ACCELERATED FATIGUE AND MOISTURE TESTING OF A Renco CK-1128 REN-GARD TRUCK MOUNTED ATTENUATOR

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TEXAS TRANSPORTATION INSTITUTE

THE TEXAS A&M UNIVERSITY SYSTEM
COLLEGE STATION, TEXAS
INTRODUCTION

The ability of truck mounted attenuators (TMA's) to save lives is a function of their initial design and their ability to maintain those attributes throughout the service life of the unit. Since the TMA must spend its operational life attached to the rear of a dump truck, it is exposed to extremes of vibration and weather. If the unit is under designed, structural failures could appear months or years after being placed in service, thereby reducing the safety benefits of the unit.

To determine if a TMA cushion is properly designed to withstand the rigors of field use for many years, accelerated fatigue and moisture testing should be performed. These full-scale fatigue and moisture tests should be capable of producing the equivalent of many years of normal use within a few days.

VIBRATION TEST PROTOCOL

The Renco Ren-Gard TMA cushion assembly was tested in the horizontal position. Testing was done at a frequency of 7Hz at a null-to-peak displacement of ±0.3 inches at the mounting plate. This level of vibration applied a dynamic load of ±1.5g at the mounting plate. To pass the test a TMA cushion is required to vibrated at this level for a total of 40 hours (approximately one million cycles).

At eight hour intervals the TMA is carefully examined for structural damage. Vertical measurements between reference marks at the rear of the cushion and the floor were also taken and compared to pretest values. A drop, on either side of more than 0.5 inches or a structural failure constitutes a failed test.

MOISTURE TEST PROTOCOL

The moisture test facility was designed to produce an uninterrupted water spray over the top and sides of the TMA for 24 hours. The spray rate was adjusted to 6 inches per hour.

Prior to the water spray the TMA cushion was weighed using a strain gage load cell. After the 24 hour spray the water is turned off and the unit allowed to drain for one hour. At that time the cushion is reweighed. A TMA is considered to pass the moisture test if any retained water did not increase the initial weight by more than 5 percent.
TEST RESULTS

Below are the results of the environmental tests.

TEST DATE

March 27 thru April 10, 1992

IDENTIFICATION

Mfg: Renco
Model No: CK-1128 Ren-Gard
Serial No: 287C
Weight: 831 Lbs.
Length: 83 inches
Width: 91 inches
Height: 23 inches

VIBRATION TEST

Total Hours 40
Total Cycles 1,008,000
Right Sag 0.0
Left Sag 0.0
Damage none visible

MOISTURE TEST

Post test wt. 840 Lbs.
Pre test wt. 831 Lbs.
Weight gain 9 Lbs.
Percent gain 1.08%

CONCLUSIONS

The TMA cushion PASSED the TTI/TxDot requirement for vibration.
The TMA cushion PASSED the TTI/TxDot requirement for moisture.

Submitted by Richard A. Zimmer
APPENDIX
TMA RESONANT FREQUENCY DETERMINATION

RENCO  CK-1128 Ren-Gard

3/27/92

TEST CONDITIONS: A vertical axis accelerometer is attached to the top, rear of the TMA cushion, mounted on the vibration test shaker. A slow, small displacement, square wave function is applied to the shaker mounting plate. The damped resonant oscillation due to the step displacement is recorded on a strip chart as acceleration.

Calculated Resonant Frequency 15.0 Hz
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TMA VIBRATION TEST
31218-9071A

Mfg. **RENEO**  Weight **831** Lbs.
Model **EK-1128 REI-GARD**  Length **83** "
Serial No. **287C**  Width **91** "
Test Date **3-26-92**  Height **23** "

Initial REF. Test Height=  Right **20\frac{3}{8}** "  Left **20\frac{3}{8}** "
Initial TMA Test Height=  Right **21.0** "  Left **21.0** "

Test Conditions =  C.P.S. **7**  Amp. P-P **0.60** "  Total Hours **40**
Resonant Freq. **15** Hz.

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COMMENTS:
Torque Bolts To 100Ft/lbs @ 0.3hr  Pass (EJ)
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TMA WATER SPRAY TEST

Project # 9081 A

Mfg. Renco
Model CK-1128 Ren-Gard
Serial No. 2876

Weight 831 Lbs.
Length 83"
Width 91"
Height 23"

Test conditions: Spray rate 6 In./Hr., 24 Hours
Post test drain 1 Hr. Position(s) Top Up

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POST TEST WEIGHT 840 Lbs
- INITIAL WEIGHT 831 Lbs

TOTAL WEIGHT DIFF. 9 Lbs
DIFF. ÷ INITIAL WEIGHT X 100 1.08 % INC.

COMMENTS:
PASS 29