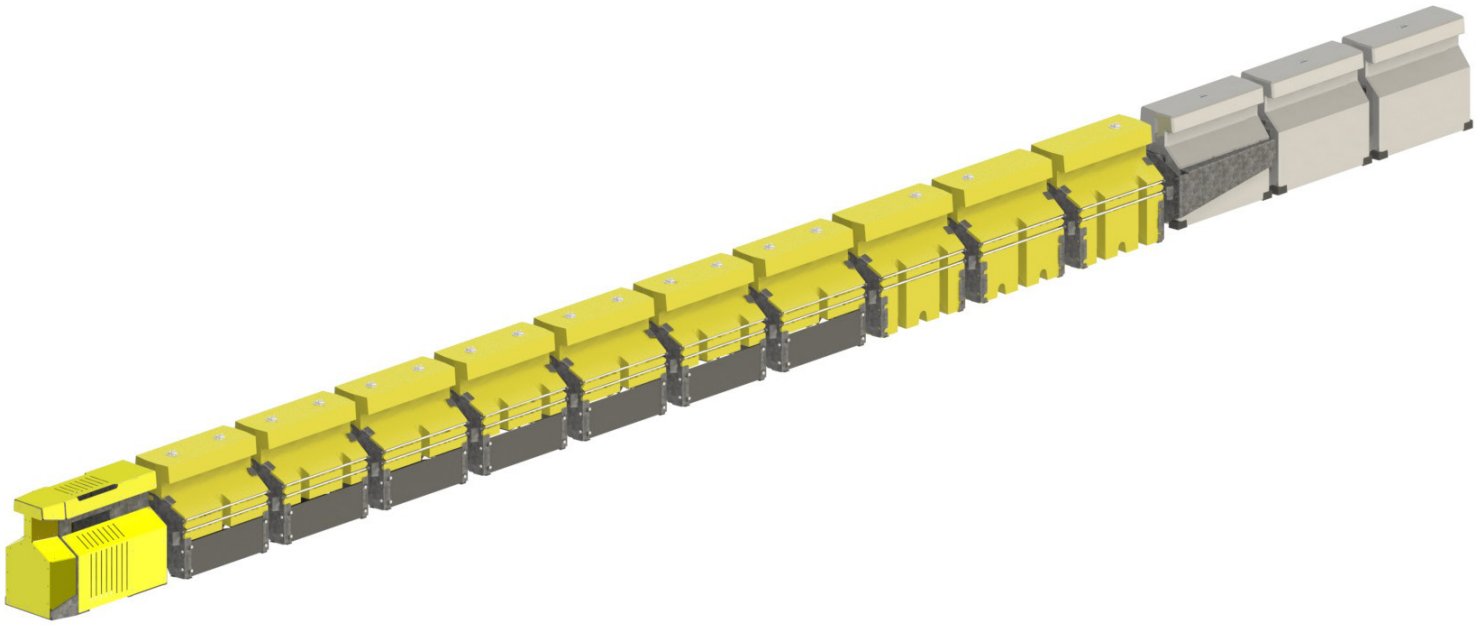
LINDSAY™ | INSTALLATION MANUAL

ABSORB-RZ™

Non-Redirective Gating, Crash Cushion

P/N 1824599 Rev B (ECN 63782)



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Important For Your Safety

We have provided important safety messages in this manual. ALWAYS read and obey all safety messages.

 This is the safety alert symbol.

This symbol alerts you to hazards that can kill or hurt you and others. All safety messages will be preceded by the safety alert symbol and the word “DANGER”, “WARNING”, or “CAUTION”.

These words mean:

⚠ DANGER **IMMEDIATE HAZARDS THAT WILL RESULT IN SEVERE PERSONAL INJURY OR DEATH.**

⚠ WARNING **Hazards or unsafe practices that COULD result in severe personal injury or death.**

⚠ CAUTION Hazards or unsafe practices that COULD result in minor personal injury or product or property damage.

This manual must be available to the person(s) overseeing and/or assembling the crash cushion system at all times. For additional copies, or if you have any questions about any portion of this manual, see below to contact Lindsay Transportation Solutions.

Contact Information

Lindsay Transportation Solutions

U.S. Toll Free: (888) 800-3691 or +1 (402) 829-6800

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Standard Limited Warranty

Lindsay Transportation Solutions, Inc. (collectively with its parent company Lindsay Corporation and all other subsidiaries and affiliates directly and indirectly owned by Lindsay Corporation, "LTS") has tested the impact performance of certain of its barriers, crash cushion systems, and other highway safety hardware at an ISO-certified crash testing laboratory under controlled conditions pursuant to the test matrix criteria of NCHRP 350, MASH or EN-1317, as applicable, as designated by the American Association of State Highway and Transportation Officials ("AASHTO") and the Federal Highway Administration ("FHWA"), or the European Committee for Standardization ("CEN"). Such tests do not replicate every possible crash scenario and they are not intended to represent the performance of barriers, crash cushion systems, and other highway safety hardware when impacted in every real world impact condition or by every vehicle type. It is widely recognized that there are impact conditions that exceed the performance expectations of all highway safety equipment.

The products with which this limited warranty is provided (the "Products") are intended to be installed, operated, and maintained in a manner not inconsistent with instructional materials provided by LTS, the AASHTO Roadside Design Guide (as applicable), and state and federal guidelines (as applicable). Selection and proper installation, operation, and maintenance of any highway safety product, including the Products, is the responsibility of the highway authority and state department of transportation.

LTS EXPRESSLY DISCLAIMS ANY WARRANTY OR LIABILITY FOR CLAIMS ARISING BY REASONS OF DEATH OR PERSONAL INJURY OR DAMAGE TO PROPERTY RESULTING FROM ANY IMPACT, COLLISION OR HARMFUL CONTACT WITH THE PRODUCTS OR NEARBY HAZARDS OR OBJECTS BY ANY VEHICLE, OBJECTS, OR PERSONS, REGARDLESS OF WHETHER THE PRODUCTS WERE INSTALLED IN CONSULTATION WITH LTS OR BY THIRD PARTIES.

LTS warrants that any Product or component part manufactured by LTS will be free from defects in material or workmanship. LTS will replace free of cost any Product or component part manufactured by LTS that contains such a defect.

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LTS' LIABILITY UNDER THIS WARRANTY IS EXPRESSLY LIMITED TO REPLACEMENT FREE OF COST (IN THE FORM AND UNDER THE TERMS ORIGINALLY SHIPPED), OR TO REPAIR BY LTS, OF PRODUCTS OR PARTS NOT COMPLYING WITH LTS SPECIFICATIONS, OR, AT LTS' ELECTION, TO THE REPAYMENT OF AN AMOUNT EQUAL TO THE PURCHASE PRICE OF SUCH PRODUCTS OR PARTS, WHETHER SUCH CLAIMS ARE FOR BREACH OF WARRANTY OR NEGLIGENCE. LTS SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, OR SPECIAL LOSSES, DAMAGES, OR EXPENSES OF ANY KIND, INCLUDING, WITHOUT LIMITATION, ANY SUCH LOSSES, DAMAGES, OR EXPENSES ARISING DIRECTLY OR INDIRECTLY FROM THE SALE, HANDLING, OR USE OF THE PRODUCTS FROM ANY OTHER CAUSE RELATING THERETO, OR FROM PERSONAL INJURY OR LOSS OF PROFIT.

Any claim by the Buyer with reference to Products sold hereunder for any cause shall be deemed waived by the Buyer unless LTS is notified in writing, in the case of defects apparent on visual inspection, within ninety (90) days from the delivery date, or, in the case of defects not apparent on visual inspection, within twelve (12) months from the said delivery date. Products claimed to be defective may be returned prepaid to LTS' plant for inspection in accordance with return shipping instructions that LTS shall furnish to the Buyer forthwith upon receipt of the Buyer's notice of claim. If the claim is established, LTS will reimburse that Buyer for all carriage costs incurred hereunder.

W030587 Rev. 11 revised October 16, 2017

LINDSAY™ | 18135 Burke Street, Ste 100 | Omaha, NE 68022 | Tel. +1 (402) 829-6800 | Fax. +1 (402) 829-6334

ABSORB-RZ™ Non-Redirective Gating, Crash Cushion

Impact Performance Limitations and Warnings

Lindsay Transportation Solutions, LLC (LTS), developed the ABSORB-RZ, a Non-Redirective, Gating, Crash Cushion, to the latest standards defined in the American Association of State Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (MASH), Second Edition, 2016, for Test Level 3 impacts.

Testing was conducted at Safe Technologies, LLC, an ISO-17025 certified crash test laboratory, pursuant to the test matrix criteria for gating non-redirective crash cushions outlined in MASH. Results were confirmed by Idiada Karco, a third-party crash test laboratory also certified to ISO 17025.

According to MASH, testing guidelines cannot include all possible impact conditions that may be experienced in real world environments. The test matrix represents the 85th percentile of impact speeds and impact angles, the 5th and 95th percentile of vehicle weights, and critical impact points that are believed to represent the worst practical conditions.

Real world environment crashes may result in different outcomes than seen during crash testing due to the limitless variety of combinations of impact conditions.

The ABSORB-RZ Crash Cushion is intended to be installed, operated, and maintained in a manner consistent with instructional materials provided by LTS, the AASHTO Roadside Design Guide, and applicable state and federal guidelines. Selection and proper installation, operation, and maintenance of any road safety product, including the ABSORB-RZ Crash Cushion, is the responsibility of the highway authority and state department of transportation.

The ABSORB-RZ is comprised of a Nose Assembly followed by 10 plastic element assemblies and a transition. All except for the first element assembly, located directly behind the Nose Assembly are filled with fluid.

The system elements designated to be filled should be filled with a proper fluid and delineated in accordance with the instructions in this manual, federal, state and local requirements. The federal, state and local requirements will always supersede the instructions in the manual regarding delineation and the type of fluid to be used in the elements of the ABSORB-RZ system.

The ABSORB-RZ system should always be installed on a firm surface that would prevent the system from becoming embedded in the surface over long periods of time. Debris should be kept clear of the system and no foreign objects should be in close proximity or on top of the system during operation.

The impact performance testing of the crash cushion described in this document was conducted under controlled conditions. Lindsay Transportation Solutions, LLC does not represent nor warrant that the results of those controlled conditions would necessarily avoid injury to persons or property. LTS expressly disclaims any warranty or liability for claims arising by reasons of death or personal injury or damage to property resulting from any impact, collision or harmful contact with the crash cushion system or nearby hazards or objects, by any vehicle, objects or persons.

Impacts that deviate from the MASH test matrix criteria or involve an improperly installed, operated, or maintained ABSORBRZ Crash Cushion may result in significantly different outcomes than those experienced in testing. For the avoidance of doubt, LTS makes no representations or warranties with respect to the performance of the ABSORB-RZ Crash Cushion (i) in impacts that deviate from the MASH test matrix criteria and/or (ii) if not installed, operated, and maintained as directed in instructional materials provided by LTS, the AASHTO Roadside Design Guide, and applicable state and federal guidelines.

If you need additional information or have questions about the ABSORB-RZ Crash Cushion, please call the LTS Customer Service Department at (866) 404-5049 (U.S. toll free) or (402) 829-6800.

Table of Contents

Preface

As with any roadside safety device, the ABSORB-RZ system must be properly maintained to ensure proper performance. Thoroughly review and fully understand the maintenance instructions and product limitations before performing any maintenance. An instructional video is available from LTS to help explain the general requirements. Do not begin any maintenance operation without the proper plans and tools. For further guidance, refer to the ABSORB-RZ Installation portion of this manual.

If you need additional information, or have questions about the ABSORB-RZ Crash Cushion, please call the Lindsay Transportation Solutions Customer Service Department at (866) 404-5049 (U.S. toll free) or (402) 829-6800.

Introduction

The ABSORB-RZ system has been tested to meet the rigorous requirements of Manual for Assessing Safety Hardware (MASH), Second Edition, 2016 Test Level 3.

The ABSORB-RZ system is a non-redirective, gating, crash cushion, and is intended for use as an end treatment on the CRTS-QMB used with the Road Zipper product.

Non-Redirective, gating, crash cushions are highway safety devices whose primary function is to improve the safety for occupants of errant vehicles that impact the end of rigid or semi-rigid barriers or fixed roadside hazards by absorbing the inertia of vehicle impact or by allowing controlled penetration by the vehicle. These devices are designed to safely decelerate errant vehicles. These types of systems are typically applied to locations where head-on and angled impacts are likely to occur and it is not necessarily desirable to have post impact trajectories on the impact side of the system. Placement and use of the ABSORB-RZ system should be accomplished in accordance with the guidelines and recommendations set forth in the "AASHTO Roadside Design Guide," FHWA memoranda and other state and local standards.

IMPORTANT INFORMATION

The ABSORB-RZ crash cushion must be installed properly to maximize the systems ability to protect errant motorists that impact the system. Designers, installers and people that maintain the system should thoroughly understand the manufacturer's instructions prior to performing any necessary maintenance or repair work. If there are any questions regarding the proper placement or installation of the ABSORB-RZ crash cushion, contact Lindsay Transportation Solutions Customer Service at U.S. toll free (866) 404-5049 or (402) 829-6800.

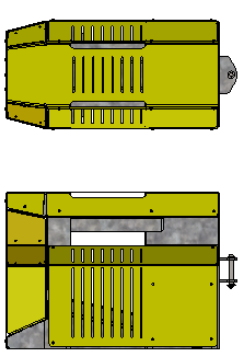
ABSORB-RZ™ SYSTEM OVERVIEW

The ABSORB-RZ is a non-redirective, gating, crash cushion designed to be used with the Lindsay Transportation Solutions RTS Movable Barrier. It was designed and tested to provide acceptable structural adequacy, minimal occupant risk and safe vehicle trajectory as set forth in the Manual for Assessing Safety Hardware (MASH), Second Edition, 2016 for Test Level 3 impacts.

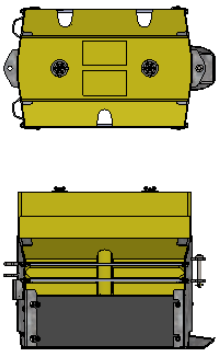
The system is comprised of a Nose Element, H-Elements with and without wedges, F-Elements, and a transition assembly as defined in the SYSTEM CONFIGURATION section. Each element is preassembled for faster field system installation.

Individual sections of the system are pinned together to form a continuous freestanding installation (the system is not anchored to the foundation surface). The first element (following the Nose Assembly) is left empty while the remaining elements are filled with fluid. The effective length of each element is 1030 mm (40.5 in). The effective overall length is 11.15 m (36 ft 7 in) and the effective overall height is 818 mm (32 1/4 in). The effective width of the upright portion of each section is 632 mm (24 7/8 in). A typical section is comprised of a plastic element, steel end weldments, and hardware allowing them to be connected together.

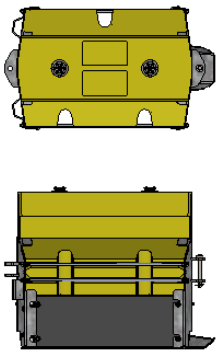
SYSTEM CONFIGURATION



① NOSE ASSEMBLY
1 REQ.



② H-ELEMENT, TYPE B
1 REQ.



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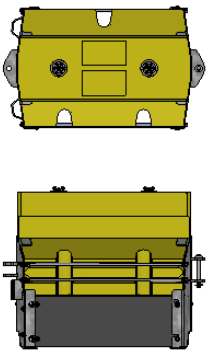
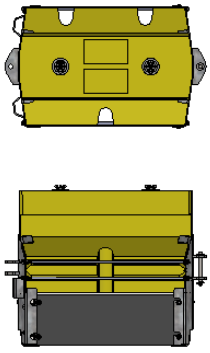
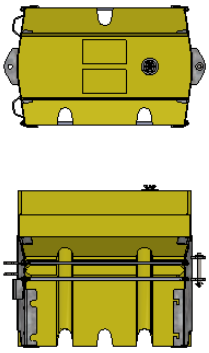


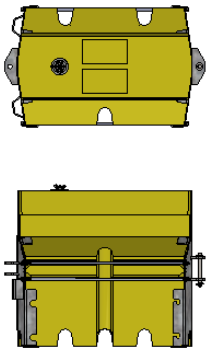
④ H-ELEMENT, TYPE B
W/O WEDGE
2 REQ.



⑤ H-ELEMENT, TYPE B
W/O WEDGE
2 REQ.



⑥ F-ELEMENT, TYPE A
2 REQ.



⑦ F-ELEMENT, TYPE B
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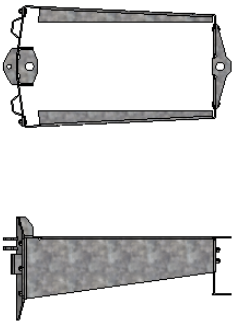
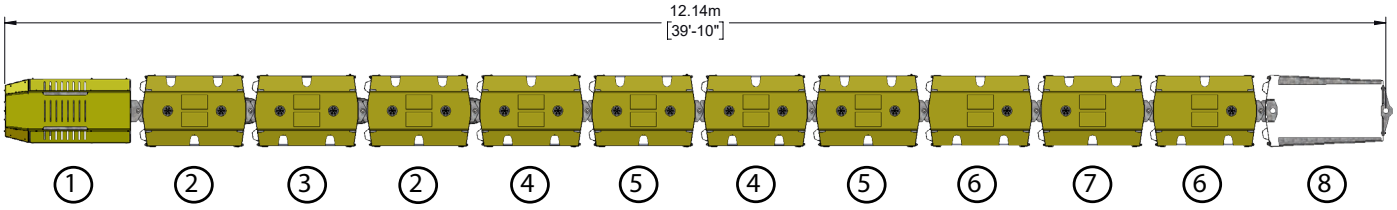


⑧ TRANSITION ASSEMBLY
ARZ-CRTS BARRIER
1 REQ.



RECOMMENDED TOOLS

NOTE: The tools listed below are general recommendations. Depending on the specific characteristics of the job site, additional tools may be necessary.

- Torque Wrench-100 ft.lb. (135.6 N.m) capable
- ½ in drive rachet and extensions
- ½ in drive deep sockets: ¾" and 15/16"
- Open or box end wrenches: ¾" and 15/16"
- Hammer
- Measuring tape
- Round tapered drift punch
- Pry bar
- Impact driver (optional)
- Pliers
- Pin Puller Device
- Barrier Lifting device
- Forklift (capable of lifting 3,500 lbs (1,600 kg))

SAFETY EQUIPMENT

- Safety Glasses
- Hearing Protection
- Gloves
- Dust Mask
- Hard Hat
- Safety Vest
- Steel Toe Boots

TRAFFIC CONTROL

- Traffic Control Equipment
- Traffic Control Plan

INSTALLING ABSORB-RZ

INSTALLATION TO CRTS-QMB BARRIER

NOTE: The installation should be completed prior to filling the energy absorbing elements with fluid.

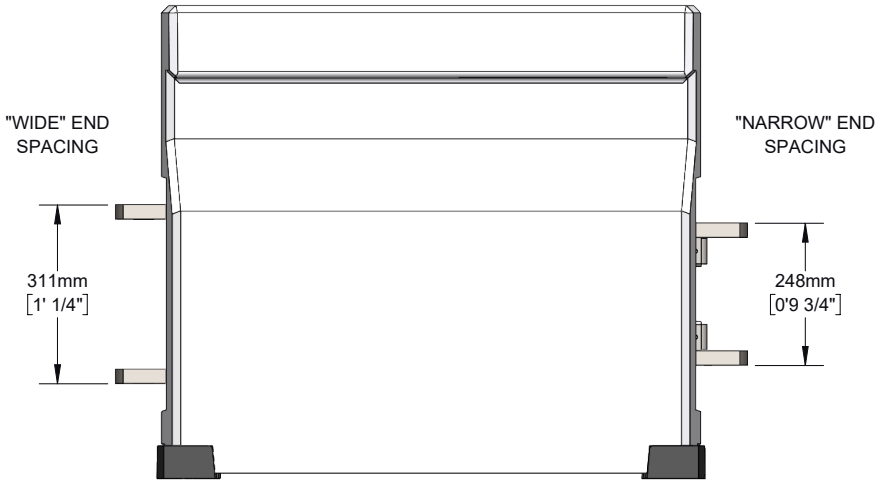
NOTE: Before installing the ABSORB-RZ system, ensure that all the materials required for the system are on site and have been identified.

Transition Installation

Begin by installing the transition assembly onto the final CRTS-QMB barrier segment of the barrier wall.

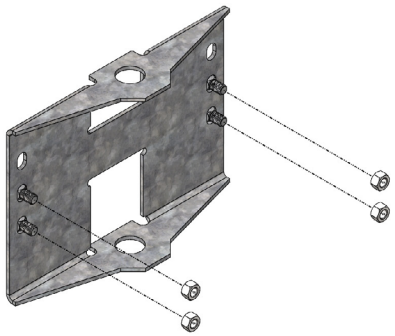
Using figure 1-1, identify which end of the CRTS-QMB barrier segment is pinned to the barrier wall.

Separate the first barrier segment from the barrier wall by removing the barrier pin clip and pulling the pin using a Pin Puller. (The Clip can be removed from the Pin by rotating it such that the middle of the clip is facing the side of the barrier. Then, it can be pulled off using a set of pliers). Using a forklift (capable of lifting 3,500 lbs (1,600 kg)), equipped with a barrier lifting device, separate the first barrier segment from the barrier wall.

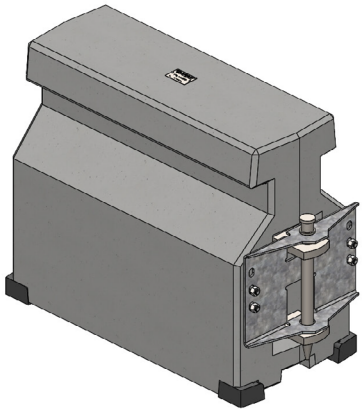


Transition Assembly Sequence For Wide End Spacing (where the wide end of the barrier segment was connected to the barrier wall):

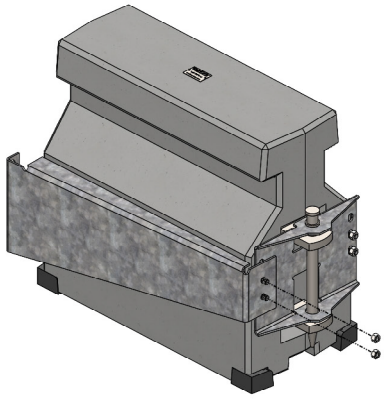
1. Install four (4) bolts into the back brace using the lower two slots as shown below. Hold bolts in place using four (4) nuts, ensuring the square necks on the bolts are seated appropriately in their slots.



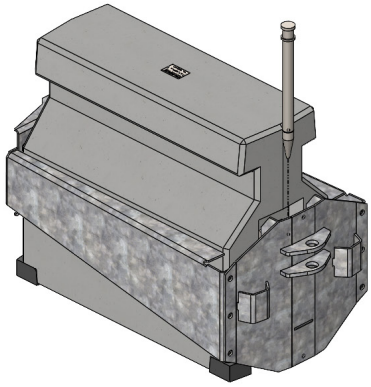
2. Place back brace onto the barrier segment (as shown below) and use a barrier pin to secure back brace to the barrier segment.



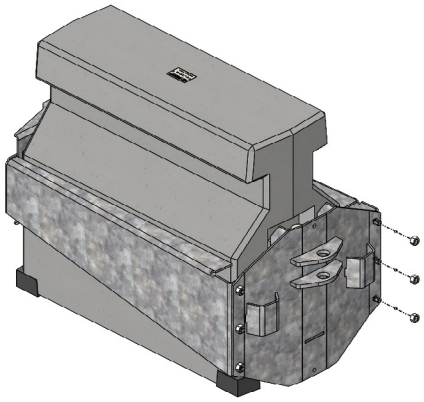
3. Remove two nuts on one side of back brace and install transition strap (right or left) as shown below. Repeat for opposite side. Hand tighten nuts to keep straps in place.



4. Install CRTS transition adapter onto other end of barrier (as shown below). Use a barrier pin to secure the transition adapter to the barrier segment through hinge bars. The transition adapter will be to the outside of transition strap ends.



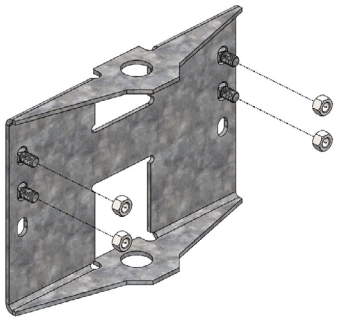
5. Use six (6) bolts and six (6) nuts (three (3) each per side) to fasten transition straps to transition adapter. Tighten nuts hand tight ensuring the square necks on the bolts are seated in the slots of the transition straps (see below).



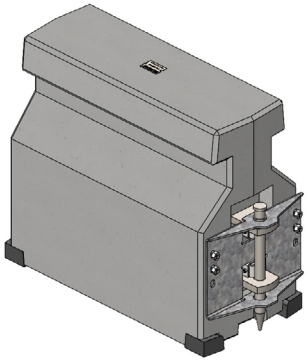
6. Once all bolted connections are hand tight, check orientation of all components. Make any adjustments needed and proceed to torque all ten (10) nuts to 65 ft.lb (88 N·m) using a torque wrench.

Transition Assembly Sequence For Narrow End Spacing (where the narrow end of the barrier segment was connected to the barrier wall):

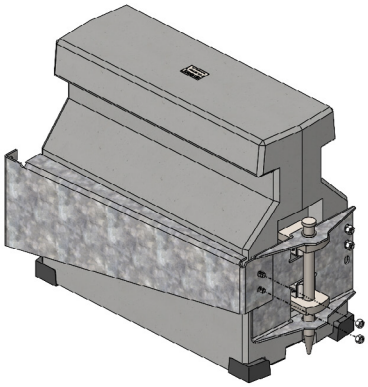
1. Install four (4) bolts into the back brace using the upper two slots as shown below. Hold bolts in place using four (4) nuts, ensuring the square necks on the bolts are seated appropriately in their slots.



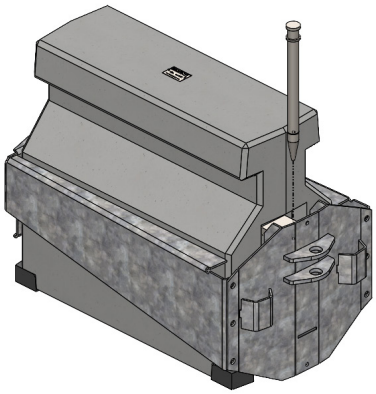
2. Place back brace onto barrier segment (as shown below) and use a barrier pin to secure back brace.



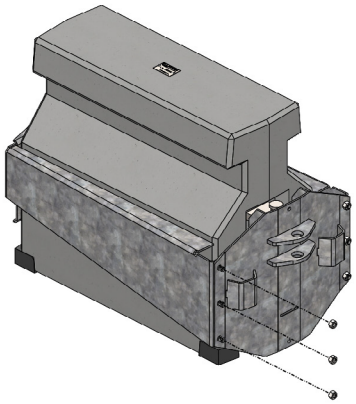
3. Remove two nuts on one side of back brace and install transition strap (right or left) as shown below. Repeat for opposite side. Hand tighten nuts to keep straps in place.



4. Install CRTS transition adapter onto the other end of barrier segment as shown below. Use a barrier pin to secure transition adapter to the barrier segment through bars. The transition adapter will be to the outside of transition strap ends.



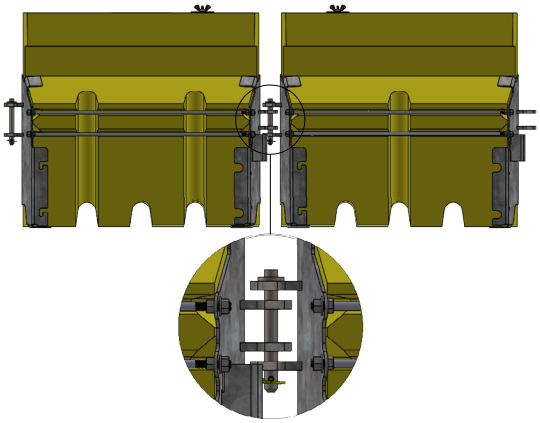
5. Use six (6) bolts and six (6) nuts (three (3) each per side) to fasten transition straps to transition adapter. Tighten nuts hand tight ensuring the square necks on the bolts are seated in the slots of the transition straps (see below).



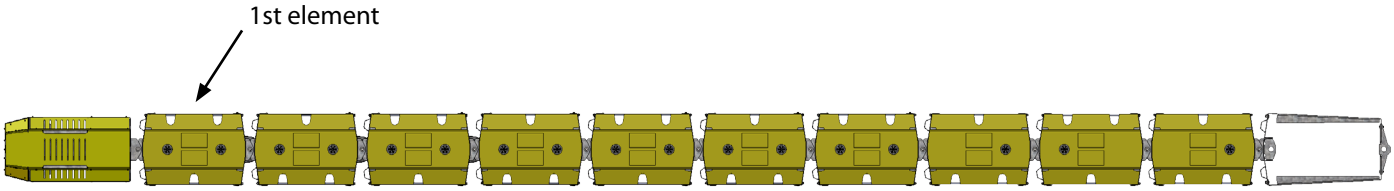
6. Once all bolted connections are hand tight, check orientation of all components. Make any adjustments needed and proceed to torque all ten (10) nuts to 65 ft.lb (88 N·m) using a torque wrench.
7. Using a forklift equipped with a barrier lifting device, reinstall the modified barrier segment to the end of the barrier wall. Pin in place using a barrier pin and a clip.

System Installation

1. Following the system configuration shown on System Drawing 1831573, assemble the system by pinning individual sections together using pin weldment #1828511. Tap head of pin with pry bar to ensure its fully seated and install lynch pin #2000090 into hole near bottom (above tapered end) of pin. Hinge plates on end of elements must be assembled correctly to each other as shown below.
2. Beginning with the rearmost element, Install the 3 full elements, the F-Element Type A, first and working forward by installing the F-Element Type B, then another F-Element Type A.



3. Install the 4 half elements with no wedge, one H-Element Type B, No Wedge, then one H-Element Type A, No Wedge, then another H-Element Type B, No Wedge and another H-Element Type A, no wedge.
4. Install the 3 half elements with wedge, the H-Element Type B with wedge followed by the H-Element Type A with Wedge and another H-Element Type B with Wedge.
5. Install the Nose Assembly.
   NOTE: Each element is pinned to the next element using the pins provided and secured in place with lynch pins.
6. Keep the elements aligned with the barrier wall. This can be done fairly accurately by looking down the wall and ensuring each element is assembled in alignment down the center of the wall.
7. Remove fill plug(s) and fill all elements FULL with fluid except for the element immediately downstream of the nose assembly. Fill elements to the top of the fill hole.



WARNING The 1st element in the system should remain empty and not filled with fluid. Filling the 1st element with fluid could cause the system to performed improperly.

WARNING 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.

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

8. Reinstall the fill plug(s) into top of elements. Ensure the plug(s) are fully seated, and the wing nuts are tightened to prevent the plug(s) from becoming dislodged during barrier transfer and/or normal handling.

INSPECTION/DRIVE-BY

The frequency of Drive-By inspections is dependent on the traffic volume and the impact history of the system. Drive-By inspections are recommended at least monthly.

1. The inspector should be moving at a speed that is sufficiently slow enough to detect impact or environmental damage (debris). If any damage is observed, a Hands-On inspection is warranted.
2. Make sure that all of the elements are present and that there is no debris lodged between or under the elements.
3. If delineation has been applied to the nose cover, make sure that it is still properly applied and visible.
4. If the system appears to have been impacted in any way (scrapes, paint marks, etc.) a Hands-On inspection should be made.

NOTE: It is important to keep a logbook of all Drive-By inspections for each installed system. Record the date of the inspection and observed condition of the system.

1. Look for tire or paint marks on front, side and transition.
2. Look for debris between elements (garbage, leaves, etc).
3. Look for transition damage.
4. Look for bent or deformed side rods.

Although there may be no obvious damage, paint marks along the side would indicate an impact and the need for a hands-on inspection.

INSPECTION/HANDS-ON

The frequency of Hands-On inspections is dependant on the traffic volume and the impact history of the system. **Hands-On inspections are recommended at least yearly.**

1. Check that all of the elements are aligned.
2. Check in the spaces between the Energy Absorbing Elements (EAEs) and remove any debris that may have accumulated, including under the half elements.
3. Check the fluid level in the elements. The fluid should be to the top of the element.

WARNING The 1st element in the system should remain empty and not filled with fluid. Filling the 1st element with fluid could cause the system to performed improperly.

4. Check the condition of and the placement of all EAEs. Replace any damaged Cartridges. Refer to drawings in System Configuration section.
5. Visually inspect the skirts. If they are sagging and not aligned the bolts at the end of the element should be tightened until aligned.

NOTE: It is important to keep a log book of all Hands-On inspections for each installed system. Record the date of inspection, the observed condition of the system and any replaced items.

Post Impact Inspection - Repairs

After an impact, the system must be thoroughly inspected to determine which parts can be reused and which parts will need to be replaced. The system must be repaired to its original condition to operate properly during the next impact.

1. If the system has sustained an impact, detach the damaged element assemblies by removing the pins. Properly discard the damaged element assembly, retain the pin if not damaged. Replace the damaged element with the same type of element. Repair of the elements, such as plastic welding is NOT allowed.
   NOTE: Due to the possibility of reduced performance, any elements with bent side rods should be replaced.
2. Ensure that the system is re-installed in the proper configuration by referencing the "System Configuration" section of this manual.
3. Inspect for damage to the bolts that attach the transition. Remove and replace any damaged bolts.
4. Inspect the Nose Assembly for damage. Repair or replace the Nose Skin if there is damage, and apply the proper delineation. Contact LTS customer service for component part numbers U.S. toll free (866) 404-5049 or (402) 829-6800.
5. Make sure that all of the pins are in place along the entire length of the system.

SYSTEM DRAWING, 1831573

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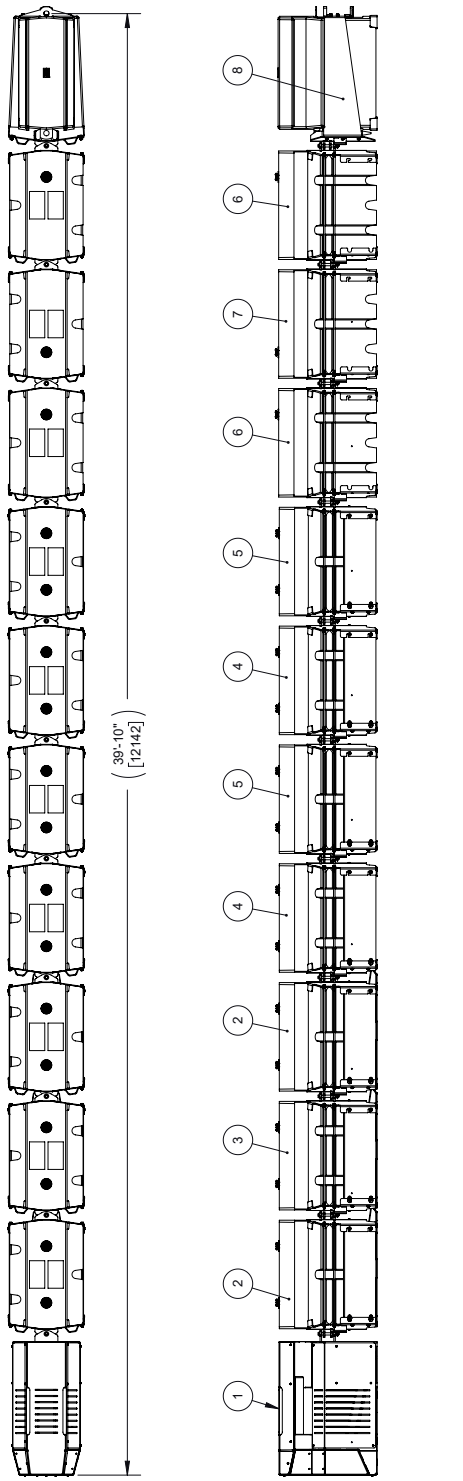
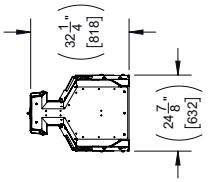
ITEM	PART NUMBER	DESCRIPTION	QTY
1	1827069	NOSE ASSEMBLY, ARZ	1
2	1831677	H-ELEMENT, TYBE B	2
3	1831678	H-ELEMENT, TYPE A	1
4	1831679	H-ELEMENT,TYPE A, NO WEDGE	2
5	1831680	H-ELEMENT,TYBE B,NO WEDGE	2
6	1831681	F-ELEMENT, TYPE A	2
7	1831682	F-ELEMENT, TYBE B	1
8	1827076	TRANSITN ASSY,ARZ-CRTS BARRIER	1





NOTES:

1. DIMENSIONS SHOWN ARE FOR REFERENCE ONLY.
2. DIMENSIONS INSIDE [BRACKETS] ARE MILLIMETERS.

Revisions

DATE	ECN	PUBLISHED ECN	REVISION	DESCRIPTION OF CHANGE
06/26/2024	61039	61039	A	Initial release
12/09/2025	63782	63782	B	Marketing Re-theme, no engineering changes.

LINDSAY™

18135 Burke Street, Suite 100 | Omaha, NE 68022
+1 (402) 829-6800 | U.S. Toll Free: (888) 800-3691

lindsay.com

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