



U.S. Department  
of Transportation  
**Federal Highway  
Administration**

400 Seventh St., S.W.  
Washington, D.C. 20590

May 1, 1995

Refer to: HNG-14

Mr. G. Kent Thompson  
Regional Director  
Engineered Systems  
2550 Market Street  
Aston, Pennsylvania 19014-3426

Dear Mr. Thompson:

We have reviewed the final test report sent to us on April 26 and the videotape supplied earlier of the crash tests conducted by the Texas Transportation Institute on the ESCO Water Twister Vehicle Arresting System (VAS).

As shown in the first attachment, the VAS consists of a chain-link restraining net connected to two energy-absorbing base units by 152-mm x 6.4-mm nylon straps (tapes). As the net is displaced by an impacting vehicle, the nylon tapes turn shafts connected to turbine rotors inside the base units, forcing the turbine blades through the water/ethylene-glycol solution in the base units. The friction thus generated in the fluid gradually slows and stops the impacting vehicle. For the tests run, each energy absorber was mounted on a steel base unit which was bolted directly onto a concrete foundation. Because the base units are substantial structures, they would generally require shielding in an actual field installation to prevent errant motorists from striking one and losing control of their vehicles.

Two full-scale crash tests were run to evaluate the impact performance of the VAS at the National Cooperative Highway Research Program (NCHRP) Report 350 test level 3 (TL-3). These are tests designated as 3-40 and 3-41. Both tests were head-on, 100-km/h impacts into the net, test 3-40 using a 820-kg passenger car and 3-41 using a 2000-kg pickup truck.

Test 3-40 stopped the passenger car smoothly in 17.8 m with little damage. Occupant impact velocity was 5.01 m/s and the 10-millisecond ridedown acceleration was -5.62 g's.

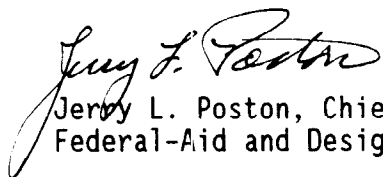
Test 3-41 stopped the pickup truck smoothly in 22.3 m. Occupant impact velocity was 5.52 m/s and the maximum ridedown acceleration was -5.70 g's.

Occupant risk criteria from both tests were substantially below the NCHRP Report 350 preferred occupant impact velocity and ridedown acceleration values of 9 m/s and 15 g's, respectively. We noted also that all components of the VAS System are reusable except the chain link fence. Based on our evaluation of test results, we conclude that the VAS system, as tested, is acceptable as a TL-3 attenuator for use on the National Highway System if such use is requested by a State highway agency.

Since the VAS is a proprietary product, the provisions of Title 23, Code of Federal Regulations, Part 635.411 governs its use on federally-funded projects. A copy of this section is enclosed for your ready reference.

A copy of this letter, with enclosures, will be sent to the Federal Highway Administration field offices for their information. Questions may be addressed to Mr. Richard D. Powers at (202) 366-1320.

Sincerely yours,

  
Jerry L. Poston, Chief  
Federal-Aid and Design Division

Enclosure

Geometric and Roadside Design Acceptance Letter CC-27

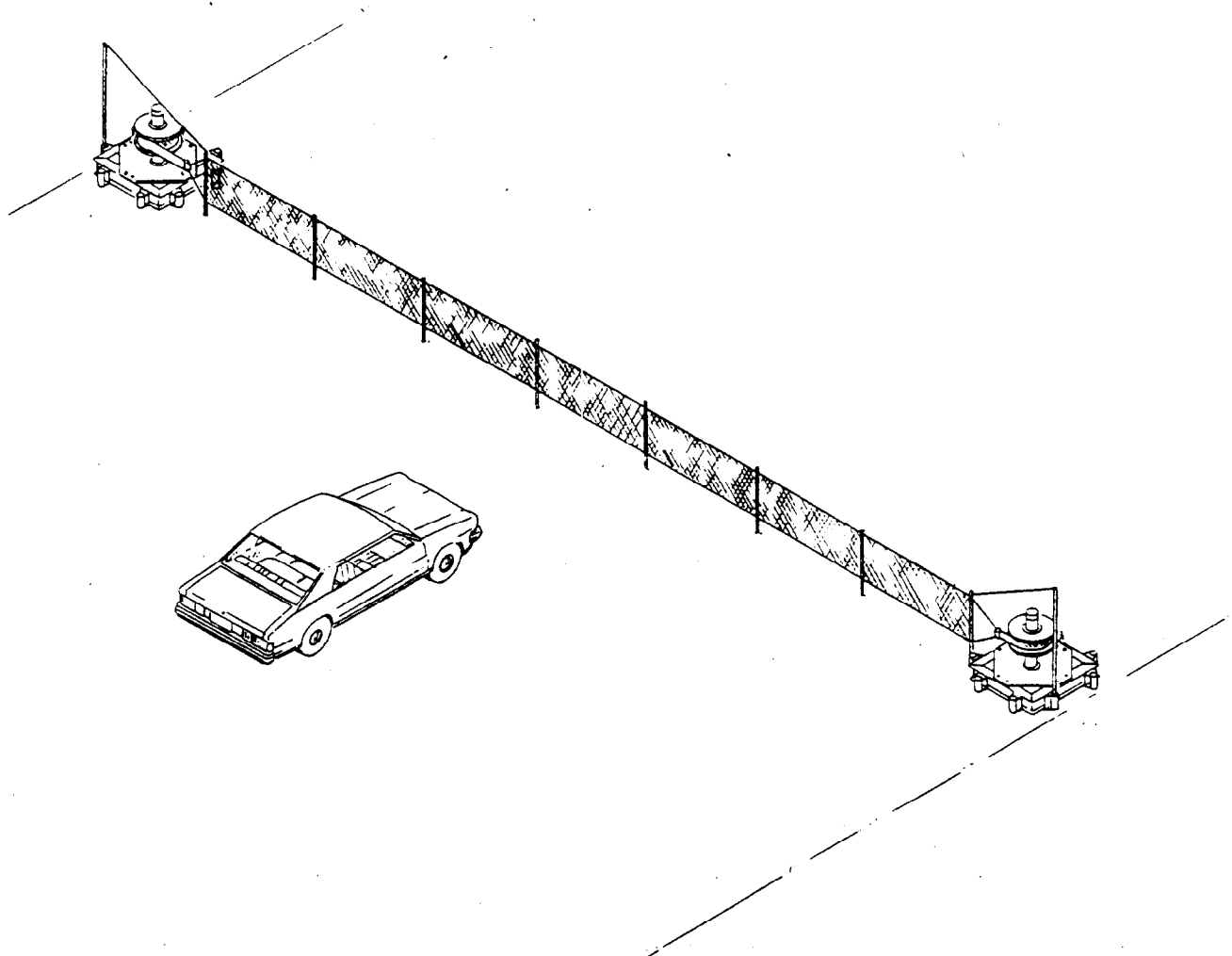
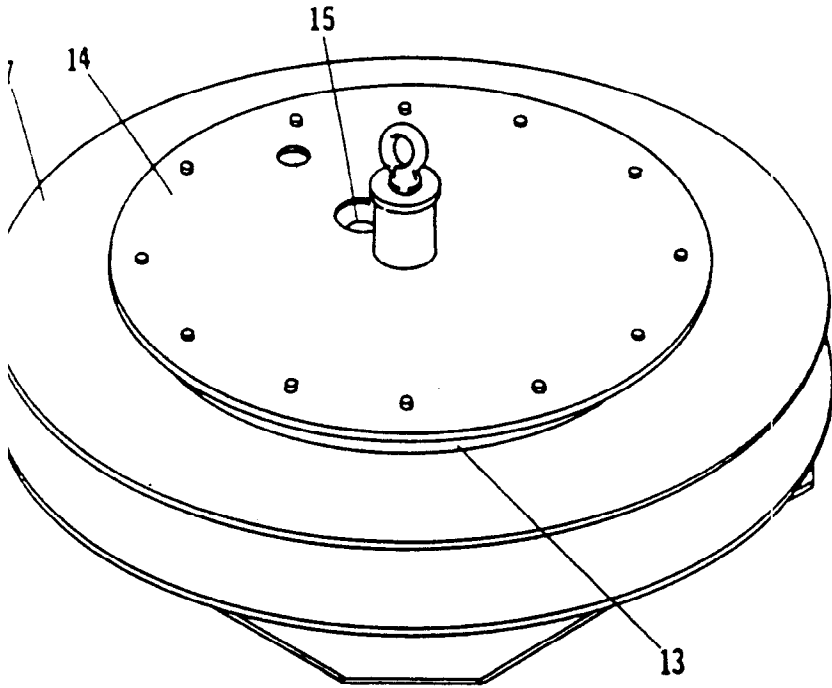


Figure 1. Engineered Systems Vehicle Arrestor System (continued).



1. HOUSING
2. HOUSING COVER
3. ROTOR VANES
4. STATOR VANES (COVER)
5. STATOR VANES (HOUSING)
6. ROTOR SHAFT
7. TAPE DRUM ASSEMBLY
8. PACKING SEAL RETAINER
9. PAD EYE
10. FILL PIPE CONNECTION
11. DRAIN PLUG
12. FLANGE ROLLER
13. CAPSTAN RING
14. TAPE DRUM COVER
15. TAPE ANCHOR PIN

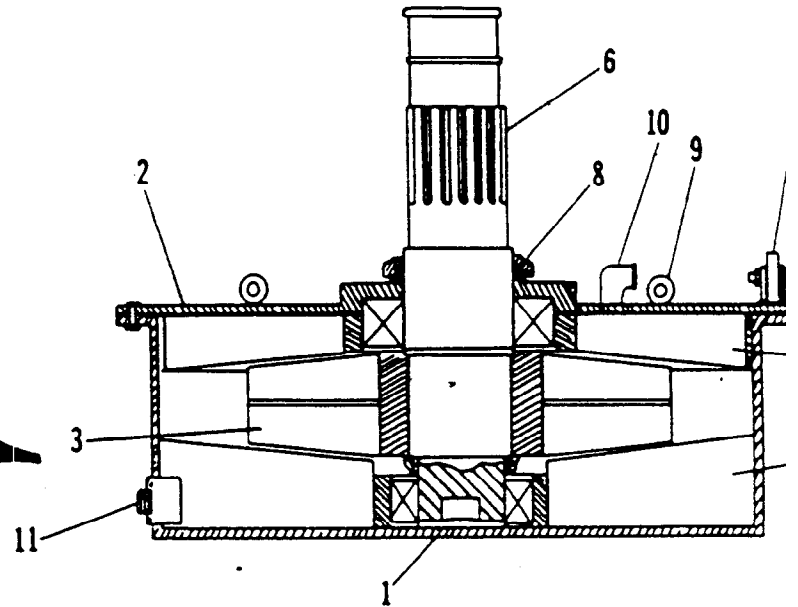
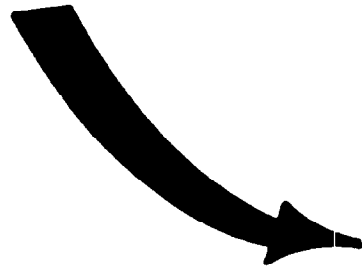


Figure 1. Engineered Systems Vehicle Arrestor System.