Quick Guide for Temporary Impact Attenuator Manuals

This document compiles installation guidance and inspection requirements for temporary impact attenuators used in Illinois. Hyperlinks and QR codes have been provided that direct the user to the manufacturer provided manuals.

Devices in this document are not to be assumed allowed by Illinois. Please refer to IDOT's Qualified Product List for Temporary Impact Attenuators.

Section 706 (Impact Attenuators, Temporary) of the Standard Specifications for Road and Bridge Construction has been provided at the end of this document for user reference.

Published by IDOT Bureau of Safety Programs and Engineering on

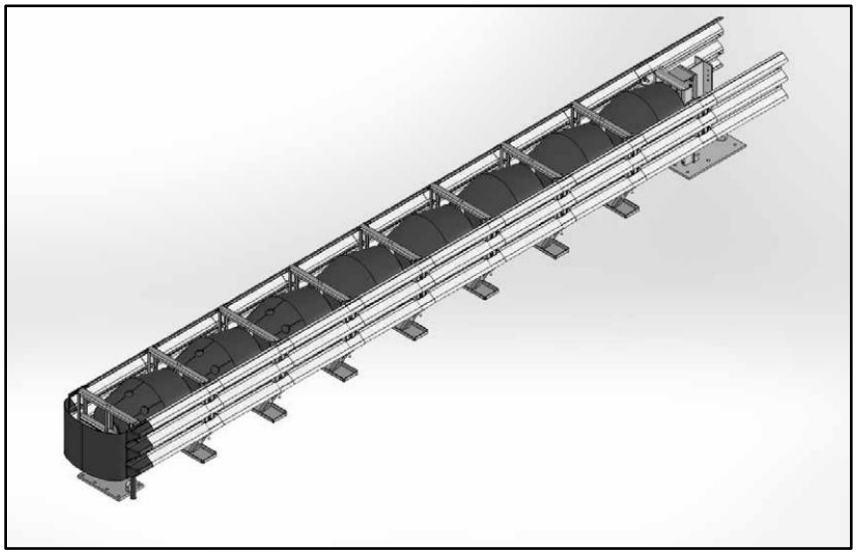
3/28/2025

Contact dot.bspewz@illinois.gov if a hyperlink or QR code is broken

Illinois Department of Transportation

Devices

Universal TAU-II



Lindsay Transportation Solutions

NCHRP 350 Test Levels 2 & 3

Fully Redirective; Narrow, Wide, and Resettable

For current details on this system, refer to the Manufacturer's Installation Manual:

https://lindsay.guide/SharedUploads/ProductGuideFiles/file_35ca62ef-a6bd-4352-a714-bffb2e902746.pdf

Additional Information

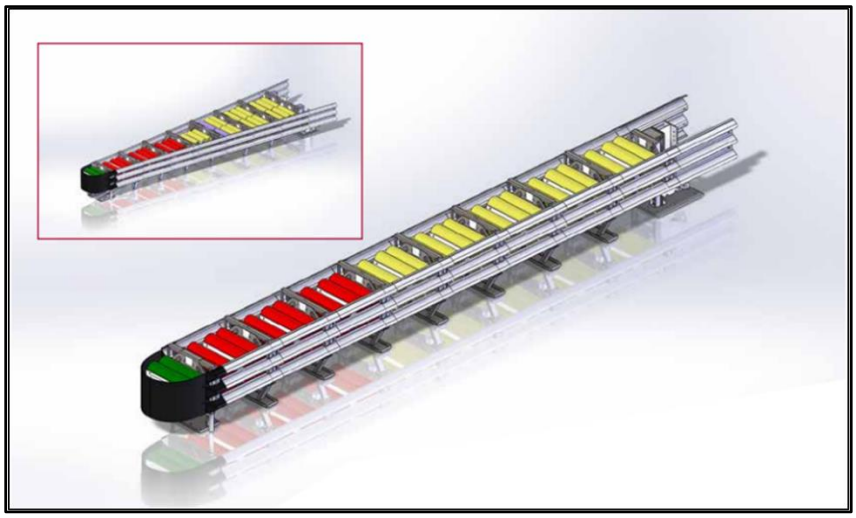
- Required tools for installation found on page 5 of the Installation Manual.
- Parallel system installation found on page 10 of the Installation Manual.
- Tapered system installation found on page 21 of the Installation Manual.
- Configuration charts on pages 44 and 45 of the Installation Manual.

Final Inspection

Found on page 43 of the Installation Manual.

Item	Complete?
All front cable anchor plate and backstop anchor bolts in place and epoxy cured.	
Clevis and pin, mounted to the front cable anchor, is installed with the handle portion of the pin on the inside of the anchor assembly, firmly tightened. (This may be different depending on the type of foundation, ie, asphalt or PCC.)	
All cable guide assemblies securely fastened.	
System cables tightened to meet torque specifications.	
Pipe panel mounts positioned properly, flat end facing back, cut out facing forward.	
Sliding panels installed properly to allow for stacking.	
Sliding panels should have no more than a ¾” (19mm) gap between stacked panels.	
Nose cover properly installed with thick spacer and tightened to specifications.	
Torque Sliding Bolt assemblies to specifications. Do NOT over tighten.	
Energy Absorbing Cartridges (EAC) installed in proper A-B position and sequence. See APPENDIX A on pg. 44 of the Installation Manual.	
EAC air discharge holes positioned properly. Rotate cast ID to the top of the cartridge.	
Asphalt adapter installed on both sides of portable concrete barrier when applicable.	
Torque all fasteners to meet specifications.	

Universal TAU-II-R



Lindsay Transportation Solutions

NCHRP 350 Test Levels 2 & 3

Fully Redirective; Narrow, Wide, and Resettable

Severe Use; Narrow and Wide

For current details on this system, refer to the Manufacturer's Installation and Maintenance Manual Supplement:

https://lindsay.guide/SharedUploads/ProductGuideFiles/file_630d3986-5429-465b-9b81-3c5bf79f3fda.pdf

Additional Information

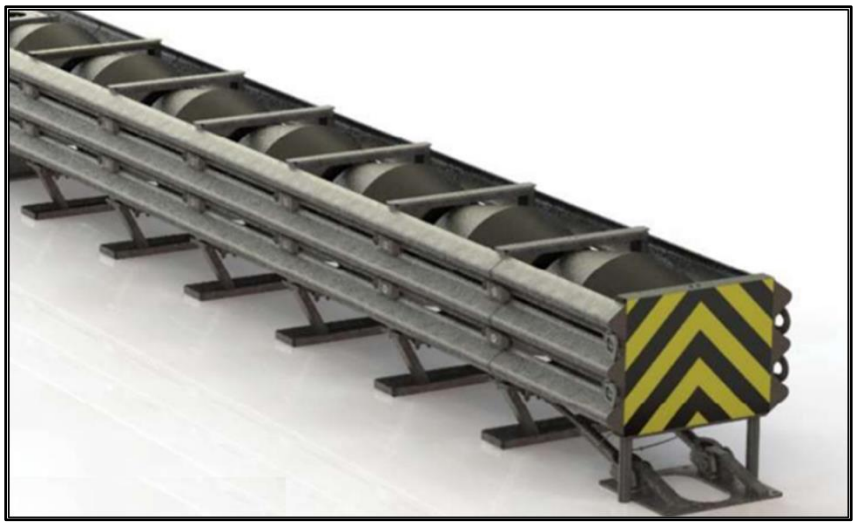
- Required tools for installation found on page 5 of the Universal TAU-II Installation manual (previous impact attenuator.)
- Additional tools needed found on page 4 of the Installation and Maintenance Manual Supplement.
- Configuration charts found on pages 6 and 7 of the Installation and Maintenance Manual Supplement.
- Maintenance and repair information found on pages 23-31 of the Installation and Maintenance Manual Supplement.

Final Inspection

Found on page 22 of the Installation and Maintenance Manual Supplement.

Item	Complete?
All front anchor plate and backstop anchor bolts are in place and epoxy has cured.	
Clevis pin, mounted to the front cable anchor, is installed with handle portion of the pin on the inside of the anchor assembly and is firmly tightened. (This may be different depending on the type of foundation, i.e. asphalt or PCC).	
All cable guides are securely fastened.	
System cables tightened to meet torque specifications.	
Pipe panel mounts are positioned properly, flat end facing back, cut out facing forward.	
Sliding panels are installed properly to allow for stacking.	
Sliding panels should not have no more than a 3/4" (19mm) gap between stacked panels.	
Nose cover is properly installed using special tow hooks.	
Torque Sliding Bolt assemblies to specifications. DO NOT OVER TIGHTEN.	
Energy Absorbing Elements (EAEs) are installed and bolted in proper configuration. Reference the Universal TAU-II-R configuration chart.	
Asphalt adapter installed on both sides of portable concrete barrier when applicable.	
Torque all fasteners to meet specifications.	

TAU-M



Lindsay Transportation Solutions

MASH Test Levels 2 & 3

Fully Redirective; Narrow and Resettable

For current details on this system, refer to the Manufacturer's Installation Instructions:

https://lindsay.guide/SharedUploads/ProductGuideFiles/file_35ca62ef-a6bd-4352-a714-bffb2e902746.pdf

Additional Information

- NCHRP 350 to MASH upgrade kits are available. Information can be found on pages 15, 16, and 41-43 of the Installation Instructions.
- Required tools for installation can be found on page 7 of the Installation Instructions.
- Maintenance inspections can be found on pages 45-47 of the Installation Instructions.

Final Inspection

Found on pages 44 and 45 of the Installation Instructions.

Item (Concrete Installation)	Complete?
Delineation Bracket is attached to Front Support. (Step 8, Page 35.)	
Ensure Tether Kit is installed. With 3-3/4" minimum on each side of cable clamp. (Step 7, Page 34.)	
Tow Hooks are installed with crescent end facing upstream. (Step 6, Page 33.)	
Anchor spacing, 121- 5/8" (TL-2), 224" (TL-3) between base plates of Front Cable Anchor and Compact Backstop. (Step 1, Page 23.)	
Cable Guides are seated flush on Mid-Support Assemblies. (Step 4, Page 29.)	
Cable Guide Torque 30 ft-lbf (48 N-m). (Step 4, Page 29.)	
Slider Panel lapping with "M" notch downstream side towards backstop. (Step 6, Page 31.)	
Slider Panels must overlap the preceding downstream panel on outside. (Step 6, Page 33.)	
Slider Shims are nested in the panel slots. (Step 6, Page 31.)	
Slider bolts are tightened. (Step 11, Page 40.)	
End Panel Mounts are parallel to the end panels with "U" cut out facing up-stream. (Step 2, Page 27.)	
End Panel Mount torque spec. 70 ft-lbf (95 N-m). (Step 2, Page 27.)	
Cables are torqued to 500 ft-lbf (680 N-m). No visible sagging. (Step 10, Page 39.)	
EACs are seated correctly on tabs. (Step 9, Page 36.)	
Text on the EACs are facing upward, two vent holes facing towards backstop. (Step 9, Page 36.)	
Anchor bolts torque to 120 ft-lbs (160 N-m). (Step 10, Page 37.)	

Item (Asphalt Installation)	Complete?
Rear Plate and Tie Channel are anchored flush to the foundation. (Step 1, Page 24.)	
For TL-3 systems Bays 6 & 7 have nested panels and stacked Slider Shims. (Step 6, Page 32.)	
Backstop Braces are anchored flush to the foundation. (Step 1, Page 26.)	
Crossmember is seated flush on top of Compact Backstop and Backstop Braces. (Step 1, Page 24.)	
Anchor bolts torqued to 5 ft-lbf (8 N-m). (Step 10, Page 38.)	
Cables torqued to 120 ft-lbf (160 N-m). (Step 10, Page 39.)	

Quadguard CZ

Valtir, LLC

NCHRP 350 Test Levels 2 & 3

Fully Redirective; Narrow

For current details on this system, refer to the Manufacturer's Assembly Manual:

https://www.valtir.com/wp-content/uploads/2023/04/115348.pdf

Additional Information

- Recommended tools for installation can be found on pages 15 and 16 of the Assembly Manual.
- Narrow System identification diagrams can be found on page 19 of the Assembly Manual.
- Wide System identification diagrams can be found on page 39 of the Assembly Manual.
- Maintenance and Repair information can be found on pages 58-60 of the Assembly Manual.

Final Inspection

Found on page 57 of the Assembly Manual.

Item	Complete?
Clearance of 30” minimum behind rear Fender Panels for movement.	
Proper Transition Panel is used for the type of barrier.	
Every borehole and slot in Backup and Monorail is utilized.	
Anchor stud(s) height is 1.5” or less above the pad.	
If no transition is used, narrow side panels are used with backup.	
Monorail guides are attached to the Diaphragms with shims.	
Mushroom Washer tabs lay flat within fender panel slots.	
Fender Panel nuts are bottomed out on Mushroom Washer bolt.	
Monorail End Cap Assembly in place.	
Cartridges are level and the same height in each Bay.	
Nose Cartridge is level.	
Fender Panel gap is 0.78” or less for Narrow systems.	
Fender Panel gap is 1” or less for Wide systems.	
Cartridge types are in properly placed in each Bay.	
Bolts and nuts are properly tightened throughout the system.	
Anchor nuts are torqued to adhesive manufacture specification.	
System is clear of debris.	

Quadguard Elite/ LMC

Valtir, LLC

NCHRP 350 Test Levels 2 & 3

Fully Redirective; Narrow and Wide

Severe Use; Narrow and Wide

For current details on this system, refer to the Manufacturer's Assembly Manual:

https://www.valtir.com/wp-content/uploads/2023/04/115269.pdf

Additional Information

- Recommended tools for installation can be found on pages 10 and 11 of the Assembly Manual.
- Narrow system configurations found on page 14 of the Assembly Manual.
- Wide system configurations found on page 33 of the Assembly Manual.
- Maintenance and repair information can be found on pages 52-57 of the Assembly Manual.

Final Inspection

Found on page 62 of the Assembly Manual.

Item	Complete?
Anchor nuts are torqued to adhesive manufacturer specification.	
Minimum clearance of 25” behind rear Fender Panels for movement.	
Proper Transition Panel is used for the type of barrier.	
If no transition is used, narrow side panels are used with backup.	
Every borehole and slot in Backup and Monorail is utilized.	
Monorail guides are attached to the Diaphragms with shims.	
Monorail End Cap Assembly in place.	
Mushroom Washers tabs lay flat within Fender Panel slots.	
Fender Panel gap is 0.78” or less for parallel systems.	
Fender Panel gap is 1” or less for flared systems.	
Bolts and nuts are properly tightened throughout the system.	
Anchor stud(s) height is 1.5” or less above the pad.	
Fender Panel nuts are bottomed out on Mushroom Washer bolt.	
Cylinder types are in properly placed and have cables attached.	
Chains are in all Bays except Bay 1 & 2 (48” unit has chains in Bay 1 & 2).	
System is clear of debris.	

QUEST

Valtir, LLC

NCHRP 350 Test Levels 2 & 3

Fully Redirective; Narrow

For current details on this system, refer to the Manufacturer's Assembly Manual:

https://www.valtir.com/wp-content/uploads/2023/04/115249.pdf

Additional Information

- Site Preparation Foundation instructions can be found on page 8 of the Assembly Manual.
- Recommended tools for installation can be found on pages 46 and 47 of the Assembly Manual.
- Maintenance and repair information can be found 54 and 55 of the Assembly Manual.

No Final Inspection Checklist Available

The Maintenance Checklists found on page 54 of the Assembly Manual are provided below.

Visual Drive-By Inspection (Monthly)	Complete?
Check to see if there is any evidence of an impact (deformed Nose or Side Panels). If so, a walk-up inspection will be necessary.	
Check to see that the surface under the system is clear of debris to ensure performance as tested.	
Note the location, condition of the QUEST® System, and the date of the visual drive-by inspection. Drive-by inspections are recommended on an as needed basis based upon traffic volume, site accident history, etc.	

Walk-Up Inspection (Concrete - Yearly) (Asphalt – Every 6 months)	Complete?
Clear and dispose of any debris on the site.	
Be sure all bolts are tight and rust-free.	
Be sure anchor bolts are securely anchored.	
Be sure the Shaper Rails are tensioned and rust-free.	
Check to see that the Trigger Bolts in the Front Anchor Assembly are intact.	
Check to see that the Support Frame Assembly has not engaged the Shaper Rails. Both Shapers must be over the forward-most part of the pre-crimped portion of the Shaper Rails.	
Check to see that the laminated straps at the Fender Panels are intact and connection points are assembled correctly.	
Check to make sure that the Diaphragm legs are on grade level and clear of debris.	
Note the location and condition of the QUEST® System for entry in the impact attenuator inspection logbook under the date of this inspection. Walk-up inspections are recommended on an as needed basis based upon traffic volume, site accident history, etc.	
Refer to Post-Impact Instructions found on page 55 for more information.	

REACT 350

Valtir, LLC

NCHRP 350 Test Levels 2 & 3

Fully Redirective; Narrow, Wide, and Resettable

Severe Use; Narrow and Wide

For current details on this system, refer to the Manufacturer's Assembly Manual:

https://www.valtir.com/wp-content/uploads/2023/04/115350.pdf

Additional Information

- Recommended tools for installation can be found on pages 10 and 11 of the Assembly Manual.
- Site Preparation/ Foundation information can be found on page 12 of the Assembly Manual.
- Maintenance and repair information can be found on pages 27-31 of the Assembly Manual.

Final Inspection

Found on page 28 of the Assembly Manual.

Item	Complete?
Appropriate transitions are in place and properly fitted.	
Every hole on the Base Track is fastened by an anchor.	
Each anchor is torqued to adhesive manufacturer specification.	
All cables are attached and tensioned.	
Ensure pre-assembled hardware fasteners have not loosened during shipment.	
Each Cylinder is properly positioned on Base Track.	
Clear all construction debris in and around system.	

REACT 350 II

Valtir, LLC

NCHRP 350 Test Level 3

Fully Redirective; Narrow and Resettable

Severe Use; Narrow

For current details on this system, refer to the Manufacturer's Product Description Assembly Manual: https://www.valtir.com/wp-content/uploads/2023/04/618083.pdf

Additional Information

- Foundation/ Anchoring information can be found on page 7 of the Product Description Assembly Manual.
- Recommended tools for installation can be found on pages 10 and 11 of the Product Description Assembly Manual.
- Maintenance and repair information can be found on pages 32-36 of the Product Description Assembly Manual.

Final Inspection

Found on page 34 of the Product Description Assembly Manual.

Item	Complete?
Each anchor is torqued to adhesive manufacturer specification.	
Every hole on the Base Track is fastened by an anchor.	
All cables are attached and tensioned.	
Appropriate transitions are in place and properly fitted.	
Ensure pre-assembled hardware fasteners have not loosened during shipment.	
Each Cylinder is properly positioned on Base Track.	
Clear all construction debris in and around system.	

HEART

Valtir, LLC

NCHRP 350 Test Level 3

Fully Redirective; Narrow and Resettable

Web access to the manufacturer provided manual is no longer available. Please email dot.bspewz@illinois.gov for a PDF version of the manual.

Additional Information

- A Suggested Tools list is provided on page 10 of the Product Description Assembly Manual for installation of the unit and page 21 for repairs to the unit.
- Site Preparation Instructions can be found on page 10 of the Product Description Assembly Manual.
- Installation Instructions can be found on pages 10-20 of the Product Description Assembly Manual.
- Repair Instructions can be found on pages 21-30 of the Product Description Assembly Manual.

No Final Inspection Checklist Available

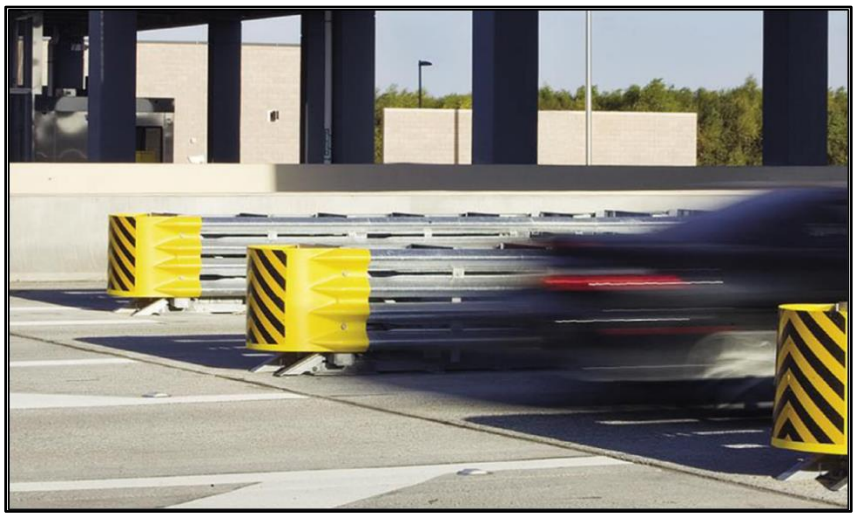
The HEART Repair Instructions can be found on pages 21-30 of the Product Description Assembly Manual.

HEART Repair Instructions

The Hybrid Energy Absorbing Reusable Terminal (HEART) is a Test Level 3 Bi-directional Crash Cushion. The HEART repair will depend on the severity of the impact. It will range from no repair to replacing 5/16-inch bolt to replacing Diaphragm or side panel. Minor side impacts could require no repair. End on impacts will require pulling the system back into place and replacing the Nose post bolt. On severe side impacts, there may be the need to replace a Diaphragm and/or side panel and in some cases, an anchor bolt or two.

Please navigate to the referenced pages in the Additional Information section on the previous page in the Product Description Assembly Manual.

TRACC



Valtir, LLC

NCHRP 350 Test Levels 2 & 3

Fully Redirective; Narrow and Wide

For current details on this system, refer to the Manufacturer's Product Description Assembly Manual:

https://www.valtir.com/wp-content/uploads/2023/04/620297.pdf

Additional Information

- Ensure the shipping plates have been removed from the system and the rip plates are in the correct sequence for proper compression.
- Recommended tools for installation can be found on pages 10 and 11 of the Product Description Assembly Manual.
- System configurations can be found on page 9 of the Product Description Assembly Manual.
- Maintenance and repair information can be found on pages 20-22 of the Product Description Assembly Manual.

No Final Inspection Checklist Available

The System Repair Checklist found on page 22 of the Product Description Assembly Manual is provided below.

Repair Checklist Item	Complete?
Replacing the TRACC® Rip Plates is a two-person job.	
Remove the Plastic Nose by removing the four bolts.	
Remove the first set of Fender Panels (4) (upper and lower) closest to the front of the collapsed system by removing bolts (4 bolts at upper Panel & 3 bolts at lower Panel on each side).	
Remove both pins holding Shredder Bolts in place in the Sled Assembly.	
Loosen and remove one rear bolt at each of the diagonally crossed flat bars located on the Sled Assembly.	
Swing each flat bar parallel to the side of the Sled Assembly, and the front bolts can be loosened slightly to allow the two bars to rotate outward.	
Slide the Sled Assembly all the way forward.	
Loosen and remove Doubler Plate bolts from the TRACC (3 bolts at each Doubler Plate).	
Remove all Doubler Plates at damaged Rip Plate locations.	
Remove exposed and damaged Rip Plates.	
Remove Shredder Bolts that may be wedged within damaged Rip Plates as the Shredder Bolts may need to be tapped loose with a hammer.	
Ensure correct replacement and sequence of Rip Plates by checking all part numbers and referring to appropriate Trinity drawings (p. 33 – 35).	
Insert new Rip Plates starting from the back.	
Re-attach the Doubler Plates on top of the Rip Plates.	
Tighten the whole assembly down with bolts (3 bolts at each Doubler Plate).	
Attach Rip Plate Shredder Bolts and crossed flat bars to the front assembly sled.	
Slide all Frames forward to equidistant positions behind the Sled Assembly.	
Ensure Fender Panels are not wedged or caught on any portion of the system when sliding Frames forward with or without Fender Panels attached.	
Once Frames are in place, re-attach remaining Fender Panels.	
Reattach / replace the Plastic Nose.	
Verify all bolts are in place and tight.	

QUADGUARD ELITE M10

Valtir, LLC

MASH Test Level 3

Fully Redirective; Narrow, Wide, and Resettable

Severe Use; Narrow and Wide

For current details on this system, refer to the Manufacturer's Product Manual:

https://www.valtir.com/wp-content/uploads/2022/10/QG-Elite-M10-24-620076.pdf

Narrow Configuration

For current details on this system, refer to the Manufacturer's Product Manual:

https://www.valtir.com/wp-content/uploads/2022/10/QG-Elite-M10-Wide-69-626821.pdf

Wide Configuration

Final Inspection

Found on page 41 of the Product Manual.

Item (Narrow Configuration)	Complete?
If no transition is used, narrow side panels are used with Backup	
Proper Transition Panel is used for the type of barrier	
Minimum clearance of 25” behind rear Fender Panels for movement	
Anchor nuts are torqued to 100 ft-lb	
Cylinder types are properly placed	
Every borehole and slot in Backup and Monorail is utilized	
Anchor stud(s) height is 1 1/2” [38 mm] or less above the pad	
Monorail guides are attached to the Diaphragms	
Monorail End Cap Assembly in place	
Fender Panel nuts are bottomed out on Mushroom Washer bolt	
Mushroom Washers tabs lay flat within Fender Panel slots	
Each Diaphragm and Backup Extension is attached	
Cylinders are bolted together and tight	
Bolts and nuts are properly tightened throughout the system	
Fender Panel gap is 0.78” or less for Narrow systems	
Nose Cylinder is level	
System is clear of debris	

Found on page 37 of the Product Manual.

Item (Wide Configuration)	Complete?
Proper Transition Panel is used for barrier type	
If no transition is used, side panels are used with backup	
Minimum clearance of 25” behind rear Fender Panels for movement	
Anchor nuts are torqued to adhesive manufacturer’s specification	
Cylinder types are properly placed	
Every borehole and slot in Backup and Monorail is utilized	
Anchor stud(s) height is 1 1/2” [38 mm]or less above the pad	
Monorail guides are attached to the Diaphragms	
Cylinder Segments are fastened on each side of the 1st Diaphragm	
Monorail End Cap Assembly in place	
Mushroom Washer Assembly nuts must be tightened to the bolt shank	
Mushroom Washers tabs lay flat within Fender Panel slots	
Belt Nose Assembly and is 32” above grade	
Fender Panel gap is 1.0” [25 mm] or less for Wide systems	
Bolts and nuts are properly tightened throughout the system	
System is clear of debris	

REACT M

Valtir, LLC

MASH Test Level 3

Fully Redirective; Narrow and Resettable

Severe Use; Narrow

For current details on this system, refer to the Manufacturer's Product Manual: https://www.valtir.com/wp-content/uploads/2022/10/REACT-626195-M-.pdf

Additional Information

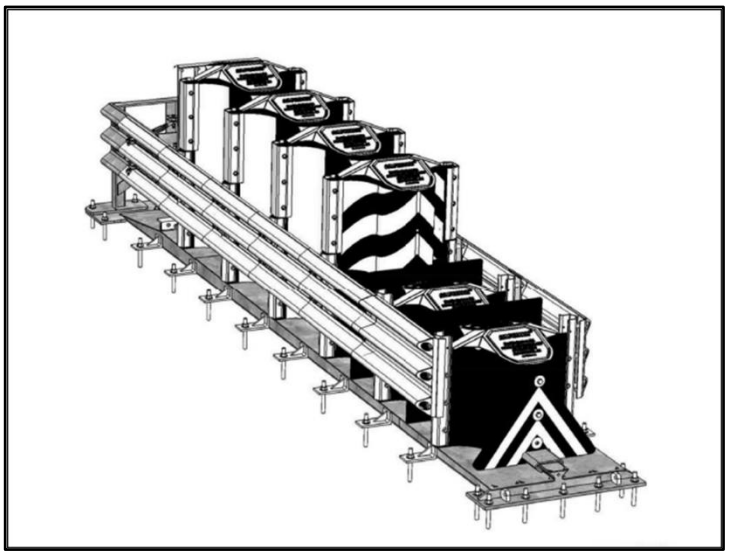
- Recommended tools for installation can be found on pages 14 and 15 of the Product Manual.
- Site Preparation/ Foundation information can be found on page 16 of the Product Manual.
- Maintenance and repair information can be found on pages 26-34 of the Product Manual.

Final Inspection

Found on page 25 of the Product Manual.

Item	Complete?
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 adhesive manufacturer specification.	
All cables are attached and properly tensioned.	
All fasteners are properly tightened.	
Each Cylinder is properly positioned on Base Track.	
Appropriate Nose Cover is attached.	
Side reflectors, if required, are attached.	
Remove all construction debris in and around the system.	

COMPRESSOR



TrafFix Devices

NCHRP 350 Test Level 3

Fully Redirective; Narrow and Resettable

Severe Use; Narrow

Web access to the manufacturer provided manual is no longer available. Please email dot.bspewz@illinois.gov for a PDF version of the manual.

Additional Information

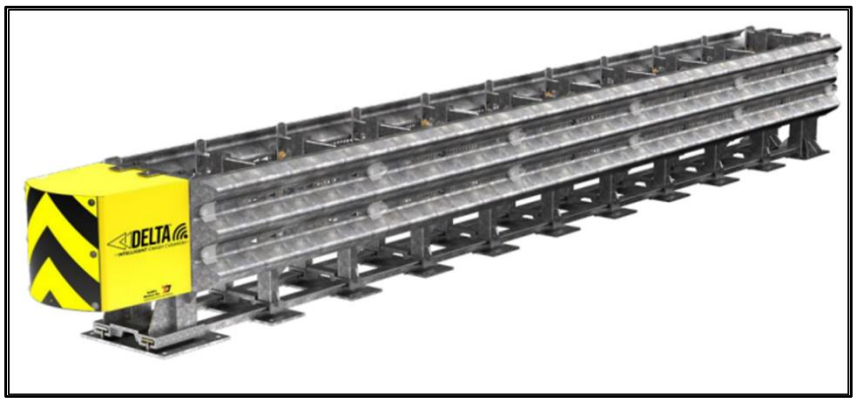
- A General System Overview can be found on page 1 of the Installation Manual.
- Tools and Equipment for Concrete Installation can be found on page 4 of the Installation Manual.
- Concrete pad requirements can be found on page 5 of the Installation Manual.
- Information on lifting and moving the unit can be found on page 8 of the Installation Manual.
- The Installation Section can be found on page 12 of the Installation Manual.

No Final Inspection Checklist Available

The Post Impact Inspection Checklist found on page 20 of the Installation Manual is provided below.

Item	Complete?
Clean and remove debris from Compressor.	
Inspect for complete rebound of attenuator.	
Inspect fender panels. Check for damage or distortion to the fender panels. Check that all attachment hardware is in place, secure any undamaged.	
Inspect attenuator anchoring. Check anchor bolts for damage. Check anchor bolts for proper torque. Check concrete pad for damage or cracking.	
Inspect plastic module elements. Check the modules for cracks, gouges, distortion. Verify the modules are positioned properly on the dovetail of the base.	
Inspect condition of Uni-base platform. Check deck surface for damage. Check dovetail rail for damage. Check backstop for damage.	
Inspect all fasteners and hardware on the Compressor. Check module bolts. Check fender panel hardware. Check retaining plate hardware.	
Inspect cover. Check for tears and damage. Check attachment points are secure. Check all shock cords are in place, and secure.	
Inspect Transition. Check for bent or damaged components. Check for damaged or loose fasteners. Check for secure attachment to protected element. Check / adjust tension of fender panel turnbuckles.	

Delta Crash Cushion



TrafFix Devices

MASH Test Level 3

Fully Redirective; Narrow

For current details on this system, refer to the Manufacturer's Installation Guide:

https://www.traffixdevices.com/docs/attenuators/delta/traffix-delta-tl3_manual-b1.pdf

Additional Information

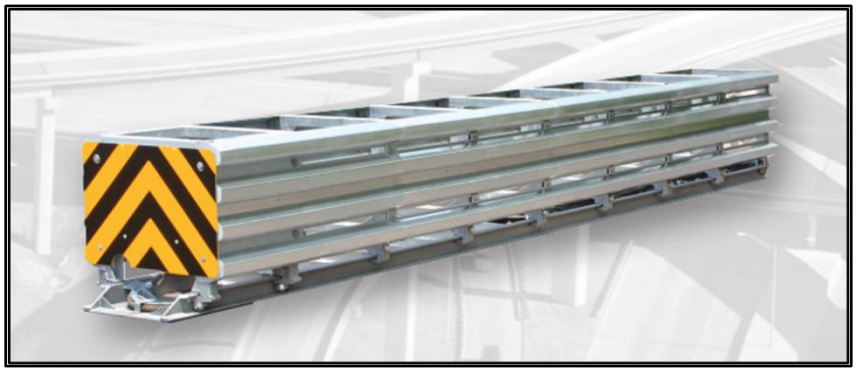
- Required tools for installation on pages 16 and 17 of the Installation Guide.
- Installation Instructions can be found on pages 18-28 of the Installation Guide.
- Maintenance information can be found on page 32 of the Installation Guide.

Final Inspection

Found on page 31 of the Installation Guide.

Item	Complete?
39 anchor bolts are installed.	
39 anchor bolts do not exceed .5 in (13 mm) past anchor nut.	
39 Anchor Bolts are Properly Torqued. Concrete Installations 100 ft- lbs (135 Nm). Asphalt Installations 10 ft-lbs (14 Nm).	
All Diaphragms are Spaced 22.25” ± 1”. If Spacing Falls out of Spec the Diaphragms with the Sacrificial Hardware shall be Adjusted.	
Rear Fender Panels can Telescope Rearward 35” (889 mm) without Obstruction.	
All Wing Washers are the Correct Orientation.	
Check all Factory Hardware.	
Front Attenuation Module is Installed with 4 Fasteners.	
Front Attenuation Module has Proper Sheeting for the Site.	
All Tools and Debris are Cleared from Delta.	
Serial Numbers have been Documented.	

SCI70GM and SCI100GM



Hill & Smith Inc.

MASH Test Levels 2 & 3

NCHRP 350 Test Levels 2 & 3

Fully Redirective; Narrow, Wide, and Resettable

For current details on this system, refer to the Manufacturer's Design, Installation, and Maintenance Manual:

https://hillandsmith.com/wp-content/uploads/2019/04/Smart-Cushion-Installation-Manual-2019.pdf

Additional Information

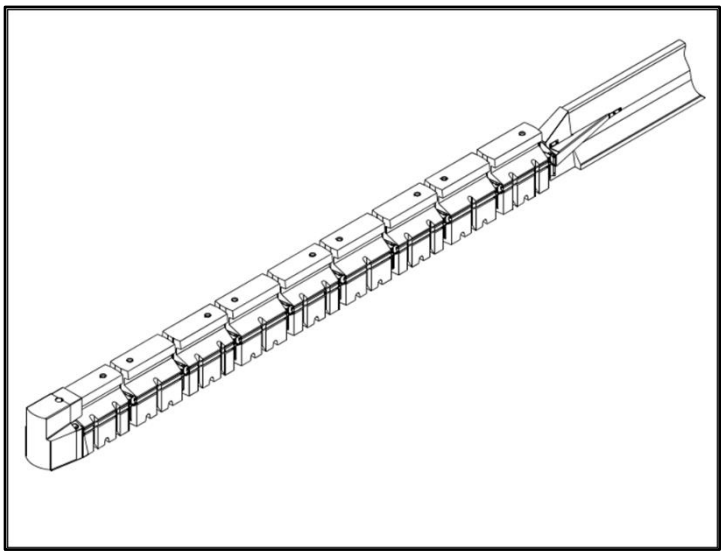
- A required equipment list for installation can be found on page 14 of the Design, Installation, and Maintenance Manual (Appendix B).
- Information on resetting the attenuator after an impact can be found on pages 8-12 of the Design, Installation, and Maintenance Manual.
- Periodic Maintenance information can be found on page 12 of the Design, Installation and Maintenance Manual.

Final Inspection

Found on page 8 of the Design, Installation, and Maintenance Manual.

Item	Complete?
The anchor bolts have been tightened to the proper torque value.	
The SMART CUSHION is not distorted in any way (might happen due to the unit being secured to a foundation which is not a flat plane).	
The front section is pulled out to within 1 inch of the front stop bolts and no part of the unit has been damaged by shipping and handling.	
All assembly bolts are tight and have not come loose during shipping or installation.	
No tools or other equipment have been left within the SMART CUSHION structure.	

ABSORB 350



Lindsay Transportation Solutions

NCHRP 350 Test Levels 2 & 3

Non-redirective

Non-redirective; Narrow

For current details on this system, refer to the Manufacturer's Installation and Maintenance Manual:

https://lindsay.guide/SharedUploads/ProductGuideFiles/file_6b3ebbe4-5f37-4240-b611-04606633e075.pdf

Additional Information

- Required tools for installation can be found on page 3 of the Installation and Maintenance Manual.
- A configuration chart can be found on page 11 of the Installation and Maintenance Manual.
- Maintenance information can be found on pages 17-22 of the Installation and Maintenance Manual.
- Post Impact Inspection instructions can be found on page 22 of the Installation and Maintenance Manual.

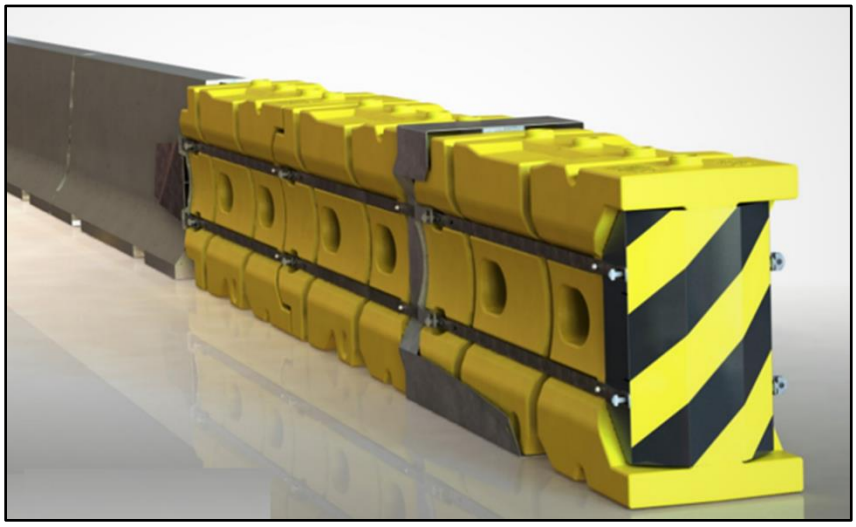
No Final Inspection Checklist Available

The Maintenance Checklists found on pages 21 and 22 of the Installation and Maintenance Manual are provided below.

Visual Drive-By Inspection (Monthly)	Complete?
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.	
Make sure that all of the elements are present and that there is no debris lodged between the elements (tires, garbage, etc.).	
Look for tire or paint marks on front, side, and transition.	
Look for transition damage.	
If delineation has been applied to the nose cover, make sure that it is still properly applied and visible.	
If the system appears to have been impacted in any way (scrapes, paint marks, etc.) a Hands-On inspection should be made.	

Hands-On Inspection (Yearly)	Complete?
Check that all of the elements are straight.	
Check in the spaces between the Energy Absorbing Elements (EAEs) to remove any debris that may have accumulated.	
Check the water level in the elements. The water should be within 2” of the top of the element. **THERE SHOULD BE NO WATER IN THE ELEMENTS ATTACHED TO THE NOSE PIECE.**	
Check the condition of and the placement of all Energy Absorbing Elements. Replace any damaged Cartridges. Refer to the chart in Appendix “B” for proper placement.	

ABSORB-M



Lindsay Transportation Solutions

MASH Test Levels 2 & 3

Non-redirective

Non-redirective; Narrow

For current details on this system, refer to the Manufacturer's Product Manual:

https://lindsay.guide/SharedUploads/ProductGuideFiles/file_2fef6dbf-0b91-4b20-ab7e-daad38b31881.pdf

Additional Information

- Recommended tools for installation can be found on page 7 of the Product Manual.
- Foundation information can be found on page 11 of the Product Manual.
- Configuration Details can be found on page 15 of the Product Manual.
- Maintenance information can be found on pages 29 and 30 of the Product Manual.

Final Inspection

Found on page 29 of the Product Manual.

Item	Complete?
Midnose is under the front Element, connected by two (2) pins, and attached to the next element by two (2) Pins.	
Nose Plate is attached to front Element by two (2) Pins.	
Middle and rear Elements connected by two (2) Pins (TL-3 only.)	
Rear Element connected to Transition and both Transition Straps by two (2) Pins.	
Transition Straps secured to the Transition Barrier with at least three (3) Anchors on each side.	
Anchors torqued to 60 ft-lbf [80 N-m].	
Front Element empty.	
Rear Element(s) full of water.	
Plug at drain ports fully seated and secure with no sign of leakage.	
Caps at fill ports are fully seated.	
Anti-freeze solution applied in accordance with manufacturer's specifications (cold weather applications only.)	

UNIVERSAL MODULE SYSTEMS

Valtir, LLC

NCHRP 350 Test Level 3

Non-redirective

For current details on this system, refer to the Manufacturer's Assembly and Maintenance Manual:

https://www.valtir.com/wp-content/uploads/2023/08/619488-ENERGITE-III-Fitch-AM.pdf

Additional Information

- Recommended tools for installation can be found on page 9 of the Assembly and Maintenance Manual.
- Site Preparation/ Foundation information can be found on page 10 of the Assembly and Maintenance Manual.
- Assembly information can be found on pages 11-15 of the Assembly and Maintenance Manual.
- Maintenance information can be found on pages 16-19 of the Assembly and Maintenance Manual.

Final Inspection

Found on page 16 of the Assembly and Maintenance Manual.

Item	Complete?
Verify that the system has been assembled according to the array specifications provided by the qualified engineer. Be sure all modules are in their proper locations.	
Verify that the lids are securely fastened and not missing or ajar.	
Clean up any debris around the system that could cause ramping.	

CRASHGARD SAND BARREL SYSTEM

Plastic Safety Systems, Inc.

MASH Test Level 3

NCHRP 350 Test Level 3

Non-redirective

For current details on this system, refer to the Manufacturer's System Product Guide:

https://pss-innovations.com/getmedia/8e1dd2aa-4409-4462-bdef-deccd8a9944e/Crashgard-12-27-2018-Update_1.pdf

Additional Information

- MASH testing information can be found on page 5 of the System Product Guide.
- Installation instructions can be found on pages 11-13 of the System Product Guide.
- Lifting instructions can be found on pages 14-16 of the System Product Guide.
- Design arrays can be found on pages 17-19 of the System Product Guide.

No Final Inspection Checklist Available

Please navigate to the referenced pages in the Additional Information section on the previous page in the System Product Guide.

BIG SANDY SAND BARRELS

TrafFix Devices, Inc.

MASH Test Level 3

Non-redirective

For current details on this system, refer to the Manufacturer's Installation Procedure Manual:

https://www.traffixdevices.com/docs/attenuators/big-sandy/traffix-big-sandy_manual_rev-a1.pdf

Additional Information

- Recommended tools for installation can be found on page 8 of the Installation Procedure Manual.
- Sand Recommendations can be found on page 9 of the Installation Procedure Manual.
- 200 lbs., 400 lbs., and 700 lbs. installation instructions can be found on page 10 of the Installation Procedure Manual.
- 1400 lbs. & 2100 lbs. installation instructions can be found on page 11 of the Installation Procedure Manual.
- Sand array configuration charts can be found on page 13 of the Installation Procedure Manual.

No Final Inspection Checklist Available

Please navigate to the referenced pages in the Additional Information section on the previous page in the Installation Procedure Manual.

SENTRY LONGITUDINAL ENERGY DISSIPATER

TrafFix Devices, Inc.

MASH Test Level 3

Non-redirective

Non-redirective; Narrow

For current details on this system, refer to the Manufacturer's Installation Procedure Manual:

https://www.traffixdevices.com/docs/attenuators/sled-us/traffix-sled_mash-manual.pdf

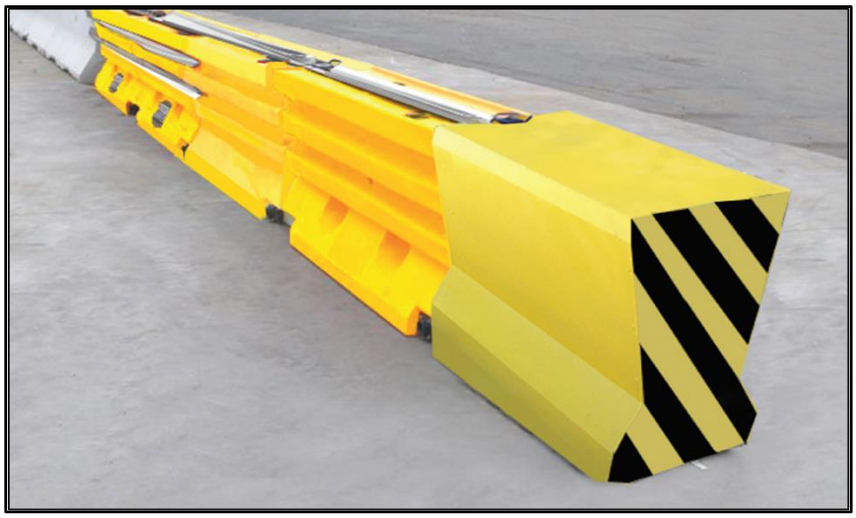
Additional Information

- Installation configurations can be found on page 14 of the Installation Procedure Manual.
- Water Freezing Prevention information can be found on page 16 of the Installation Procedure Manual.
- Recommended tools for installation can be found on page 19 of the Installation Procedure Manual.
- Installation procedures can be found on pages 20-31 of the Installation Procedure Manual.

No Final Inspection Checklist Available

Please navigate to the referenced pages in the Additional Information section on the previous page in the Installation Procedure Manual.

ACZ 350 SYSTEM



Valtir, LLC

NCHRP 350 Test Levels 2 & 3

Non-redirective; Narrow

Web access to the manufacturer provided manual is no longer available. Please email dot.bspewz@illinois.gov for a PDF version of the manual.

Additional Information

- Recommended Tools for assembly can be found on page 13 of the Product Description Assembly Manual.
- Assembly instructions can be found on pages 13-31 of the Product Description Assembly Manual.
- Information on converting the system to different test levels can be found on pages 32-33 of the Product Description Assembly Manual.
- Maintenance and Repair information can be found on pages 35-39 of the Product Description Assembly Manual.

Final Inspection

Found on page 34 of the Product Description Assembly Manual.

Item	Complete?
Check the assembly to ensure that all sections are properly aligned, full of water ballast, and not leaking.	
All fill level indicators should be up. If any are not up, check to see if the Retaining Decals for shipment are still in place, and, if they are, remove them.	
Make sure that all steel stiffeners and side straps are present, and all pins are securely inserted.	
If for any reason a section needs replacement, refer to the Maintenance and Repair section of this Manual on Page 35.	

SECTION 706. IMPACT ATTENUATORS, TEMPORARY

706.01 Description. This work shall consist of furnishing, installing, maintaining, and removing temporary impact attenuators of the category and test level specified.

706.02 Materials. Materials shall be according to the impact attenuator manufacturer's specifications and the following:

	Item	Article/Section
(a)	Fine Aggregate (Note 1)	1003.01
(b)	Steel Posts, Structural Shapes, and Plates	1006.04
(c)	Rail Elements, End Section Plates, and Splice Plates	1006.25
(d)	Bolts, Nuts, Washers and Hardware	1006.25
(e)	Hollow Structural Tubing	1006.27(b)
(f)	Wood Posts and Wood Blockouts	1007.01, 1007.02, 1007.06
(g)	Preservative Treatment	1007.12
(h)	Packaged, Dry, Rapid Hardening Mortar or Concrete	1018

Note 1. Fine aggregate shall be FA 1 or FA 2, Class A quality. The sand shall be unbagged and shall have a maximum moisture content of five percent.

Construction Requirements

706.03 General. Impact attenuators shall meet the testing criteria contained in either the National Cooperative Highway Research Program (NCHRP) Report 350 or MASH and shall be on the Department's qualified product list.

706.04 Installation. Impact attenuators shall be installed according to the manufacturer's specifications and include all necessary transitions between the impact attenuator and the item to which it is attached. Regrading of slopes or approaches for the installation shall be as shown on the plans.

Attenuator bases, when required by the manufacturer, shall be constructed on a prepared subgrade according to the manufacturer's specifications. The surface of the base shall be slightly sloped or crowned to facilitate drainage.

When water filled attenuators are used between November 1 and April 15, they shall contain anti-freeze according to the manufacturer's recommendations.

706.05 Markings. Sand module impact attenuators shall be striped with alternating reflectorized Type AA or Type AP fluorescent orange and reflectorized white horizontal, circumferential stripes. There shall be at least two of each stripe on each module.

Other types of impact attenuators shall have a terminal marker applied to their nose and reflectors along their sides.

706.06 Maintenance. All maintenance of the impact attenuators shall be the responsibility of the Contractor until removal is directed by the Engineer.

706.07 Relocate. When relocation of temporary impact attenuators is specified, they shall be removed, relocated, and reinstalled at the new location. The reinstallation requirements shall be the same as those for a new installation.

706.08 Removal. Surplus material shall be disposed of according to Article 202.03. Anti-freeze, when present, shall be disposed of/recycled according to local ordinances.

When impact attenuators have been anchored to the pavement, the anchor holes shall be repaired with rapid set mortar; only enough water to permit placement and consolidation by rodding shall be used and the material shall be struck-off flush.

706.09 Method of Measurement. This work will be measured for payment as each, where each is defined as one complete installation.

706.10 Basis of Payment. This work will be paid for at the contract unit price per each for IMPACT ATTENUATORS, TEMPORARY (FULLY REDIRECTIVE, NARROW); IMPACT ATTENUATORS, TEMPORARY (FULLY REDIRECTIVE, WIDE); IMPACT ATTENUATORS, TEMPORARY (FULLY REDIRECTIVE, RESETTABLE); IMPACT ATTENUATORS, TEMPORARY (SEVERE USE, NARROW); IMPACT ATTENUATORS, TEMPORARY (SEVERE USE, WIDE); IMPACT ATTENUATORS, TEMPORARY (NON-REDIRECTIVE); or IMPACT ATTENUATORS, TEMPORARY (NON-REDIRECTIVE, NARROW); of the test level specified.

Relocation of the devices will be paid for at the contract unit price per each for IMPACT ATTENUATORS, RELOCATE (FULLY REDIRECTIVE); IMPACT ATTENUATORS, RELOCATE (SEVERE USE); or IMPACT ATTENUATORS, RELOCATE (NON-REDIRECTIVE); of the test level specified.

Regrading of slopes or approaches will be paid for according to Section 202 and/or Section 204 of the Standard Specifications.