

**STATE OF CALIFORNIA, DEPARTMENT OF TRANSPORTATION  
DIVISION OF EQUIPMENT**

ITEM NO	UNIT	CAB	TRANS	ENG	CAP	C.A.	F.A.	R.A.

SPECIFICATION NUMBER: 079-2062-141

SPECIFICATION FOR: ATTENUATOR, TRUCK MOUNTED – CARTRIDGE ASSEMBLY

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SPECIFICATION DATE: MAY 2014

It is the intent of this specification to describe the minimum requirements for a truck mounted replacement attenuator box assembly, meeting the requirements of NCHRP 350, that will be attached to existing mounting hardware on various highway maintenance vehicles. Whenever the word “attenuator” is used, it is meant to be a Truck Mounted Attenuator (TMA) box assembly built to these specifications. Drawings Number P2-A001-01, P2-A001-02, and U1-A010-02 form a part of this specification.

1. VENDOR’S RESPONSIBILITY:

- A. Supply all material.
- B. Construct all attenuators.
- C. Pay for all testing unless otherwise noted (See Item 4. TESTING).
- D. Supply test results per National Cooperative Highway Research Program (NCHRP) Report 350, Test Level 2. Test results shall be certified by a Licensed Professional Engineer.
- E. Supply test results for vibration, moisture, and corrosion tests per Item 4. B. VIBRATION, MOISTURE, CORROSION TESTS. Test results shall be certified by a Licensed Mechanical Engineer.

F. Caltrans shall retain the right to test a production unit TMA box assembly per specified NCHRP, Test Level 2 requirements; or, the vibration, moisture, corrosion test requirements. Caltrans shall be responsible for any costs related to such retest(s).

2. DESIGN AND CONSTRUCTION: The attenuator assembly shall consist of three (3) basic components: basic attenuator, lights/harness, and rear jack. The attenuator assembly shall be constructed, assembled, wired and painted in accordance with these specifications.

The attenuator shall have an overall height of 24 inches,  $\pm 2$  inches; an overall width of 94 inches, +0, -2 inches; and, an overall length not to exceed 100 inches.

The attenuator shall be adaptable to existing headframe and mounting hardware presently in use by the Department of Transportation (See Dwg. No. P2-A001-01).

The attenuator shall be designed, constructed and tested to protect the occupants and vehicle from errant vehicles striking it from the rear.

The attenuator assembly shall be designed and constructed such that the impact end of the attenuator resists 'nuisance hit' damage at speeds up to 5 miles per hour (8 kilometers per hour).

The attenuator box, when impacted, shall be designed and constructed so that its components are retained and will not be obstacles to nearby traffic.

The attenuator assembly shall be designed so that it can be removed from its carrier vehicle and moved to a storage area without the need of additional support or transfer equipment. This will be accomplished by leaving the attenuator assembly attached to the state installed 'headframe' with integral vertical adjusting jacks equipped with swivel castors; and, the vertical rear adjusting jack supplied with each attenuator. The rear center mounted vertical adjustable jack shall be supplied with a swivel castor and shall have a 500 pound minimum capacity. The jack shall have a minimum travel of 14 inches.

3. WEIGHT AND WEIGHT CERTIFICATION: The attenuator assembly, when constructed, assembled, wired and painted in accordance with these specifications shall weigh not more than 425 pounds.

Caltrans inspection personnel may witness the weighing of an attenuator assembly during the inspection of the first production article (see Item 15. INSPECTION).

4. **TESTING:** The attenuators shall withstand physical tests as outlined. See attached *Test Method and Procedure for Truck Mounted Attenuator Box Assembly*.

- A. **Crash Test:** Two (2) attenuators shall be subjected to crash testing in accordance with NCHRP 350, Test Level 2. One attenuator shall be struck head-on by a vehicle weighing 820 kg (1808 lbs.), and the second attenuator shall be struck head-on by a vehicle weighing 2000 kg (4410 lbs).

Test results (certified test reports, associated reports, films, etc.) shall be certified by a Licensed Professional Engineer. The engineer's certification document shall contain his Professional Engineer (P.E.) stamp and shall be submitted with the bid to supply the attenuators.

- B. **Vibration, Moisture, and Corrosion Tests:** One (1) attenuator assembly shall be subjected to four tests in the sequence outlined below.

1. Two (2) Vibration tests.
2. One (1) Moisture test.
3. One (1) Corrosion test.

Test results (certified test reports, associated reports, films, etc.) shall be certified by a Licensed Mechanical Engineer. The engineer's certification document shall contain his Professional Engineer (P.E.) stamp and shall be submitted with the bid to supply the attenuators.

5. **PRINTS:** Three (3) sets of customer reference prints of the attenuator, identified by model number and traceable to all attenuators tested and supplied under these specifications, shall be submitted with the bid.

These prints shall clearly define the attenuator assembly configuration, all pertinent dimensions, external parts and material utilized in the manufacture and assembly of the delivered attenuators.

Drawings shall be of such quality and detail that a unit may be inspected utilizing said prints.

6. **TRACEABILITY:** Each production and test attenuator shall be individually identified with a Serial Number (S/N) and a Model Number (M/N) such that a record of its history can be maintained with that S/N and M/N identification. The S/N and M/N shall be located together on the left (street) side, at the lower front corner. The letters and/or numbers used in the M/N and S/N shall be not less than 2-inches high and shall be permanently imprinted into the base metal and identifiable through the painted finish.

All test results, test procedures, supporting documentation (both preliminary and final), crash films, and engineering prints submitted shall show S/N and M/N of the attenuator assembly used.

7. ELECTRICAL EQUIPMENT: Lights shall be installed on the attenuator assembly. Each unit shall have two (2) tail lights, (2) stop lights, turn signal lights, and side marker lights (these lights may be in combination); one (1) set at each rear corner of the attenuator assembly. ICC identification lights shall be mounted at the center rear near the top. These lights may be offset up to three (3) inches from the centerline of the unit to provide better visibility. All lights shall be light emitting diode (LED) type. Retro-reflective tape reflectors (Ref. Petersen Mfg. #B490R and #B490A, or comparable), shall be used where needed to meet FMVSS requirements for Class A reflectors.

Wiring may be internal (preferred), or mounted on the outside of the attenuator assembly. If mounted on the outside of the attenuator, the wiring shall be securely attached by mechanical clips at not more than 18-inch intervals.

All wiring installed by the manufacturer or supplier shall be the stranded copper type, have cross-linked polyethylene insulation, and be protected in plastic automotive-type loom. Where applicable, rigid or flexible conduit may be used. The edge of all metal members which wire harness or loom pass through shall be deburred, flanged, rolled, or bushed with suitable grommets. In general, wire routing shall be such that maximum protection is provided by the vehicle sheetmetal and structural components.

Adequate size gauge wire shall be used in accordance with SAE standards for distance from the power source and load demand.

The wire ends shall be mechanically stripped and the terminals crimped securely with the appropriate tool.

All splices shall be sealed against moisture. Scotch Lock wire-type piercing devices shall not be used. All electrical work and installation of equipment/ devices shall be completed in a workmanlike manner, mechanically and electrically secure. Devices, lamps, etc., requiring periodic service shall be serviceable and accessible by providing wire length to reasonably accomplish this.

A seven-wire SAE standard trailer light plug (Ref. Pollak No. 11-700 with the No. 11-763 cable guard) shall be installed on trailer cable extending 36 to 42 inches beyond the top center front of the attenuator assembly. The plug supplied must mate with Pollak NO. 11-721 socket in use on State trucks. A wiring schematic, Drawing No. U1-A010-02, for the plug and wire color code is attached. The

attenuator shall have a storage socket for the plug while the plug is not in use (Ref. Cole-Hersee, "Stor-a-Way" 7 way plug holder or comparable).

8. **WELDING:** All welding shall comply with the requirements as represented in American Welding Society (AWS), D14.3-82, and American National Standard entitled "Specification for Welding Earthmoving and Construction Equipment."

All welds shall be performed by personnel who are certified in accordance with the requirements as established by AWS. Personnel who perform any welds on the units shall have the proper certification documents indicating they are qualified to perform the type, size, and position of the weld performed, with the welding process utilized, and on the material being welded. The supplier will be required to supply proof of current welding certifications for personnel performing any welding on the unit, upon request of the State, whether written or verbal.

All welds shall be continuous except as noted. Intermittent or spot welds shall be spaced and proportioned to provide ample strength for the material being welded. Weld sizes not indicated shall be equal to the thickness of the least of the joined plates.

All welds shall be properly fused, displaying proper penetration and a professional finish, and must meet the qualification requirements of applicable AWS specifications. Examples of unacceptable weldments are:

- |             |                       |
|-------------|-----------------------|
| a. Cracks   | d. Excessive Splatter |
| b. Undercut | e. Blow Holes         |
| c. Overlap  | f. Slag Entrapment    |

Any weld failing to comply with the AWS specification or failing to pass a quality assurance inspection performed by the State, will be corrected by the manufacturer, at their expense, and be corrected off State property. The State shall determine if a weld is acceptable or deficient.

Any deficient weld shall be corrected by a welder who is certified in accordance with the requirements as established by AWS. The welder shall have the proper certification documents indicating that he/she is qualified to perform the type, size, and position of the weld performed, with the welding process utilized, and on the material being welded. The supplier will be required to supply proof of current welding certifications for personnel performing any re-welding on the unit, upon request of the State whether written or verbal.

**GRINDING OF WELDS** must have prior approval of the Department of Transportation, Division of Equipment, Engineering Specifications. Welds which have been ground without approval shall be subject to complete re-welding upon request, at no additional cost to the State.

All assembly dimensions and tolerances on drawings apply after welding. Excessive warpage of assembled parts is not acceptable. Weld symbols on drawings shall be interpreted per American National Standard Welding Symbols. In the event of the lack of a weld symbol, the best commercial practice shall prevail. The covering of welds with body fillers or similar materials is unacceptable.

9. PAINT: All exterior metal surfaces shall be finished with a lead-free, corrosion resistant primer and a finish paint coat as described below. All interior ferrous metal surfaces shall be finished with a corrosion resistant primer.

If any plywood is used in the construction of the unit it shall be marine grade medium density overlay (MDO) plywood. Any wood edges or saw cuts shall be treated with an EPA-registered, fungicidal preservative (Ref. Wolman Woodlife Classic Preservative; or comparable). Any wood surface shall be prime coated and the exposed surfaces shall be finish coated with the paint described below.

The basic unit and the primary finish surfaces of any optional equipment shall be finish coated with lead-free Cardinal Gloss #6609 Federal Standard Color #13655 Yellow; or equivalent. The finish coat shall be free from runs, drips, sags, etc., and shall be evenly applied to provide a gloss finish. The finish or top coat shall be compatible for re-coat or touch-up with the paint referenced above. Compatibility and comparability will be determined by Caltrans. Other minor or incidental component parts may be finished according to the standard factory finish. (Cardinal Industrial Finishes: Contact your local distributor, or; 1329 Potrero Avenue, El Monte, CA 91733; 213-283-9335; or, 890 Commercial Street, San Jose, CA; 408-452-8522).

10. SAFETY MARKING: The rear face of the attenuator assembly (as viewed in the horizontal position) shall have a retro-reflective sheeting, vehicle marking safety decal with orange and white striping as follows:
- A. MATERIAL: The sheeting shall be of a highly flexible, durable, adhesive-backed, metallized, micro-prismatic type retro-reflectorized material having a smooth, flat, outer surface (Reference: Reflexite Daybrite Material, or comparable) and shall be finished with an exterior grade, ultraviolet stabilized, clear coat material. Backing shall be easily removed by peeling without soaking in water or other solutions. Decal surface shall be weather resistant and show no appreciable cracking, blistering, crazing, or dimensional change after not less than six (6) years of unprotected outdoor exposure.
  - B. COLOR: Orange and white to meet ASTM D 4956-00 Table 10.

- C. REFLECTIVITY: Reflectivity shall meet ASTM D 4956-00 Type IV for minimum retro-reflectivity.
  - D. ADHESIVE: The sheeting shall be precoated with a pressure-activated adhesive that allows positioning on clean, dry surfaces without bonding until pressure activated. The sheeting shall be capable of being easily positioned or repositioned in temperatures ranging from 50 degrees minimum to 100 degrees maximum, provided the adhesive has not been pressure activated. The adhesive shall be protected with a removable liner.
  - E. SIZE: Approximate overall width (height) of the safety striping shall be eight (8) inches. The overall length of the safety striping shall extend from the left hand edge of the rear face to the right hand edge of the rear face (94-inches, +0, -2 inches). The safety striping shall be centered across the entire width of the attenuator. Stripes shall be in an alternating pattern of six (6) inches orange and six (6) inches white and slant from lower left to upper right at a 45° angle. (NOTE: The decal may be applied in two (2) pieces if necessary to accommodate the design of that portion of the attenuator which provides resistance to 'nuisance hits' damage.)
- 11. WORKMANSHIP: The equipment and any accessories shall be a product of good workmanship and shall be free from any defects that will affect their appearance or serviceability.
  - 12. WARRANTY: The unit and any optional accessory shall be free from defects in workmanship and materials and be covered (parts and labor) under warranty for two (2) years following the date the Department of Transportation (Caltrans) puts the unit into service. Caltrans will notify the supplier by mail of the in-service date.

A copy of the manufacturer's standard warranty for the unit, any accessory, optional equipment, and components shall be submitted with the bid and supplied with each unit at delivery. The manufacturer will be held responsible for warranty (commencing from the date Caltrans puts the unit into service) for the following circumstances:

- 1. The manufacturer's standard warranty exceeds two (2) years. Under this circumstance, the supplier is responsible until one (1) year is reached.  
  
The manufacturer will be held responsible for the balance of the manufacturer's standard warranty.
- 2. The supplier is no longer an authorized dealer of the equipment supplied. Under this circumstance, the manufacturer will be held responsible for the balance of the manufacturer's standard warranty. The manufacturer shall establish a fully operational warranty service provider with capabilities

equal to or exceeding the supplier's (or his designated warranty provider) within 45 days of the supplier's authorized dealer termination.

If the supplier is not the manufacturer or manufacturer's authorized representative, then a statement agreeing to the warranty conditions stated herein shall be signed by the manufacturer and submitted upon request prior to Purchase Order award.

Any supplier or manufacturer non-compliant with the warranty provisions set forth herein may be subject by the Procurement Division, Department of General Services, State of California to be removed from any future bidding.

13. SAFETY: The entire unit and accessories shall comply to the applicable provisions of the California Vehicle Code, the Safety Orders of the Division of Industrial Relations, and all Federal regulations in effect at the time of manufacture.
14. COMPLIANCE CERTIFICATE: There shall be a certificate delivered with each attenuator assembly on the order showing that the unit meets the specifications for material and construction of the approved test unit. Each certificate shall include the following:
  - A. Manufacturer's name, address and telephone number.
  - B. Attenuator model number.
  - C. Attenuator serial number.
  - D. Attenuator weight.
15. INSPECTION: One (1) attenuator assembly, the first production or pre-production unit manufactured for this contract, shall also serve as the first production article for inspection purposes.

The inspections shall be conducted by the Department of Transportation, Division of Equipment, Quality Assurance. These inspections shall take place at an adequate site provided by the vendor within the State of California. The inspection site shall meet all of the following criteria:

- A. The site shall not be the Purchase Order delivery destination. The site shall be paved, secure and zoned for commercial use.
- B. The site shall include electricity, lights, water, compressed air and a secure paved lot. The facilities shall also include lift equipment adequate to raise the units and support them on safety stands with a minimum of 12 inches of tire clearance. The supplier shall provide conditions which meet

the safety standards of CAL-OSHA and Title 8 of the California Code of Regulations.

- C. The adequacy of the site shall be determined by the Department of Transportation, Division of Equipment, Quality Assurance Section. Contact the Quality Assurance Chief at (916) 227-9709 for approval.
- D. If the facility is deemed unacceptable by the Department of Transportation, Division of Equipment, Quality Assurance Section, the vendor shall be billed for the inspection trip including wages and expenses. This cost shall be deducted from the purchase order payment.

If the supplier receives notice that the unit(s) is not acceptable, whether written or oral, the unit(s) shipped to the Purchase Order destination shall be removed within seven (7) calendar days. If the supplier fails to remove said unit(s) from the State's facilities within the specified period, the State may forward said unit(s) to the supplier by common carrier at the supplier's expense and risk.

Acceptance of delivery or placement in service of any equipment shall not release the manufacturer from liability for faulty design, workmanship, or materials appearing even after final payment has been made.

- 16. DELIVERY: Shipping and delivery instructions will be as stated in the purchase orders from Department of Transportation, Division of Equipment Shops located throughout the State of California.

The minimum purchase order quantity shall be one (1) unit.

Each attenuator assembly delivered shall be completely wrapped and sealed with not less than a six (6) mil thickness of clear plastic sheeting and secured on a shipping pallet. Plastic wrapping is required as units are stored exposed to weather for unknown periods of time prior to installation.

Pallets shall be of a type for use with forklift trucks and shall be of a quality and construction to safely carry the weight and material loaded on the pallet.

- 17. PAYMENT: Process for payment will be initiated when all units on the order are received and deemed acceptable. The discount period will start after acceptance of each unit on the Purchase Order.