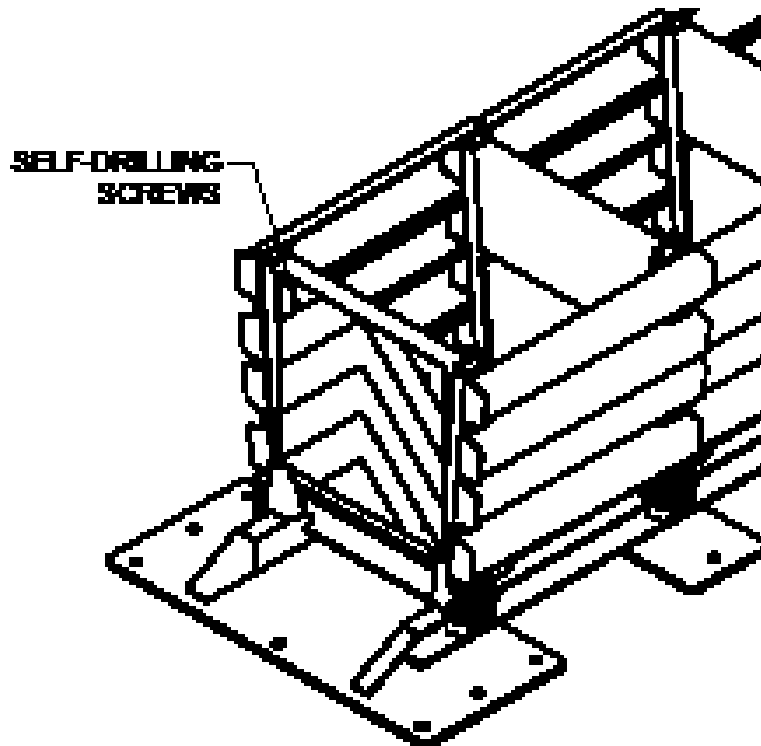


Lifting strap must be removed after system installation.

NOVUS™ 100 systems can be placed directly onto the foundation as a complete unit. The system should be aligned with 1 of the downstream barrier according to the approach and downstream zone requirements set forth in the section entitled, Location Requirements (p. 14). Holes for the anchor studs can be drilled into foundation using the system as a template. Because of the open design of all the NOVUS™ 100 systems, it is not necessary to disassemble any portion of the system in order to drill the anchoring holes.

Nose Delineation

The NOVUS™ 100 is intended for use on gores or median in both unidirectional and bidirectional traffic situations. Delineation of the plastic Nose section can be customized for any location. Standard yellow reflective sheeting is provided with the NOVUS™ 100 and can be used to delineate left shoulder, right shoulder, or gore applications. Striping patterns will be available through EDC. There is one panel that is directional (left or right) or gore on reverse side.



Gore Area

Assembly Checklist

Performed by: _____

Date: _____

Location: _____

- Transitions, if required, are in place and properly fitted.
- Every anchor hole on the backup and base track is fastened to the foundation by an anchor.
- Each anchor is torqued to the adhesive manufacturer's specifications.
- Sling and sling strap are removed from the system.
- Appropriate nose cover is attached.
- Remove all construction debris in and around the system.

Maintenance and Repair

The NOVUS™ 100 must be inspected after each impact. Depending on the impact, components may get damaged and need replacement. It is critical that all components and anchoring be checked and returned to original assembly conditions.



Use only Valtir parts that are specified herein for assembling, maintaining, or repairing the NOVUS™ 100. Do not utilize or otherwise commingle parts from other systems even if those systems are other Valtir systems. Such configurations have not been tested, nor have they been deemed eligible for use. Assembly, maintenance, or repairs using unspecified parts or accessories is strictly prohibited.



Valtir makes no recommendation whether use or reuse of any part of the system is appropriate or acceptable following an impact. It is the sole responsibility of the project engineer and/or the local highway authority and its engineers to make that determination. It is critical that you inspect this product after assembly is complete to make certain that the instructions provided in this manual have been strictly followed.

Assembly Checklist

Inspections by the appropriate highway authority are recommended as determined by that authority based upon volume of traffic and impact history. Visual drive-by inspections are recommended at least once every three months. Walk-up inspections are recommended at least twice a year.

Visual Drive-By Inspection

1. If the NOVUS™ 100 is not fully extended, a walk-up inspection will be required to determine the cause or identify damage.



It is important to inspect a system after an impact.

2. Determine the condition of the first bay components.
3. Record the date, location, and system location.



Debris, snow, or ice inside the bays may prevent the NOVUS™ 100 from absorbing the impact of a crash as observed in MASH compliant crash testing. Perform a walk-up inspection as needed to check for and remove any debris inside or around each bay. Failing to remove this debris or other material infringes upon the performance of the system as tested.

Walk-Up Inspection

- Remove debris found inside the NOVUS™ 100 bays.
- Remove debris found under and around the NOVUS™ 100.
- Check that anchor studs are securely anchored.
- Inspect all diaphragm outer rail guides.
- Transitions are properly attached (if applicable).
- Note the location and condition of the NOVUS™ 100 and any work done for the date of this inspection. If further repair is necessary, note the repair requested.
- Replace all damaged parts as soon as possible.

Post-Impact

If any significant damage is observed, replace the system with a new NOVUS™ 100

System Repair

NOVUS™ 100 systems are designed for minor field repair or rapid replacement of the entire unit.

The energy-absorbing side panels of the NOVUS™ 100 systems can be replaced depending on the extent of the impact. Because NOVUS™ 100 systems are delivered fully assembled, replacing the entire damaged system on the roadside and then performing the necessary repairs safely and accurately in the maintenance shop away from traffic dangers may be more practical.

Removal / Replacement of System

The NOVUS™ 100 system can be removed from its foundation by releasing the Anchor Nuts that hold down the Crossties. Flat wrenches may be required to access the Anchor Studs along the perimeter of the base track and backup. Once released, the system can be lifted as a unit and transported back to a maintenance facility for repair. A new or reconditioned NOVUS™ 100 system can be positioned on the existing Anchor Studs and firmly attached using approved nuts and washers.

In some impacts, a small number of Anchor Studs may become bent or fractured. In these cases it will be necessary to remove the old Anchor Stud, drill out the adhesive in the old hole, and replace the removed Anchor Stud with a new Anchor Stud and adhesive.



Complete replacement of a roadside system after an impact is a convenient, but not required, way to protect workers by limiting exposure to traffic. All decisions for reusability are made by the specifying highway authority.

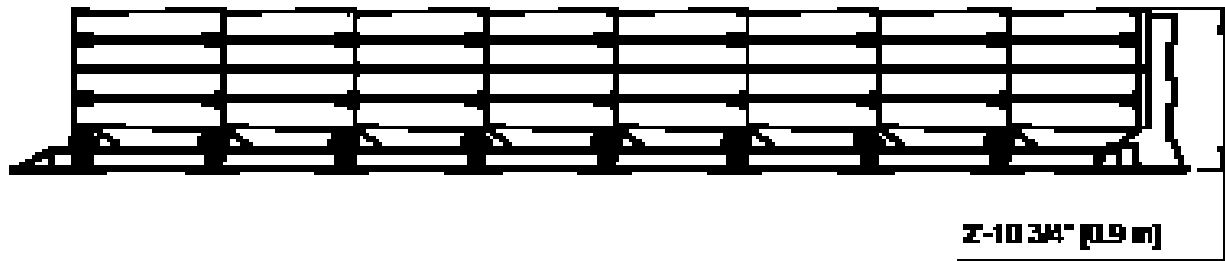
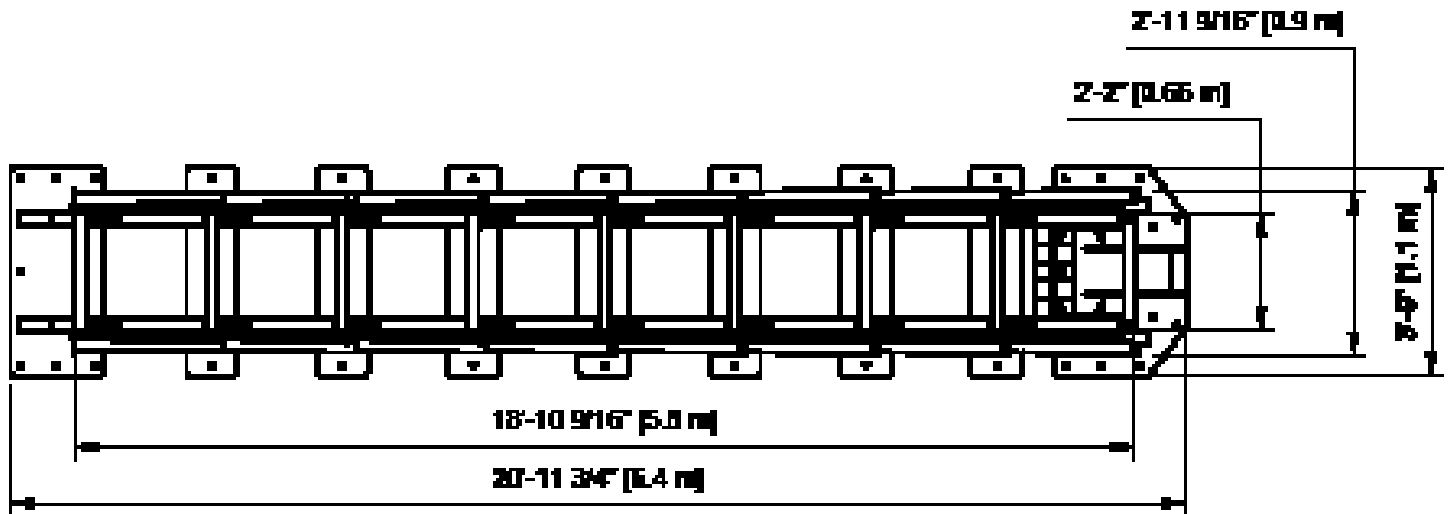
Types of Damage

NOVUS™ 100 systems are designed to withstand end-on impacts and redirecting side impacts within the AASHTO MASH criteria. Side impacts, depending on the severity, may only cause cosmetic damage to the system. Any system that has been impacted along its side should be examined to ensure that the damage is only cosmetic and that any damage that might hinder subsequent functions of the system is repaired. During some severe high-speed redirecting impacts with heavy vehicles, a NOVUS™ 100 system may become permanently twisted. If the deformation of the Base Assembly causes a portion of one side of the system to be raised more than 1 1/2" when compared to the other side of the system, then the damaged Base Assembly should be replaced.

Technical Specifications

Dimensions (nominal)

Length	21' [6.4 m]
Width	26" [660 mm]
Height	34 3/4" [883 mm]
Weight	3,800 lb [1723.6 kg] (approx)



Inspection Log

Location: _____

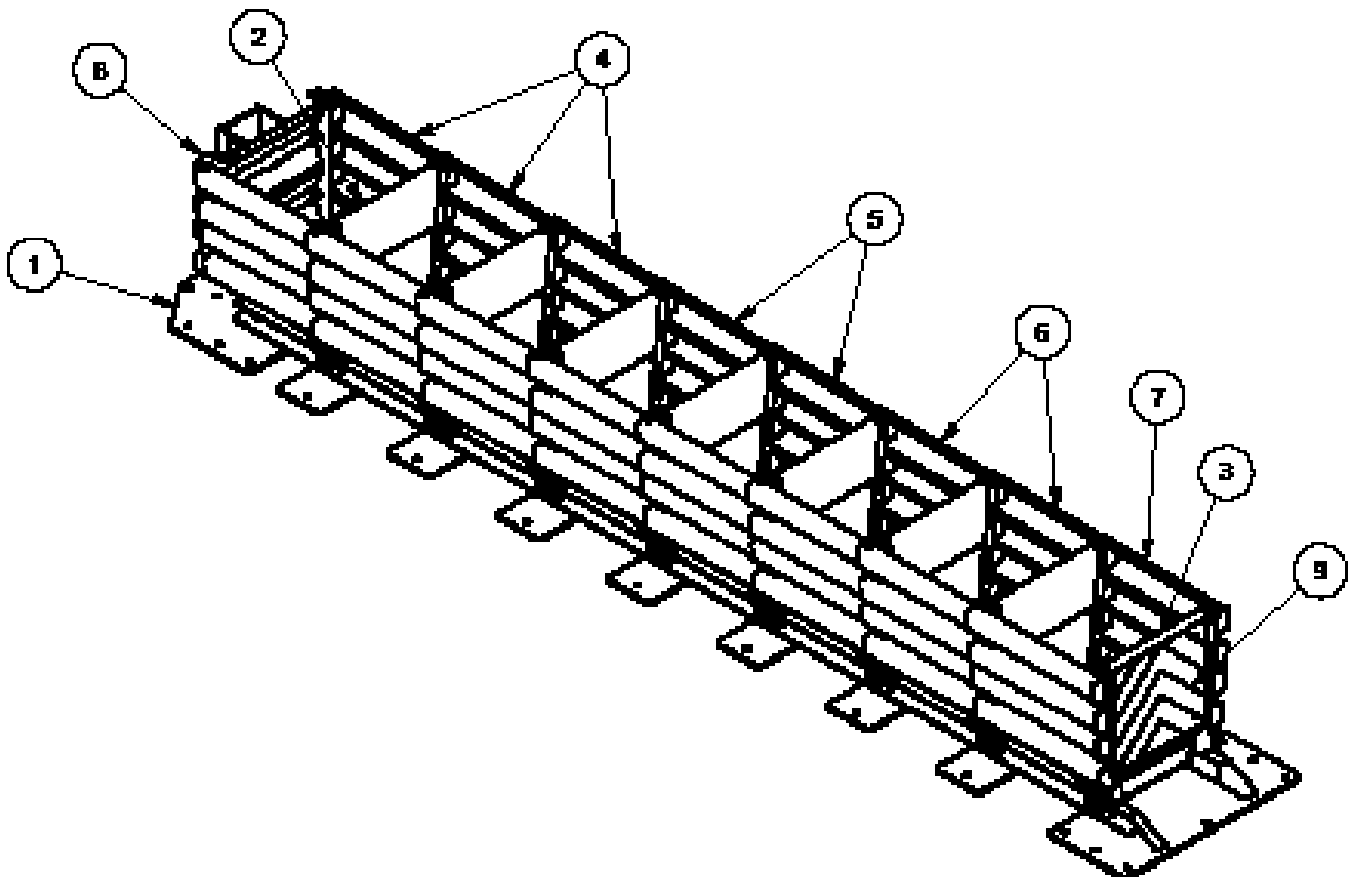
System Serial Number: _____

Date	Inspector	Condition	Maintenance/Actions

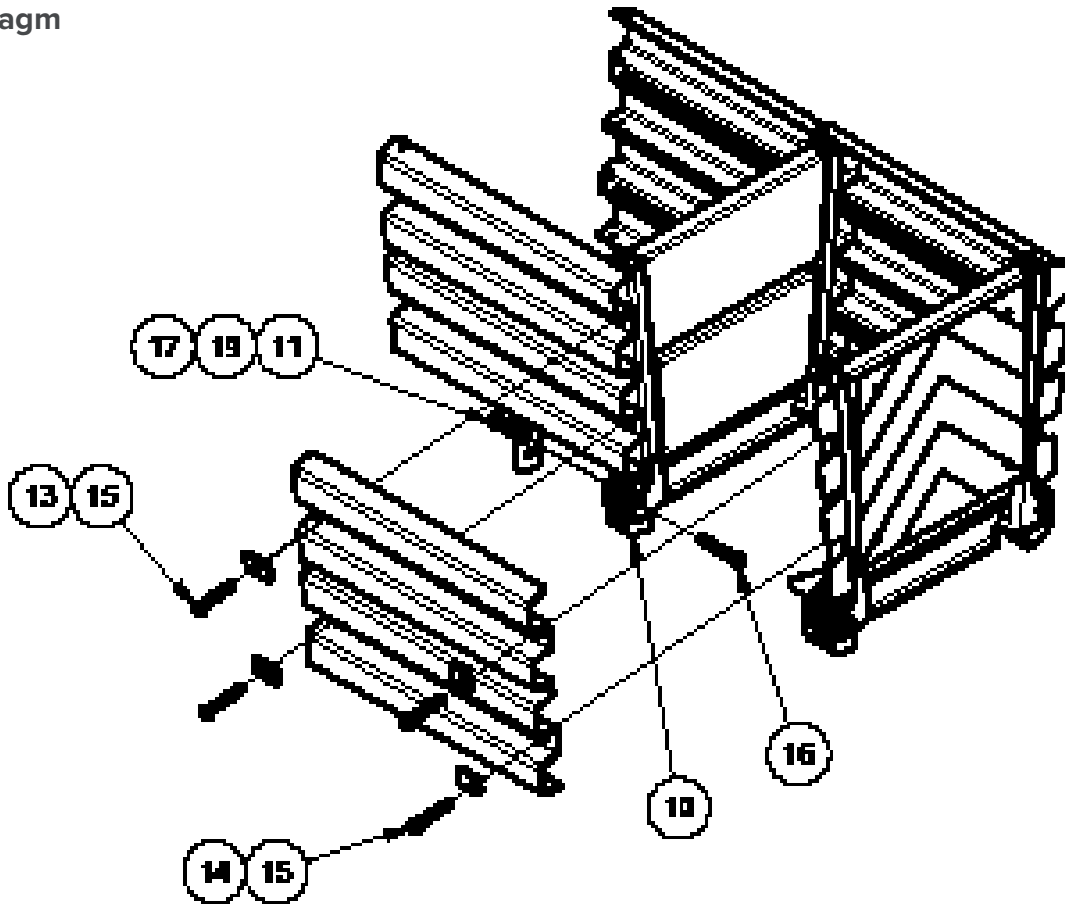
Parts List

System Components

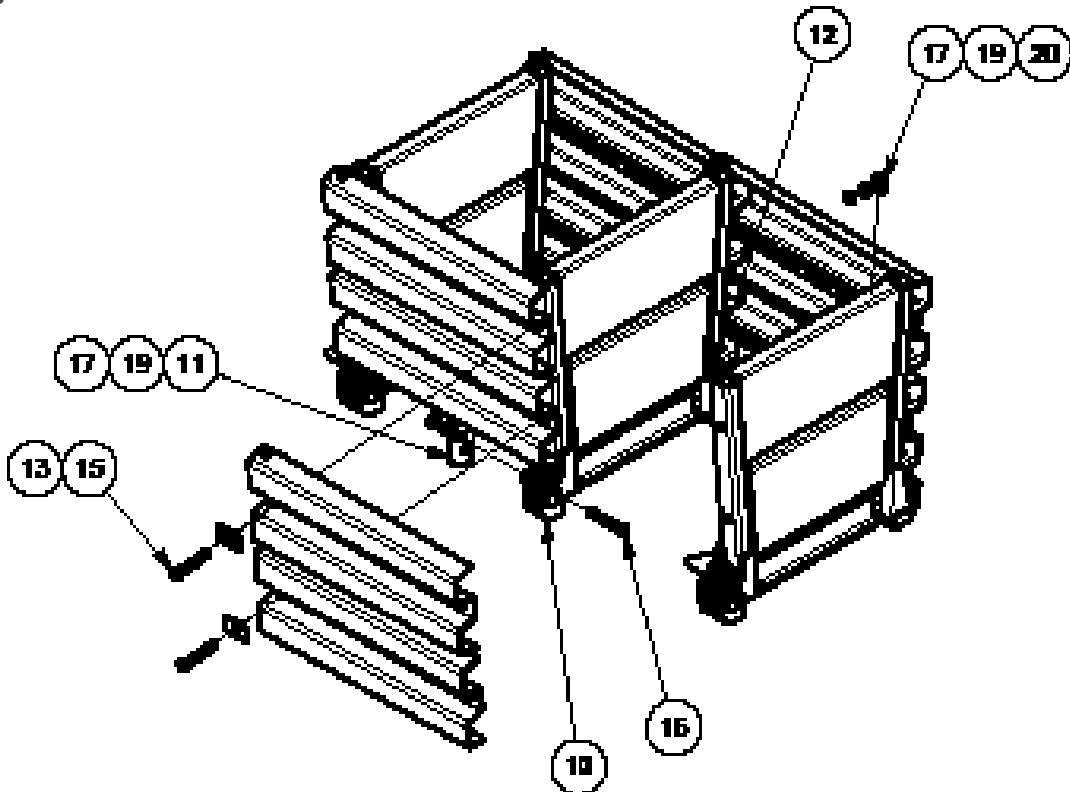
1	628720	BACKUP & BASETRACK ASSY,NOVUS
2	628721	DIAPHRAGM,WELDMENT,NOVUS
3	628727	DIAPHRAGM,WELDMENT,HD,NOVUS
4	628736	PANEL,END,NOVUS,G
5	628737	PANEL,SIDE,SLOT III,NOVUS,G
6	628738	PANEL,SIDE,SLOT II,NOVUS,G
7	628739	PANEL,SIDE,SLOT I,NOVUS,G
8	628740	PANEL,SIDE,SLOT,WELDMENT,NOVUS,G
9	628747	REFL PNL,23X23,Y/B,GORE,KIT,NOVUS
10	628731	RAIL,GUIDE,KIT,NOVUS
11	628734	BRACKET,RAIL GUIDE,R
12	628735	BRACKET,RAIL GUIDE,L
13	628743	FLT 1/4X2X3 1/4,W/HOLE
14	628744	FLT 1/4X2 1/4X2 7/8,W/HOLE
15	113564	BOLT,HX,3/4X4 1/2,G5,G
16	113573	BOLT,HX,3/4X5,G5,G
17	003704	3/4 HVY HEX NUT A563 DH
18	118027	WASHER,FLAT,3/4X2,HEAVY,G
19	118089	WASHER,LOCK,3/4,G



Front Diaphragm

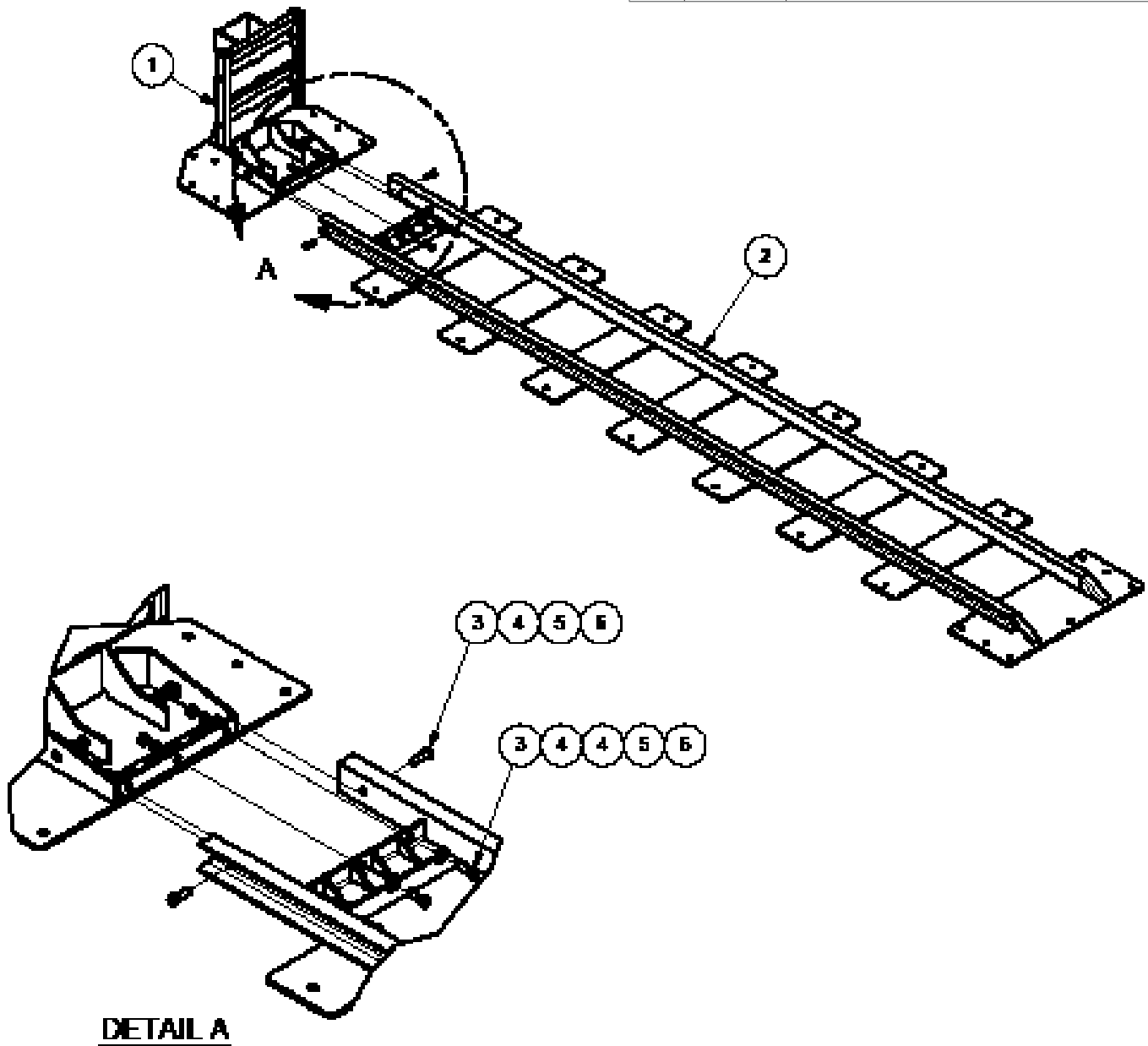


Diaphragms



Backup & Basetrack Assembly

1	628700	BACKUP,BOLT-TOGETHER,NOVUS
2	628713	BASETRACK,BOLT-TOGETHER,NOVUS
3	113550	BOLT,HX,3/4X2 1/2,G2,G
4	118027	WASHER,FLAT,3/4X2,HVY,G
5	118089	WASHER,LOCK,3/4,G
6	003704	3/4 HVY HEX NUT A563 DH





For more complete information on Valtir products and services, visit us on the web at www.valtir.com. Materials and specifications are subject to change without notice. Please contact Valtir to confirm that you are referring to the most current instructions.

WWW.VALTIR.COM
1.888.323.6374