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| **SUPERSEDED** BY EI 01-026 EFFECTIVE 7/11/02<br>MODIFIED BY EI 99-032 EFFECTIVE 5/4/00 | | *New York State Department of Transportation*<br>**ENGINEERING INSTRUCTION** | **EI 98-028** |

Title: **QUADGUARD REDIRECTIVE IMPACT ATTENUATOR**

Distribution:

- ☐ Manufacturers (18)
- ☒ Main Office (30)
- ☐ Local Govt. (31)
- ☒ Regions/Agencies (32)
- ☐ Surveyors (33)
- ☒ Consultants (34)
- ☐ Contractors (39)
- ☐ _____( )

Approved:

R. Dennison, Deputy Chief Engineer, Design Division — Date: 5/7/98

**ADMINISTRATIVE INFORMATION**. This instruction becomes effective with the letting of November 19, 1998. The device described and the transmitted specifications may be used sooner. No instructions or bulletins are superseded. Some special specifications, under which some earlier impact attenuators have been obtained, are made obsolete by the specifications transmitted hereby.

**SUPERSEDED SPECIFICATIONS**. US customary unit specifications superseded: 11654.1701-11654.1708; 06654.4103; 10654.4103XX; 03654.4106; 25654.4123; 03654.71; 08654.71; 11654.81; 11654.8101-11654.8110. Metric specifications superseded: 10654.4103XX M; 05654.8101 M.

**PURPOSE.** To issue specifications and design information for permanent applications of the Quadguard, a redirective impact attenuator manufactured by Energy Absorption, Inc. Temporary applications will be treated separately.

**TRANSMITTED MATERIAL**. Special Specifications for the Quadguard as indicated below:

| | | |
|---|---|---|
| 15654.04XXYY | Quadguard Terminal Impact Attenuator, XX Inches Wide, YY Bays | Each |
| 15654.04XXYY M | Quadguard Terminal Impact Attenuator, XX Width Class, YY Bays | Each |

*where: In the english unit system, XX is the width of these units, in inches, measured at the back of the unit, and YY is the number of bays in the completed unit. The pay item numbers created for the english unit specifications are retained in the metric system for units of the same physical dimensions. The resulting numbering system coincides with the product numbering system adopted by the manufacturer.*

No drawings are transmitted. Because of the variety of installation conditions which may be encountered at the site, the manufacturer and vendor prefer to continue to prepare shop drawings showing all of the details needed at the particular sites. This service is part of the price of the unit. Considerable design, maintenance, and installation information, however, may be found in manuals which are under development and will be made available.

**BACKGROUND**. The Guard Rail Energy Absorbing Terminal (GREAT), predecessor of the QuadGuard, has been used for some time in Department projects to shield narrow objects at locations where guide rails are not practical. In some cases, they have also been used for median barrier end terminals. The GREAT is mentioned in the Highway Design Manual in §10.2.6 and §10.2.6.4. It is an energy absorbing device fabricated from thrie beam guide rail beams and hex foam cartridges that crush on impact, thereby absorbing the energy of the impacting vehicle.

The Hex Foam Sandwich System has also been used for some time in Department work to protect objects up to 2.29 meters wide. This system is discussed in §10.2.6.3 of the Highway Design Manual.

The manufacturer of these devices ( the GREAT and the Hex Foam Sandwich System) has developed an alternative system. It is the manufacturer's intent that this system, the Quadguard, replace the earlier GREAT system as their standard narrow redirective impact attenuator and also replace the Hex Foam Sandwich System as their standard wide redirective impact attenuator for objects up to 2.29 meters wide. The Quadguard is available in five widths and up to 12 different lengths[1]. With six or more bays, the Quadguard is rated as a NCHRP 350 "Test Level 3" device. This means the units

[1] Several of the available lengths are rated by the manufacturer as performing satisfactorily in the same speed ranges as shorter, and presumably, less expensive units. We have not coded pay items for these less efficient lengths.

can be used on all facilities if the right number of "bays"is specified.

Because of the recent interpretation of the federal rule that only NCHRP 350 qualified devices may be install the National Highway System in projects advertised after 9-30-98, or under force account procedures after that date regardless of letting, the GREATs and the Hex Foam Sandwich System will not be acceptable at some point in the future. Quadguards, on the other hand, will be acceptable for installation beyond that date in accordance with the federal rule.

Quadguards with widths of 610mm (24"), 760mm (30"), or 915 mm (36") have the same "footprint" as the GREATs of those widths, and may be substituted for GREATs of these widths on contracts by order-on-contract at no additional costs and without rebate.

The QuadGuards with 1750 mm(69") or 2285 mm (96") widths may be substituted for Hex Foam Sandwich System of those widths by O.O.C. at no additional cost to the State & without rebate. *Note, however, that the thicknesses of the reinforced concrete slabs used with the Quadguards are a minimum of 150 mm thick versus the minimum 100 mm thick concrete slab used with the Hex Foam Sandwich System. Reinforcement details are different as well.*

Quadguards may be used to protect one way approaching traffic and, with the appropriate transition piece, may also be used in two-way traffic situations. Five of these transition pieces are available. These are for: 1) Concrete Jersey Barrier, 2) Corrugated W-rail, 3) Thrie Beam, 4) Vertical Surfaces, and 5) Single Slope Barrier.

**LAYOUT INFORMATION.** The table below contains the number of Quadguard bays required for the various speeds, physical dimensions, and cost information. This information has been taken from the Quadguard Design Manual and communications with the vendor.

Number of bay, various physical dimensions, and estimated costs of unit.

| IMPACT SPEED (km/h/mph) | NO. OF BAYS | UNIT LENGTH METERS | EFFECT. LENGTH METERS | PAD LENGTH METERS | COST OF UNIT .61,76, .92 m | COST OF UNIT 1.76, 2.29 m | COST OF CONC. PAD |
|---|---|---|---|---|---|---|---|
| 70/45 | 3 | 4.00 | 3.57 | 3.66 | $11,500 | $13,000 | $750 |
| 80/50 | 4 | 4.91 | 4.49 | 4.57 | 14,000 | 15,500 | 800 |
| 90/55 | 5 | 5.83 | 5.40 | 5.49 | 16,000 | 17,500 | 900 |
| 100/60 | 6 | 6.74 | 6.32 | 6.40 | 18,000 | 19,500 | 1000 |
| 110/70 | 9 | 9.49 | 9.06 | 9.14 | 24,000 | 25,500 | 1200 |

Costs in this table are based on concrete costs of $294 per CY, $0.94 per pound for reinforcing steel. Cost of units includes parts and installation costs by subcontractor and $1000 contractor markup for the prime contractor. The nose piece is not considered a bay. Impact speed is preferably the design speed for the highway, but should not be less than the posted speed.

**USAGE.** Quadguards may be included in contracts or considered as substitutes for the GREATs or for the Hex Foam Sandwich System[2] by order-on-contract, without rebate or additional cost to the State, if requested by the Contractor. After the effective date of this instruction, Quadguards shall be included in the PS & Es, instead of the GREATs or Hex Foam Sandwich Systems, when these type devices are desired. The number of bays shall be selected from the table above, based on impact speed. The width of the unit, measured at the back of the unit near the protected object, shall be not less than the width of the protected object.

QuadGuards are especially warranted when the end of a narrow object is to be shielded and the width available at the site is very limited.

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2 Provided proper pad is provided or available.

Quadguards intended for permanent application[3] shall be installed on reinforced[4] concrete pads 1.22 m wide and 150 mm thick minimum, on existing reinforced concrete that thick and in good condition, or on unreinforced concrete 200 mm minimum thickness. Should such a foundation not be available, one must be built. Avoid crossing working cracks or joints as special anchoring hardware will be required. If working joints or cracks cannot be avoided, contact either the manufacturer or vendor with joint/crack location and movement information for assistance with design as needed. Either steel tension strut back-up structures or concrete back-up structures are required. The specifications indicate that steel tension strut back-up structures may be used in all applications. The specifications also indicate that, with the approval of the Engineer, concrete back-up structure may be used at the contractor's option.

Curbs and islands higher than 100 mm should be removed. Mountable curbs and islands 100 mm or lower may be retained if they are needed to collect and control pavement runoff, but otherwise even they should be removed from the back of the unit to a point fifteen meters (15 m) in advance of the nose of the unit. New curbings,of any height, are not to installed within the above described limits.

Cross slopes steeper than 8% and changes in the rate of cross slope (twist) greater than 2% from front to back of slab are to be avoided. If encountered, they should be corrected by means of leveling or grading.

**IMPLEMENTATION.** The attached pay items are main office inserts.

Certain information should be shown on the plans. This information would include a plan view showing the unit, its concrete pad or notes that the existing foundation at the site is to be used for foundation, the locations of any drainage structures, utility information, expansion joints, working cracks, edges of pavements, curbing or islands, and identifying any special transitions required between the Quadguard and the protected object.

If QuadGuards are to be attached to concrete barrier, the concrete barrier should be embedded and reinforced over the first 2.50 m from the Quadguard. Bar reinforcement, consisting of # 13 epoxy coated bars at 200 mm c/c each-way, is required. Twelve (12) Type A Typical Stirrups from the Standard Sheets, spaced 200 mm on centers, will provide the vertical reinforcement in both faces. Six (6) straight bars 2.50 m long replace the four (4) 600 mm long dowels shown on the standard sheets. These would be spaced at 200 mm to provide the horizontal reinforcement.

**VENDOR INFORMATION.** The Quadguard is vended in New York State by Transpo Industries. (914) 636-1000.

**CONTACT PERSON.** Larry Brown of DQAB at (518) 457-4093.

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[3] There are temporary Quadguards for use in the construction work zones. These will be covered separately.

[4] Reinforcement must be equal to or exceed number 16 rebar @ 200

## ITEM 15654.04XXYY QUADGUARD TERMINAL IMPACT ATTENUATOR

**DESCRIPTION.** The contractor shall furnish and install QuadGuard Terminal Impact Attenuators at the locations shown on the plans or directed by the Engineer in accordance with these specifications, the approved Shop Drawings, and the directions of the Engineer.

**MATERIALS** QuadGuard Terminal Impact Attenuators shall be manufactured by Energy Absorption Systems, Inc. of Chicago, Illinois or they shall be a terminal determined by the Regional Director to be equal thereto and be approved by the Deputy Chief Engineer, Design Division.

Each QuadGuard Terminal Impact Attenuator shall contain all external and internal parts necessary to give satisfactory service at the indicated site. QuadGuard Terminal Impact Attenuator component parts shall meet the following requirements:

A. **Cartridges**. The cartridge boxes shall be Type I and Type II cartridge boxes and shall be of the number and arrangement required by the Manufacturer for the intended application. Cartridge boxes shall be manufactured from a weather resistant plastic material. Type I cartridges shall contain paper honeycomb material. Type II cartridges shall contain steel honeycomb material which shall be coated to minimize the effects of corrosion.

B. **Cartridge Brackets.** Each bay shall be equipped with cartridge brackets.

C. **Diaphragms.** Diaphragms shall be made from 10 gage ASTM A 36 steel Quadruple corrugated beam. The length of each diaphragm shall be as required for each application. Two support legs shall be welded to a channel which, in turn, shall be welded to the quadruple corrugated beam. Ski shaped plates shall be welded to the bottom of the support legs. The diaphragms shall be designed to lock onto, and be guided by, an anchored and mounted center monorail support structure.

After fabrication, the diaphragms shall be hot dipped galvanized in accordance with ASTM A123.

D. **Fender Panels**. Fender panels shall be fabricated from 10 gage steel quadruple corrugated beam guide rail sections. Each fender panel shall be drilled and slotted so that when assembled in the field, the front end shall be bolted to a diaphragm by means of the three horizontally placed 5/8 inch bolts, one of which shall be a "mushroom bolt." The back end of each quadruple corrugated beam fender panel shall overlap and be connected to the fender panel of the next bay by means of mushroom bolts, which fit through the long horizontal slot in the forward fender panel and the short vertical slot in the overlapped fender panel. (The bolt shall have a nut and square washer on the inside.) This permits movement, front to back, of one set of fender panels relative to the panels in the following bay.

E. **Monorail Assembly.** The monorail assembly shall be fabricated to the dimensions shown on the plans.

F. **Tension Strut Back-up**. If a concrete back-up structure is <u>not</u> to be provided, then a tension strut back-up assembly shall be provided. The details of this assembly shall be as indicated in the plans.

G. **Nose Cover**. The nose cover shall be made from a high density polyethylene plastic material of the color indicated in the plans or directed by the Engineer.

H. **Metal Work**. All metal work, except transition panels, shall be fabricated from either M1020 Merchant Quality or ASTM A36 steel. After fabrication, all metal work shall be hot dip galvanized in accordance with ASTM A123. Welding shall be in accordance with the New York State Steel Construction Manual.

I. **Fasteners**. All bolts used within the QuadGuard Terminal Impact Attenuator shall be American Standard Regular Bolts, unless indicated otherwise in the Plans. Anchor bolts shall be ASTM A193 grade B7 grouted into the concrete slab with polyester grout.

J. **Concrete.** Concrete for back-up walls and pad shall meet the requirements of Sections 501 and 555 of the Standard Specifications for Class A concrete.

K. **Reinforcing Steel.** Reinforcing steel shall conform to §709-04 Epoxy Coated Bar Reinforcement, Grade 60.

L. **Transition Panels.** Transition panels shall be fabricated from steel conforming to ASTM A36, hot dip galvanized in accordance with ASTM A123. Five standard transition panels shall be available. These shall be: QuadGuard to Jersey Barrier; QuadGuard to W-rail Corrugated Beam; QuadGuard to Thrie Beam; and QuadGuard End Shoe(for vertical surfaces); and QuadGuard to Single Slope Concrete Barrier.

**Reflectorization.** Reflectorization, consisting of Class B (High Intensity) sheeting conforming to §730-05 directly applied to aluminum sheeting, shall be affixed to the nose piece of the QuadGuard in a manner satisfactory to the engineer. Aluminum sheeting shall be 6061T6, 0.032" thick. The pattern and color of the reflectorization shall be as indicated on the plans.

If no pattern is provided, the pattern shall be approximately square, 18 inches on a side. Whenever traffic is allowed to pass on both sides of the unit, the pattern shall be chevrons formed with alternating four inch (4") reflectorized stripes and black opaque non-reflectorized stripes. When traffic will be permitted on only one side, the pattern shall be diagonal four inch (4") stripes, downward pointing to the side traffic is to be permitted, formed as indicated above.

If no color is given, color shall be yellow.

**Acceptance.** QuadGuard Terminal Impact Attenuator will be accepted on the basis of conformance of the QuadGuard Terminal Impact Attenuator with the approved Shop Drawings and the manufacturer's certificate of compliance with these specifications.

**CONSTRUCTION DETAILS** Prior to ordering any materials required under this item, the Contractor shall submit two copies of the shop drawings to the Engineer for approval. Shop drawings shall show supports, connections, miscellaneous parts, concrete back-up walls or steel back-up plates, and anchorages not detailed in the plans but necessary to develop the full potential of the QuadGuard Terminal Impact Attenuator. In addition to the above, the Contractor shall deliver to the Engineer two (2) copies of Design Manuals, Installation Manuals, and Maintenance Manuals prepared for the product. The Contractor shall install the QuadGuard Terminal Impact Attenuator only after approval of the above shop drawings and authorization from the Engineer to do so.

The Contractor shall construct the concrete pad and back-up structure at the locations shown, or directed, to the dimensions indicated in the approved shop drawings. Steel Tension Strut Backup Assemblies shall be used, except, when protecting concrete piers, concrete parapets, concrete walls, or other rigid objects, either the Steel Tension Strut Backup Assembly or the Concrete Backup Assembly, at the option of the Contractor, shall be used. The appropriate standard transition or special transition piece, if none of the standard transitions is appropriate, shall be furnished and installed.

QuadGuard Terminal Impact Attenuators shall bear upon prepared surfaces as shown in the plans. Necessary site preparation shall be performed in accordance with, and included under, their respective items.

To minimize exposure of vehicular traffic to the possibility of impact on the back-up structure, the Contractor shall complete the attenuator installation within seven calendar days after completion of the back-up structure.

Traffic protection devices, such as cones, drums, lights, signs, barricades, or other articles directed by the Engineer, shall be provided and maintained under their respective items. Those devices shall not be removed until the QuadGuard Terminal Impact Attenuator is fully operational, and, in

lighted areas or areas to be lighted, these articles shall also be maintained until the lighting system is operational.

**METHOD OF MEASUREMENT.** The work will be measured as the number of QuadGuard Terminal Impact Attenuators of the specified width and number of bays satisfactorily furnished and installed in accordance with these specifications, the plans, approved shop drawings, and the directions of the Engineer. *Note: The plastic nose assembly and its Type I cartidge are not counted in determining the number of bays.*

**BASIS OF PAYMENT.** The unit price bid shall include the cost of all labor, materials, and equipment necessary to satisfactorily perform the work, including the metal or concrete back-up system, the concrete pad if indicated, and necessary materials to fasten the QuadGuard Terminal Impact Attenuator to the protected feature. Site preparation and maintenance and protection of traffic will be paid for separately under their respective items.

*Payment will be made under:*

| | | |
|---|---|---|
| 15654.04XXYY | QuadGuard Terminal Impact Attenuator, XX Inches Wide, YY Bays | Each |

*where: XX is the width of the QuadGuard Terminal Impact Attenuator, in inches, measured at the diaphragms; and YY is the number of bays. XX may take on values of 24, 30, 36, 69, and 90. YY may take on values of 03, 04, 05, 06, 09.*

**ITEM 15654.04XXYY M** **QUADGUARD TERMINAL IMPACT ATTENUATOR**

**DESCRIPTION.** The contractor shall furnish and install Quadguard Terminal Impact Attenuators at the locations shown on the plans or directed by the Engineer in accordance with these specifications, the approved Shop Drawings, and the directions of the Engineer.

**MATERIALS** Quadguard Terminal Impact Attenuators shall be manufactured by Energy Absorption Systems, Inc. of Chicago, Illinois or they shall be a terminal determined by the Regional Director to be equal thereto and be approved by the Deputy Chief Engineer, Design Division.

Each Quadguard Terminal Impact Attenuator shall contain all external and internal parts necessary to give satisfactory service at the indicated site. Quadguard Terminal Impact Attenuator component parts shall meet the following requirements:

A. **Cartridges**. The cartridge boxes shall be Type I and Type II cartridge boxes and shall be of the number and arrangement required by the Manufacturer for the intended application. Cartridge boxes shall be manufactured from a weather resistant plastic material. Type I cartridges shall contain paper honeycomb material. Type II cartridges shall contain steel honeycomb material which shall be coated to minimize the effects of corrosion.

B. **Cartridge Brackets.** Each bay shall be equipped with cartridge brackets.

C. **Diaphragms.** Diaphragms shall be made from 10 gage ASTM A 36 M steel Quadruple corrugated beam. The length of each diaphragm shall be as required for each application. Two support legs shall be welded to a channel which, in turn, shall be welded to the quadruple corrugated beam. Ski shaped plates shall be welded to the bottom of the support legs. The diaphragms shall be designed to lock onto, and be guided by, an anchored and mounted center monorail support structure.

After fabrication, the diaphragms shall be hot dipped galvanized in accordance with ASTM A123.

D. **Fender Panels**. Fender panels shall be fabricated from 10 gage steel quadruple corrugated beam guide rail sections. Each fender panel shall be drilled and slotted so that when assembled in the field, the front end shall be bolted to a diaphragm by means of the three horizontally placed 16 mm bolts, one of which shall be a "mushroom bolt." The back end of each quadruple corrugated beam fender panel shall overlap and be connected to the fender panel of the next bay by means of mushroom bolts, which fit through the long horizontal slot in the forward fender panel and the short vertical slot in the overlapped fender panel. (The bolt shall have a nut and square washer on the inside.) This permits movement, front to back, of one set of fender panels relative to the panels in the following bay.

E. **Monorail Assembly.** The monorail assembly shall be fabricated to the dimensions shown on the plans.

F. **Tension Strut Back-up**. If a concrete back-up structure is not to be provided, then a tension strut back-up assembly shall be provided. The details of this assembly shall be as indicated in the plans.

G. **Nose Cover**. The nose cover shall be made from a high density polyethylene plastic material of the color indicated in the plans or directed by the Engineer.

H. **Metal Work**. All metal work, except transition panels, shall be fabricated from either M1020 Merchant Quality or ASTM A36M steel. After fabrication, all metal work shall be hot dip galvanized in accordance with ASTM A123. Welding shall be in accordance with the New York State Steel Construction Manual.

I. **Fasteners**. All bolts used within the Quadguard Terminal Impact Attenuator shall be American Standard Regular Bolts, unless indicated otherwise in the Plans. Anchor bolts shall be ASTM A193 grade B7 grouted into the concrete slab with polyester grout.

J. **Concrete.** Concrete for back-up walls and pad shall meet the requirements of Sections 501 and 555 of the Standard Specifications for Class A concrete.

K. **Reinforcing Steel.** Reinforcing steel shall conform to §709-04 Epoxy Coated Bar Reinforcement, Grade 420.

L. **Transition Panels.** Transition panels shall be fabricated from steel conforming to ASTM A36 M, hot dip galvanized in accordance with ASTM A123. Five standard transition panels shall be available. These shall be: Quadguard to Jersey Barrier; Quadguard to W-rail Corrugated Beam; Quadguard to Thrie Beam; and Quadguard End Shoe(for vertical surfaces); and Quadguard to Single Slope Concrete Barrier.

**Reflectorization.** Reflectorization, consisting of Class B (High Intensity) sheeting conforming to §730-05 directly applied to aluminum sheeting, shall be affixed to the nose piece of the QuadGuard in a manner satisfactory to the engineer. Aluminum sheeting shall be 6061T6, 0.81mm thick. The pattern and color of the reflectorization shall be as indicated on the plans.

If no pattern is provided, the pattern shall be approximately square, 450 mm on a side. Whenever traffic is allowed to pass on both sides of the unit, the pattern shall be chevrons formed with alternating 100 mm reflectorized stripes and black opaque non-reflectorized stripes. When traffic will be permitted on only one side, the pattern shall be diagonal 100 mm stripes, downward pointing to the side traffic is to be permitted, formed as indicated above.

If no color is given, color shall be yellow.

**Acceptance.** Quadguard Terminal Impact Attenuator will be accepted on the basis of conformance of the Quadguard Terminal Impact Attenuator with the approved Shop Drawings and the manufacturer's certificate of compliance with these specifications.

**CONSTRUCTION DETAILS** Prior to ordering any materials required under this item, the Contractor shall submit two copies of the shop drawings to the Engineer for approval. Shop drawings shall show supports, connections, miscellaneous parts, concrete back-up walls or steel back-up plates, and anchorages not detailed in the plans but necessary to develop the full potential of the Quadguard Terminal Impact Attenuator. In addition to the above, the Contractor shall deliver to the Engineer two (2) copies of Design Manuals, Installation Manuals, and Maintenance Manuals prepared for the product. The Contractor shall install the Quadguard Terminal Impact Attenuator only after approval of the above shop drawings and authorization from the Engineer to do so.

The Contractor shall construct the concrete pad and back-up structure at the locations shown, or directed, to the dimensions indicated in the approved shop drawings. Steel Tension Strut Backup Assemblies shall be used, except, when protecting concrete piers, concrete parapets, concrete walls, or other rigid objects, either the Steel Tension Strut Backup Assembly or the Concrete Backup Assembly, at the option of the Contractor, shall be used. The appropriate standard transition or special transition piece, if none of the standard transitions is appropriate, shall be furnished and installed.

Quadguard Terminal Impact Attenuators shall bear upon prepared surfaces as shown in the plans. Necessary site preparation shall be performed in accordance with, and included under, their respective items.

To minimize exposure of vehicular traffic to the possibility of impact on the back-up structure, the Contractor shall complete the attenuator installation within seven calendar days after completion of the back-up structure.

Traffic protection devices, such as cones, drums, lights, signs, barricades, or other articles directed by the Engineer, shall be provided and maintained under their respective items. Those devices

shall not be removed until the Quadguard Terminal Impact Attenuator is fully operational, and, in lighted areas or areas to be lighted, these articles shall also be maintained until the lighting system is operational.

**METHOD OF MEASUREMENT.** The work will be measured as the number of Quadguard Terminal Impact Attenuators of the specified width and number of bays satisfactorily furnished and installed in accordance with these specifications, the plans, approved shop drawings, and the directions of the Engineer. *Note: The plastic nose assembly and its Type I cartidge are not counted in determining the number of bays.*

**BASIS OF PAYMENT.** The unit price bid shall include the cost of all labor, materials, and equipment necessary to satisfactorily perform the work, including the metal or concrete back-up system, the concrete pad if indicated, and necessary materials to fasten the QuadGuard Terminal Impact Attenuator to the protected feature. Site preparation and maintenance and protection of traffic will be paid for separately under their respective items.

*Payment will be made under:*

15654.04XXYY M QuadGuard Terminal Impact Attenuator, XX ~~Inches Wide~~ width Class, YY Bays Each

*where: XX is the width class of the QuadGuard Terminal Impact Attenuator. Width class corresponds to the actual width, in inches, measured at the diaphragms. YY is the number of bays. XX may take on values of 24, 30, 36, 69, and 90. YY may take on values of 03, 04, 05, 06, 09.*