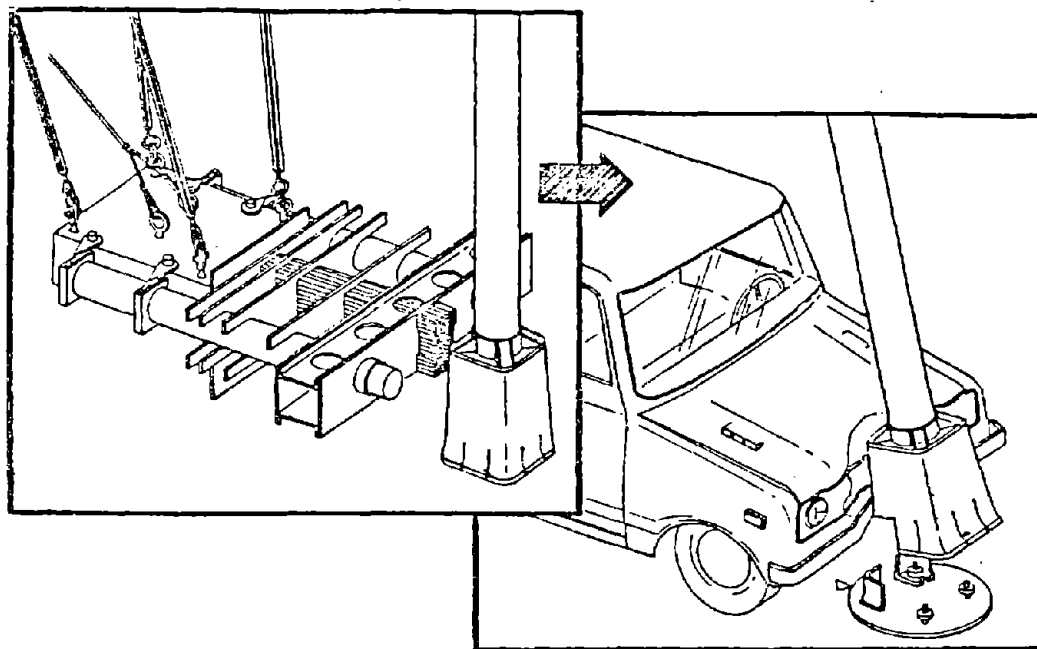




# Laboratory Evaluation of Existing Breakaway Structures

FINAL REPORT  
VOLUME 3-TEST DATA

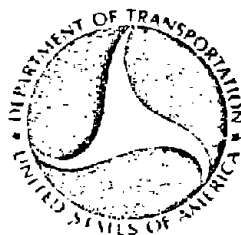


OCTOBER 1979

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FEDERAL HIGHWAY ADMINISTRATION  
OFFICE OF RESEARCH  
WASHINGTON, DC 20590



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16. Abstract  A whole array of existing breakaway luminaire supports were tested using the FHWA soft-nosed pendulum test device. The pendulum was developed to simulate a subcompact car behavior. This nose was properly validated against full-scale test data.  Due to unacceptable impact performance, modifications were made to cast aluminum transformer bases to reduce momentum change levels. Performance was greatly improved.  The FHWA bogie test device was built and validated for use in testing dual-legged breakaway sign supports. Full scale tests were run to provide full-scale validation data and to study off-center hit problems.  This is the third of three volumes. This volume contains test data only. Volume I is an Executive Summary while Volume II contains the technical results of the project.					
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FEDERAL HIGHWAY ADMINISTRATION  
CONTRACT DOT-FH-11-9194

LABORATORY EVALUATION OF  
EXISTING BREAKAWAY STRUCTURES

FINAL REPORT

Volume III - Test Data

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October 1979

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U.S. DEPARTMENT OF TRANSPORTATION  
Federal Highway Administration  
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Protective Systems Group  
Washington, DC 20590

## INTRODUCTION

This report is Volume III of the three volume final report for contract DOT-FH-11-9194. The testing presented here was carried out at the FHWA Impact Test Facility in Riverdale, MD and two full scale test facilities located in the Washington, DC area.

This volume presents a data sheet detailing the test parameters (including pole and base descriptions) for each test conducted under this contract. This data sheet also presents a summary of the test results. Following each data sheet is a tracing of the actual accelerometer curves from each test. A copy of a comparison between certain ENSCO tests and similar full-scale tests is also presented. This is found after the applicable test data sheet and associated trace. Drawings of the different dual-legged signs are presented and referenced from the appropriate data sheet.

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-101  
Date : Jan 11, 1977  
Weather : Clear, cold  
Pendulum Mass : 2400 lbs (1090 kg)

SUPPORT:

Type : Tapered steel pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lbs (168 kg)

BASE:

Type : Slip/three-bolt  
Manufacturer : Union Metal  
Modifications : None

FASTENERS (Base):

Type : 3 - 1 in Strain Sert Bolts  
Load : 10,000 lbs (44,480 N)

TEST DATA:

Impact Speed : -- \*  
Exit Speed : -- \*  
Momentum Change : -- \*  
Speed Trap : 227 lb-sec (1010 Ns)  
Accelerometer : 3.7 g's  
Peak Deceleration : 3.7 g's

\*Speed trap not functioning

COMMENTS:

Honeycomb (width x height x length x static crush pressure)

- #1 8 in x 8 in x 8 in x 75 psi (20.3 x 20.3 x 20.3 cm x 517 kPa)
- #2 8 in x 8 in x 8 in x 130 psi (20.3 x 20.3 x 20.3 cm x 896 kPa)
- #3 8 in x 8 in x 8 in x 230 psi (20.3 x 20.3 x 20.3 cm x 1586 kPa)

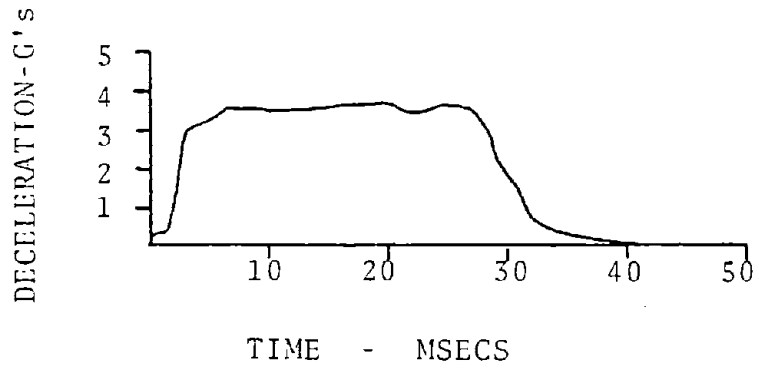


Fig. 1  
Longitudinal Accelerometer Traces for Test 1147-101



## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-102  
Date : Jan 25, 1977  
Weather : Cold  
Pendulum Mass : 2425 lbs (1090 kg)

### SUPPORT:

Type : Tapered steel pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lbs (168 kg)

### BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

### FASTENERS (Base):

Type : 3-1 in Strain Sert Bolts  
Load : 10000 lbs (44,800 N)

### TEST DATA:

Impact Speed : -- \*  
Exit Speed : -- \*  
Momentum Change  
Speed Trap : -- \*  
Accelerometer : 208 lb-sec (925 Ns)  
Peak Deceleration : 5.9 g

\*Speed trap not functioning

### COMMENTS:

Honeycomb (width x height x length x static crush pressure)

#1 6 in x 6 in x 8 in x 75 psi (15.2 x 15.2 x 20.3 cm x 517 kPa)  
#2 7 in x 7 in x 8 in x 130 psi (17.8 x 17.8 x 20.3 cm x 896 kPa)  
#3 8 in x 8 in x 8 in x 230 psi (20.3 x 20.3 x 20.3 cm x 1586 kPa)

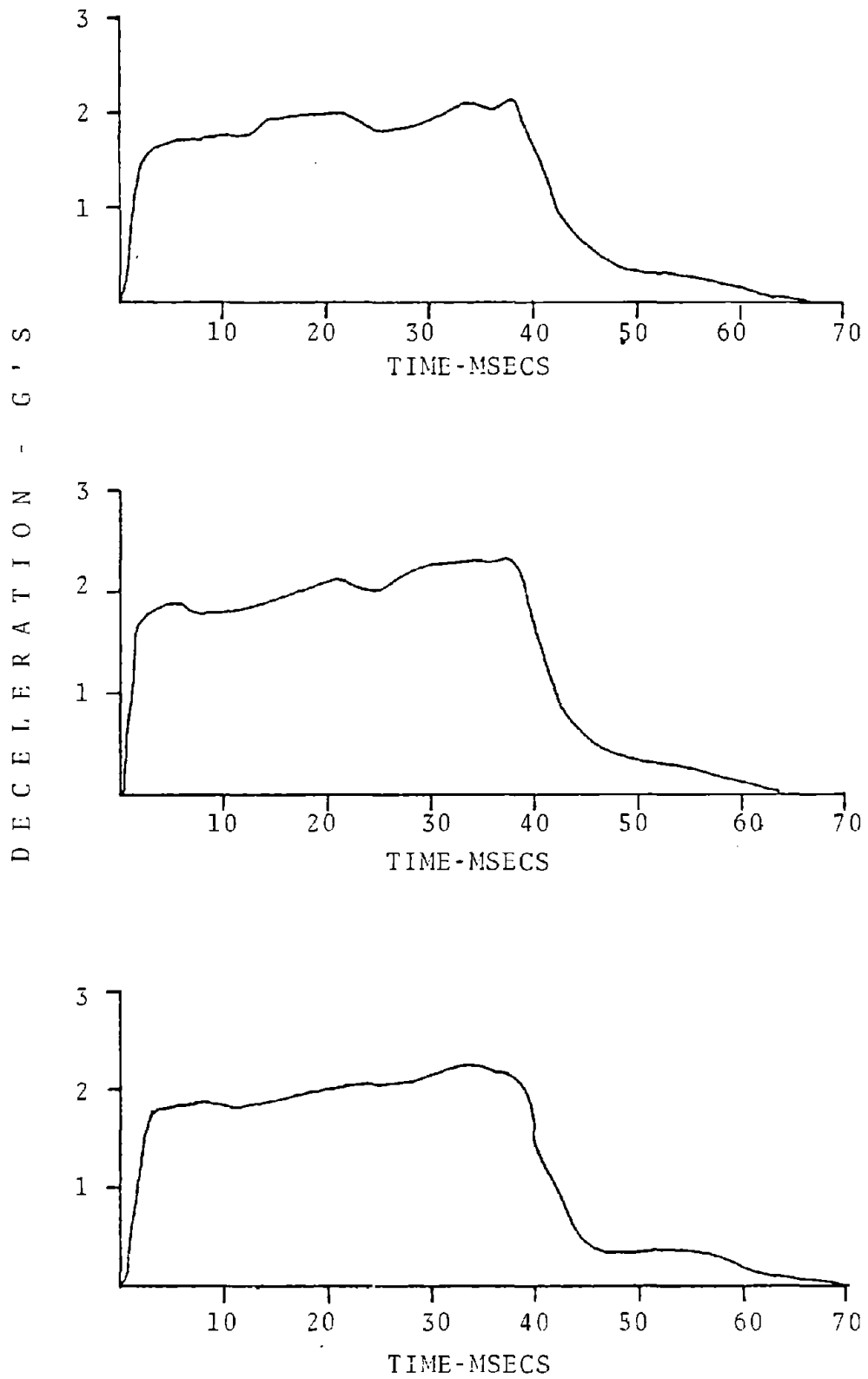


Fig. 2  
Longitudinal Accelerometer Traces for Test 1147-192

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-103  
Date : Jan 25, 1977  
Weather : Clear, Cold  
Pendulum Mass : 2425 lbs (1090 kg)

### SUPPORT:

Type : Tapered steel pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lbs (168 kg)

### BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

### FASTENERS (Base):

Type : 3-1 in strain sert bolts  
Load : 15,000 lbs (66,720 N)

### TEST DATA:

Impact Speed : -- \*  
Exit Speed : -- \*  
Momentum Change : -- \*  
Speed Trap : 250 lb-sec (1112 Ns)  
Accelerometer : 9.5 g's  
Peak Deceleration : 9.5 g's

\*Speed trap not functioning

### COMMENTS:

Honeycomb (width x height x length x static crush pressure)

#1 6 in x 6 in x 8 in x 75 psi (15.2 x 15.2 x 20.3 cm x 517 kPa)  
#2 7 in x 7 in x 8 in x 130 psi (17.8 x 17.8 x 20.3 cm x 896 kPa)  
#3 8 in x 8 in x 8 in x 230 psi (20.3 x 20.3 x 20.3 cm x 1586 kPa)

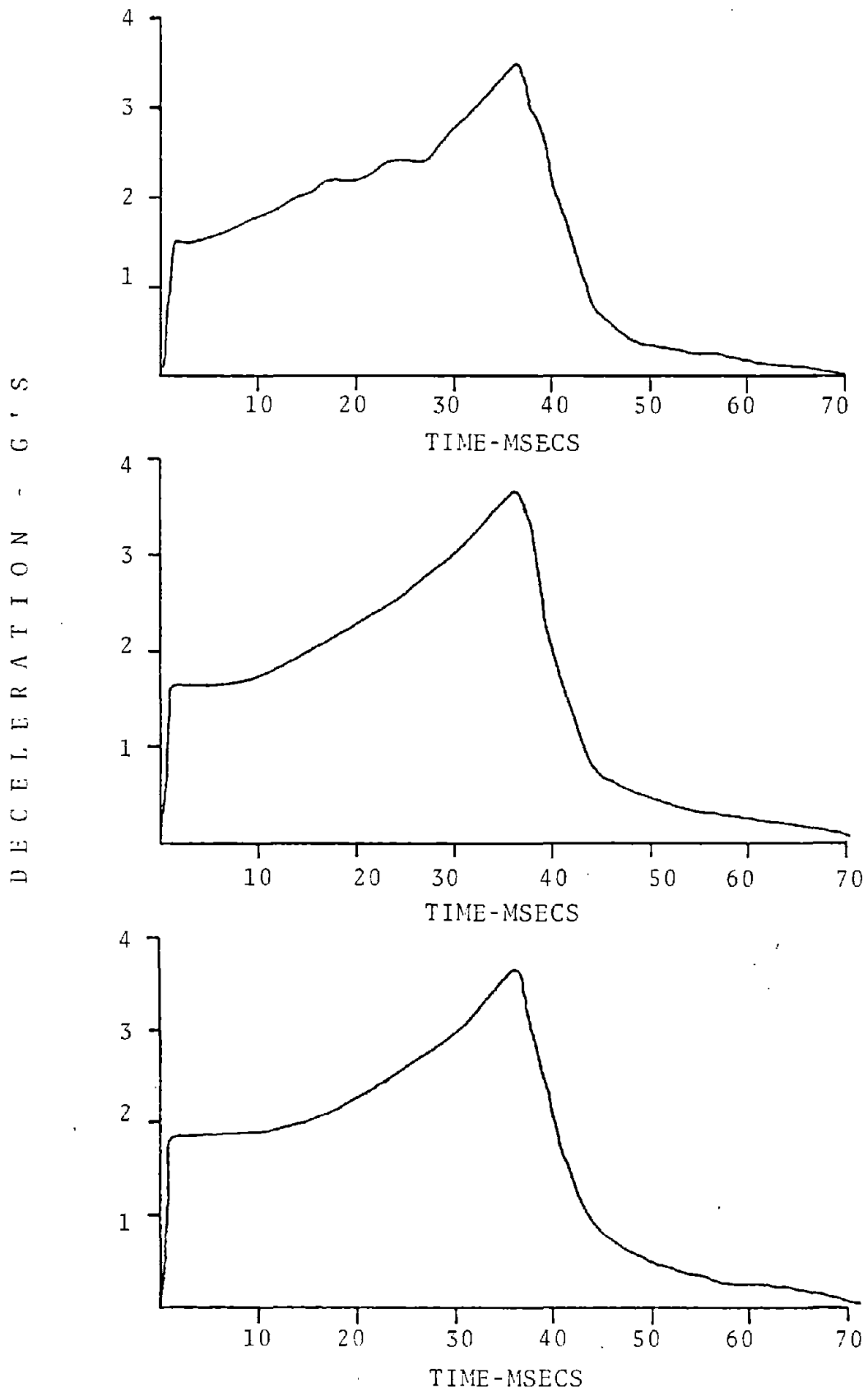


Fig. 3  
Longitudinal Accelerometer Traces for Test 1147-103

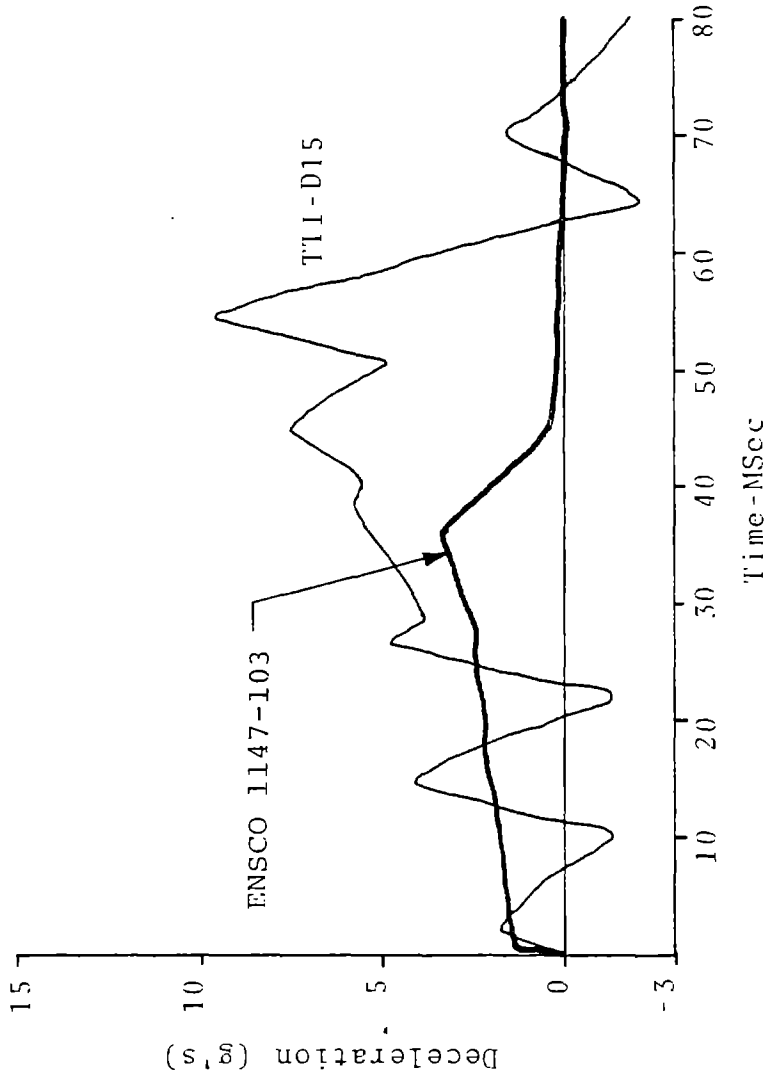


Fig. 4  
Comparison of Longitudinal Accelerometer  
Traces for TTI Test D-15 and ENSCO Test 1147-103

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-104  
Date : Jan 25, 1977  
Weather : Clear, cold  
Pendulum Mass : 2425 lbs (1090 kg)

SUPPORT:

Type : Tapered steel pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 320 lbs (168 kg)

BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

FASTENERS (Base):

Type : 3-1" Strain Sert Bolts  
Load : 15,000 lbs (66,720 N)

TEST DATA:

Impact Speed : 30.6 f/s (9.3 m/s)  
Exit Speed : --\*  
Momentum Change  
Speed Trap : --\*  
Accelerometer : 262 lb-sec (1165 Ns)  
Peak Deceleration : 3.0 g's

\*Speed trap not functioning

COMMENTS:

Honeycomb (width x height x length x static crush pressure)

- #1 Tapered 2" x 8" → 5" x 8" x 8" x 75 psi  
(5 x 20.3 cm → 12.7 x 20.3 cm x 20.3 cm x 517 kPa)
- #2 Tapered 5' x 8" → 8" x 8" x 8" x 130 psi  
(12.7 x 20.3 cm → 20.3 x 20.3 cm x 20.3 cm x 896 kPa)
- #3 Tapered 2' x 8" → 8" x 8" x 8" x 230 psi  
(5 x 20.3 cm → 20.3 x 20.3 cm x 20.3 cm x 1586 kPa)

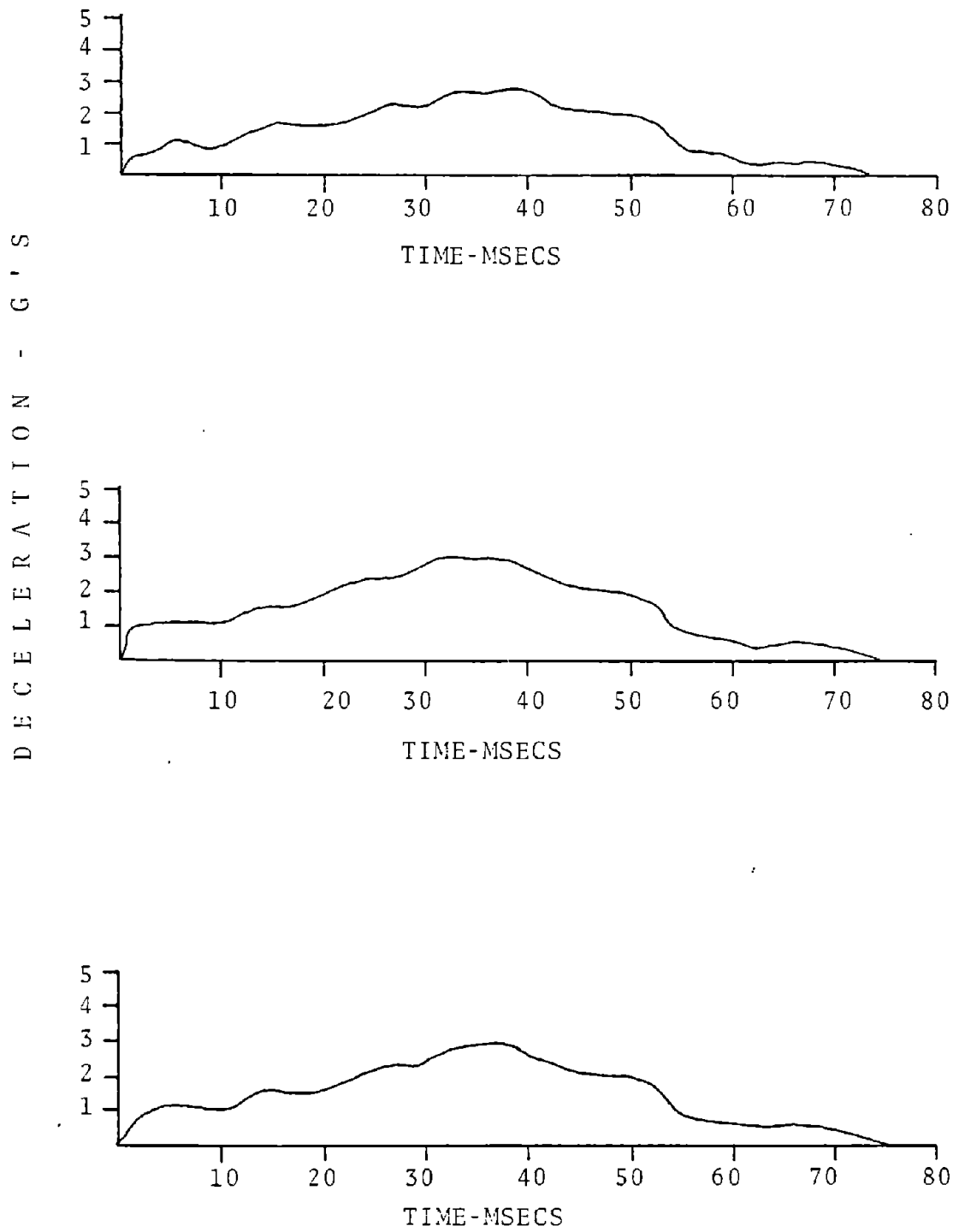


Fig. 5  
 Longitudinal Accelerometer Traces for Test 1147-104

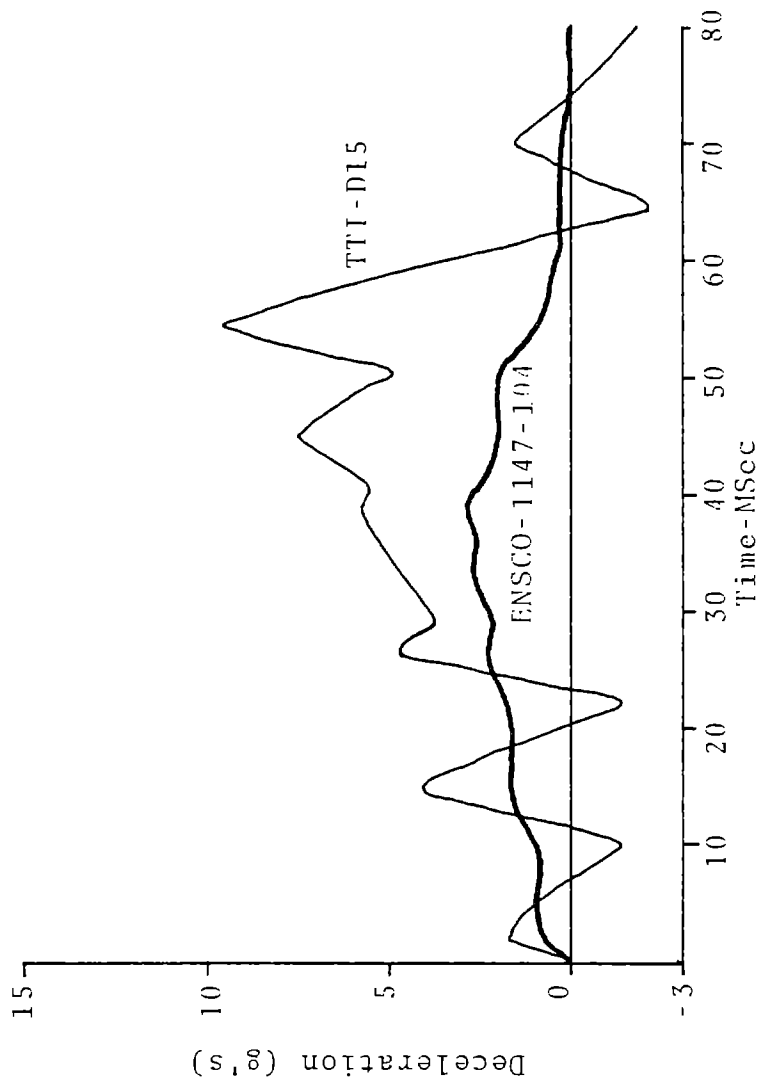


Fig. 6  
Comparison of Longitudinal Accelerometer  
Traces for TTI Test D15 vs. ENSCO Test 1147-104



## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-105  
Date : Feb 4, 1977  
Weather : Cold, overcast  
Pendulum Mass : 2385 lbs (1083 kg)

### SUPPORT:

Type : Tapered steel pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lbs (168 kg)

### BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

### FASTENERS (Base):

Type : 3-1 in strain sert bolts  
Load : 15,000 lbs (66720 N)

### TEST DATA:

Impact Speed : 30.8 f/s (9.3 m/s)  
Exit Speed : 23.1 f/s (7.1 m/s)  
Momentum Change  
Speed Trap : 570 lb-sec (2536 Ns)  
Accelerometer : 604 lb-sec (2687 Ns)  
Peak Deceleration : 6.4 g's

### COMMENTS:

Honeycomb (width x height x length x static crush pressure)

- #1 8" x 8" x 4" x 230 psi (20.3 x 20.3 x 10.2 cm x 1586 kPa)
- #2 8" x 8" x 8" x 75 psi (20.3 x 20.3 x 20.3 cm x 517 kPa)
- #3 8" x 8" x 8" x 130 psi (20.3 x 20.3 x 20.3 cm x 896 kPa)
- #4 8" x 8" x 8" x 230 psi (20.3 x 20.3 x 20.3 cm x 1586 kPa)

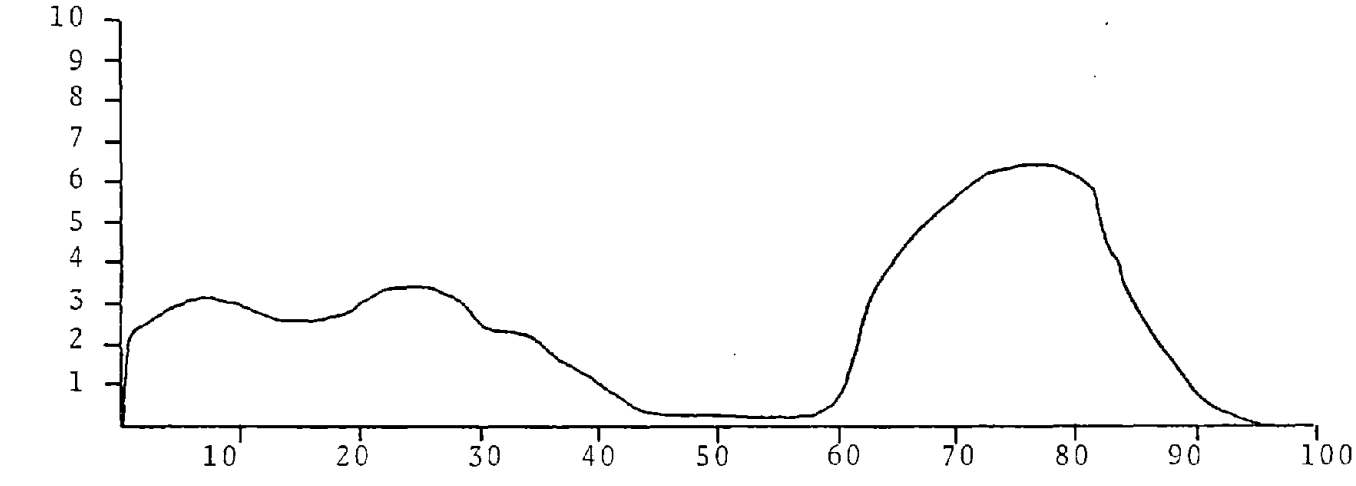
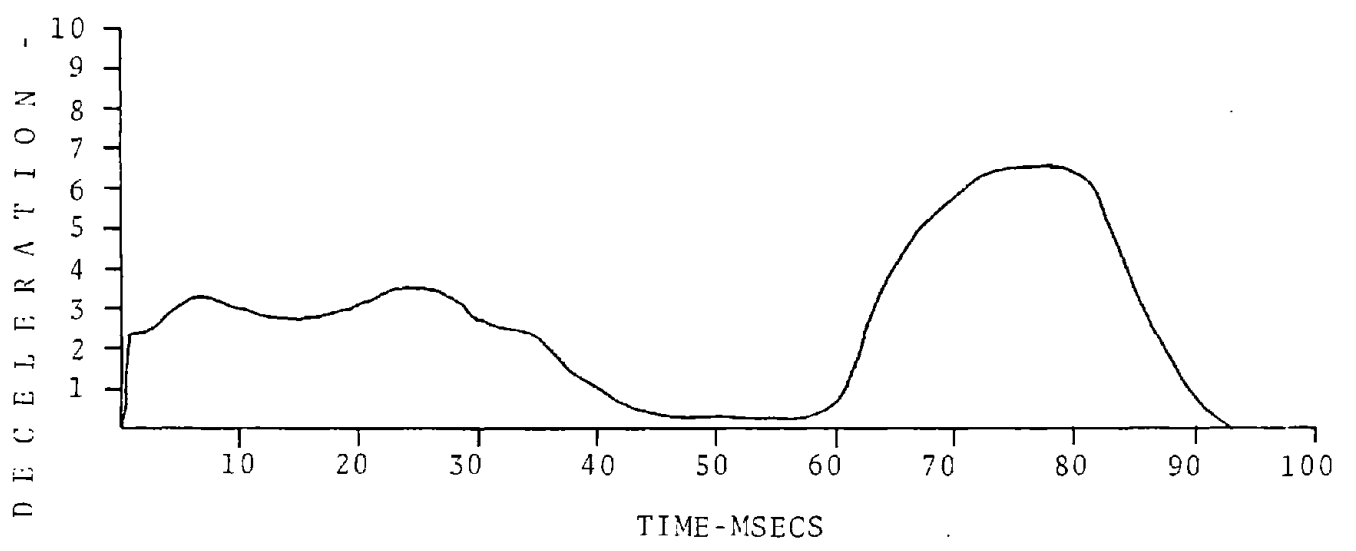
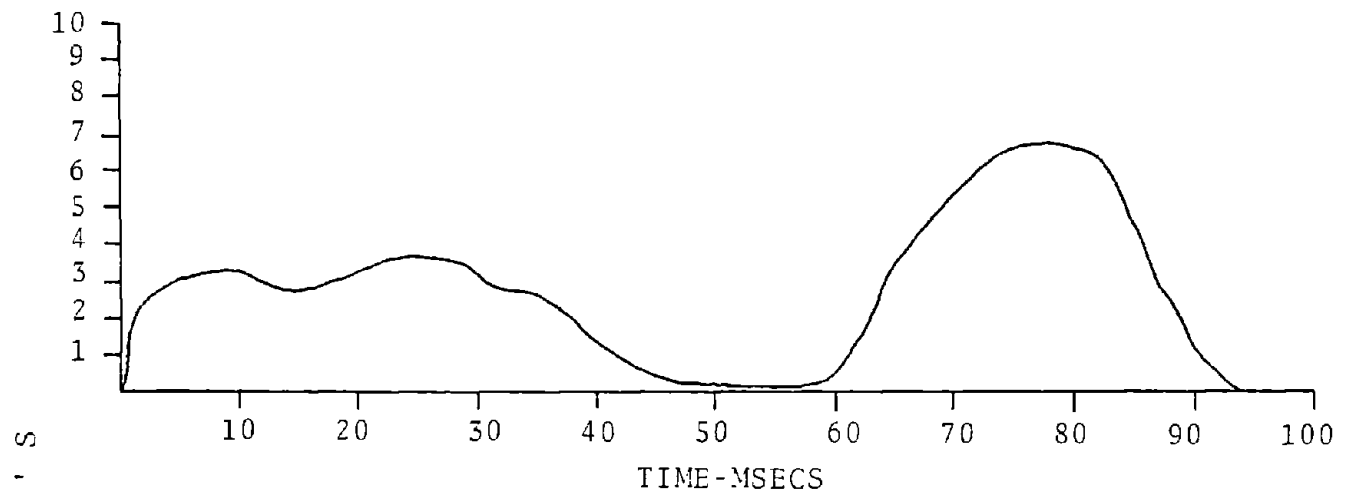


Fig. 7  
Longitudinal Accelerometer Traces for Test 1147-105

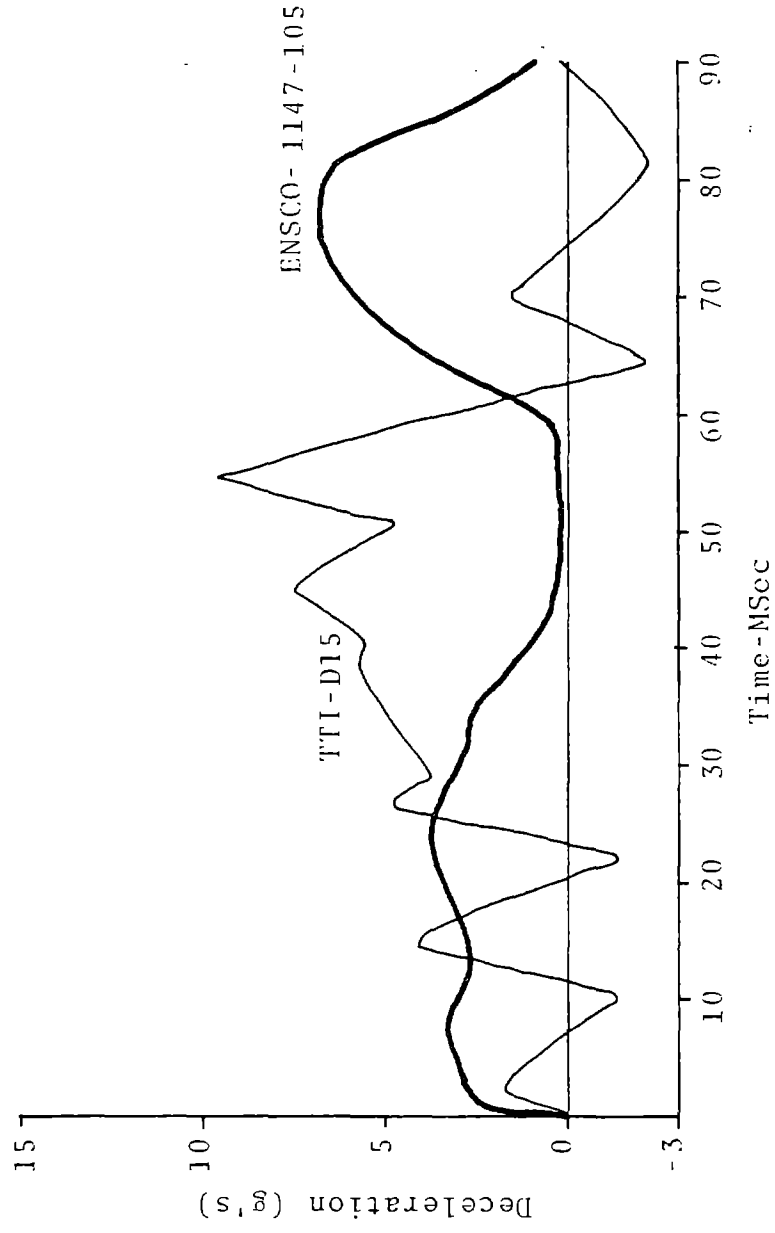


Fig. 8  
 Comparison of Longitudinal Accelerometer  
 Traces for TTI Test D15 Vs. ENSCO Test 1147-105

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-106  
Date : Feb 4, 1977  
Weather : Overcast, cool  
Pendulum Mass : 2385 lbs (1083 kg)

SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lbs (168 kg)

BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

FASTENERS (Base):

Type : 3-1" Strain Sert Bolts  
Load : 15,000 (66,720 N)

TEST DATA:

Impact Speed : 30.9 f/s (9.4 m/s)  
Exit Speed : 14.9 f/s (5.4 m/s)  
Momentum Change  
Speed Trap : 1185 lb-sec (5271 Ns)  
Accelerometer : 1205 lb-sec (5360 Ns)  
Peak Deceleration : 8.4 g's

COMMENTS:

Honeycomb (width x height x length x static crush pressure)

#1 8" x 8" x 4" x 230 psi (20.3 x 20.3 x 10.2 cm x 1586 kPa)  
#2 8" x 8" x 8" x 75 psi (20.3 x 20.3 x 20.3 cm x 517 kPa)  
#3 8" x 8" x 8" x 130 psi (20.3 x 20.3 x 20.3 cm x 896 kPa)  
#4 8" x 8" x 8" x 230 psi (20.3 x 20.3 x 20.3 cm x 1586 kPa)

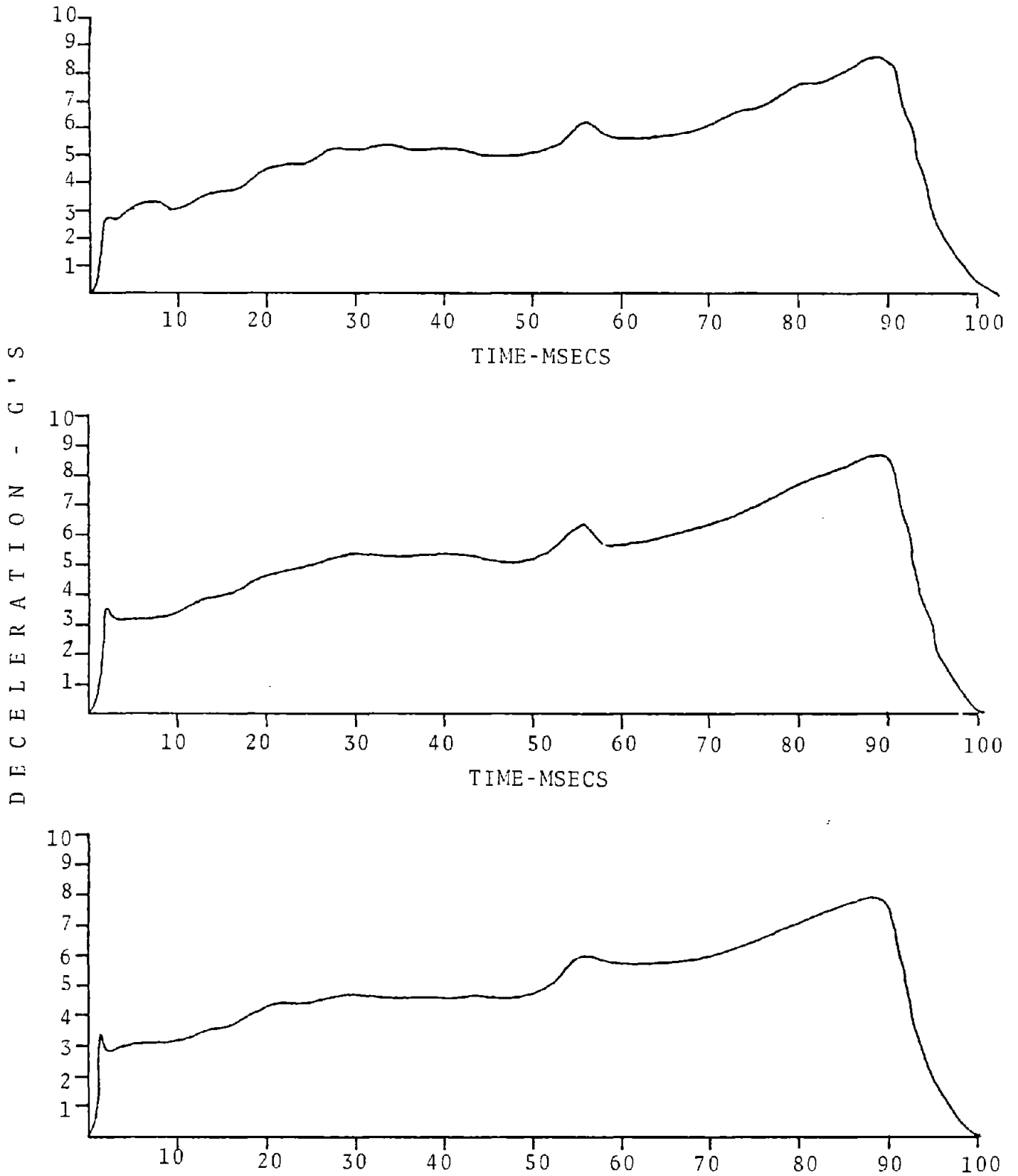


Fig. 9  
 Longitudinal Accelerometer Traces for Test 1147-106

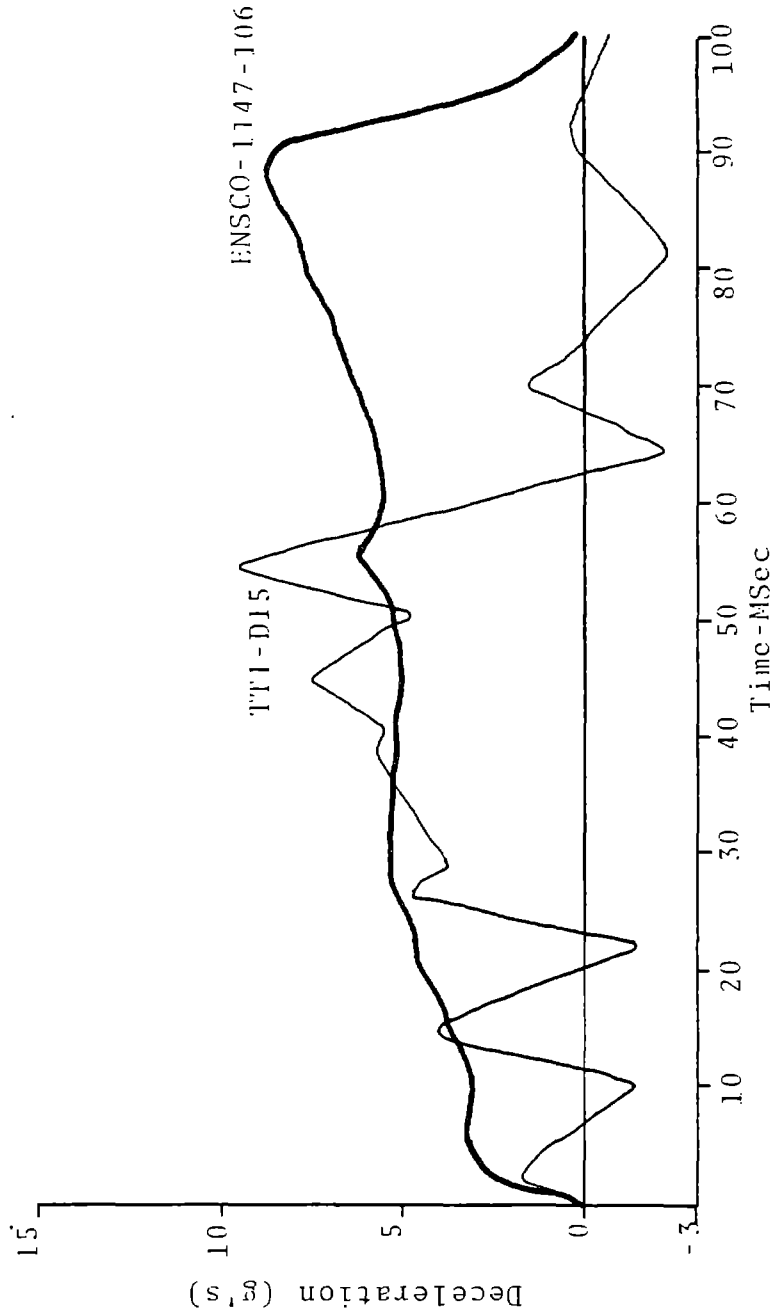


Fig. 10  
 Comparison of Longitudinal Accelerometer  
 Traces for TTI Test D15 and ENSCO Test 1147-106

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-107  
Date : Feb 8, 1977  
Weather : Clear  
Pendulum Mass : 2371 lbs (723 kg)

SUPPORT:

Type : Tapered steel pole  
Manufacturer : Union Metal  
Height : 36 ft (11.0 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lbs (168 kg)

BASE:

Type : Slip/3 bolt  
Manufacturer : Union Metal  
Modifications : None

FASTENERS (Base):

Type : 3-1" Strain sert bolt  
Load : 15,000 lbs (66,720 N)

TEST DATA:

Impact Speed : 30.8 f/s (9.4 m/s)  
Exit Speed : 16.3 f/s (5.0 m/s)  
Momentum Change  
Speed Trap : 1065 lb-sec (4737 Ns)  
Accelerometer : 1050 lb-sec (4670 Ns)  
Peak Deceleration : 11.0 g's

COMMENTS:

Honeycomb (width x height x length x static crush pressure)

- #1 5" x 5" x 4" x 75 psi (12.7 x 12.7 x 10.2 cm x 517 kPa)
- #2 5" x 8" x 4" x 75 psi (12.7 x 20.3 x 10.2 cm x 517 kPa)
- #3 5" x 8" x 4" x 130 psi (12.7 x 20.3 x 10.2 cm x 896 kPa)
- #4 5" x 8" x 4" x 230 psi (12.7 x 20.3 x 10.2 cm x 1586 kPa)
- #5 8" x 8" x 4" x 230 psi (20.3 x 20.3 x 10.2 cm x 1586 kPa)
- #6 12" x 8" x 4" x 230 psi (30.5 x 20.3 x 10.2 cm x 1586 kPa)

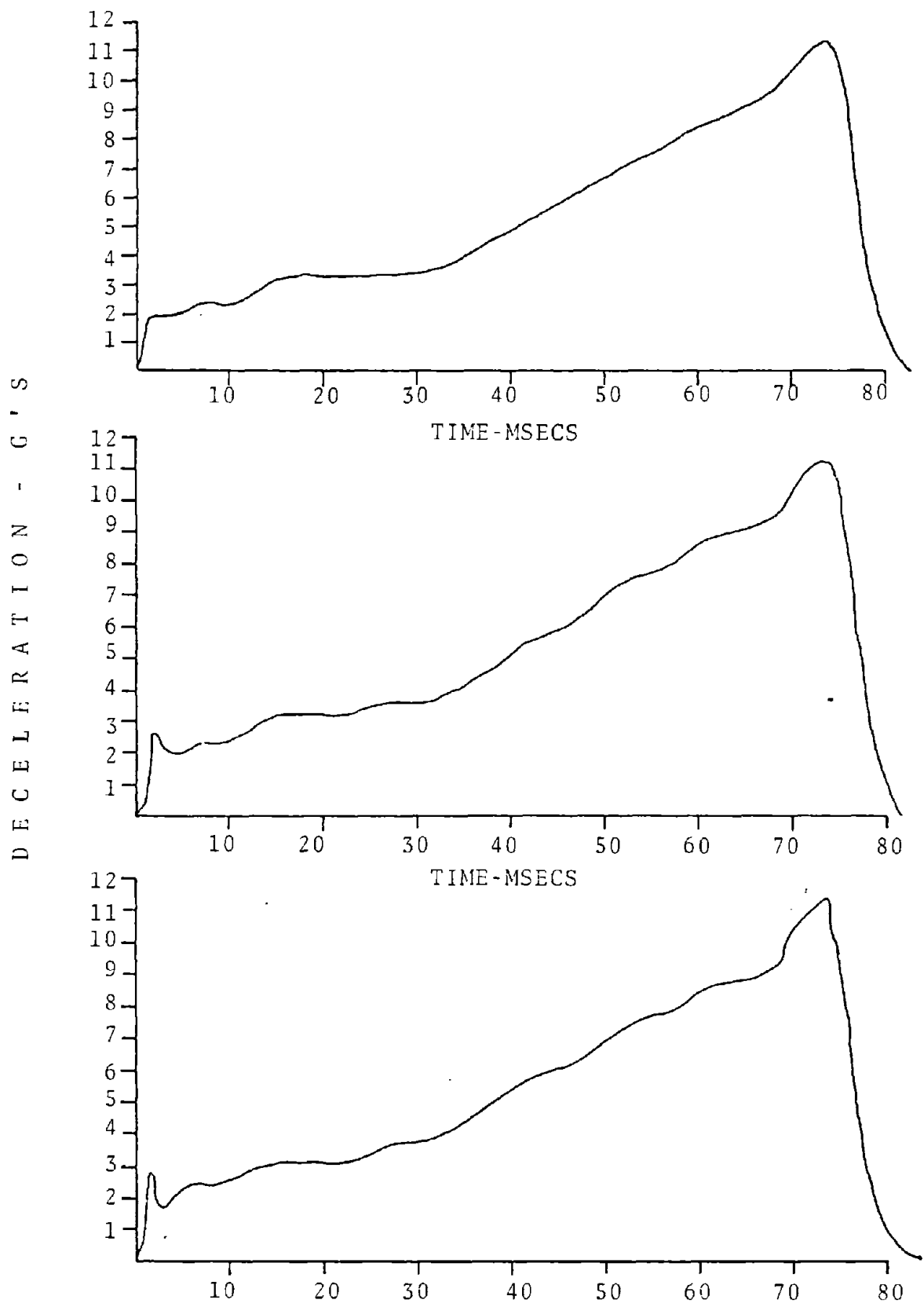


Fig. 11  
 Longitudinal Accelerometer Traces for Test 1147-107



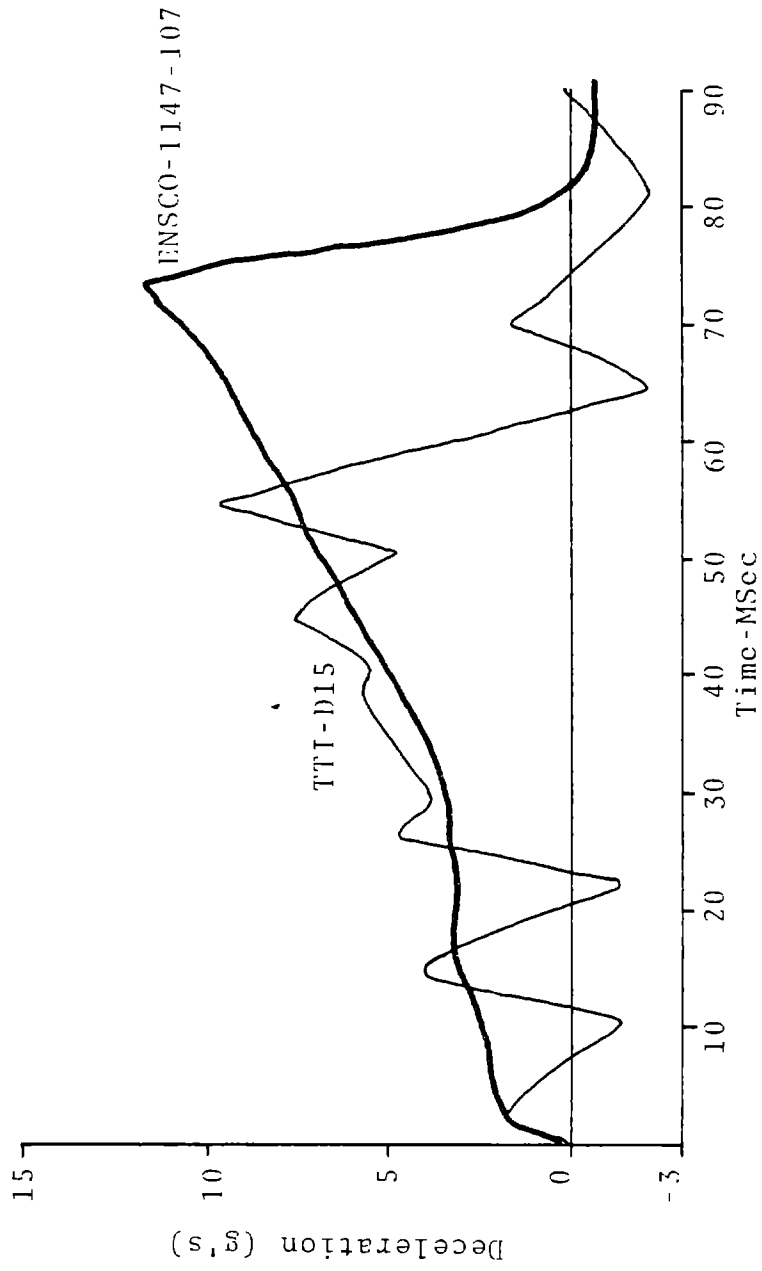


Fig. 12  
 Comparison of Longitudinal Accelerometer  
 Traces for TTI Test D15 and ENSCO Test 1147-107

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-108  
Date : Feb 8, 1977  
Weather : Clear  
Pendulum Mass : 2371 lb (1076 kg)

SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lbs (168 kg)

BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

FASTENERS (Base):

Type : 3-1" Strain Sert Bolts  
Load : 15,000 lbs (66,720 N)

TEST DATA:

Impact Speed : 30.7 f/s (9.4 m/s)  
Exit Speed : 2.5 f/s (0.8 m/s)  
Momentum Change  
Speed Trap : 2074 lb-sec (9225 Ns)  
Accelerometer : 2074 lb-sec (9225 Ns)  
Peak Deceleration : 13.0 g's

COMMENTS:

Honeycomb (width x height x length x static crush pressure)

#1 5" x 5" x 4" x 75 psi (12.7 x 12.7 x 10.2 cm x 517 kPa)  
#2 5" x 8" x 4" x 75 psi (12.7 x 20.3 x 10.2 cm x 517 kPa)  
#3 5" x 8" x 4" x 130 psi (12.7 x 20.3 x 10.2 cm x 896 kPa)  
#4 5" x 8" x 4" x 230 psi (12.7 x 20.3 x 10.2 cm x 1586 kPa)  
#5 8" x 8" x 4" x 230 psi (20.3 x 20.3 x 10.2 cm x 1586 kPa)

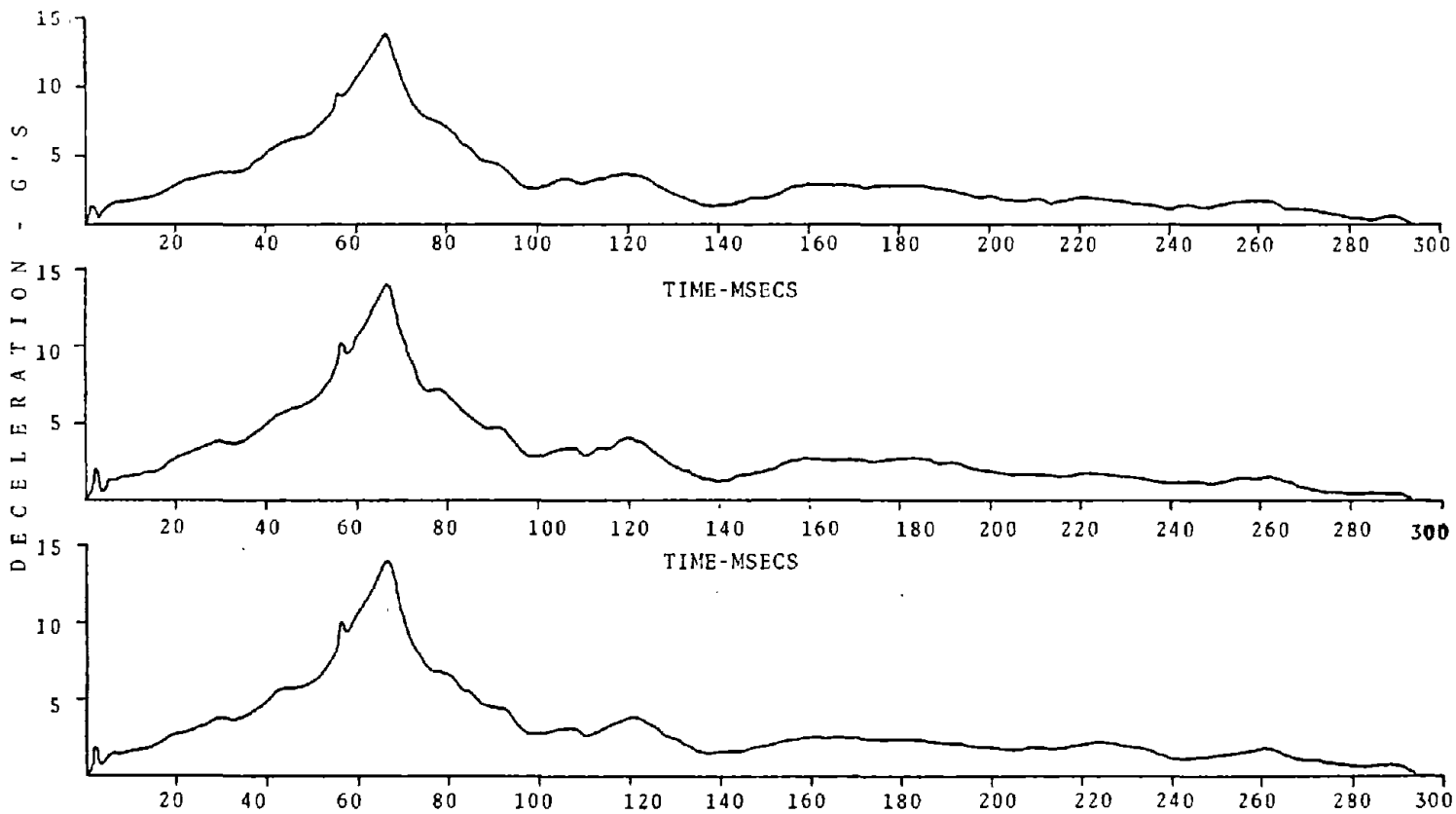


Fig. 13  
Longitudinal Accelerometer Traces for Test 1147-108

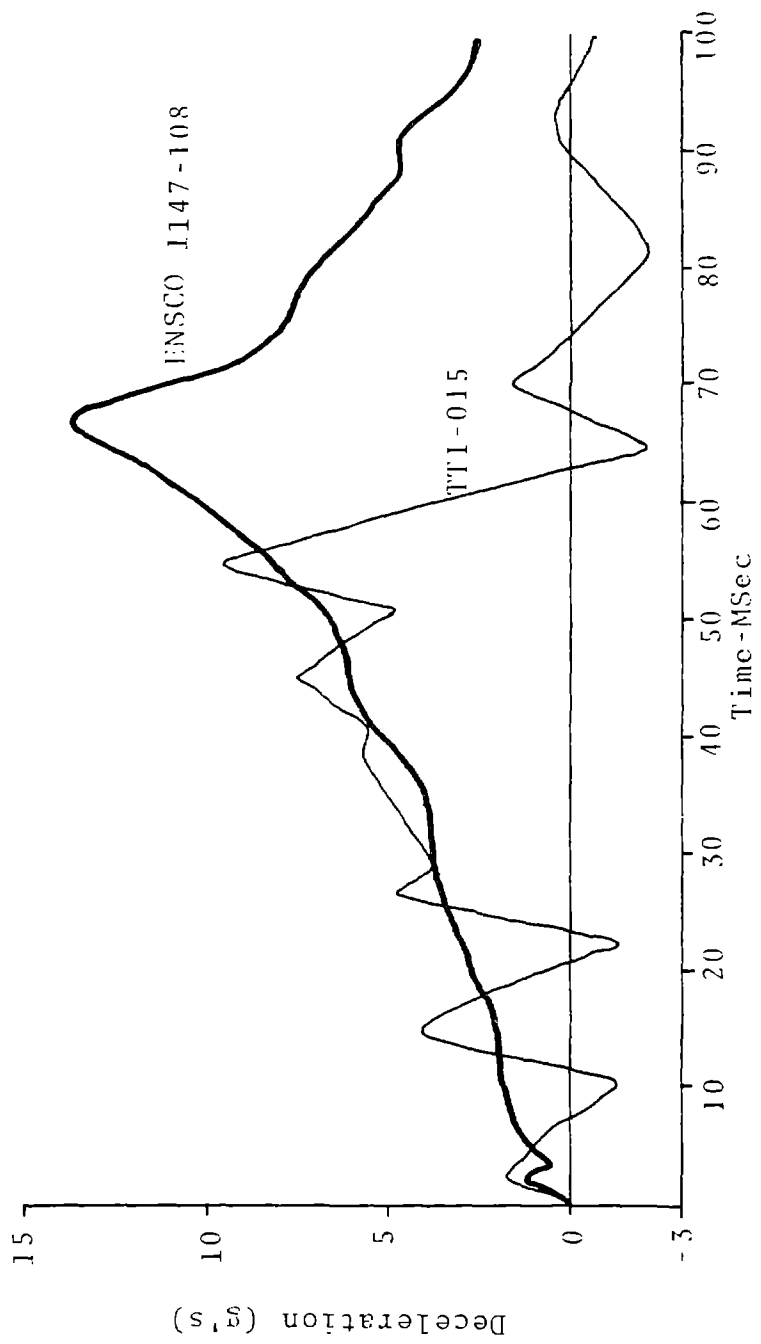


Fig. 14  
 Comparison of Longitudinal Accelerometer  
 Traces for TTI Test D15 and ENSCO Test 1147-108

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-109  
Date : Feb 16, 1977  
Weather : Overcast, cold  
Pendulum Mass : 2248 lbs (1021 kg)

### SUPPORT:

Type : Tapered steel pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lbs (168 kg)

### BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

### FASTENERS (Base):

Type : 3-1" Strain Sert Bolts  
Load : 15,000 lbs (66,720 N)

### TEST DATA:

Impact Speed : 30.5 f/s (9.3 m/s)  
Exit Speed : 18.9 f/s (5.8 m/s)  
Momentum Change  
Speed Trap : 813 lb-sec (3617 Ns)  
Accelerometer : 803 lb-sec (3572 Ns)  
Peak Deceleration : 10.2 g's

### COMMENTS:

Honeycomb (width x height x length x static crush pressure)

#1 5" x 5" x 4" x 75 psi (12.7 x 12.7 x 10.2 cm x 517 kPa)  
#2 5" x 8" x 4" x 75 psi (12.7 x 20.3 x 10.2 cm x 517 kPa)  
#3 5" x 8" x 4" x 130 psi (12.7 x 20.3 x 10.2 cm x 896 kPa)  
#4 5" x 8" x 4" x 230 psi (12.7 x 20.3 x 10.2 cm x 1586 kPa)  
#5 8" x 8" x 4" x 230 psi (20.3 x 20.3 x 10.2 cm x 1586 kPa)  
#6 12" x 8" x 4" x 230 psi (30.5 x 20.3 x 10.2 cm x 1586 kPa)

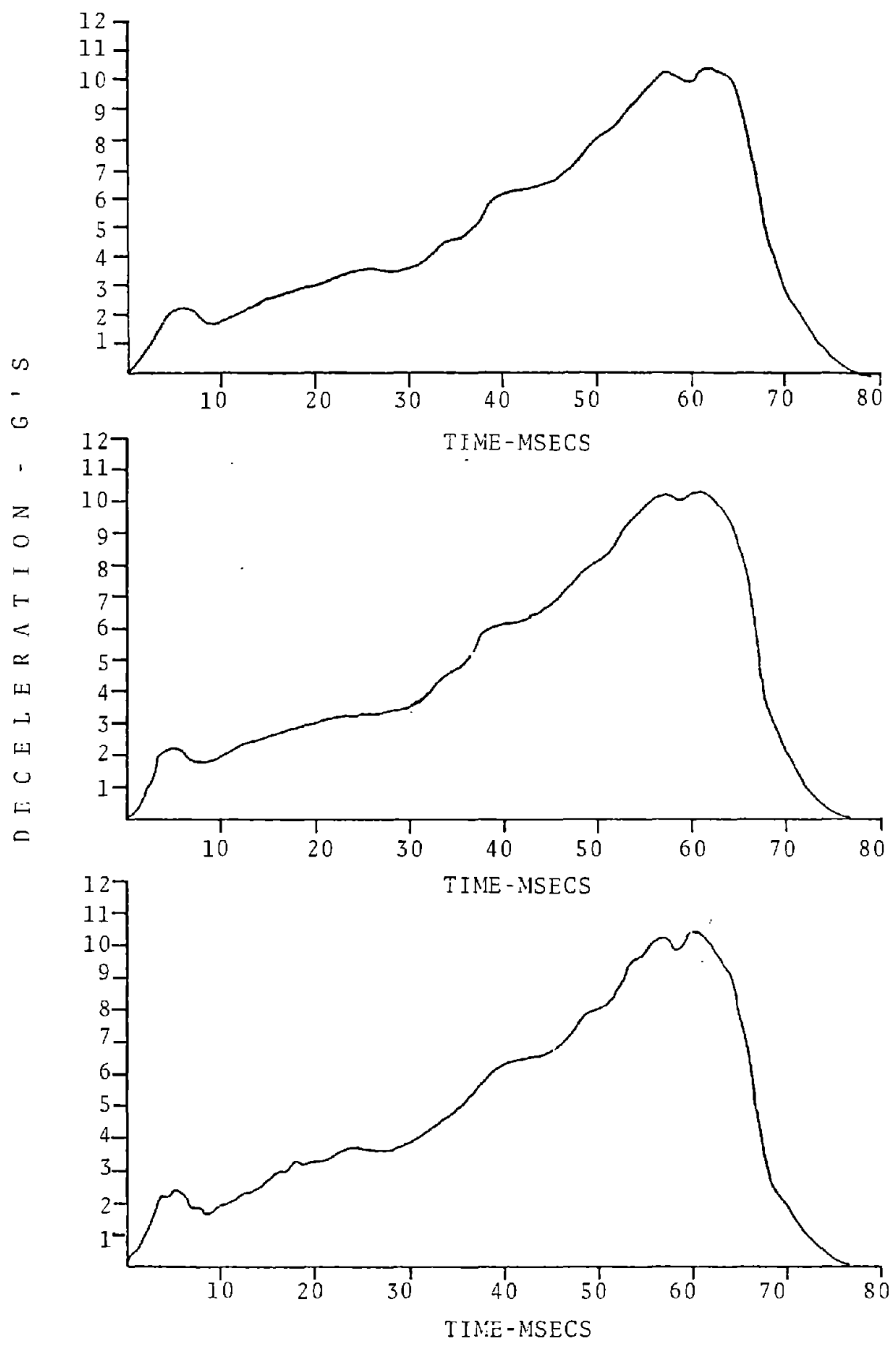


Fig. 15  
 Longitudinal Accelerometer Traces for Test 1147-109

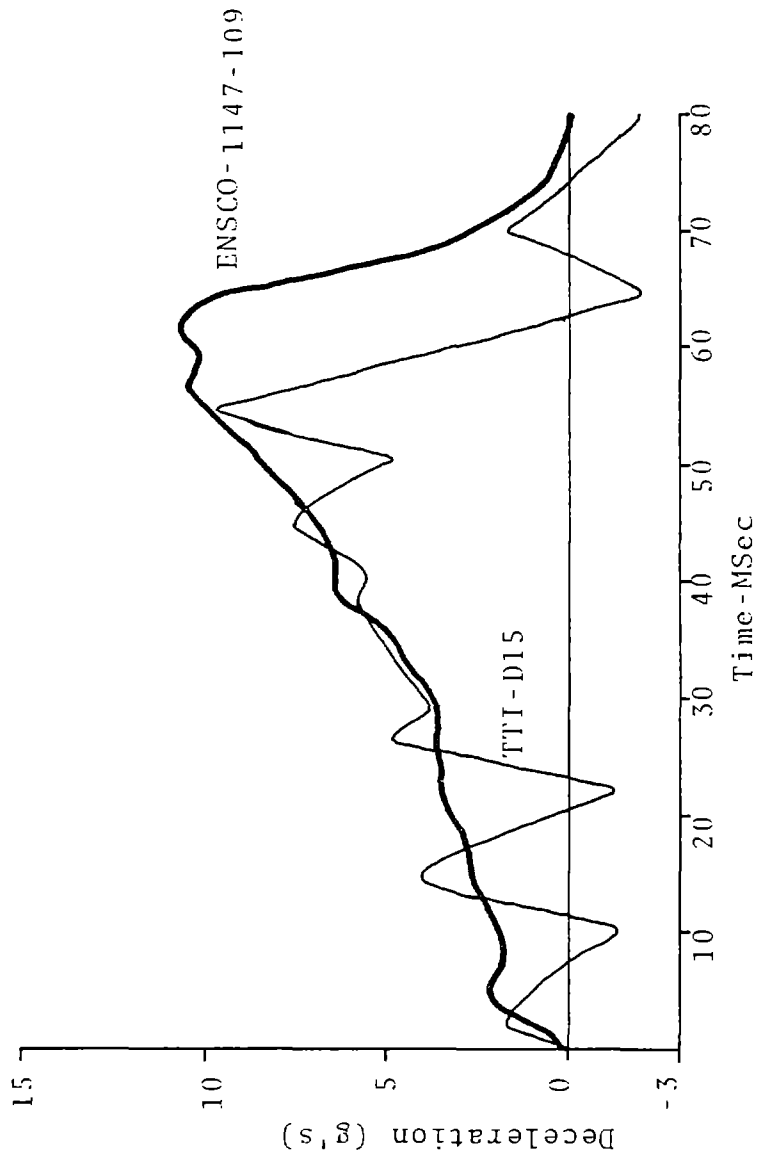


Fig. 16  
Comparison of Longitudinal Accelerometer  
Traces for TTI Test D15 and ENSCO Test 1147-109

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-110  
Date : Feb 16, 1977  
Weather : Clear, cold  
Pendulum Mass : 2248 lbs (1021 kg)

### SUPPORT:

Type : Tapered steel pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lbs (168 kg)

### BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

### FASTENERS (Base):

Type : 3-1" Strain sert bolts  
Load : 15,000 lbs (66,720 N)

### TEST DATA:

Impact Speed : 30.6 f/s (9.3 m/s)  
Exit Speed : 22.9 f/s (7.0 m/s)  
Momentum Change  
Speed Trap : 537 lb-sec (3389 Ns)  
Accelerometer : 538 lb-sec (2393 Ns)  
Peak Deceleration : 8.7 g's

### COMMENTS:

Honeycomb (width x height x length x static crush pressure) "

#1 5" x 5" x 4" x 75 psi (12.7 x 12.7 x 10.2 cm x 517 kPa)  
#2 5" x 8" x 4" x 75 psi (12.7 x 20.3 x 10.2 cm x 517 kPa)  
#3 5" x 8" x 4" x 230 psi (12.7 x 20.3 x 10.2 cm x 1586 kPa)  
#4 8" x 8" x 4" x 230 psi (20.3 x 20.3 x 10.2 cm x 1586 kPa)  
#5 10" x 8" x 4" x 230 psi (25.4 x 20.3 x 10.2 cm x 1586 kPa)  
#6 12" x 8" x 4" x 230 psi (30.5 x 20.3 x 10.2 cm x 1586 kPa)



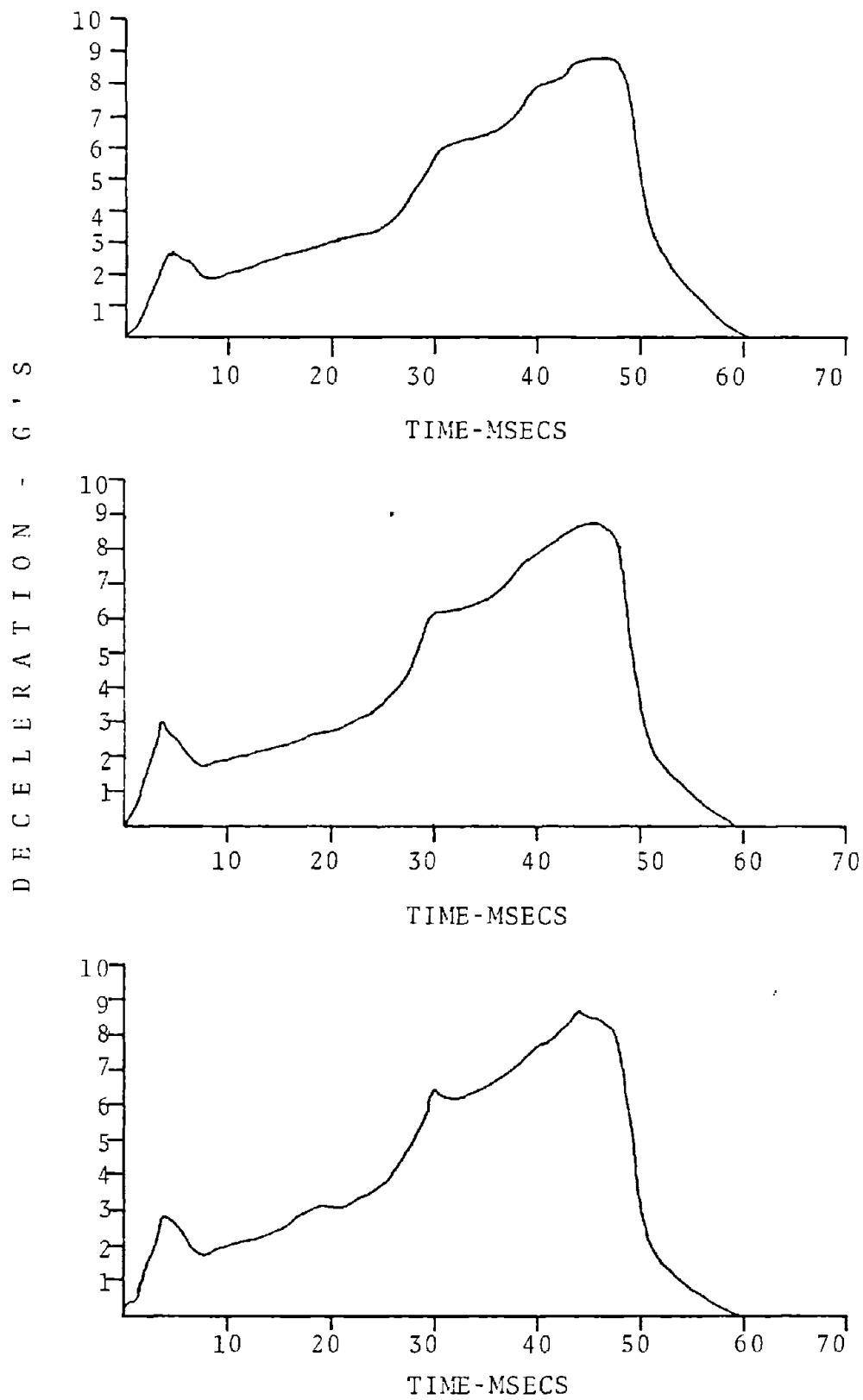


Fig. 17  
 Longitudinal Accelerometer Traces for Test 1147-110

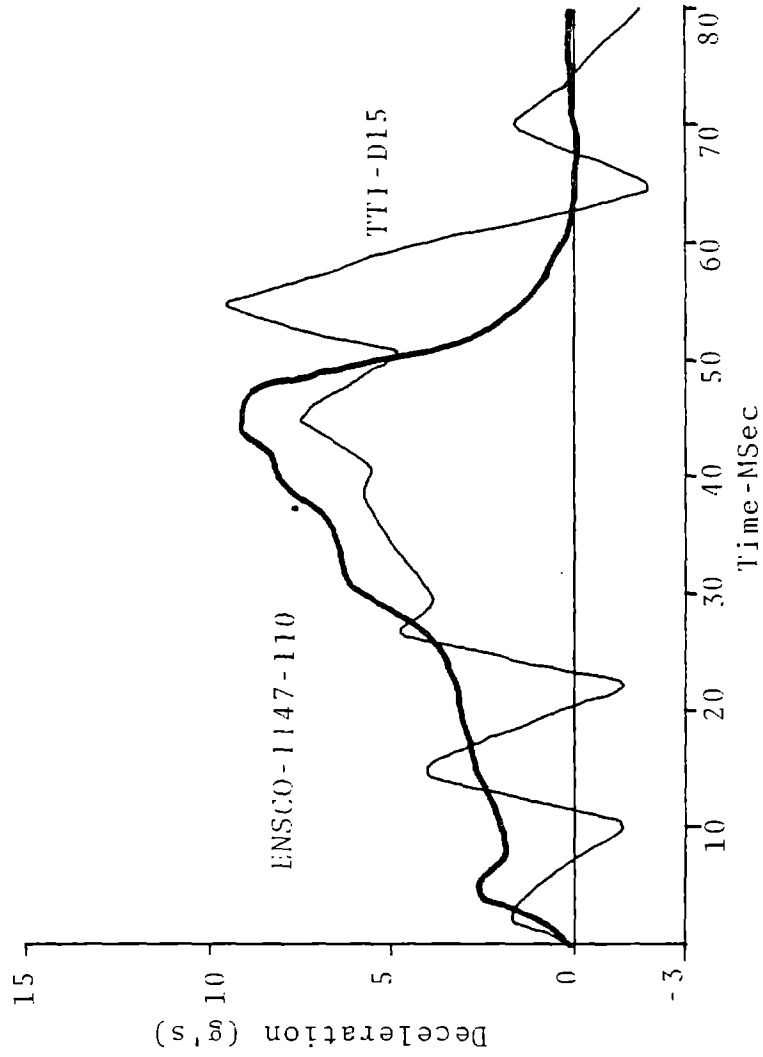


Fig. 18  
 Comparison of Longitudinal Accelerometer  
 Traces for TTI Test D15 and ENSCO Test 1147-110

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-111  
Date : March 8, 1977  
Weather : Clear, Warm  
Pendulum Mass : 2250 lb (1022 kg)

### SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lb (168 kg)

### BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

### FASTENERS (Base):

Type : 3-1" Strain sert bolts  
Load : 15,000 lbs (66,720 N)

### TEST DATA:

Impact Speed : 30.2 f/s (9.2 m/s)  
Exit Speed : 20.1 f/s (6.1 m/s)  
Momentum Change  
Speed Trap : 706 lb-sec (3140 Ns)  
Accelerometer : 701 lb-sec (3118 Ns)  
Peak Deceleration : 9.0 g's

### COMMENTS:

Honeycomb (width x height x length x static crush pressure)

#1 5" x 5" x 4" x 75 psi (12.7 x 12.7 x 10.2 cm x 517 kPa)  
#2 5" x 8" x 4" x 75 psi (12.7 x 20.3 x 10.2 cm x 517 kPa)  
#3 5" x 8" x 6" x 130 psi (12.7 x 20.3 x 15.2 cm x 896 kPa)  
#4 5" x 8" x 4" x 230 psi (12.7 x 20.3 x 10.2 cm x 1586 kPa)  
#5 8" x 8" x 4" x 230 psi (20.3 x 20.3 x 10.2 cm x 1586 kPa)  
#6 12" x 8" x 4" x 230 psi (30.5 x 20.3 x 10.2 cm x 1586 kPa)

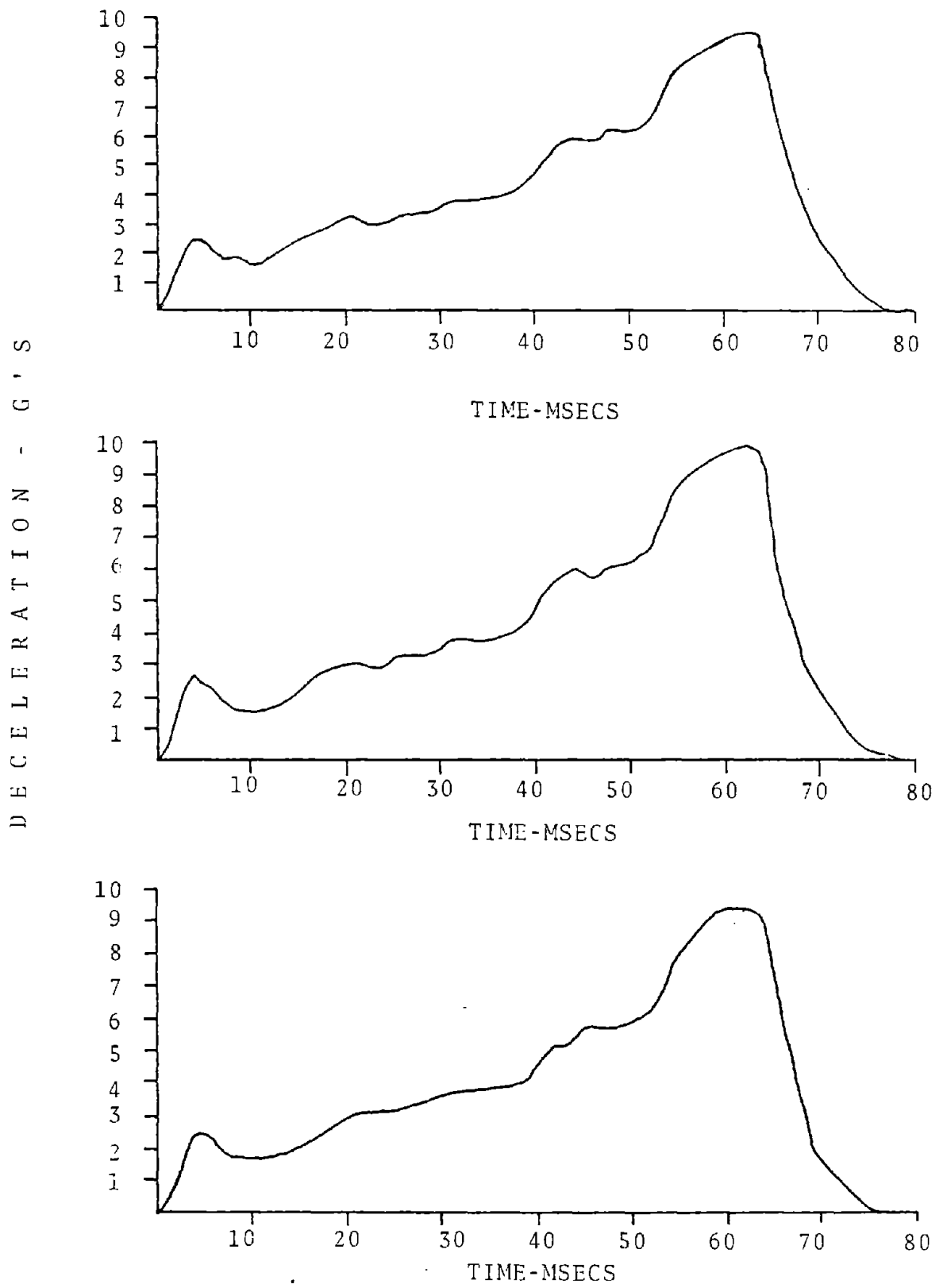


Fig. 19  
 Longitudinal Accelerometer Traces for Test 1147-111

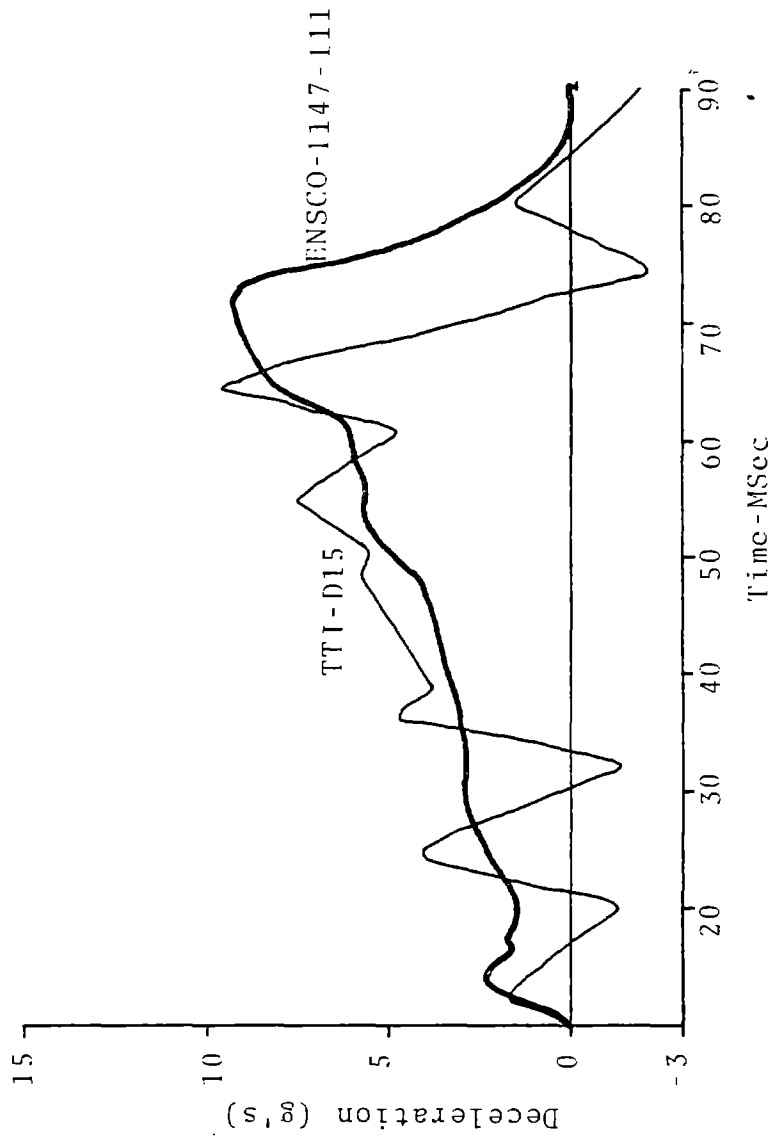


Fig. 20  
Comparison of Longitudinal Accelerometer  
Traces for TTI Test D15 and ENSCO Test 1147-111

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-112  
Date : Mar 8, 1977  
Weather : Clear warm  
Pendulum Mass : 2250 lb (1022 kg)

### SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lb (168 kg)

### BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

### FASTENERS (Base):

Type : 3-1" Strain sert bolts  
Load : 15,000 lb (66,720 N)

### TEST DATA:

Impact Speed : 30.0 f/s (9.2 m/s)  
Exit Speed : 18.7 f/s (5.7 m/s)  
Momentum Change  
Speed Trap : 788 lb-sec (3505 Ns)  
Accelerometer : 777 lb-sec (3456 Ns)  
Peak Deceleration : 9.1 g's

### COMMENTS:

Honeycomb (width x height x length x static crush pressure)

- #1 5" x 5" x 4" x 75 psi (12.7 x 12.7 x 10.2 cm x 517 kPa)
- #2 5" x 8" x 4" x 75 psi (12.7 x 20.3 x 10.2 cm x 517 kPa)
- #3 5" x 8" x 6" x 130 psi (12.7 x 20.3 x 15.2 cm x 896 kPa)
- #4 5" x 8" x 4" x 230 psi (12.7 x 20.3 x 10.2 cm x 1586 kPa)
- #5 10" x 8" x 4" x 230 psi (25.4 x 20.3 x 10.2 cm x 1586 kPa)
- #6 12" x 8" x 4" x 230 psi (30.5 x 20.3 x 10.2 cm x 1586 kPa)

DECELERATION - G'S

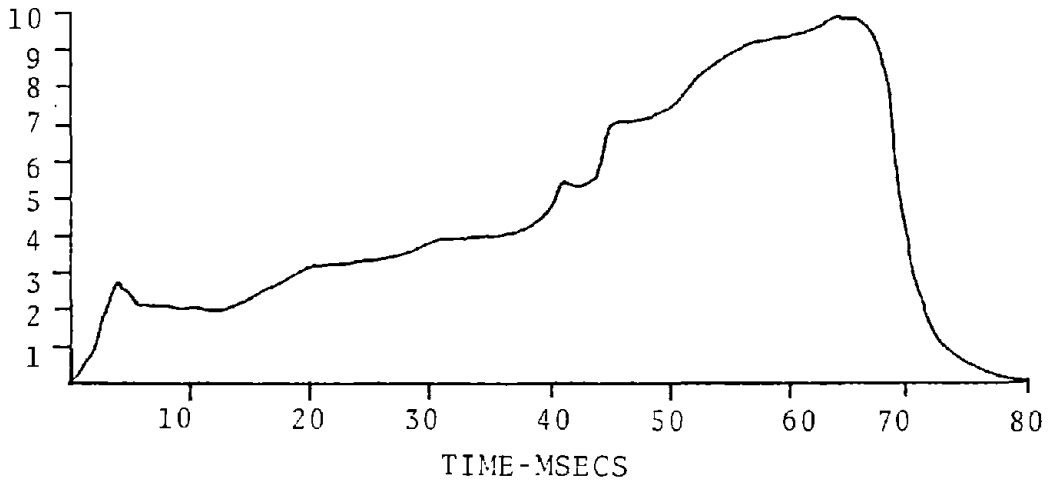
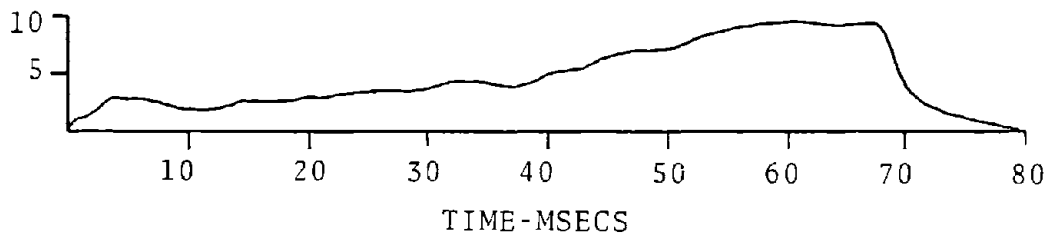
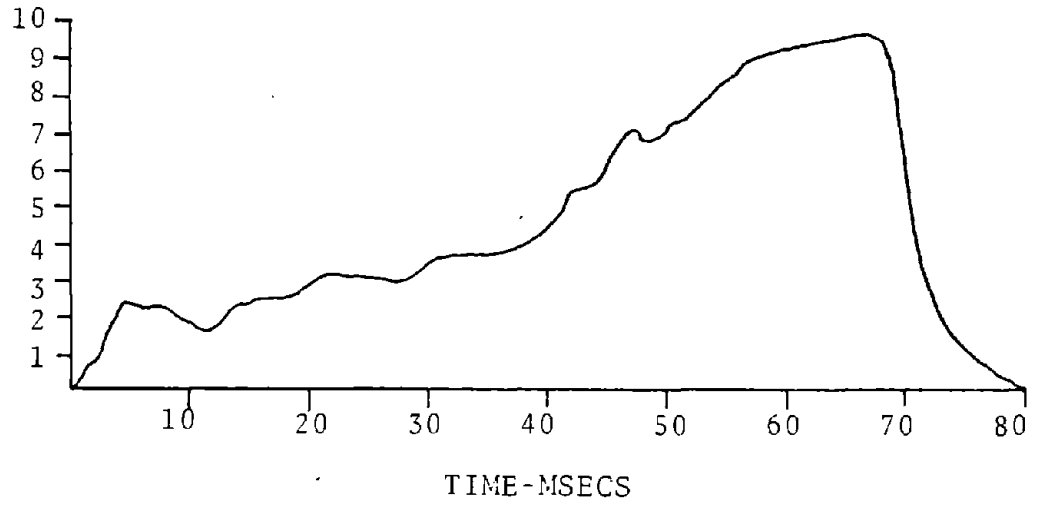


Fig. 21  
Longitudinal Accelerometer Traces for Test 1147-112

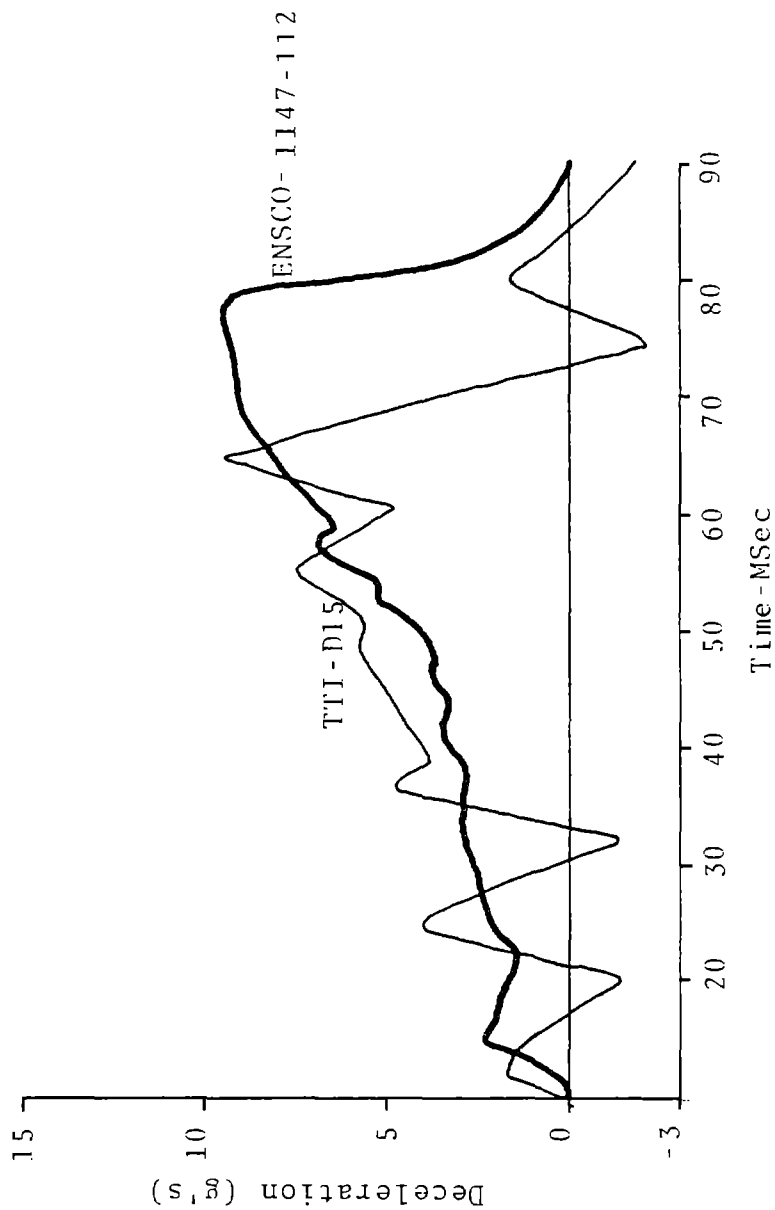


Fig. 22  
 Comparison of Longitudinal Accelerometer  
 Traces for TTI Test 1147-112 and ENSCO Test 1147-112



TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-113  
Date : March 9, 1977  
Weather : Clear, warm  
Pendulum Mass : 2250 lb (1022 kg)

SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lb (168 kg)

BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

FASTENERS (Base):

Type : 3-1" Strain sert bolts  
Load : 15,000 lb (66,720 N)

TEST DATA:

Impact Speed : 30.0 f/s (9.2 m/s)  
Exit Speed : 20.9 f/s (6.4 m/s)  
Momentum Change  
Speed Trap : 638 lb-sec (2838 Ns)  
Accelerometer : 635 lb-sec (2825 Ns)  
Peak Deceleration : 10.2 g

COMMENTS:

Honeycomb (width x height x length x static crush pressure)

- #1 5" x 5" x 4" x 75 psi (12.7 x 12.7 x 10.2 cm x 517 kPa)
- #2 5" x 8" x 4" x 75 psi (12.7 x 20.3 x 10.2 cm x 517 kPa)
- #3 5" x 8" x 6" x 130 psi (12.7 x 20.3 x 15.2 cm x 896 kPa)
- #4 5" x 8" x 4" x 230 psi (12.7 x 20.3 x 10.2 cm x 1586 kPa)
- #5 10" x 8" x 2" x 230 psi (25.4 x 20.3 x 5.1 cm x 1586 kPa)
- #6 16" x 8" x 4" x 230 psi (40.6 x 20.3 x 10.2 cm x 1586 kPa)

DECELERATION - G'S

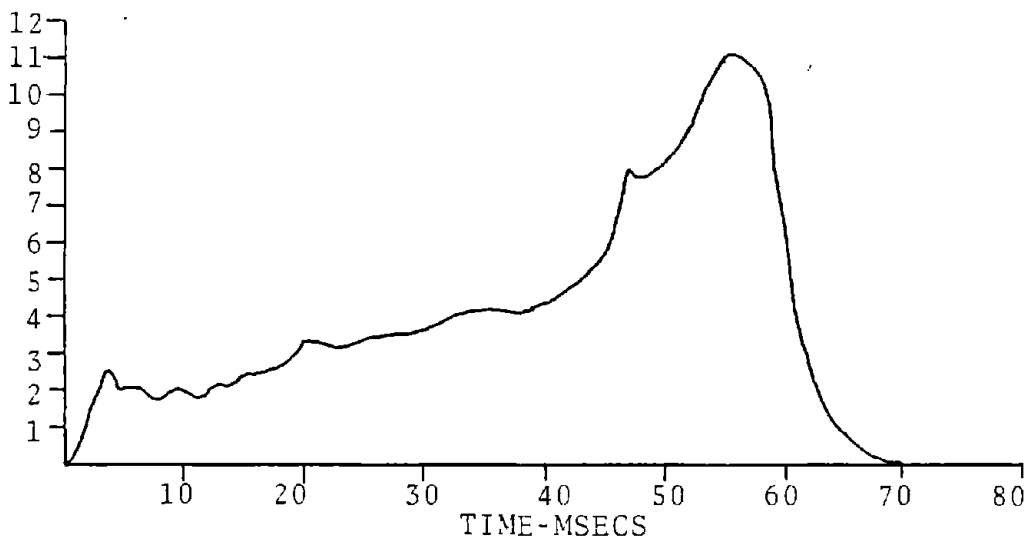
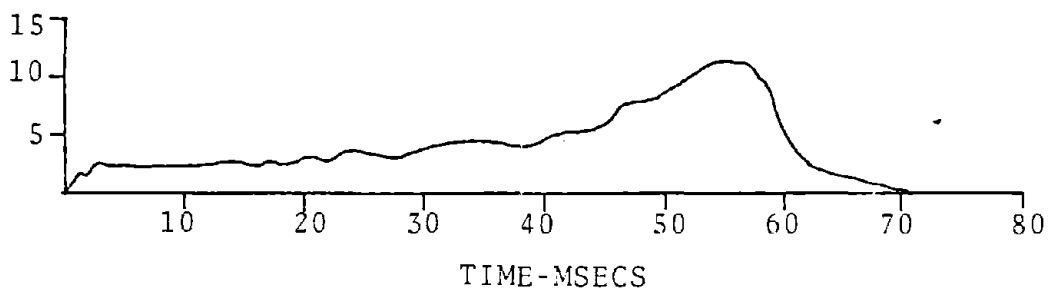
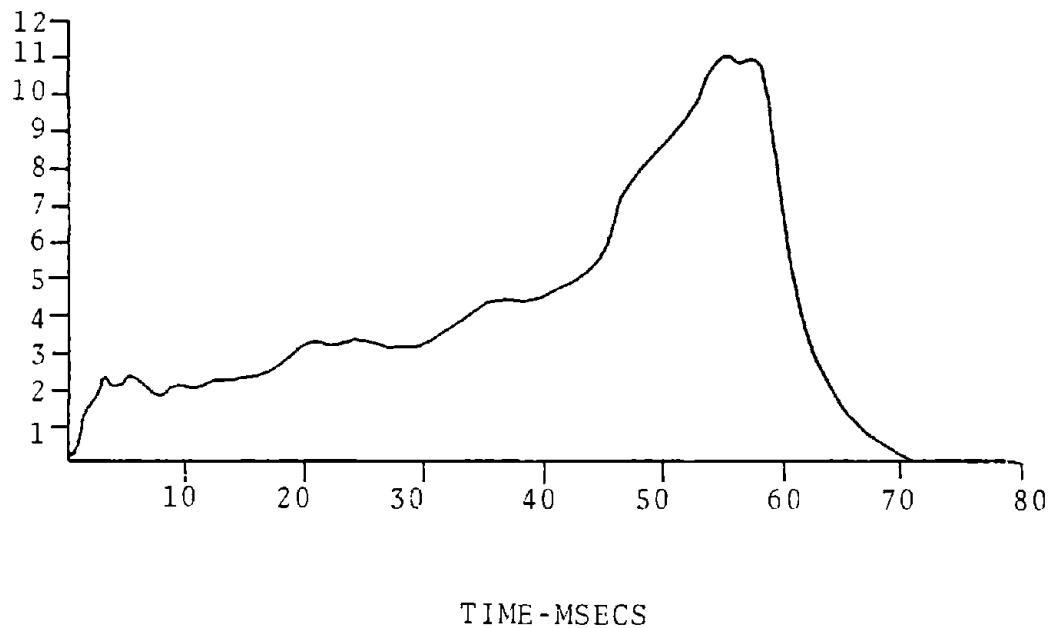


Fig. 23

Longitudinal Accelerometer Traces for Test 1147-113

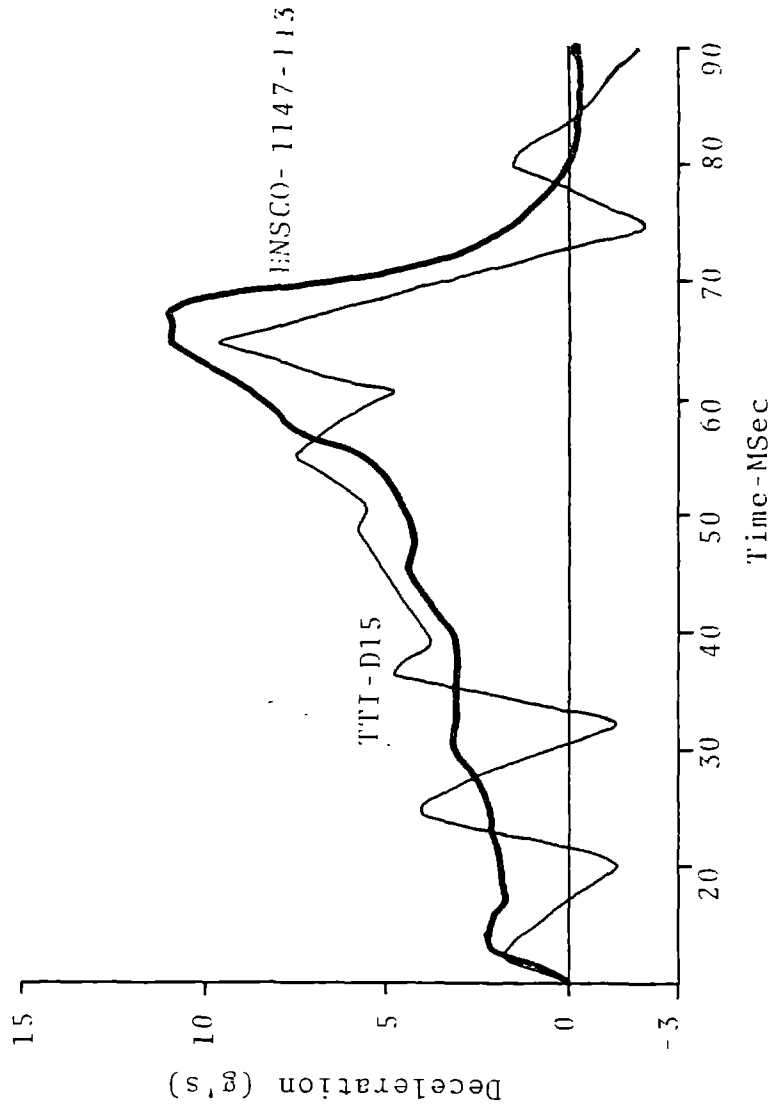


Fig. 24  
Comparison of Longitudinal Accelerometer  
Traces for TTI Test D15 and ENSCO Test 1147-113

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-114  
Date : Mar 9, 1977  
Weather : Clear, warm  
Pendulum Mass : 2250 lbs (1022 kg)

### SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lb (168 kg)

### BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

### FASTENERS (Base):

Type : 3-1" Strain Sert Bolts  
Load : 15,000 lb (66,720 N)

### TEST DATA:

Impact Speed : 30.4 f/s (9.3 m/s)  
Exit Speed : 20.6 f/s (6.3 m/s)  
Momentum Change  
Speed Trap : 688 lb-sec (3060 Ns)  
Accelerometer : 659 lb-sec (2931 Ns)  
Peak Deceleration : 12.7 g

### COMMENTS:

Honeycomb (width x height x length x static crush pressure)

- #1 5" x 5" x 4" x 75 psi (12.7 x 12.7 x 10.2 cm x 517 kPa)
- #2 5" x 8" x 4" x 75 psi (12.7 x 20.3 x 10.2 cm x 517 kPa)
- #3 5" x 8" x 6" x 130 psi (12.7 x 20.3 x 15.2 cm x 896 kPa)
- #4 5" x 8" x 4" x 230 psi (12.7 x 20.3 x 10.2 cm x 1586 kPa)
- #5 8" x 8" x 2" x 230 psi (20.3 x 20.3 x 5.1 cm x 1586 kPa)
- #6 16" x 8" x 4" x 230 psi (40.6 x 20.3 x 10.2 cm x 1586 kPa)

DECELERATION - G'S

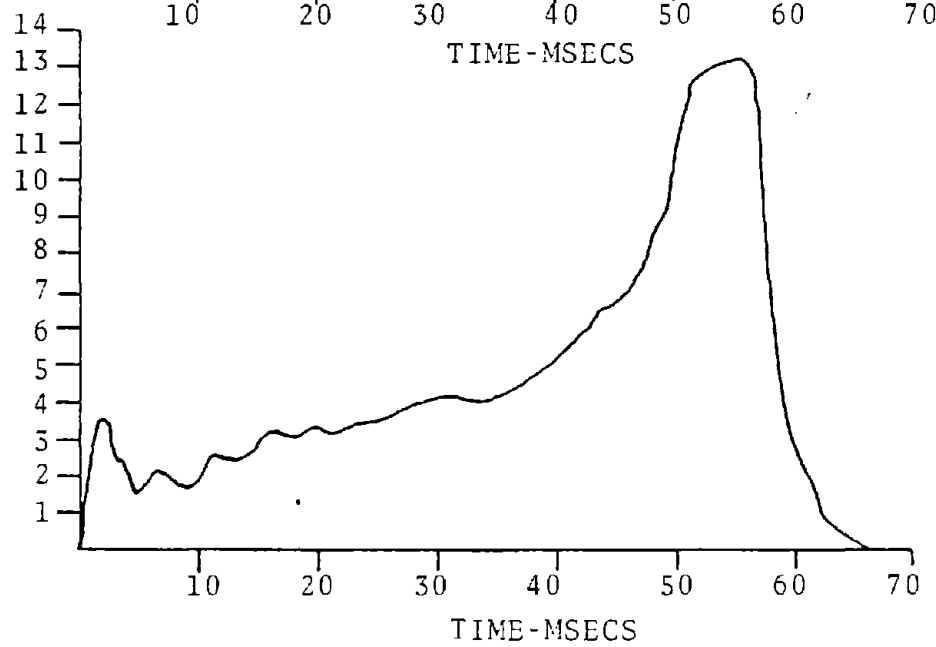
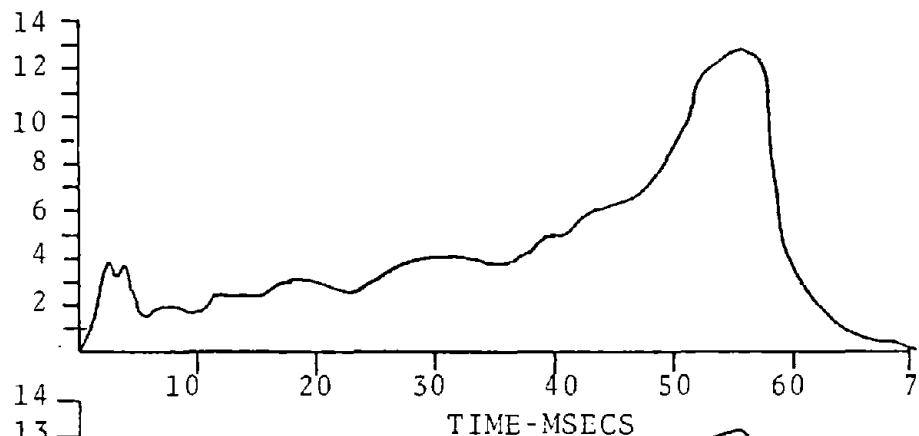
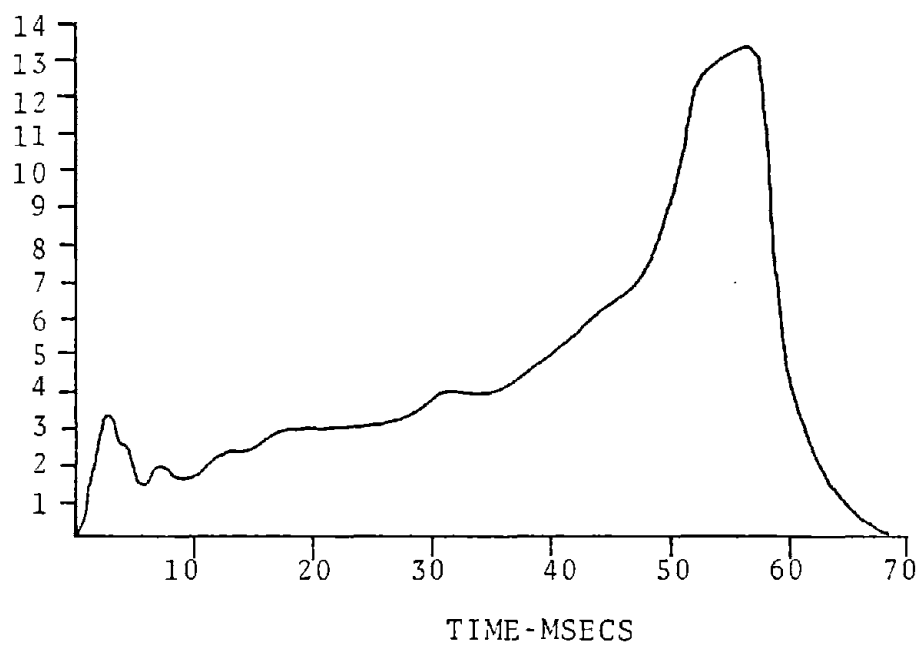


Fig. 25  
Longitudinal Acceleration Traces for Test 1147-114

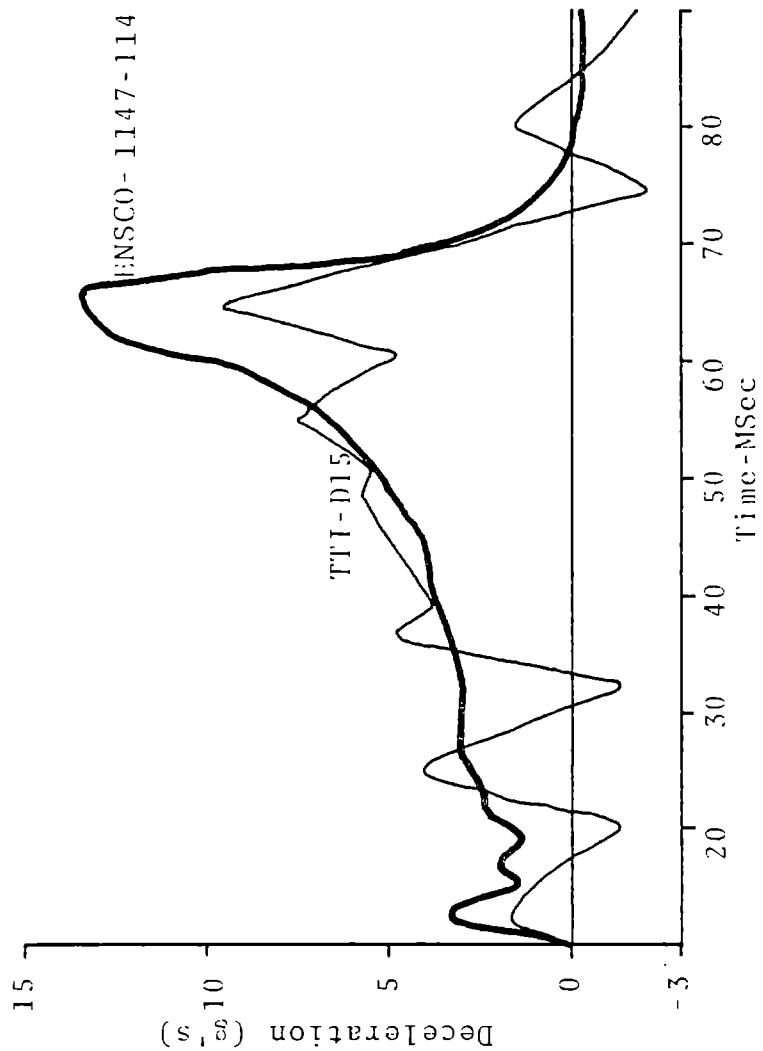


Fig. 26  
 Comparison of Longitudinal Accelerometer  
 Traces for TTI Test D15 and ENSCO Test 1147-114

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-115  
Date : Mar 9, 1977  
Weather : Clear, warm  
Pendulum Mass : 2250 lb (1022 kg)

### SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lb (168 kg)

### BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

### FASTENERS (Base):

Type : 3-1" Strain sert bolts  
Load : 15,000 lb (66,720 N)

### TEST DATA:

Impact Speed : 30.2 f/s (9.2 m/s)  
Exit Speed : 17.6 f/s (5.4 m/s)  
Momentum Change  
Speed Trap : 881 lb-sec (3919 Ns)  
Accelerometer : 898 lb-sec (3994 Ns)  
Peak Deceleration : 11.8 g

### COMMENTS:

Honeycomb (width x height x length x static crush pressure)

#1 5" x 5" x 4" x 75 psi (12.7 x 12.7 x 10.2 cm x 517 kPa)  
#2 5" x 8" x 4" x 75 psi (12.7 x 20.3 x 10.2 cm x 517 kPa)  
#3 5" x 8" x 6" x 130 psi (12.7 x 20.3 x 15.2 cm x 896 kPa)  
#4 5" x 8" x 4" x 230 psi (12.7 x 20.3 x 10.2 cm x 1586 kPa)  
#5 8" x 8" x 2" x 230 psi (20.3 x 20.3 x 5.1 cm x 1586 kPa)  
#6 16" x 8" x 4" x 230 psi (40.6 x 20.3 x 10.2 cm x 1586 kPa)

DECELERATION - G'S

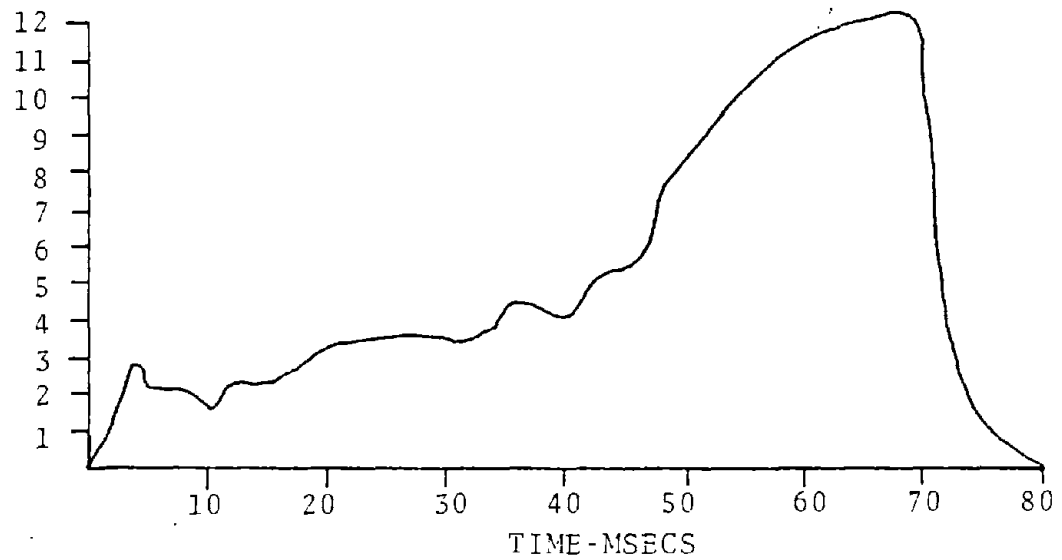
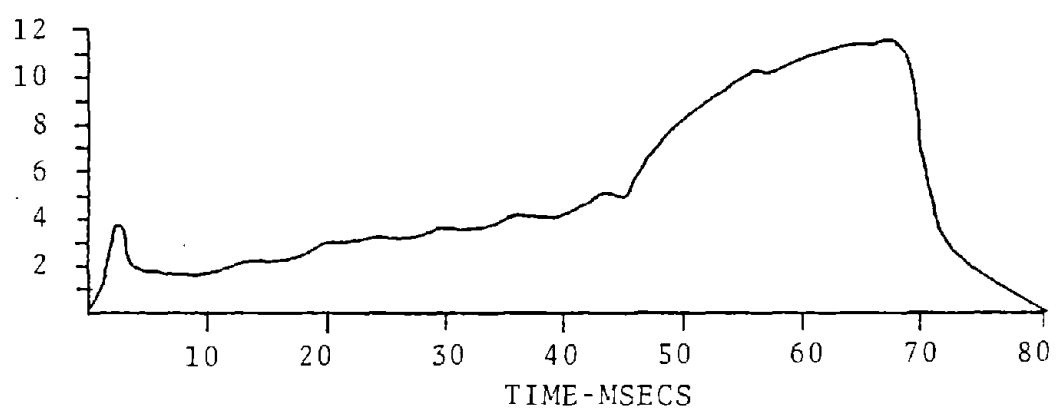
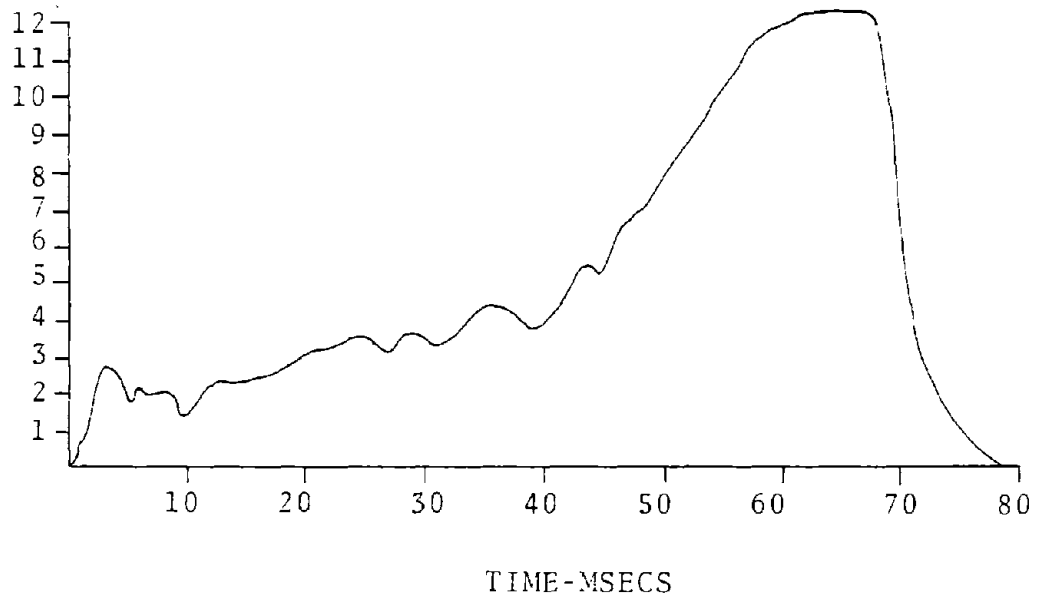


Fig. 27  
Longitudinal Accelerometer Traces for Test 1147-115



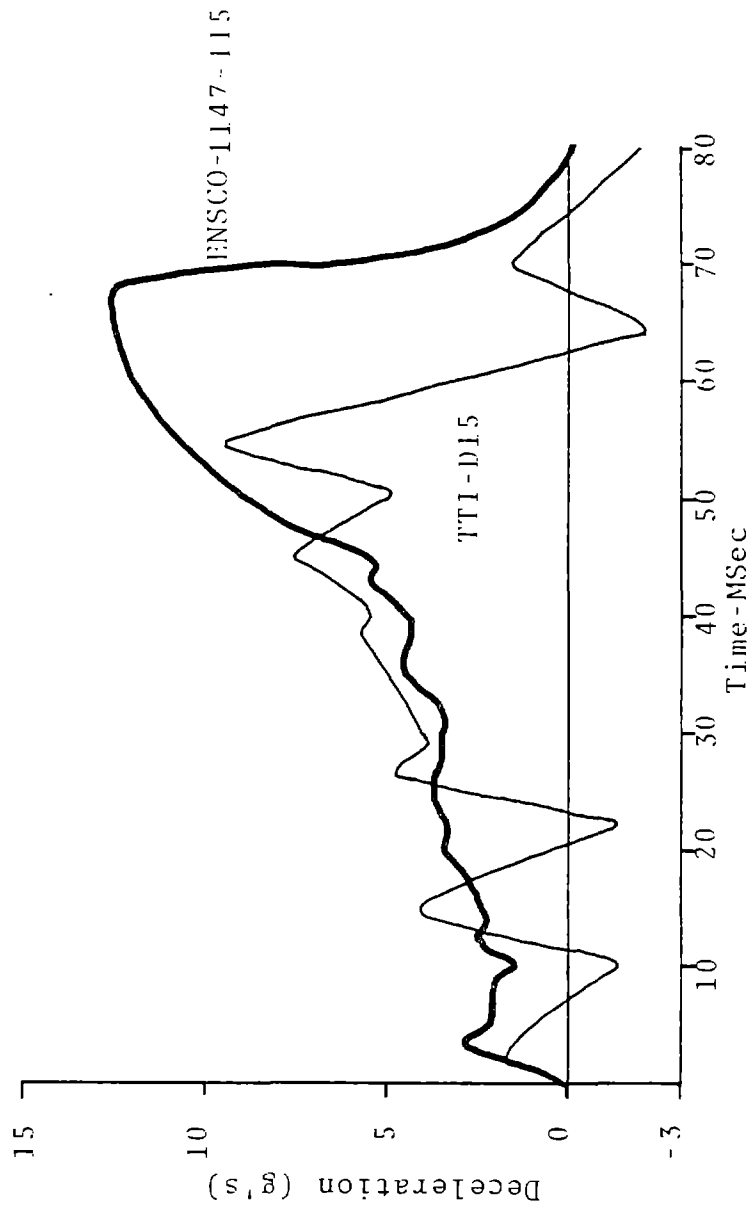


Fig. 28  
Comparison of Longitudinal Accelerometer  
Traces for TTI Test D15 and ENSCO Test 1147-115

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-116  
Date : Mar 16, 1977  
Weather : Clear, warm  
Pendulum Mass : 2248 lb (1021 kg)

### SUPPORT:

Type : Tapered steel pole  
Manufacturer : Union Metal  
Height : 35 Ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lb (168 kg)

### BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

### FASTENERS (Base):

Type : 3-1" Strain sert bolts  
Load : 15,000 lbs (66,720 N)

### TEST DATA:

Impact Speed : 30.6 f/s (9.3 m/s)  
Exit Speed : 21.4 f/s (6.5 m/s)  
Momentum Change  
Speed Trap : 641 lb-sec (2852 Ns)  
Accelerometer : 649 lb-sec (2887 Ns)  
Peak Deceleration : 12.3 g's

### COMMENTS:

Honeycomb (width x height x length x static crush pressure)

#1 5" x 5" x 4" x 75 psi (12.7 x 12.7 x 10.2 cm x 517 kPa)  
#2 5" x 8" x 4" x 75 psi (12.7 x 20.3 x 10.2 cm x 517 kPa)  
#3 5" x 8" x 6" x 130 psi (12.7 x 20.3 x 15.2 cm x 896 kPa)  
#4 5" x 8" x 4" x 230 psi (12.7 x 20.3 x 10.2 cm x 1586 kPa)  
#5 8" x 8" x 2" x 230 psi (20.3 x 20.3 x 5.1 cm x 1586 kPa)

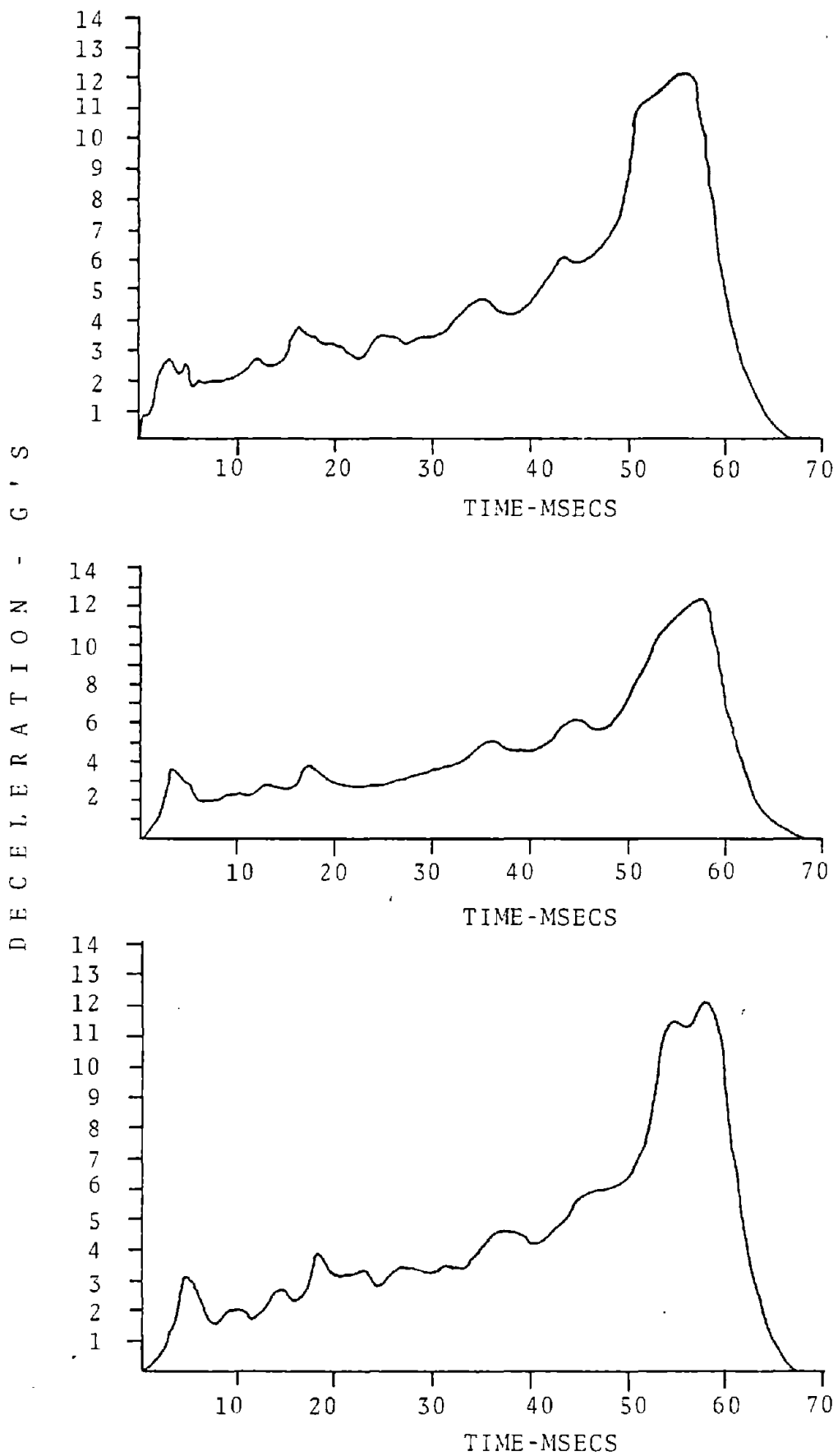


Fig. 29  
 Longitudinal Accelerometer Traces for Test 1147-116

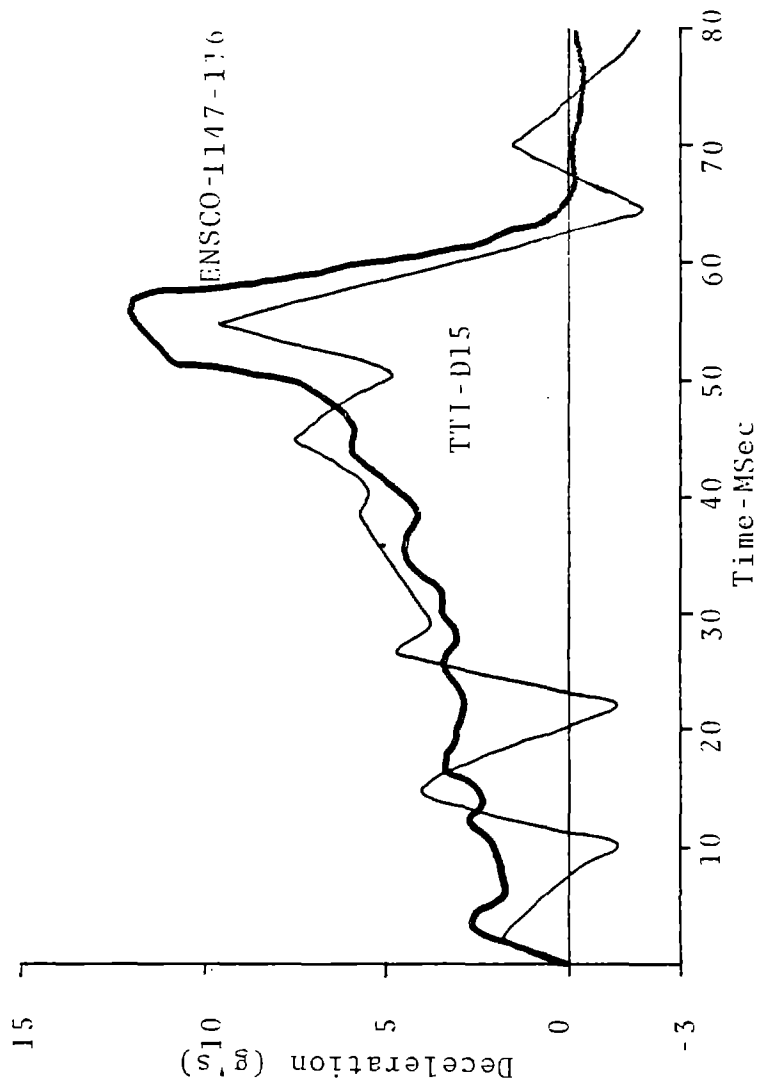


Fig. 30  
Comparison of Longitudinal Accelerometer  
Traces for TTI Test DI5 and ENSCO Test 1147-116

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-117  
Date : Mar 16, 1977  
Weather : Clear, warm  
Pendulum Mass : 2248 lb (1021 kg)

### SUPPORT:

Type : Tapered steel pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lb (168 kg)

### BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

### FASTENERS (Base):

Type : 3-1" Strain Sert Bolts  
Load : 15,000 lb (66,720 N)

### TEST DATA:

Impact Speed : 30.3 f/s (9.2 m/s)  
Exit Speed : 21.5 f/s (6.6 m/s)  
Momentum Change : 616 lb-sec (2740 Ns)  
Speed Trap : 630 lb-sec (2802 Ns)  
Accelerometer : 14 g's  
Peak Deceleration :

### COMMENTS:

Honeycomb (width x height x length x static crush pressure)

#1 5" x 5" x 4" x 75 psi (12.7 x 12.7 x 10.2 cm x 517 kPa)  
#2 5" x 8" x 4" x 75 psi (12.7 x 20.3 x 10.2 cm x 517 kPa)  
#3 5" x 8" x 6" x 130 psi (12.7 x 20.3 x 15.2 cm x 896 kPa)  
#4 5" x 8" x 6" x 230 psi (12.7 x 20.3 x 15.2 cm x 1586 kPa)

DECELERATION - G'S

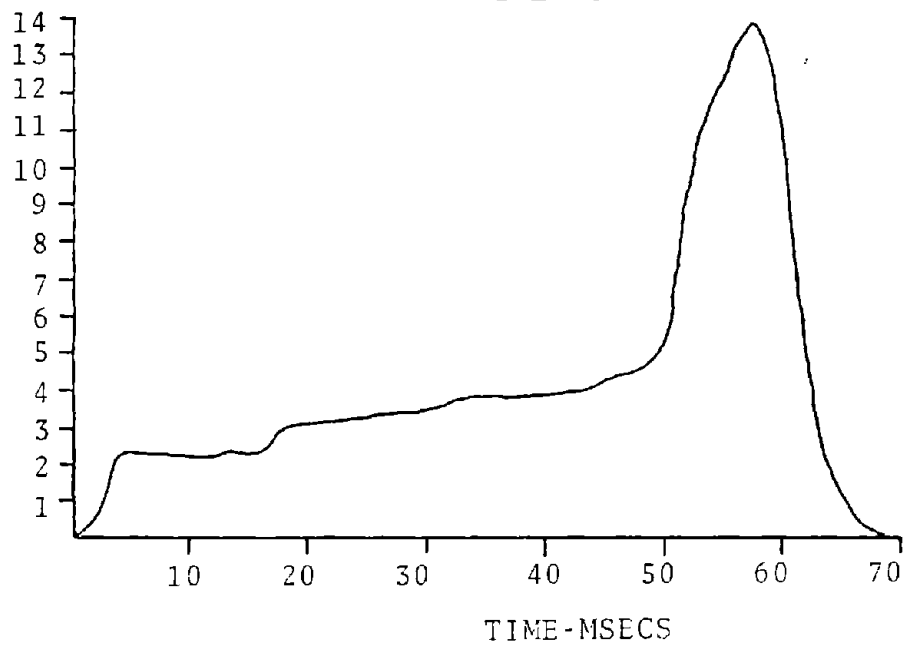
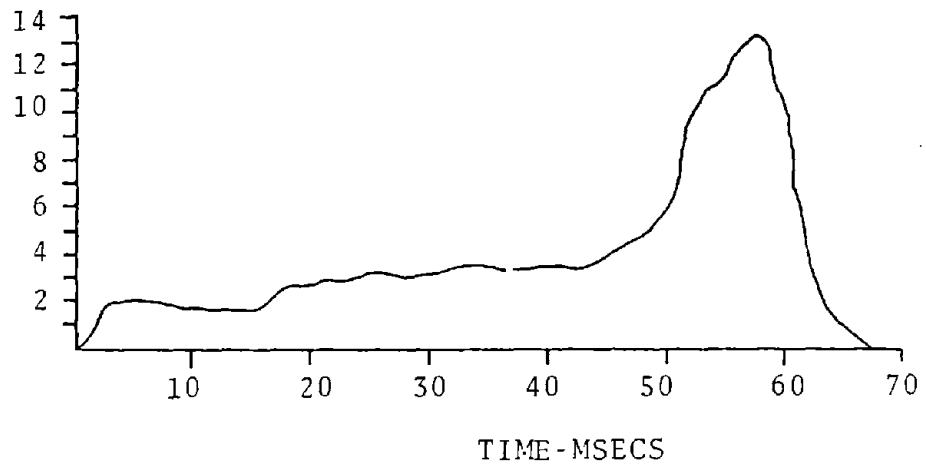
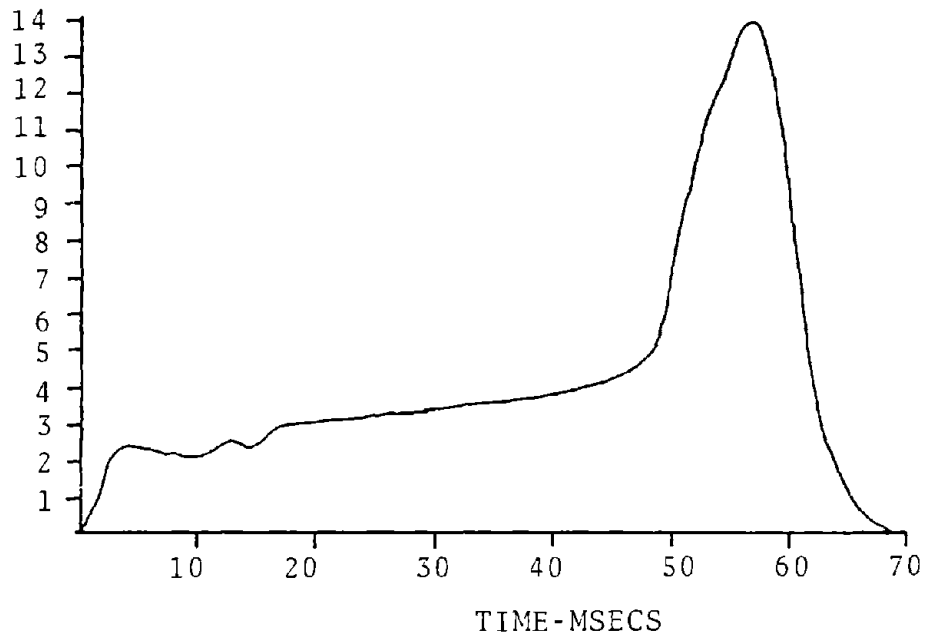


Fig. 51  
Longitudinal Accelerometer Traces for Test 1147-117

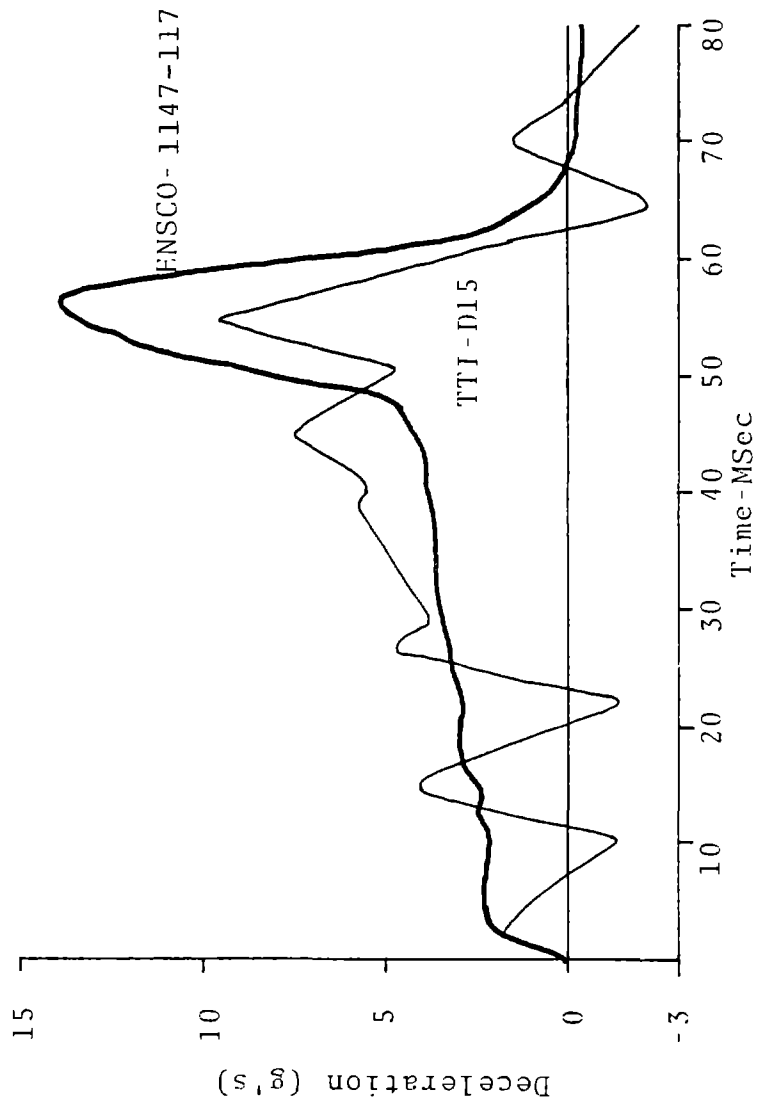


Fig. 32  
Comparison of Longitudinal Accelerometer  
Traces for TTI Test D15 and ENSCO Test 1147-117

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-118  
Date : Mar 16, 1977  
Weather : Clear, warm  
Pendulum Mass : 2248 lb (1021 kg)

### SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lb (168 kg)

### BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

### FASTENERS (Base):

Type : 3-1" Strain sert bolts  
Load : 15,000 lbs (66,720 N)

### TEST DATA:

Impact Speed : 30.4 f/s (9.3 m/s)  
Exit Speed : 21.2 f/s (6.5 m/s)  
Momentum Change : 640 lb-sec (2847 Ns)  
Speed Trap : 629 lb-sec (2798 Ns)  
Accelerometer : 13.0 g's  
Peak Deceleration :

### COMMENTS:

Honeycomb (width x height x length x static crush pressure)

#1 5" x 5" x 4" x 75 psi (12.7 x 12.7 x 10.2 cm x 517 kPa)  
#2 5" x 8" x 4" x 75 psi (12.7 x 20.3 x 10.2 cm x 517 kPa)  
#3 5" x 8" x 6" x 130 psi (12.7 x 20.3 x 15.2 cm x 896 kPa)  
#4 5" x 8" x 4" x 230 psi (12.7 x 20.3 x 10.2 cm x 1586 kPa)  
#5 8" x 8" x 2" x 230 psi (20.3 x 20.3 x 5.1 cm x 1586 kPa)



DECELERATION - G'S

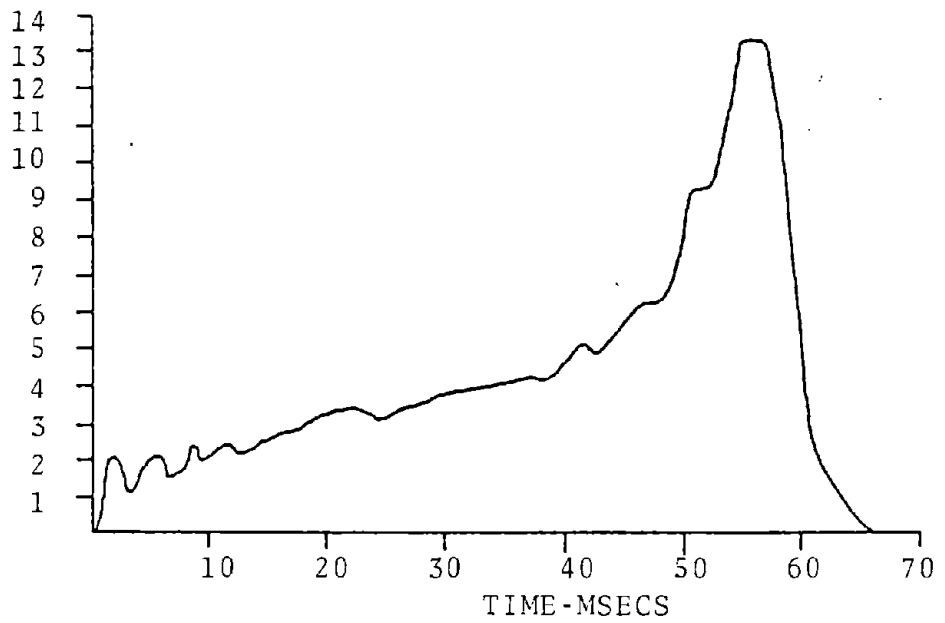
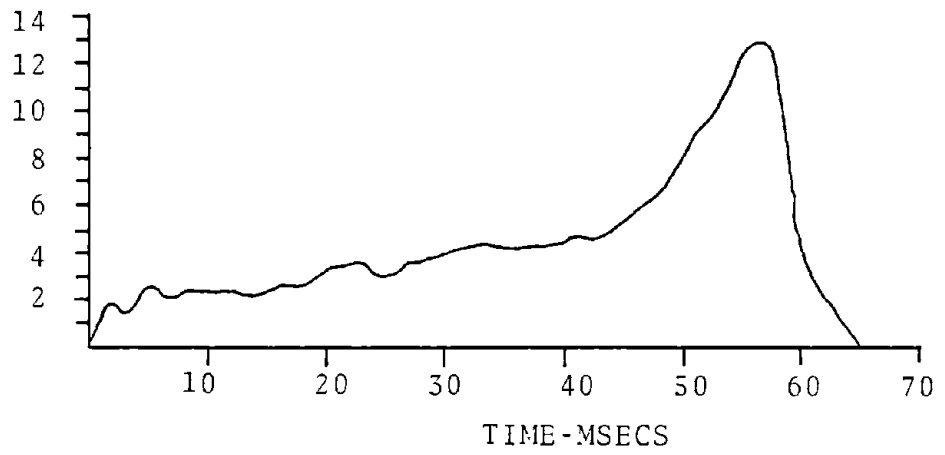
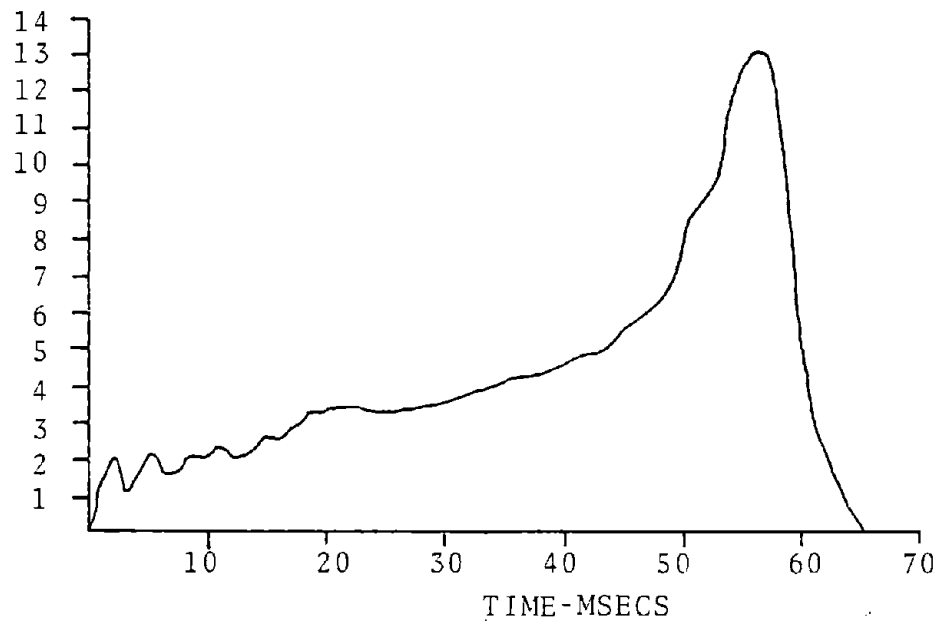


Fig. 33  
Longitudinal Accelerometer Traces for Test 1147-118

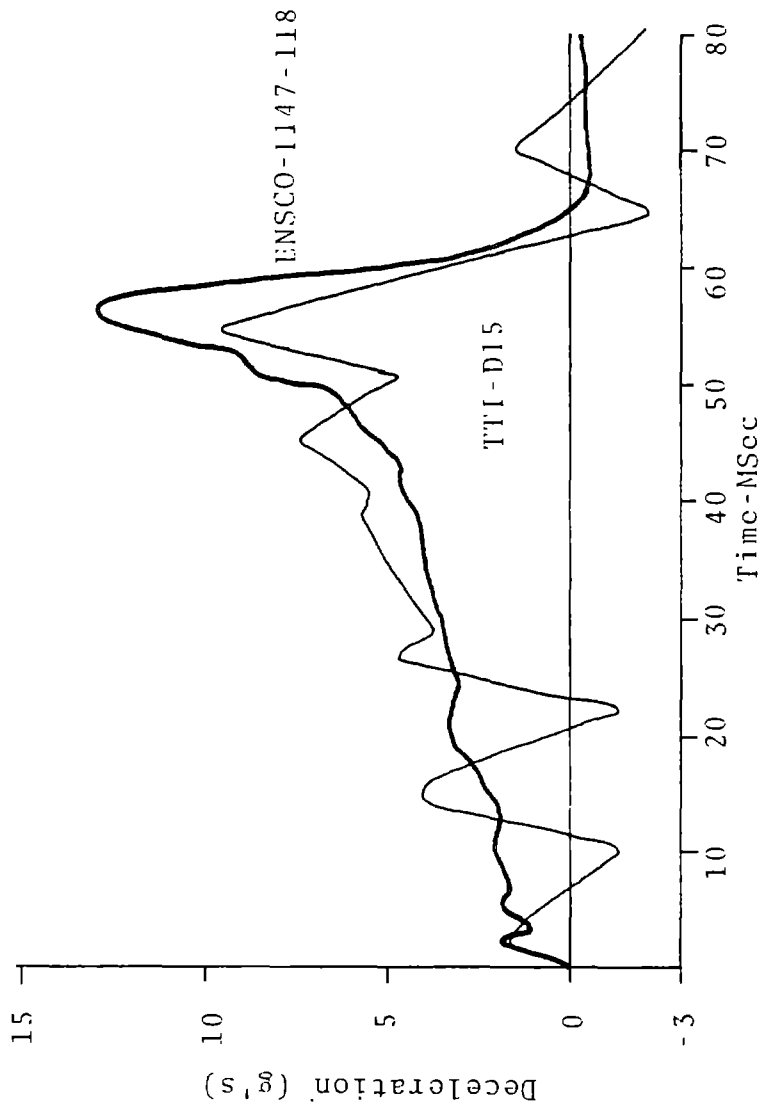


Fig. 34  
Comparison of Longitudinal Accelerometer  
Traces for TTI Test D15 and ENSCO Test 1147-118

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-119  
Date : Mar 16, 1977  
Weather : Clear, warm  
Pendulum Mass : 2248 lb (1021 kg)

### SUPPORT:

Type : Tapered steel pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lb (168 kg)

### BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

### FASTENERS (Base):

Type : 3-1" Strain sert bolts  
Load : 15,000 (66,720 Ns)

### TEST DATA:

Impact Speed : 29.5 f/s (9.0 m/s)  
Exit Speed : 21.2 f/s (6.5 m/S0)  
Momentum Change  
Speed Trap : 585 lb-sec (2602 Ns)  
Accelerometer : 576 lb-sec (2562 Ns)  
Peak Deceleration : 10.3 g's

### COMMENTS:

Honeycomb (width x height x length x static crush pressure)

#1 5" x 5" x 4" x 75 psi (12.7 x 12.7 x 10.2 cm x 517 kPa)  
#2 5" x 8" x 4" x 75 psi (12.7 x 20.3 x 10.2 cm x 517 kPa)  
#3 5" x 8" x 6" x 130 psi (12.7 x 20.3 x 15.2 cm x 896 kPa)  
#4 5" x 8" x 4" x 230 psi (12.7 x 20.3 x 10.2 cm x 1586 kPa)  
#5 8" x 8" x 2" x 230 psi (20.3 x 20.3 x 5.1 cm x 1586 kPa)

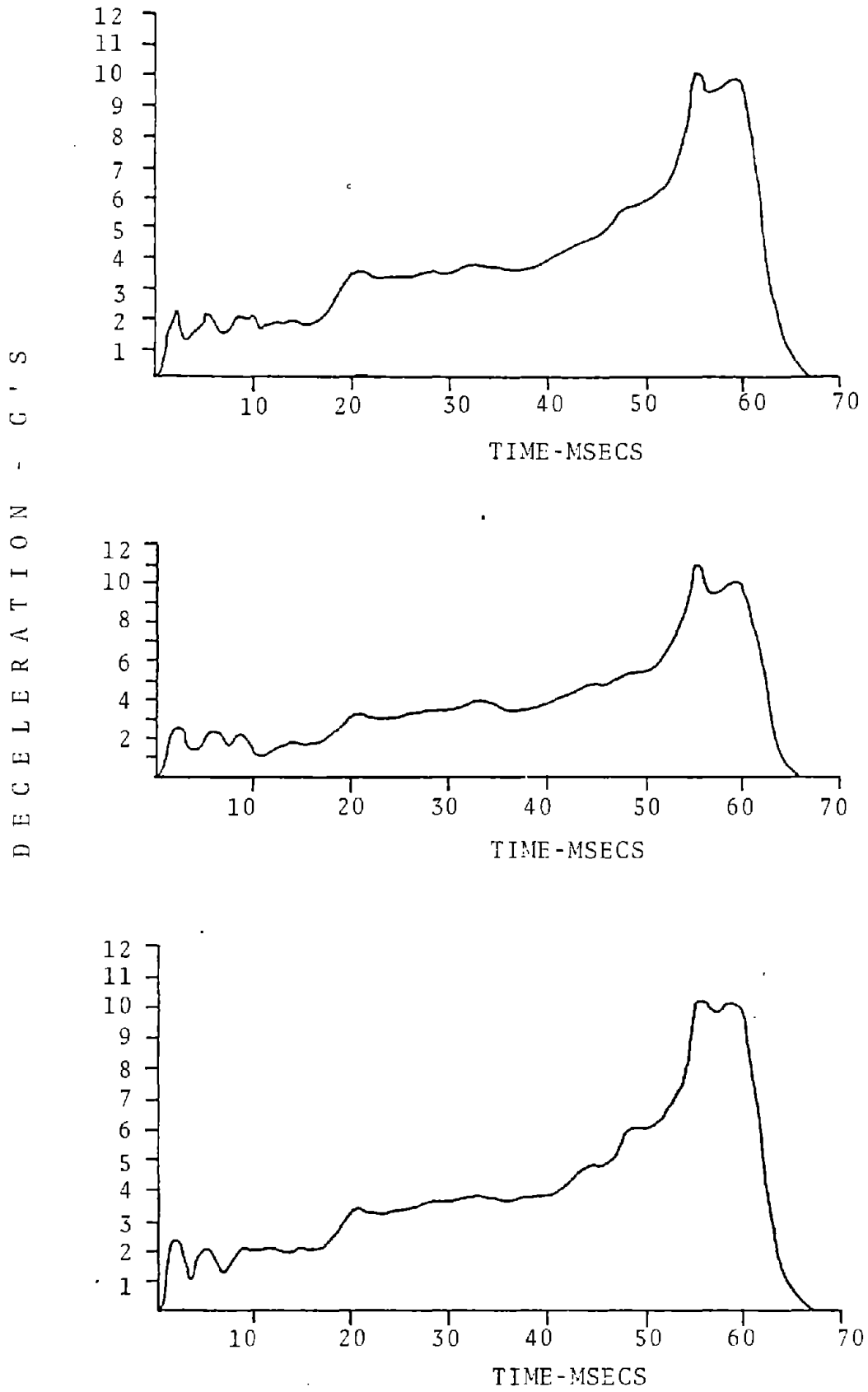


Fig. 35  
 Longitudinal Accelerometer Traces for Test 1147-119

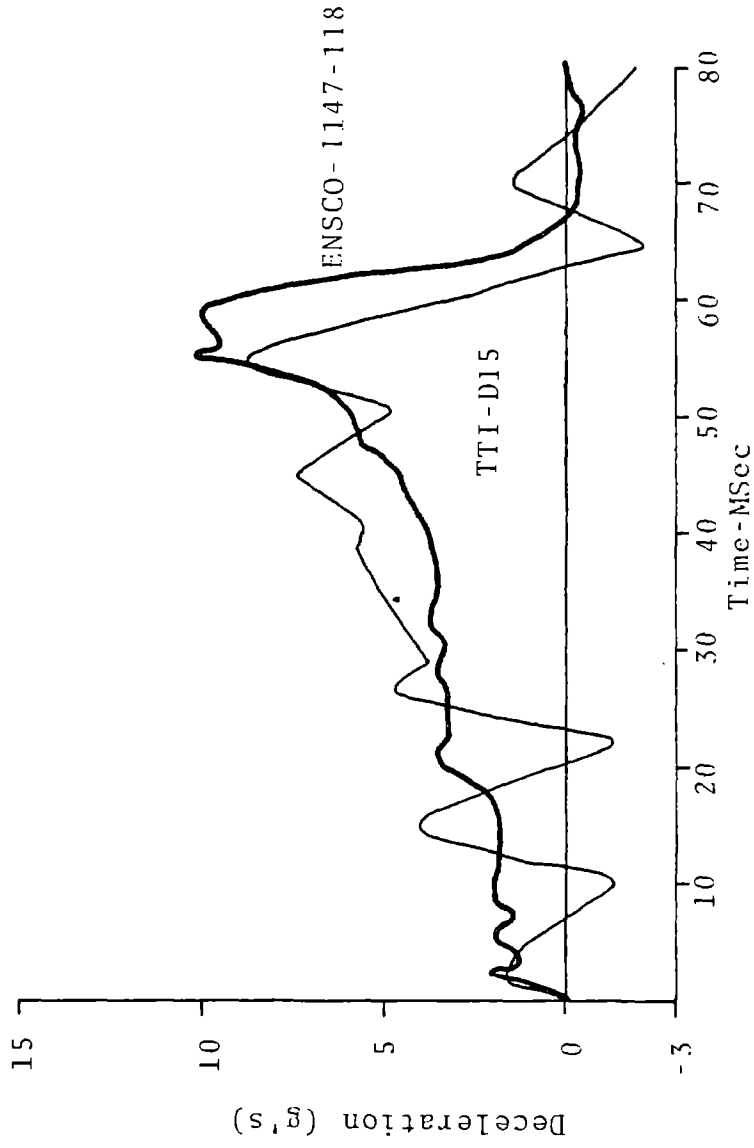


Fig. 36  
Comparison of Longitudinal Accelerometer  
Traces for TTI Test D15 and ENSCO Test 1147-119

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-120  
Date : Mar 23, 1977  
Weather : Clear  
Pendulum Mass : 2248 lb (1021 kg)

SUPPORT:

Type : Tapered steel pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lb (168 kg)

BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

FASTENERS (Base):

Type : 3-1" Strain sert bolts  
Load : 15,000 lb (66,720 N)

TEST DATA:

Impact Speed : 29.8 ft/sec (9.1 m/s)  
Exit Speed : 19.9 ft/sec (6.1 m/s)  
Momentum Change  
Speed Trap : 690 lb sec (3074 Ns)  
Accelerometer : 715 lb-sec (3180 Ns)  
Peak Deceleration : 13 g's

COMMENTS:

Honeycomb (width x height x length x static crush pressure)  
#1 5" x 5" x 4" x 75 psi (12.7 x 12.7 x 10.2 cm x 517 kPa)  
#2 5" x 8" x 4" x 75 psi (12.7 x 20.3 x 10.2 cm x 517 kPa)  
#3 5" x 8" x 6" x 130 psi (12.7 x 20.3 x 15.2 cm x 896 kPa)  
#4 5" x 8" x 4" x 230 psi (12.7 x 20.3 x 10.2 cm x 1586 kPa)  
#5 8" x 8" x 2" x 230 psi (20.3 x 20.3 x 5.1 cm x 1586 kPa)

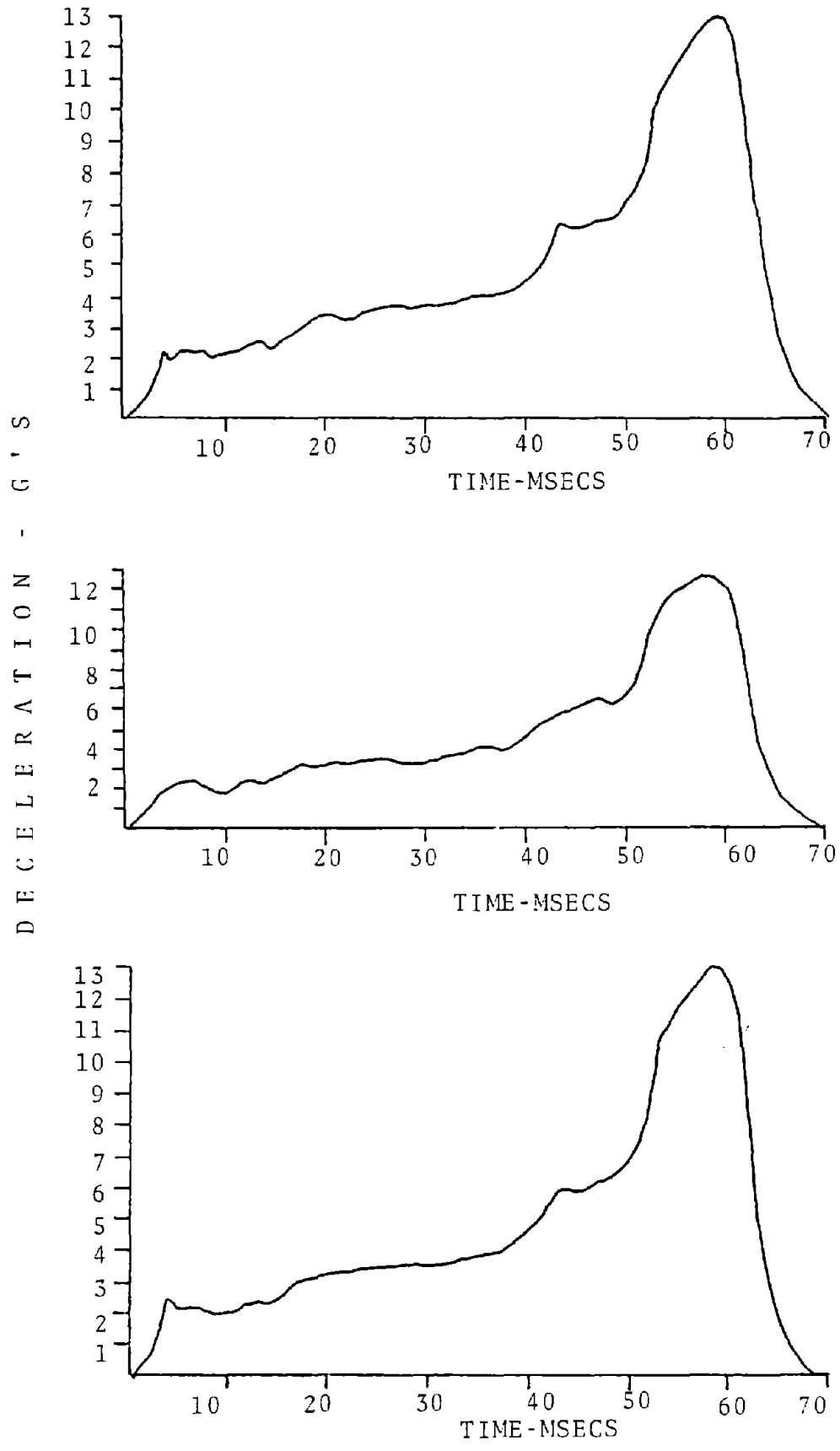


Fig. 37  
 Longitudinal Accelerometer Traces for Test 1147-120

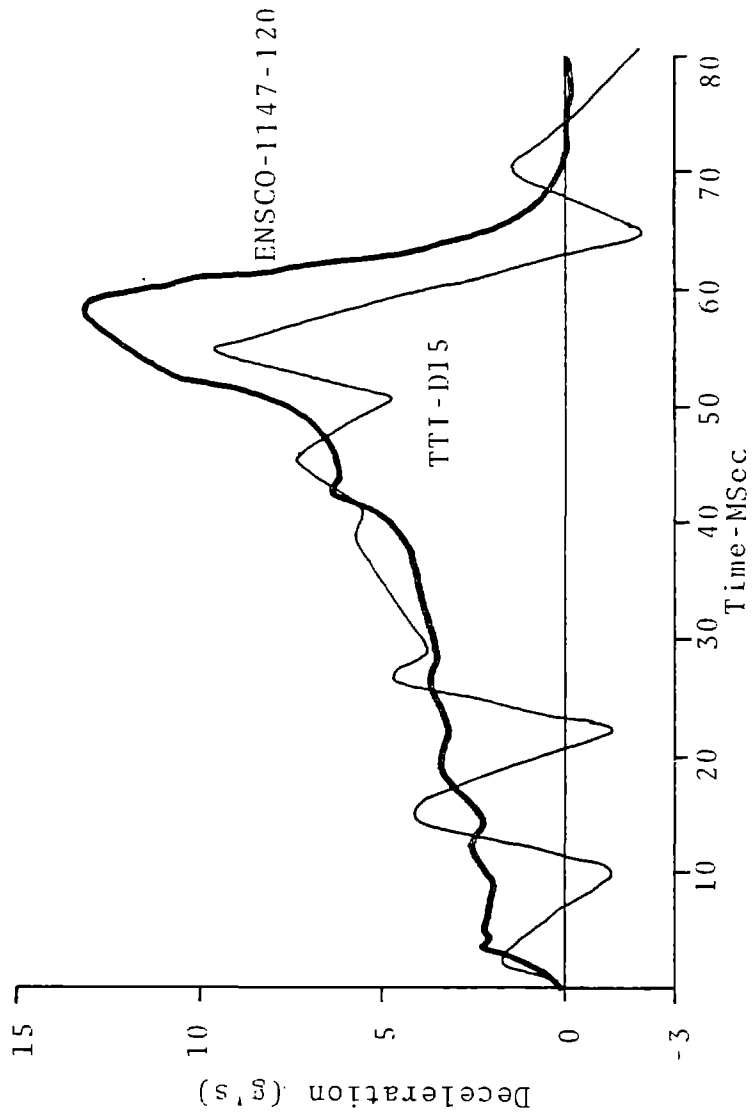


Fig. 38  
 Comparison of Longitudinal Accelerometer  
 Traces for TTI Test D15 and ENSCO Test 1147-120



## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-121  
Date : Mar 24, 1977  
Weather : Clear, cool  
Pendulum Mass : 2248 lb (1020 kg)

### SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lb (168 kg)

### BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

### FASTENERS (Base):

Type : 3-1" strain sert bolts  
Load : 15,000 lb (66,720 N)

### TEST DATA:

Impact Speed : 29.7 f/s (9.1 m/s)  
Exit Speed : 19.6 f/s (6.0 m/s)  
Momentum Change  
Speed Trap : 708 lb-sec (3149 Ns)  
Accelerometer : 644 lb-sec (2865 Ns)  
Peak Deceleration : 13.5 g's

### COMMENTS:

Honeycomb (width x height x length x static crush pressure)

#1 5" x 5" x 4" x 75 psi (12.7 x 12.7 x 10.2 cm x 517 kPa)  
#2 5" x 8" x 4" x 75 psi (12.7 x 20.3 x 10.2 cm x 517 kPa)  
#3 5" x 8" x 6" x 130 psi (12.7 x 20.3 x 15.2 cm x 896 kPa)  
#4 5" x 8" x 4" x 230 psi (12.7 x 20.3 x 10.2 cm x 1586 kPa)  
#5 8" x 8" x 2" x 230 psi (20.3 x 20.3 x 5.1 cm x 1586 kPa)

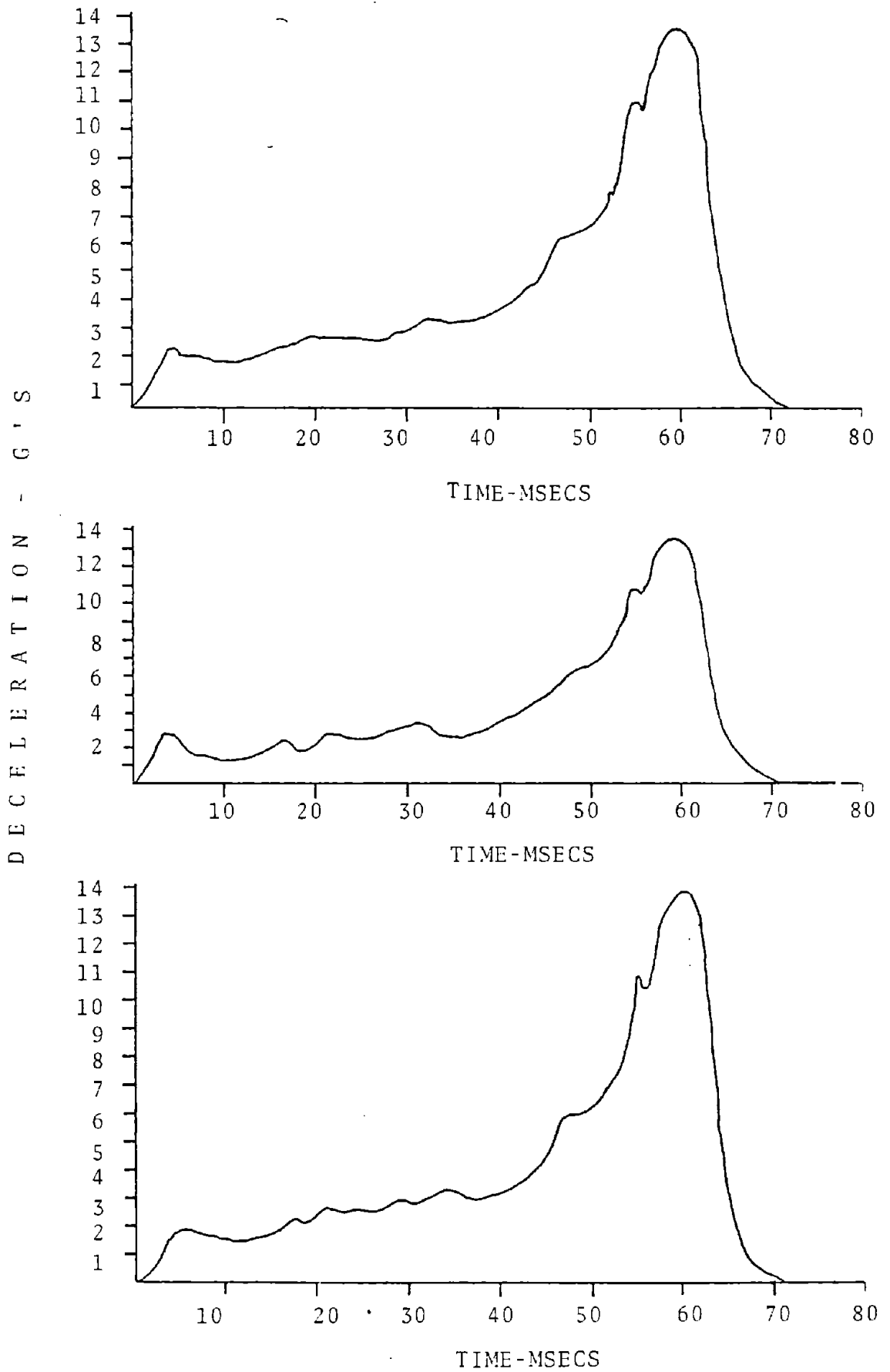


Fig. 39  
Longitudinal Accelerometer Traces for Test 1147-121

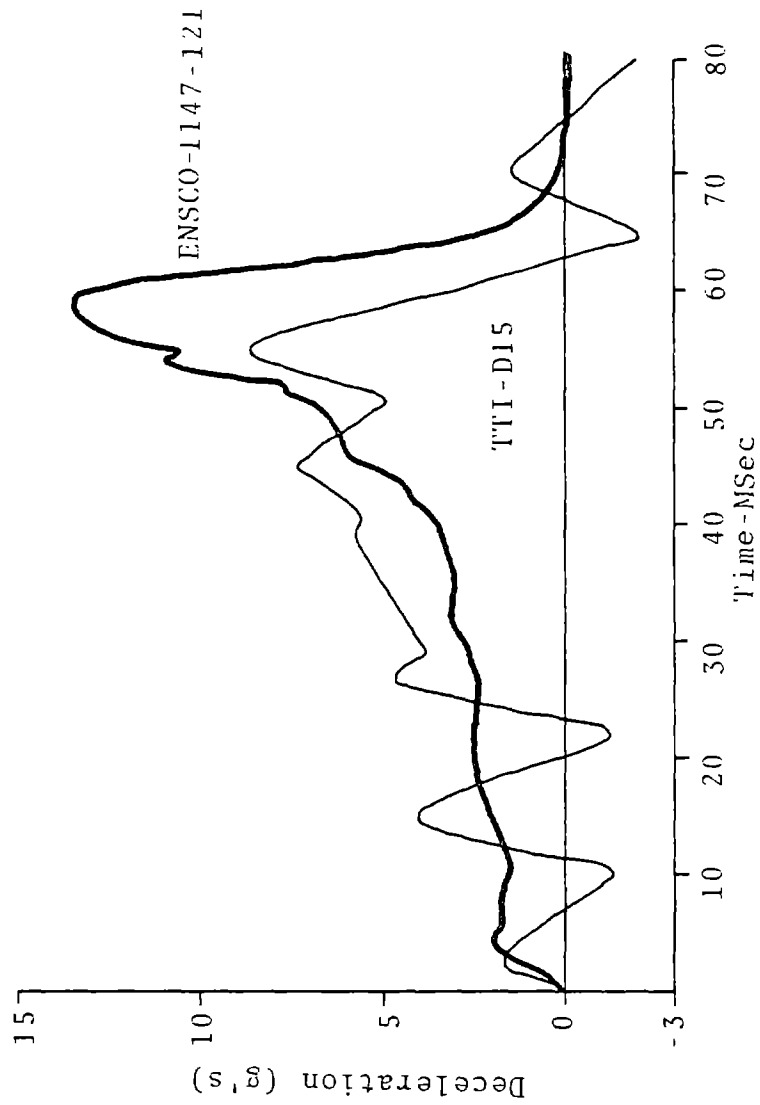


Fig. 40  
Comparison of Longitudinal Accelerometer  
Traces for TTI Test D15 and ENSCO Test 1147-121

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-122  
Date : Mar 24, 1977  
Weather : Clear  
Pendulum Mass : 2248 lb (1020 kg)

### SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lb (168 kg)

### BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

### FASTENERS (Base):

Type : 3-1" Strain sert bolts  
Load : 15,000 lb (66,720 N)

### TEST DATA:

Impact Speed : 29.3 f/s (8.9 m/s)  
Exit Speed : 18.8 f/s (5.7 m/s)  
Momentum Change  
Speed Trap : 735 lb-sec (3269 Ns)  
Accelerometer : 714 lb-sec (3176 Ns)  
Peak Deceleration : 11 g's

### COMMENTS:

Honeycomb (width x height x length x static crush pressure)

- #1 5" x 5" x 4" x 75 psi (12.7 x 12.7 x 10.2 cm x 517 kPa)
- #2 5" x 8" x 4" x 75 psi (12.7 x 20.3 x 10.2 cm x 517 kPa)
- #3 5" x 8" x 6" x 130 psi (12.7 x 20.3 x 15.2 cm x 896 kPa)
- #4 5" x 8" x 4" x 230 psi (12.7 x 20.3 x 10.2 cm x 1586 kPa)
- #5 8" x 8" x 2" x 230 psi (20.3 x 20.3 x 5.1 cm x 1586 kPa)

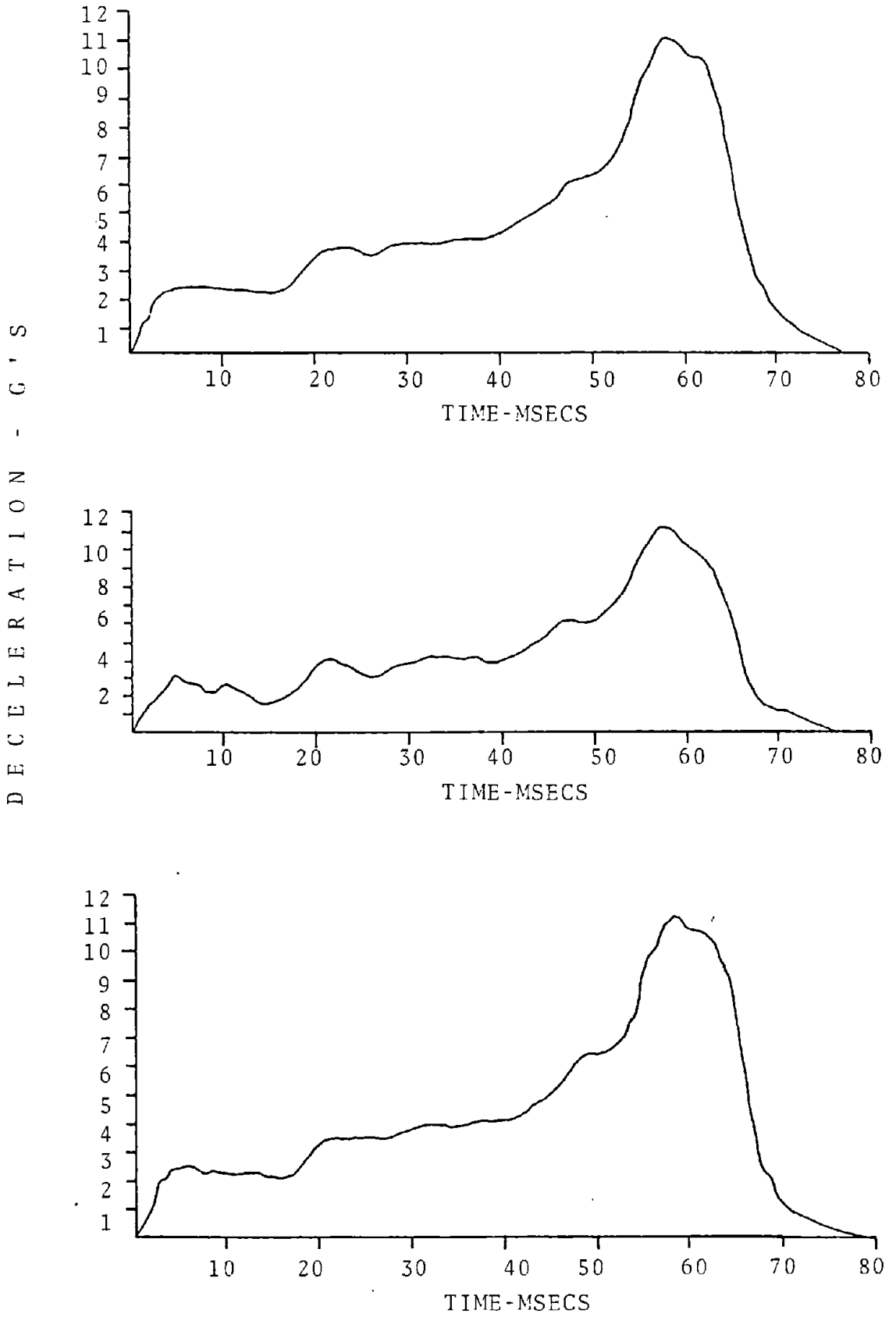


Fig.41  
 Longitudinal Accelerometer Traces for Test 1147-122

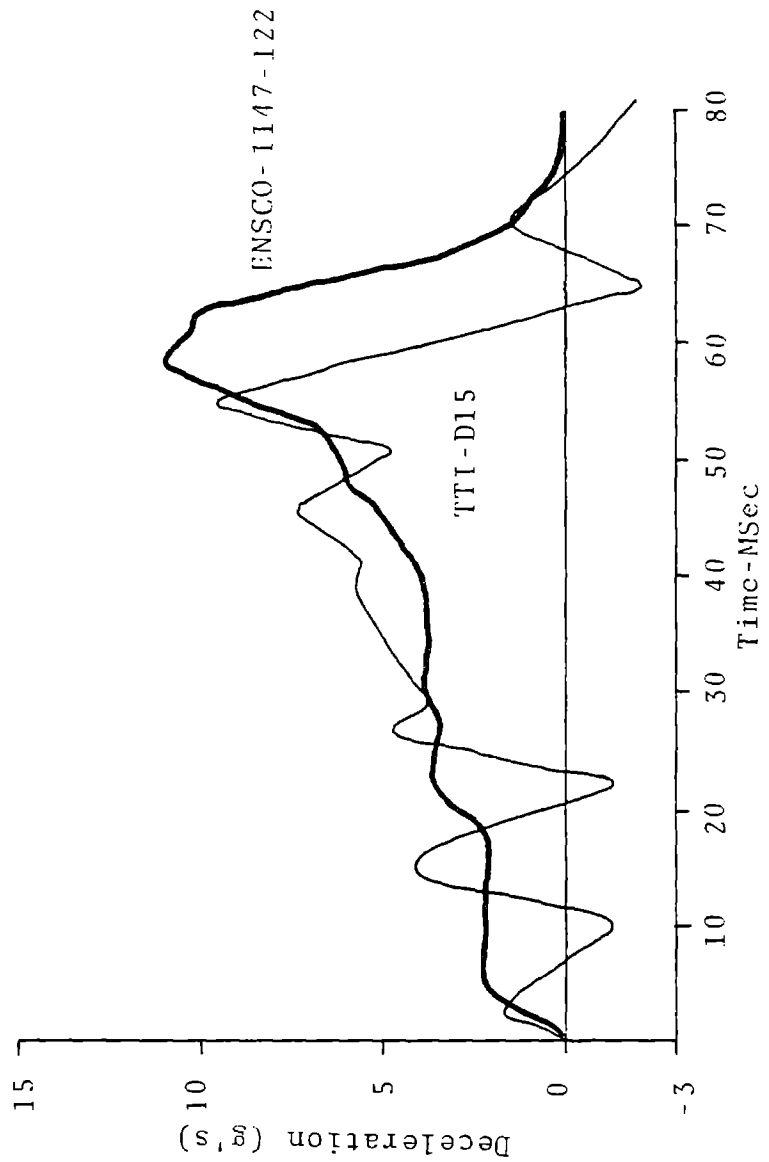


Fig. 42  
 Comparison of Longitudinal Accelerometer  
 Traces for TTI Test D15 and ENSCO Test 1147-122

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-123  
Date : Apr 25, 1977  
Weather : Clear, warm  
Pendulum Mass : 2260 lb (1026 kg)

### SUPPORT:

Type : Tapered steel pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lb (168 kg)

### BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

### FASTENERS (Base):

Type : 3-1" Strain sert bolts  
Load : 15,000 lb (66,720 N)

### TEST DATA:

Impact Speed : --\*  
Exit Speed : --\*  
Momentum Change : --\*  
Speed Trap : --\*  
Accelerometer : 560 lb-sec  
Peak Deceleration : 7.7 g's

### COMMENTS:

\* Speed Trap Not Functioning

Honeycomb (width x height x length x static crush pressure)

- #1 8" x 16" x 4" x 75 psi (20.3 x 40.6 x 10.2 cm x 517 kPa)
- #2 4" x 8" x 4" x 75 psi (10.2 x 20.3 x 10.2 cm x 517 kPa)
- #3 4" x 8" x 6" x 130 psi (10.2 x 20.3 x 15.2 cm x 896 kPa)
- #4 4" x 8" x 4" x 230 psi (10.2 x 20.3 x 10.2 cm x 1586 kPa)
- #5 8" x 8" x 2" x 230 psi (20.3 x 20.3 x 5.1 cm x 1586 kPa)

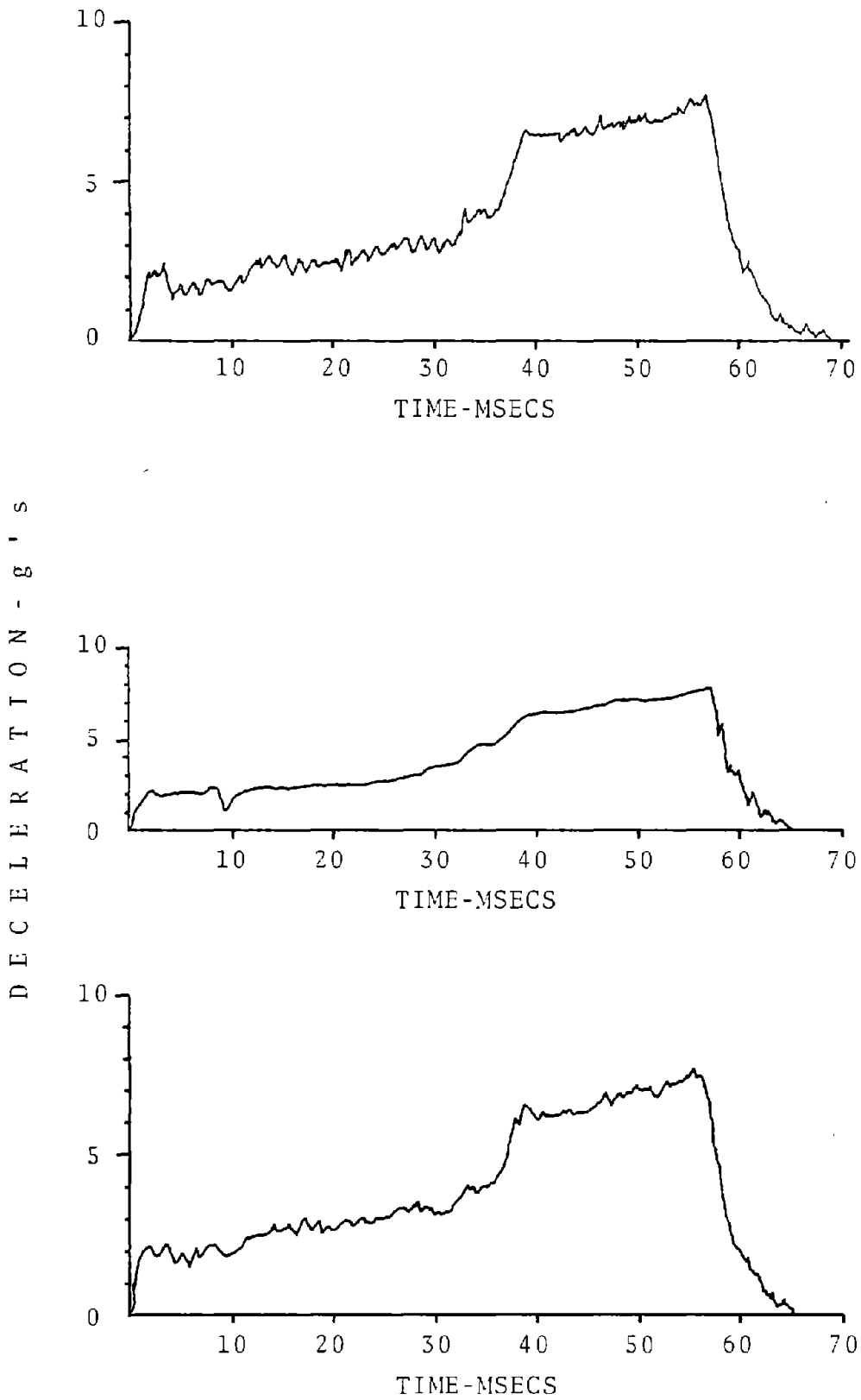


Fig. 43  
Longitudinal Accelerometer Traces for Test 1147-123



## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-124  
Date : Apr 25, 1977  
Weather : Partly cloudy, warm  
Pendulum Mass : 2260 lb (1026 kg)

### SUPPORT:

Type : Tapered steel pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lb (168 kg)

### BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

### FASTENERS (Base):

Type : 3-1" Strain Sert Bolts  
Load : 15,000 (66,720 N)

### TEST DATA:

Impact Speed : --\*  
Exit Speed : --\*  
Momentum Change : --\*  
Speed Trap :  
Accelerometer : 570 lb-sec (2535 Ns)  
Peak Deceleration : 7.4 g's

### COMMENTS:

\*Speed Trap Not Functioning  
Honeycomb (width x height x length x static crush pressure)

#1 8" x 12" x 4" x 75 psi (20.3 x 30.5 x 10.2 x 517 kPa)  
#2 4" x 8" x 4" x 75 psi (10.2 x 20.3 x 10.2 cm x 517 kPa)  
#3 4" x 8" x 6" x 130 psi (10.2 x 20.3 x 15.2 cm x 896 kPa)  
#4 4" x 8" x 4" x 230 psi (10.2 x 20.3 x 10.2 cm x 1586 kPa)  
#5 8" x 8" x 2" x 230 psi (20.3 x 20.3 x 5.1 cm x 1586 kPa)

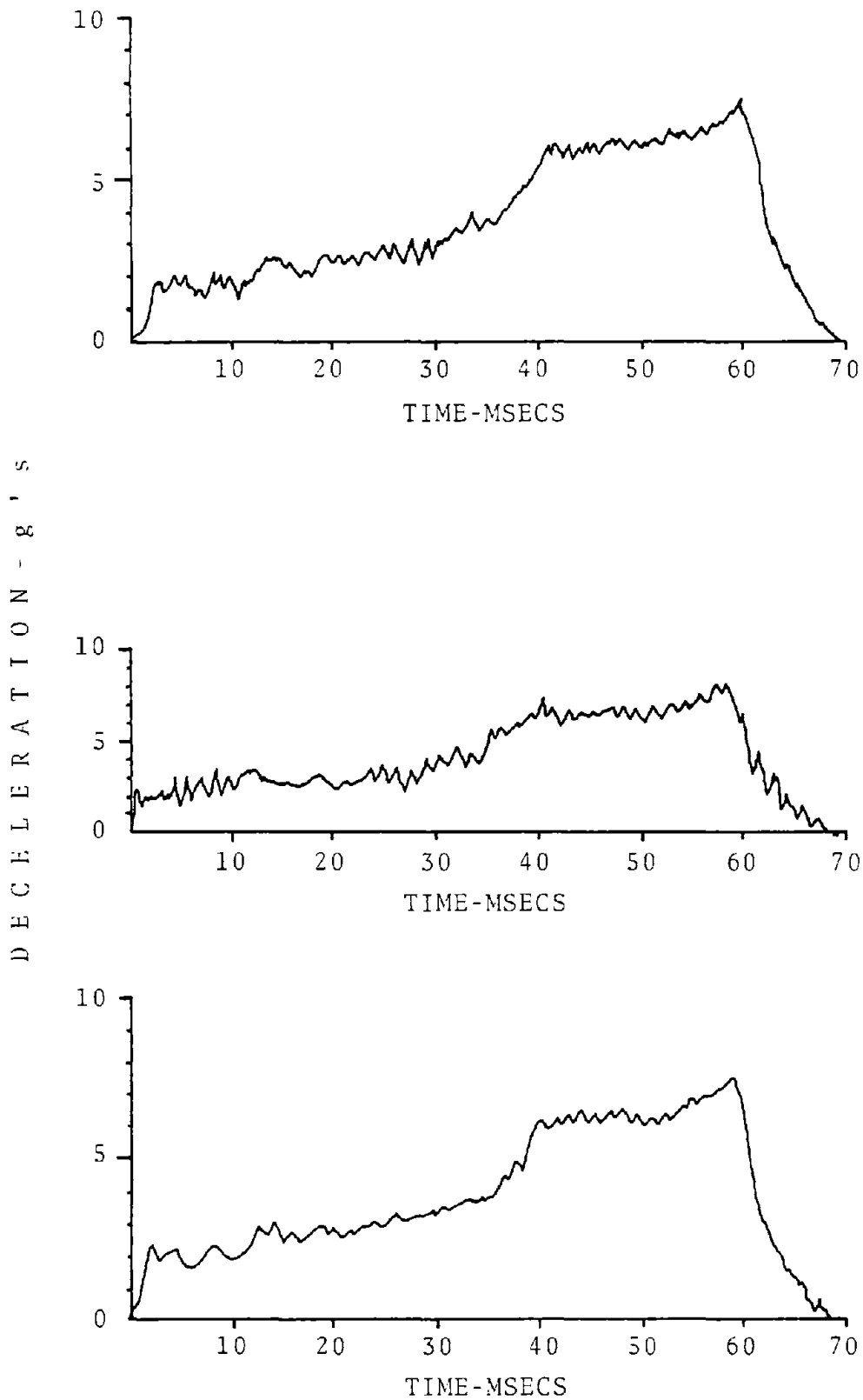


Fig. 44  
 Longitudinal Accelerometer Traces for Test 1147-124

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-125  
Date : Jun 7, 1977  
Weather : Clear, mild  
Pendulum Mass : 2170 lb (985 kg)

SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 370 lb (168 kg)

BASE:

Type : Slip/3-bolt  
Manufacturer : Union Metal  
Modifications : None

FASTENERS (Base):

Type : 3-1" Strain sert bolts  
Load : 15,000 (66,720 N)

TEST DATA:

Impact Speed : --\*  
Exit Speed : --\*  
Momentum Change : --\*  
Speed Trap : --\*  
Accelerometer : 563 lb-sec (2504 Ns)  
Peak Deceleration : 9.3 g's

COMMENTS:

\*Speed trap not functioning

Honeycomb (width x height x length x static crush pressure)

- #1 8" x 12" x 4" x 75 psi (20.3 x 30.5 x 10.2 cm x 517 kPa)
- #2 4" x 8" x 4" x 75 psi (10.2 x 20.3 x 10.2 cm x 517 kPa)
- #3 4" x 8" x 6" x 130 psi (10.2 x 20.3 x 15.2 cm x 896 kPa)
- #4 4" x 8" x 4" x 230 psi (10.2 x 20.3 x 10.2 cm x 1586 kPa)
- #5 8" x 8" x 2" x 230 psi (20.3 x 20.3 x 5.1 cm x 1586 kPa)

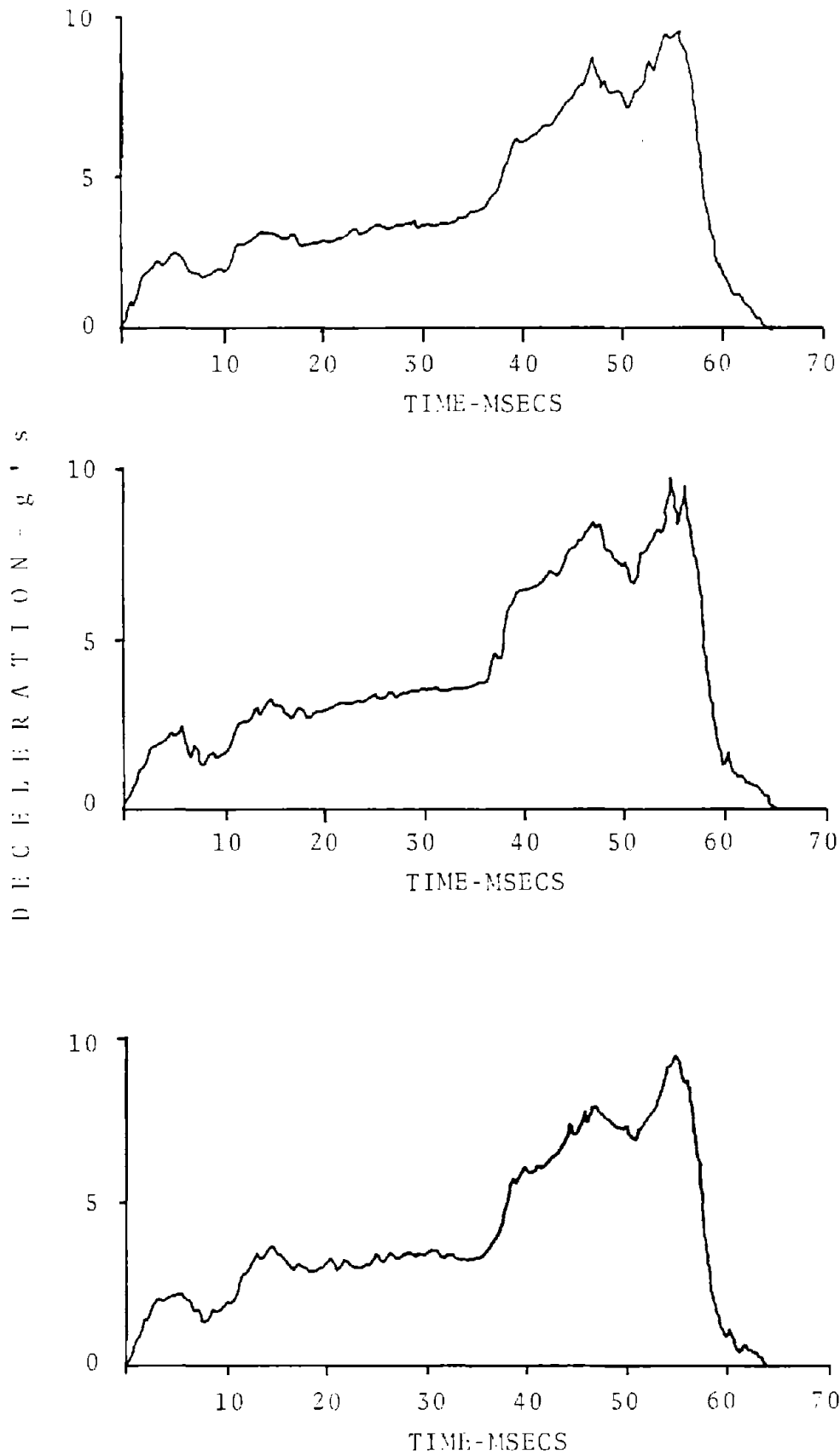


Fig. 45  
 Longitudinal Accelerometer Traces for Test 1147-125

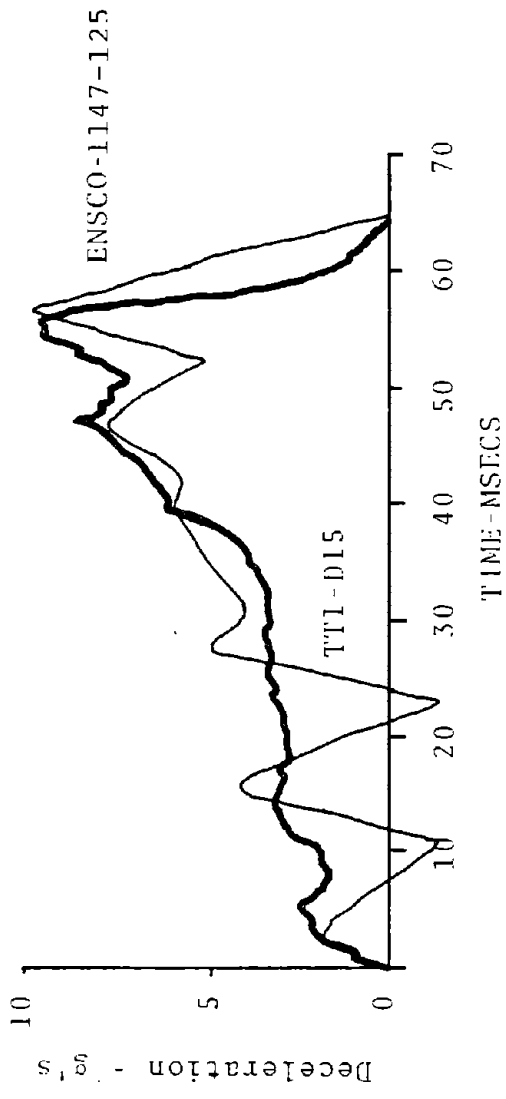


Fig. 46  
Comparison of Longitudinal Accelerometer  
Traces for TTI Test D15 and ENSCO Test 1147-125

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-201  
Date : Mar 24, 1977  
Weather : Clear, windy  
Pendulum Mass : 2250 lb (1022 kg)

SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : HAPCO  
Height : 28 ft (8.5 m)  
Base Diameter : 8 in (20 cm)  
Weight : 145 lb (66 kg)

BASE:

Type : Transformer/Tapered Skirt, small  
Manufacturer : Hapco Model No. 45964  
Modifications : None

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 28.9 f/s (8.8 m/s)  
Exit Speed : 0  
Momentum Change  
Film : 2019 lb-sec (8984 Ns)  
Accelerometer : 2049 lb-sec (9114 Ns)  
Peak Deceleration : 18 g's

COMMENTS:

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-202  
Date : Jun 7, 1977  
Weather : Cloudy, mild  
Pendulum Mass : 2165 lb (983 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 28 ft (8.5 m)  
Base Diameter : 8 in (20 cm)  
Weight : 145 lb (66 kg)

### BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Hapco, Model No. 45964  
Modifications : None

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.6 f/s (8.7 m/s)  
Exit Speed : 16.7 f/s (5.1 m/s)  
Momentum Change  
    Film : 797 lb-sec (3545 Ns)  
    Accelerometer : 846 lb-sec (3763 Ns)  
Peak Deceleration : 16 g's

### COMMENTS:

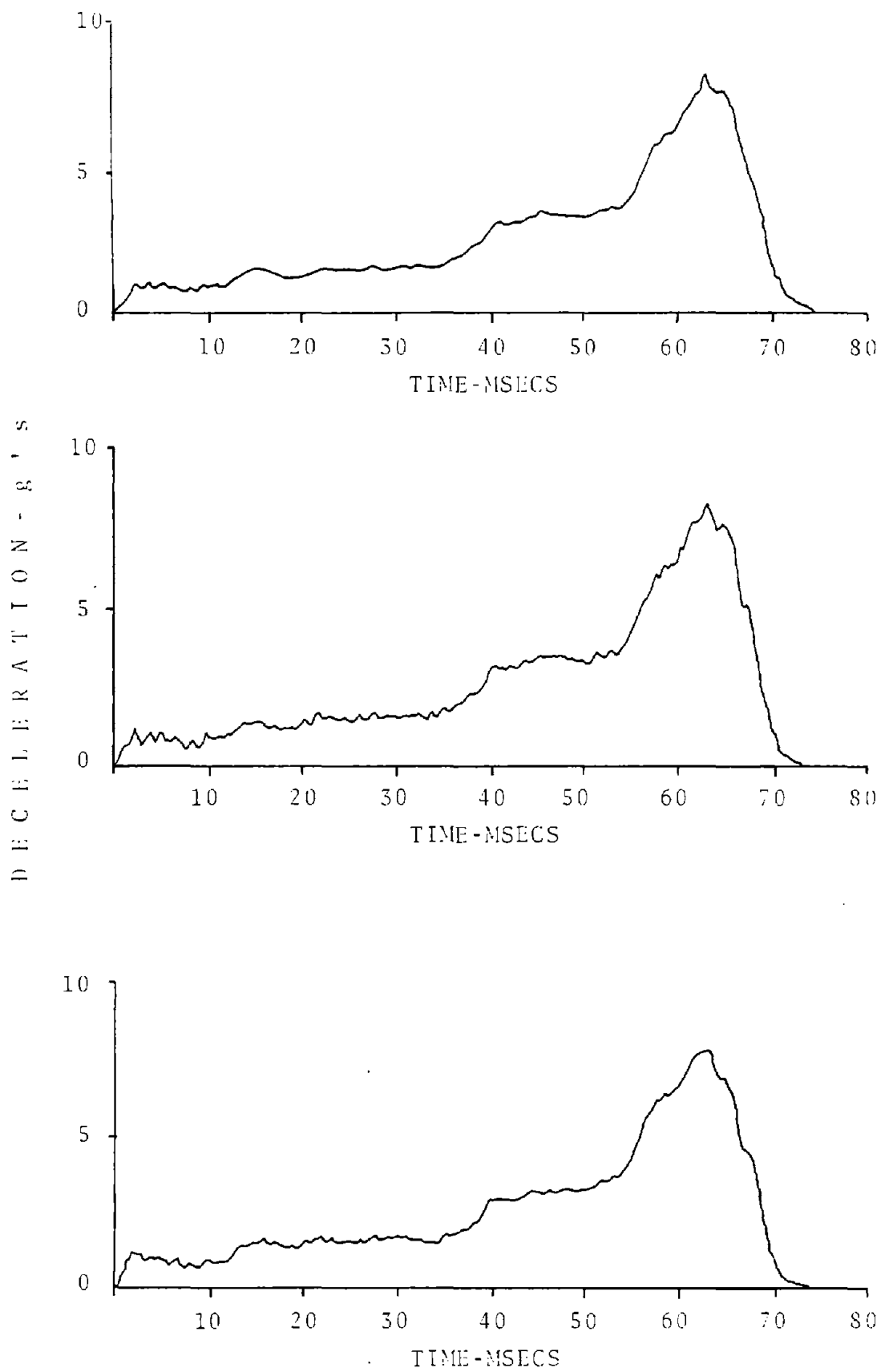


Fig. 48  
 Longitudinal Accelerometer Traces for Test 1147-202



## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-203  
Date : June 10, 1977  
Weather : Cloudy, cool  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered aluminum pole  
Manufacturer : Hapco  
Height : 28 ft (8.5 m)  
Base Diameter : 8 in (20 cm)  
Weight : 145 lb (66 kg)

### BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Hapco, Model No. 45964  
Modifications : None

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 27.6 ft/sec (9.1 m/s)  
Exit Speed : 7.0 ft/sec (2.1 m/s)  
Momentum Change  
  Film : 1467 lb-sec (6524 Ns)  
  Accelerometer : 1532 lb-sec (6814 Ns)  
Peak Deceleration : 22 g's

### COMMENTS:

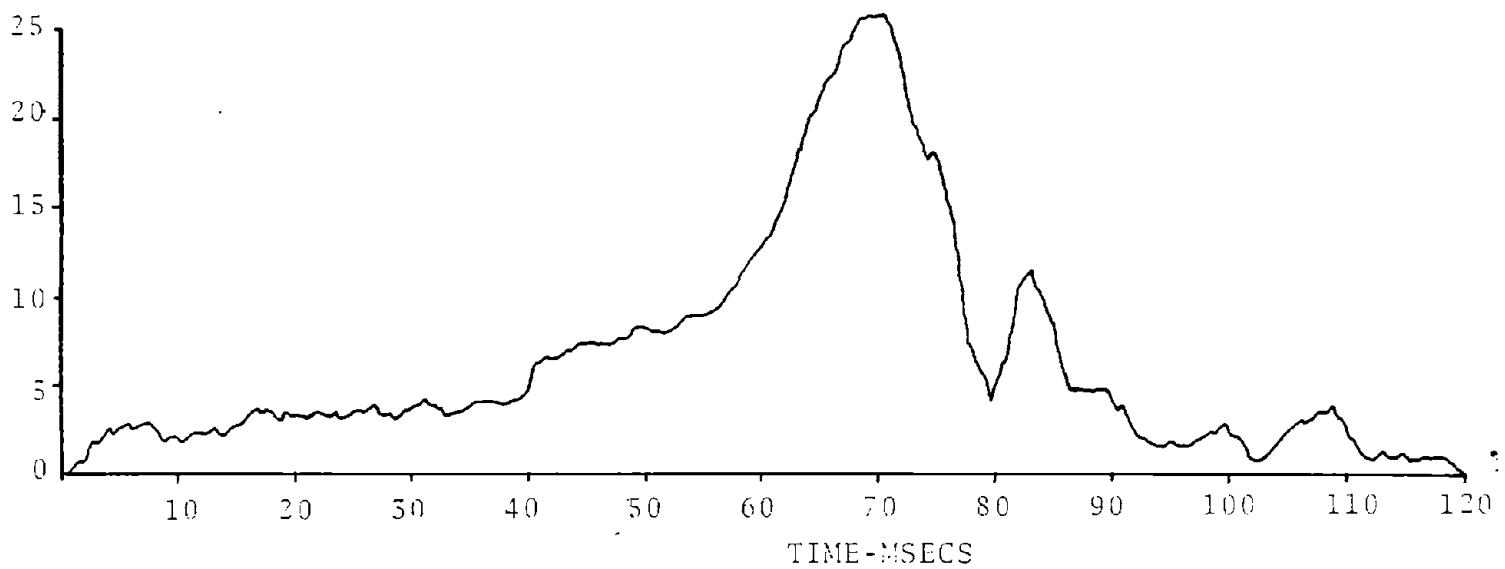
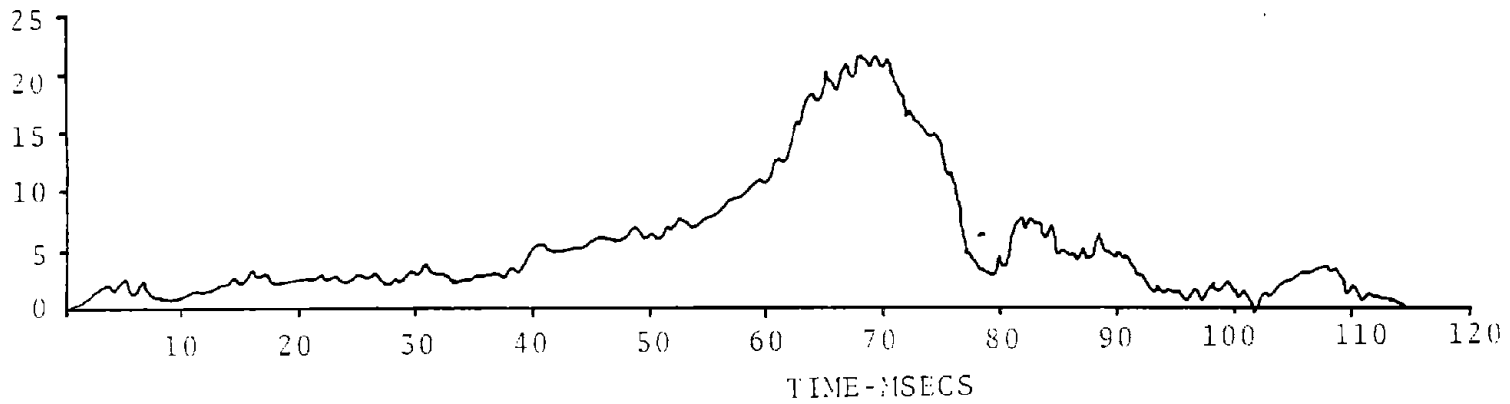
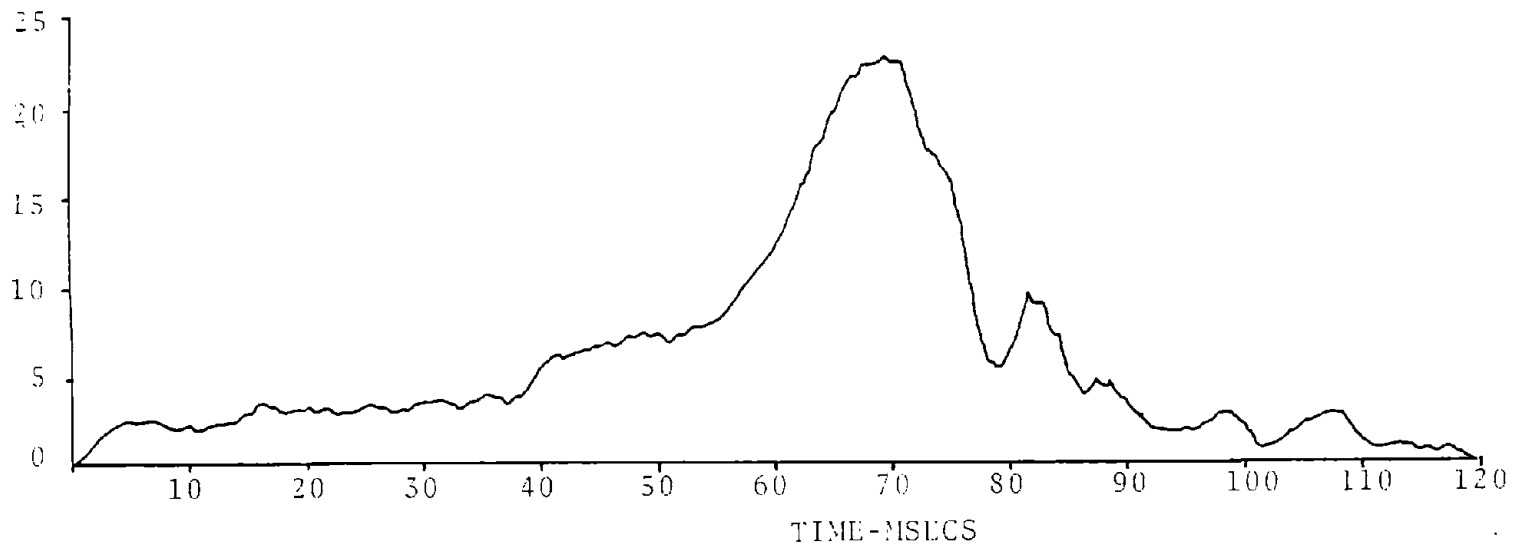


Fig. 49  
 Longitudinal Accelerometer Traces for Test 1147-205

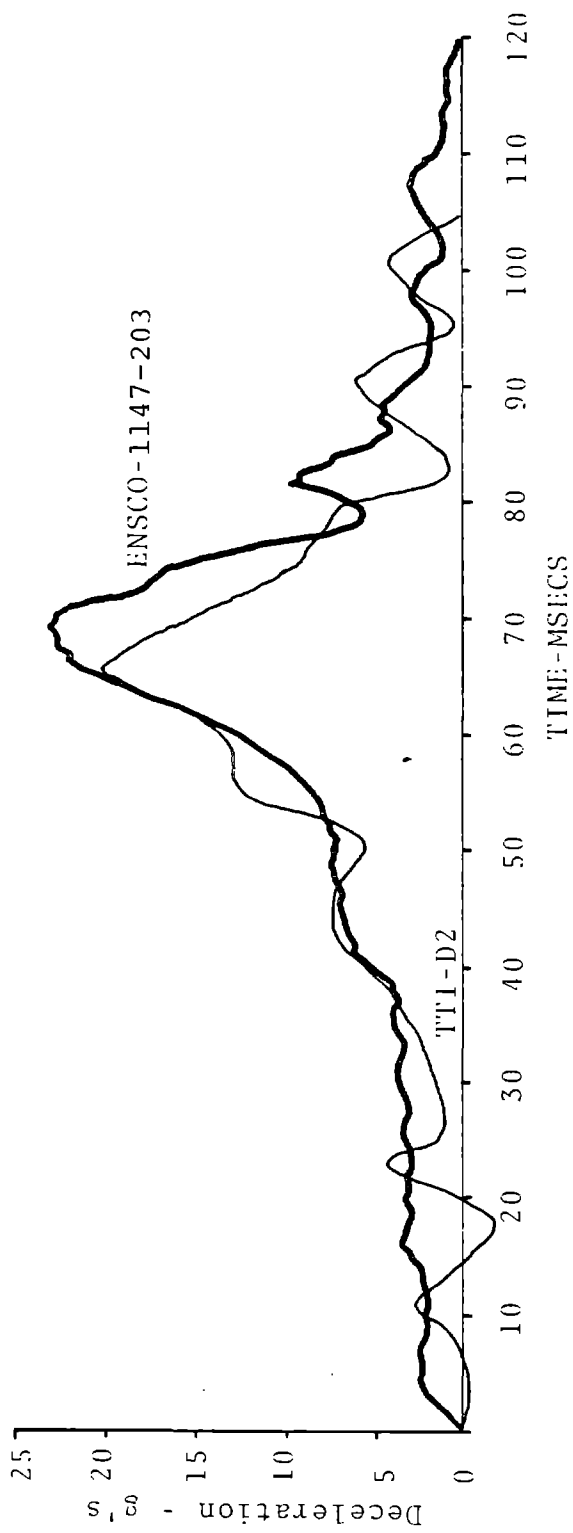


Fig. 50  
 Comparison of Longitudinal Accelerometer  
 Traces for TTI Test D2 and ENSCO Test 1147-203

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-204  
Date : Jun 10, 1977  
Weather : Cloudy, cool  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 28 ft (8.5 m)  
Base Diameter : 8 in (20 cm)  
Weight : 145 lb (66 kg)

### BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Hapco, Model #45964  
Modifications : Yes/1A1

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.5 ft/sec (8.7 m/s)  
Exit Speed : 3.7 ft/sec (1.1 m/s)  
Momentum Change  
Film : 1758 lb-sec (7822 Ns)  
Accelerometer : 1745 lb-sec (7762 Ns)  
Peak Deceleration : 21 g's

### COMMENTS:

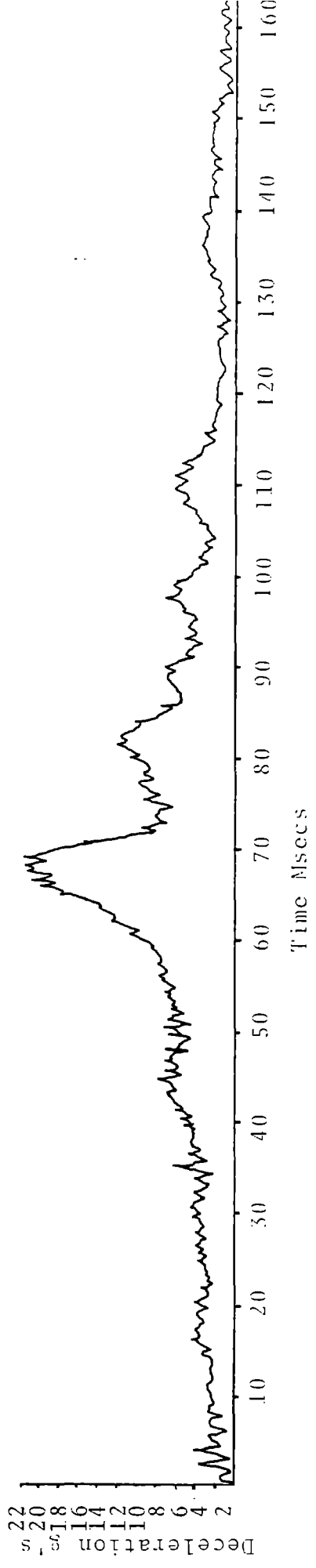
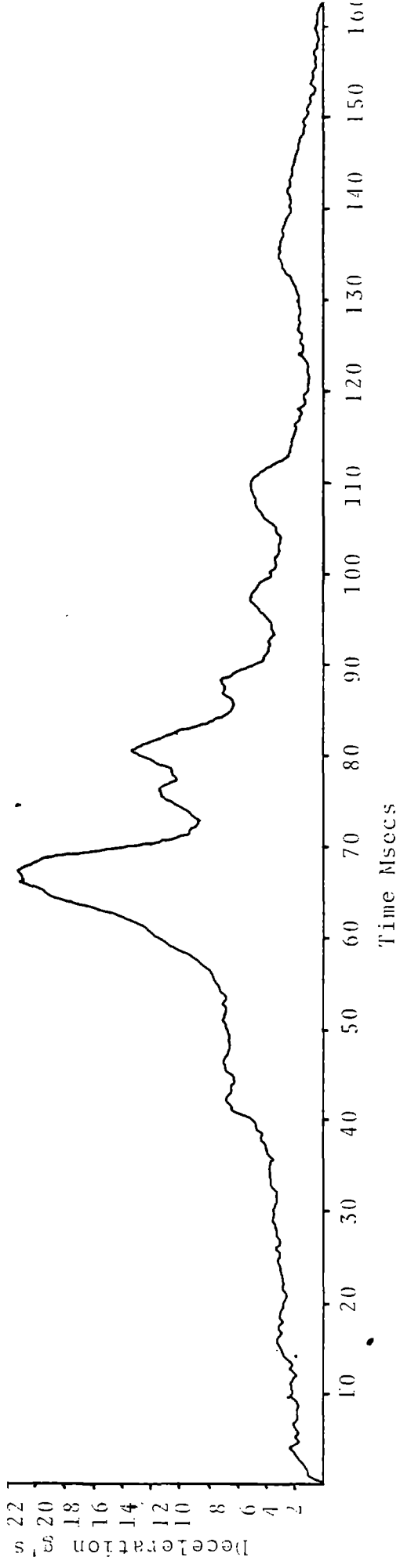


Fig. 51  
 Longitudinal Accelerometer Traces for Test I147-204

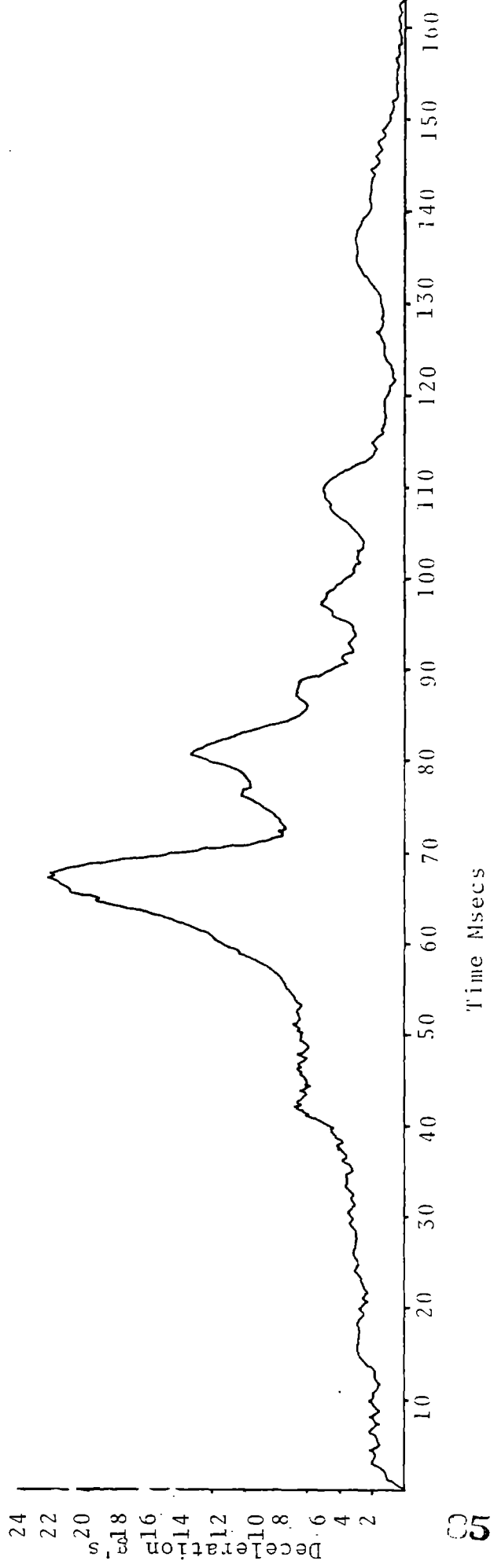


Fig. 51 (Cont'd)  
Longitudinal Accelerometer Traces for Test 1147-204

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-205  
Date : Jun 16, 1977  
Weather : Hot, sunny  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 28 ft (8.5 m)  
Base Diameter : 8 in (20 cm)  
Weight : 145 lb (66 kg)

### BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Hapco, Model #45964  
Modifications : Yes/1A2

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 27.9 ft/sec (8.5 m/s)  
Exit Speed : 21.8 ft/sec (6.6 m/s)  
Momentum Change  
    Film : 436 lb-sec (1939 Ns)  
    Accelerometer : 561 lb-sec (2495 Ns)  
Peak Deceleration : 8 g's

### COMMENTS:

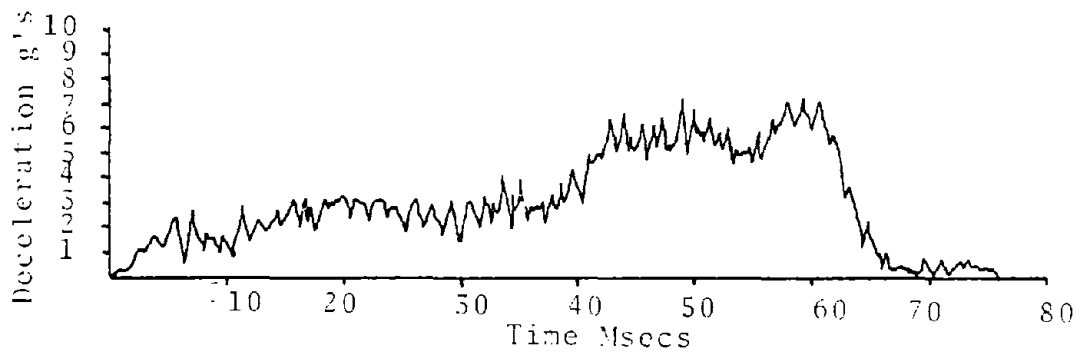
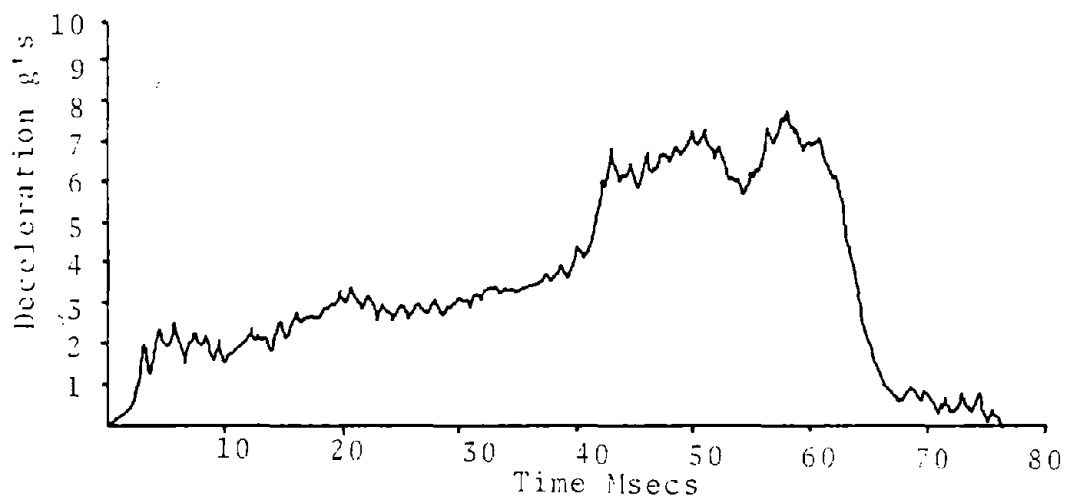
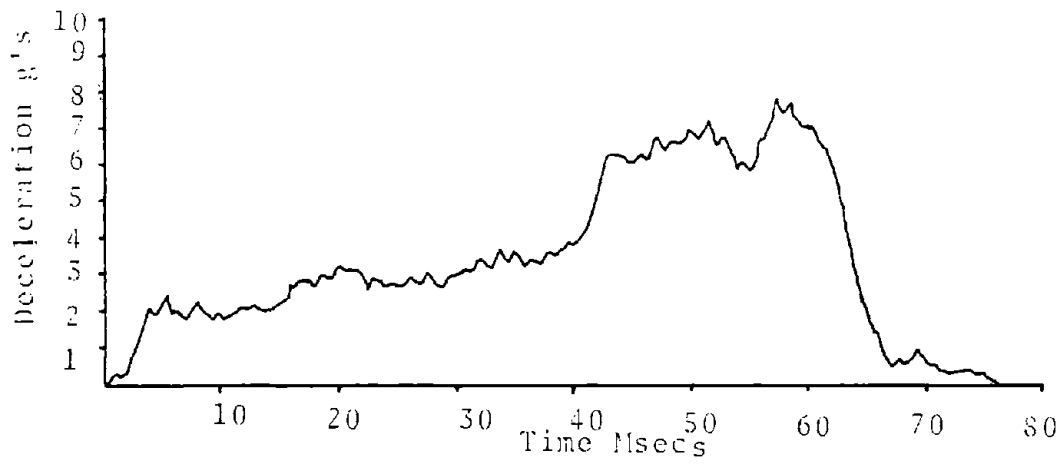


Fig. 52  
 Longitudinal Accelerometer Traces for Test 1147-205



## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-206  
Date : Jun 29, 1977  
Weather : Hot, sunney  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pfaff & Kendall  
Height : 36 ft (11.0 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 186 lb (84 kg)

### BASE:

Type : Transformer/Tapered Skirt with  
Beltline weld, small  
Manufacturer : Pfaff & Kendall, Model #TB2A  
Modifications : No

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 29.0 ft/sec (8.8 m/s)  
Exit Speed : 19.7 ft/sec (6.0 m/s)  
Momentum Change  
Film : 601 lb-sec (2940 Ns)  
Accelerometer : 735 lb-sec (3269 Ns)  
Peak Deceleration : 9.3 g's

### COMMENTS:

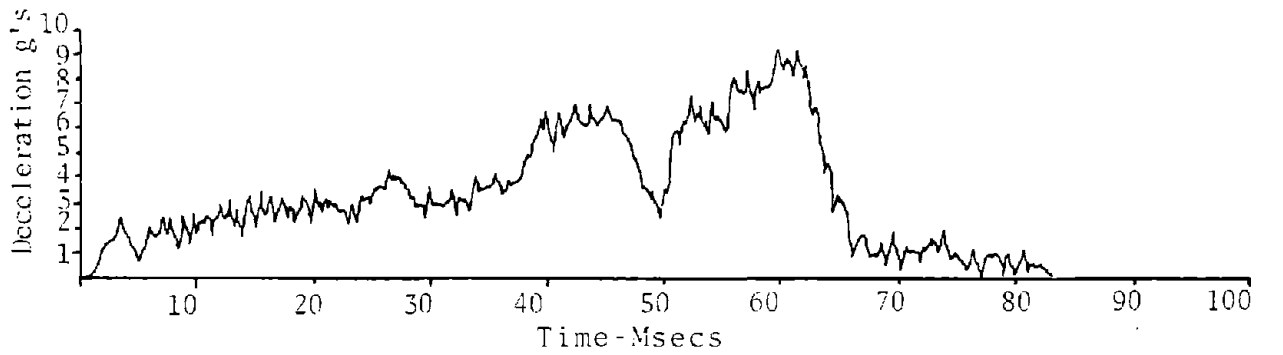
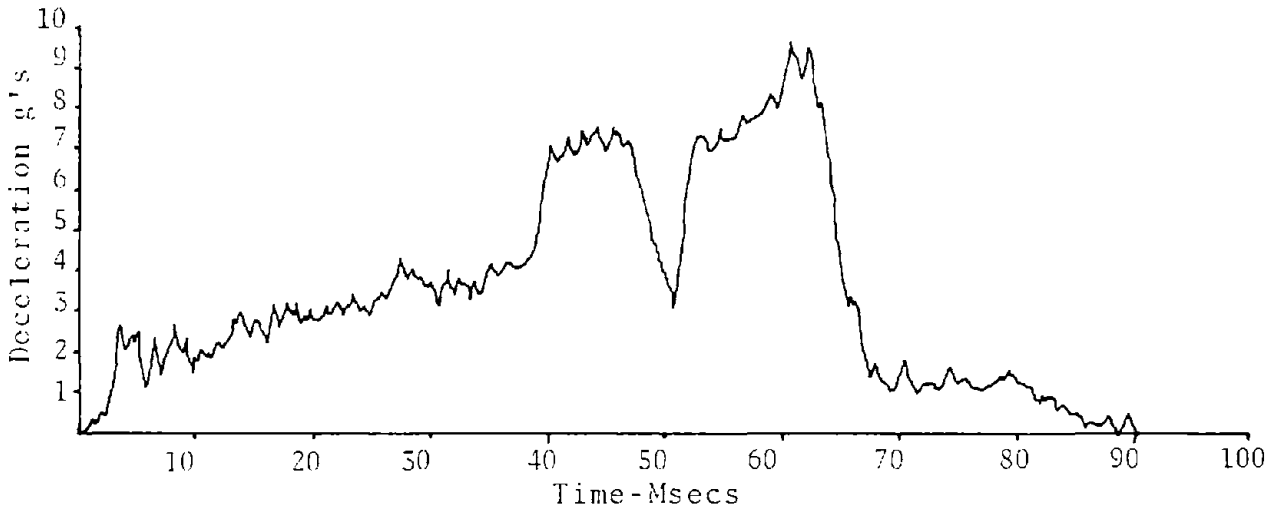
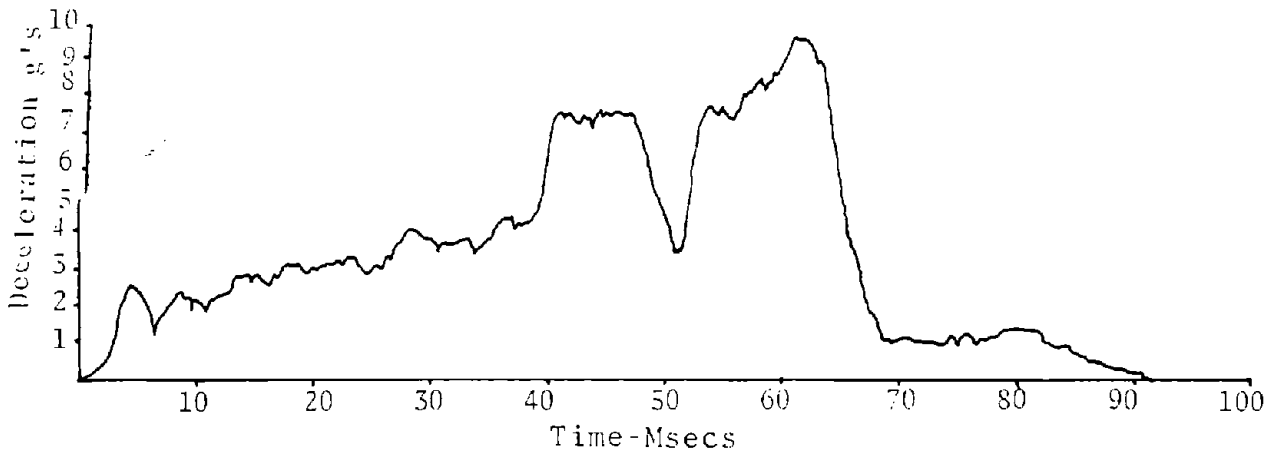


Fig. 53  
Longitudinal Accelerometer Traces for Test 1147-206

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-207  
Date : June 29, 1977  
Weather : Hot, sunny  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pffaff & Kendall  
Height : 36 ft (11.0 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 186 lb (84 kg)

### BASE:

Type : Transformer/tapered skirt with  
Beltline weld, small  
Manufacturer : Pfaff & Kendall, Model #TB2A  
Modifications : Yes/lbl

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.5 ft/sec (8.7 m/s)  
Exit Speed : 21.4 ft/sec (6.5 m/s)  
Momentum Change  
Film : 498 lb-sec (2215 Ns)  
Accelerometer : 644 lb-sec (2865 Ns)  
Peak Deceleration : 8.1 g's

### COMMENTS:

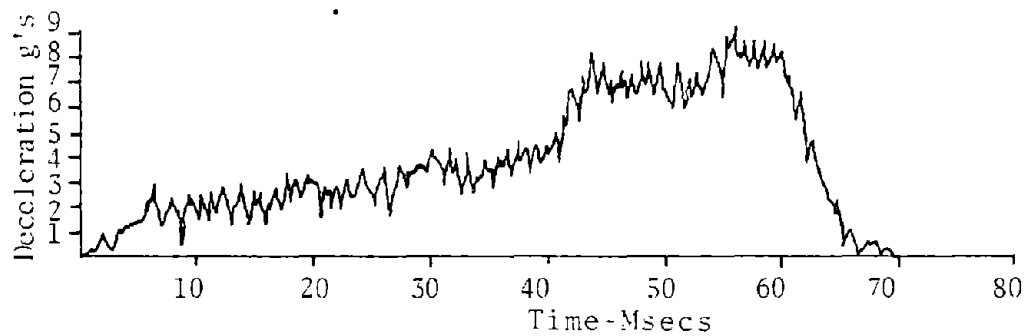
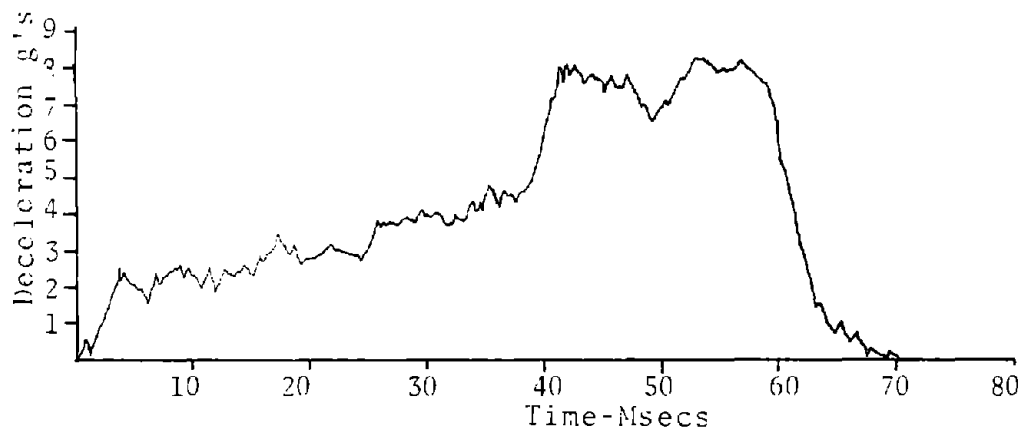


Fig. 54  
 Longitudinal Accelerometer Traces for Test 1147-207

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-208  
Date : Jun 29, 1977  
Weather : Hot, Sunny  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 28 ft (8.5 m)  
Base Diameter : 8 in (20 cm)  
Weight : 145 lb (66 kg)

### BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Hapco, Model # 45964  
Modifications : None

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.7 ft/sec (8.8 m/s)  
Exit Speed : 18.4 ft/sec (5.6 m/s)  
Momentum Change  
  Film : 734 lb-sec (3265 Ns)  
  Accelerometer : 901 lb-sec (4008 Ns)  
Peak Deceleration : 16 g's

### COMMENTS:

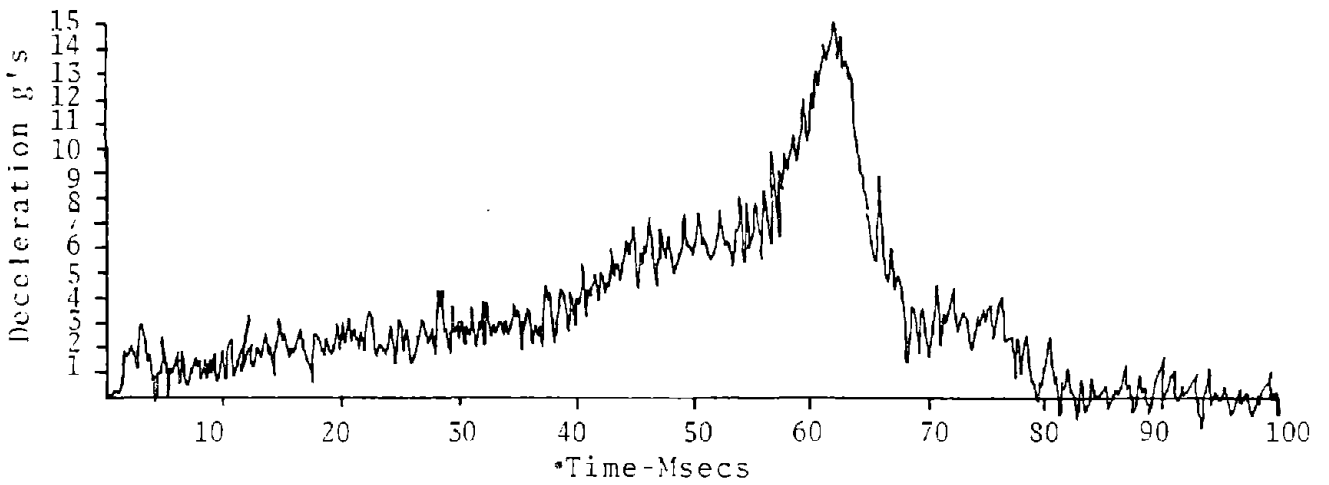
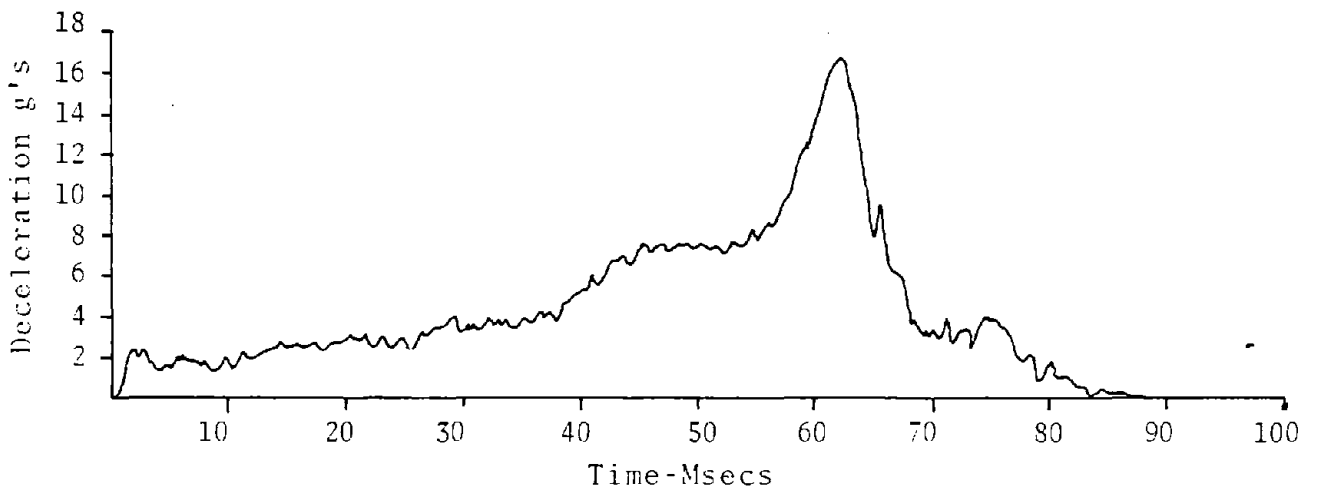
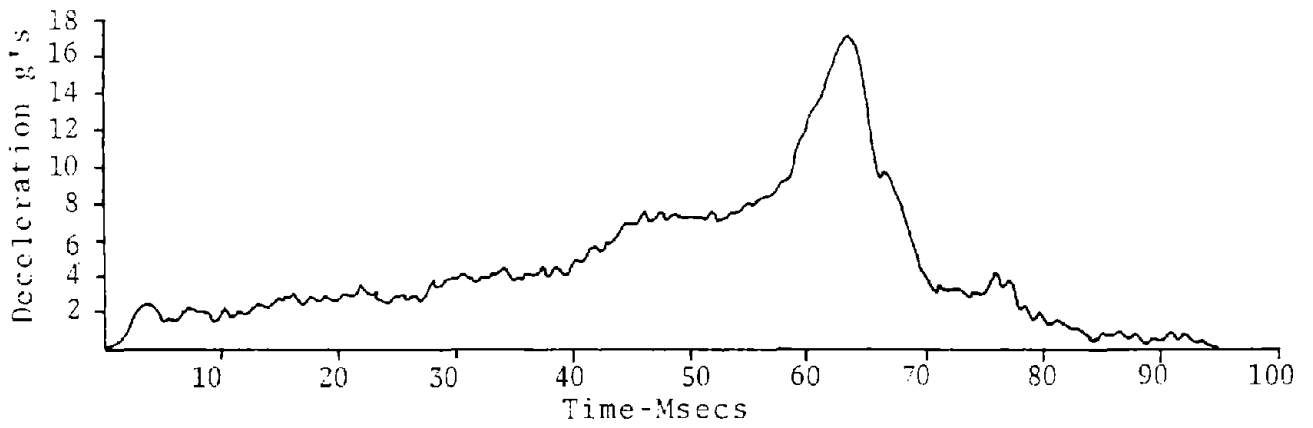


Fig. 55  
 Longitudinal Accelerometer Traces for Test 1147-208

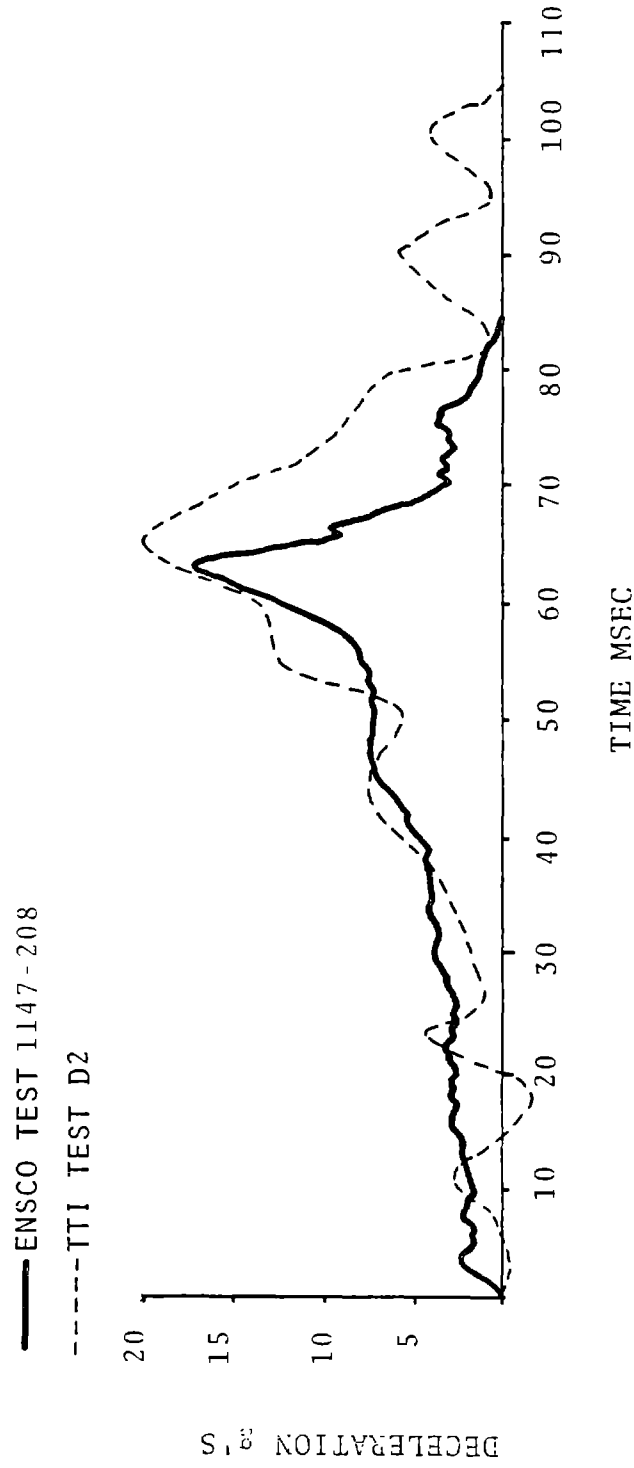


Fig. 56  
 Comparison of Longitudinal Accelerometer  
 Traces for TTI Test D2 and ENSCO Test 1147-208

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-209  
Date : Jul 12, 1977  
Weather : Overcast, hot  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 28 ft (8.5 m)  
Base Diameter : 8 in (20 cm)  
Weight : 145 lb (66 kg)

BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Hapco, Model No. 45964  
Modifications : None (temper change) (T51)

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 29.2 ft/sec (8.9 m/s)  
Exit Speed : 8.0 ft/sec (2.4 m/s)  
Momentum Change  
  Film : 1503 lb-sec (6885 Ns)  
  Accelerometer : 1555 lb-sec (6917 Ns)  
Peak Deceleration : 21.2 g's

COMMENTS:



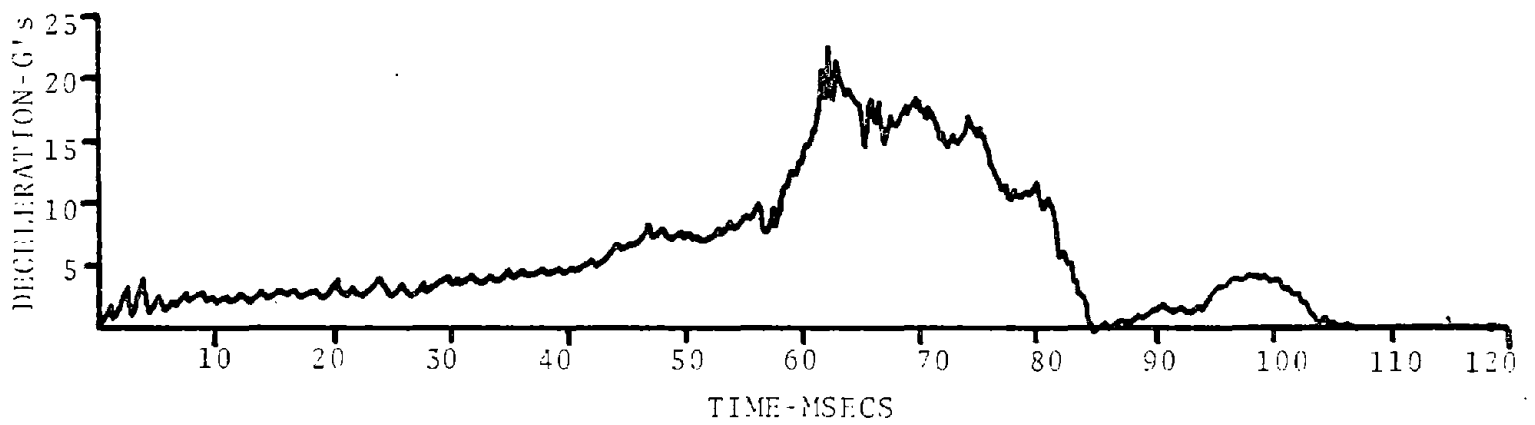
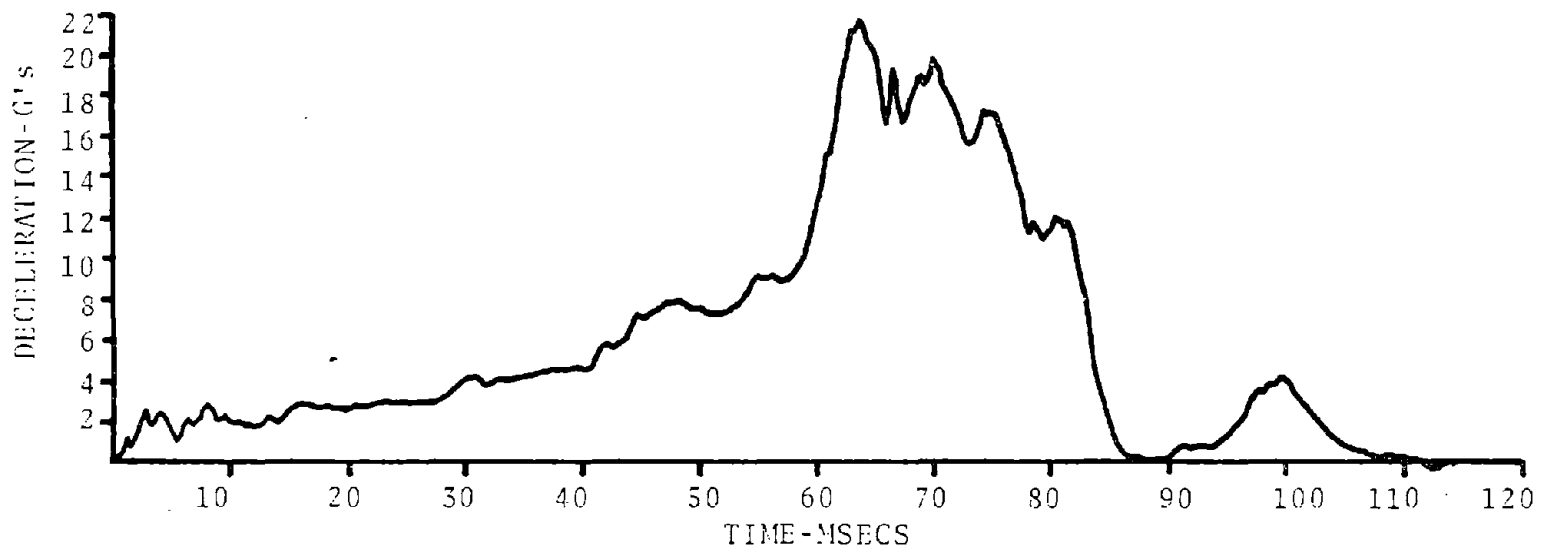
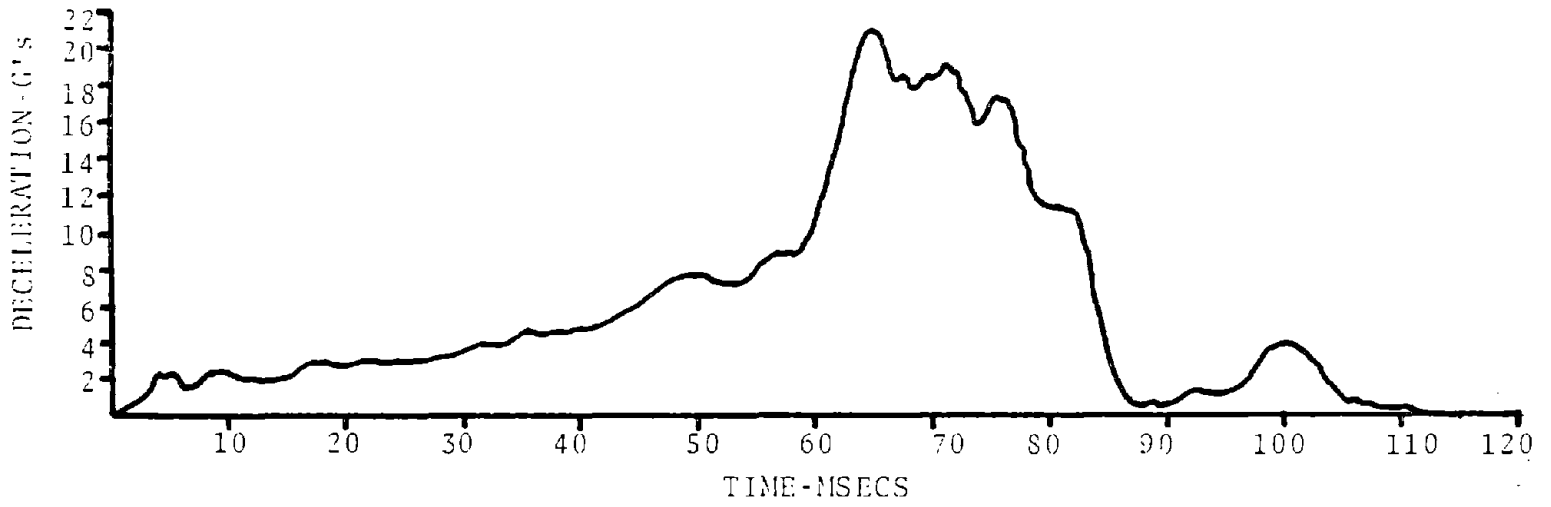


Fig. 57  
 Longitudinal Accelerometer Traces for Test 1147-209

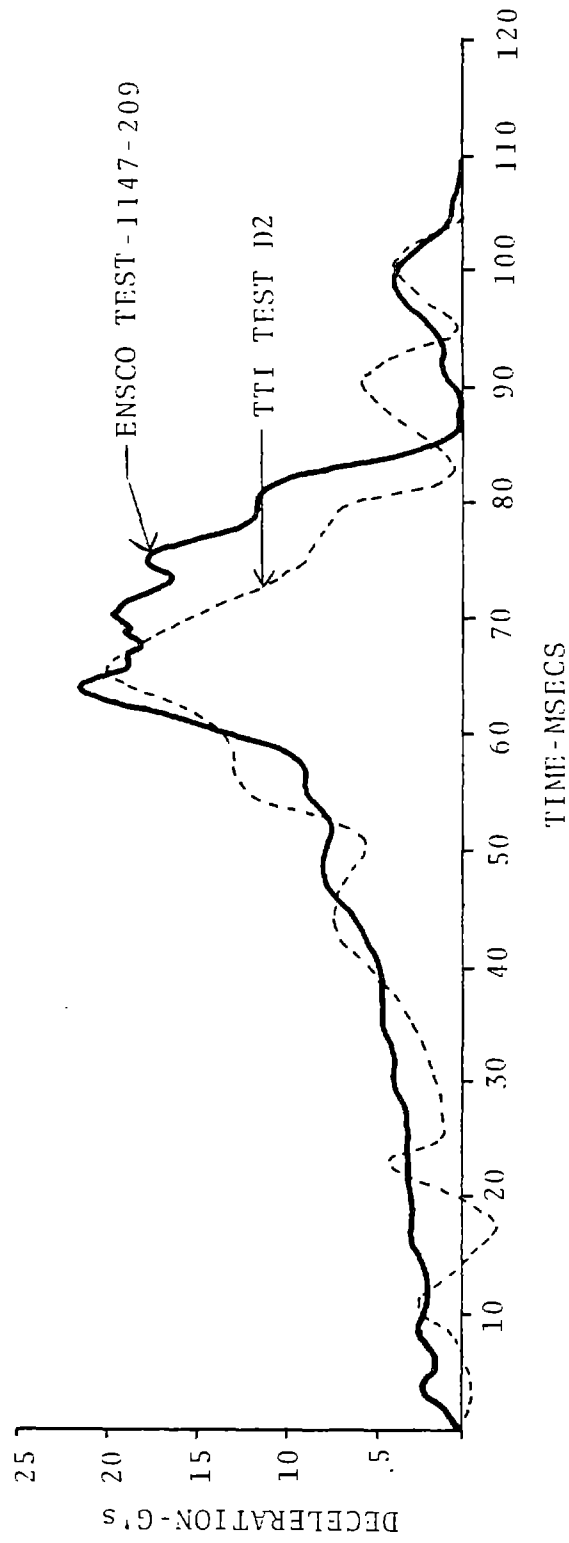


Fig. 58  
 Comparison of Longitudinal Accelerometer  
 Traces for TTI Test D2 and ENSCO Test 1147-209

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-210  
Date : Jul 12, 1977  
Weather : Hot  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 28 ft (8.5 cm)  
Base Diameter : 8 in (20 cm)  
Weight : 145 lb (66 kg)

### BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Hapco, Model #45964  
Modifications : None

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 27.2 ft/sec (8.3 m/s)  
Exit Speed : 0 ft/sec (0 m/s)  
Momentum Change  
  Film : 1934 lb-sec (8604 Ns)  
  Accelerometer : 2037 lb-sec (9061 Ns)  
Peak Deceleration : 22 g's

### COMMENTS:

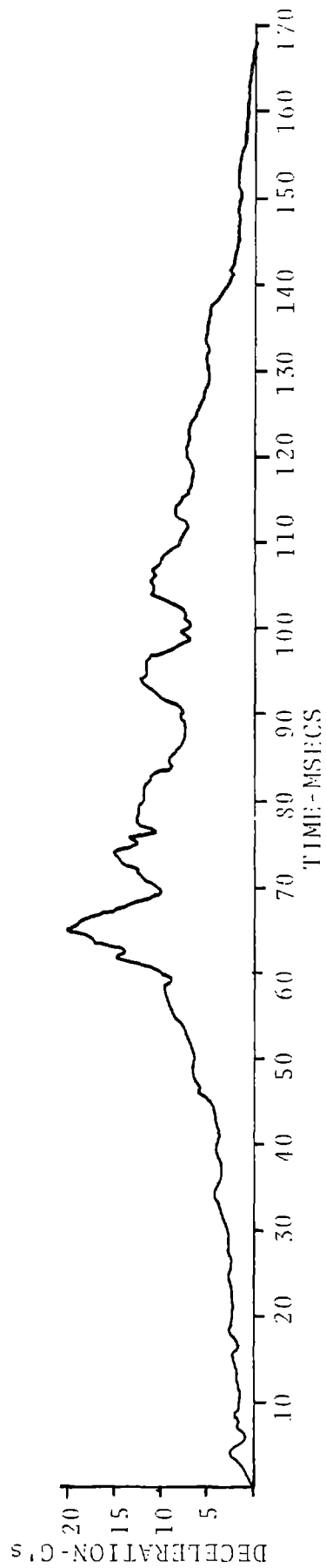
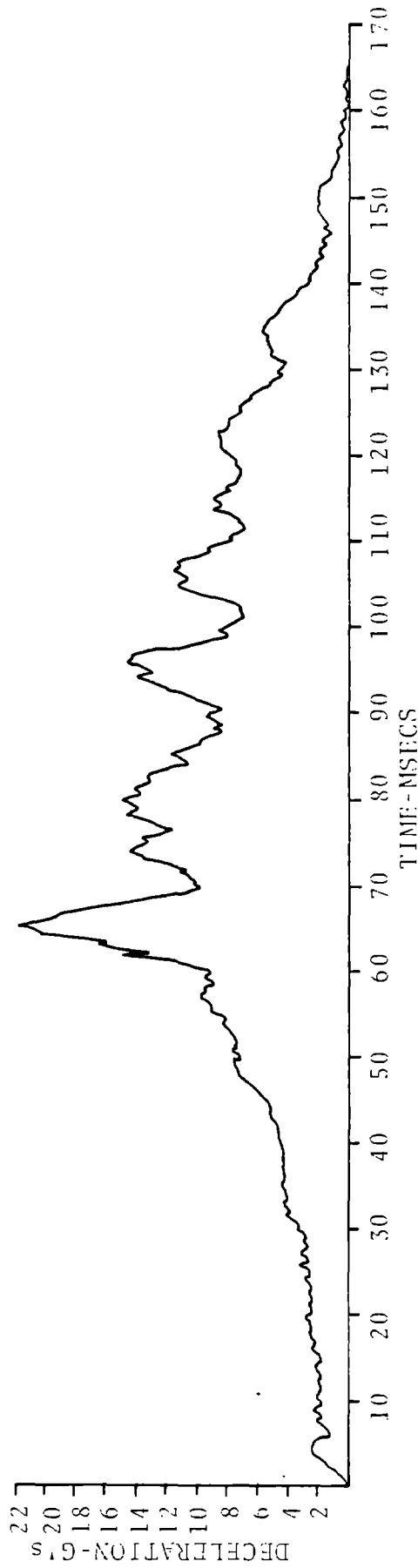
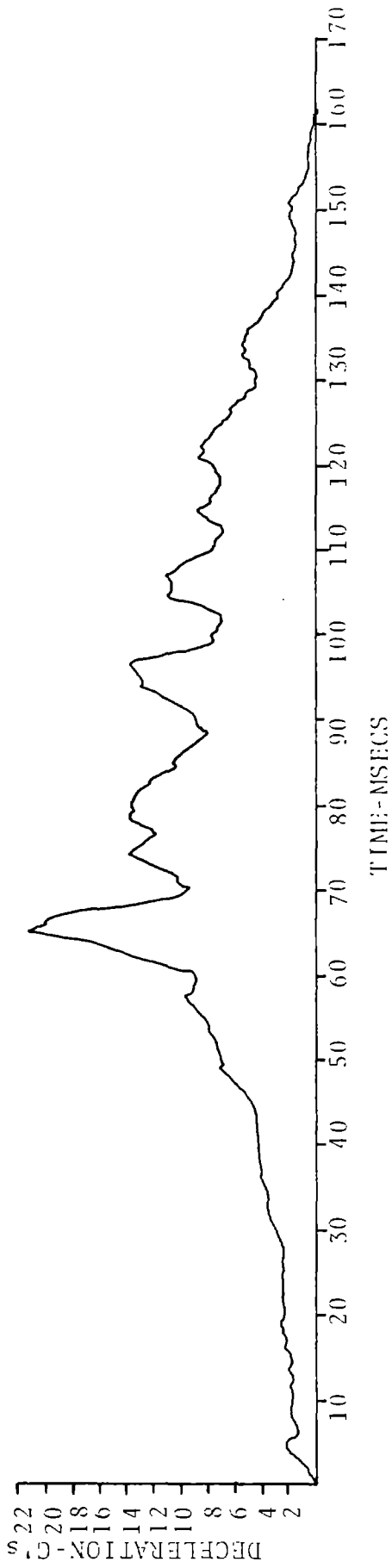


Fig. 59

Longitudinal Accelerometer Traces for Test 1147-210

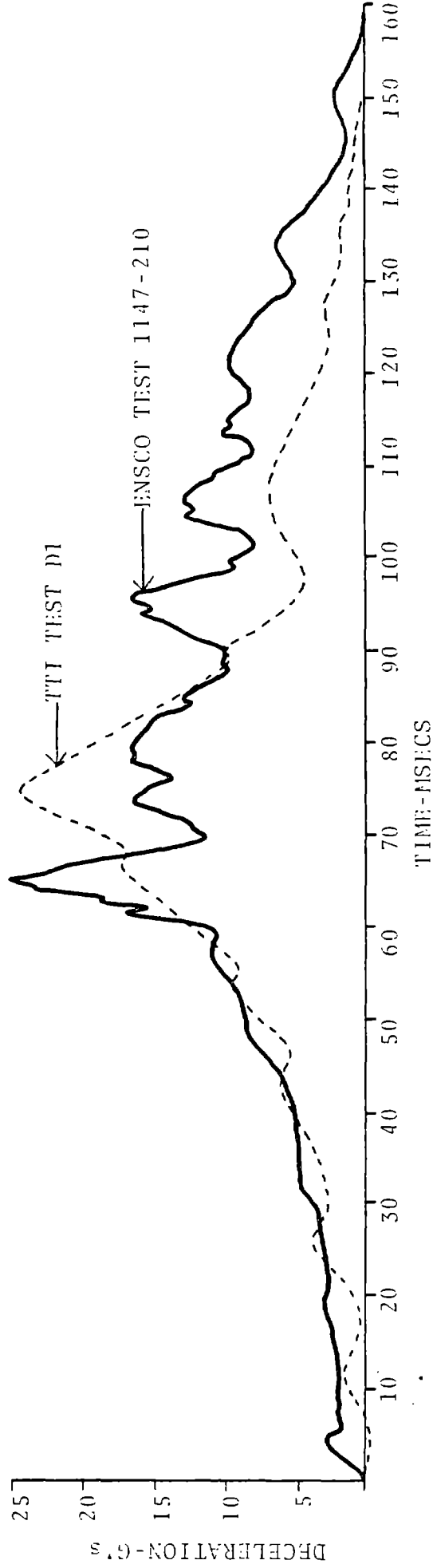


Fig.60  
 Comparison of Longitudinal Accelerometer  
 Traces for TTI Test D1 and ENSCO Test 1147-210

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-211  
Date : Aug 11, 1977  
Weather : Hot  
Pendulum Mass : 2290 (1040 kg)

SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 28 ft (8.5 m)  
Base Diameter : 8 in (20 cm)  
Weight : 145 lb (66 kg)

BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Hapco, Model #45964  
Modifications : Yes/1A3

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 27.5 ft/sec (8.4 m/s)  
Exit Speed : 14.9 ft/sec (4.5 m/s)  
Momentum Change  
  Film : 896 lb-sec (3988 Ns)  
  Accelerometer : 1079 lb-sec (4799 Ns)  
Peak Deceleration : 8.6 g's

COMMENTS:

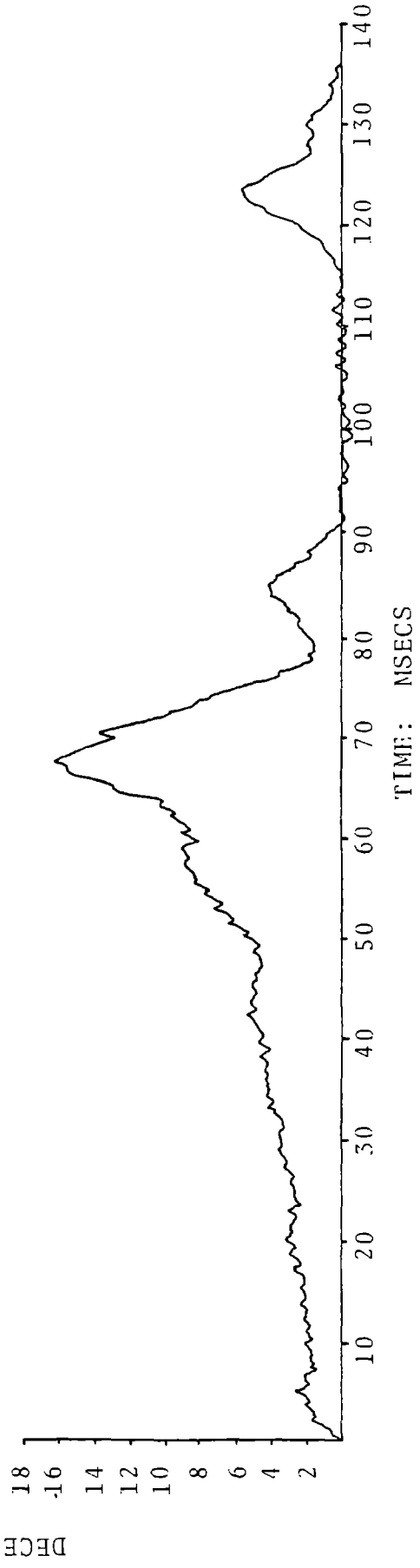
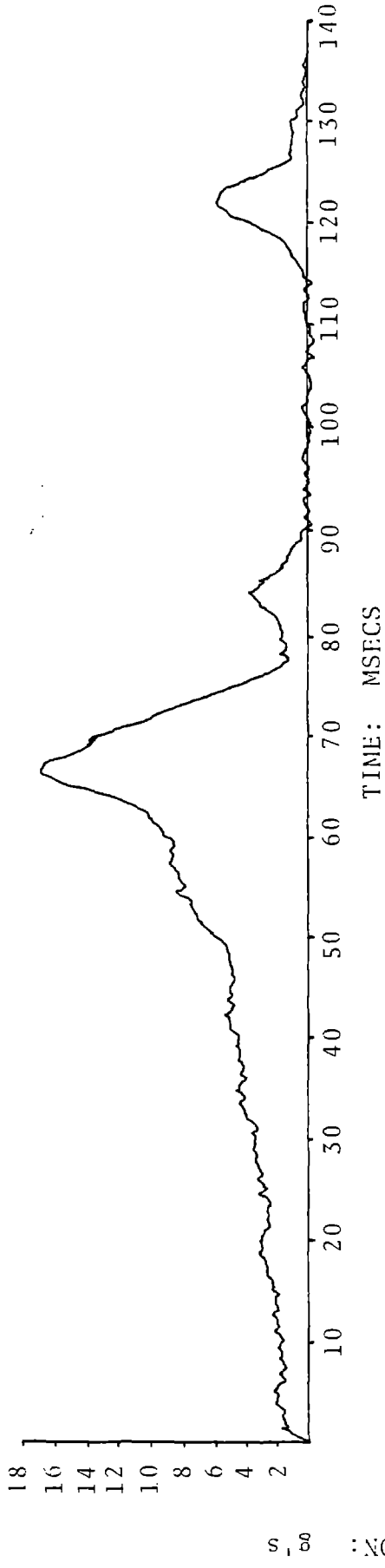


Fig. 61  
 Longitudinal Accelerometer Traces for Test 1147-211

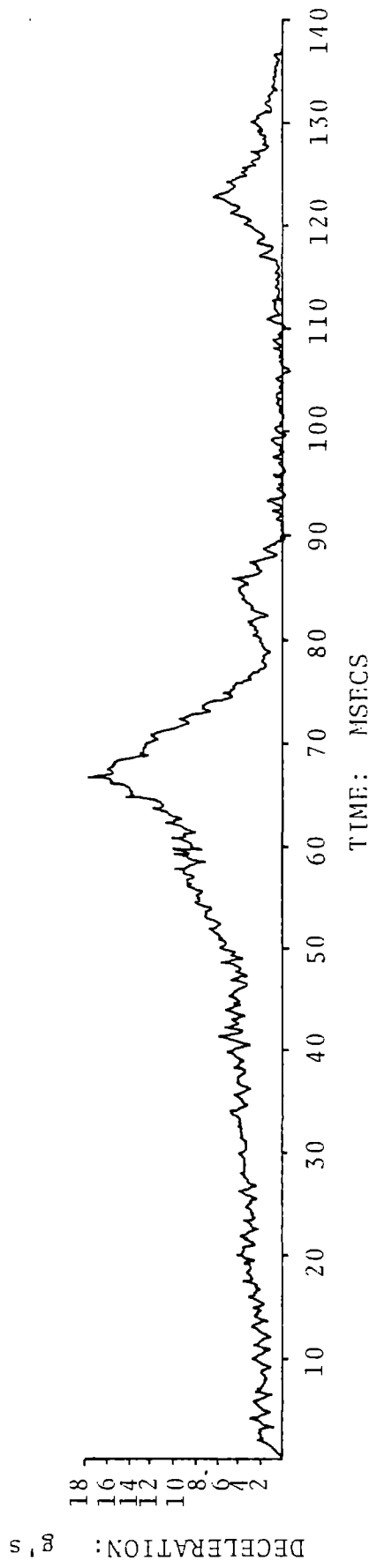


Fig. 61 (Cont'd)  
 Longitudinal Accelerometer Traces for Test 1147-211



## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-212  
Date : Aug 16, 1977  
Weather : Hot, overcast  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pfaff & Kendall  
Height : 36 ft (11.0 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 186 lb (84 kg)

### BASE:

Type : Transformer/tapered skirt  
with Beltline weld, small  
Manufacturer : Pfaff & Kendall, Model #TB2A  
Modifications : None

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.9 ft/sec (8.8 m/s)  
Exit Speed : 17.4 ft/sec (5.3 m/s)  
Momentum Change  
Film : 814 lb-sec (3621 Ns)  
Accelerometer : 870 lb-sec (3870 Ns)  
Peak Deceleration : 10.2 g's

### COMMENTS:

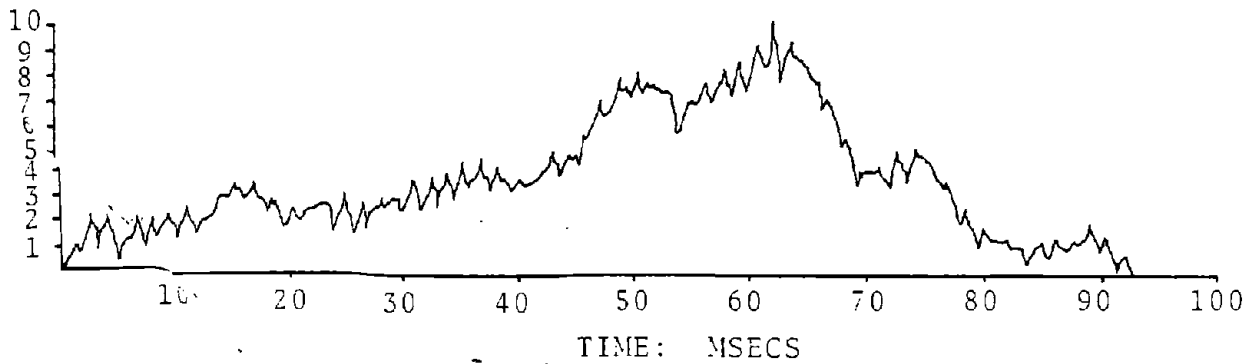
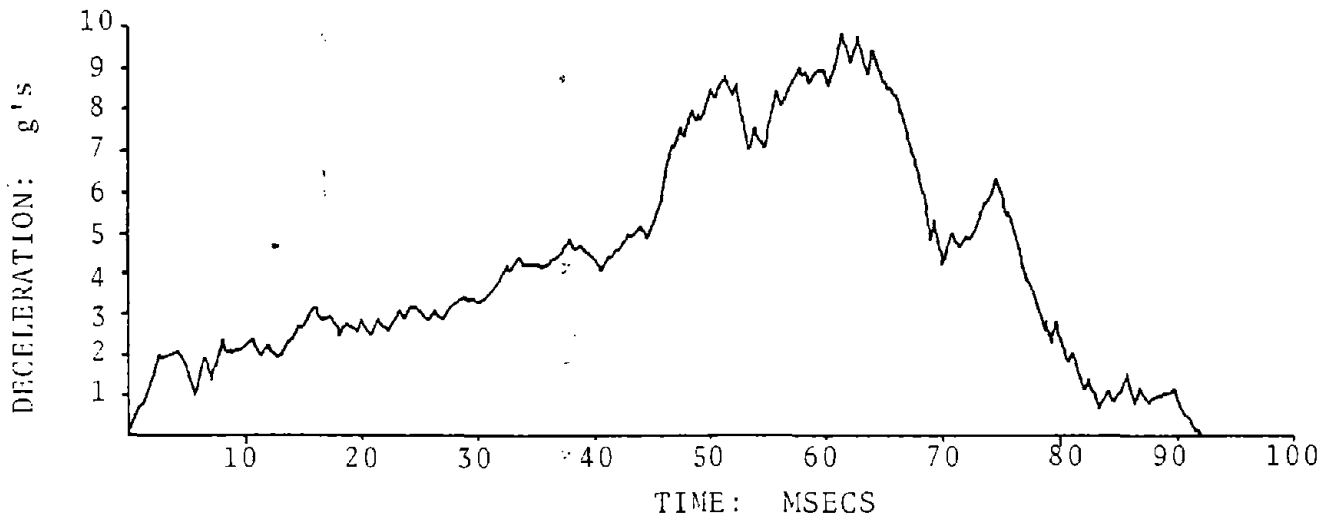
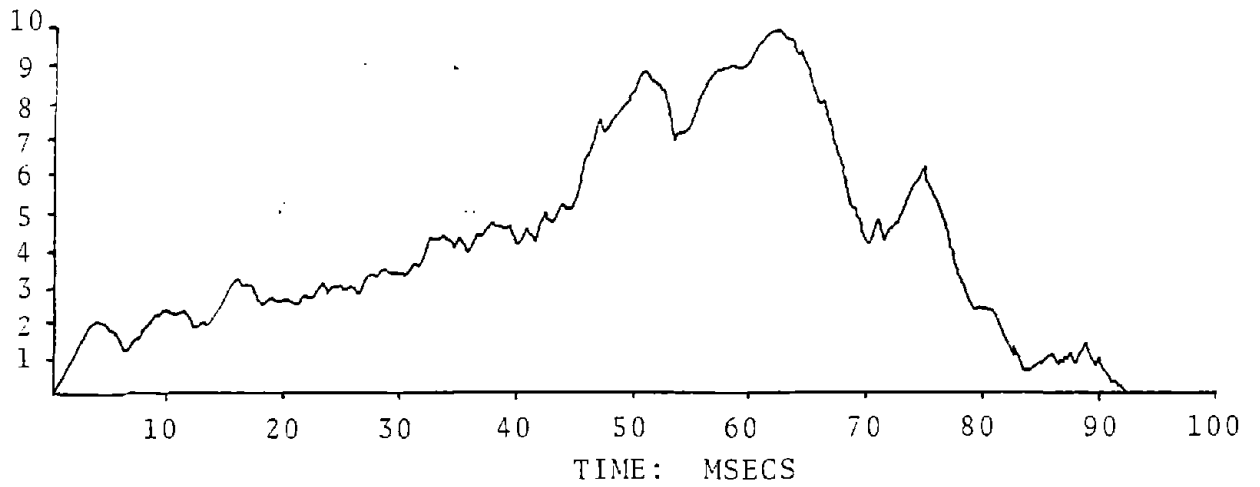


Fig. 62  
 Longitudinal Accelerometer Traces for Test 1147-212

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-213  
Date : Aug 16, 1977  
Weather : Hot, overcast  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pfaff & Kendall  
Height : 36 ft (11.0m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 186 lb (84 kg)

### BASE:

Type : Transformer/tapered skirt  
with Beltline weld  
Manufacturer : Pfaff & Kendall, Model # TB2A  
Modifications : None

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.1 ft/sec (8.6 m/s)  
Exit Speed : 11.9 ft/sec (3.6 m/s)  
Momentum Change :  
    Film : 1152 lb-sec (5125 Ns)  
    Accelerometer : 1244 lb-sec (5533 Ns)  
Peak Deceleration : 19.8 g's

### COMMENTS:

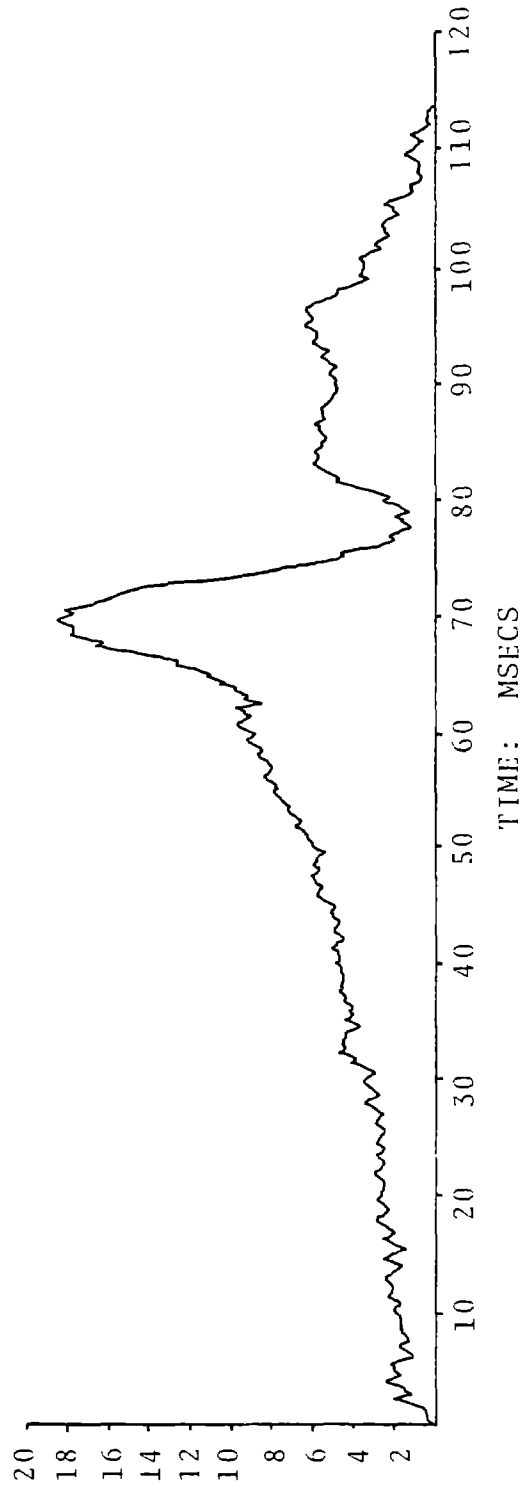
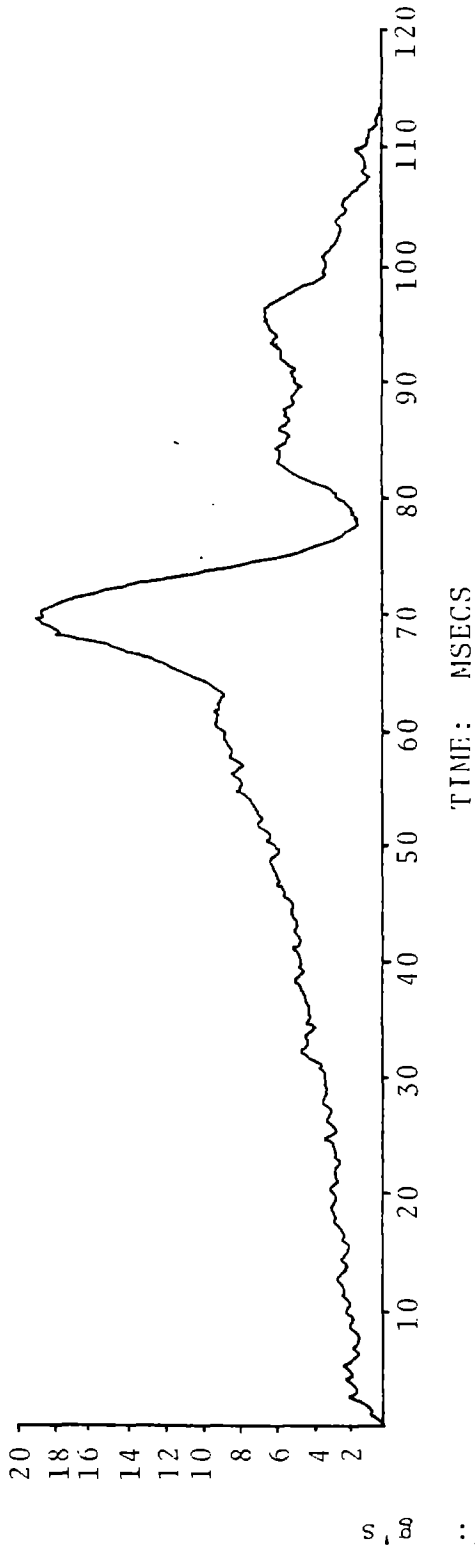


Fig. 63  
 Longitudinal Accelerometer Traces for Test 1147-213

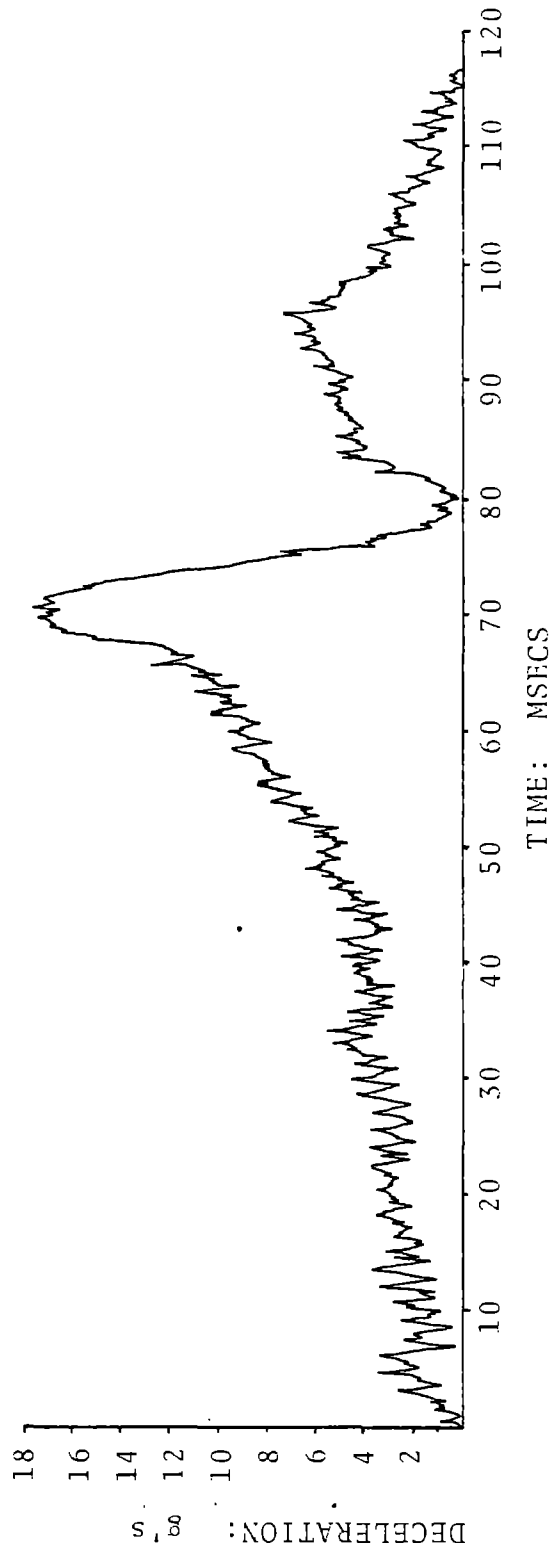


Fig. 63 (Cont'd)  
Longitudinal Accelerometer Traces for Test 1147-213

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-214  
Date : Aug 19, 1977  
Weather : Mild, Overcast  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pfaff & Kendall  
Height : 36 ft (11.0 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 186 lb (84 kg)

### BASE:

Type : Transformer/tapered skirt  
with beltline weld, small  
Manufacturer : Pfaff & Kendall, Model #TB2A  
Modifications : Yes/lb2

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 26.5 ft/sec (8.1 m/s)  
Exit Speed : 14.3 ft/sec (4.4 m/s)  
Momentum Change  
Film : 868 lb-sec (3860 Ns)  
Accelerometer : 964 lb-sec (4288 Ns)  
Peak Deceleration : 15 g's

### COMMENTS:

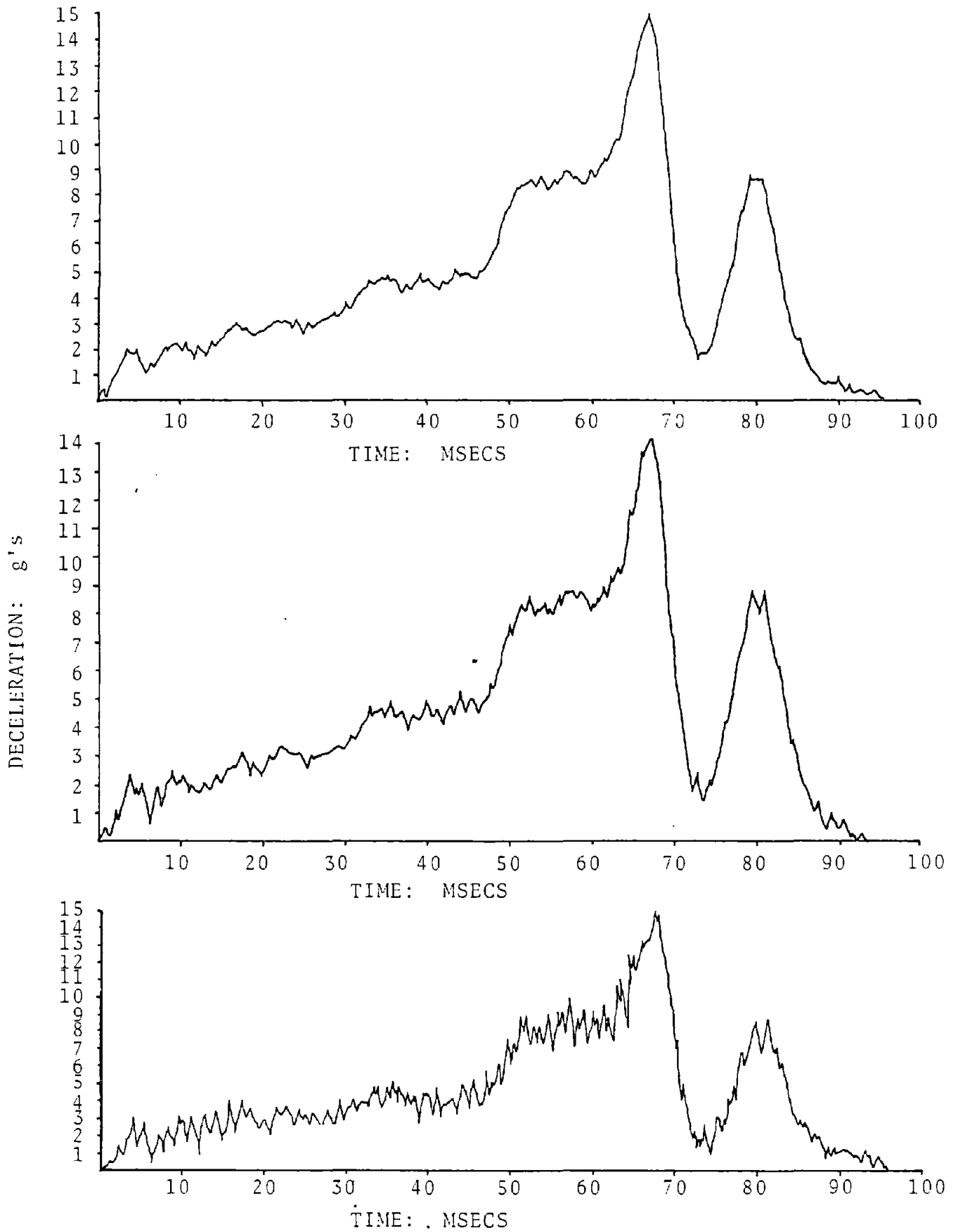


Fig. 64  
 Longitudinal Accelerometer Traces for Test 1147-214

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-215  
Date : Sep 23, 1977  
Weather : Overcast, cool  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 28 ft (8.5 m)  
Base Diameter : 8 in (20 cm)  
Weight : 145 lb (66 kg)

BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Hapco, model #45964  
Modifications : Yes/1A4

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 29.1 ft/sec (8.9 m/s)  
Exit Speed : 21.5 ft/sec (6.6 m/s)  
Momentum Change  
    Film : 669 lb-sec (2976 Ns)  
    Accelerometer : 668 lb-sec (2971 Ns)  
Peak Deceleration : 9.6 g's

COMMENTS:



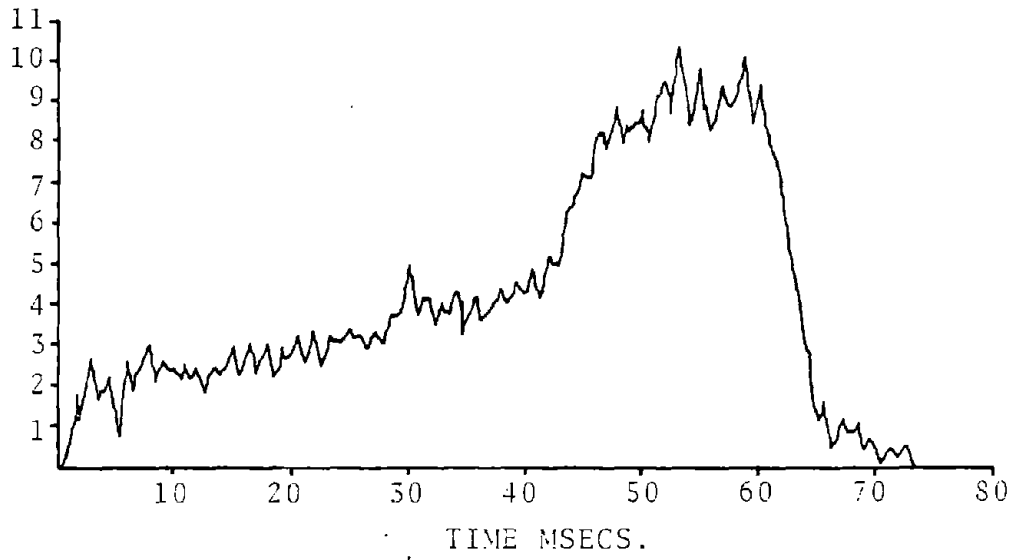
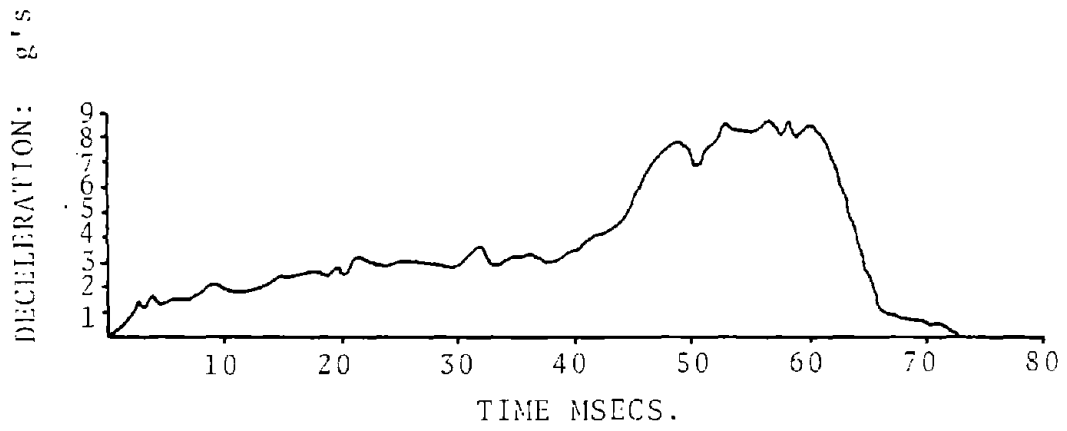
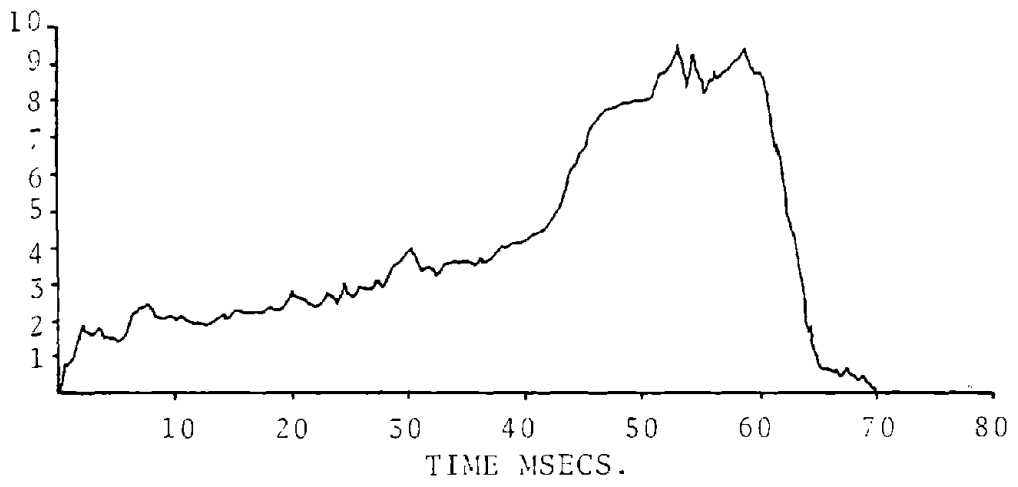


Fig. 65  
 Longitudinal Accelerometer Traces for Test 1147-215

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-216  
Date : Oct 13, 1977  
Weather : Overcast, cold  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pfaff & Kendall  
Height : 36 ft (11.0 cm)  
Base Diameter : 10 in (25.4 cm)  
Weight : 186 lb (84 kg)

### BASE:

Type : Transformer/tapered skirt with  
Beltline weld, small  
Manufacturer : Pfaff & Kendall, Model #TB2A  
Modifications : Yes/1B3

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.9 ft/sec (8.8 m/s)  
Exit Speed : 17.4 ft/sec (5.3 m/s)  
Momentum Change  
Film : 557 lb-sec (2500 Ns)  
Accelerometer : 946 lb-sec (4208 Ns)  
Peak Deceleration : 25 g's

### COMMENTS:

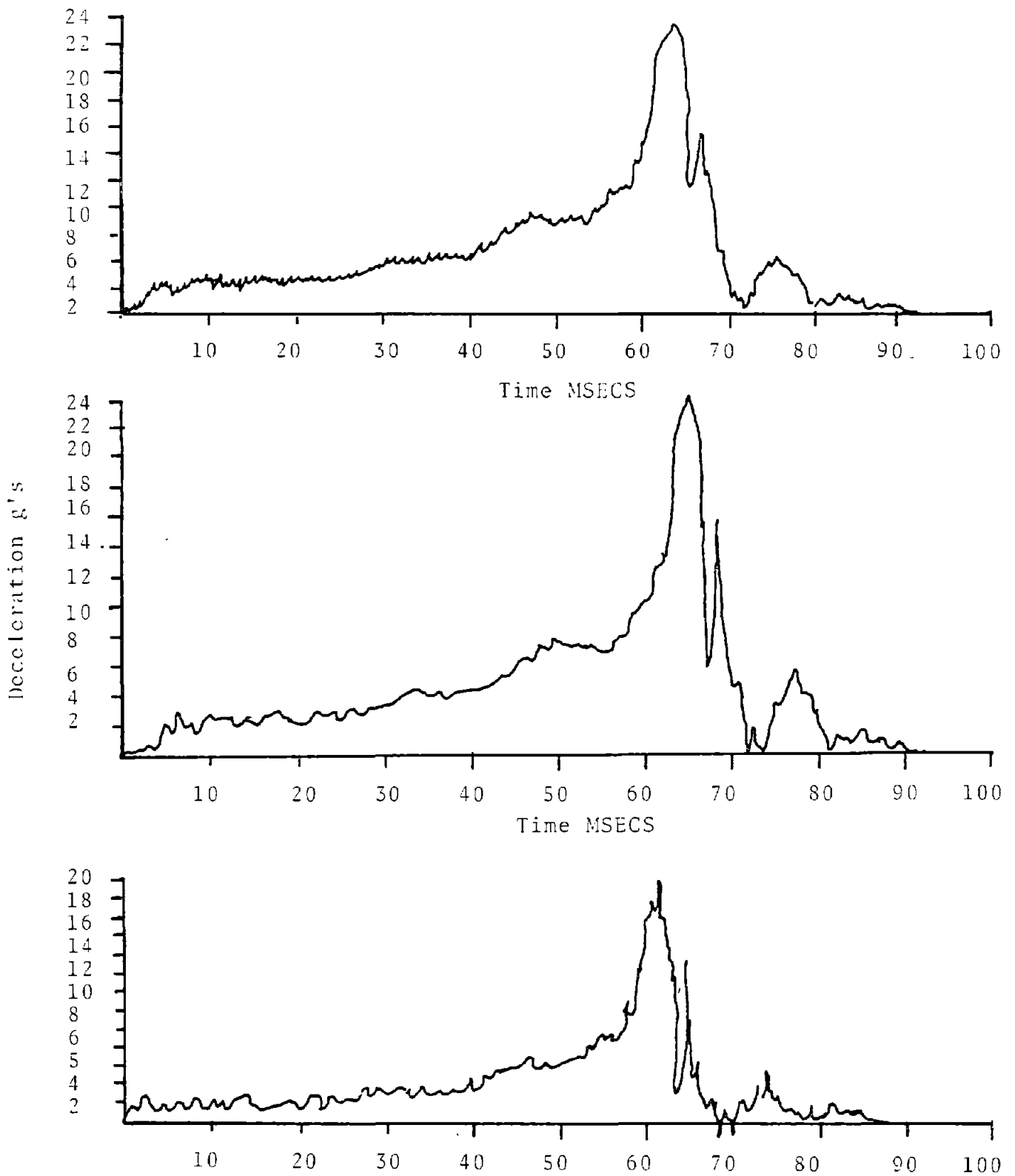


Fig. 66  
 Longitudinal Accelerometer Traces for Test 1147-216

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-217  
Date : Oct 13, 1977  
Weather : Overcast, cool  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pfaff & Kendall  
Height : 36 ft (11.0 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 186 lb (84 kg)

### BASE:

Type : Transformer/tapered skirt  
with Beltline Weld, small  
Manufacturer : Pfaff & Kendall, Model #TB2A  
Modifications : Yes/lB4

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.7 ft/sec (8.8 m/s)  
Exit Speed : 16.1 ft/sec (4.9 m/s)  
Momentum Change  
Film : 892 lb-sec (3968 (Ns)  
Accelerometer : -- \*  
Peak Deceleration : -- \*

### COMMENTS:

\*Accelerometers Data System Not Functioning

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-218  
Date : Nov 1, 1977  
Weather : Cloudy, mild  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 28 ft (8.5 m)  
Base Diameter : 8 in (20 cm)  
Weight : 145 lb (66 kg)

BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Hapco, Model #45964  
Modifications : Yes/1A5

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 28.2 ft/sec (8.6 m/s)  
Exit Speed : 10.9 ft/sec (3.3 m/s)  
Momentum Change  
  Film : 1234 lb-sec (5489 Ns)  
  Accelerometer : 1302 lb-sec (5791 Ns)  
Peak Deceleration : 18.5 g's

COMMENTS:

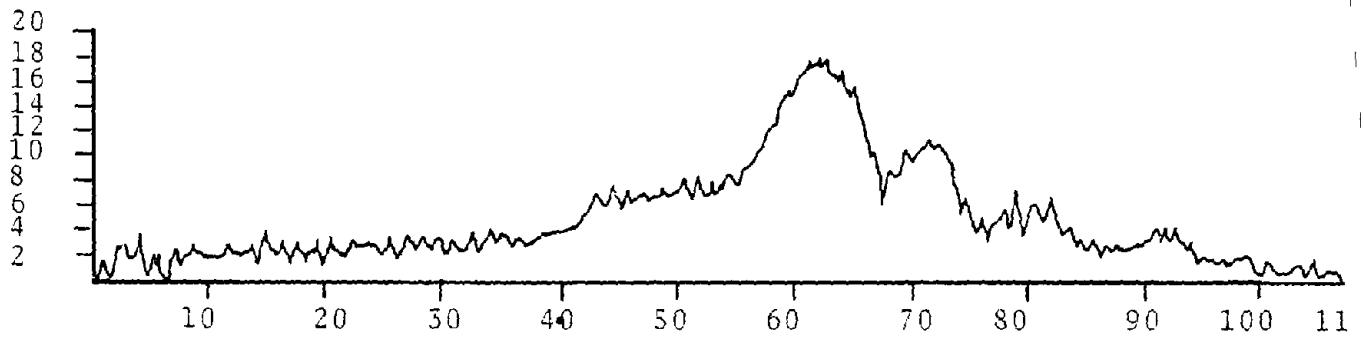
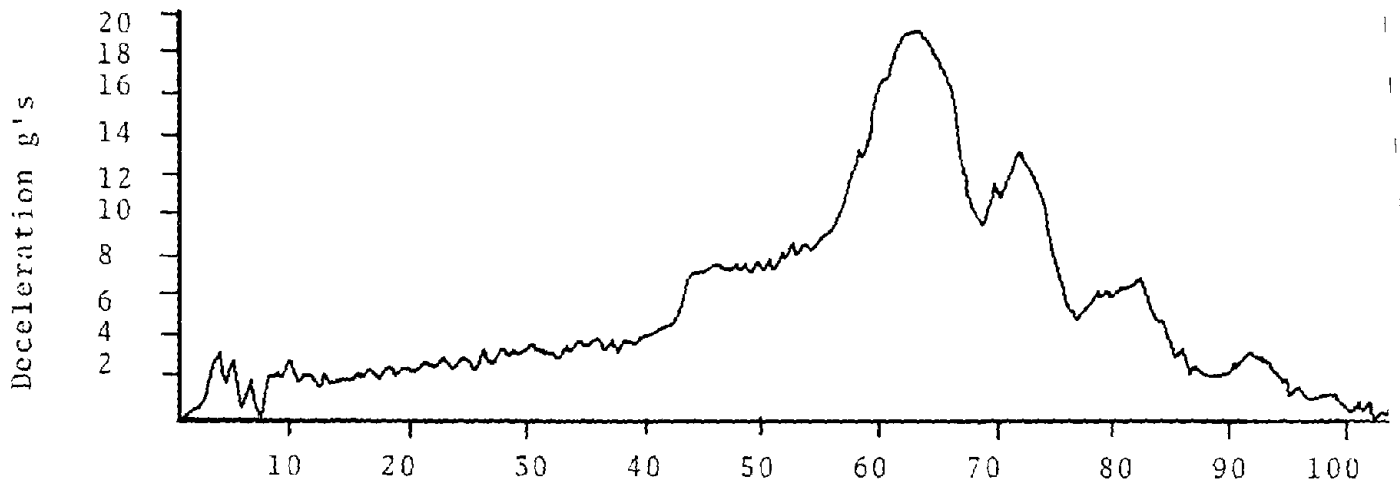
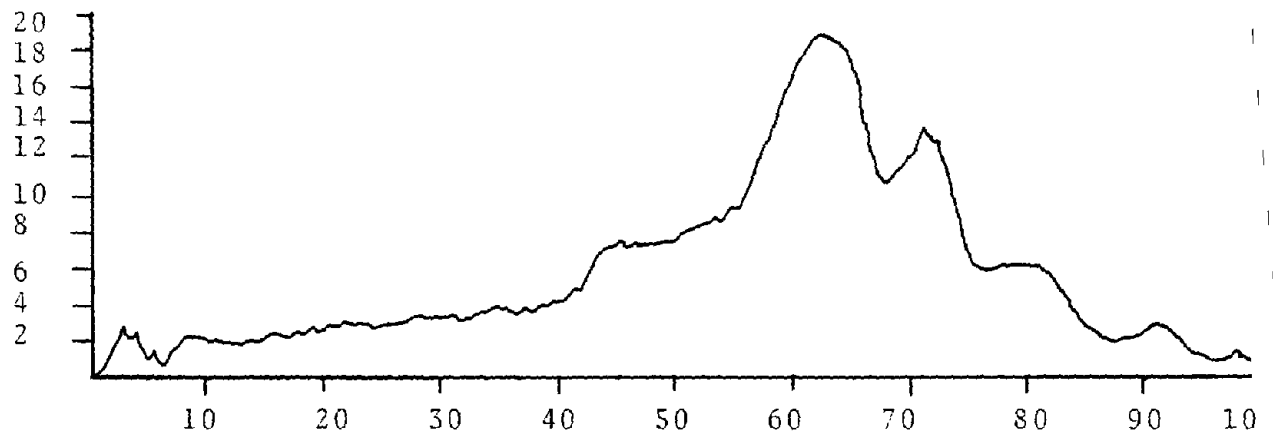


Fig. 67

Longitudinal Accelerometer Traces for Test 1147-218

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-219  
Date : Nov 1, 1977  
Weather : Overcast, cool  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 28 ft (8.5 m)  
Base Diameter : 8 in (20 cm)  
Weight : 145 lb (66 kg)

### BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Hapco, Model #45964  
Modifications : Yes/1A4

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.9 ft/sec (8.8 m/s)  
Exit Speed : 17.4 ft/sec (5.3 m/s)  
Momentum Change  
  Film : 742 lb-sec (3300 Ns)  
  Accelerometer : 842 lb-sec (3745 Ns)  
Peak Deceleration : 12 g's

### COMMENTS:

Impact 90° from door side.

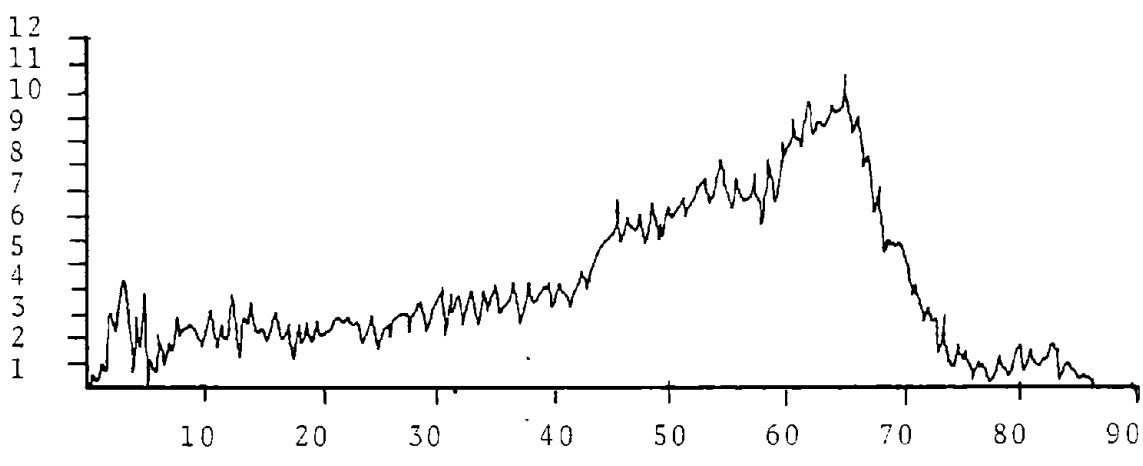
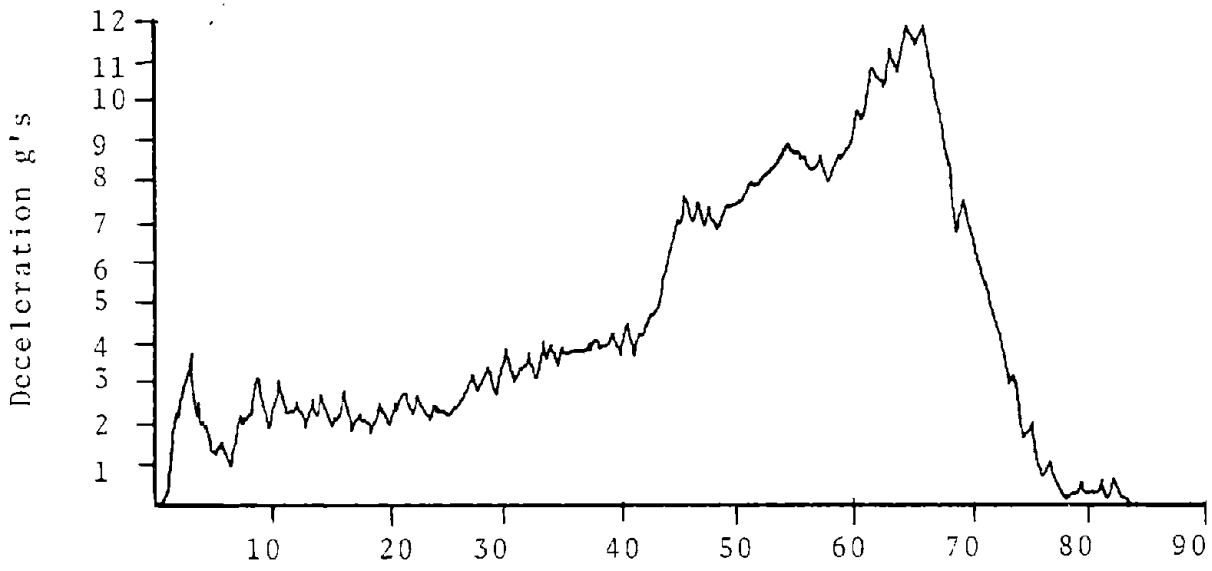
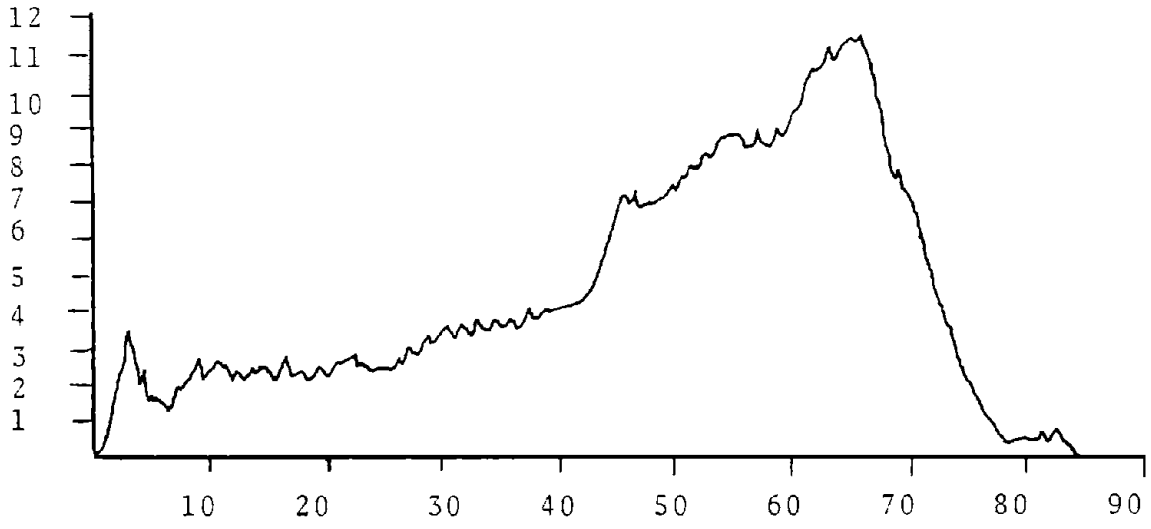


Fig. 68  
 Longitudinal Accelerometer Traces for Test 1147-219



## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-220  
Date : Nov 28, 1977  
Weather : Overcast, cool  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 28 ft (8.5 m)  
Base Diameter : 8 in (20 cm)  
Weight : 145 lb (66 kg)

### BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Hapco, Model #45964  
Modifications : Yes/lA4

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 29.5 ft/sec (9.0 m/s)  
Exit Speed : 17.9 ft/sec (5.5 m/s)  
Momentum Change  
    Film : 821 lb-sec (3652 Ns)  
    Accelerometer : 839 lb-sec (3732 Ns)  
Peak Deceleration : 10.9 g's

### COMMENTS:

Impact 90° from door side

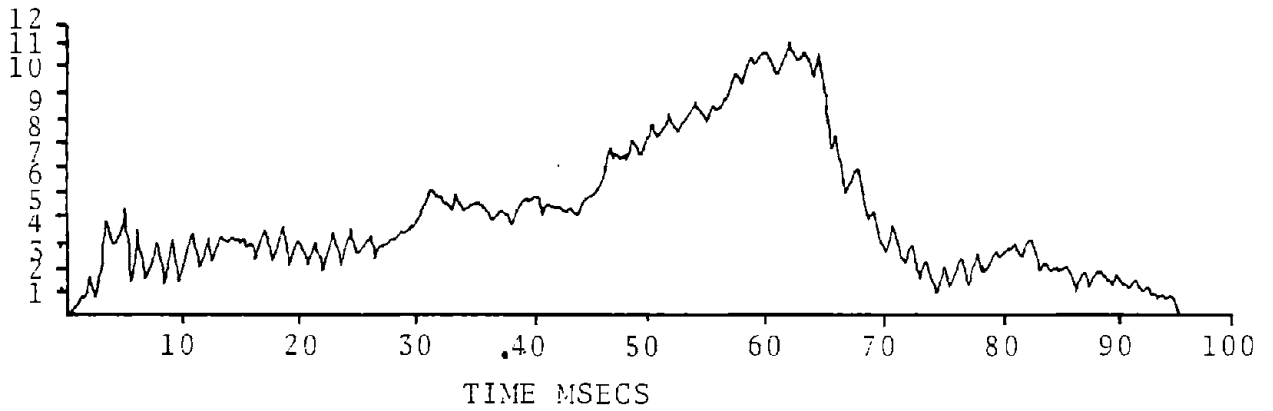
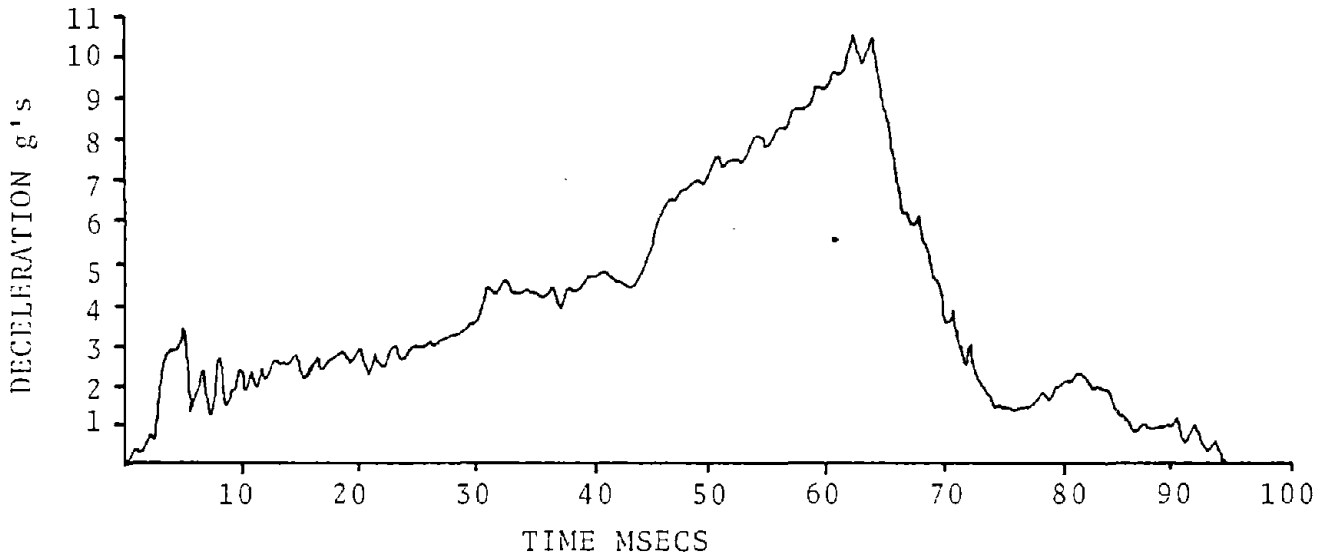
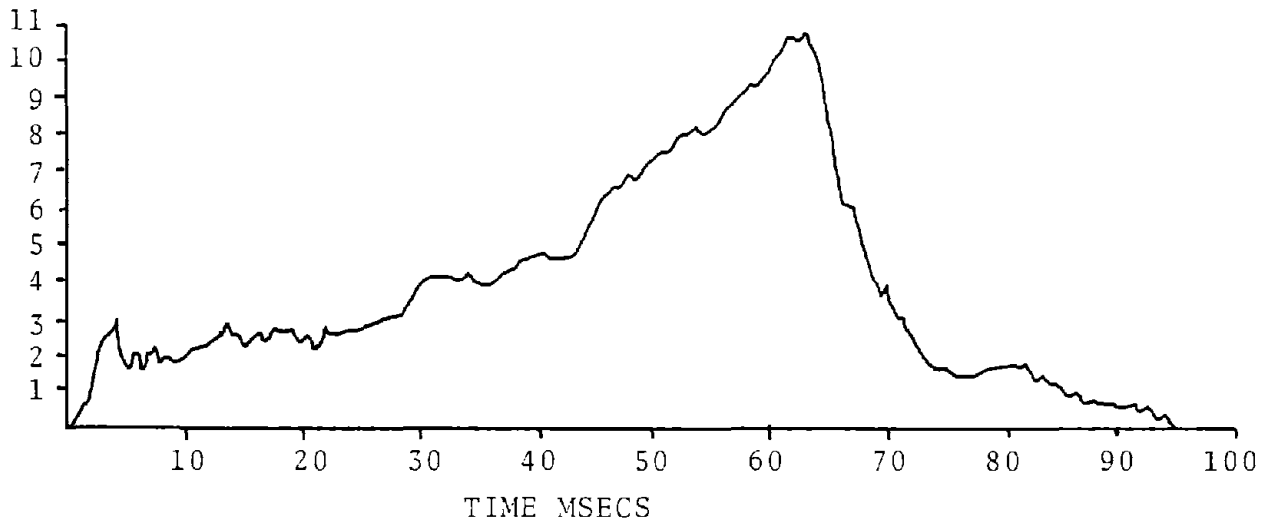


Fig. 69  
Longitudinal Accelerometer Traces for Test 1147-220

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-221  
Date : Dec 13, 1977  
Weather : Clear  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 45 ft (13.7 m)  
Base Diameter : 10 in (25 cm)  
Weight : 415 lb (188 kg)

BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Union Metal, Model #2852  
Modifications : None

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 30.7 ft/sec (9.4 m/s)  
Exit Speed : 20.7 ft/sec (6.3 m/s)  
Momentum Change  
  Film : 711 lb-sec (3163 Ns)  
  Accelerometer : 639 lb-sec (2842 Ns)  
Peak Deceleration : 8.3 g's

COMMENTS:

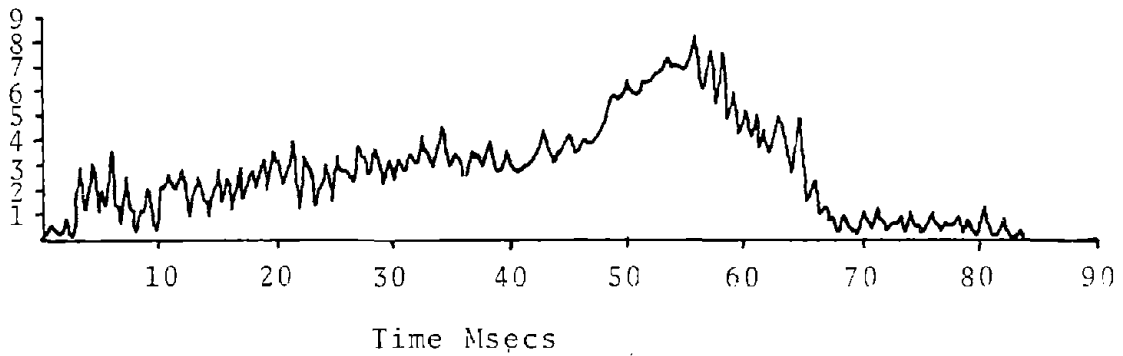
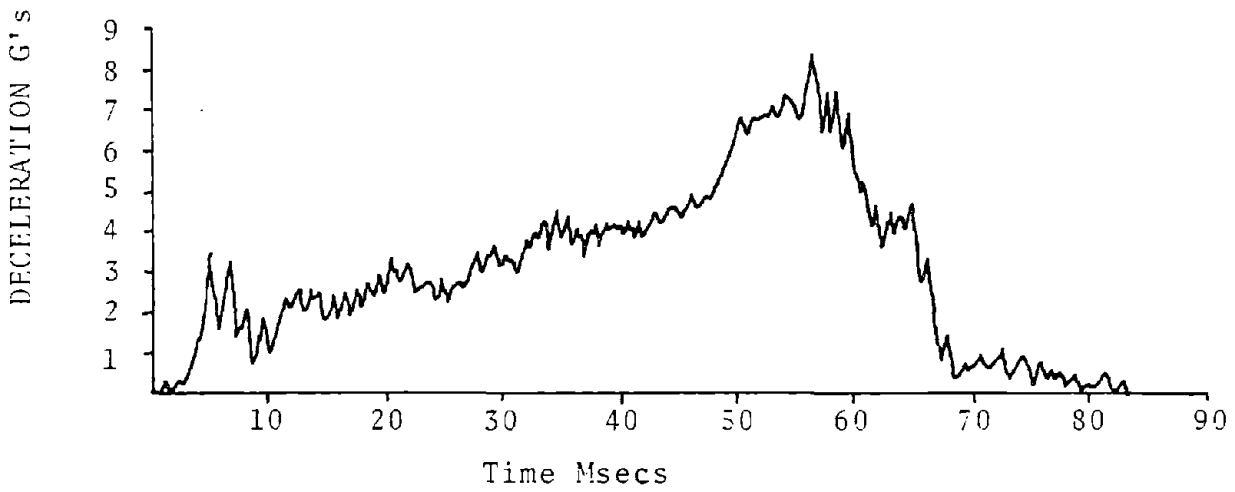
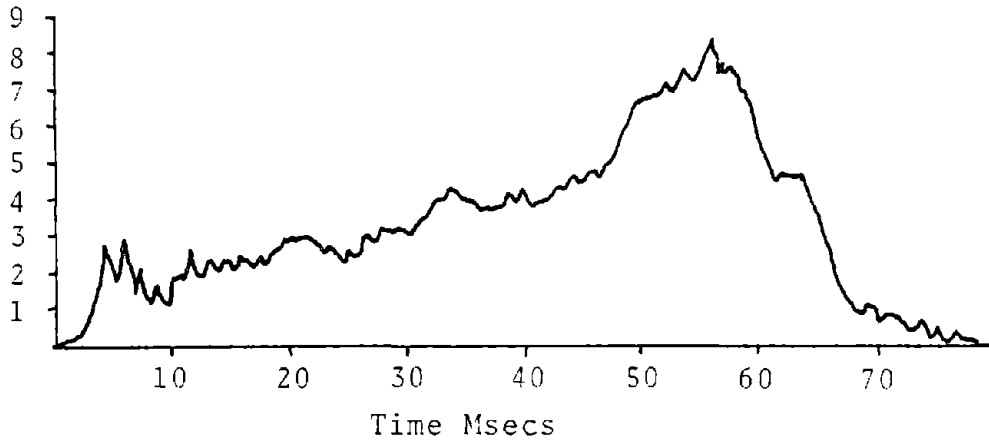


Fig. 70  
 Longitudinal Accelerometer Traces for Test 1147-221

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-222  
Date : Dec 12, 1977  
Weather : Clear, mild  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 45 ft (13.7 m)  
Base Diameter : 10 in (25 cm)  
Weight : 415 lb (188 kg)

### BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Union Metal, Model #2851  
Modifications : None

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 30.2 ft/sec (9.2 m/s)  
Exit Speed : 13.2 ft/sec (4 m/s)  
Momentum Change  
  Film : 1210 lb-sec (5382 Ns)  
  Accelerometer : 1196 lb-sec (5320 Ns)  
Peak Deceleration : 10.3 g's

### COMMENTS:

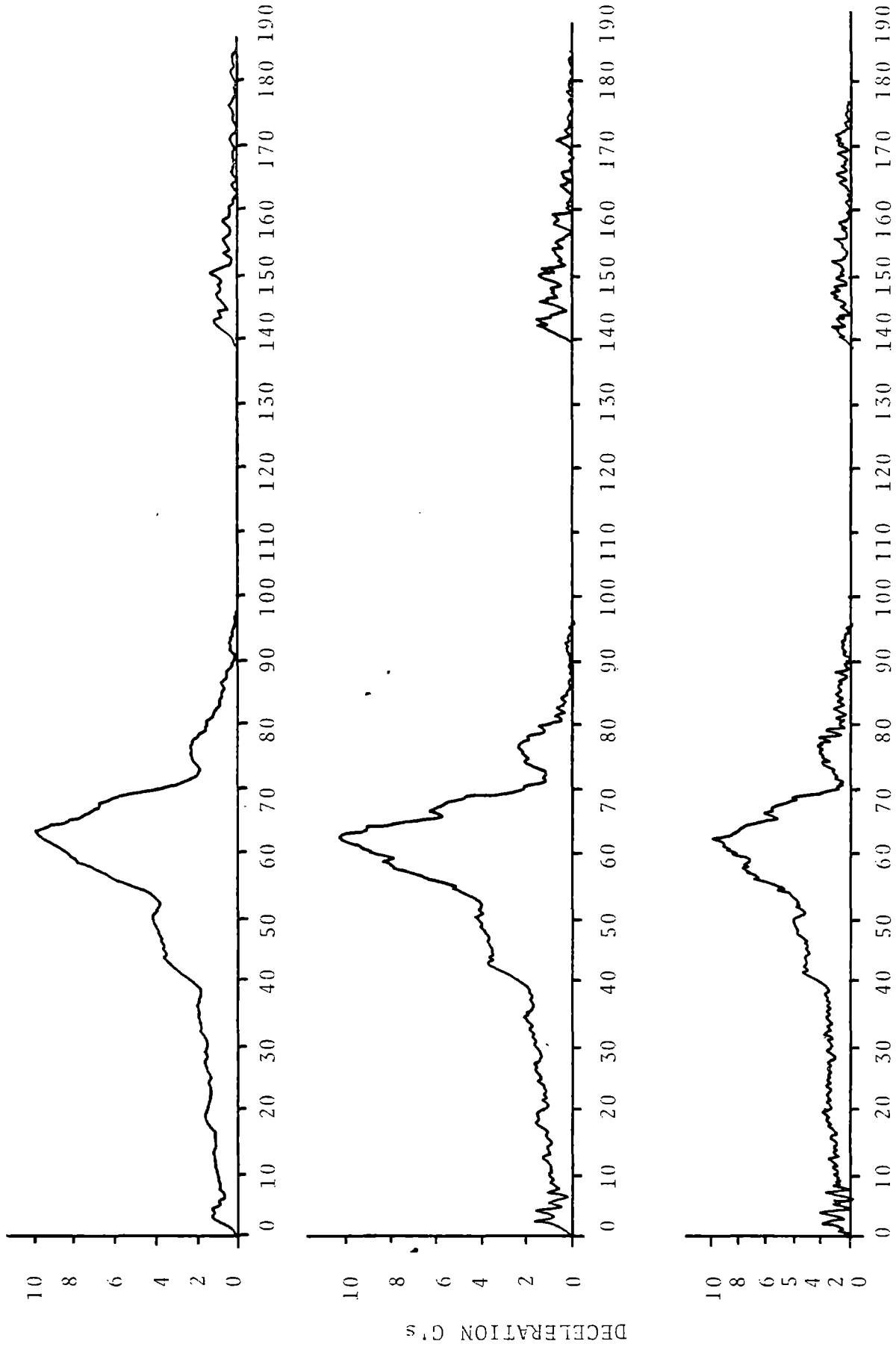


Fig. 71  
Longitudinal Accelerometer Traces for Test 1147-222

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-223  
Date : Dec 15, 1977  
Weather : Sunny, mild  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 45 ft (13.7 m)  
Base Diameter : 10 in (25 cm)  
Weight : 415 lb (188 kg)

### BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Union Metal, Model # 2851  
Modifications : Yes/1C1

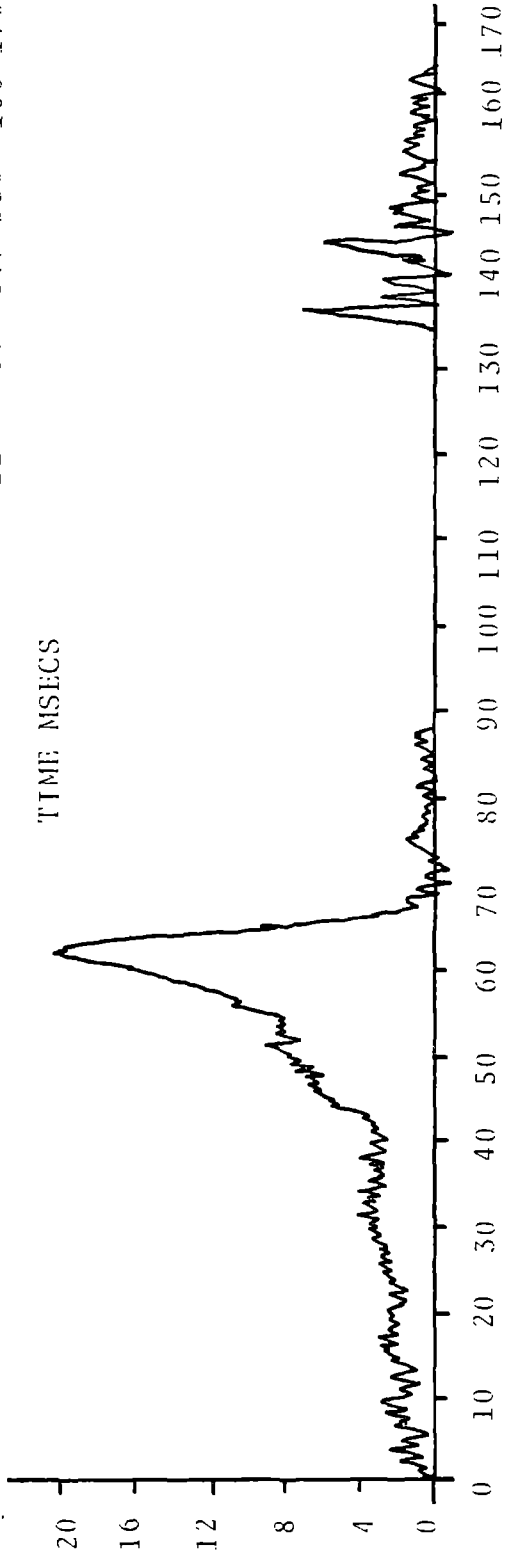
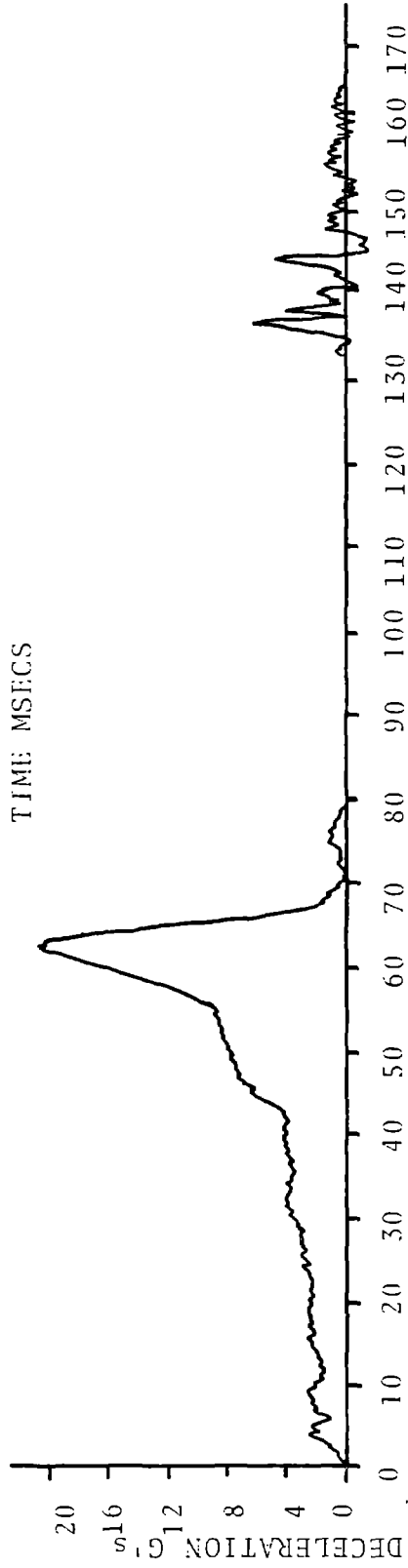
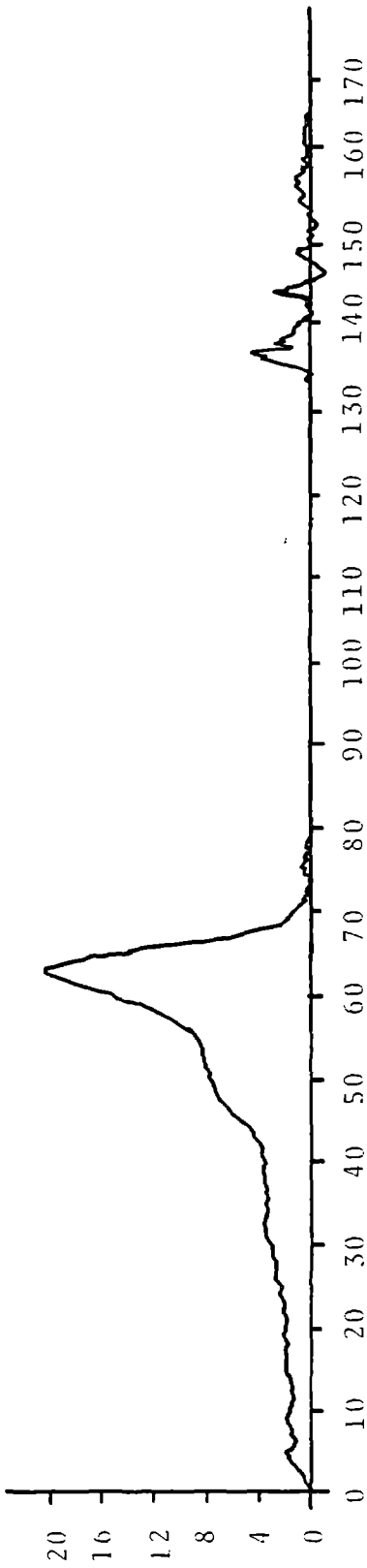
### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 30.0 ft/sec (9.2 m/s)  
Exit Speed : 15.9 ft/sec (4.8 m/s)  
Momentum Change  
  Film : 1000 lb-sec (4448 Ns)  
  Accelerometer : 911 lb-sec (4052 Ns)  
Peak Deceleration : 20.5 g's

### COMMENTS:



TIME MSECS

Fig. 72

Longitudinal Accelerometer Traces for Test 1147-223



TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-224  
Date : Dec 15, 1977  
Weather : Clear, Mild  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 45 ft (13.7 m)  
Base Diameter : 10 in ( 25 cm)  
Weight : 415 lb (188 kg)

BASE:

Type : Transformer/Tapered skirt, small  
Manufacturer : Union Metal, Model #2851  
Modifications : Yes/1C1

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 29.1 ft/sec (8.9 m/s)  
Exit Speed : 15.5 ft/sec (4.7 m/s)  
Momentum Change  
    Film : 964 lb-sec (4288 Ns)  
    Accelerometer : 946 lb-sec (4208 Ns)  
Peak Deceleration : 20.5 g's

COMMENTS:

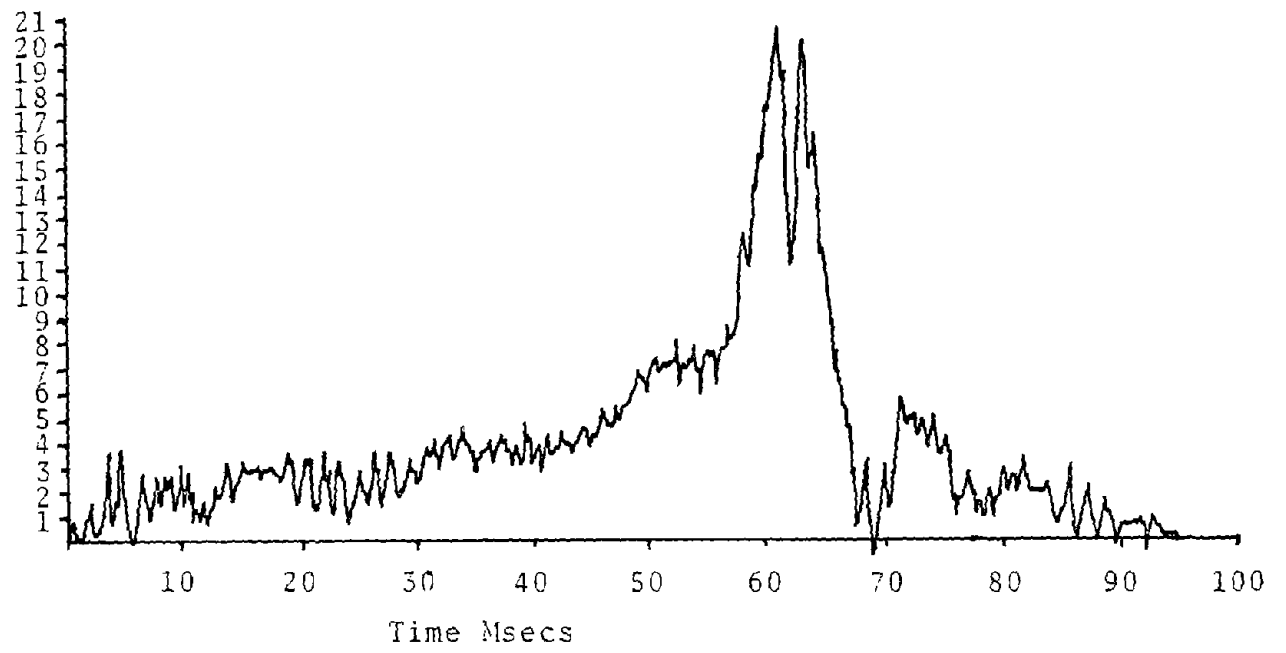
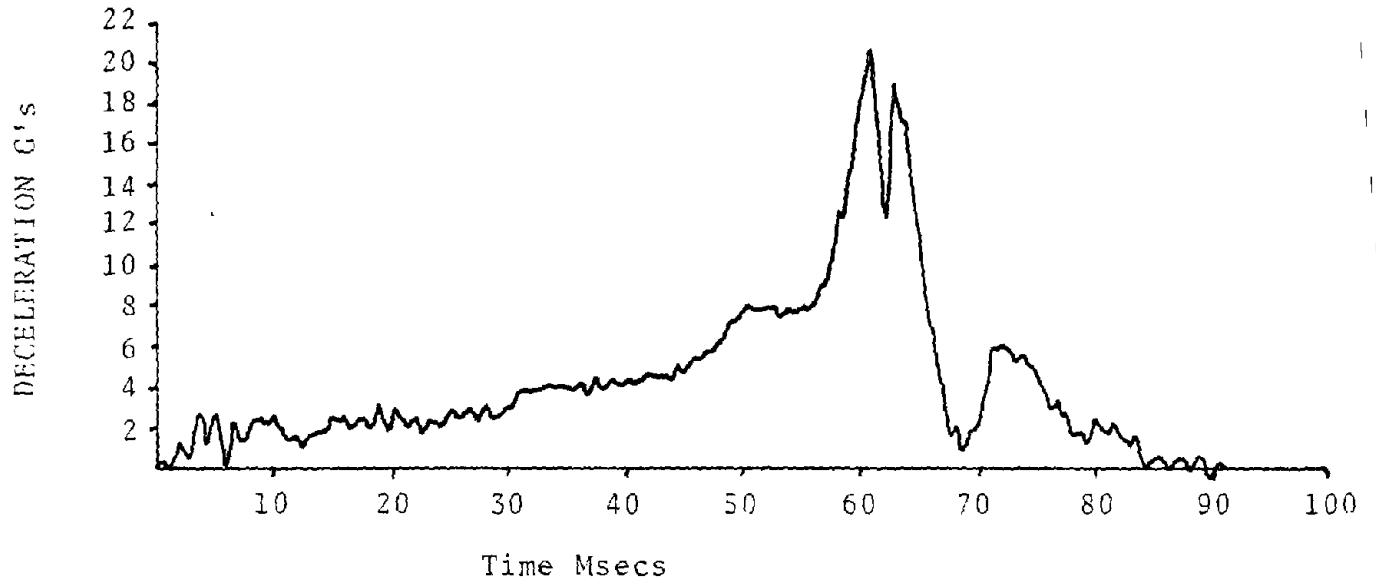
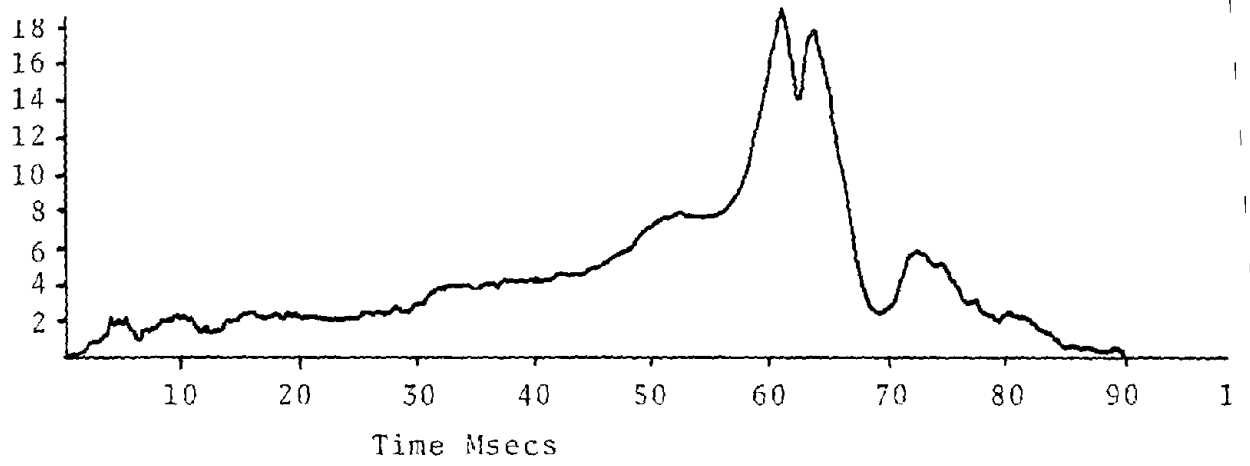


Fig. 73  
 Longitudinal Accelerometer Traces for Test 1147-224

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-225  
Date : Dec 15, 1977  
Weather : Sunny, mild  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 45 ft (13.7 m)  
Base Diameter : 10 in (25 cm)  
Weight : 415 lb (188 kg)

BASE:

Type : Transformer/Tapered Skirt, small  
Manufacturer : Union Metal, Model #2852  
Modifications : None

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 30.7 ft/sec (9.4 m/s)  
Exit Speed : 19.5 ft/sec (5.9 m/s)  
Momentum Change  
  Film : 798 lb-sec (3550 Ns)  
  Accelerometer : 672 lb-sec (2989 Ns)  
Peak Deceleration : 10.4 g's

COMMENTS:

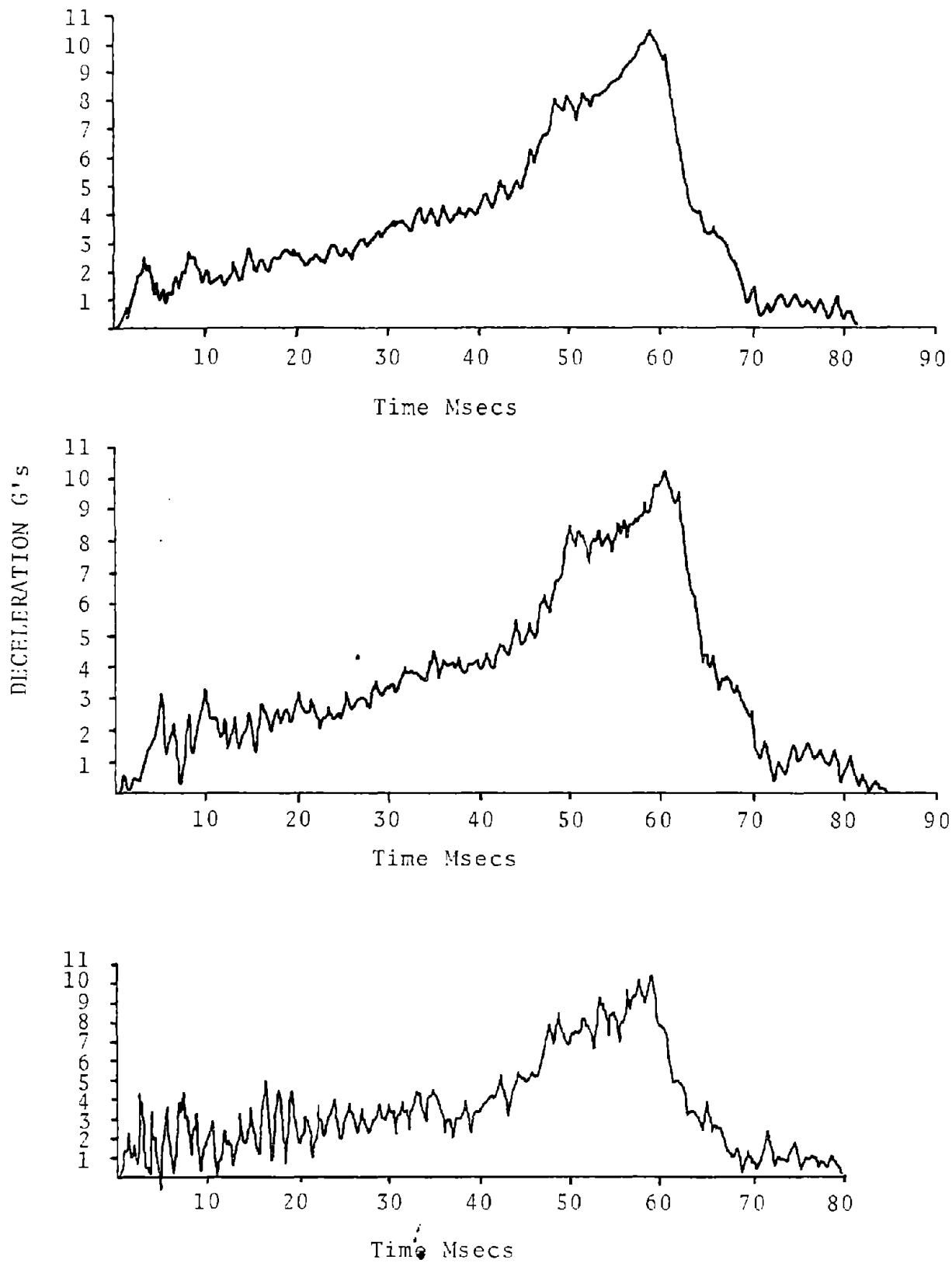


Fig. 74  
 Longitudinal Accelerometer Traces for Test 1147-225

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-226  
Date : Dec 22, 1977  
Weather : Cold, clear  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pfaff & Kendall  
Height : 36 Ft (11.0 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 186 lb (84 kg)

### BASE:

Type : Transformer/Tapered Skirt  
with Beltline weld, small  
Manufacturer : Pfaff & Kendall, Model #TB2A  
Modifications : Yes/lB1

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 30.8 ft/sec (9.4 m/s)  
Exit Speed : 18.3 ft/sec (5.6 m/s)  
Momentum Change  
Film : 887 lb-sec (3945 Ns)  
Accelerometer : 808 lb-sec (3594 Ns)  
Peak Deceleration : 12 g's

### COMMENTS:

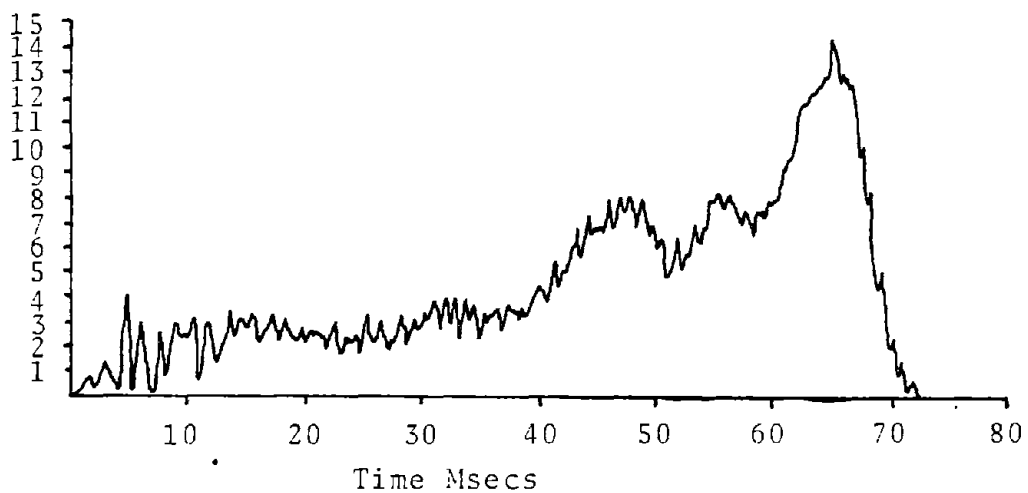
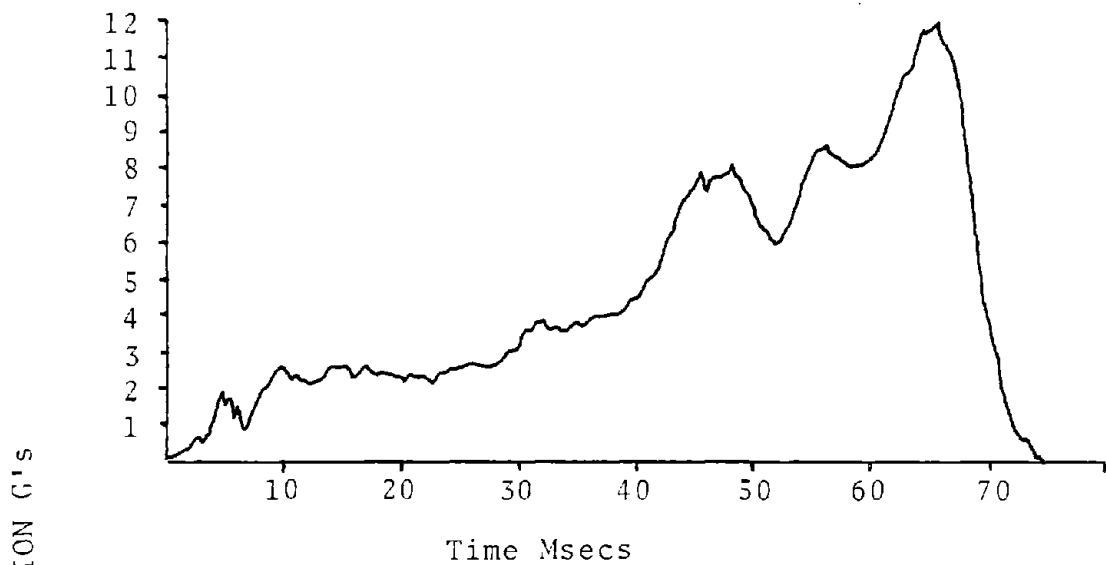


Fig. 75

Longitudinal Accelerometer Traces for Test 1147-226

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-227  
Date : Dec 28, 1977  
Weather : Cold, partly cloudy  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 42 ft-6 in (13.0 m)  
Base Diameter : 8 in (20 cm)  
Weight : 285 lb (129 kg)

### BASE:

Type : Transformer/Tapered Skirt, small  
Manufacturer : Hapco, model #45964  
Modifications : Yes/1A4

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.3 ft/sec (8.6 m/s)  
Exit Speed : 18.6 ft/sec (5.7 m/s)  
Momentum Change  
  Film : 689 lb-sec (3065 Ns)  
  Accelerometer : 714 lb-sec (3176 Ns)  
Peak Deceleration : 9.5 g's

### COMMENTS:

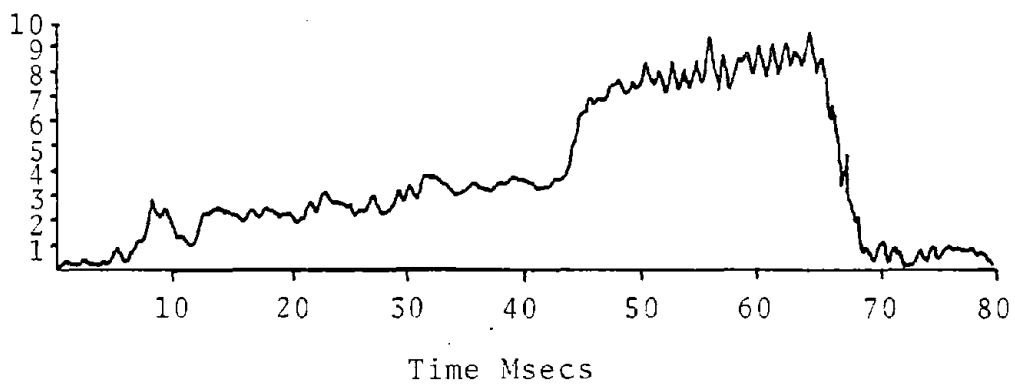
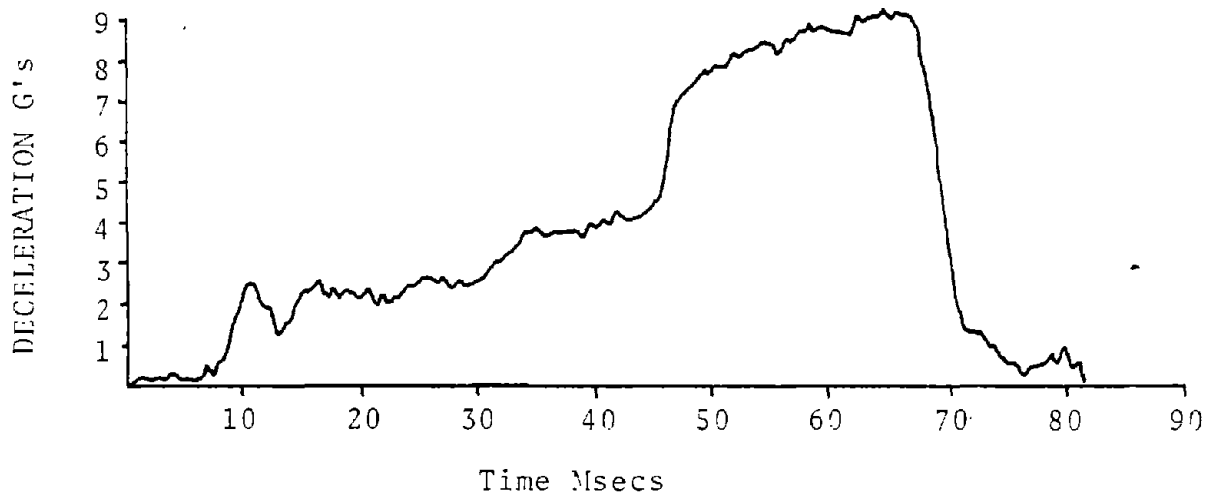
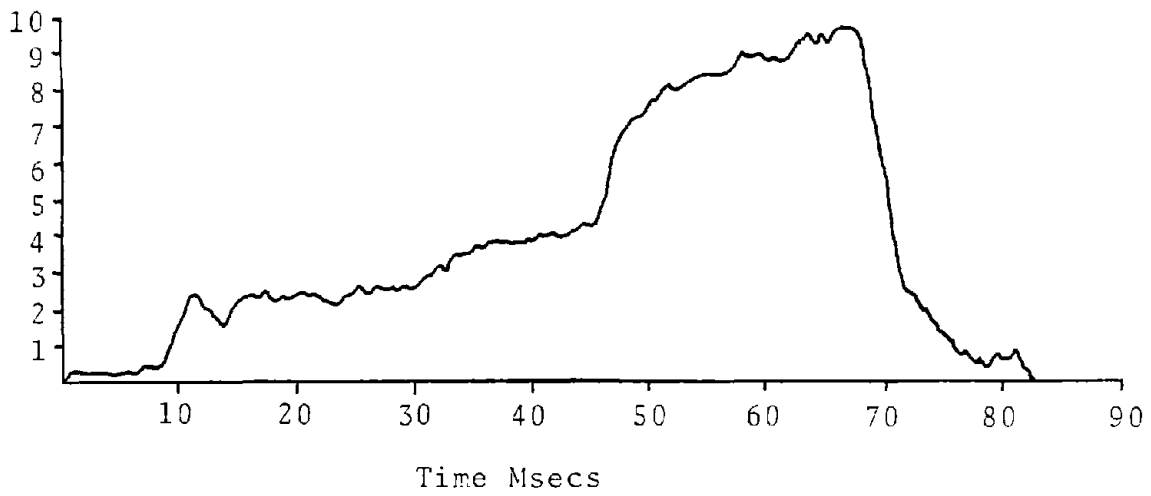


Fig. 76  
 Longitudinal Accelerometer Traces for Test 1147-227



## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-228  
Date : Dec 29, 1977  
Weather : Overcast, very cold  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 45 ft (13.7 m)  
Base Diameter : 10 in (25 cm)  
Weight : 415 lb (188 kg)

### BASE:

Type : Transformer/Tapered skirt, small  
Manufacturer : Union Metal, Model #2851  
Modifications : Yes/lc2

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 29.8 ft/sec (9.1 m/s)  
Exit Speed : 17.8 ft/sec (5.4 m/s)  
Momentum Change  
  Film : 854 lb-sec (3799 Ns)  
  Accelerometer : 855 lb-sec (3803 Ns)  
Peak Deceleration : 10.2 g's

### COMMENTS:

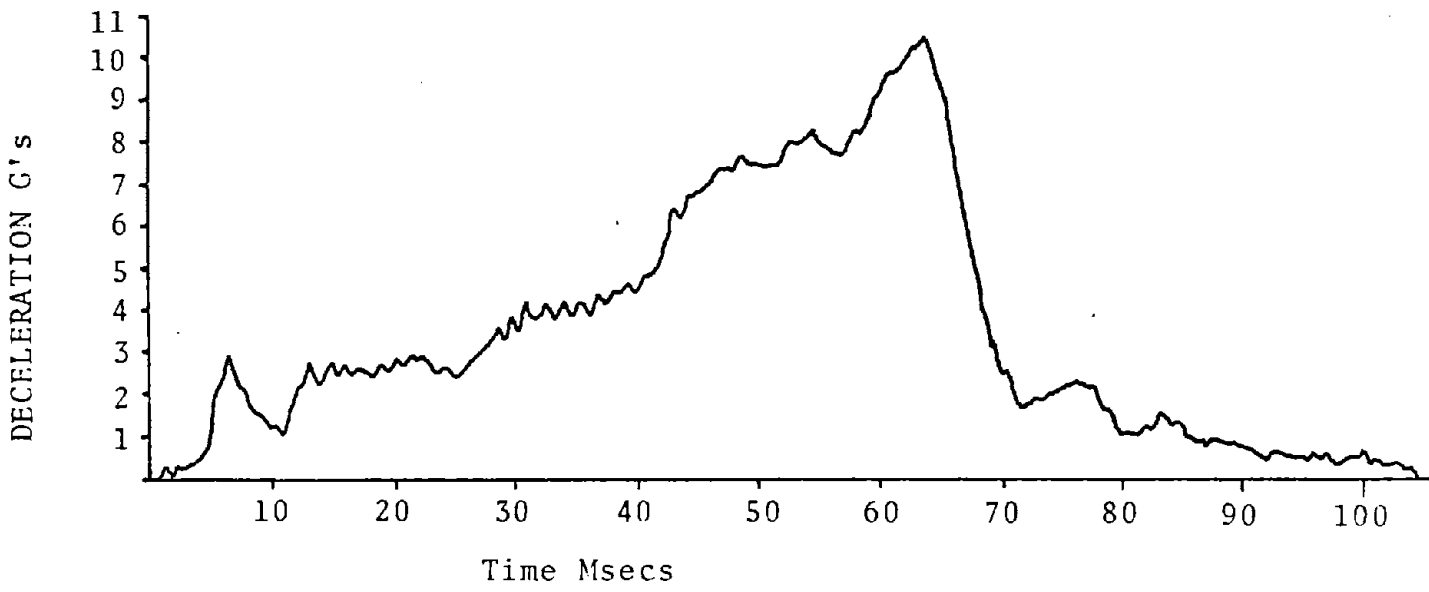
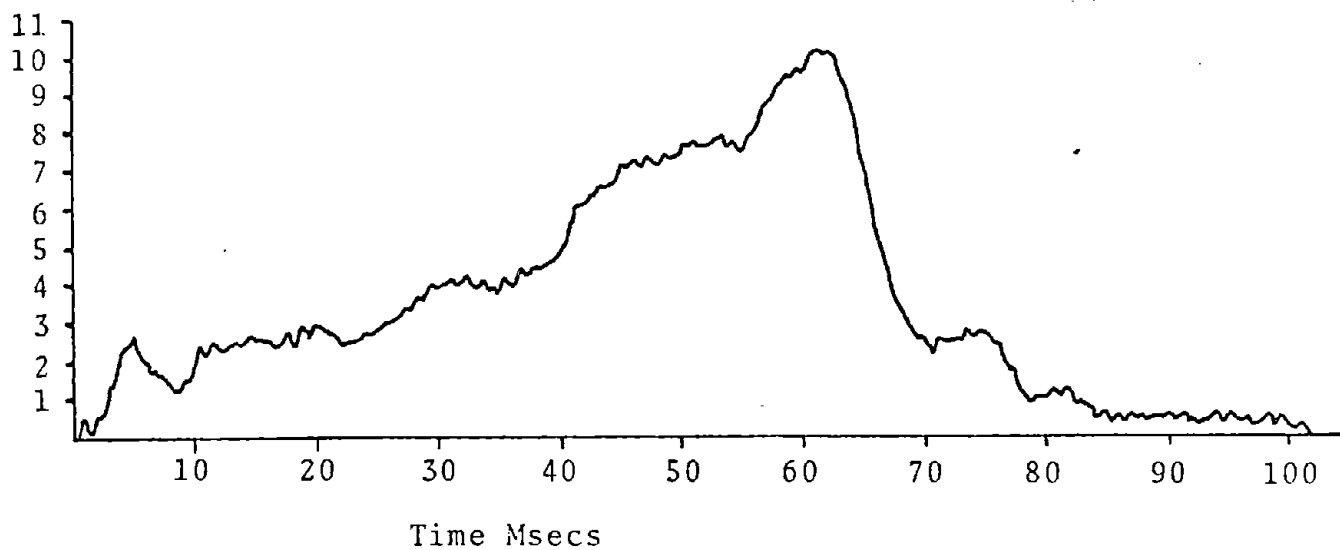


Fig. 77 .  
 Longitudinal Accelerometer Traces for Test 1147-228

# TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

## GENERAL:

Test Number : 1147-229  
Date : Feb 1, 1978  
Weather : Clear, Cold  
Pendulum Mass : 2290 lb (1040 kg)

## SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 45 ft (13.7 m)  
Base Diameter : 10 in (25 cm)  
Weight : 415 lb (188 kg)

## BASE:

Type : Transformer/Tapered Skirt, small  
Manufacturer : Union Metal, Model #2851  
Modifications : Yes/1C3

## FASTENERS (Base):

Type : N/A  
Load : N/A

## TEST DATA:

Impact Speed : 28.0 ft/sec (8.5 m/s)  
Exit Speed : 18.6 ft/sec (5.7 m/s)  
Momentum Change  
    Film : 674 lb-sec (2998 Ns)  
    Accelerometer : 665 lb-sec (2958 Ns)  
Peak Deceleration : 8.5 g's

## COMMENTS:

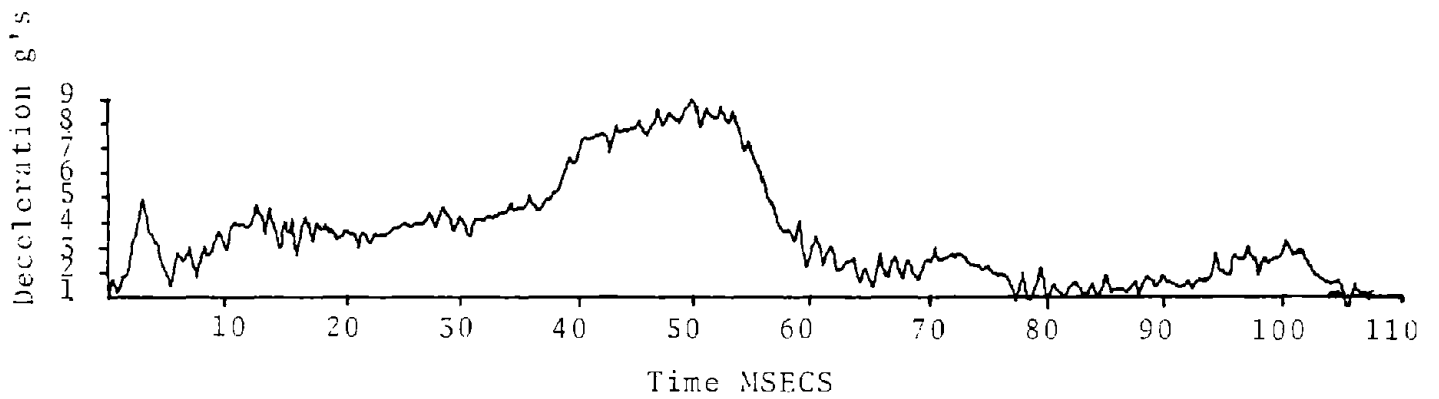
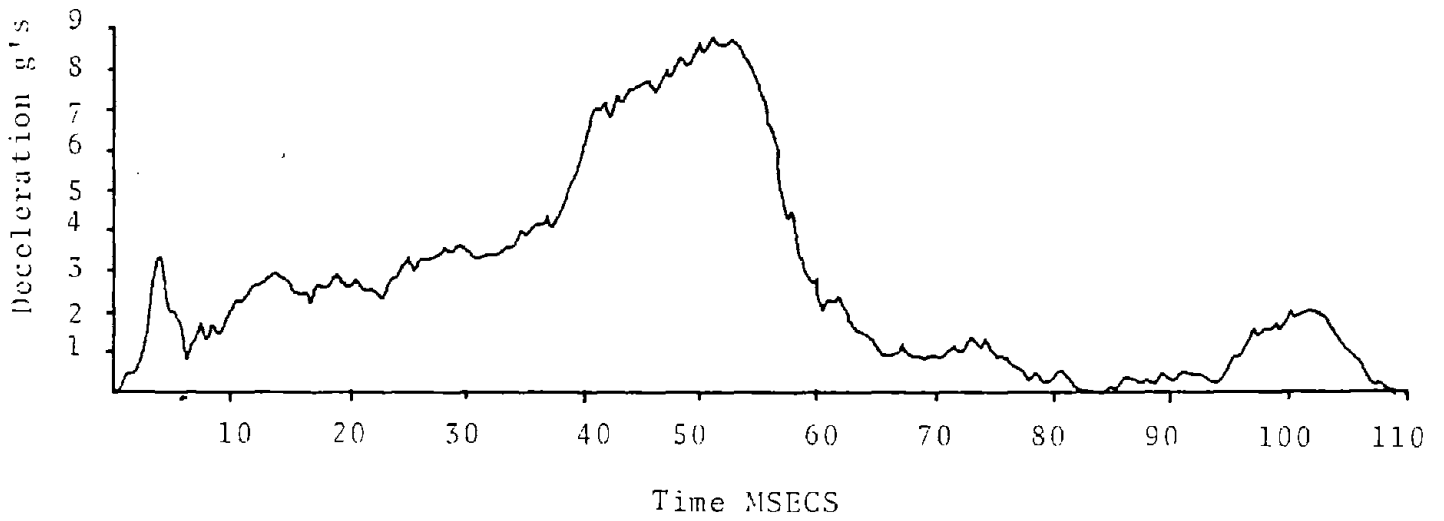
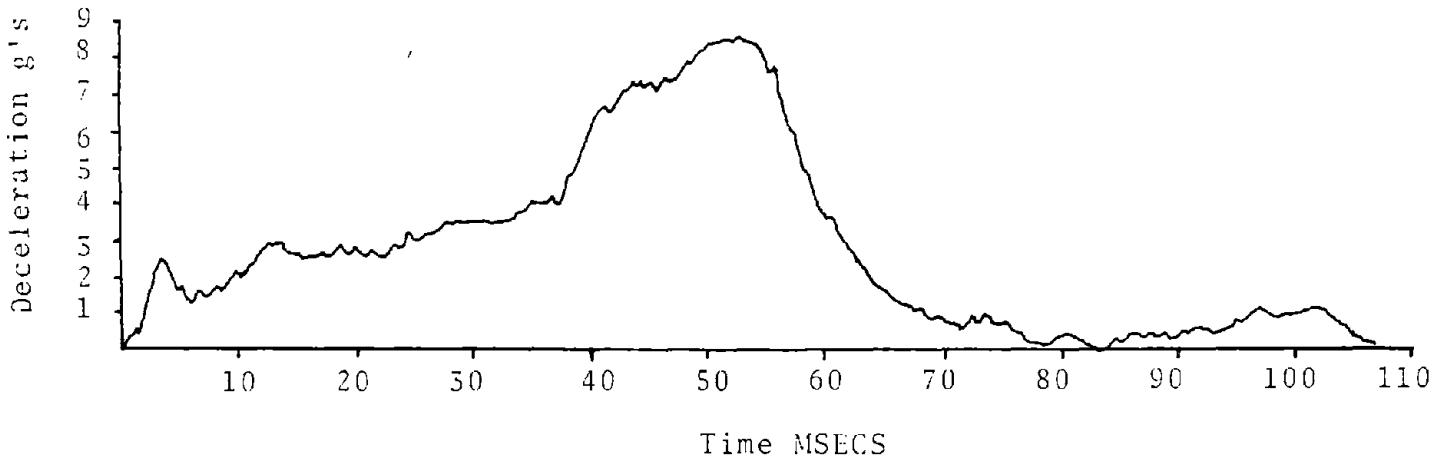


Fig. 78  
Longitudinal Accelerometer Traces for Test 1147-229

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-230  
Date : Feb 15, 1978  
Weather : Clear, cold  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 45 ft (13.7 m)  
Base Diameter : 10 in (25 cm)  
Weight : 415 lb (188 kg)

### BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Union Metal, Model #2851  
Modifications : Yes/lc4

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 29.3 ft.sec (8.9 m/s)  
Exit Speed : 0 ft/sec (0 m/s)  
Momentum Change  
    Film : 2084 lb-sec (9270 Ns)  
    Accelerometer : 1761 lb-sec (7833 Ns)  
Peak Deceleration : 25 g's

### COMMENTS:

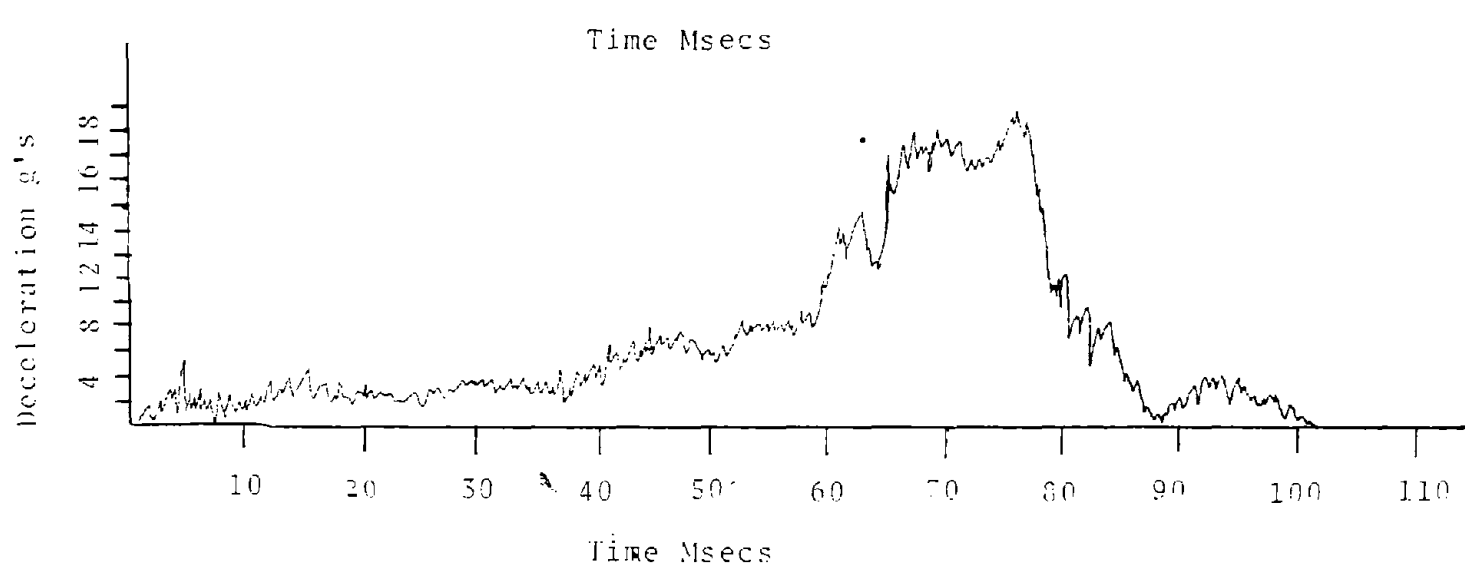
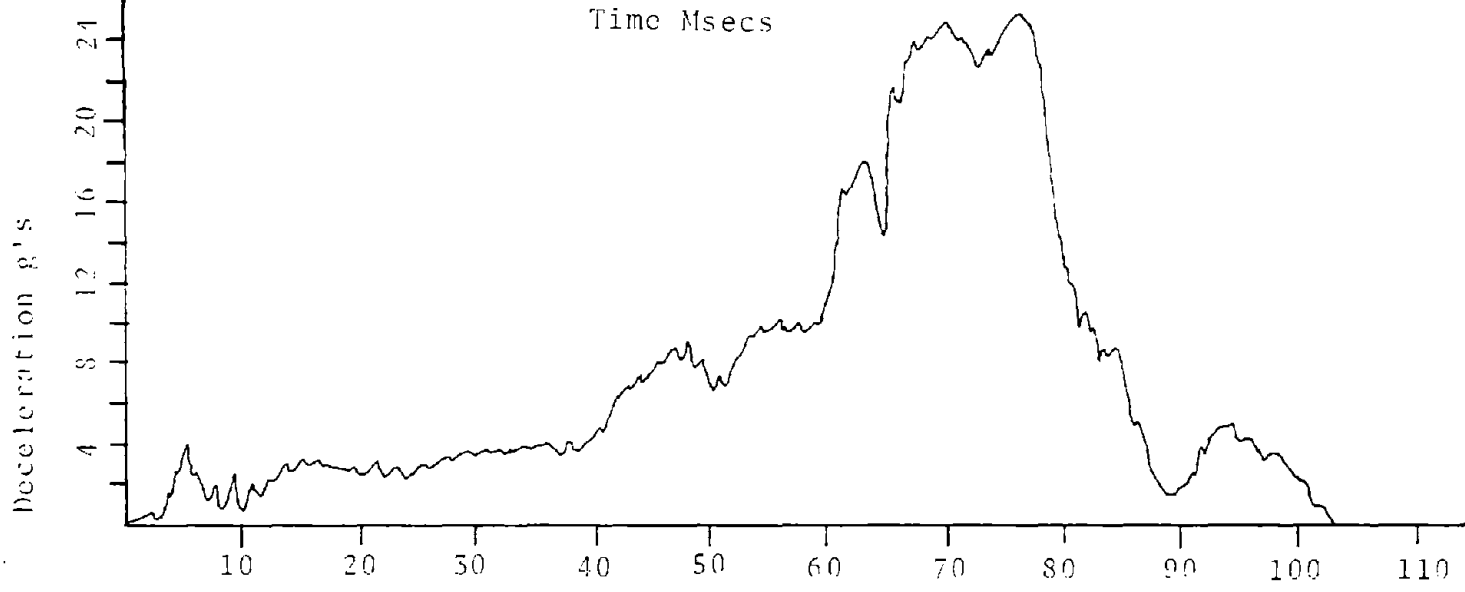
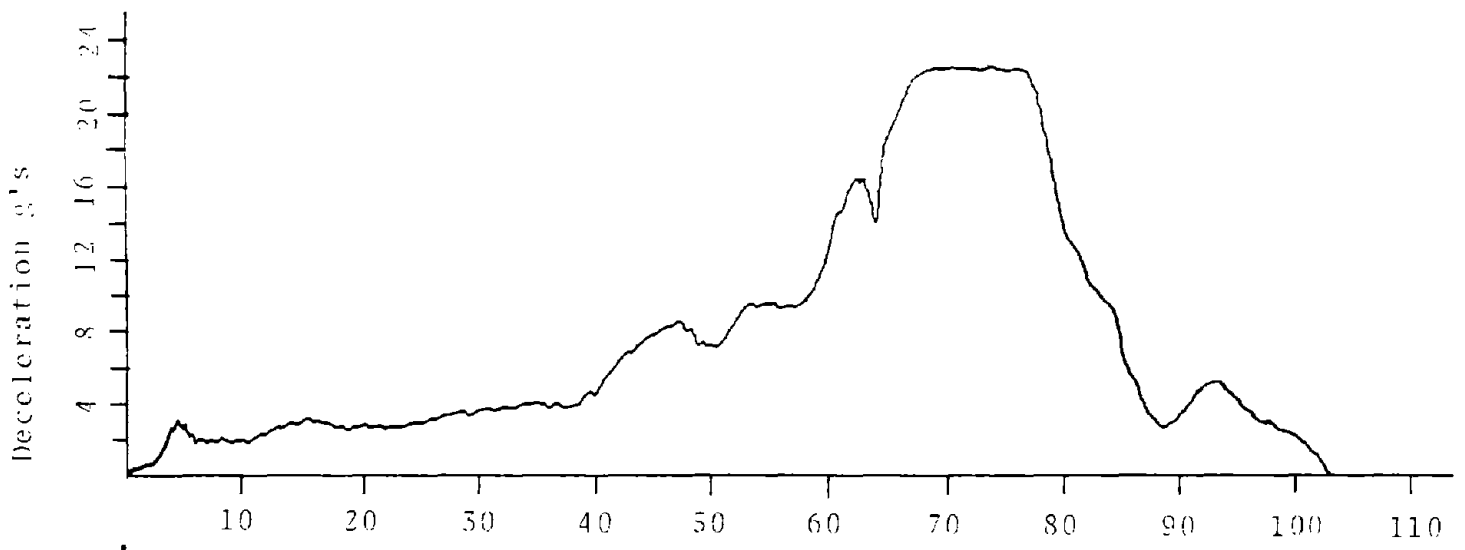


Fig. 79  
 Longitudinal Accelerometer Traces for Test 1147-250

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-231  
Date : Feb 15, 1978  
Weather : Clear, cold  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 45 ft (13.7 m)  
Base Diameter : 10 in (25 cm)  
Weight : 415 lb (188 kg)

BASE:

Type : Transformer/insert  
Manufacturer : Union Metal, Model #2850  
Modifications : None

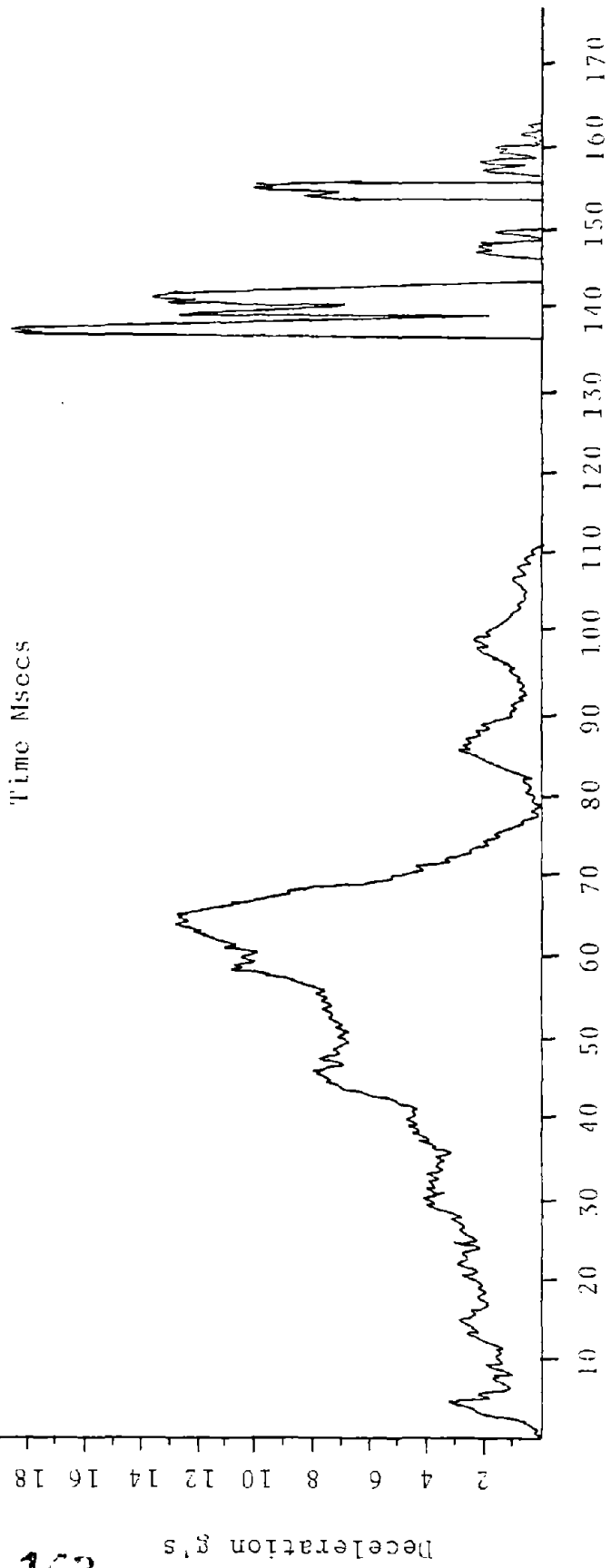
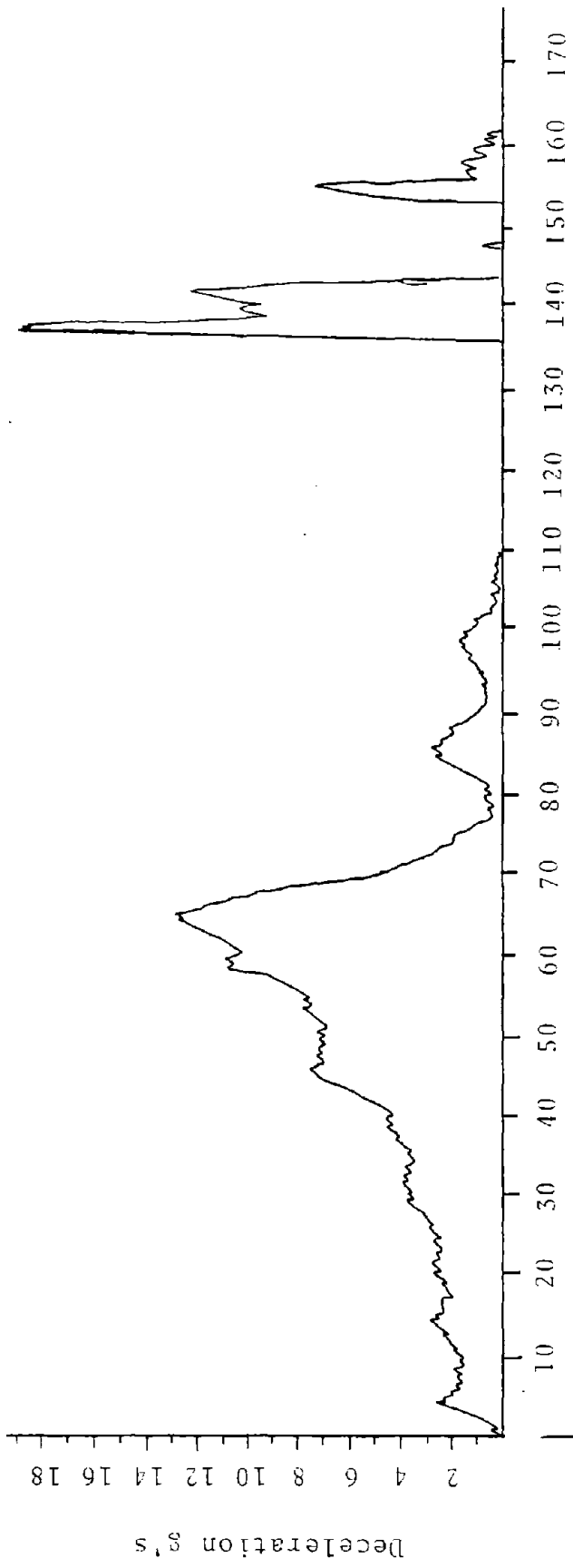
FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 28.4 ft/sec (8.7 m/s)  
Exit Speed : 13.1 ft/sec (4.0 m/s)  
Momentum Change  
    Film : 1084 lb-sec (4822 Ns)  
    Accelerometer : 1058 lb-sec (4706 Ns)  
Peak Deceleration : 12.7 g's

COMMENTS:



Time Msecs

Fig. 80  
Longitudinal Accelerometer Traces for Test 1147-231

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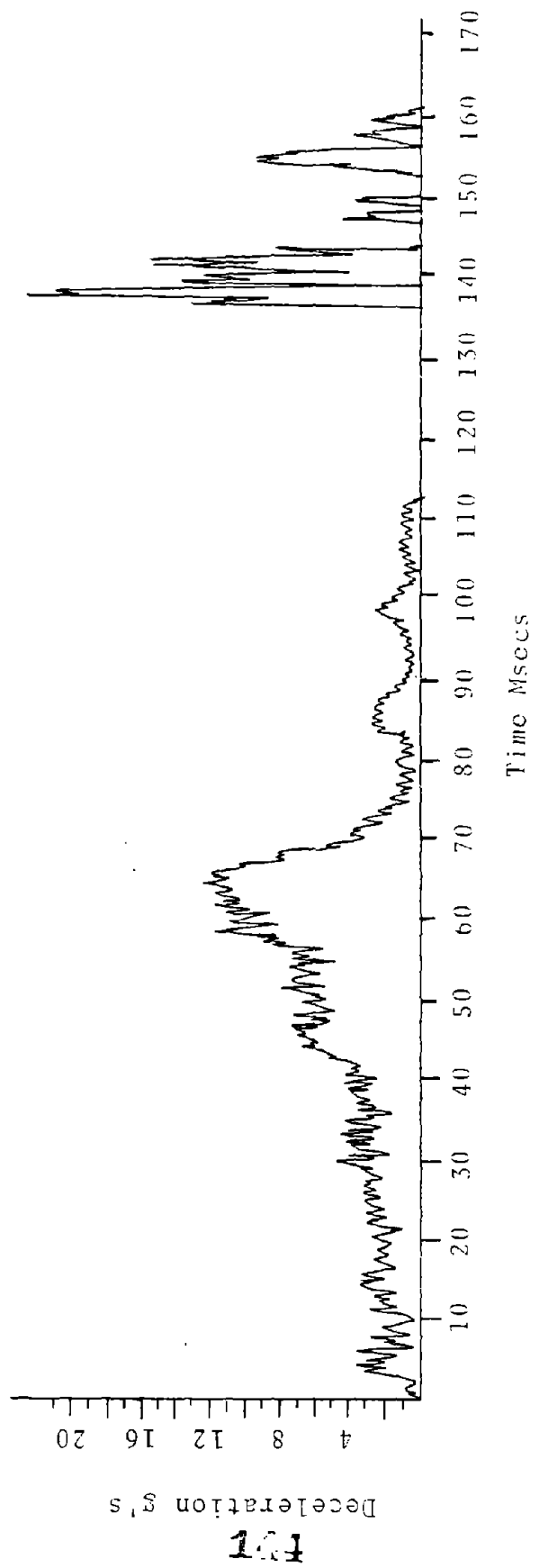


Fig. 80 (Cont'd)  
 Longitudinal Acceleration Traces for Test 1147-231

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-232  
Date : Feb 22, 1978  
Weather : Clear, cold  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pfaff & Kendall  
Height : 36 ft (11.0 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 186 lb (84 kg)

### BASE:

Type : Transformer/tapered skirt  
with beltline weld, small  
Manufacturer : Pfaff & Kendall, Model #TB2A  
Modifications : Yes/lB5

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.4 ft/sec (8.7 m/s)  
Exit Speed : 16.2 ft/sec (4.9 m/s)  
Momentum Change  
    Film : 863 lb-sec (3839 Ns)  
    Accelerometer : 877 lb-sec (3901 Ns)  
Peak Deceleration : 13.8 g's

### COMMENTS:

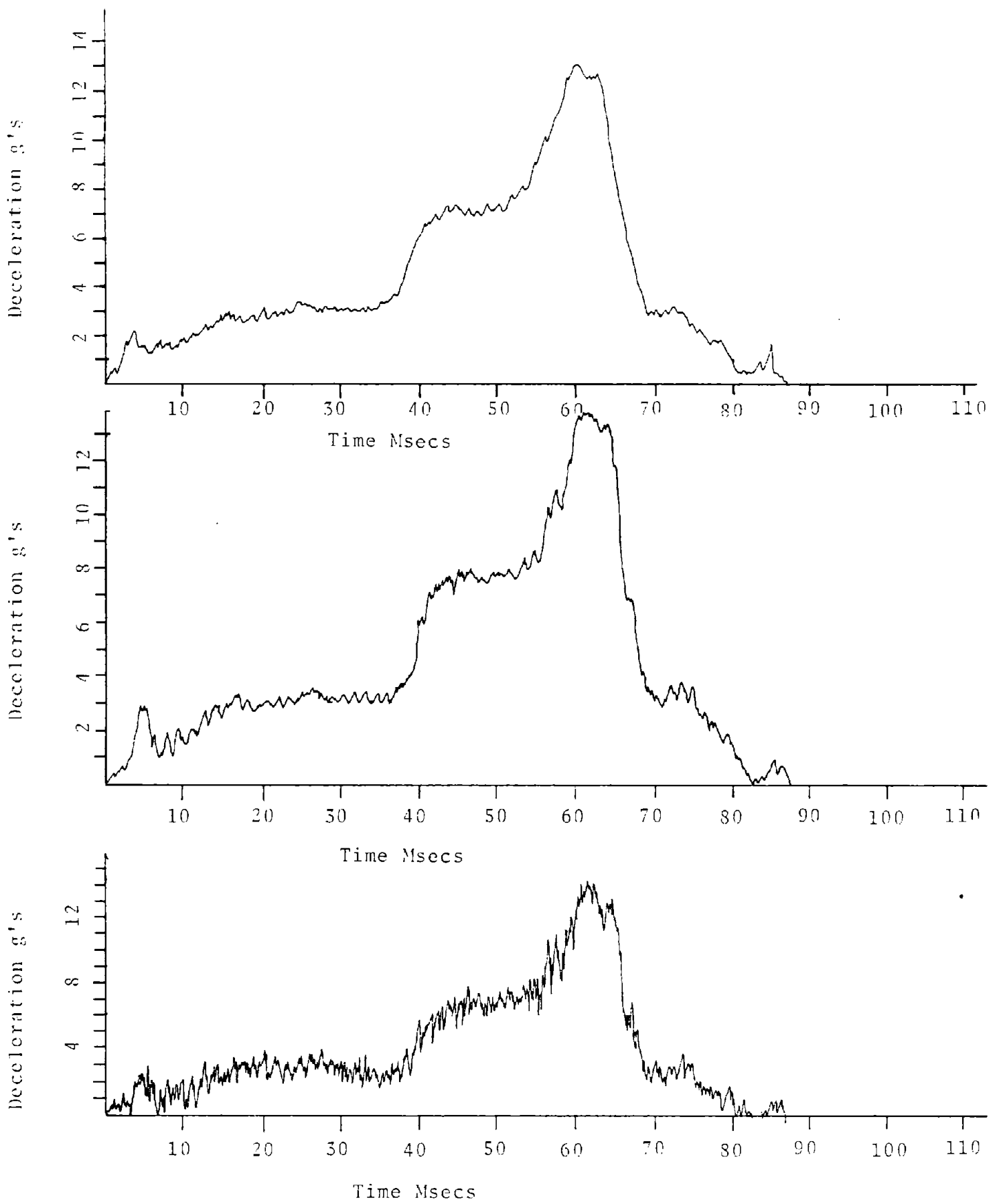


Fig. 81  
Longitudinal Accelerometer Traces for Test 1147-232

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-233  
Date : Feb 22, 1978  
Weather : Cold, clear  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pfaff & Kendall  
Height : 36 ft (11.0 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 186 lb (84 kg)

BASE:

Type : Transformer/tapered skirt  
with Beltline Weld, small  
Manufacturer : Pfaff & Kendall, Model #TB2A  
Modifications : Yes/lB5

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 29.3 ft/sec (8.9 m/s)  
Exit Speed : 11.3 ft/sec (3.5 m/s)  
Momentum Change  
Film : 1282 lb-sec (5702 Ns)  
Accelerometer : 1084 lb-sec (4822 Ns)  
Peak Deceleration : 20.1 g's

COMMENTS:

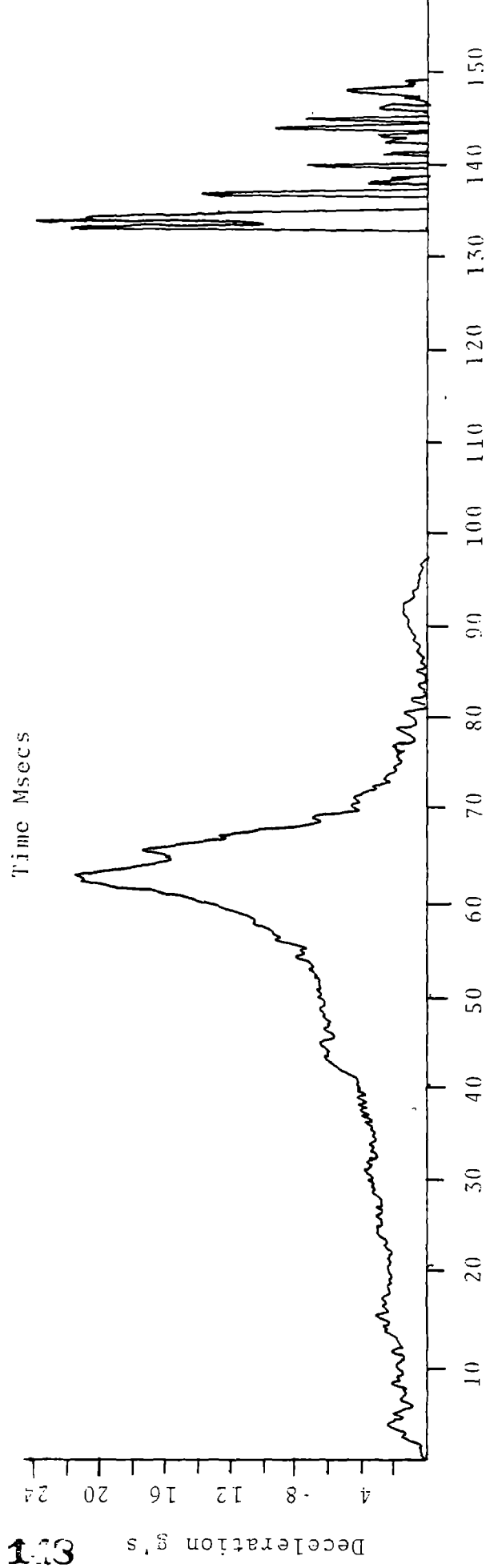
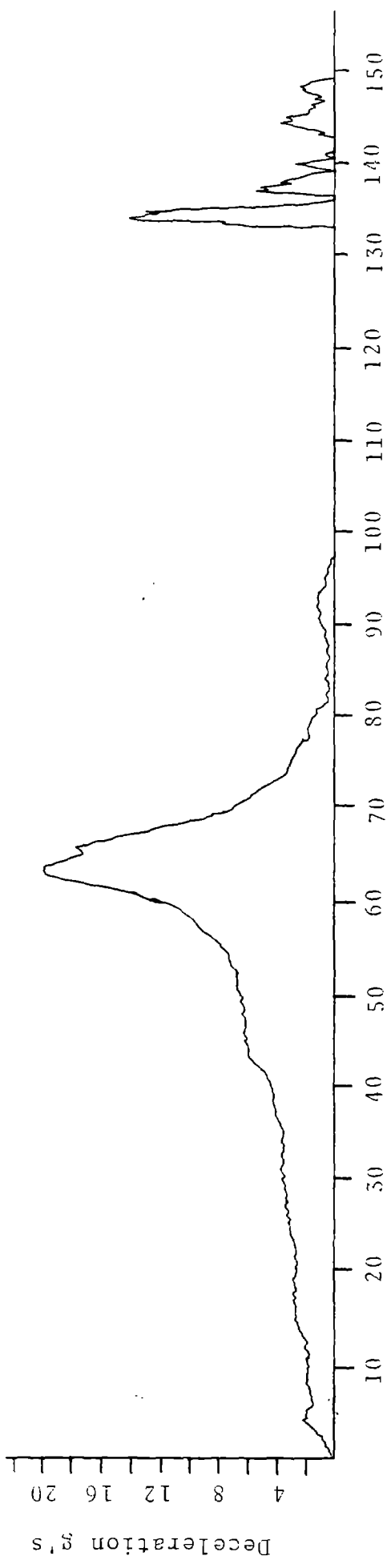


Fig. 82  
 Longitudinal Accelerometer Traces for Test 1147-233

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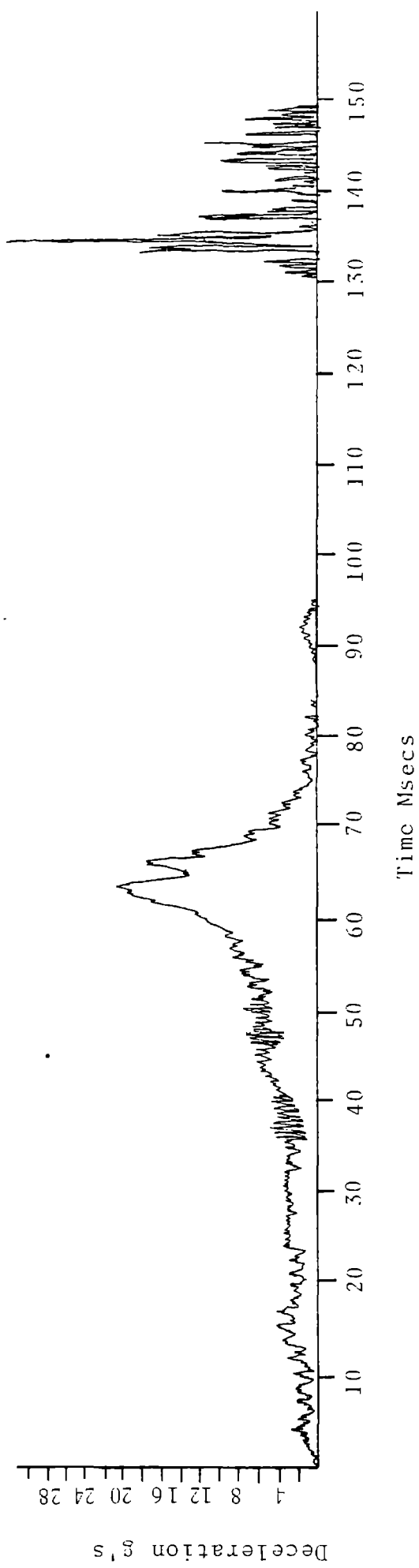


Fig. 82 (Cont'd)  
 Longitudinal Accelerometer Traces for Test 1147-233

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-234  
Date : Feb 27, 1978  
Weather : Cold, partly cloudy  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 45 ft (13.7 m)  
Base Diameter : 10 in (25 cm)  
Weight : 415 lb (188 kg)

### BASE:

Type : Transformer/Insert  
Manufacturer : Union Metal, Model #2850  
Modifications : Yes/3A1

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.4 ft/sec (8.7 m/s)  
Exit Speed : 12.6 ft/sec (3.8 m/s)  
Momentum Change  
  Film : 1120 lb (4982 Ns)  
  Accelerometer : 1059 lb-sec (4710 Ns)  
Peak Deceleration : 14.9 g's

### COMMENTS:

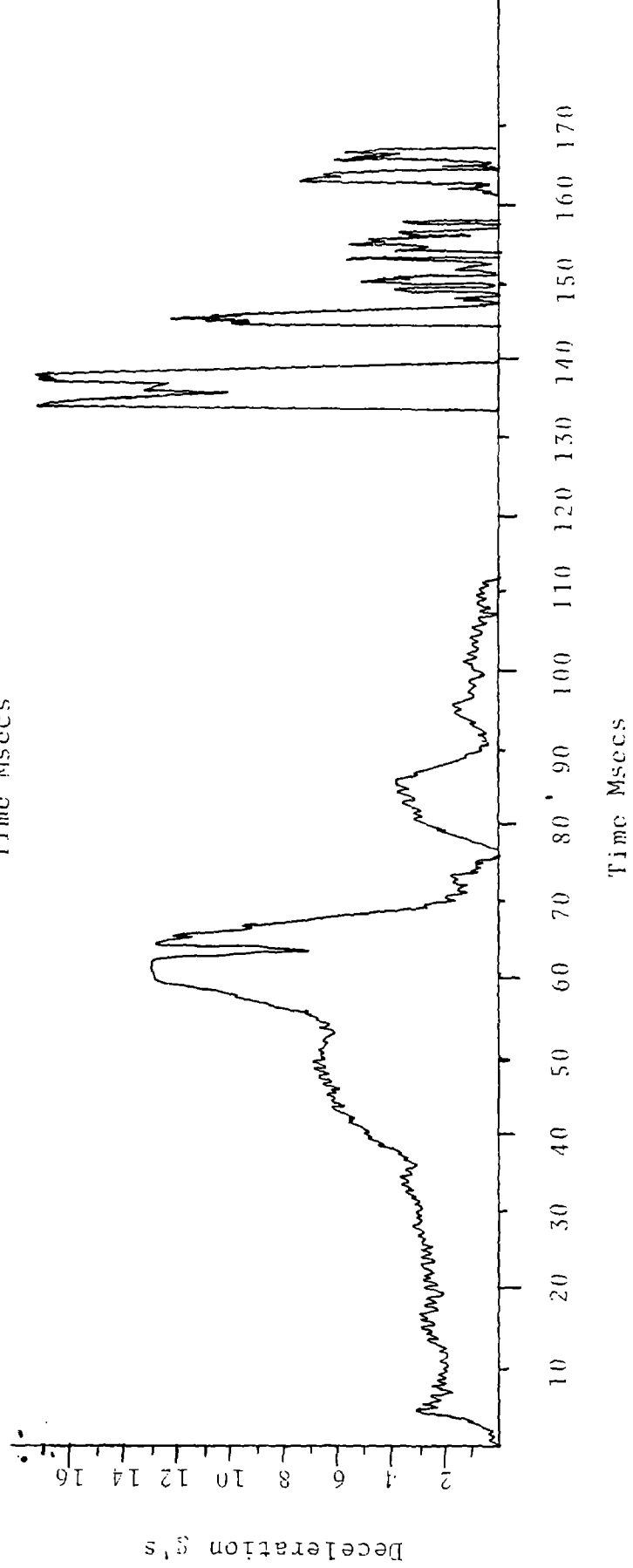
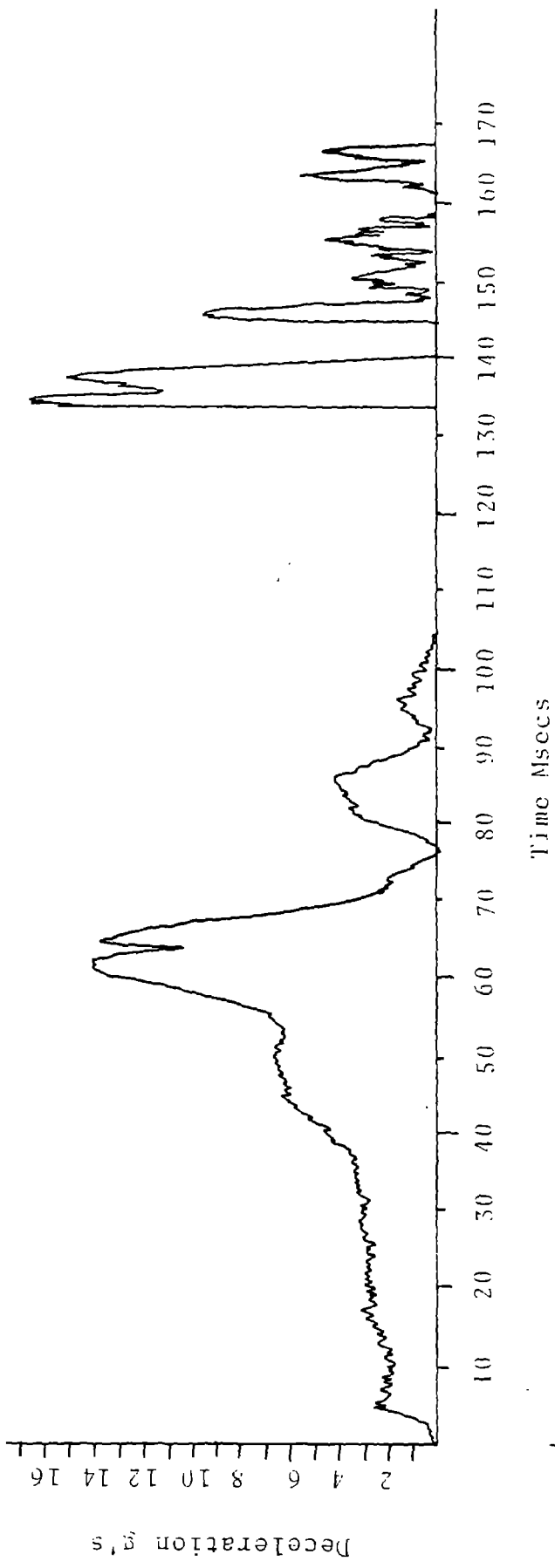


Fig. 85  
Longitudinal Accelerometer Traces for Test 1147-234



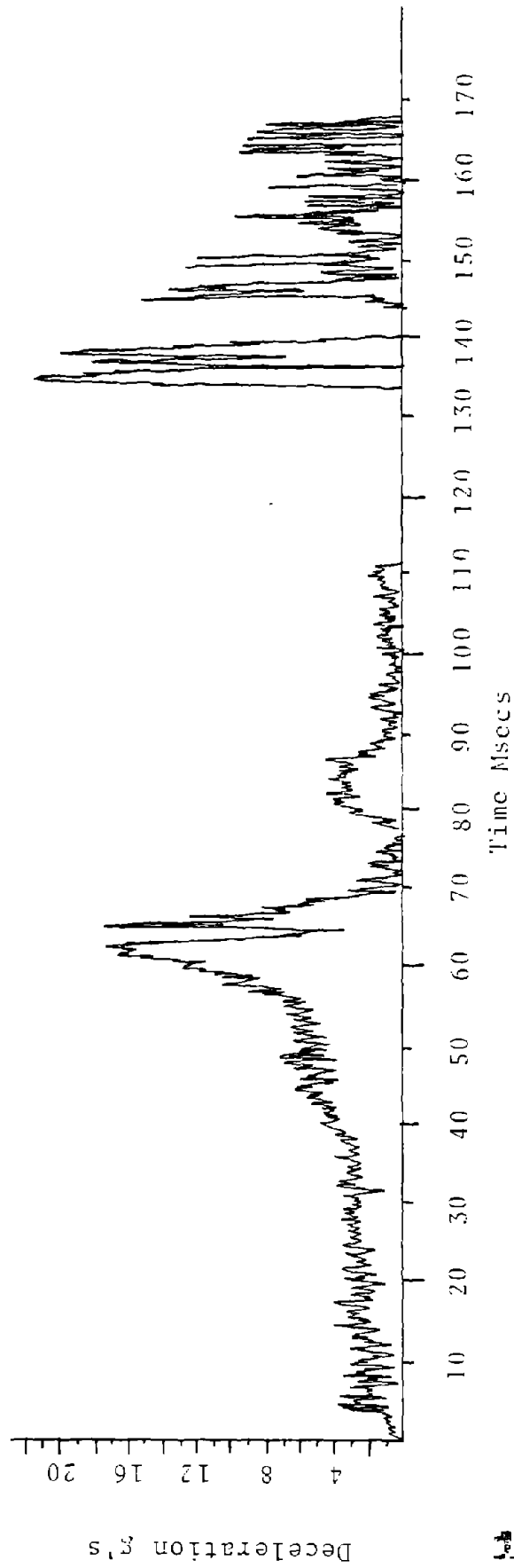


Fig. 83 (Cont'd)  
Longitudinal Accelerometer Traces for Test 1147-234

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-235  
Date : Feb 27, 1978  
Weather : Clear, cold  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 45 ft (13.7 m)  
Base Diameter : 10 in (25 cm)  
Weight : 415 lb (188 kg)

### BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Union Metal, Model #2851  
Modifications : Yes/lc3

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 30.5 ft/sec (9.3 m/s)  
Exit Speed : 17.5 ft/sec (5.3 m/s)  
Momentum Change  
  Film : 923 lb-sec (4106 Ns)  
  Accelerometer : 724 lb-sec (3220 Ns)  
Peak Deceleration : 10.6 g's

### COMMENTS:

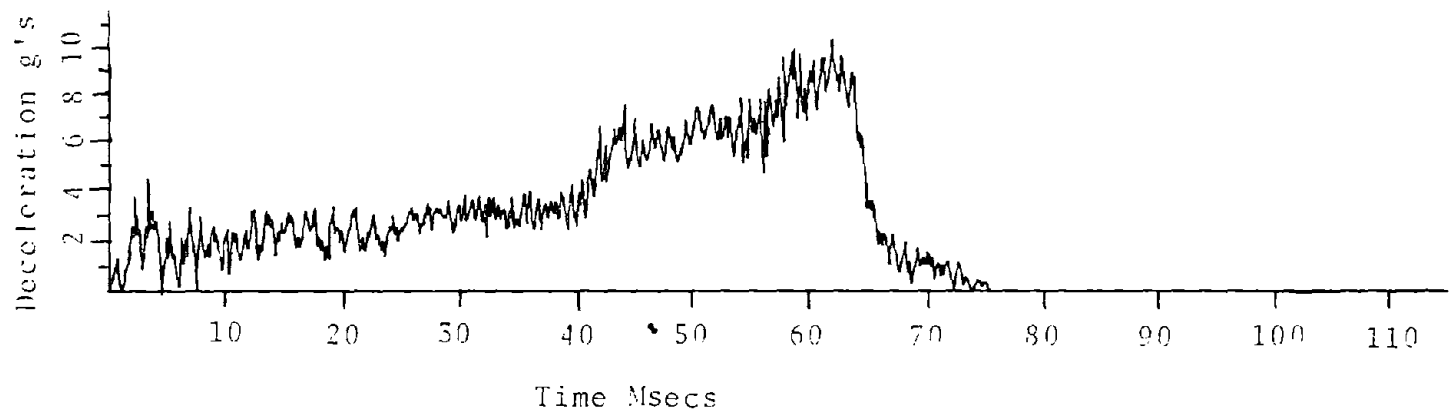
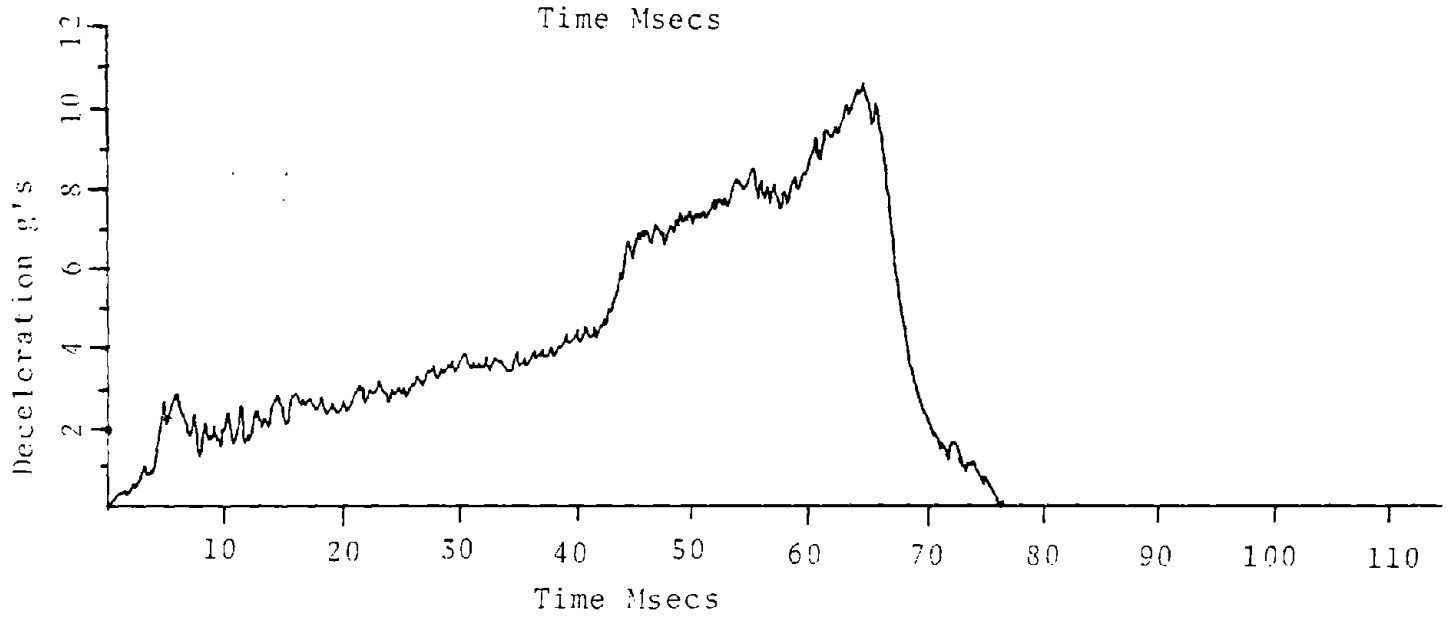
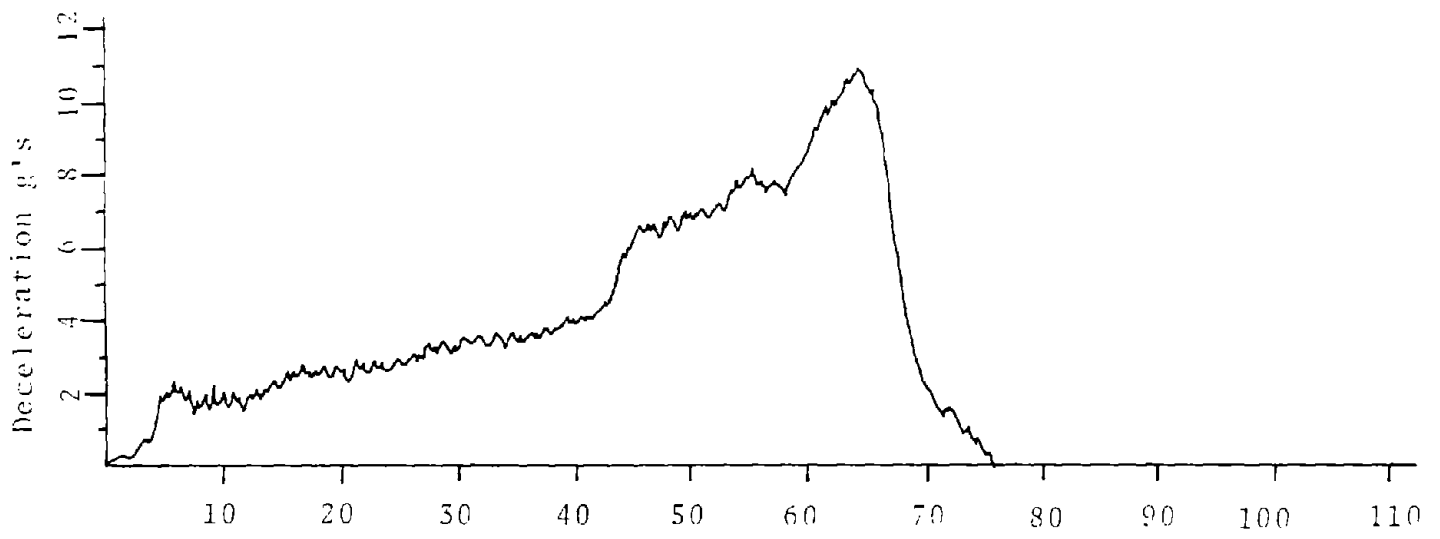


Fig. 84  
 Longitudinal Accelerometer Traces for Test 1147-235

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-236  
Date : Mar 6, 1978  
Weather : Cold, overcast  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pole Lite  
Height : 33 ft-4 in (10.2 m)  
Base Diameter : 8 in (20 cm)  
Weight : 190 lb (86 kg)

BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : pole lite, Model #TB-20-8  
Modifications : None

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 28.4 ft/sec (9.7 m/s)  
Exit Speed : 14.0 ft/sec (4.3 m/s)  
Momentum Change  
Film : 1022 lb-sec (4546 Ns)  
Accelerometer : -- \*  
Peak Deceleration : -- \*

COMMENTS:

\*Accelerometer data system not functioning.

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-237  
Date : Mar 6, 1978  
Weather : Cold, overcast  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pole Lite  
Height : 33 ft-4 in (10.2 m)  
Base Diameter : 8 in (20 cm)  
Weight : 190 lb (86 kg)

### BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Pole Lite, Model #TB-20-8  
Modifications : None

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.3 ft/sec (8.6 m/s)  
Exit Speed : 15.1 ft/sec (4.6 m/s)  
Momentum Change  
  Film : 937 lb-sec (4168 Ns)  
  Accelerometer : -- \*  
  Peak Deceleration : -- \*

### COMMENTS:

\*Accelerometer data system not functioning

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-238  
Date : Mar 13, 1978  
Weather : Clear, warm  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pole Lite  
Height : 33 ft-4 in (10.2 m)  
Base Diameter : 8 in (20 cm)  
Weight : 190 lb (86 kg)

### BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Pole-Lite, Model #TB-20-8  
Modifications : Yes/1D1

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 29.2 ft/sec (8.9 m/s)  
Exit Speed : 17.1 ft/sec (5.2 m/s)  
Momentum Change  
  Film : 863 lb-sec (3839 Ns)  
  Accelerometer : 787 lb-sec (3501 Ns)  
Peak Deceleration : 7.6 g's

### COMMENTS:

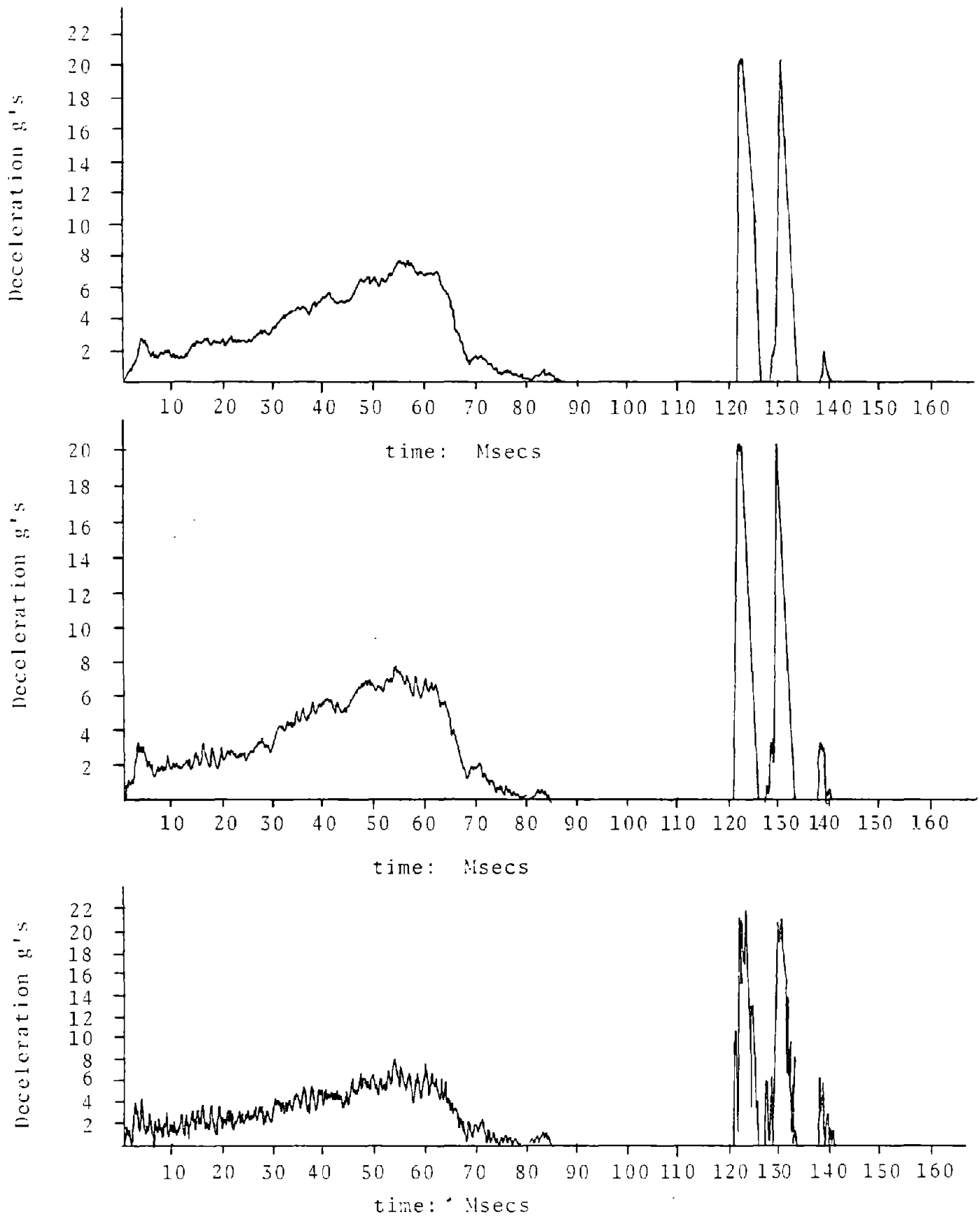


Fig. 85  
 Longitudinal Accelerometer Traces for Test 1147-238

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-239  
Date : Mar 13, 1978  
Weather : Clear, warm  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 45 ft (13.7 m)  
Base Diameter : 10 in (25 cm)  
Weight : 415 lb (188 kg)

BASE:

Type : Transformer/insert  
Manufacturer : Union Metal, Model #2850  
Modifications : Yes/3A2

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 28.7 ft/sec (8.8 m/s)  
Exit Speed : 18.6 ft/sec (5.7 m/s)  
Momentum Change  
Film : 718 lb-sec (3194 Ns)  
Accelerometer : 705 lb-sec (3136 Ns)  
Peak Deceleration : 10 g's

COMMENTS:



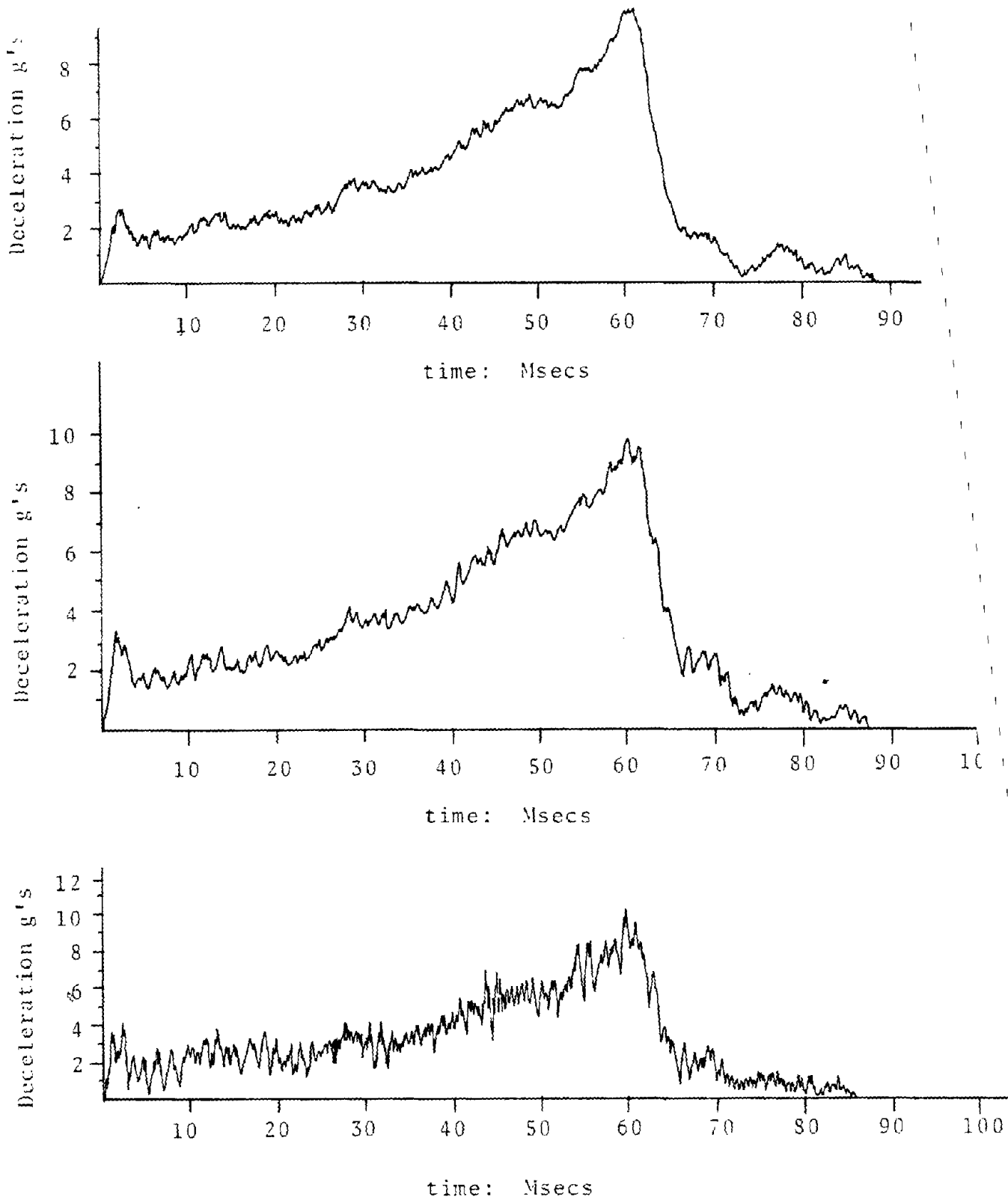


Fig. 86  
 Longitudinal Accelerometer Traces for Test 1147-239

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-240  
Date : Mar 13, 1978  
Weather : Clear, warm  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pfaff & Kendall  
Height : 36 ft (11.0 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 186 lb (84 kg)

### BASE:

Type : Transformer/tapered skirt  
with Beltline weld, small  
Manufacturer : Pfaff & Kendall, Model #TB-2A  
Modifications : Yes/1B6

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.9 ft/sec (8.8 m/s)  
Exit Speed : 14.9 ft/sec (4.5 m/s)  
Momentum Change  
Film : 999 lb-sec (4444 Ns)  
Accelerometer : 1033 lb-sec (4595 Ns)  
Peak Deceleration : 19.9 g's

### COMMENTS:

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-241  
Date : Mar 17, 1978  
Weather : Clear, cool  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pfaff & Kendall  
Height : 36 ft (11.0 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 186 lb (84 kg)

### BASE:

Type : Transformer/tapered skirt  
with Beltline Weld, small  
Manufacturer : Pfaff & Kendall, Model #TB-2A  
Modifications : Yes/1B7

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.7 ft/sec (8.8 m/s)  
Exit Speed : 19.2 ft/sec (5.7 m/s)  
Momentum Change  
Film : 677 lb-sec (3011 Ns)  
Accelerometer : -- \*  
Peak Deceleration : -- \*

### COMMENTS:

\*Accelerometer data system not functioning.

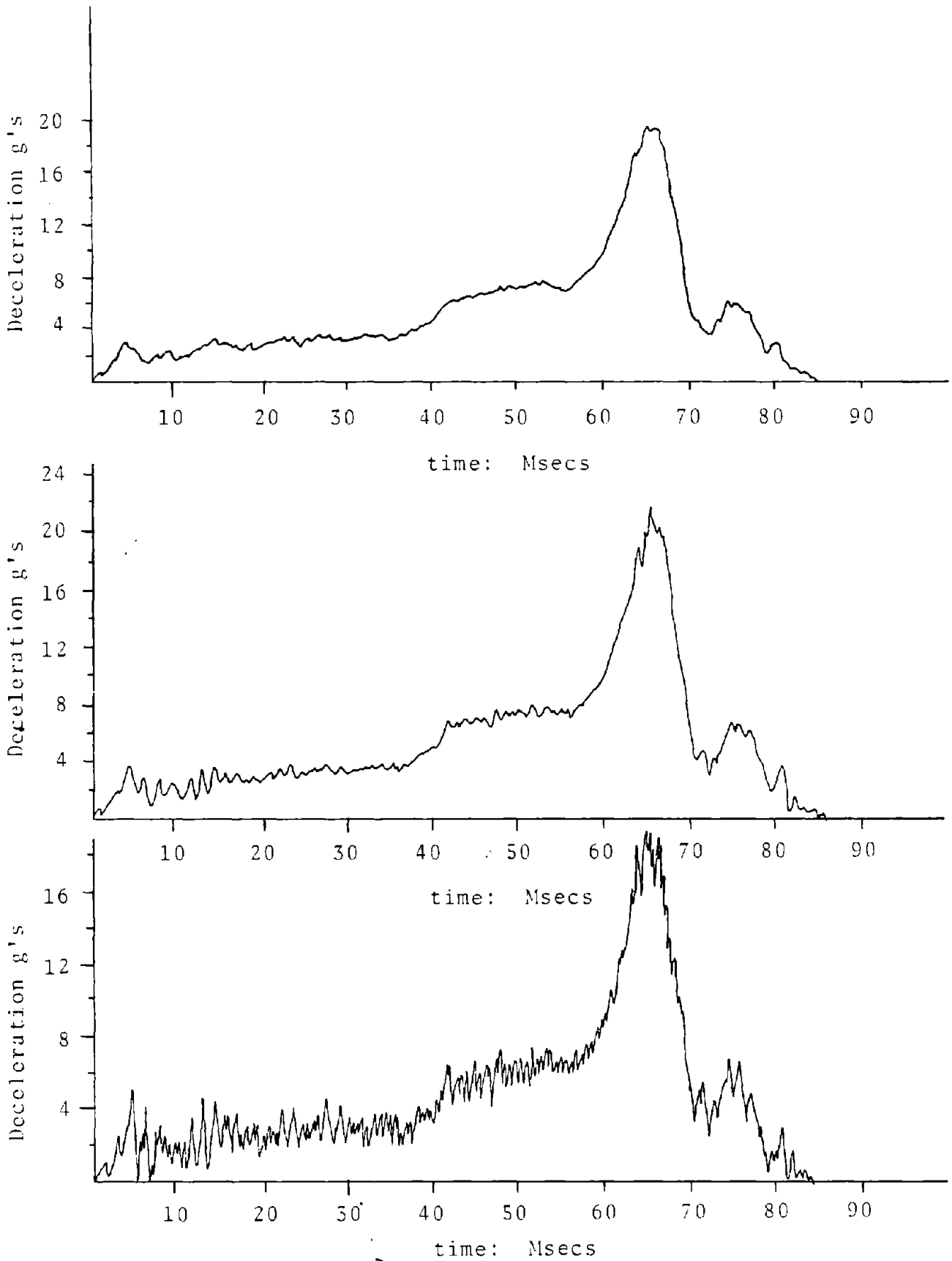


Fig. 87  
 Longitudinal Accelerometer Traces for Test 1147-240

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-242  
Date : Mar 17, 1978  
Weather : Clear, cool  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 45 ft (13.7 m)  
Base Diameter : 10 in (25 cm)  
Weight : 415 lb (188 kg)

### BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Union Metal, Model #2851  
Modifications : Yes/lc5

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.8 ft/sec (8.8 m/s)  
Exit Speed : 14.2 ft/sec (4.3 m/s)  
Momentum Change  
  Film : 1040 lb-sec (4626 Ns)  
  Accelerometer : 992 lb-sec (4412 Ns)  
Peak Deceleration : 20.8 g's

### COMMENTS:

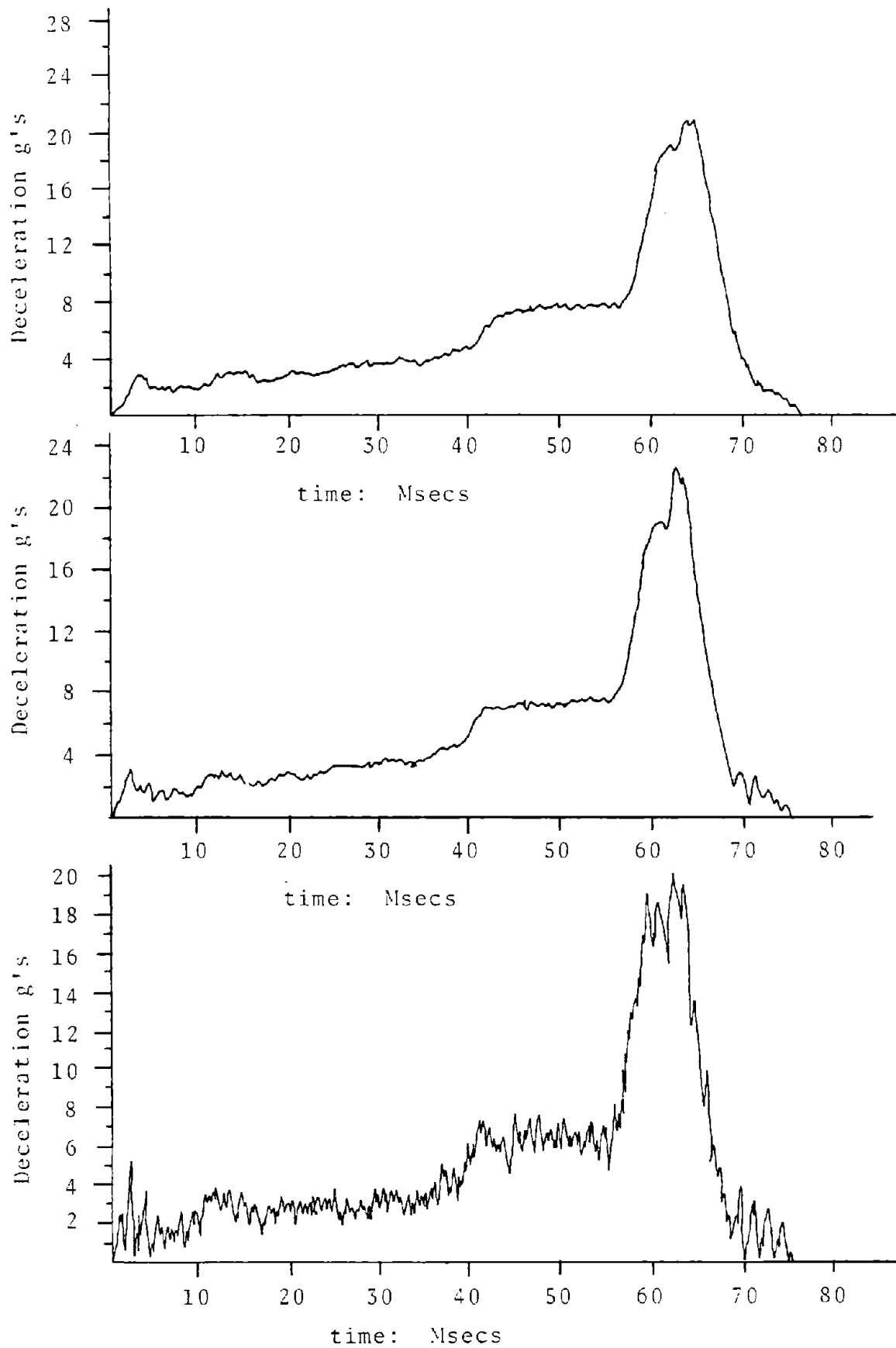


Fig. 88  
 Longitudinal Accelerometer Traces for Test 1147-242

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-243  
Date : Mar 21, 1978  
Weather : Clear, warm  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pole Lite  
Height : 33 ft -4 in (10.2 m)  
Base Diameter : 8 in (20 cm)  
Weight : 190 lb (86 kg)

### BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Pole Lite, Model #TB-20-8  
Modifications : Yes/1D2

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 29.3 ft/sec (8.9 m/s)  
Exit Speed : 19.5 ft/sec (6.0 m/s)  
Momentum Change  
    Film : 698 lb-sec (3105 Ns)  
    Accelerometer : 649 lb-sec (2887 Ns)  
Peak Deceleration : 8.9 g's

### COMMENTS:

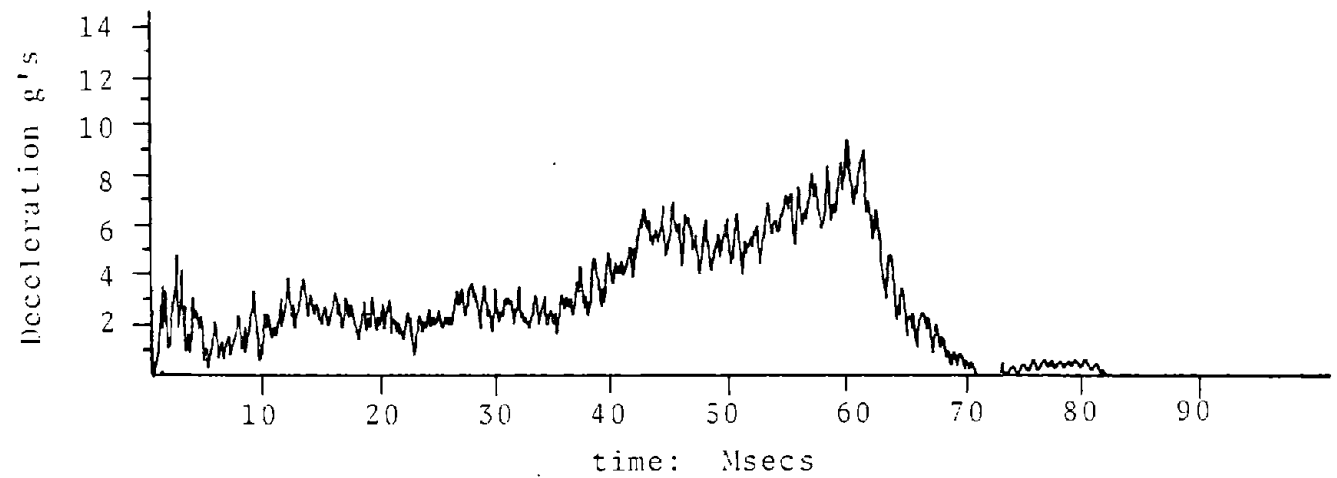
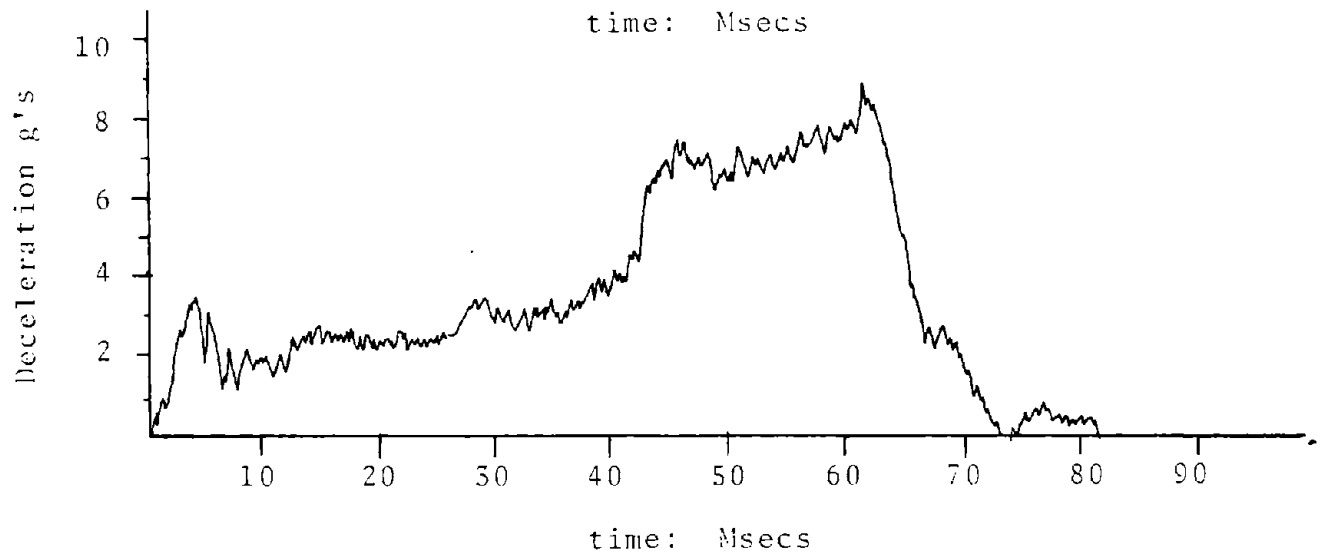
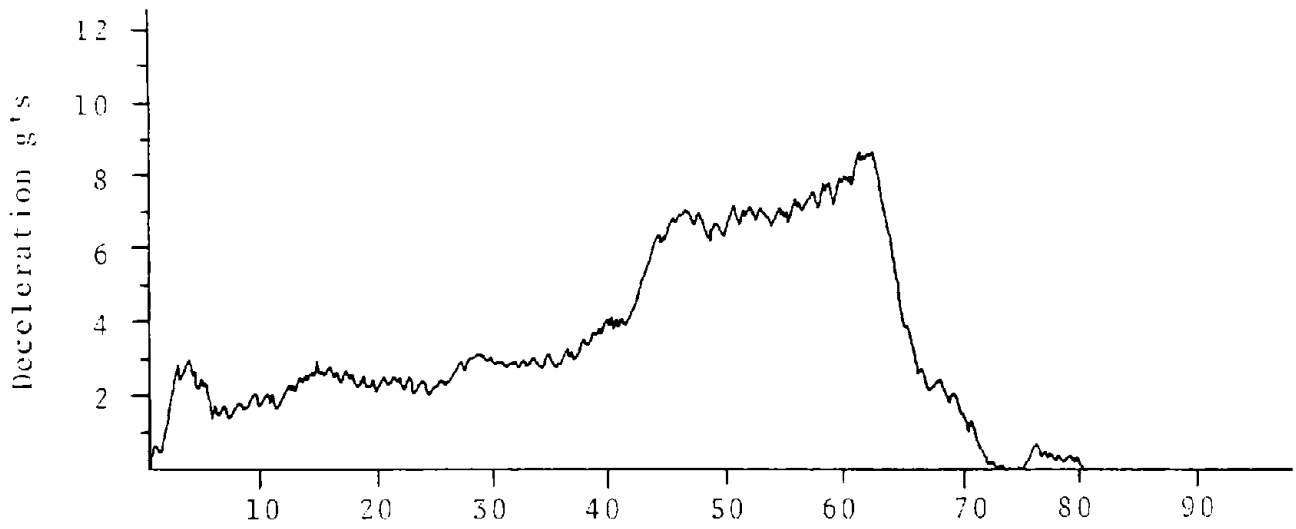


Fig. 89  
 Longitudinal Accelerometer Traces for Test 1147-243



## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-244  
Date : Mar 21, 1978  
Weather : Clear, mild  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 45 ft (13.7 m)  
Base Diameter : 10 in (25 cm)  
Weight : 415 lb (188 kg)

### BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Union Metal, Model # 2851  
Modifications : Yes/lc5

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.2 ft/sec (8.6 m/s)  
Exit Speed : 14.2 ft/sec (4.3 m/s)  
Momentum Change  
  Film : 1001 lb-sec (4452 Ns)  
  Accelerometer : 921 lb-sec (4097 Ns)  
Peak Deceleration : 21.7 g's

### COMMENTS:

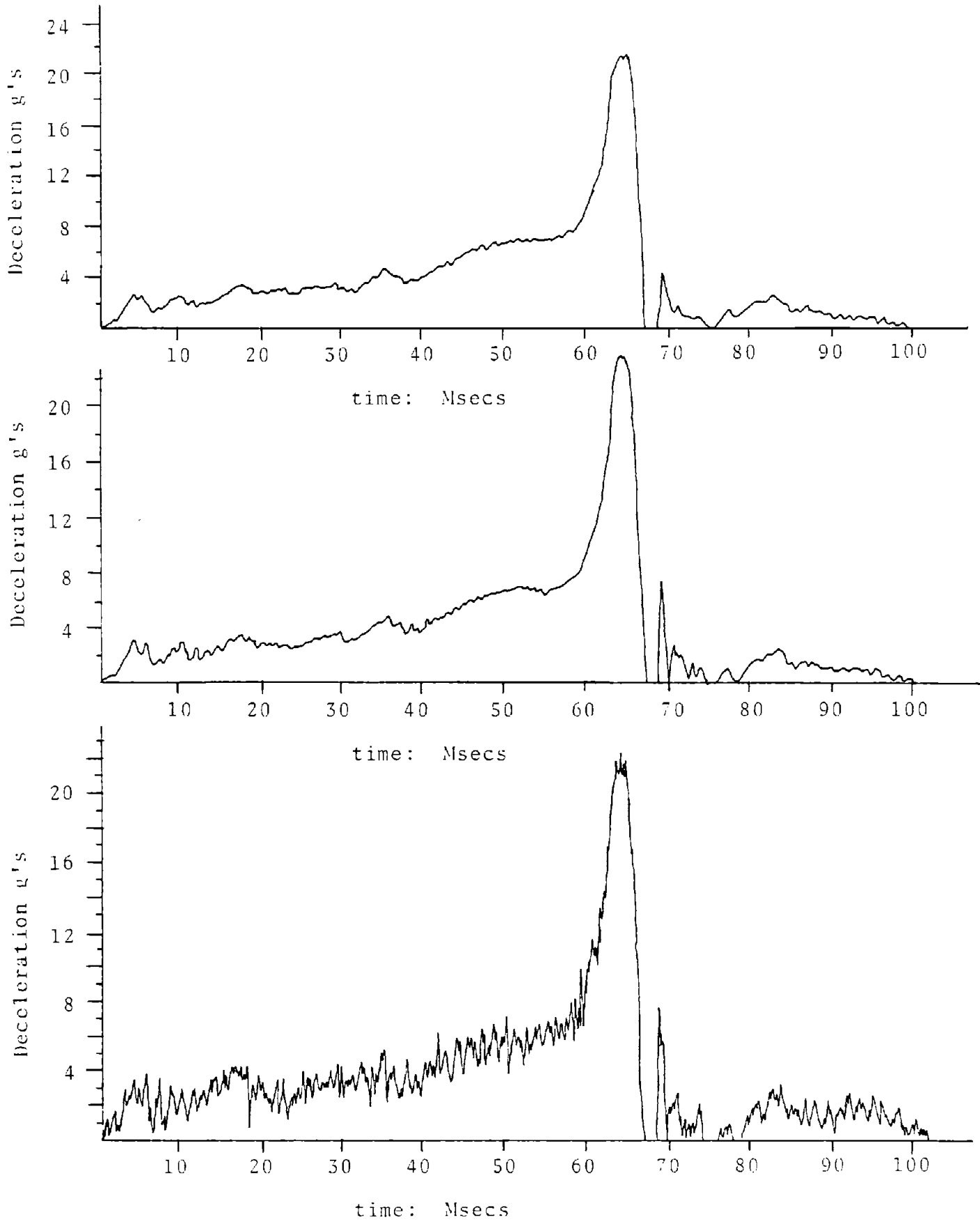


Fig. 90  
Longitudinal Accelerometer Traces for Test 1147-244

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-245  
Date : May 30, 1978  
Weather : Hot, sunny  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 50 ft-9 in (15.5 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 452 lb (205 kg)

### BASE:

Type : Transformer/tapered skirt, large  
Manufacturer : Hapco, Model #44681  
Modifications : None

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 27.8 ft/sec (8.5 m/s)  
Exit Speed : 16.1 ft/sec (4.9 m/s)  
Momentum Change  
  Film : 841 lb-sec (3741 Ns)  
  Accelerometer : 788 lb-sec (3505 Ns)  
Peak Deceleration : 10.8 g's

### COMMENTS:

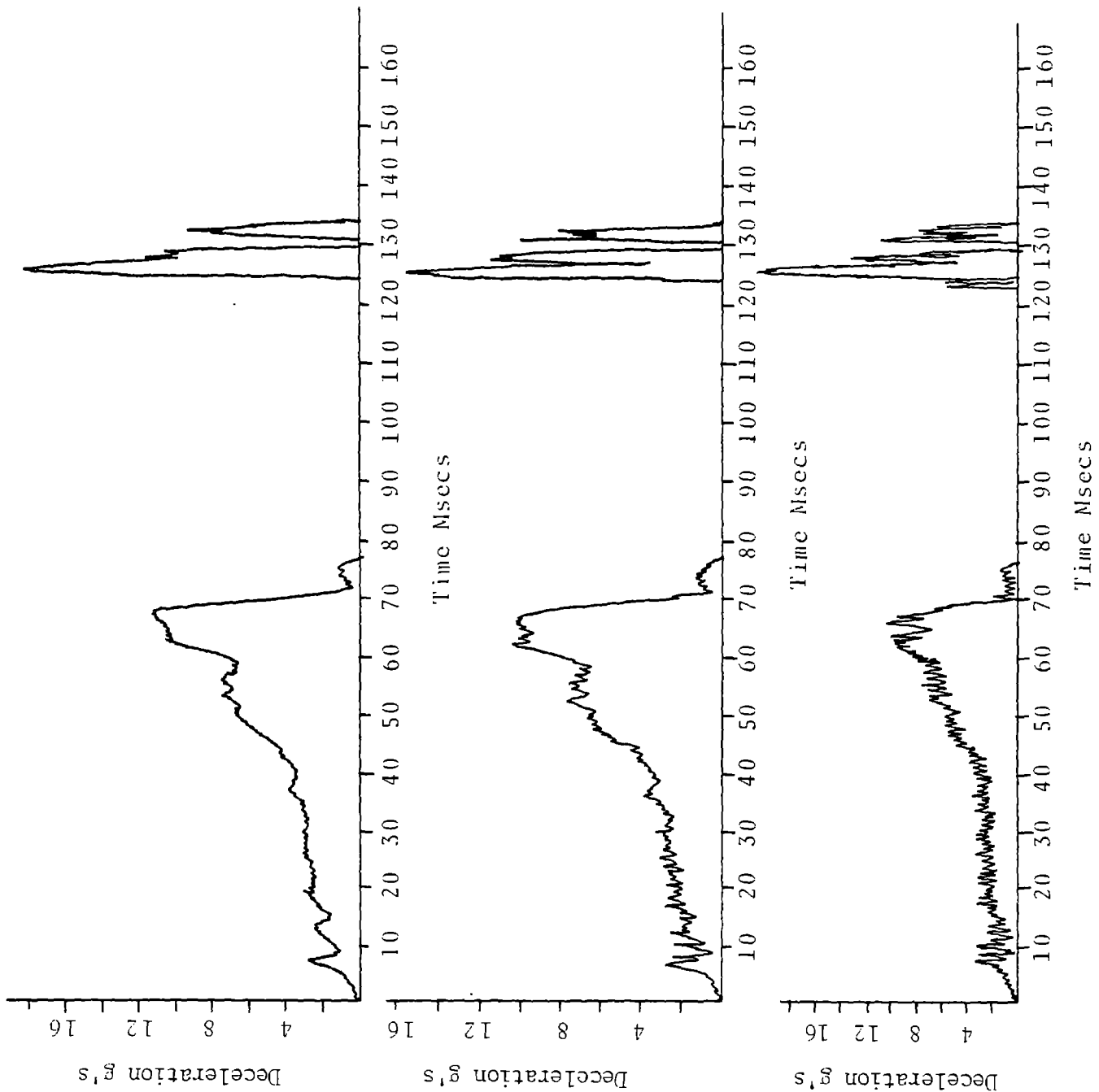


Fig. 91  
 Longitudinal Accelerometer Traces for Test 1147-245

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-246  
Date : May 31, 1978  
Weather : Cloudy  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 50 ft-9 in (15.5 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 452 lb (205 kg)

### BASE:

Type : Transformer/tapered skirt, large  
Manufacturer : Hapco, Model #44681  
Modifications : None

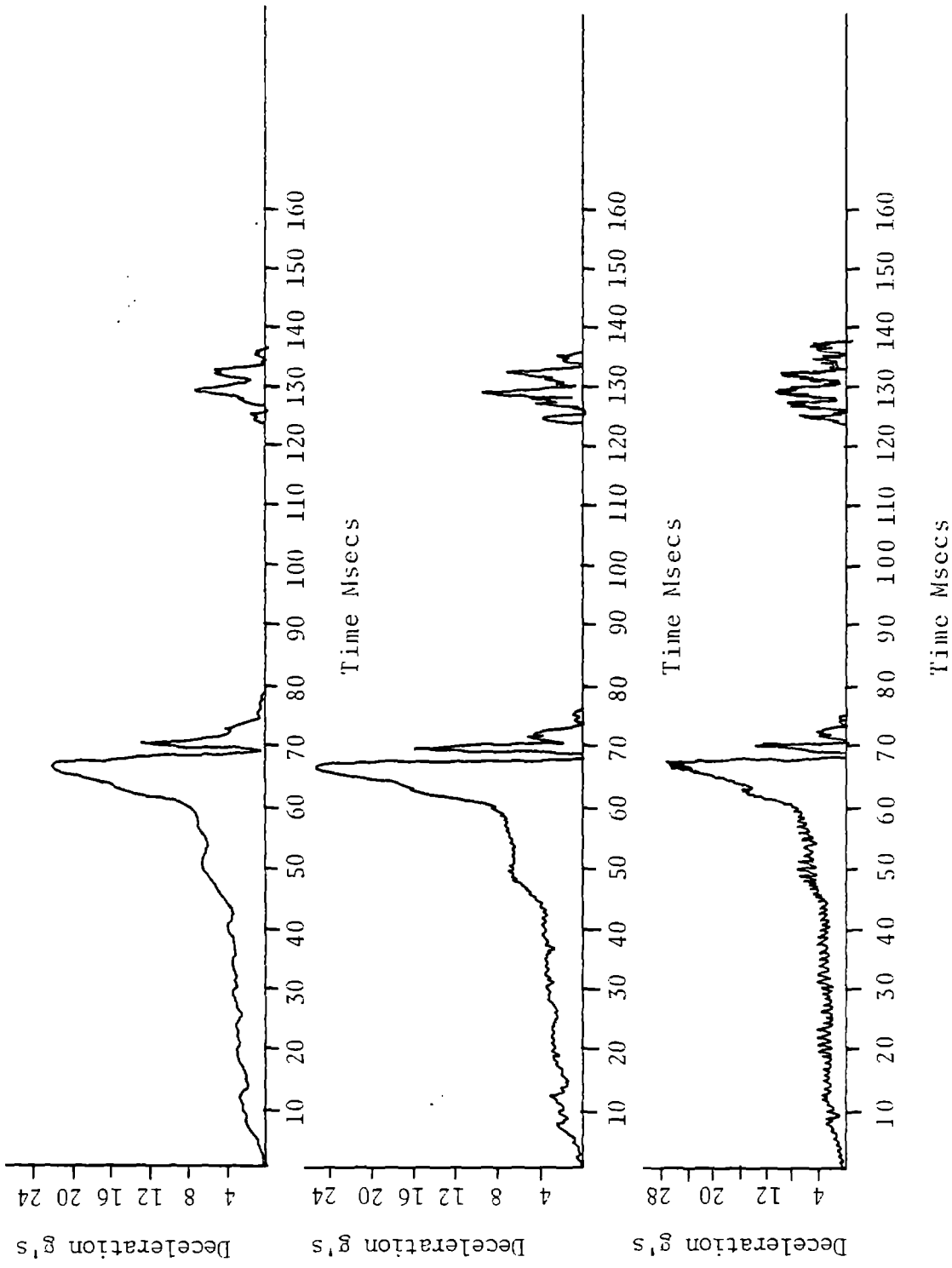
### FASTENERS (Base):

Type : N/a  
Load : N/A

### TEST DATA:

Impact Speed : 28.9 ft/sec (8.8 m/s)  
Exit Speed : 16.9 ft/sec (5.2 m/s)  
Momentum Change  
Film : 851 lb-sec (3785 Ns)  
Accelerometer : 948 lb-sec (4217 Ns)  
Peak Deceleration : 24.7 g's

### COMMENTS:



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Fig. 92  
 Longitudinal Accelerometer Traces for Test 1147-246

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-247  
Date : May 31, 1978  
Weather : Cloudy, Warm  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 50 ft-9 in (15.5 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 452 lb (205 kg)

### BASE:

Type : Transformer/tapered skirt  
with Beltline weld; large  
Manufacturer : Pfaff & Kendall, Model #TB-4  
Modifications : None

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.3 ft/sec (8.6 m/s)  
Exit Speed : 10.5 ft/sec (3.2 m/s)  
Momentum Change :  
Film : 1263 lb-sec (5618 Ns)  
Accelerometer : 1464 lb-sec (6512 Ns)  
Peak Deceleration : 24 g's

### COMMENTS:

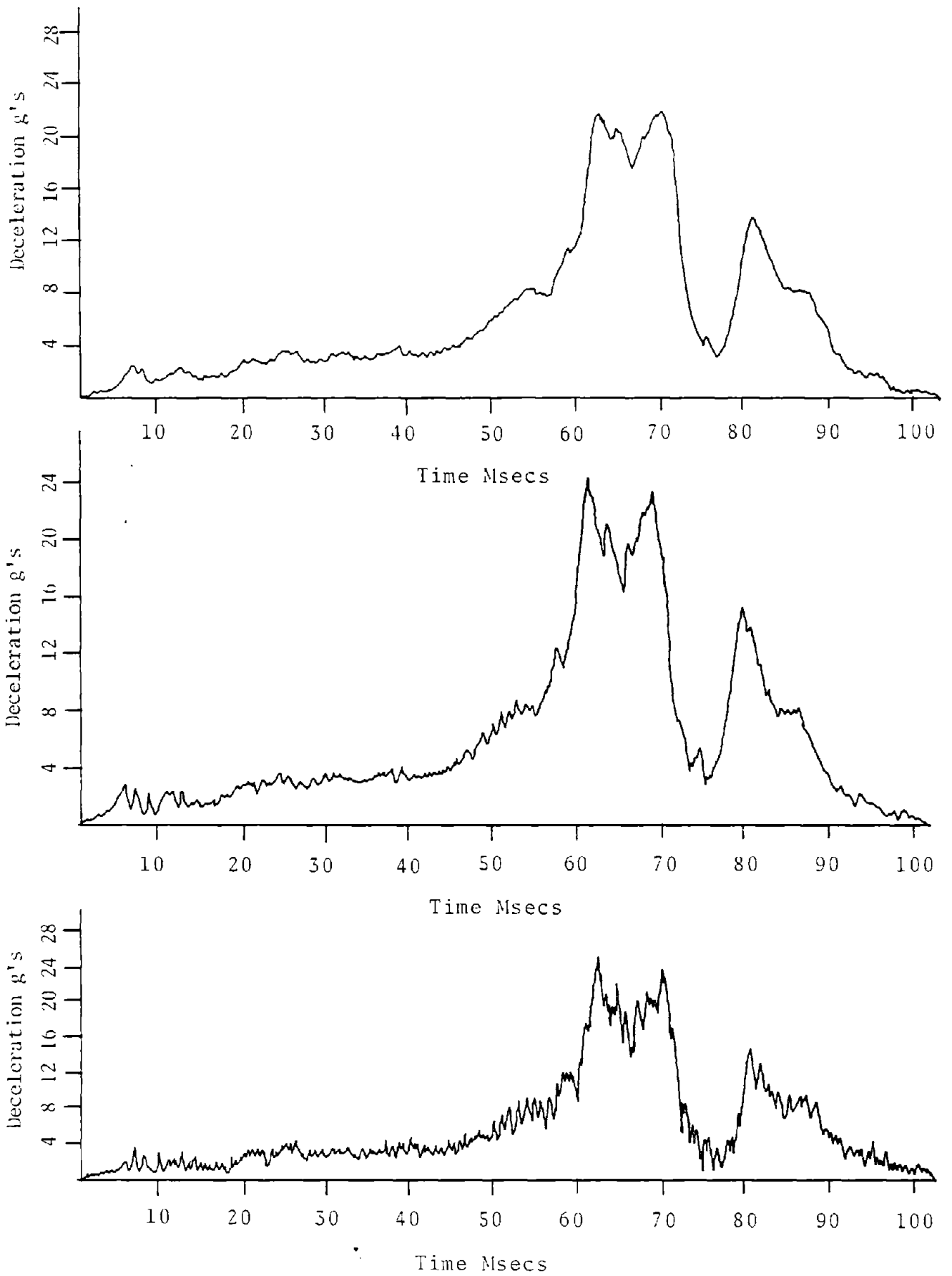


Fig. 93  
Longitudinal Accelerometer Traces for Test 1147-247



TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-248  
Date : Jun 6, 1978  
Weather : Clear, warm  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 59 ft-9 in (15.5 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 452 lb (205 kg)

BASE:

Type : Transformer/tapered shirt  
with Beltline Weld, Large  
Manufacturer : Pfaff & Kendall, Model #TB-4  
Modifications : Yes/2B1

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 29.4 ft/sec (9.0 m/s)  
Exit Speed : 15.3 ft/sec (4.7 m/s)  
Momentum Change : 1003 lb-sec (4461 Ns)  
Film : 913 lb-sec (4061 Ns)  
Accelerometer : 21.5 g's  
Peak Deceleration :

COMMENTS:

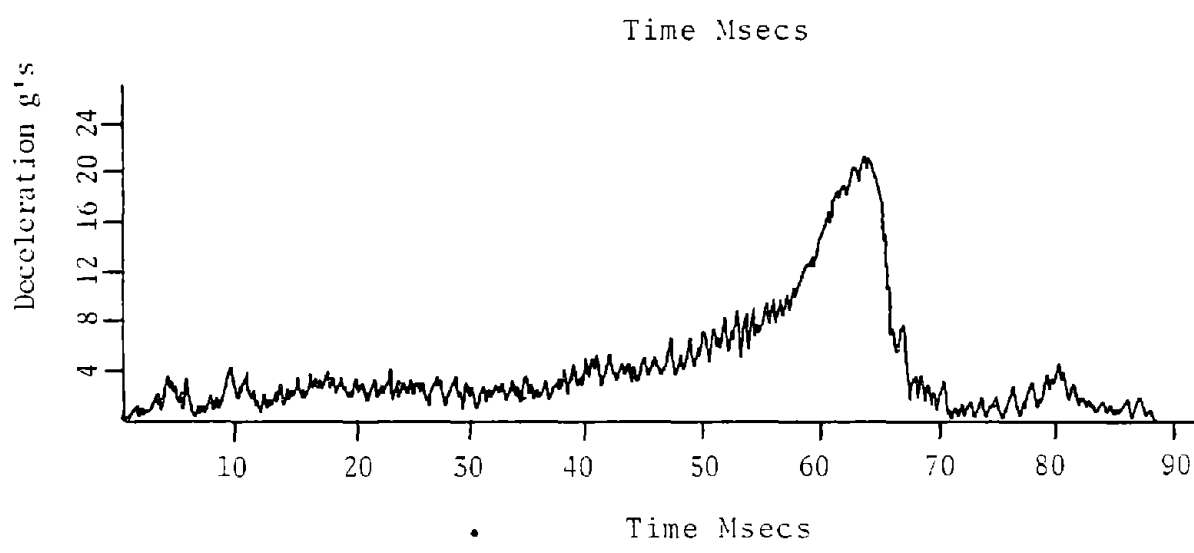
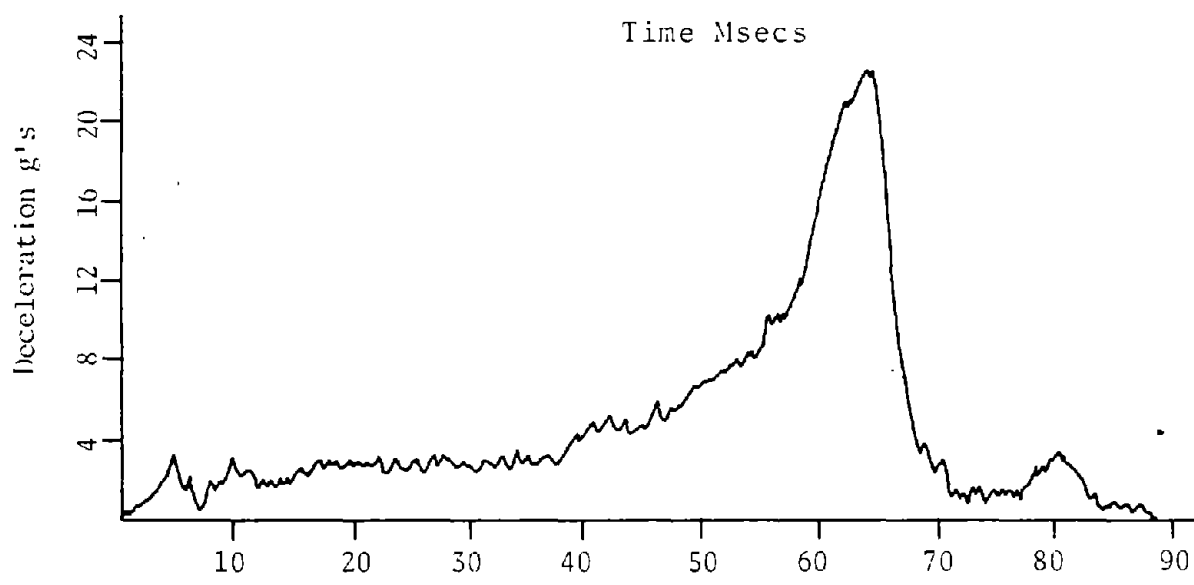
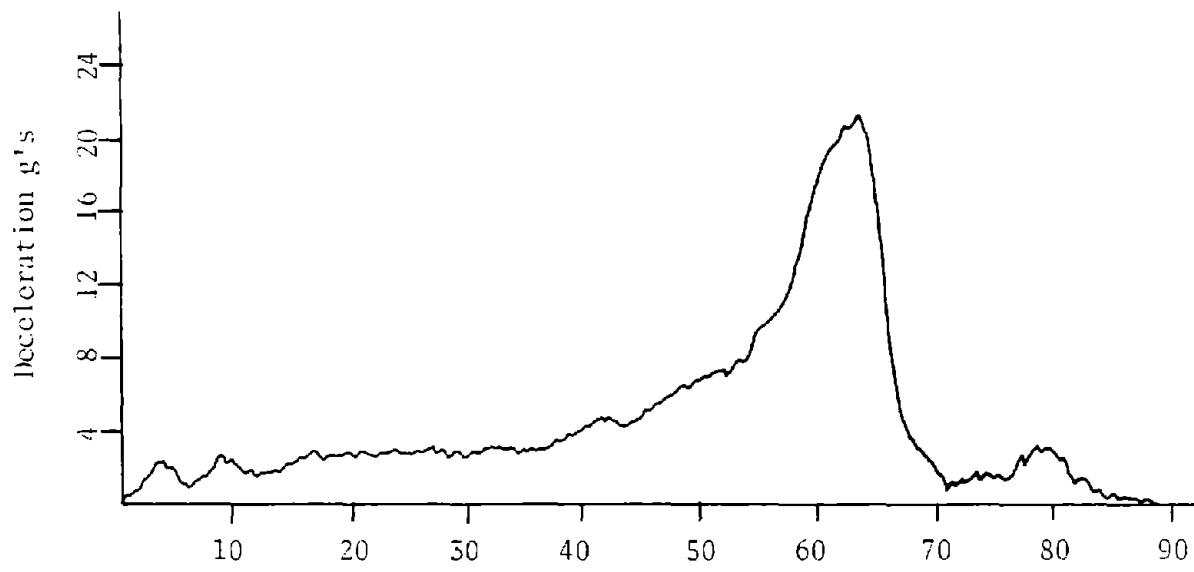


Fig. 94  
 Longitudinal Accelerometer Traces for Test 1147-248

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-249  
Date : Jun 6, 1978  
Weather : Clear, warm  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 50 ft-9 in (15.5 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 452 lb (205 kg)

### BASE:

Type : Transformer/tapered skirt, large  
Manufacturer : Hapco, Model #44681  
Modifications : Yes/2A1

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 27.8 ft/sec (8.5 m/s)  
Exit Speed : 12.8 ft/sec (3.9 m/s)  
Momentum Change  
  Film : 1067 lb-sec (4746 Ns)  
  Accelerometer : 1060 lb-sec (4715 Ns)  
Peak Deceleration : 22.2 g's

### COMMENTS:

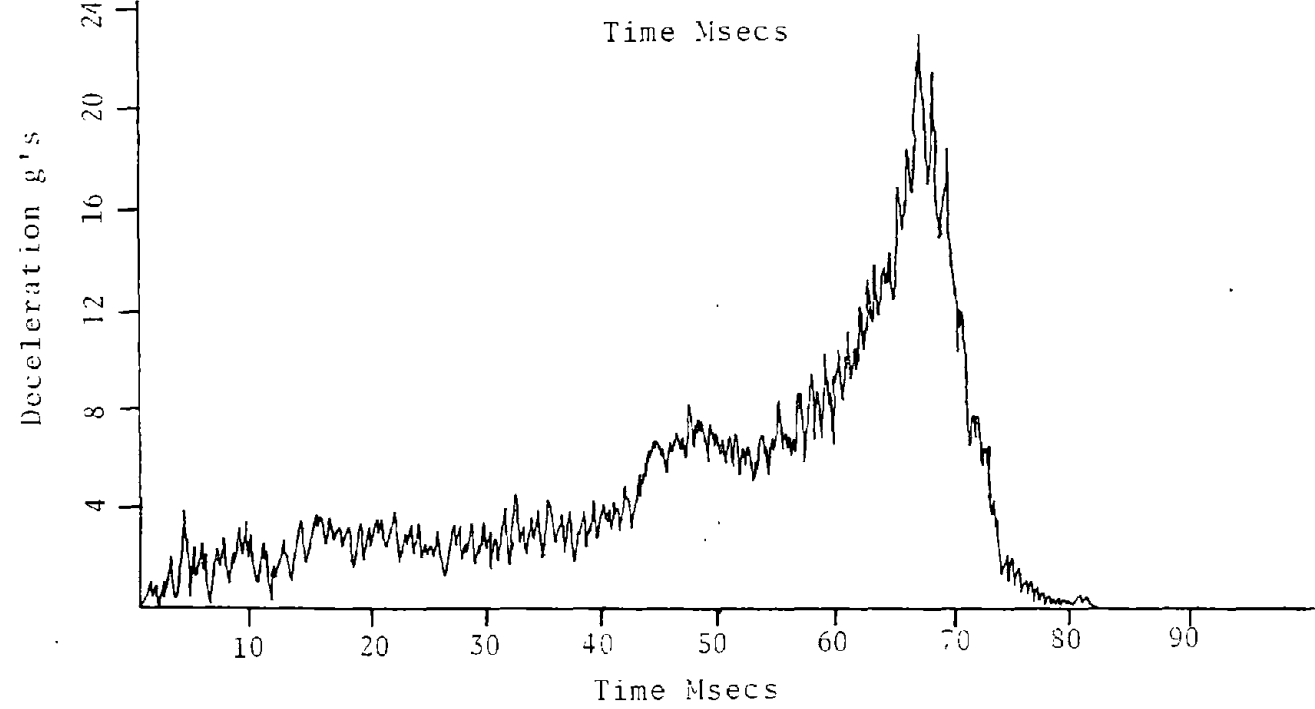
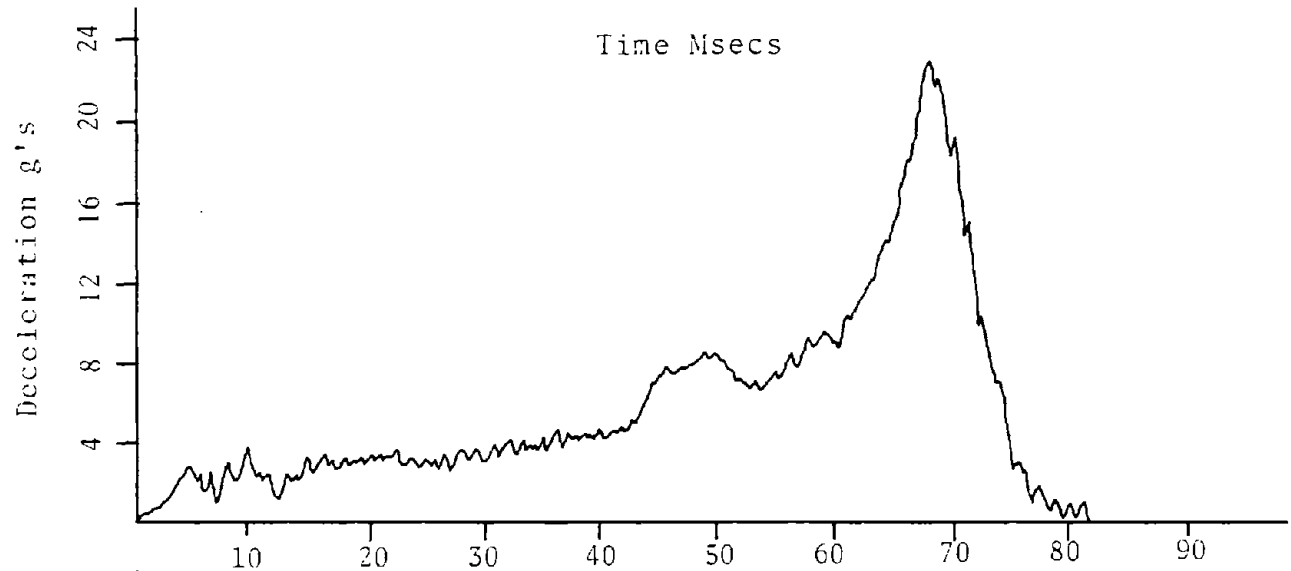
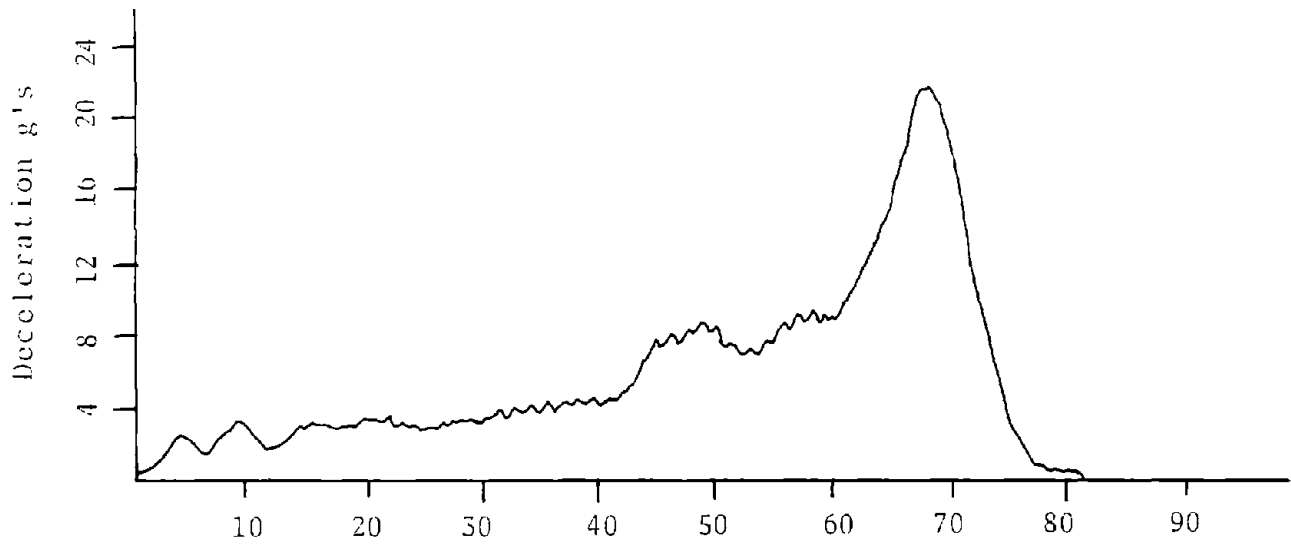


Fig. 95  
 Longitudinal Accelerometer Traces for Test 1147-249

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-250  
Date : Jun 15, 1978  
Weather : Clear, mild  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Alumunim Pole  
Manufacturer : Pole Lite  
Height : 33 ft-4 in (10.2 m)  
Base Diameter : 8 in (20 cm)  
Weight : 190 lb (86 kg)

### BASE:

Type : Transformer/insert  
Manufacturer : Union Metal, Model #2850  
Modifications : Yes/RF-1

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 29.3 ft/sec (8.9 m/s)  
Exit Speed : 16.4 ft/sec (5.0 m/s)  
Momentum Change  
  Film : 915 lb-sec (4070 Ns)  
  Accelerometer : 932 lb-sec (4146 Ns)  
Peak Deceleration : 11.7 g's

### COMMENTS:

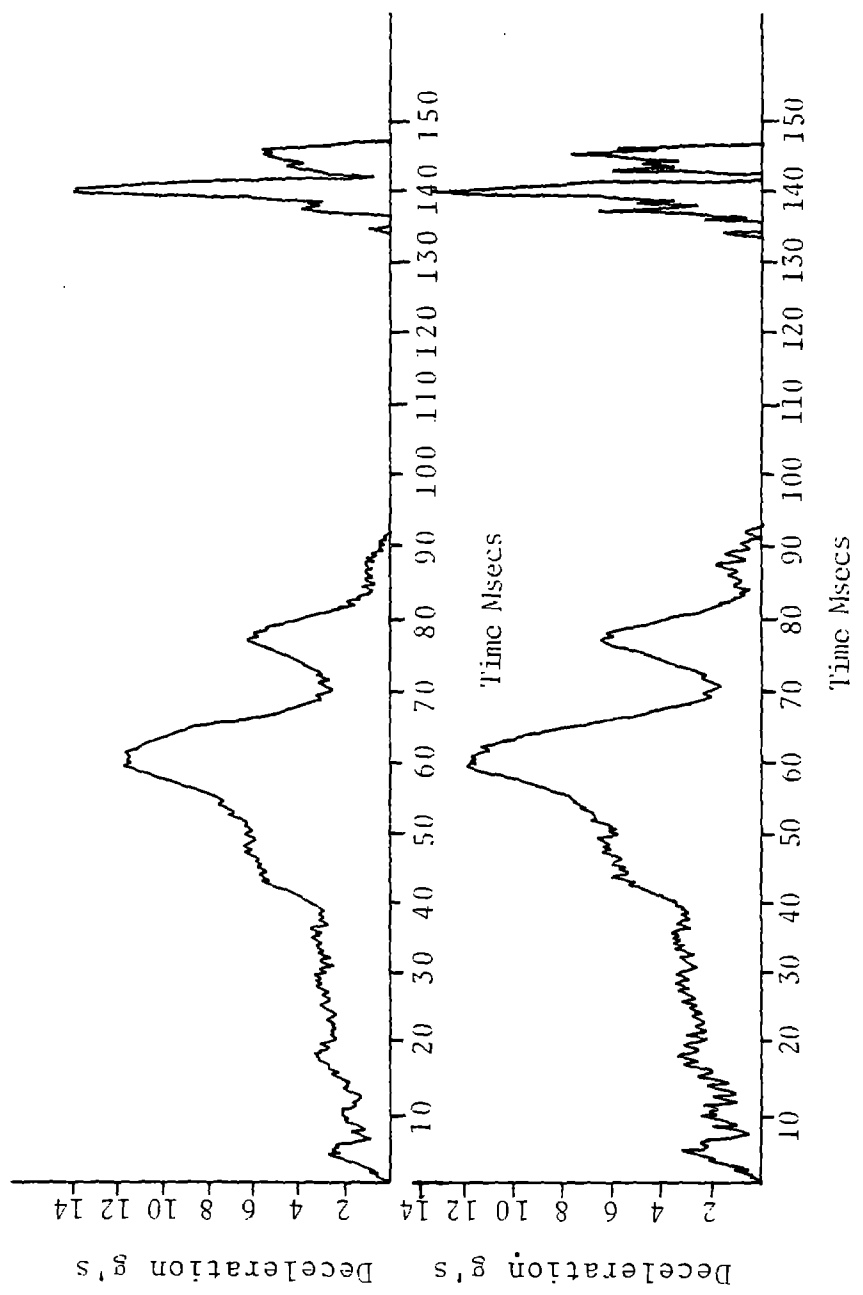


Fig. 96  
 Longitudinal Accelerometer Traces for Test 1147-250

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-251  
Date : Jun 15, 1978  
Weather : Clear, warm  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pole Lite  
Height : 33 ft-4 in (10.2 m)  
Base Diameter : 8 in (20 cm)  
Weight : 190 lb (86 kg)

### BASE:

Type : Transformer/insert  
Manufacturer : Union Metal, Model #2850  
Modifications : Yes/3A2

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 29.3 ft/sec (8.9 m/s)  
Exit Speed : 17.1 ft/sec (5.2 m/s)  
Momentum Change  
  Film : 884 lb-sec (3932 Ns)  
  Accelerometer : 970 lb-sec (4315 Ns)  
Peak Deceleration : 19.6 g's

### COMMENTS:

Special "off center hole" round washer enabling mounting on 15 in (38.1 cm) bolt circle

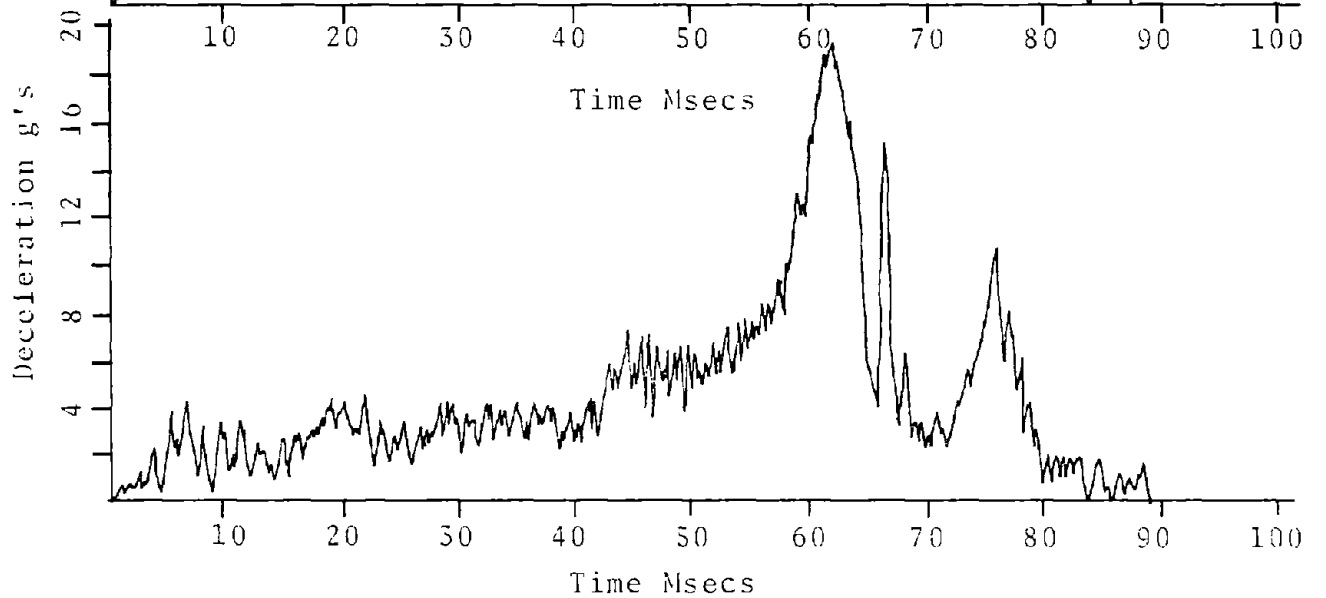
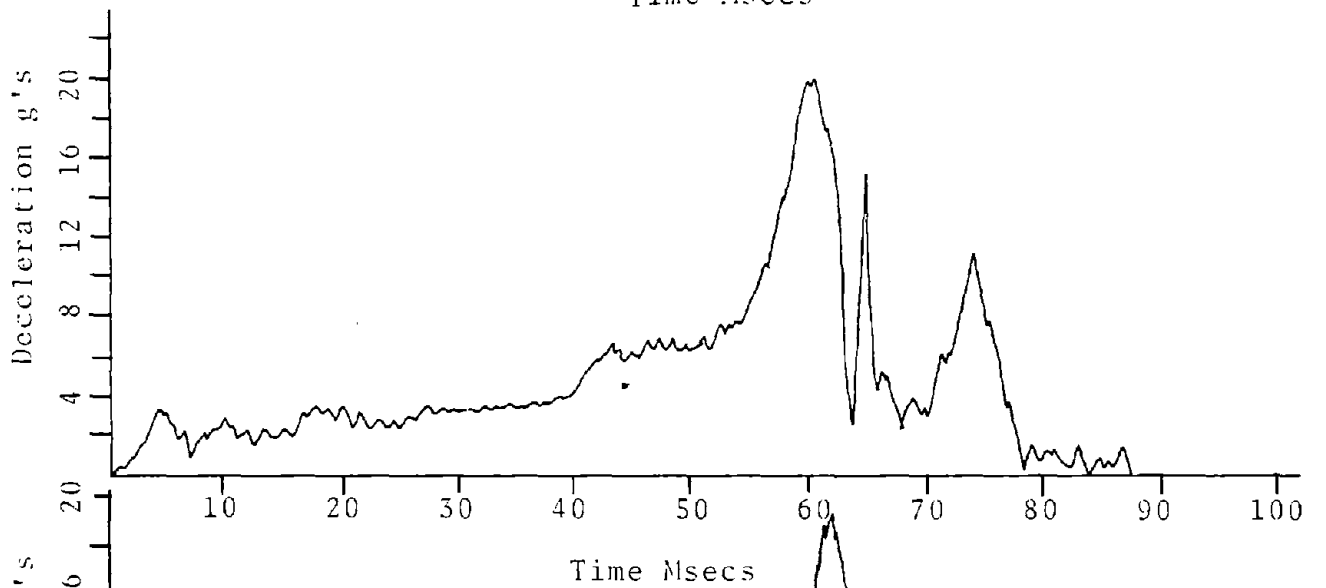
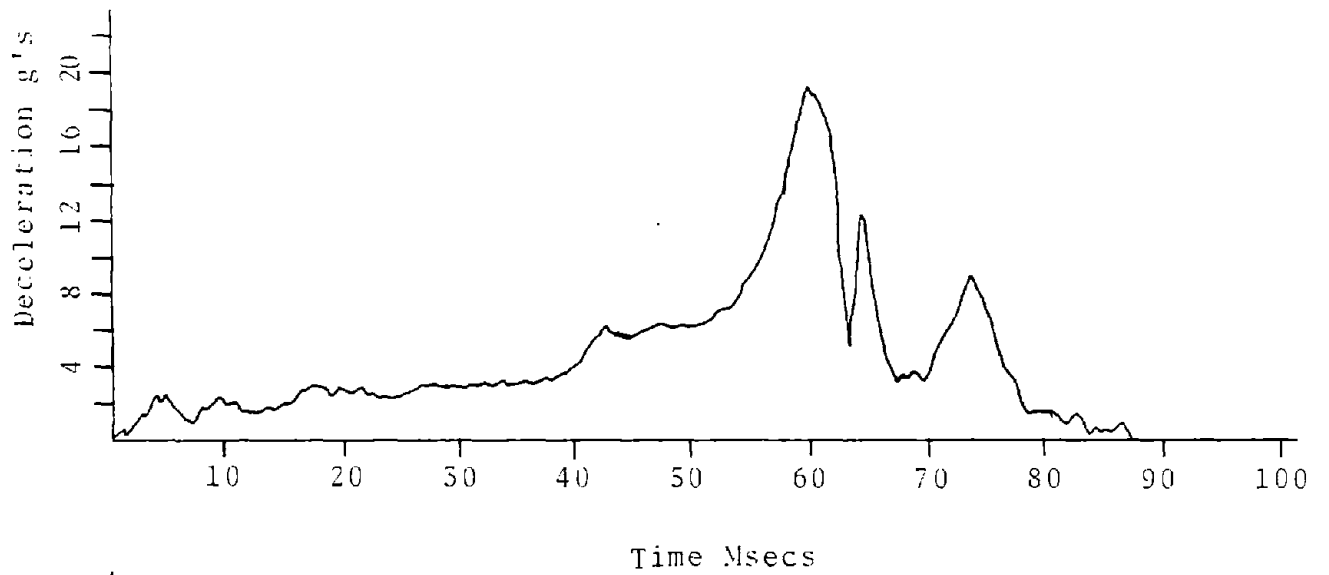


Fig. 97  
 Longitudinal Accelerometer Traces for Test 1147-251



## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-252  
Date : Jun 15, 1978  
Weather : Clear, warm  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pole Lite  
Height : 33 ft-4 in (10.2 m)  
Base Diameter : 8 in (20 cm)  
Weight : 190 lb (86 kg)

### BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Hapco, Model #45964  
Modifications : Yes/RF-1

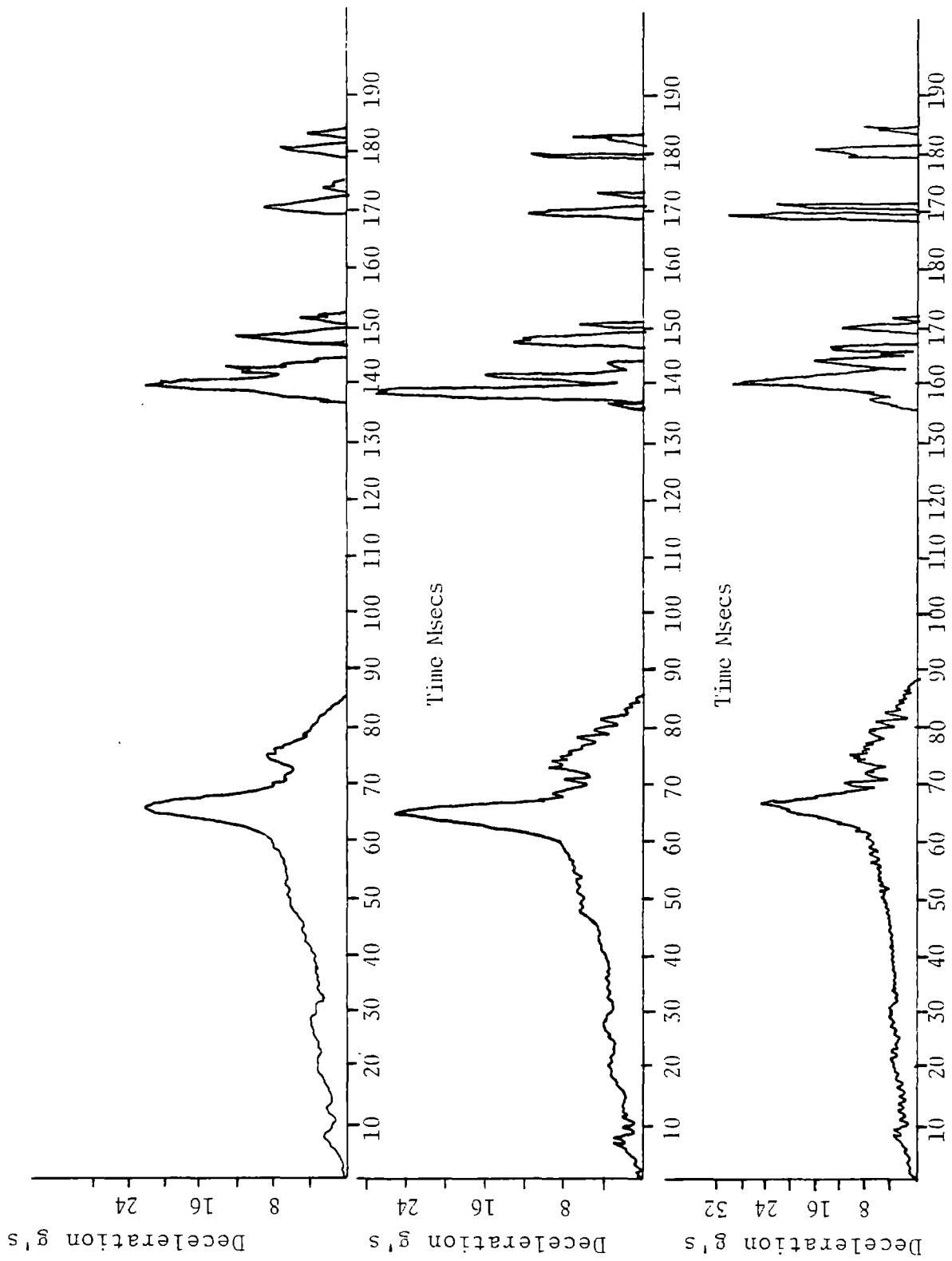
### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 27.7 ft/sec (8.4 m/s)  
Exit Speed : 12.9 ft/sec (3.9 m/s)  
Momentum Change  
  Film : 1056 lb-sec (4697 Ns)  
  Accelerometer : 1258 lb-sec (5596 Ns)  
Peak Deceleration : 23.8 g's

### COMMENTS:



Time Msecs

Fig. 98

Longitudinal Accelerometer Traces for Test 1147-252

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-253  
Date : Jun 20, 1978  
Weather : Warm  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pole Lite  
Height : 33 ft-4 in (10.2 m)  
Base Diameter : 8 in (20 cm)  
Weight : 190 lb (86 kg)

BASE:

Type : Transformer/insert  
Manufacturer : Union Metal, Model #2850  
Modifications : Yes/RF-2

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 28.4 ft/sec (8.7 m/s)  
Exit Speed : 11.7 ft/sec (3.6 m/s)  
Momentum Change  
    Film : 1183 lb-sec (5262 Ns)  
    Accelerometer : 1411 lb-sec (6272 Ns)  
Peak Deceleration : 24.7 g's

COMMENTS:

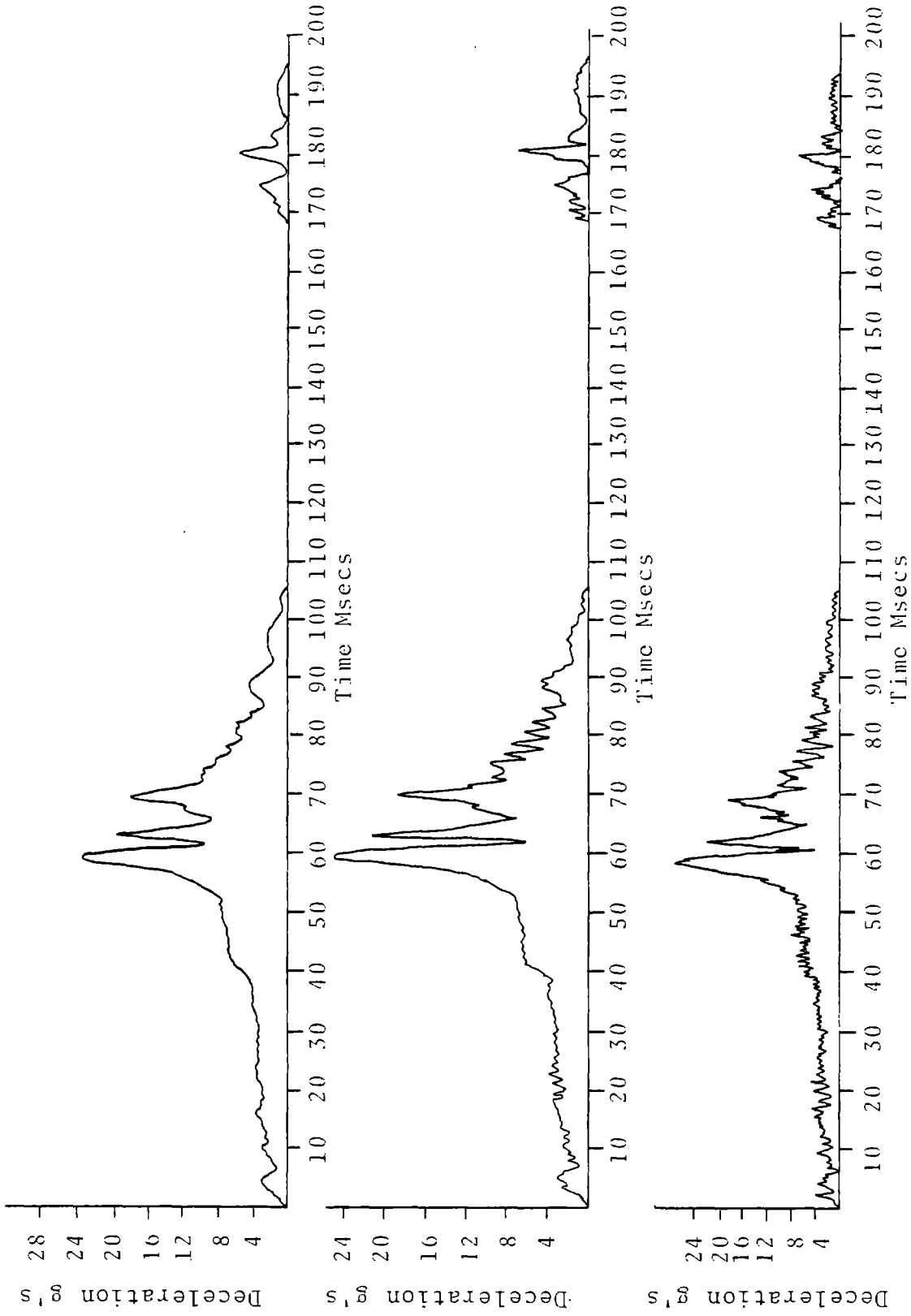


Fig. 99  
 Longitudinal Accelerometer Traces for Test 1147-253

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-254  
Date : Jun 20, 1978  
Weather : Hot  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pole Lite  
Height : 33 ft-4 in (10.2 m)  
Base Diameter : 8 in (20 cm)  
Weight : 190 lb (86 kg)

BASE:

Type : Transformer/insert  
Manufacturer : Union Metal, Model #2850  
Modifications : Yes/Rf-3

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 28.7 ft/sec (8.8 m/s)  
Exit Speed : 20.6 ft/sec (6.3 m/s)  
Momentum Change  
  Film : 616 lb-sec (2740 Ns)  
  Accelerometer : 591 lb-sec (2629 Ns)  
Peak Deceleration : 8.2 g's

COMMENTS:

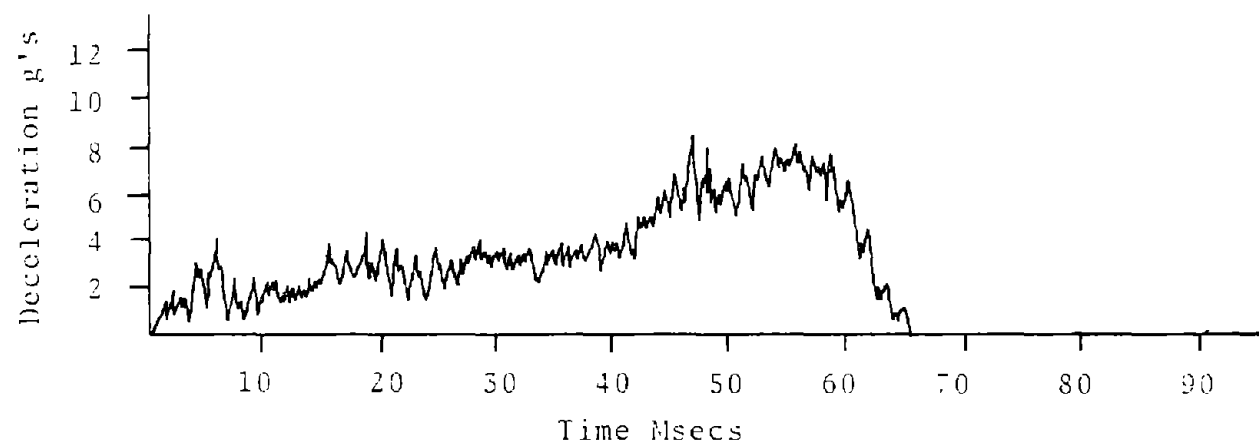
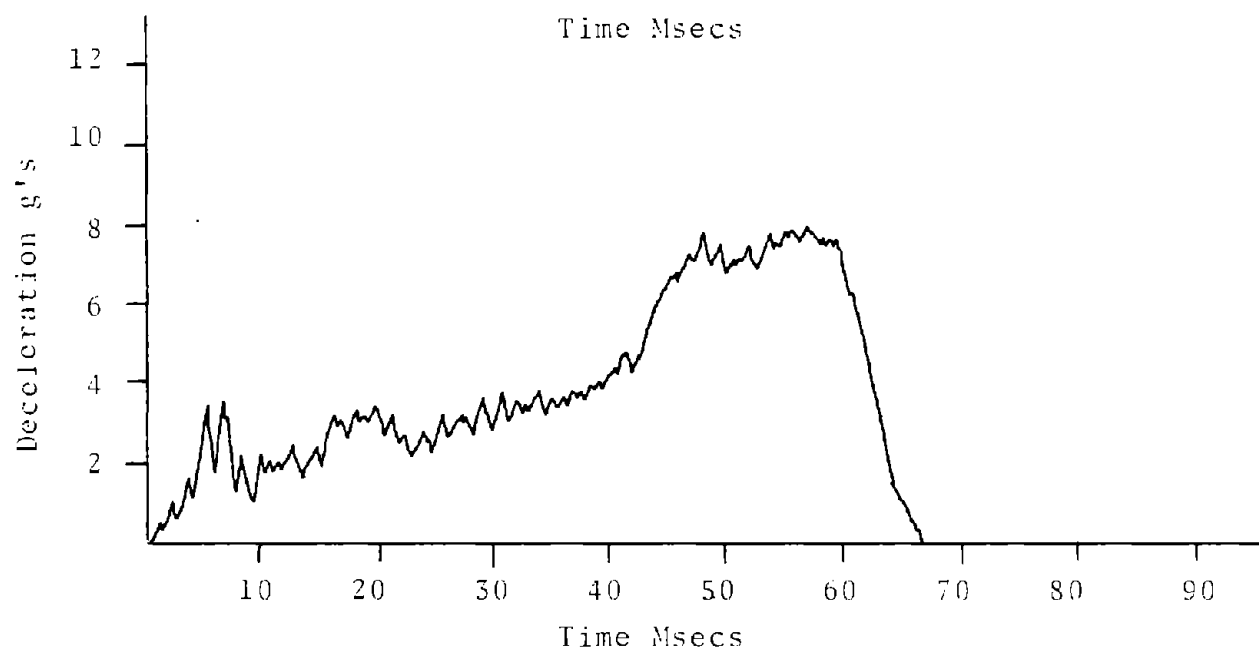
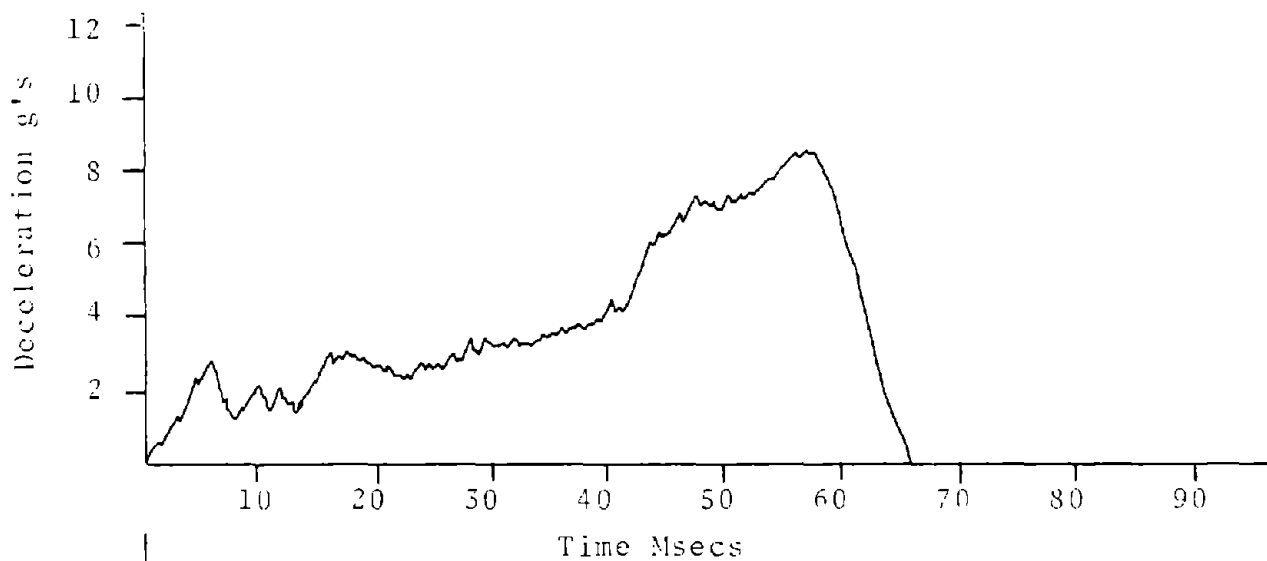


Fig. 100  
Longitudinal Accelerometer Traces for Test 1147-254

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-255  
Date : Jun 20, 1979  
Weather : Clear, hot  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Pole Lite  
Height : 33 ft-4 in (10.2 m)  
Base Diameter : 8 in (20 cm)  
Weight : 190 lb (86 kg)

### BASE:

Type : Transformer/tapered skirt  
with Beltline weld, small  
Manufacturer : Pfaff & Kendall, Model #TB-2A  
Modifications : Yes/lB8

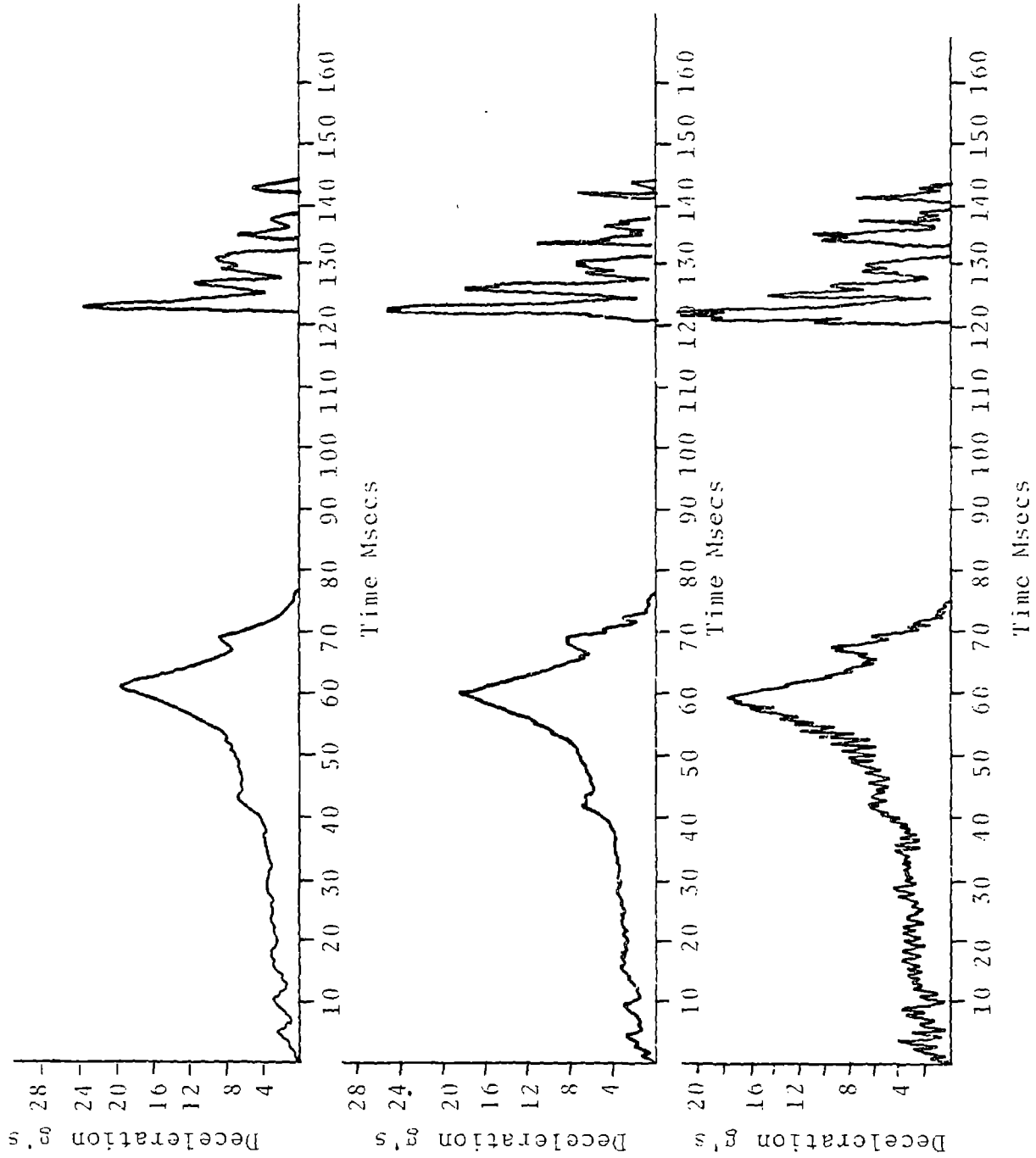
### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 29.0 ft/sec (8.8 m/s)  
Exit Speed : 13.1 ft/sec (4.0 m/s)  
Momentum Change  
  Film : 1133 lb-sec (5040 Ns)  
  Accelerometer : 1078 lb-sec (4795 Ns)  
Peak Deceleration : 18.9 g's

### COMMENTS:



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Fig. 101



## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-256  
Date : Jun 27, 1978  
Weather : Clear, hot  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 42 ft-6 in (13.0 m)  
Base Diameter : 8 in (20 cm)  
Weight : 285 lb (129 kg)

### BASE:

Type : Transformer/insert  
Manufacturer : Union Metal, Model #2850  
Modifications : Yes/3A2

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 29.8 ft/sec (9.1 m/s)  
Exit Speed : 14.8 ft/sec (4.5 m/s)  
Momentum Change  
  Film : 1067 lb (4746 Ns)  
  Accelerometer : -- \*  
  Peak Deceleration : -- \*

### COMMENTS:

Special "off center hole" round washer enabling mounting on 15 in (38.1 cm) bolt circle

\*Accelerometer data system not functioning

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-257  
Date : Jun 27, 1978  
Weather : Clear, hot  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 42 ft-6 in (13.0 m)  
Base Diameter : 8 in (20 cm)  
Weight : 285 lb (129 kg)

### BASE:

Type : Transformer/insert  
Manufacturer : Union Metal, model #2850  
Modifications : Yes/RF-4

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.7 ft/sec (8.8 m/s)  
Exit Speed : 14.1 ft/sec (4.3 m/s)  
Momentum Change  
  Film : 1036 lb-sec (4608 Ns)  
  Accelerometer : 994 lb-sec (4421 Ns)  
Peak Deceleration : 20.3 g's

### COMMENTS:

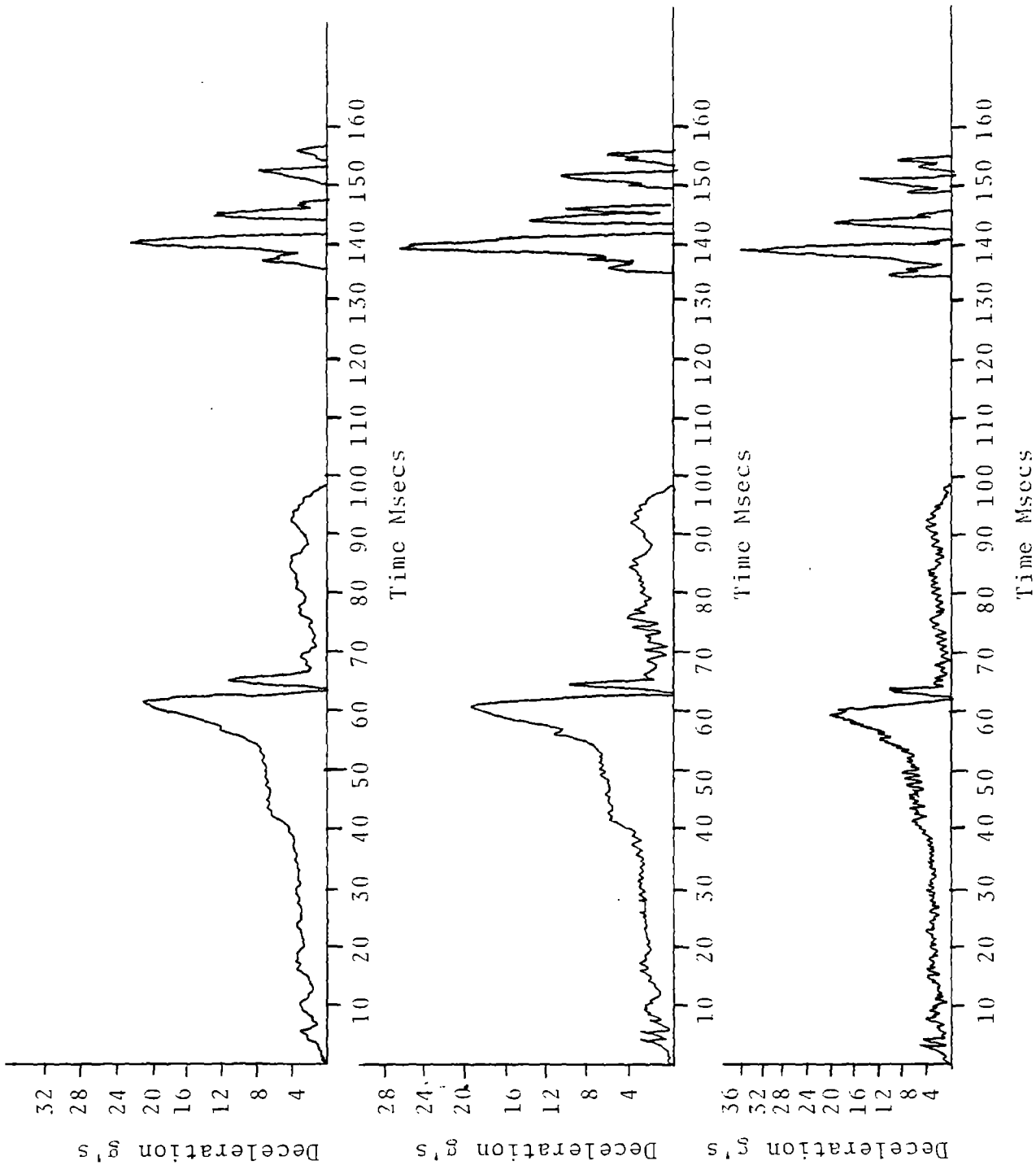


Fig. 102  
Longitudinal Accelerometer Traces for Test 1147-257

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-258  
Date : Jun 27, 1978  
Weather : Hot, clear  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 42 ft-6 in (13.0 m)  
Base Diameter : 8 in (20 cm)  
Weight : 285 lb (129 kg)

BASE:

Type : Transformer/insert  
Manufacturer : Union Metal, Model #2850  
Modifications : Yes/3A2

FASTENERS (Base):

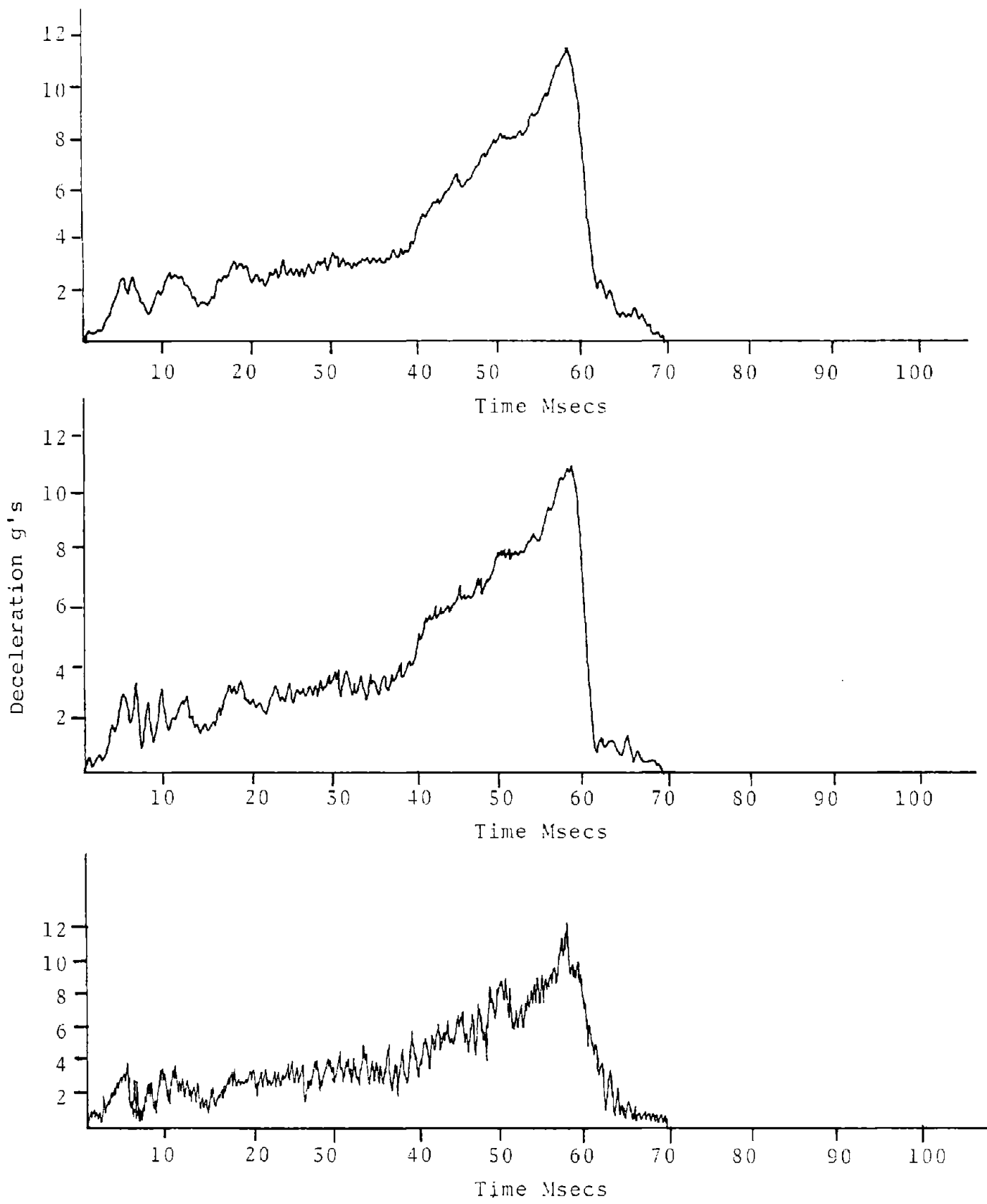
Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 29.2 ft/sec (8.9 m/s)  
Exit Speed : 21.2 ft/sec (6.5 m/s)  
Momentum Change  
Film : 564 lb-sec (2509 Ns)  
Accelerometer : 580 lb-sec (2580 Ns)  
Peak Deceleration : 11.4 g's

COMMENTS:

Impacted at 45° to door side.



. Fig. 103

Longitudinal Accelerometer Traces for Test 1147-258

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number	:	1147-259
Date	:	Jun 30, 1978
Weather	:	Clear, hot
Pendulum Mass	:	2290 lb (1040 kg)

### SUPPORT:

Type	:	Tapered Aluminum Pole
Manufacturer	:	Hapco
Height	:	42 ft-6 in (13.0 m)
Base Diameter	:	8 in (20 cm)
Weight	:	285 lb (129 kg)

### BASE:

Type	:	Transformer/tapered skirt, small
Manufacturer	:	Hapco, Model #145964
Modifications	:	Yes/1A4

### FASTENERS (Base):

Type	:	N/A
Load	:	N/A

### TEST DATA:

Impact Speed	:	30.1 ft/sec (9.2 m/s)
Exit Speed	:	15.1 ft/sec (4.6 m/s)
Momentum Change	:	
Film	:	1067 lb-sec (4746 Ns)
Accelerometer	:	965 lb-sec (4292 Ns)
Peak Deceleration	:	19.0 g's

### COMMENTS:

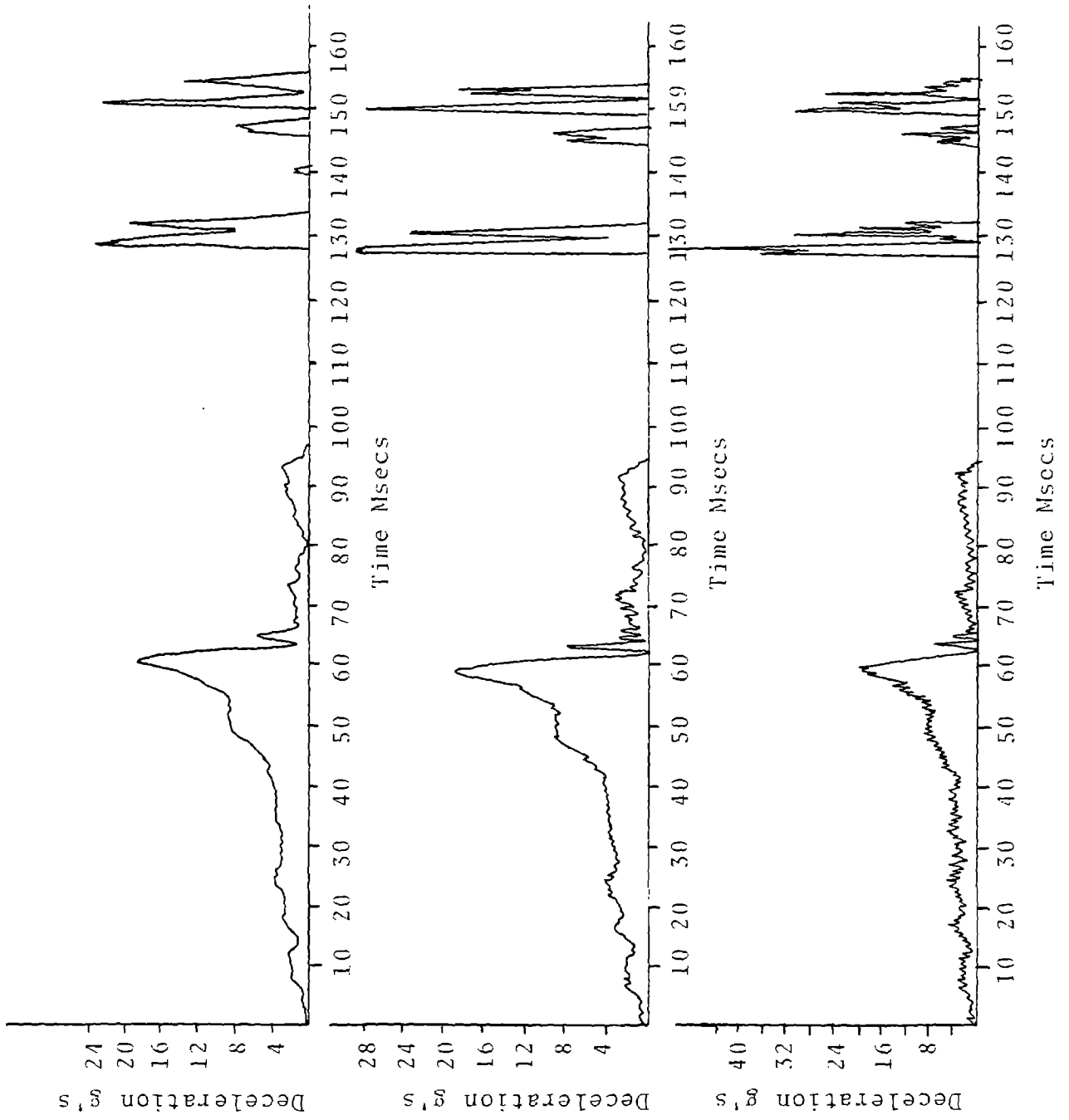


Fig. 104

Longitudinal Accelerometer Traces for Test 1147-259

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-260  
Date : Jun 30, 1978  
Weather : Clear, hot  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 12 ft-6 in (13.0 m)  
Base Diameter : 8 in (20 cm)  
Weight : 285 lb (129 kg)

### BASE:

Type : Transformer/insert  
Manufacturer : Union Metal, Model #2850  
Modifications : Yes/RF-5

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 30.5 ft/sec (9.3 m/s)  
Exit Speed : 15.4 ft/sec (4.7 m/s)  
Momentum Change  
  Film : 1078 lb-sec (4795 Ns)  
  Accelerometer : 936 lb-sec (4163 Ns)  
Peak Deceleration : 12.0 g's

### COMMENTS:



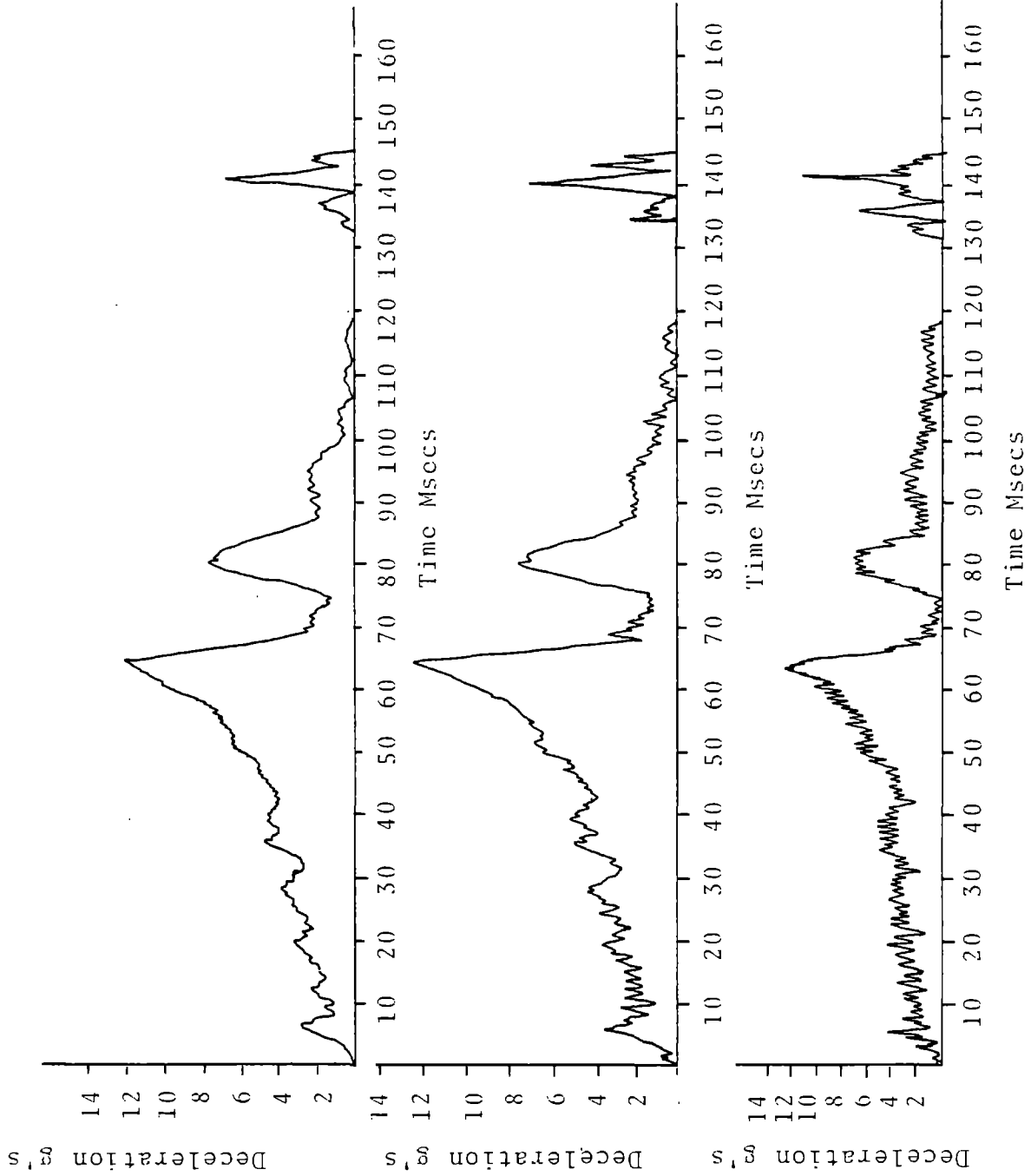


Fig. 105

Longitudinal Accelerometer Traces for Test 1147-260

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number	:	1147-261
Date	:	Jul 10, 1978
Weather	:	Clear, hot
Pendulum Mass	:	2290 lb (1040 kg)

### SUPPORT:

Type	:	Tapered Steel Pole
Manufacturer	:	Valmont
Height	:	47 ft (14.3 m)
Base Diameter	:	10.5 ft (27 cm)
Weight	:	432 lb (196 kg)

### BASE:

Type	:	Transformer/prototype
Manufacturer	:	Valmont, breakaway base
Modifications	:	None

### FASTENERS (Base):

Type	:	N/A
Load	:	N/A

### TEST DATA:

Impact Speed	:	29.8 ft/sec (9.1 m/s)
Exit Speed	:	15.6 ft/sec (4.8 m/s)
Momentum Change	:	
Film	:	1011 lb-sec (4497 Ns)
Accelerometer	:	1113 lb-sec (4951 Ns)
Peak Deceleration	:	14.1 g's

### COMMENTS:

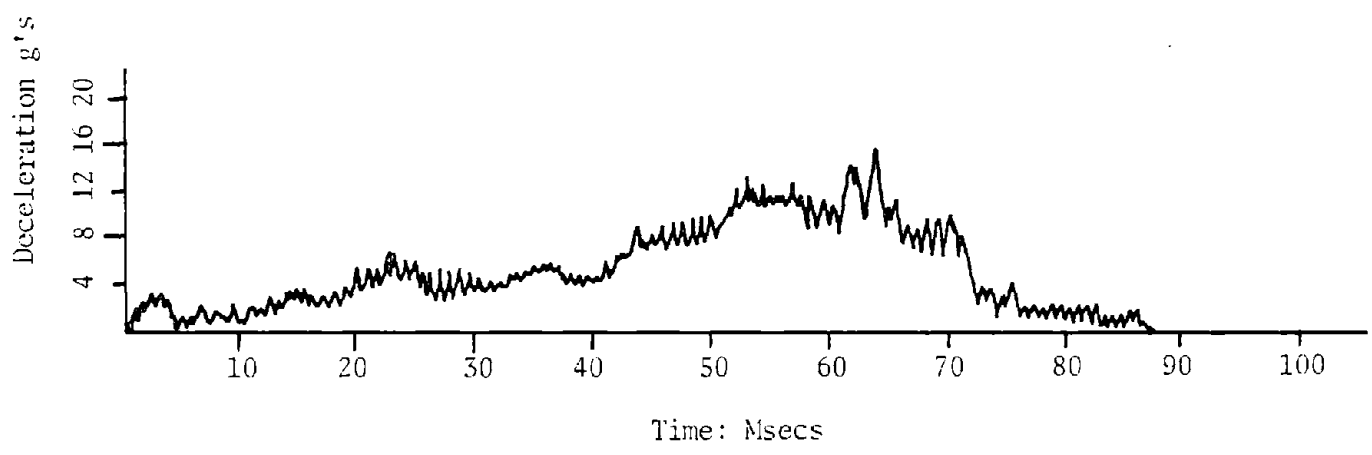
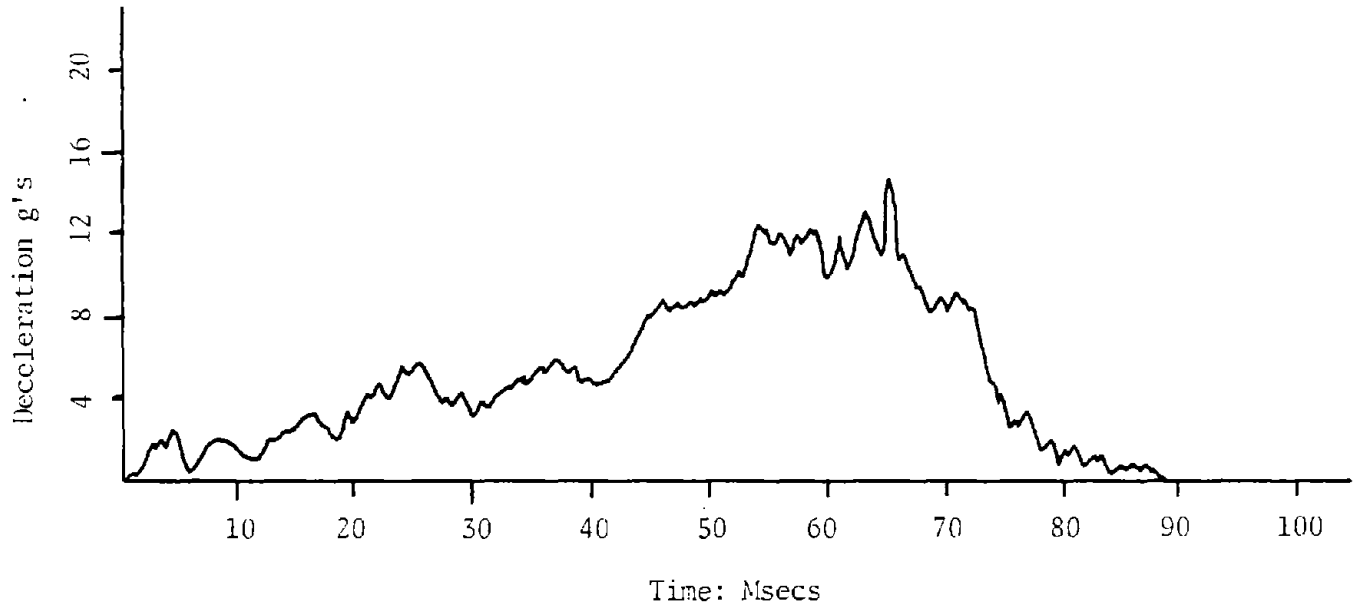
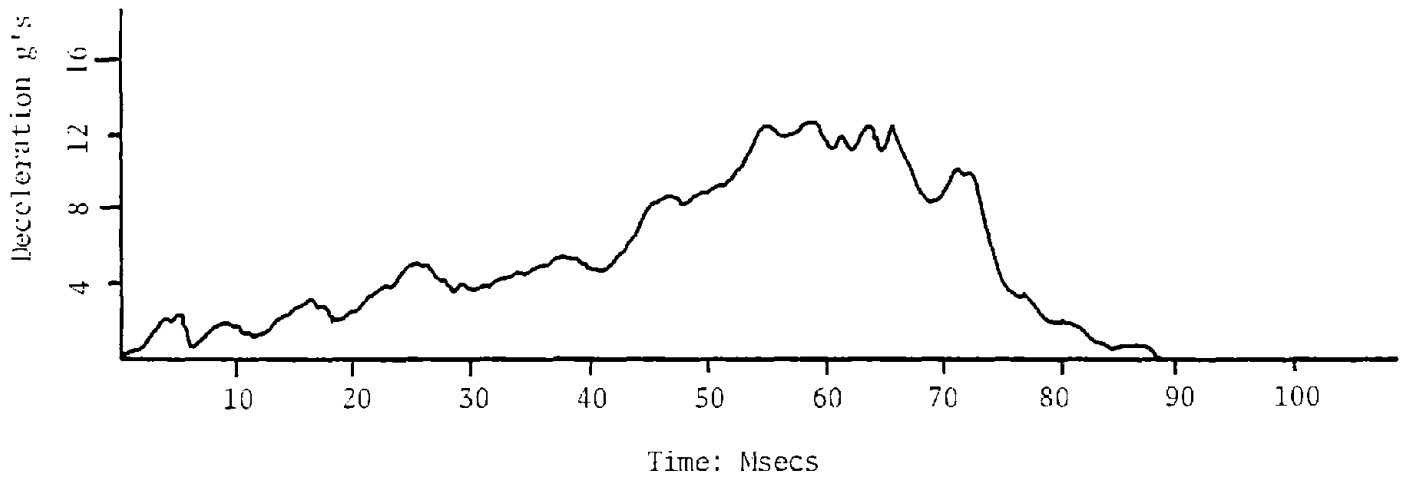


Fig. 106  
 Longitudinal Accelerometer Traces for Test 1147-261

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number	:	1147-262
Date	:	Jul 10, 1978
Weather	:	Clear, hot
Pendulum Mass	:	2290 lb (1040 kg)

### SUPPORT:

Type	:	Tapered Steel Pole
Manufacturer	:	Valmont
Height	:	47 ft (14.3 m)
Base Diameter	:	10.5 in (27 cm)
Weight	:	432 lb (196 kg)

### BASE:

Type	:	Transformer/prototype
Manufacturer	:	Valmont/breakaway base
Modifications	:	None

### FASTENERS (Base):

Type	:	N/A
Load	:	N/A

### TEST DATA:

Impact Speed	:	29.4 ft/sec (9.0 m/s)
Exit Speed	:	7.2 ft/sec (2.2 m/s)
Momentum Change	:	
Film	:	1580 lb-sec (7028 Ns)
Accelerometer	:	1619 lb-sec (7201 Ns)
Peak Deceleration	:	20.6 g's

### COMMENTS:

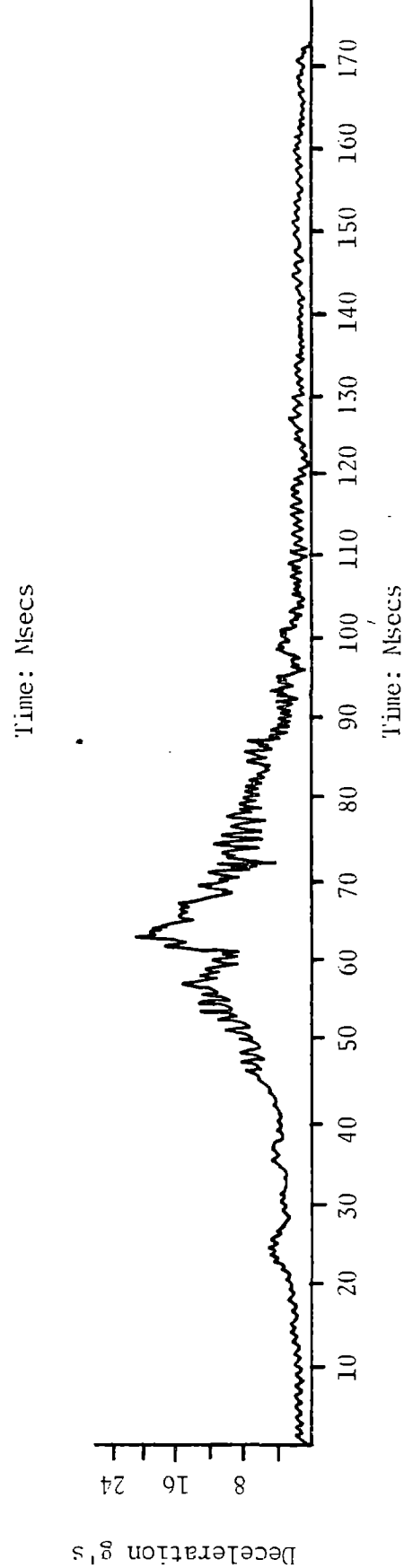
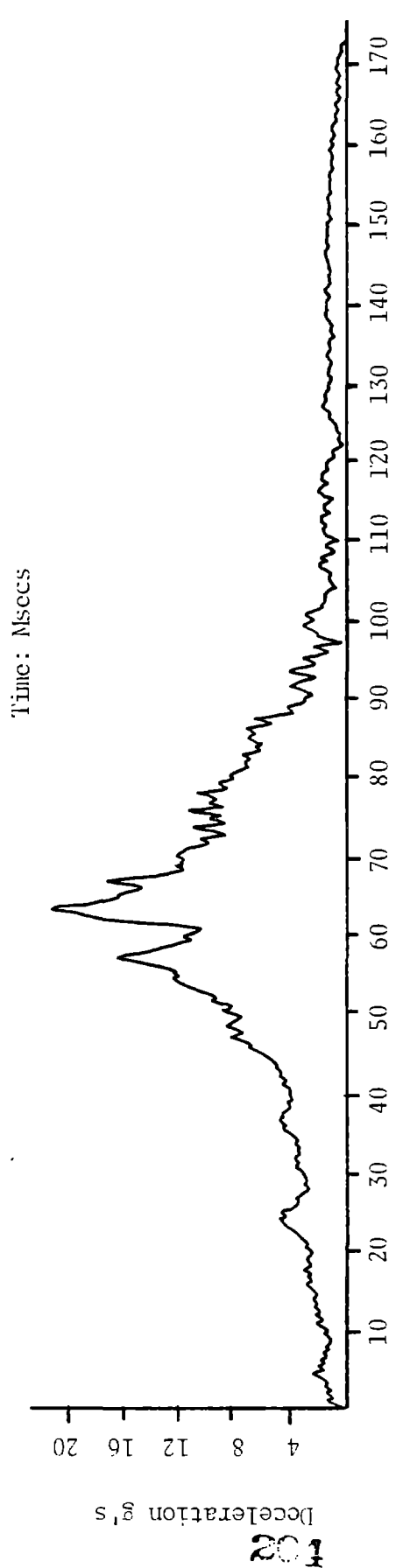
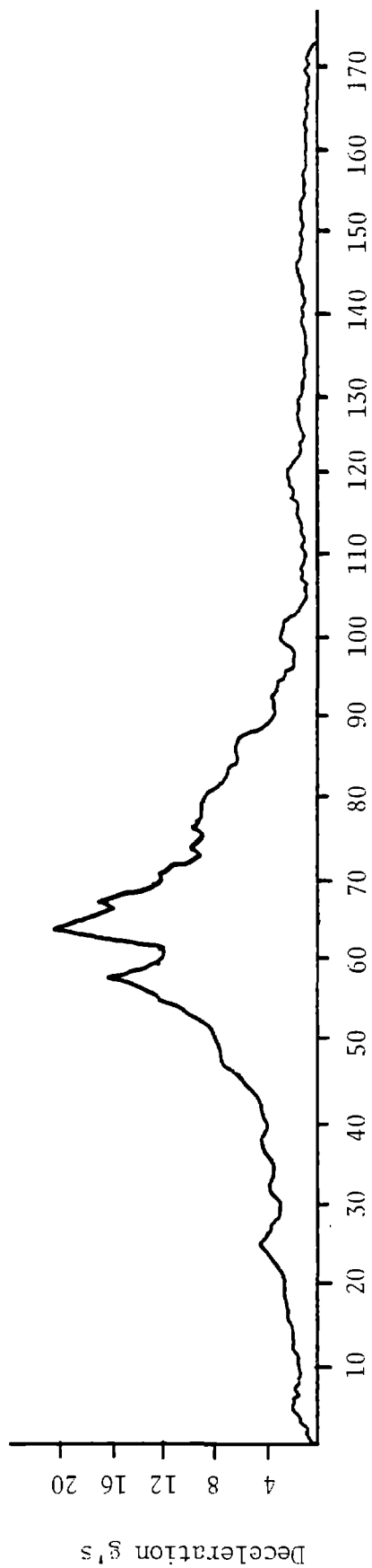


Fig. 107  
 Longitudinal Accelerometer Traces for Test 1147-262

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-263  
Date : Jul 19, 1978  
Weather : Clear, warm  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 42 ft-6 in (13.0 m)  
Base Diameter : 8 in (20 cm)  
Weight : 285 lb (129 kg)

### BASE:

Type : Transformer/tapered skirt, small  
Manufacturer : Pole Lite, Model # TB-20-8  
Modifications : Yes/1D3

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 29.1 ft/sec (8.9 m/s)  
Exit Speed : 20.0 ft/sec (6.1 m/s)  
Momentum Change  
  Film : 649 lb-sec (2887 Ns)  
  Accelerometer : 692 lb-sec (3078 Ns)  
Peak Deceleration : 15.5 g's

### COMMENTS:

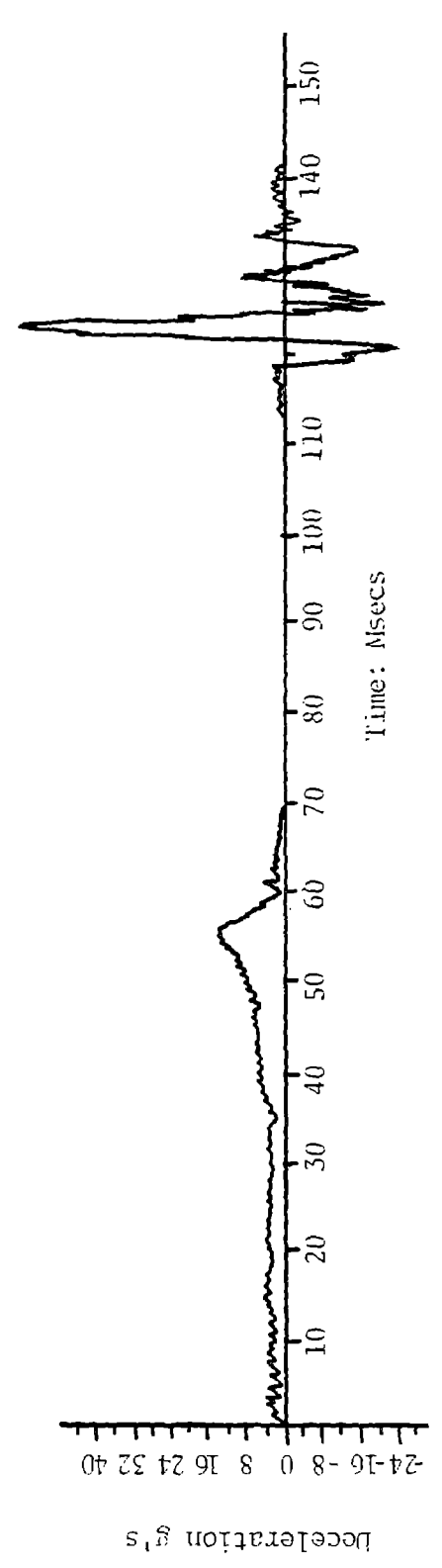
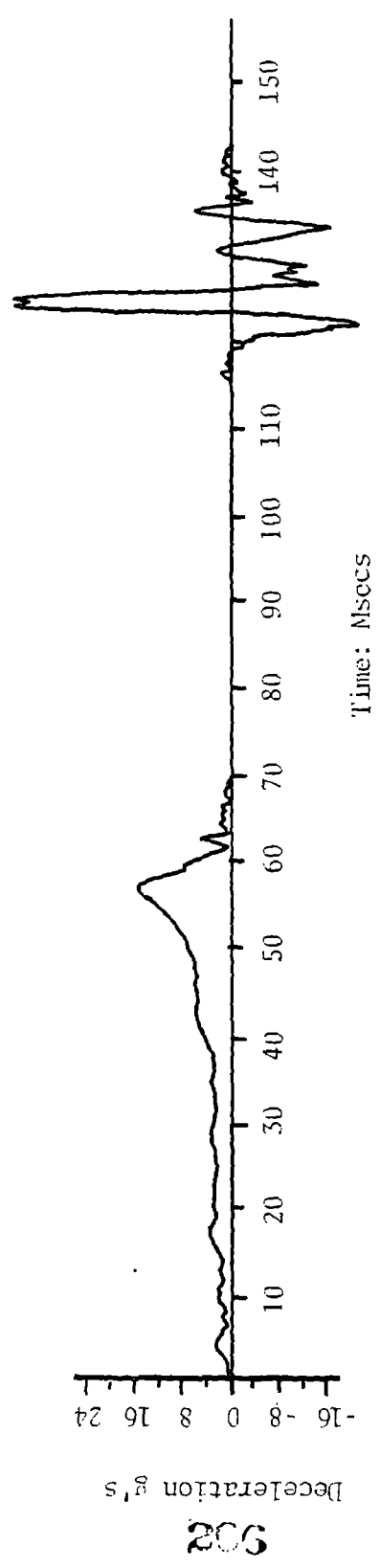
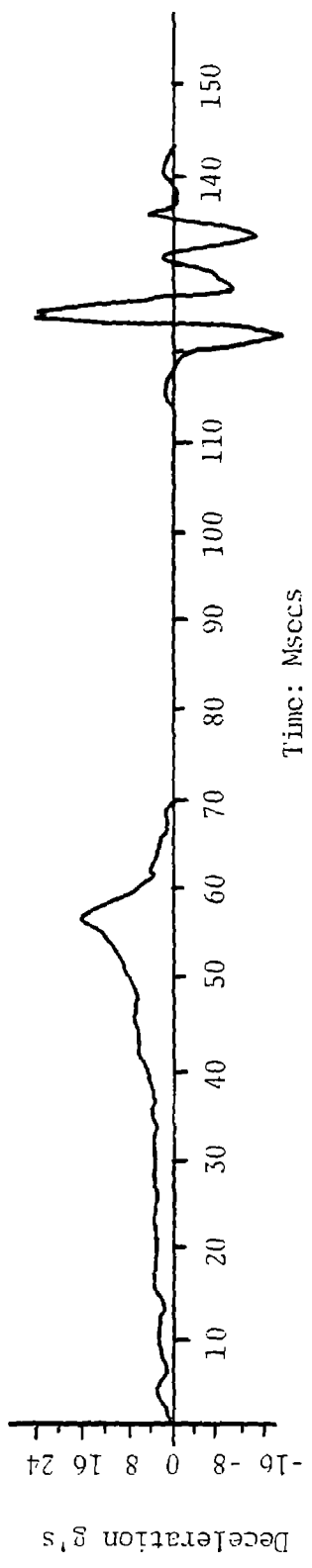


Fig. 108

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-264  
Date : Jul 19, 1978  
Weather : Clear, hot  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 50 ft-9 in (15.5 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 420 lb (191 kg)

### BASE:

Type : Transformer/tapered skirt  
with Beltline Weld, large  
Manufacturer : Pfaff & Kendall, Model #TB-4  
Modifications : Yes/2B1

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.7 ft/sec (8.8 m/s)  
Exit Speed : 12.5 ft/sec (3.8 m/s)  
Momentum Change : 1154 lb-sec (5133 Ns)  
Film : 1182 lb-sec (5258 Ns)  
Accelerometer : 28.6 g's  
Peak Deceleration :

### COMMENTS:



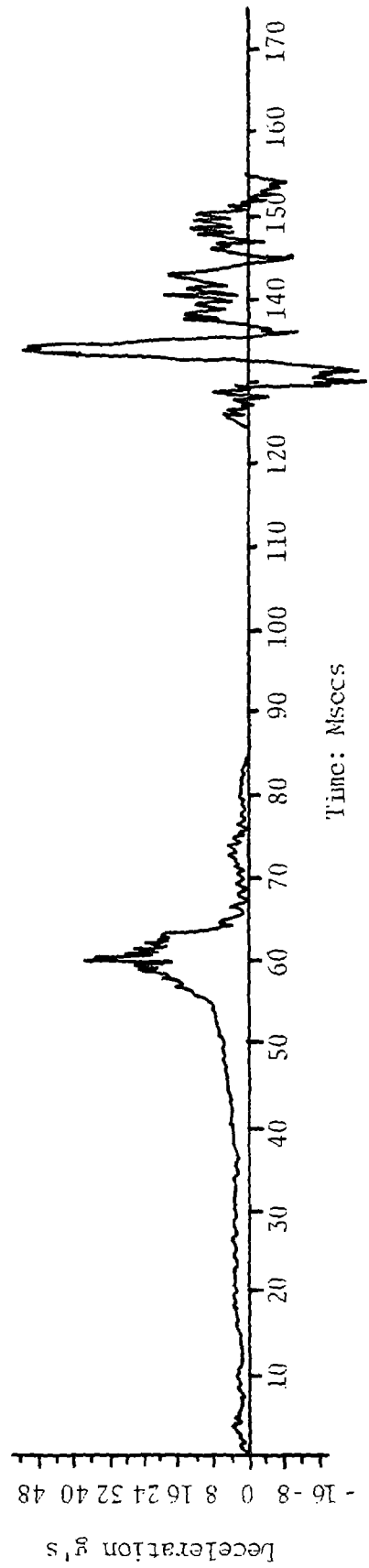
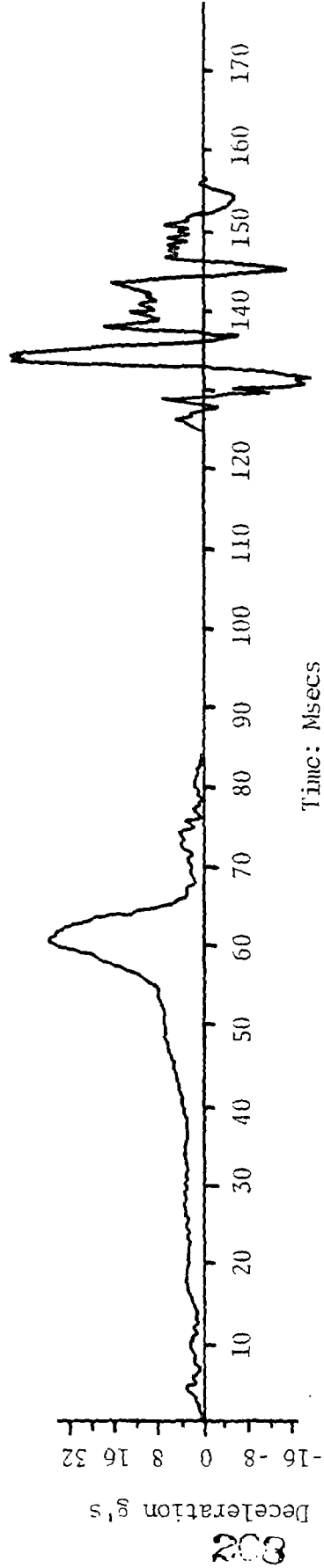
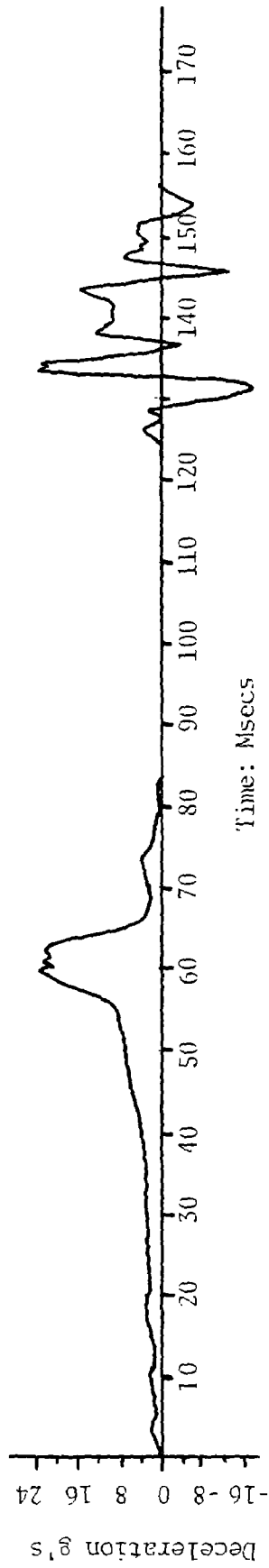


Fig. 109  
 Longitudinal Accelerometer Traces for Test 1147-264

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-265  
Date : Aug 1, 1978  
Weather : Cloudy  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 50 ft-9 in (15.5 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 420 lb (191 kg)

### BASE:

Type : Transformer/tapered skirt  
with Beltline Weld, Large  
Manufacturer : Pfaff & Kendall, Model TB-4  
Modifications : Yes/2B2

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 30.3 ft/sec (9.2 m/s)  
Exit Speed : 17.5 f/s (5.3 m/s)  
Momentum Change  
Film : 910 lb-sec (4048 Ns)  
Accelerometer : 833 lb-sec (3705 Ns)  
Peak Deceleration : 18.9 g's

### COMMENTS:

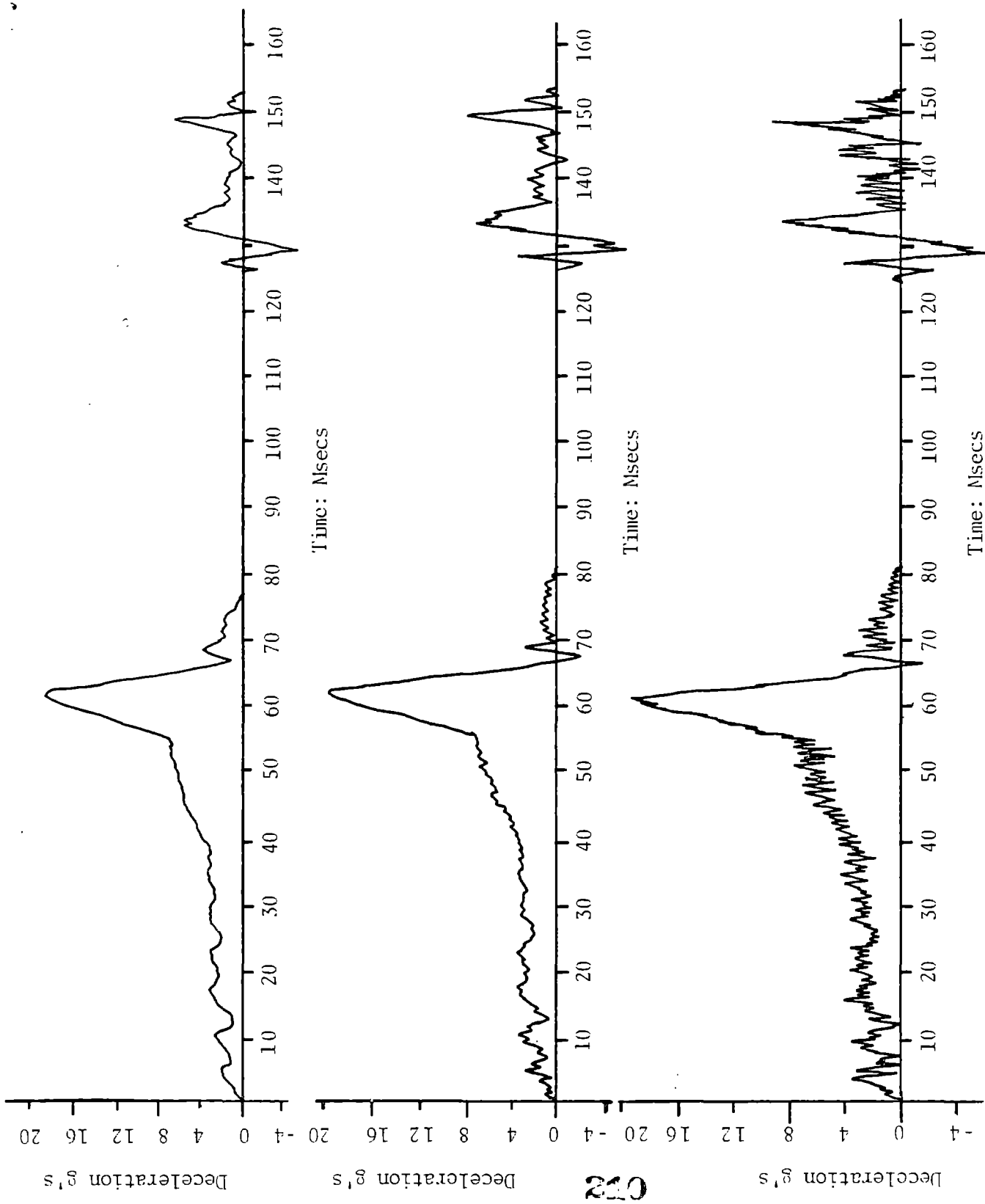


Fig. 110

Longitudinal Accelerometer Traces for Test 1147-265

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-266  
Date : Aug 30, 1978  
Weather : Overcast  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 50 ft-9 in (15.5 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 420 lb (420 kg)

### BASE:

Type : Transformer/tapered skirt  
with Beltline Weld, Large  
Manufacturer : Pfaff & Kendall, Model #TB-4  
Modifications : Yes/2B2

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.9 ft/sec (8.8 m/s)  
Exit Speed : 16.1 ft/sec (4.9 m/s)  
Momentum Change  
Film : 910 lb-sec (4049 Ns)  
Accelerometer : 982 lb-sec (4368 Ns)  
Peak Deceleration : 24.8 g's

### COMMENTS:

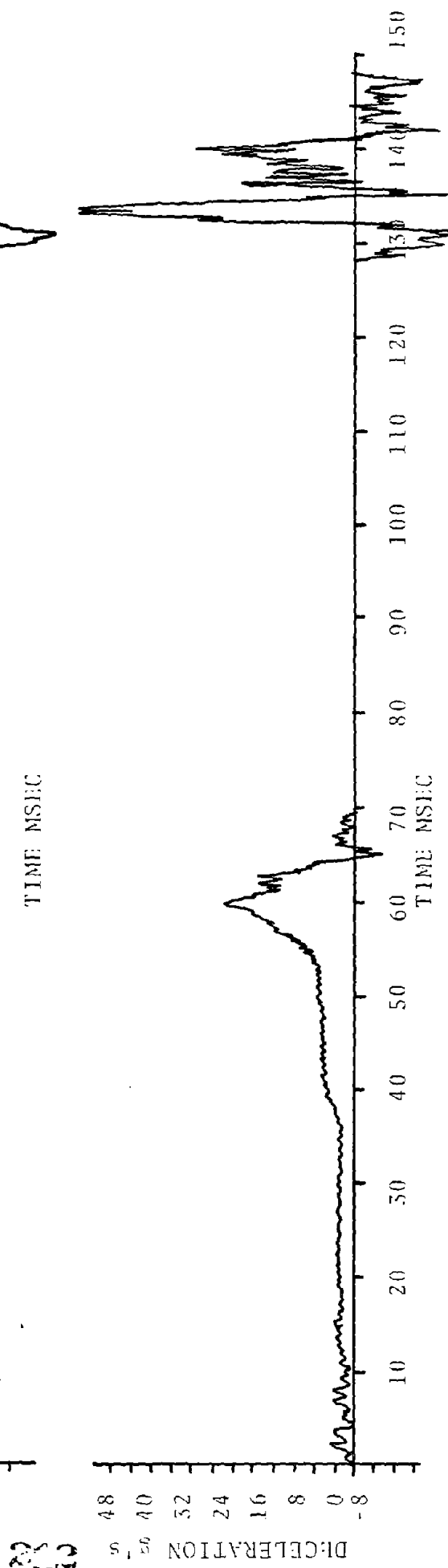
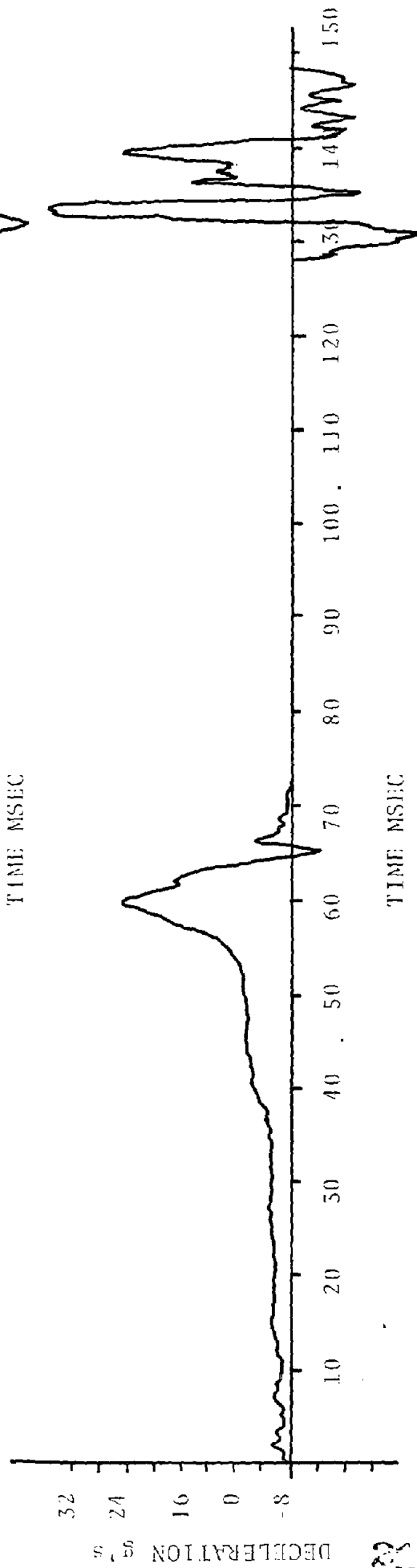
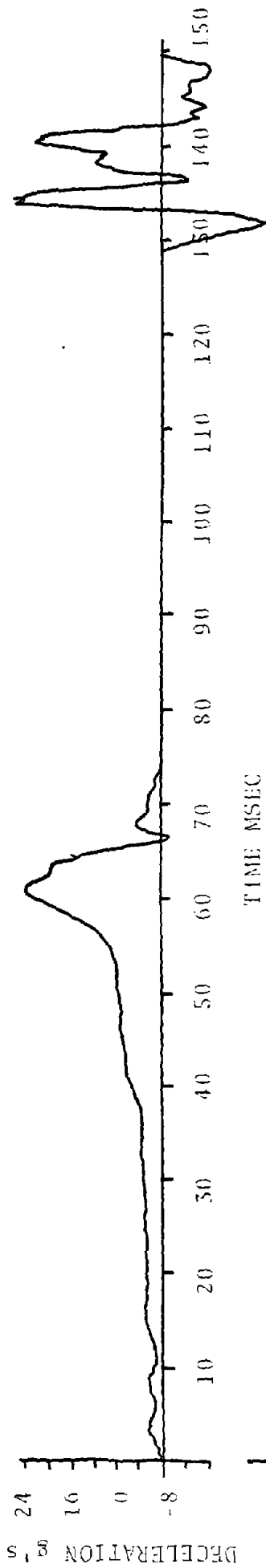


Fig. 111

Longitudinal Acceleration Traces for Test 1147-266

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-301  
Date : Oct 28, 1977  
Weather : Warm, clear  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Kaiser AT-50  
Height : 44 ft - 8 in (13.6 m)  
Base Diameter : 13.5 in (34 cm)  
Weight : 220 (100 kg)

BASE:

Type : Flange base/with integral riser  
Manufacturer : Kaiser  
Modifications : None

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 28.9 ft/sec (8.8 m/s)  
Exit Speed : 6.1 ft/sec (1.9 m/s)  
Momentum Change  
  Film : 1624 lb-sec (7224 Ns)  
  Accelerometer : 1596 lb-sec (7099 Ns)  
Peak Deceleration : 16 g's

COMMENTS:

DECELERATION g's

DECELERATION g's

DECELERATION g's

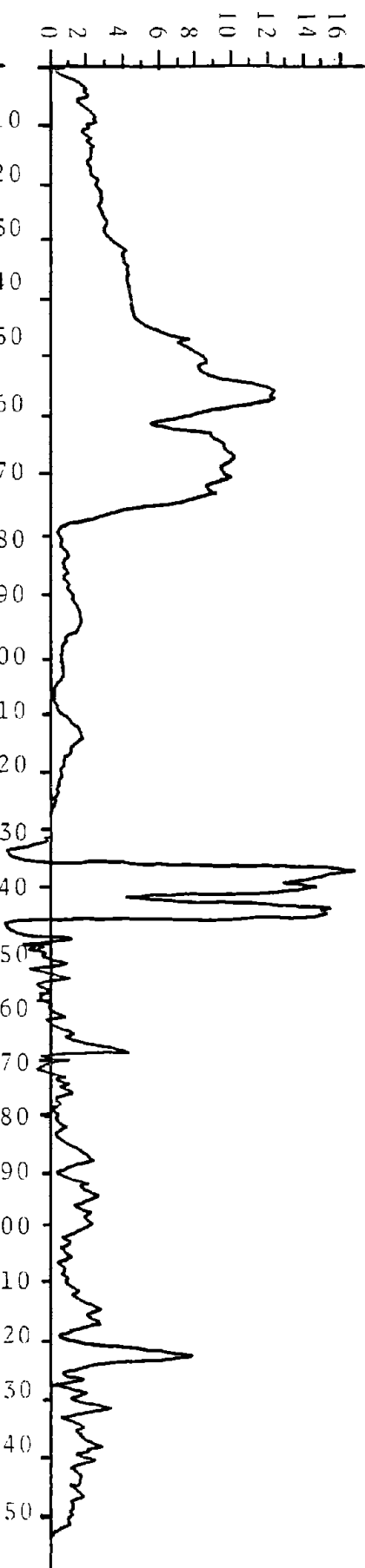
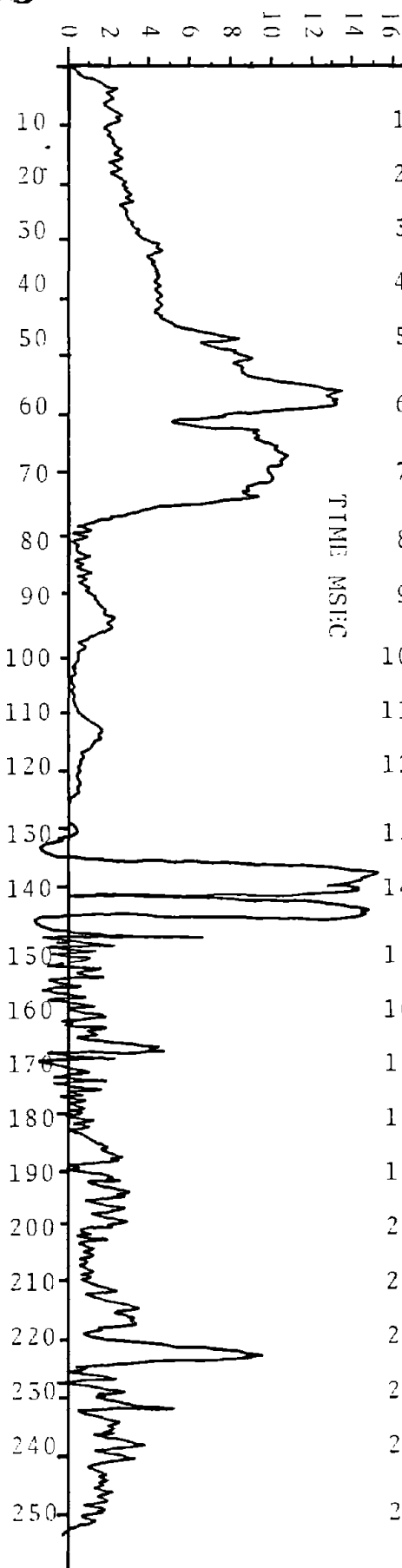
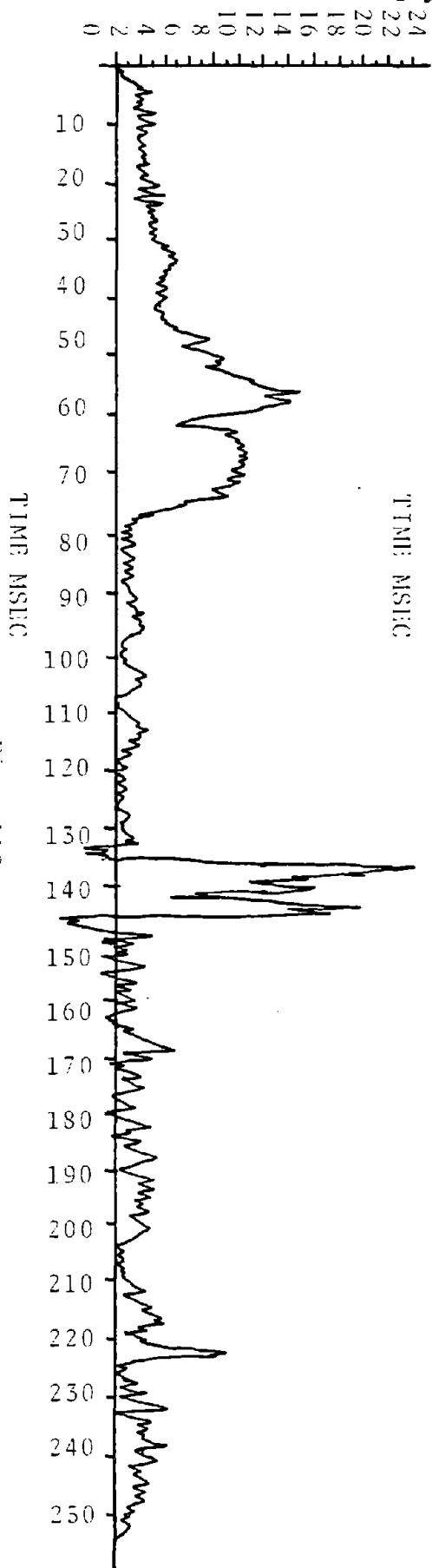


Fig. 112

Longitudinal Accelerometer Traces for Test 1147-301

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-302  
Date : Oct 28, 1977  
Weather : Warm, partly cloudy  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 28 ft (8.5 m)  
Base Diameter : 8 in (20 cm)  
Weight : 145 lb (66 kg)

BASE:

Type : Flange  
Manufacturer : Hapco  
Modifications : None

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 29.1 ft/sec (8.9 m/s)  
Exit Speed : 18.5 ft/sec (5.6 m/s)  
Momentum Change  
Film : 749 lb-sec (3332 Ns)  
Accelerometer : 777 lb-sec (3456 Ns)  
Peak Deceleration : 8.1 g's

COMMENTS:



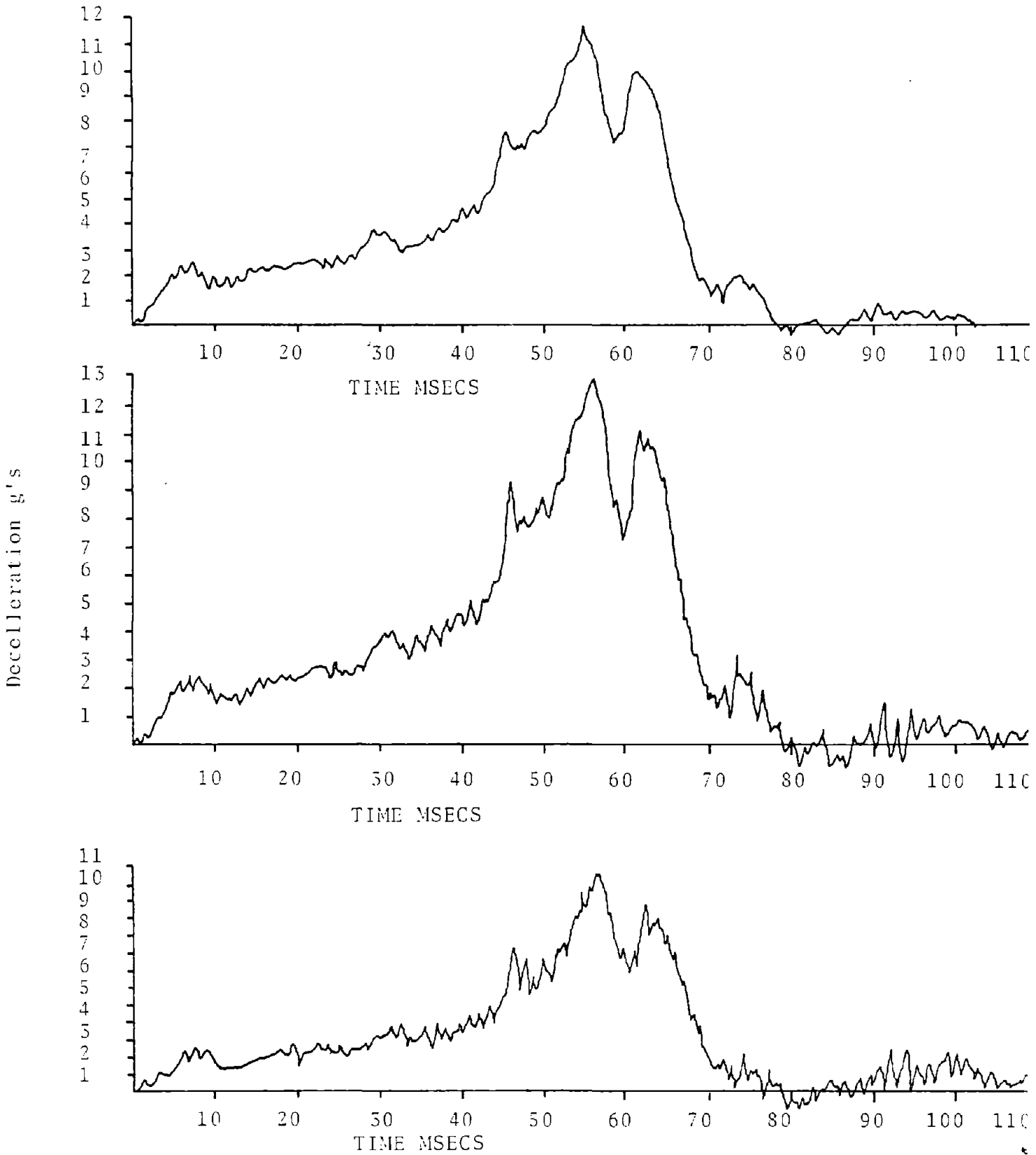


Fig. 113  
 Longitudinal Accelerometer Traces for Test 1147-302

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-303  
Date : Mar 13, 1978  
Weather : Clear, warm  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 23 ft (7 m)  
Base Diameter : 7 in (18 cm)  
Weight : 110 (50 kg)

### BASE:

Type : Flange  
Manufacturer : Hapco  
Modifications : None

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 29.6 ft/sec (9.0 m/s)  
Exit Speed : 17.7 ft/sec (5.4 m/s)  
Momentum Change  
  Film : 842 lb-sec (3742 Ns)  
  Accelerometer : 774 lb-sec (3443 Ns)  
Peak Deceleration : 12.1 g's

### COMMENTS:

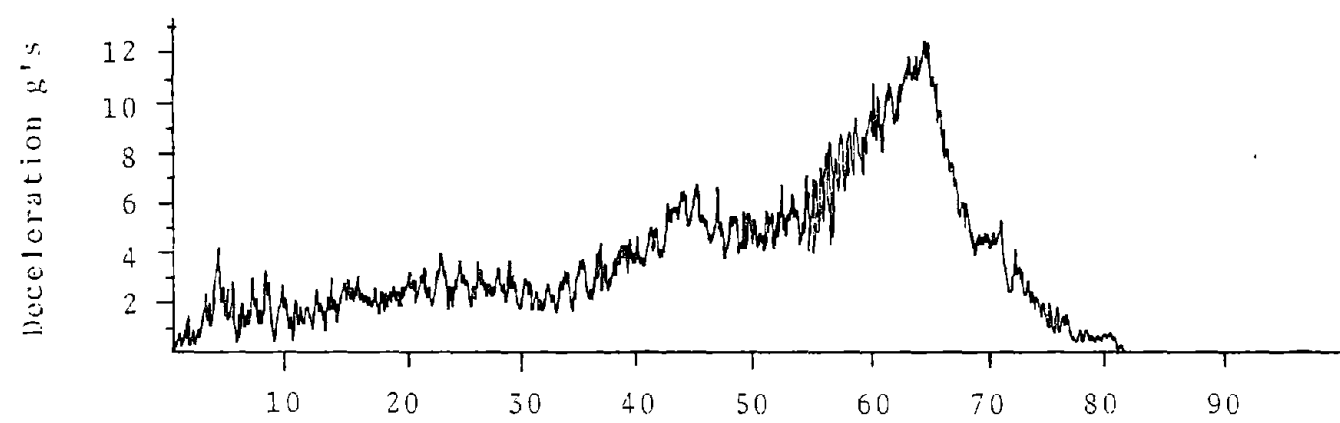
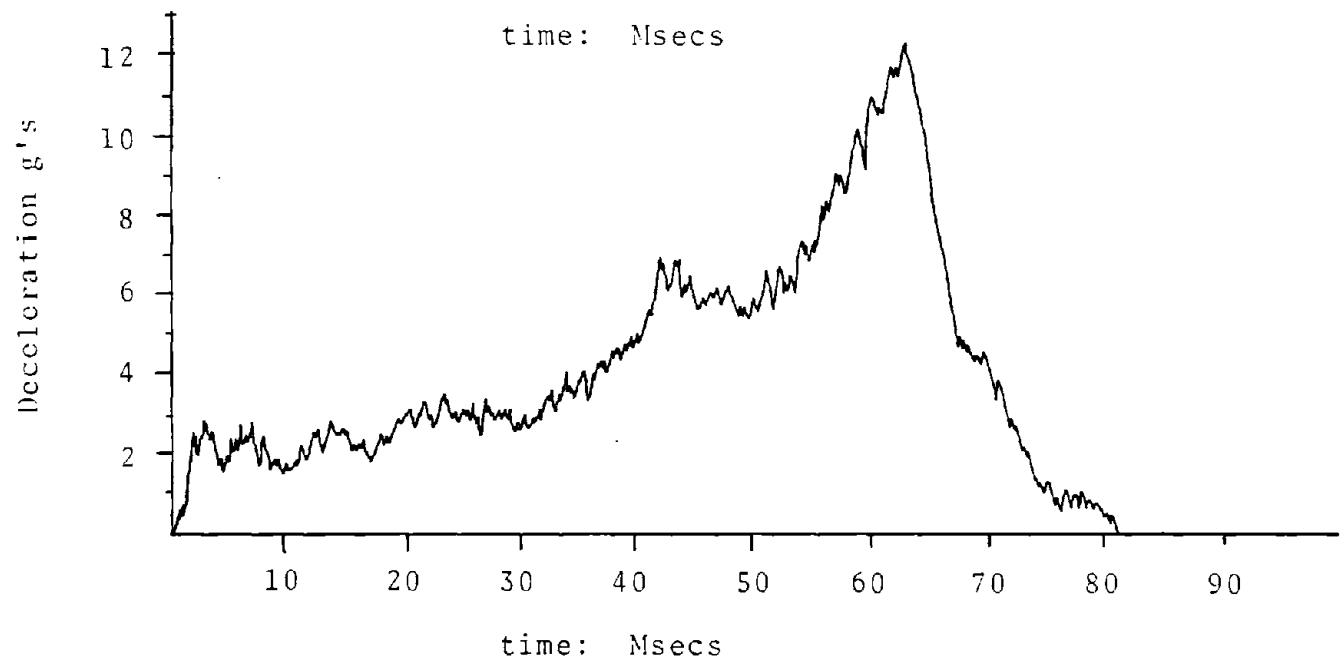
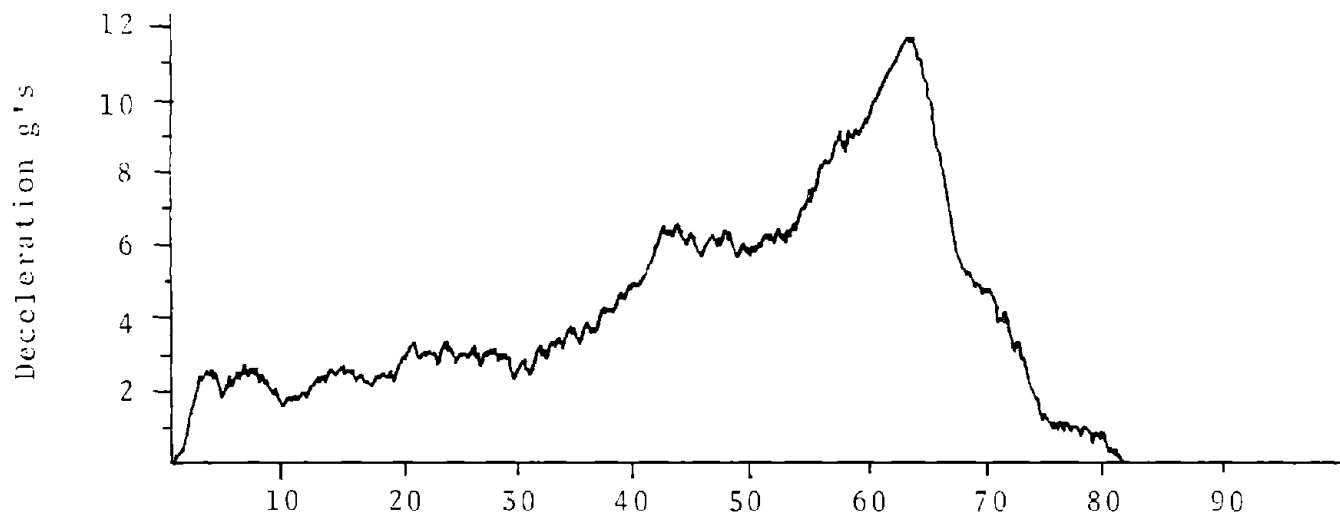


Fig. 114  
Longitudinal Accelerometer Traces for Test 1147-303

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-401  
Date : Jun 21, 1977  
Weather : Clear, hot  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered octaflute stainless steel  
pole with integral mast arm  
Manufacturer : Millerbernd  
Height : 40.5 ft (12.4 m)  
Base Diameter : 9.6 in (24 cm)  
Weight : 396 lb (180 kg) (with base)

BASE:

Type : Progressive shear/stainless steel  
Manufacturer : Millerbernd/H small  
Modifications : None

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 29.1 ft/sec (8.9 m/s)  
Exit Speed : 22.1 ft/sec (6.7 m/s)  
Momentum Change  
Film : 498 lb-sec (2215 Ns)  
Accelerometer : 580 lb-sec (2580 Ns)  
Peak Deceleration : 6.5 g's

COMMENTS:

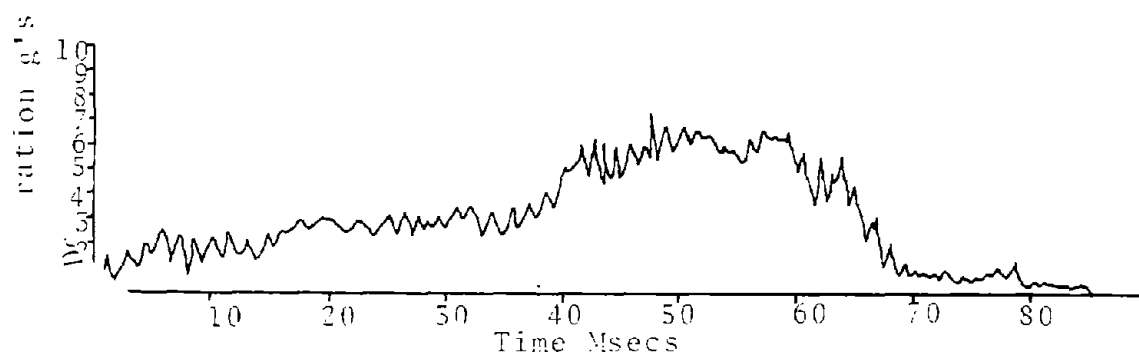
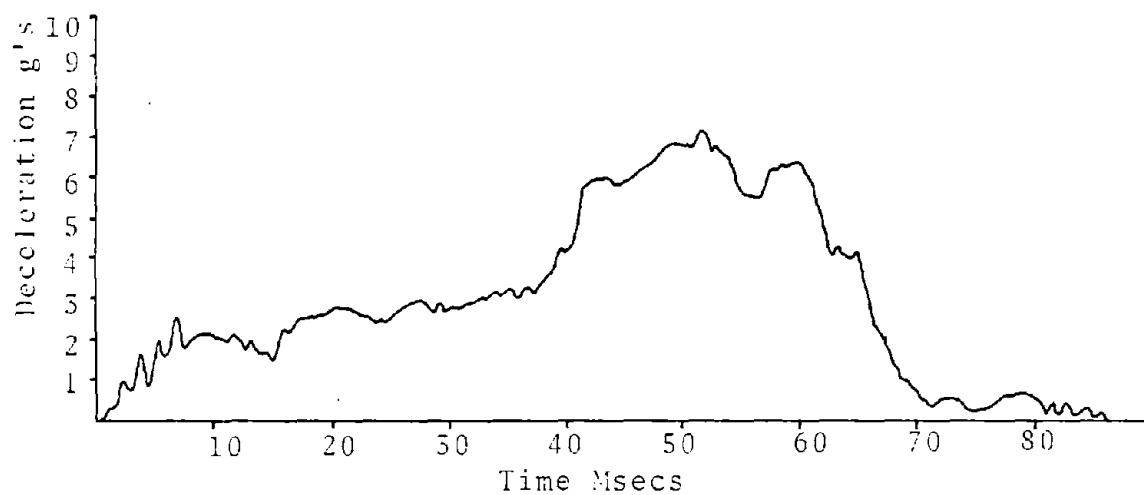
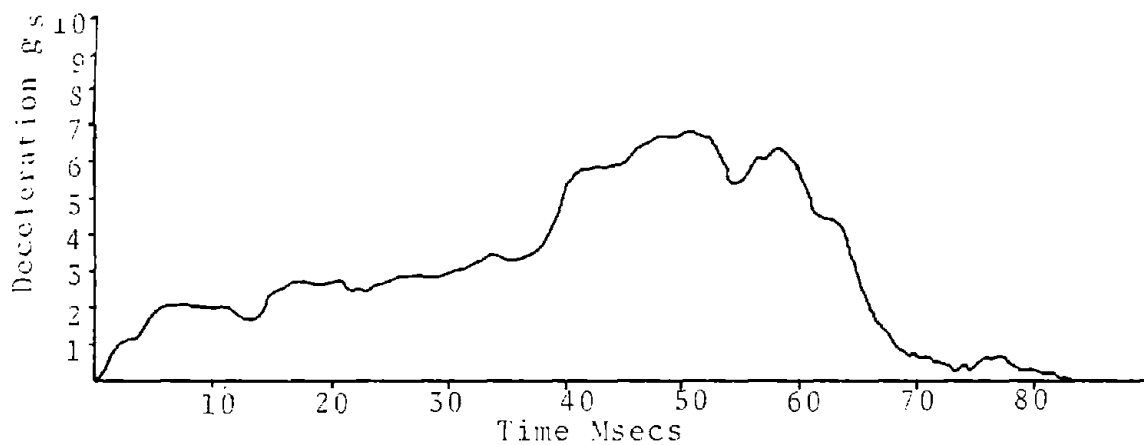


Fig. 115  
 Longitudinal Accelerometer Traces for Test 1147-401

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-402  
Date : Jun 21, 1977  
Weather : Sunny, warm  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered octaflute stainless steel  
with integral mast arm  
Manufacturer : Millerbernd  
Height : 40.5 ft (12.4 m)  
Base Diameter : 9.6 in (24 cm)  
Weight : 396 lb (180 kg) (with base)

### BASE:

Type : Progresssive shear/stainless steel  
Manufacturer : Millerbernd/H small  
Modifications : None

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 29.5 ft/sec (9 m/s)  
Exit Speed : 20.2 ft/sec (6.2 m/s)  
Momentum Change :  
    Film : 661 lb-sec (2942 Ns)  
    Accelerometer : 612 lb-sec (2722 Ns)  
Peak Deceleration : 7.5 g's

### COMMENTS:

Impact 45° from door side plane.

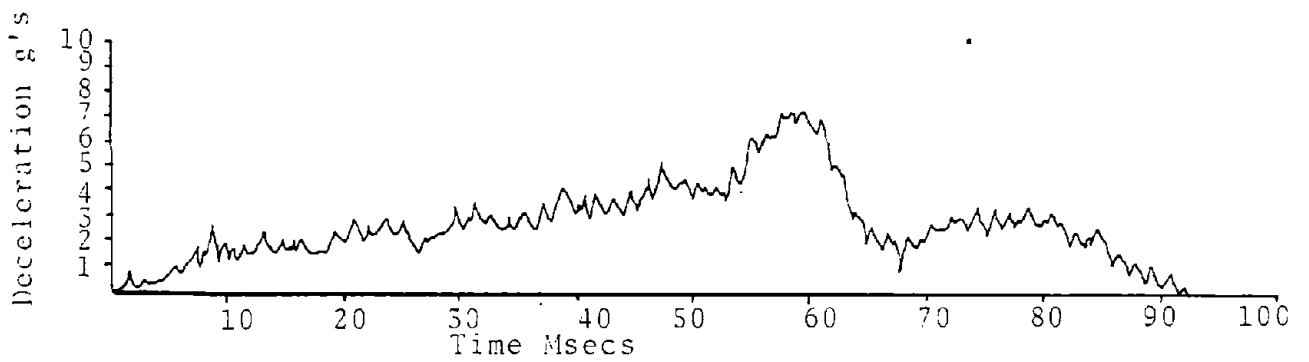
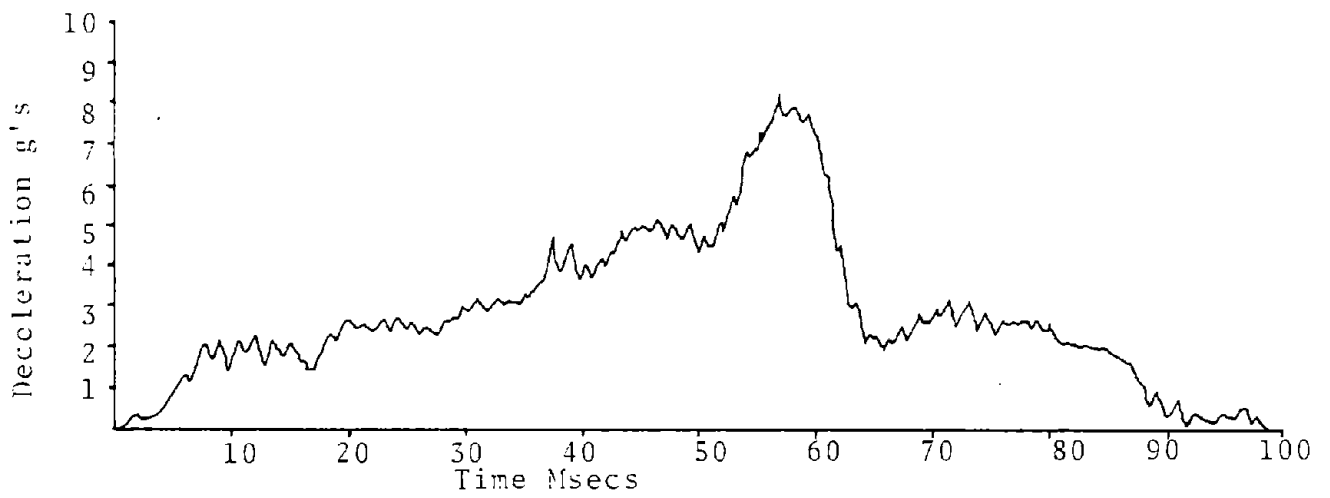
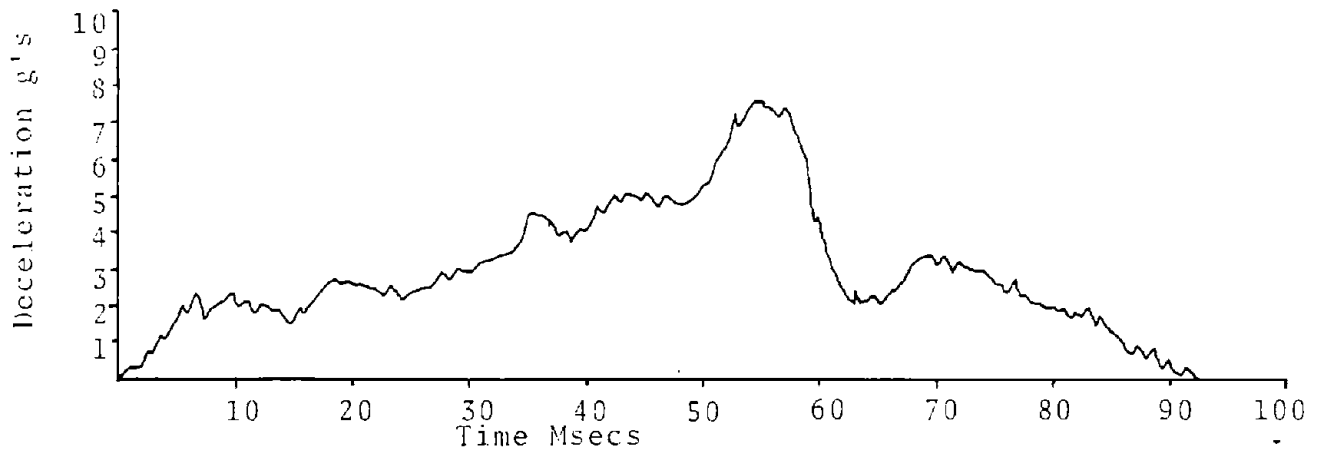


Fig. 116  
Longitudinal Accelerometer Traces for Test 1147-402

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-403  
Date : Aug 19, 1977  
Weather : Sunny, mild  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered octaflute stainless steel pole  
Manufacturer : Millerbernd  
Height : 35 ft-1½ in (10.7 m)  
Base Diameter : 10 ¾ in (27 cm)  
Weight : 220 lb (100 kg)

BASE:

Type : Progressive shear/stainless steel  
Manufacturer : Millerbernd/H large  
Modifications : None

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 28.1 ft/sec (8.6 m/s)  
Exit Speed : 17.6 ft/sec (5.4 m/s)  
Momentum Change :  
    Film : 733 lb-sec (3260 Ns)  
    Accelerometer : 703 lb-sec (3127 Ns)  
Peak Deceleration : 7.7 g's

COMMENTS:



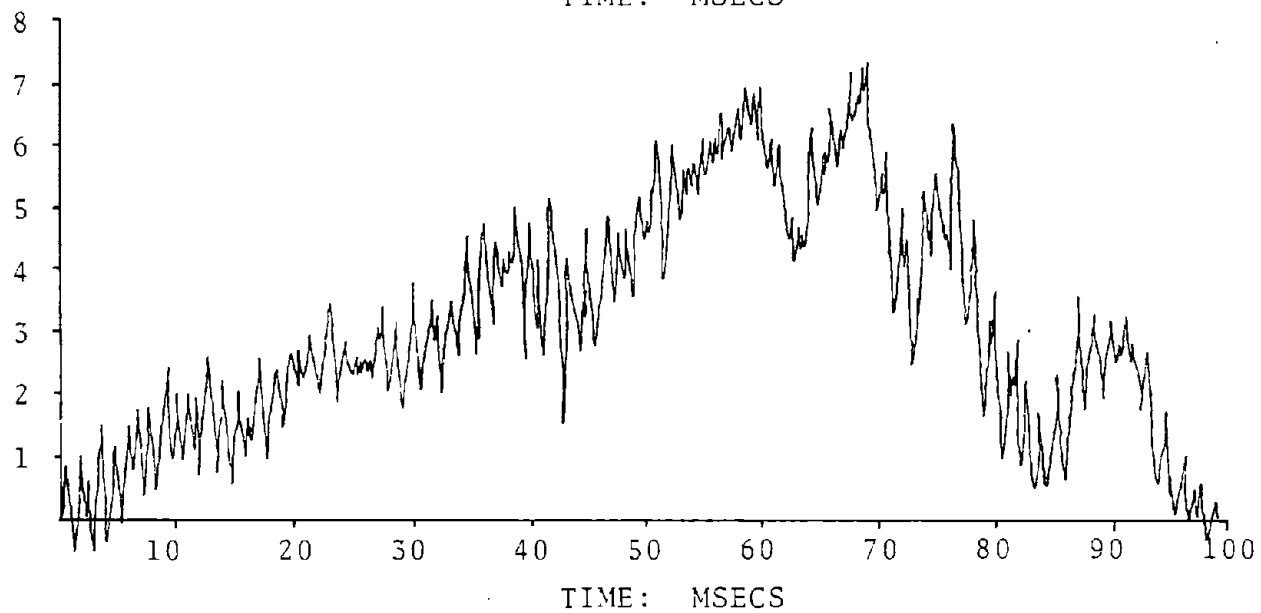
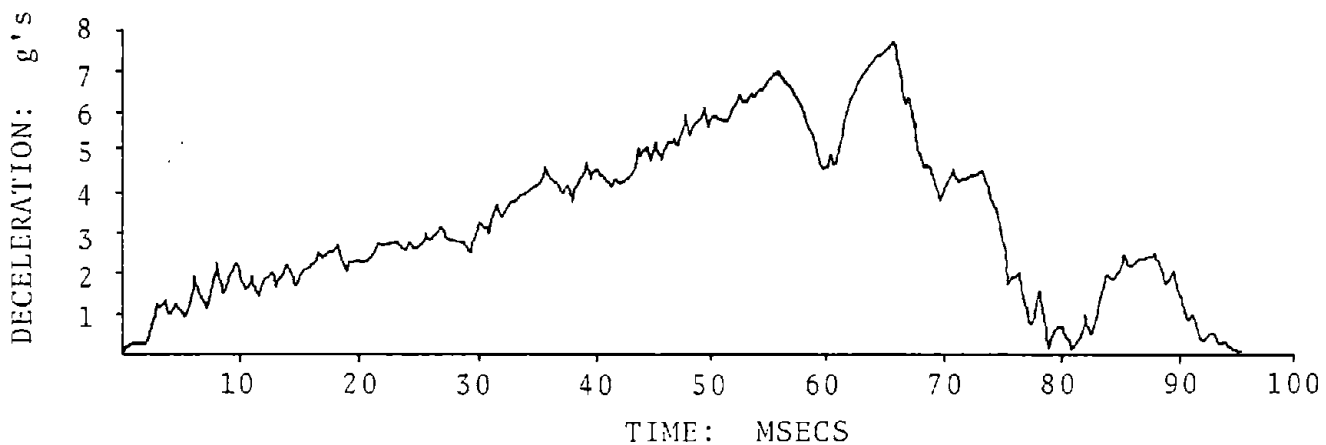
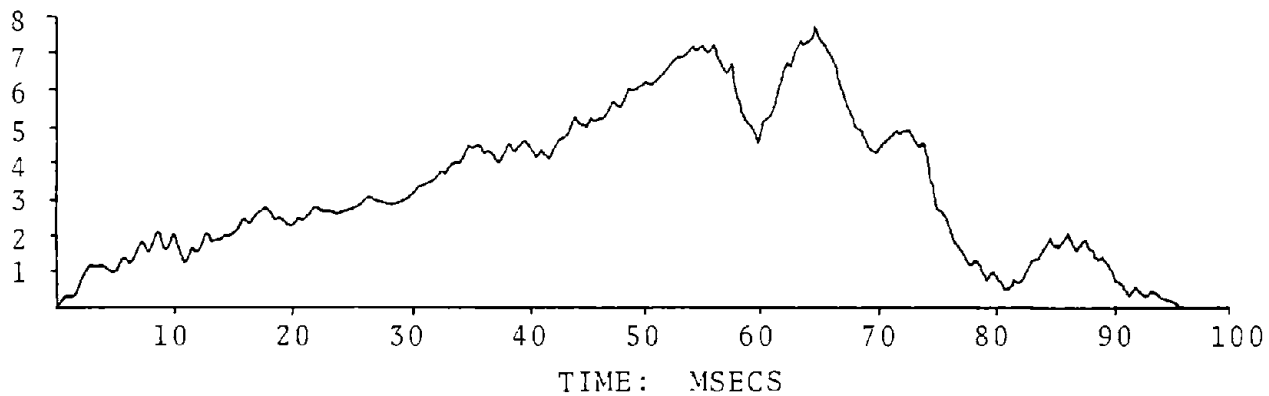


Fig. 117  
Longitudinal Accelerometer Traces for Test 1147-405

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-404  
Date : Nov 9, 1977  
Weather : Cloudy, mild  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered octaflute steel pole  
Manufacturer : Millerbernd  
Height : 43 ft (13.1 m)  
Base Diameter : 8.6 in (22 cm)  
Weight : 384 lb (174 kg)

BASE:

Type : Progressive shear/steel  
Manufacturer : Millerbernd/T-large  
Modifications : None

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 29.0 ft/sec (8.8 m/s)  
Exit Speed : 17.3 ft/sec (5.3 m/s)  
Momentum Change :  
    Film : 832 lb-sec (3701 Ns)  
    Accelerometer : 984 lb-sec (4377 Ns)  
Peak Deceleration : 8.9 g's

COMMENTS:

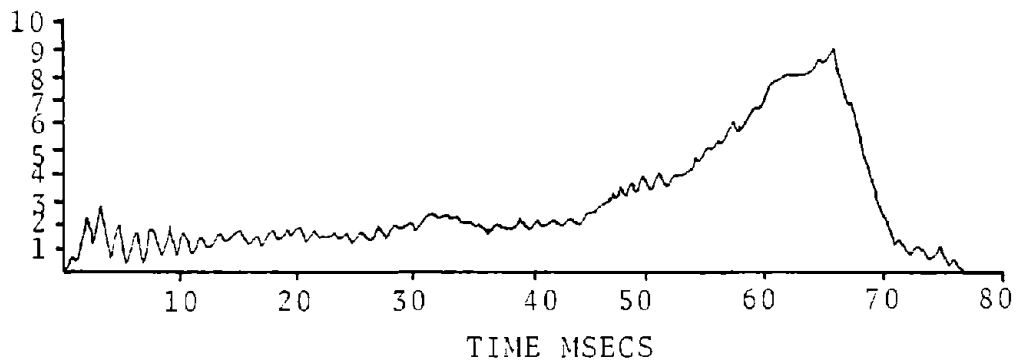
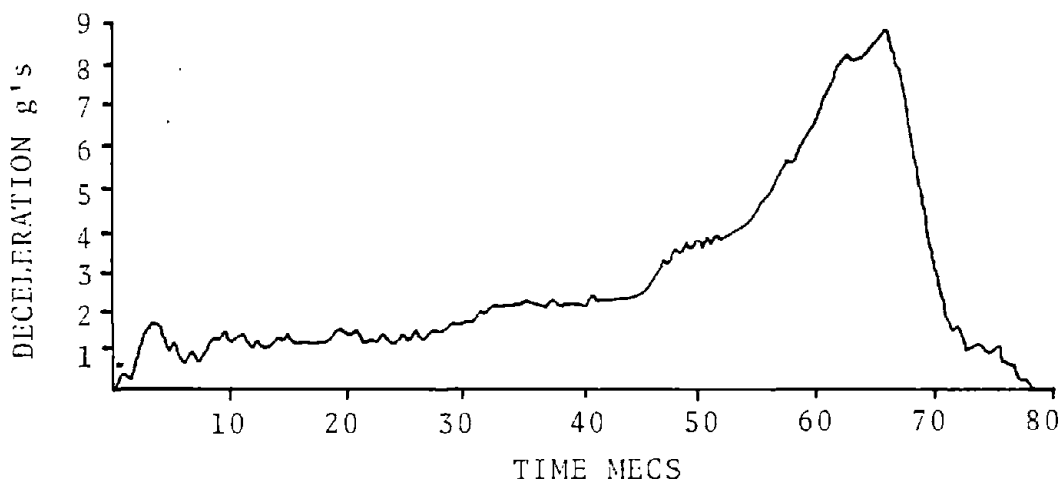
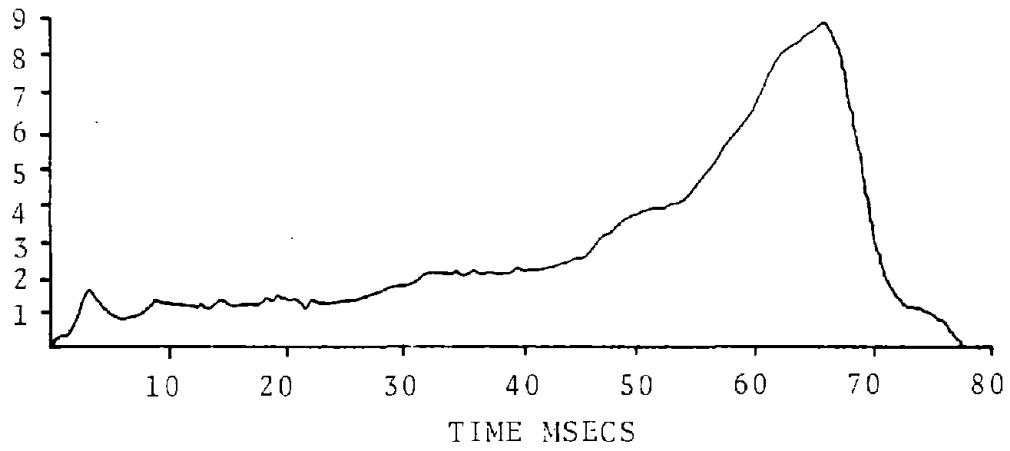


Fig. 118.  
Longitudinal Accelerometer Traces for Test 1147-404

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-405  
Date : Nov 18, 1977  
Weather : Clear, cool  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered octaflute steel pole  
Manufacturer : Millerbernd  
Height : 43 ft (13.1 m)  
Base Diameter : 8.6 in (22 cm)  
Weight : 384 lb (174 kg)

BASE:

Type : Progressive shear/steel  
Manufacturer : Millerbernd/T-large  
Modifications : None

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 30.0 ft/sec (9.2 m/s)  
Exit Speed : 15.9 ft/sec (4.8 m/s)  
Momentum Change  
  Film : 1006 lb-sec (4475 Ns)  
  Accelerometer : 972 lb-sec (4324 Ns)  
Peak Deceleration : 8.9 g's

COMMENTS:

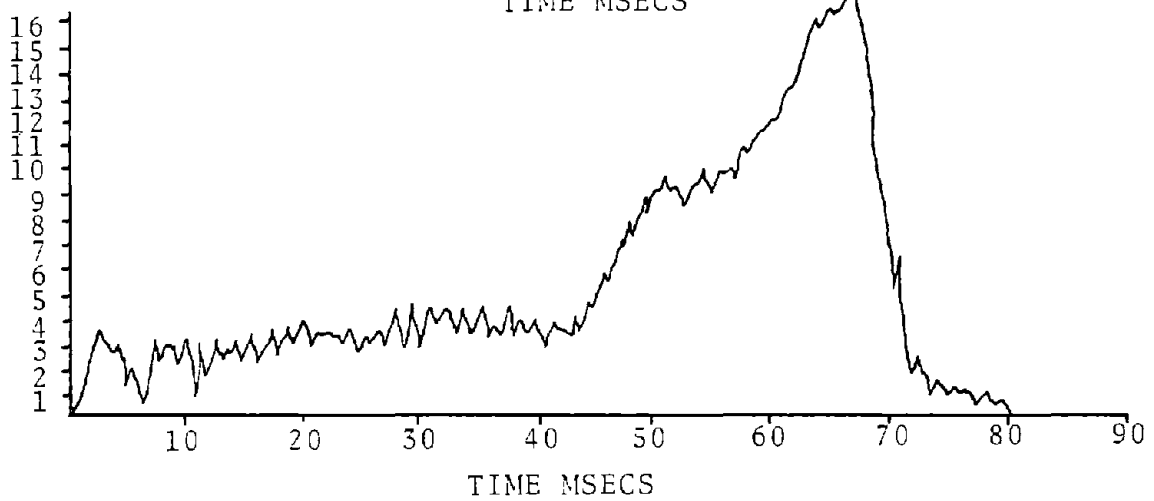
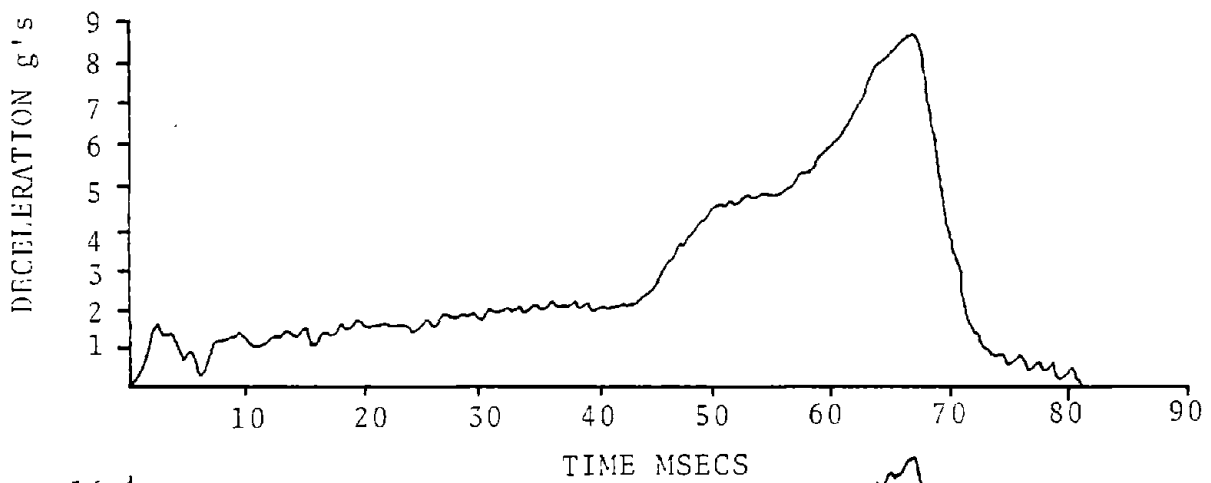
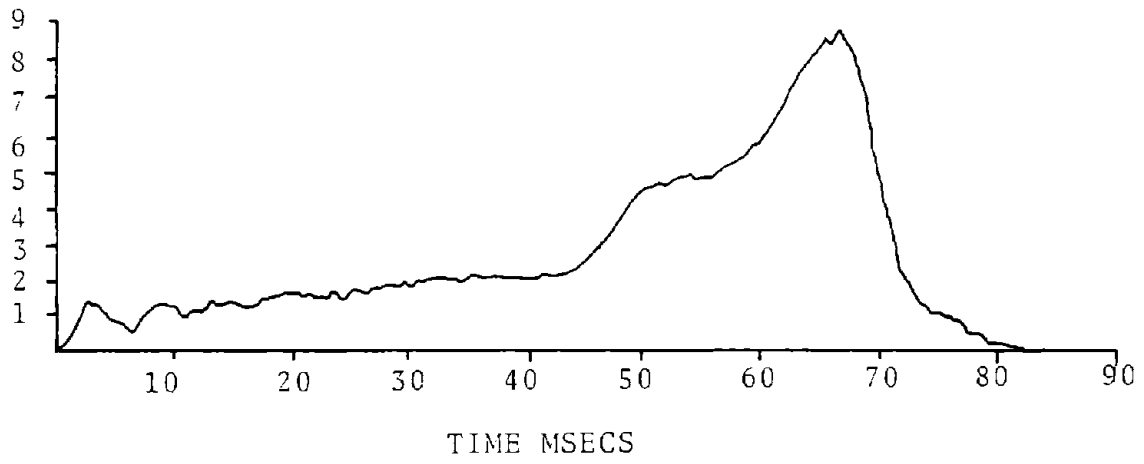


Fig. 119  
 Longitudinal Accelerometer Traces for Test 1147-405

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-406  
Date : Mar 17, 1978  
Weather : Clear, cool  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Ameron  
Height : 28 ft-6 in (8.7 m)  
Base Diameter : 7-3/4 in (19.7 cm)  
Weight : 203 lb (92 kg)

BASE:

Type : Progressive shear/steel  
Manufacturer : Millerbernd/T-small  
Modifications : None

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 27.5 ft/sec (8.4 m/s)  
Exit Speed : 16.8 ft/sec (5.1 m/s)  
Momentum Change  
  Film : 760 lb-sec (3381 Ns)  
  Accelerometer : 829 lb-sec (3687 Ns)  
Peak Deceleration : 14.1 g's

COMMENTS:

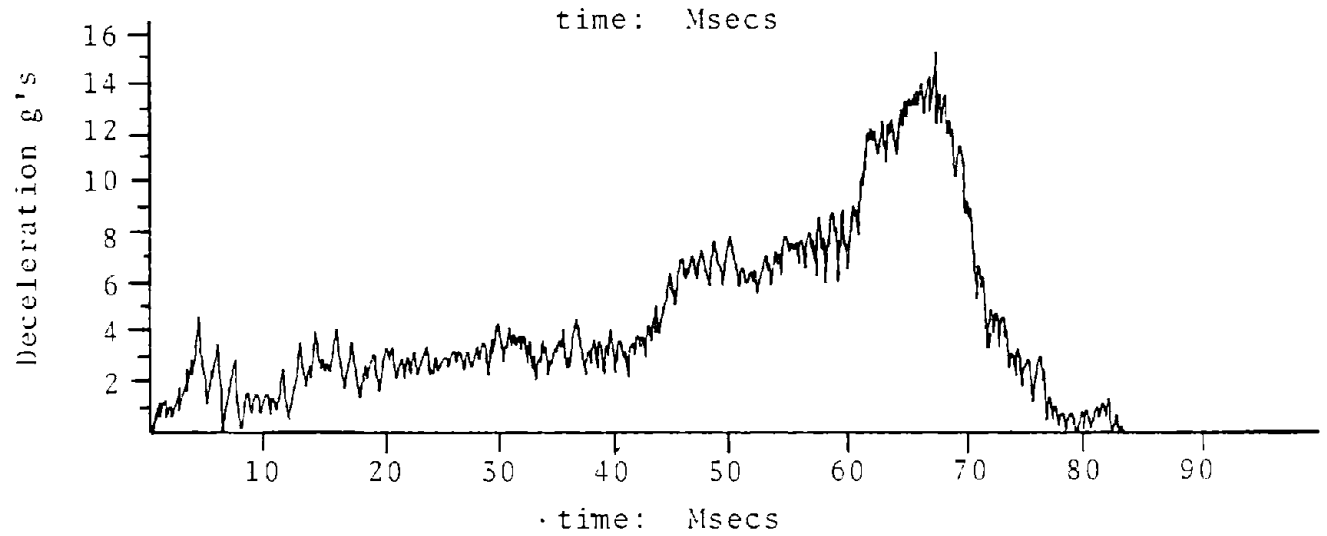
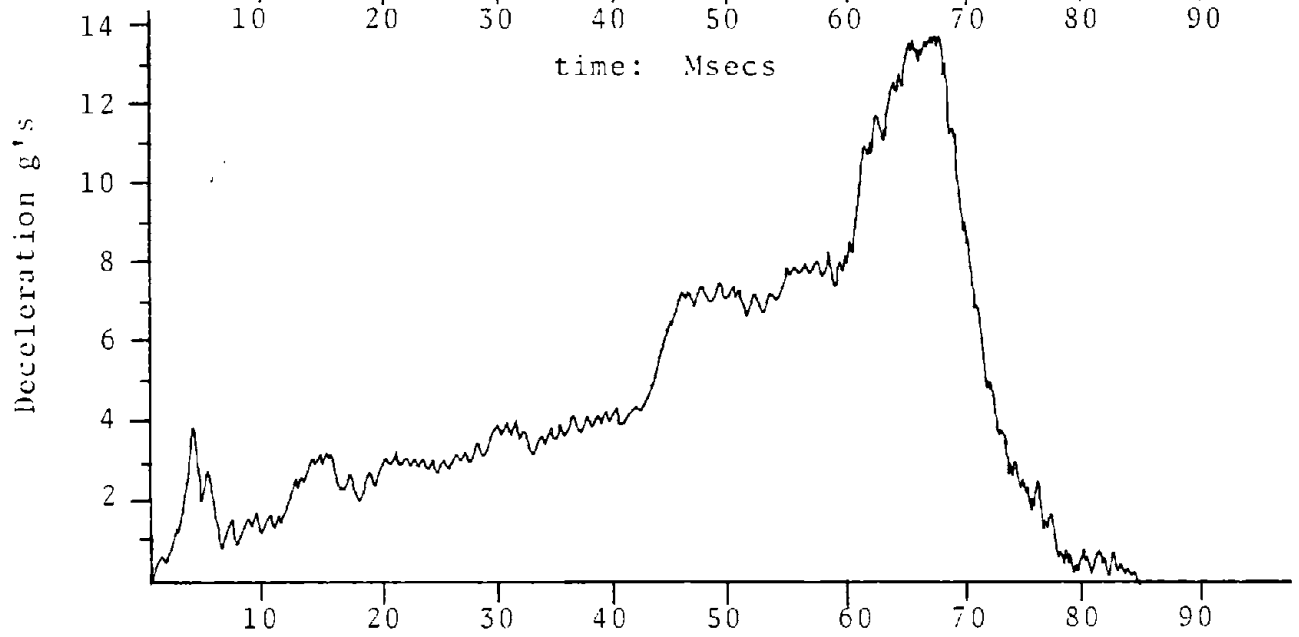
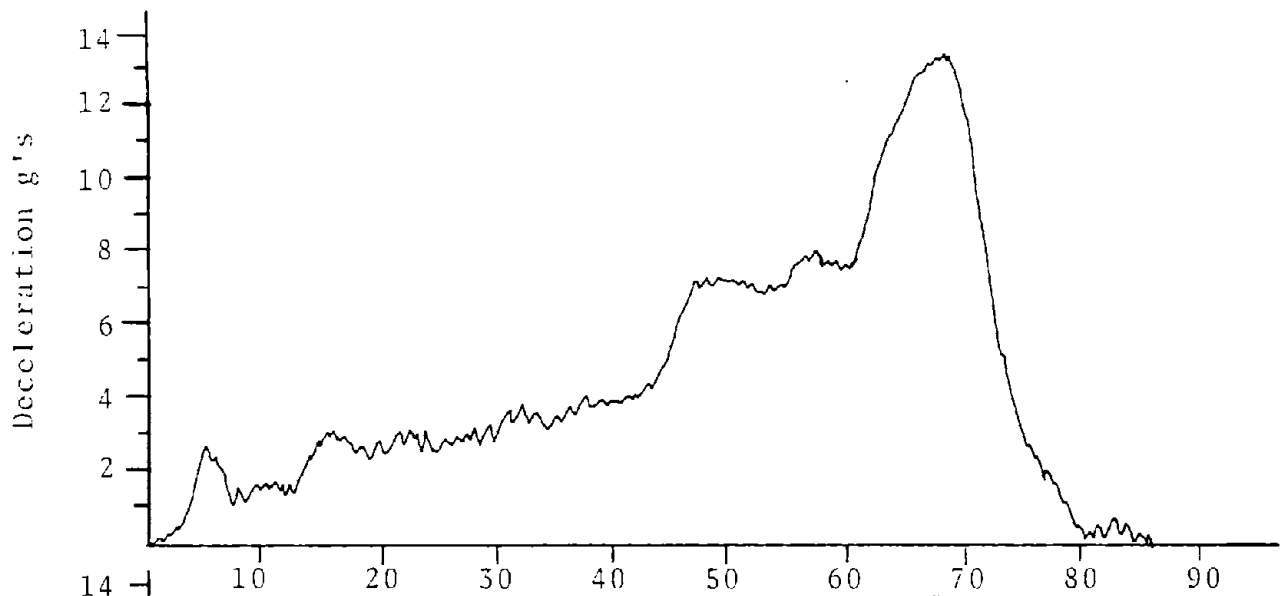


Fig. 120  
 Longitudinal Accelerometer Traces for Test 1147-406

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-407  
Date : Mar 23, 1978  
Weather : Clear, warm  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Ameron  
Height : 28 ft-6 in (8.7 m)  
Base Diameter : 7-3/4 in (19.7 cm)  
Weight : 203 lb (92 kg)

BASE:

Type : Progressive Shear/steel  
Manufacturer : Millerbernd/T-small  
Modifications : None

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 28.9 ft/sec (8.8 m/s)  
Exit Speed : 17.5 ft/sec (5.3 m/s)  
Momentum Change  
Film : 812 lb-sec (3612 Ns)  
Accelerometer : -- \*  
Peak Deceleration : -- \*

COMMENTS:

\*Accelerometer data system not functioning



## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-501  
Date : Aug 24, 1977  
Weather : Overcast, mild  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Steel Pole\*  
Manufacturer : Ameron  
Height : 28 ft-6 in (8.7 m)  
Base Diameter : 7-3/4 in (19.7 cm)  
Weight : 302 lb (137 kg)

### BASE:

Type : Slip base/4 bolt  
Manufacturer : Ameron/Utah  
Modifications : None

### FASTENERS (Base):

Type : 1" dia bolts  
Load : 80 ft-lb (109 Nm)

### TEST DATA:

Impact Speed : 28.7 ft/sec (8.6 m/s)  
Exit Speed : 24.5 ft/sec (7.5 m/s)  
Momentum Change  
  Film : 299 lb-sec (1330 Ns)  
  Accelerometer : 224 lb-sec (996 Ns)  
Peak Deceleration : 3.4 g's

### COMMENTS:

\*Test Pole incorporated 128 lb(58 kg) mast arm

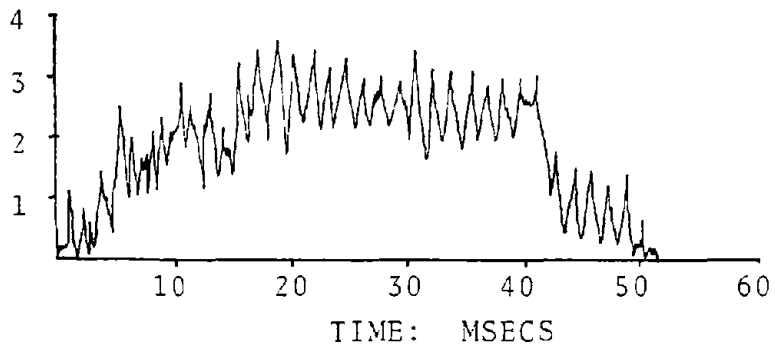
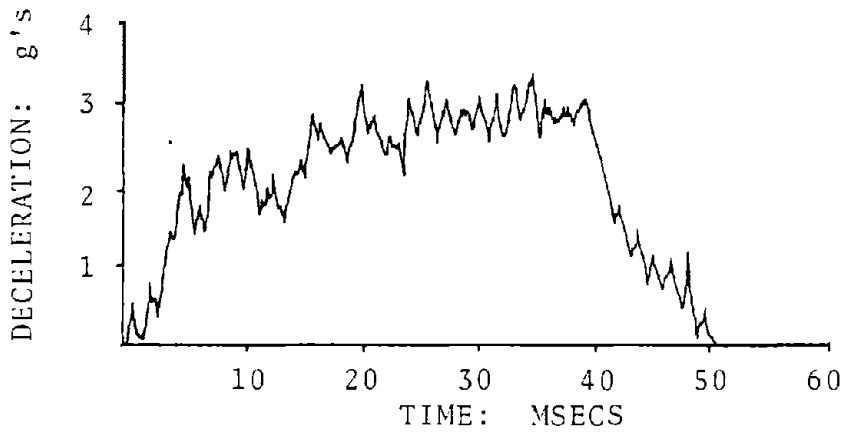
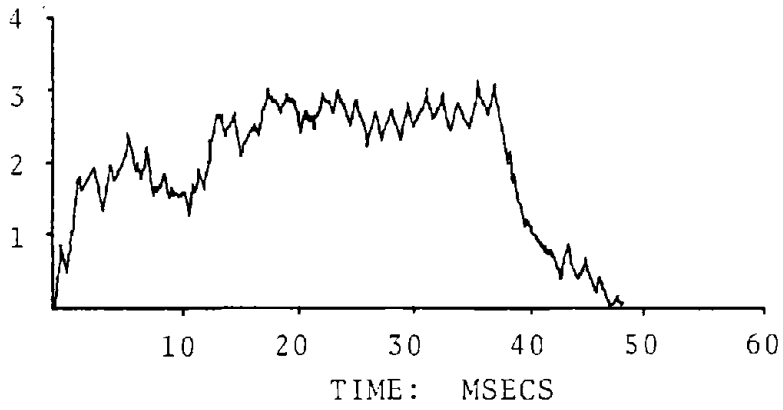


Fig. 121  
 Longitudinal Accelerometer Traces for Test 1147-501

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-502  
Date : Aug 26, 1977  
Weather : Mild, partly cloudy  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Ameron  
Height : 28 ft-6 in (8.7 m)  
Base Diameter : 7-3/4 in (19.7 cm)  
Weight : 302 lb (137 kg)

### BASE:

Type : Slip base/4 bolt  
Manufacturer : Ameron/Utah  
Modifications : None

### FASTENERS (Base):

Type : 1" dia bolts  
Load : 120 ft-lbs (163 Nm)

### TEST DATA:

Impact Speed : 28.6 ft/sec (8.7 m/s)  
Exit Speed : 20.3 ft/sec (6.2 m/s)  
Momentum Change  
  Film : 590 lb-sec (2624 Ns)  
  Accelerometer : 534 lb-sec (2375 Ns)  
Peak Deceleration : 8.5 g's

### COMMENTS:

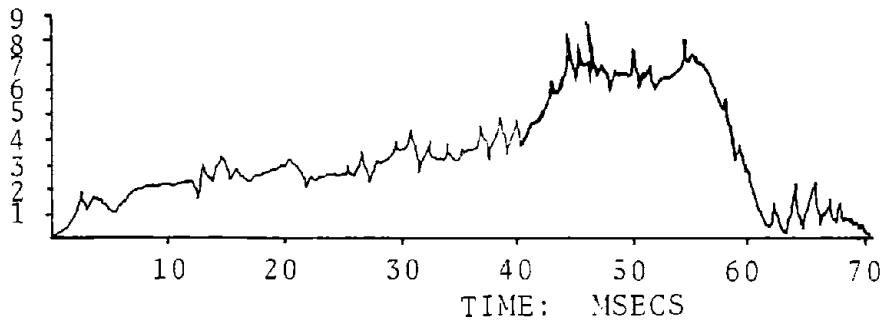
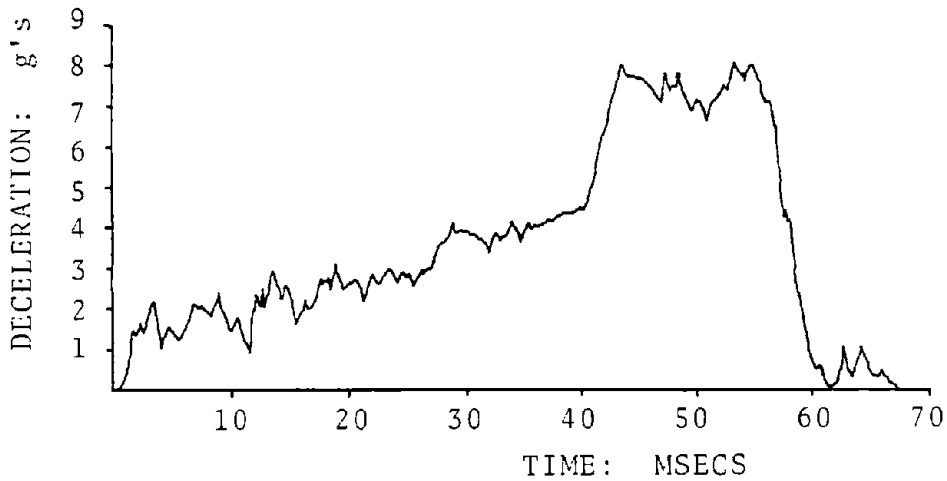
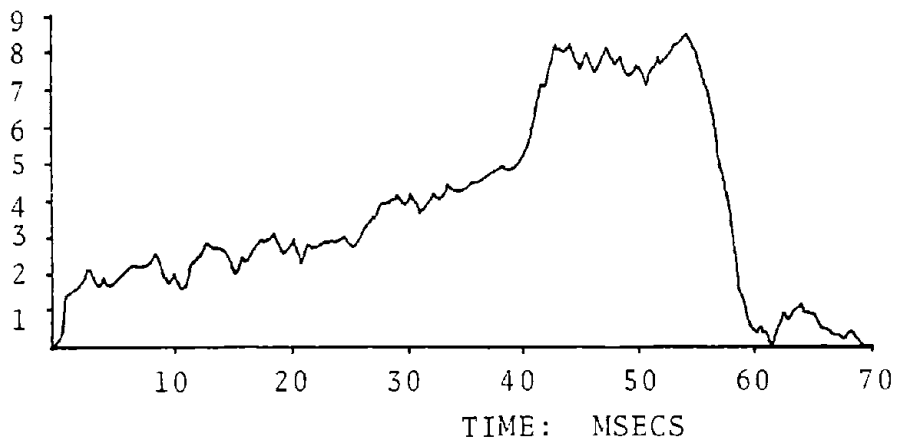


Fig. 122  
 Longitudinal Accelerometer Traces for Test 1147-502

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-503  
Date : Aug 26, 1977  
Weather : Mild, overcast  
Pendulum Mass : 2290 lbs (1040 kg)

### SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Ameron  
Height : 28 ft-6 in (8.7 m)  
Base Diameter : 7-3/4 in (19.7 cm)  
Weight : 307 lb (139 kg)

### BASE:

Type : Slip base/3 bolt insert  
Manufacturer : Ameron  
Modifications : None

### FASTENERS (Base):

Type : 7/8 " dia bolts  
Load : 150 ft-lbs (203 Nm)

### TEST DATA:

Impact Speed : 27.6 ft/sec (8.4 m/s)  
Exit Speed : 18.6 ft/sec (5.7 m/s)  
Momentum Change  
  Film : 640 lb-sec (2847 Ns)  
  Accelerometer : 680 lb-sec (3025 Ns)  
Peak Deceleration : 9.3 g's

### COMMENTS:

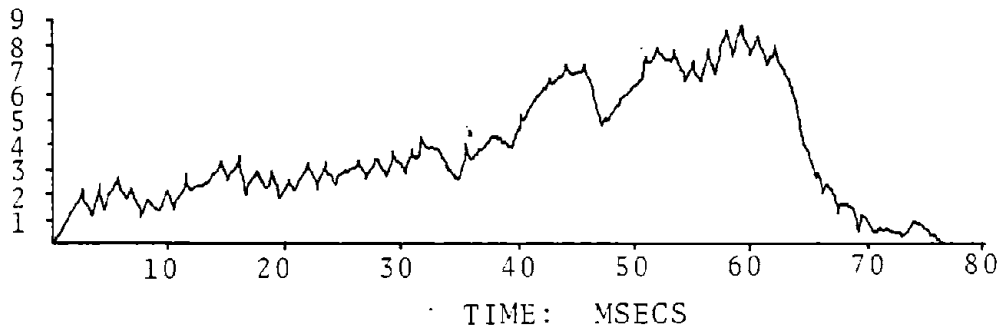
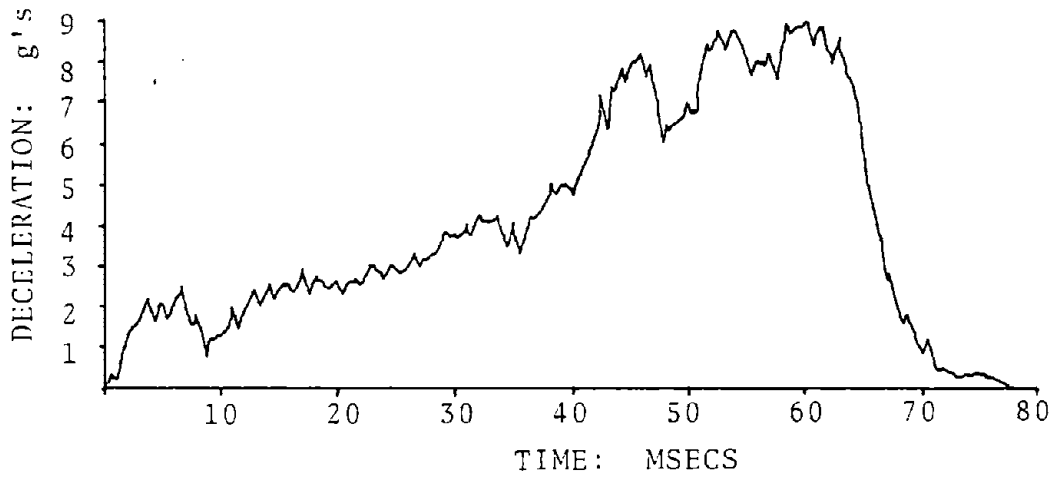
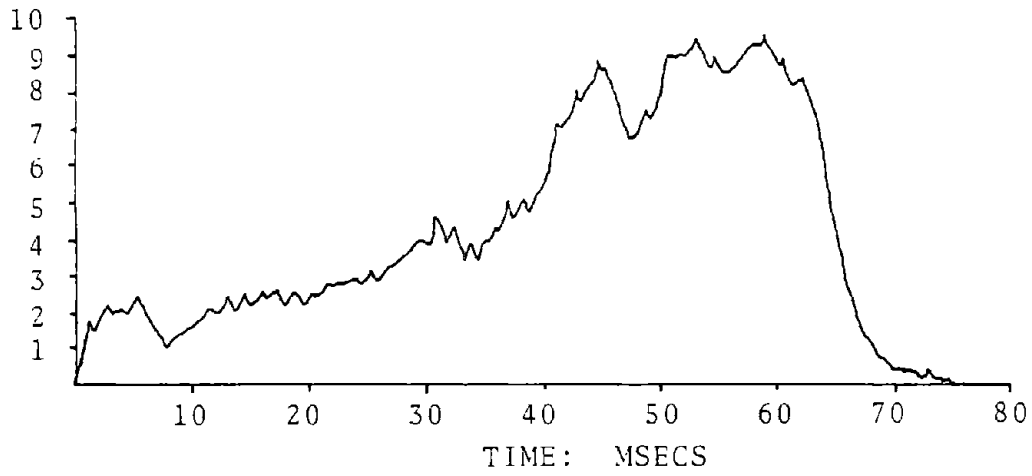


Fig. 123  
 Longitudinal Accelerometer Traces for Test 1147-503

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number	:	1147-504
Date	:	Sep 2, 1977
Weather	:	Hot
Pendulum Mass	:	2290 lb (1040 kg)

### SUPPORT:

Type	:	Tapered Steel Pole
Manufacturer	:	Ameron
Height	:	28 ft-6 in (8.7 m)
Base Diameter	:	7-3/4 in (19.7 cm)
Weight	:	307 lb (139 kg)

### BASE:

Type	:	Slip base
Manufacturer	:	Ameron/California Type 15
Modifications	:	None

### FASTENERS (Base):

Type	:	7/8" dia bolts
Load	:	150 ft-lb (203 Nm)

### TEST DATA:

Impact Speed	:	27.3 ft/sec (8.3 m/s)
Exit Speed	:	17.0 ft/sec (5.2 m/s)
Momentum Change	:	
Film	:	731 lb-sec (3252 Ns)
Accelerometer	:	578 lb-sec (2571 Ns)
Peak Deceleration	:	8.9 g's

### COMMENTS:

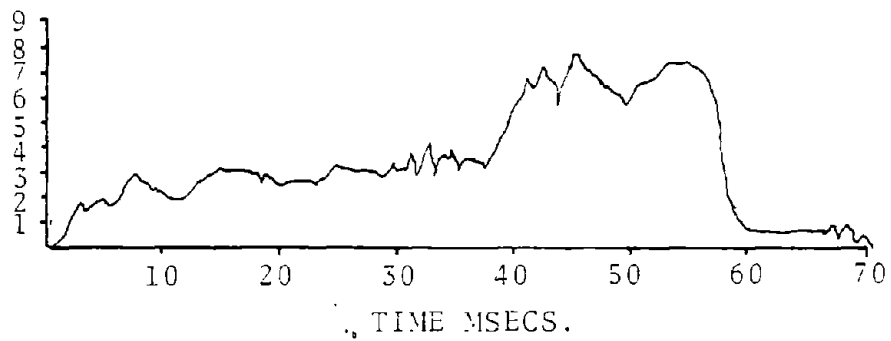
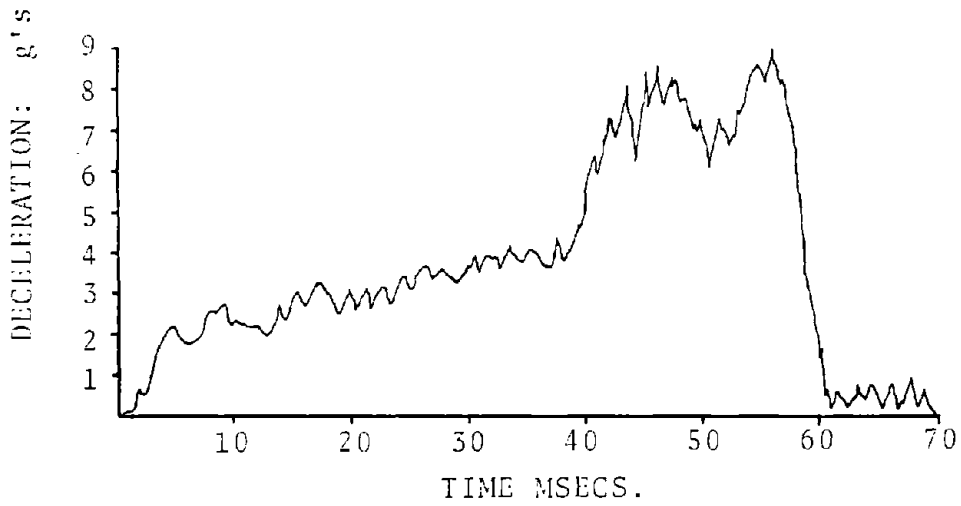
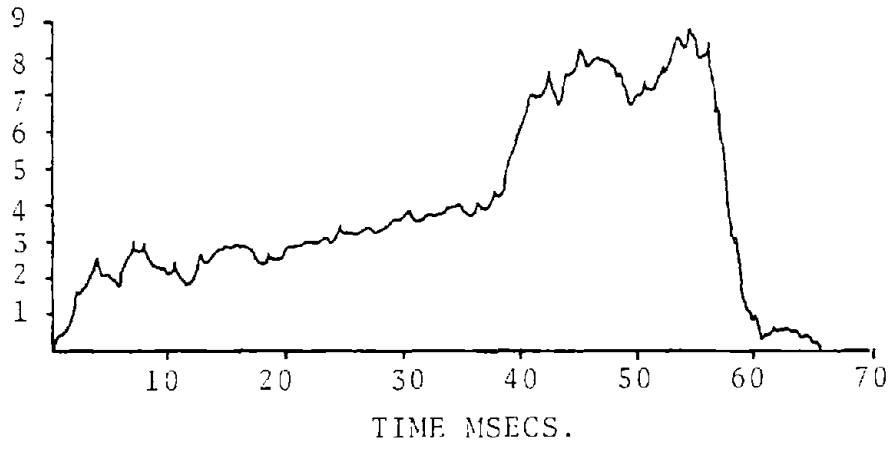


Fig. 124  
 Longitudinal Accelerometer Traces for Test 1147-504



TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-505  
Date : Sep 19, 1977  
Weather : Hot, clear  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Ameron  
Height : 35 ft (10.7 m)  
Base Diameter : 8-11/16 in (22.1 cm)  
Weight : 650 lb (295 kg)

BASE:

Type : Slip base  
Manufacturer : Ameron/California Type 31  
Modifications : None

FASTENERS (Base):

Type : 1" dia bolts  
Load : 200 ft-lbs (271 Nm)

TEST DATA:

Impact Speed : 25.3 ft/sec (7.7 m/s)  
Exit Speed : 17.2 ft/sec (5.2 m/s)  
Momentum Change  
Film : 575 lb-sec (2558 Ns)  
Accelerometer : 658 lb-sec (2927 Ns)  
Peak Deceleration : 8.4 g's

COMMENTS:

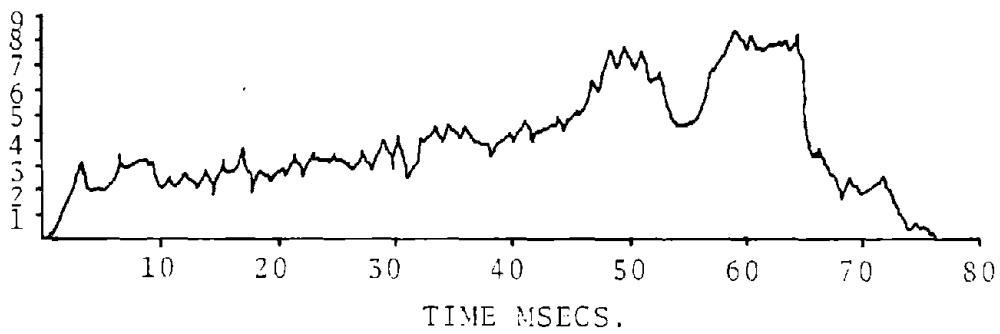
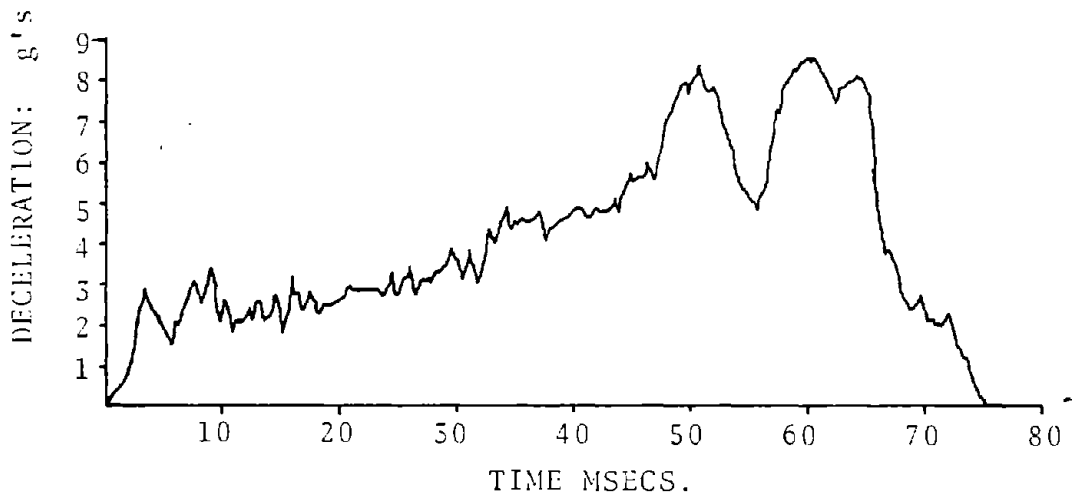
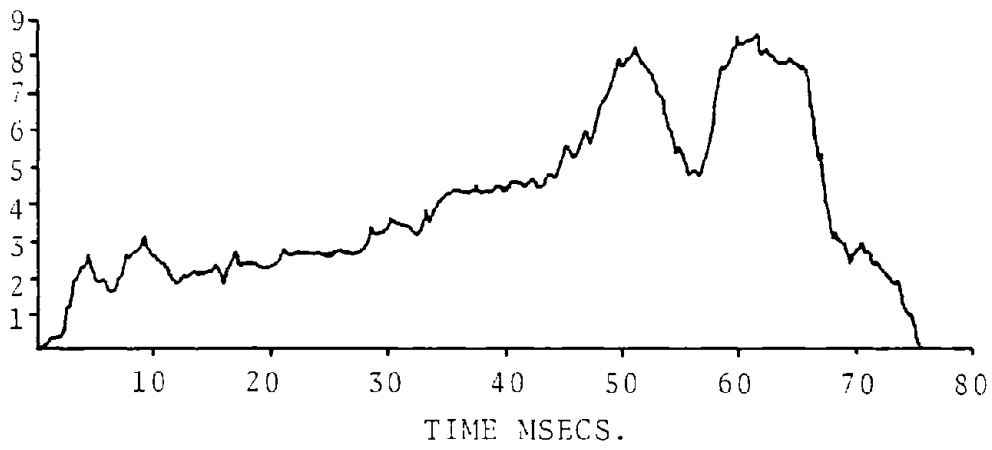


Fig. 125  
 Longitudinal Accelerometer Traces for Test 1147-505

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-506  
Date : Apr 12, 1978  
Weather : Clear, warm  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Valmont  
Height : 47 ft (14.3 m)  
Base Diameter : 10.5 in (27 cm)  
Weight : 608 lb(276 kg) with mast arm  
and simulated luminaire

### BASE:

Type : Slip base/3 bolt  
Manufacturer : Valmont  
Modifications : None

### FASTENERS (Base):

Type : 7/8" dia bolts  
Load : 110 lb-ft (149 Nm)

### TEST DATA:

Impact Speed : 29.0 ft/sec (8.8 m/s)  
Exit Speed : 24.3 ft/sec (7.4 m/s)  
Momentum Change  
Film : 334 lb-sec (1486 Ns)  
Accelerometer : 295 lb-sec (1312 Ns)  
Peak Deceleration : 4.3 g's

### COMMENTS:

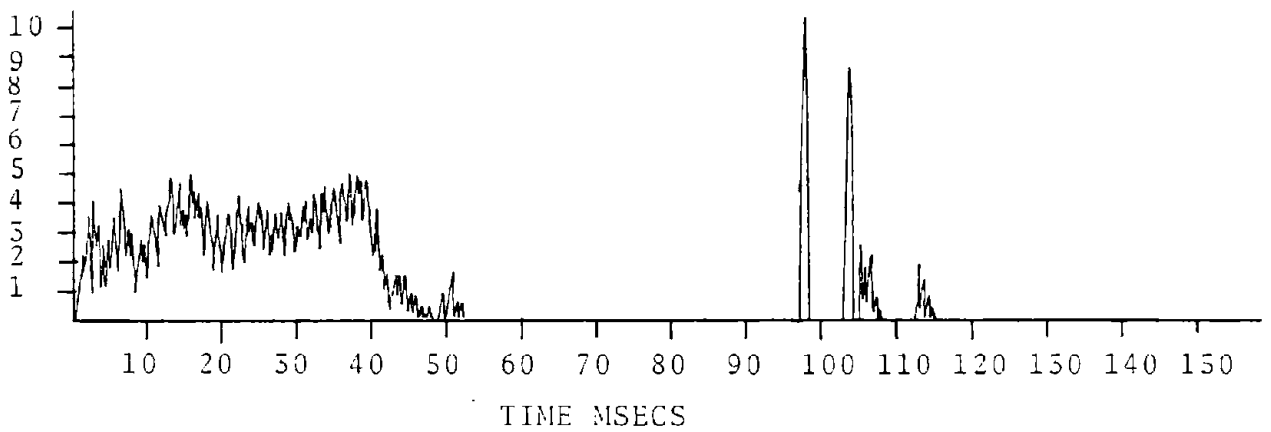
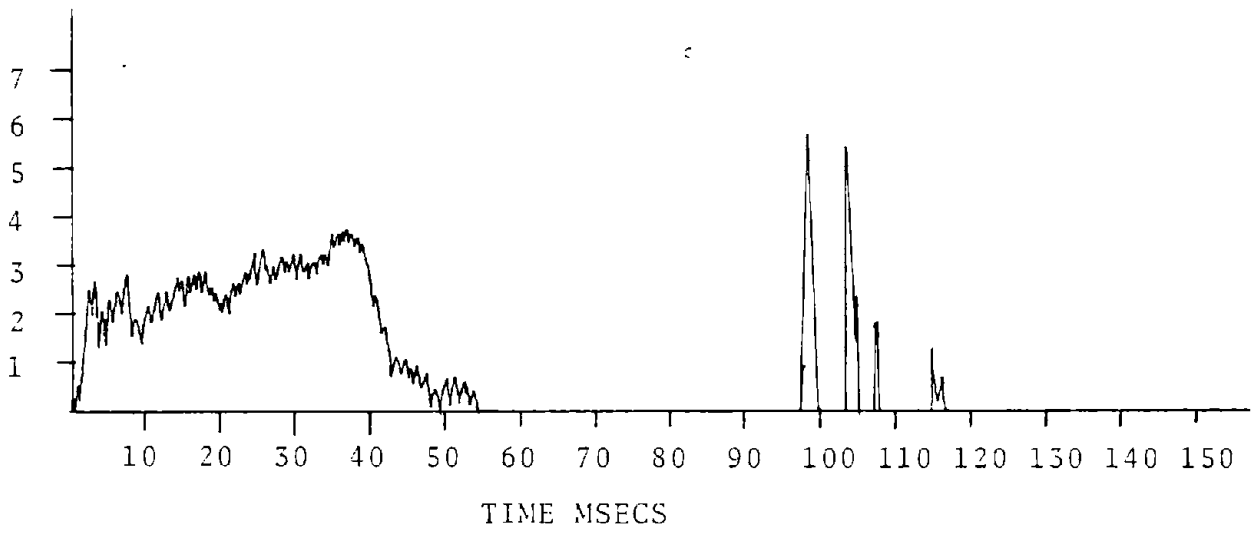
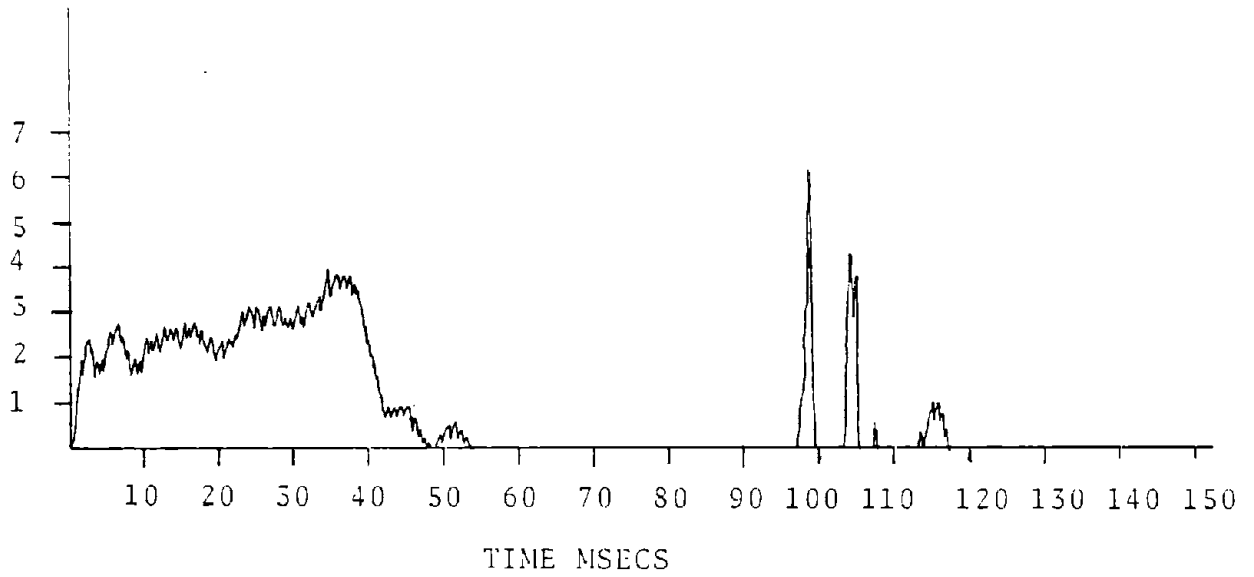


Fig. 126  
 Longitudinal Accelerometer Traces for Test 1147-506

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-507  
Date : Apr 12, 1978  
Weather : Clear, warm  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Valmont  
Height : 47 ft (14.3 m)  
Base Diameter : 10.5 in (27 cm)  
Weight : 432 lb (196 kg)

### BASE:

Type : Slip base/3 bolt  
Manufacturer : Valmont  
Modifications : None

### FASTENERS (Base):

Type : 7/8" dia bolts  
Load : 110 lb-ft (149 Nm)

### TEST DATA:

Impact Speed : 28.9 ft/sec (8.8 m/s)  
Exit Speed : 24.5 ft/sec (7.5 m/s)  
Momentum Change  
  Film : 308 lb-sec (1370 Nm)  
  Accelerometer : 309 lb-sec (1375 Nm)  
Peak Deceleration : 3.8 g's

### COMMENTS:

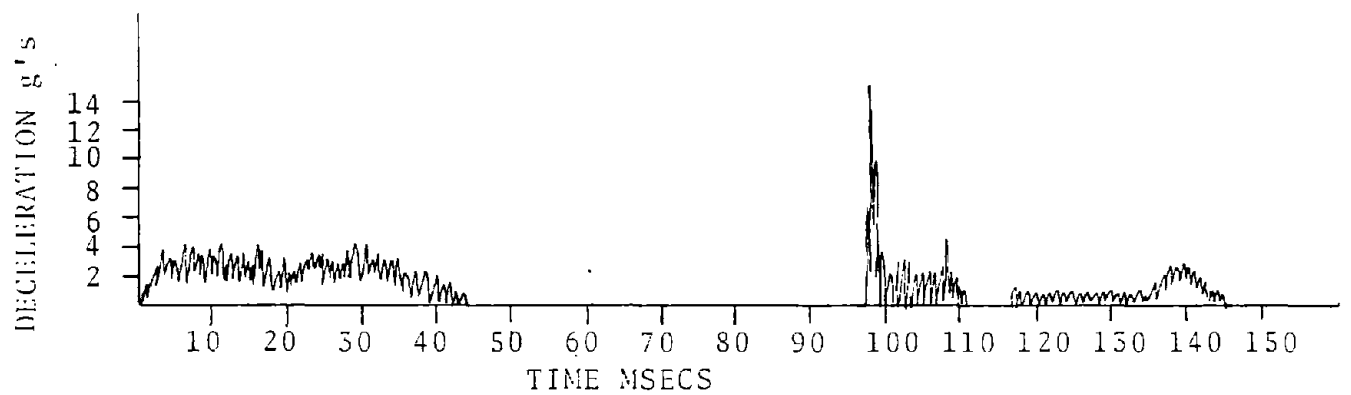
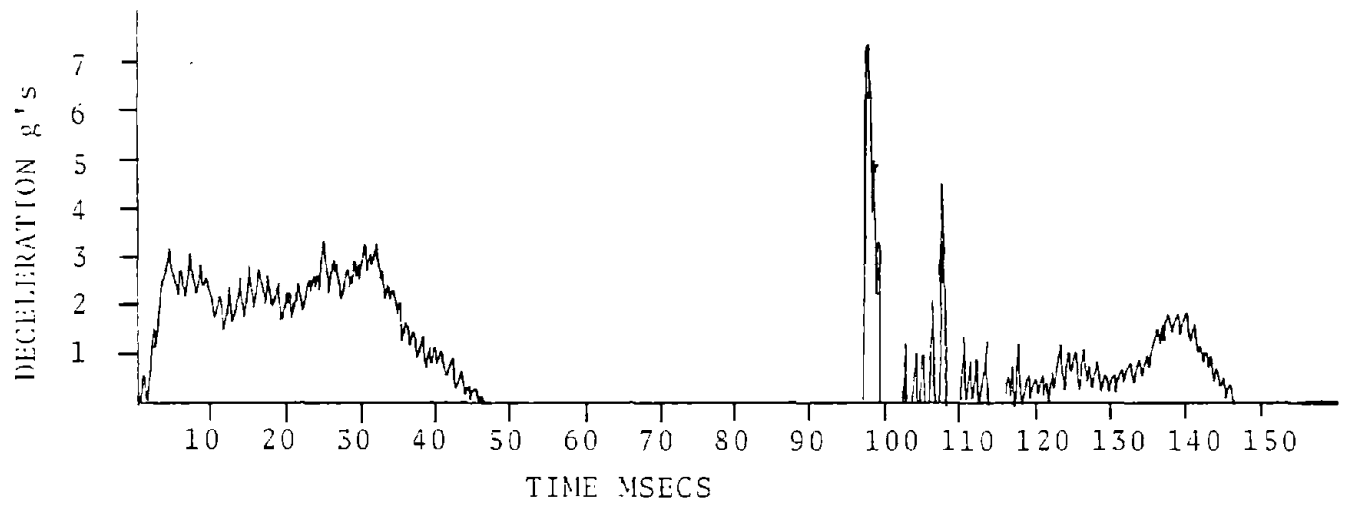
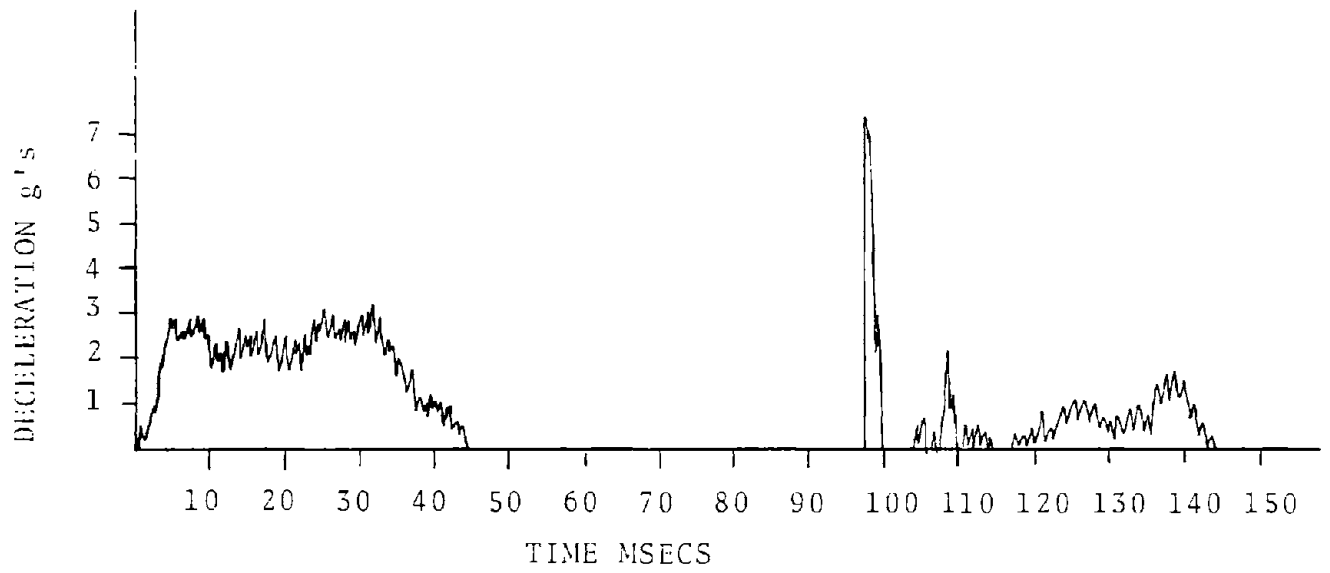


Fig. 127  
 Longitudinal Accelerometer Traces for Test 1147-507

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number	:	1147-601
Date	:	Jun 23, 1977
Weather	:	Warm, sunny
Pendulum Mass	:	2290 lb (1040 kg)

### SUPPORT:

Type	:	Tapered Aluminum Pole
Manufacturer	:	Hapco
Height	:	47 ft-2 in (14.4 m)
Base Diameter	:	10 in (25.4 m)
Weight	:	407 lb (185 kg)

### BASE:

Type	:	Couplings
Manufacturer	:	Alcoa
Modifications	:	None

### FASTENERS (Base):

Type	:	N/A
Load	:	N/A

### TEST DATA:

Impact Speed	:	29.0 ft/sec (8.6 m/s)
Exit Speed	:	20.6 ft/sec (6.3 m/s)
Momentum Change	:	
Film	:	598 lb-sec (2660 Ns)
Accelerometer	:	606 lb-sec (2696 Ns)
Peak Deceleration	:	8 g's

### COMMENTS:

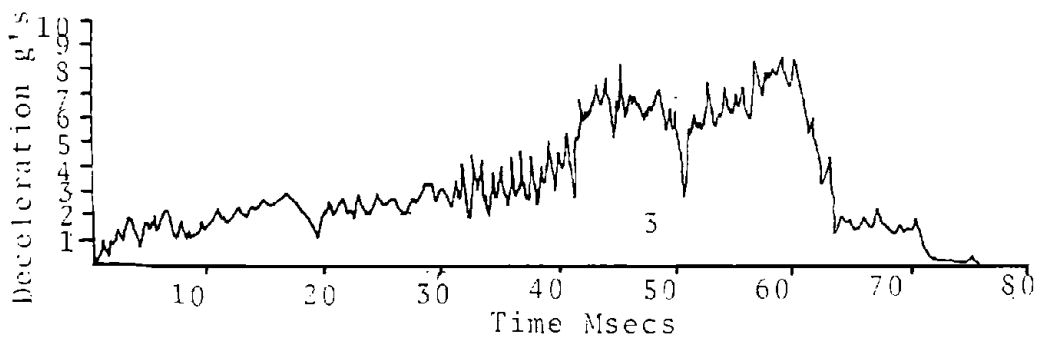
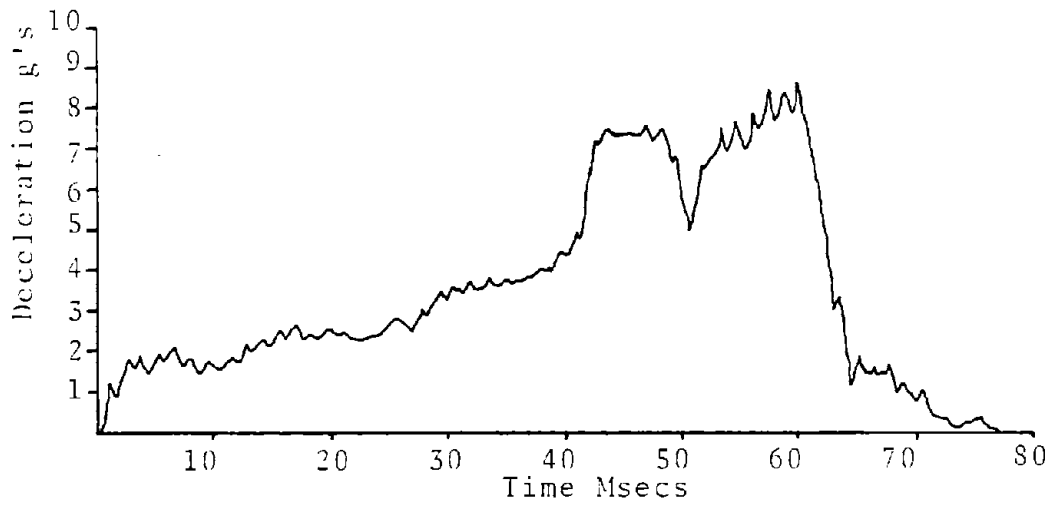
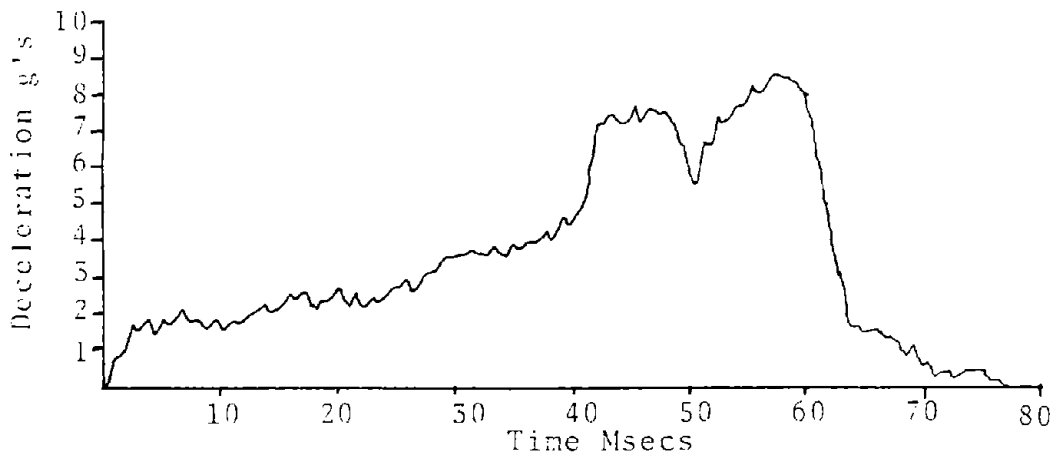


Fig. 128  
 Longitudinal Accelerometer Traces for Test 1147-601



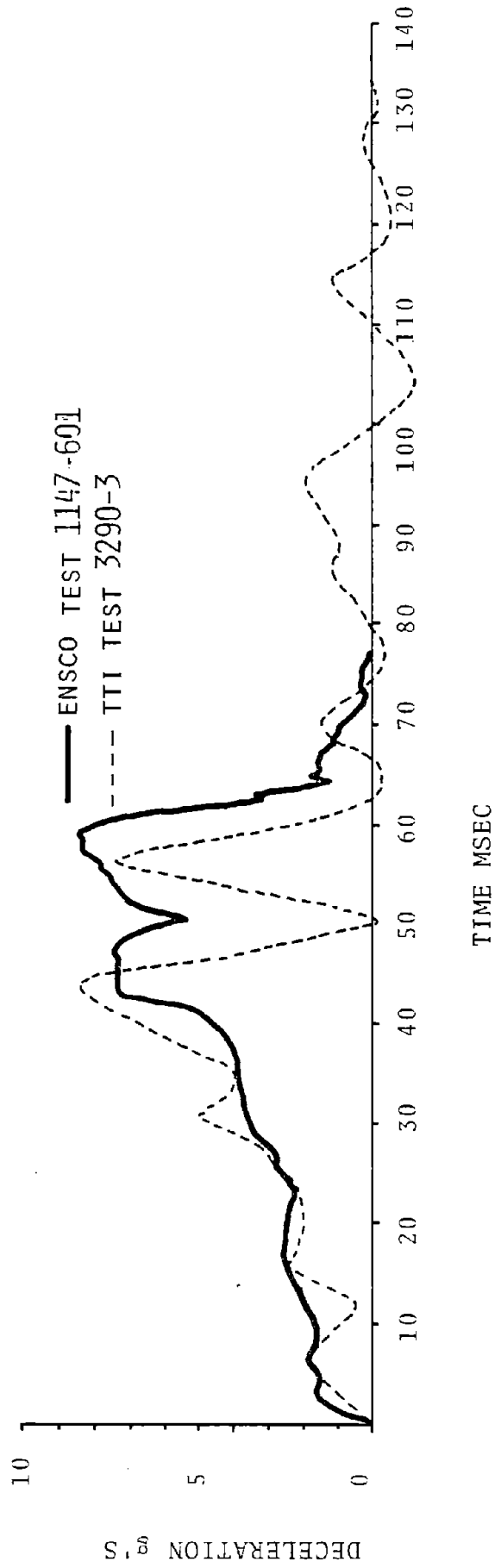


Fig. 129  
 Comparison of Longitudinal Accelerometer  
 Traces for TTI Test 3290-3 and ENSCO Test 1147-601

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-602  
Date : Aug 30, 1977  
Weather : Hot, slightly overcast  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 28 ft-6 in (8.7 m)  
Base Diameter : 8 in (20 cm)  
Weight : 145 lb (66 kg)

BASE:

Type : Couplings  
Manufacturer : Hapco  
Modifications : None

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 29.9 ft/sec (9.1 m/s)  
Exit Speed : 20.1 ft/sec (6.1 m/s)  
Momentum Change  
  Film : 697 lb-sec (3100 Ns)  
  Accelerometer : 627 lb-sec (2789 Ns)  
Peak Deceleration : 8.8 g's

COMMENTS:

Stud engagement = 1½ in (3.2 cm)

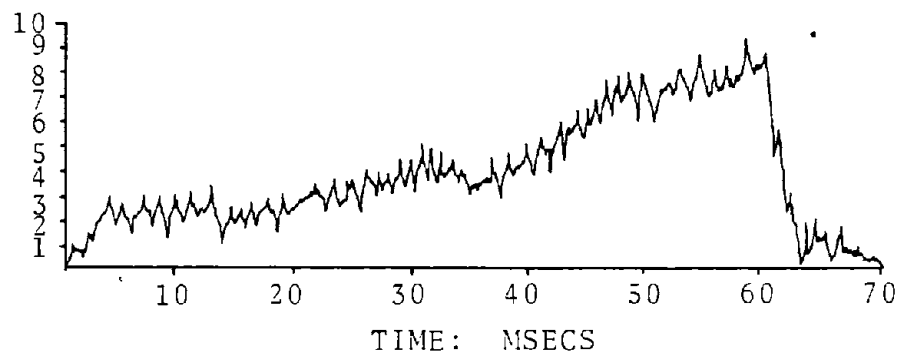
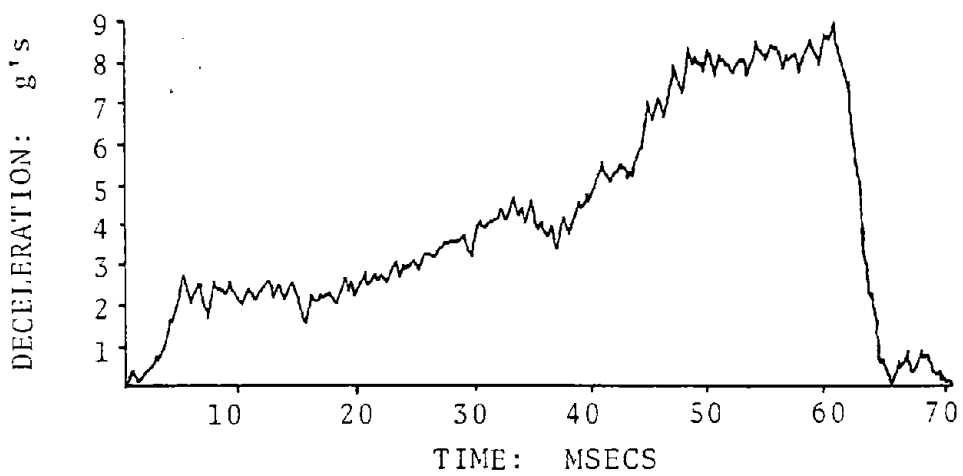
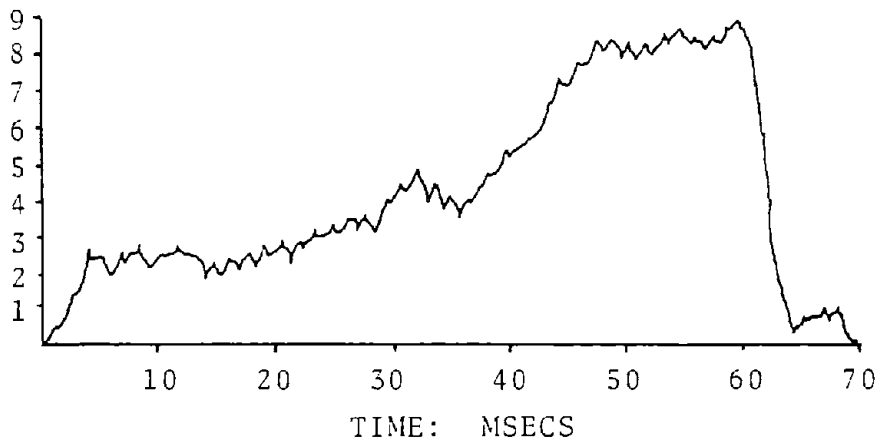


Fig. 130  
 Longitudinal Accelerometer for Test 1147-602

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-603  
Date : Aug 30, 1977  
Weather : Hot, clear  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 28 ft-6 in (8.7 m)  
Base Diameter : 8 in (20 cm)  
Weight : 145 lb (66 kg)

BASE:

Type : Couplings  
Manufacturer : Hapco  
Modifications : None

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 28.7 ft/sec (8.8 m/s)  
Exit Speed : 0 ft/sec (0 m/s)  
Momentum Change  
Film : 2040 lb-sec (9074 Ns)  
Accelerometer : 1822 lb-sec (8104 Ns)  
Peak Deceleration : 30 g's

COMMENTS: Stud engagement = 2-3/4 ft (7 cm)

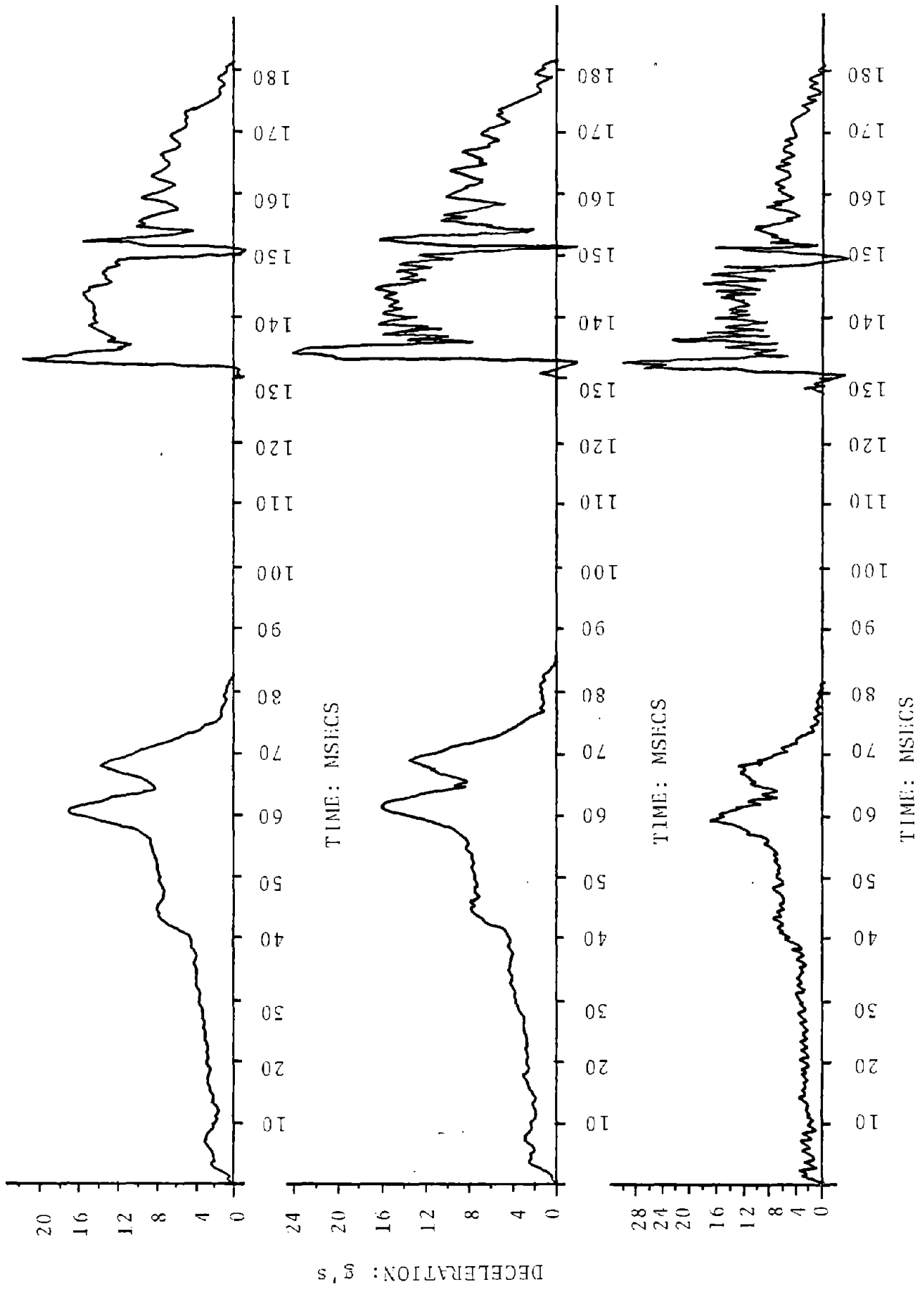


Fig. 131  
 Longitudinal Accelerometer Traces for Test 1147-603

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-604  
Date : Sep 19, 1977  
Weather : Clear, hot  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 47 ft-2 in (14.4 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 407 lb (185 kg)

BASE:

Type : Couplings  
Manufacturer : Transpo Safety/pole safe  
Modifications : None

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 28.8 ft/sec (8.8 m/s)  
Exit Speed : 20.8 ft/sec (6.3 m/s)  
Momentum Change  
Film : 569 lb-sec (2531 Ns)  
Accelerometer : 531 lb-sec (2362 Ns)  
Peak Deceleration : 8.3 g's

COMMENTS:

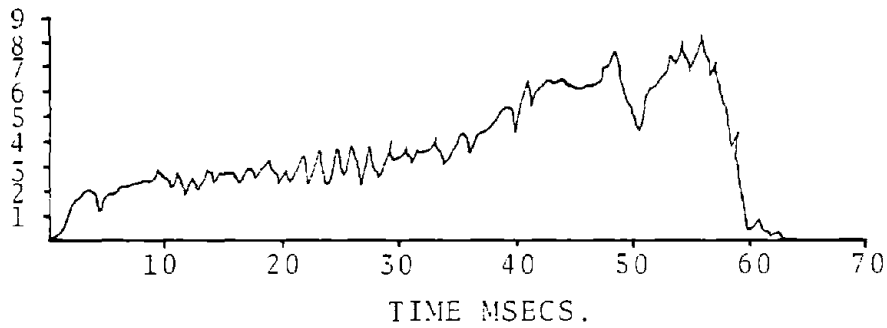
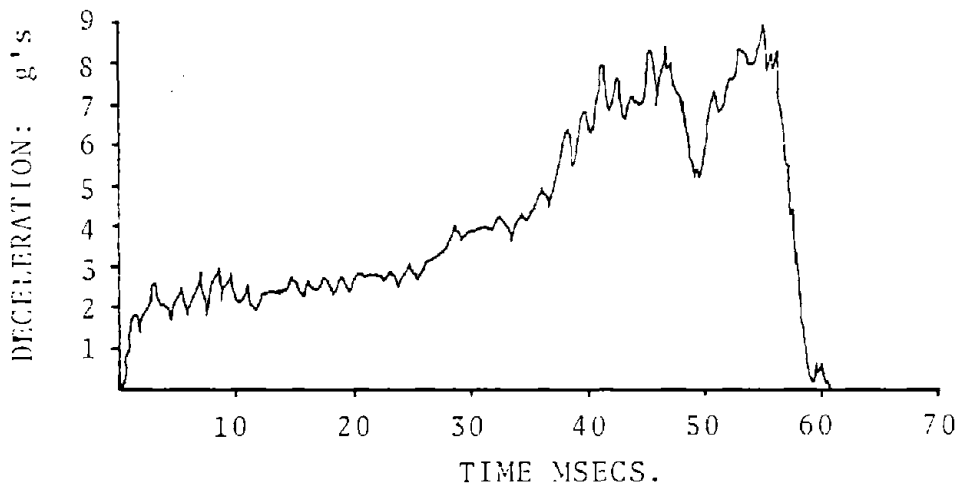
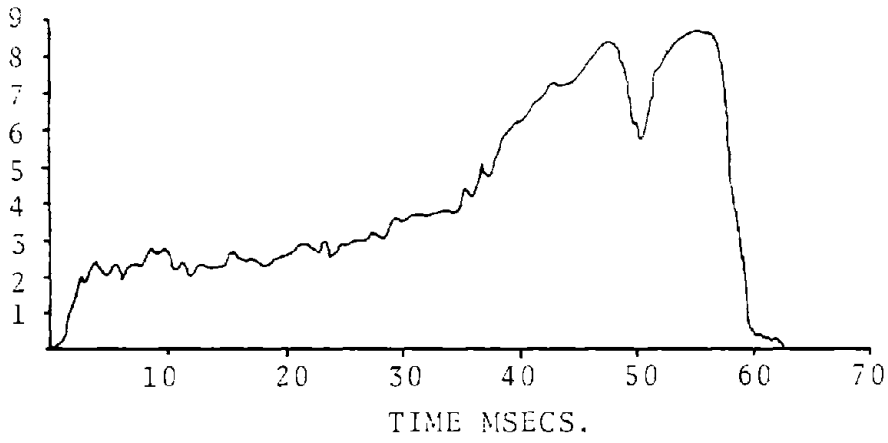


Fig. 132  
 Longitudinal Accelerometer Traces for Test 1147-604

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-605  
Date : Nov 28, 1977  
Weather : Overcast, cool  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 28 ft-6 in (8.7 m)  
Base Diameter : 8 in (20 cm)  
Weight : 145 lb (66 kg)

BASE:

Type : Couplings under transformer  
base (NYC)  
Manufacturer : Transpo Safety/pole safe  
Modifications : None

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 29.1 ft/sec (8.9 m/s)  
Exit Speed : 16.4 ft/sec (5.0 m/s)  
Momentum Change  
Film : 900 lb-sec (4003 Nm)  
Accelerometer : 809 lb-sec (3598 Nm)  
Peak Deceleration : 10.9 g's

COMMENTS:



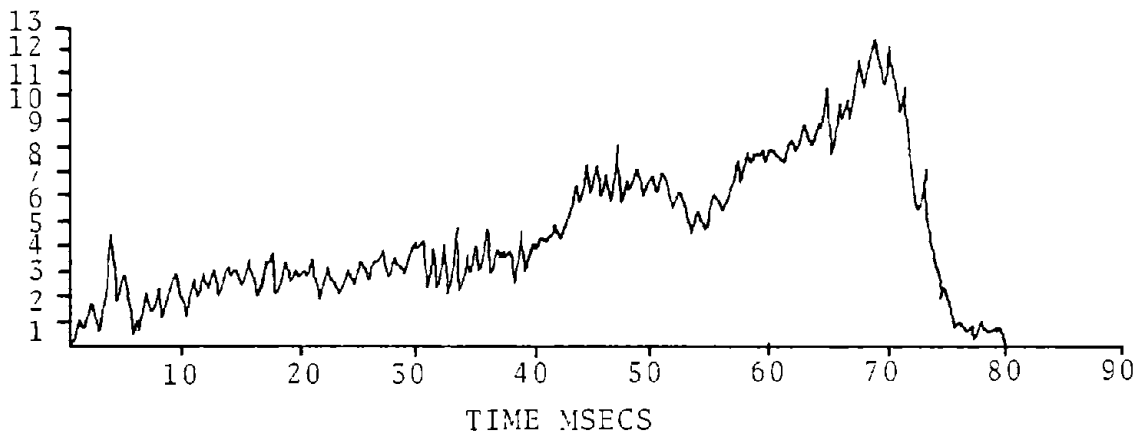
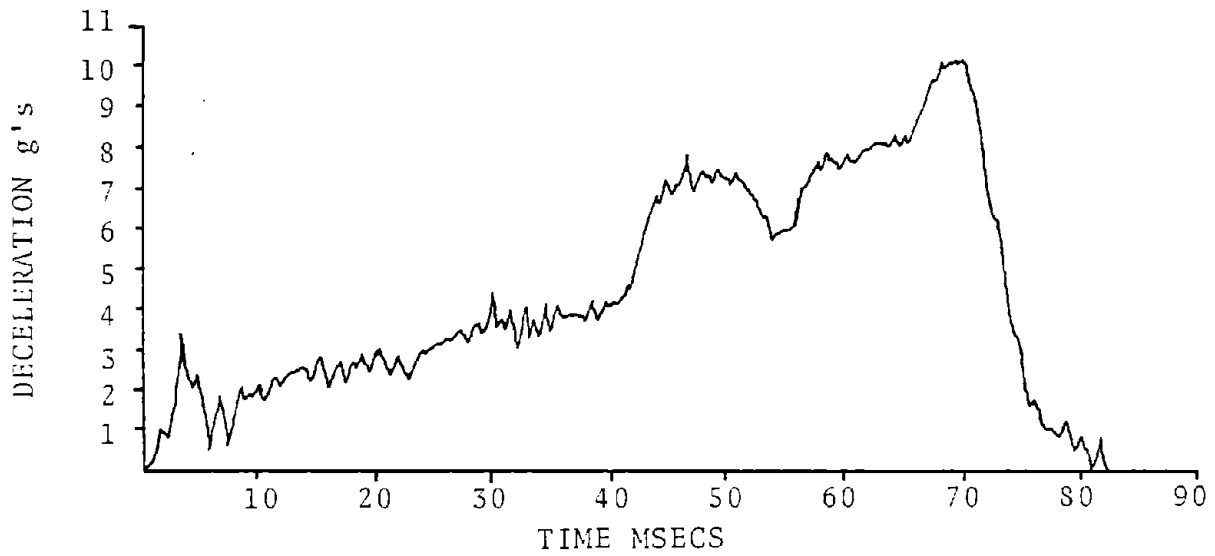
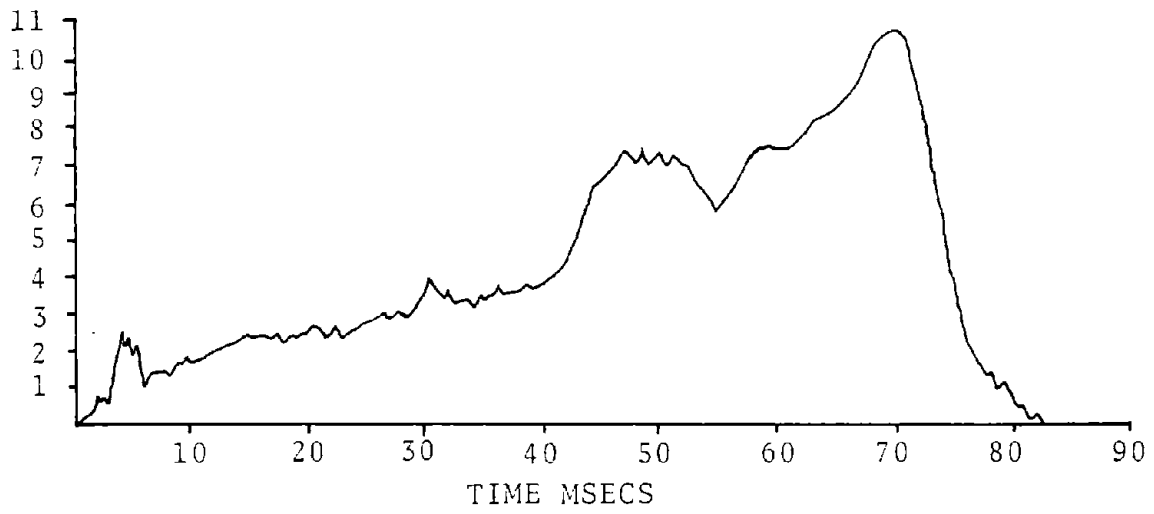


Fig. 133  
 Longitudinal Accelerometer for Test 1147-605

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-606  
Date : Dec 12, 1977  
Weather : Clear, cold  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 47 ft-2 in (14.4 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 407 lb (185 kg)

BASE:

Type : Couplings under transformer  
base (P&K TB2A)  
Manufacturer : Transpo Safety/pole safe  
Modifications : None

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 30.5 ft/sec (9.3 m/s)  
Exit Speed : 21.3 ft/sec (6.5 m/s)  
Momentum Change :  
Film : 651 lb-sec (2896 Ns)  
Accelerometer : 721 lb-sec (3207 Ns)  
Peak Deceleration : 10.2 g's

COMMENTS:

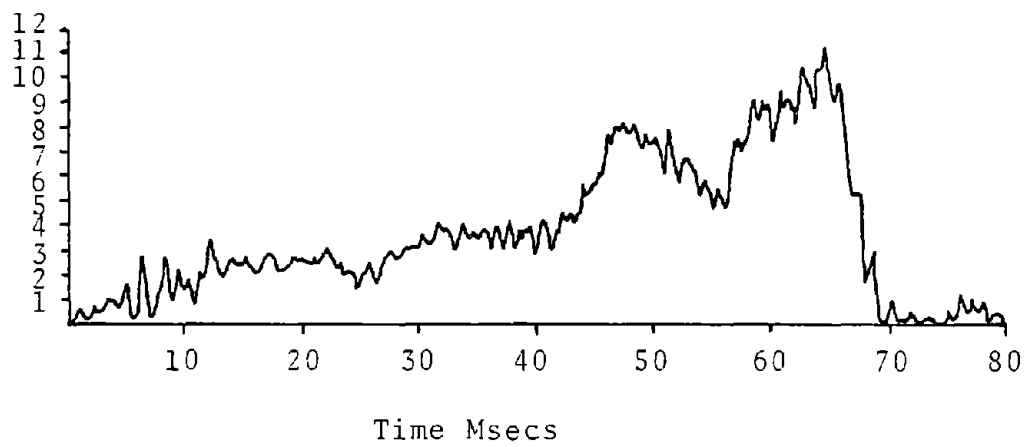
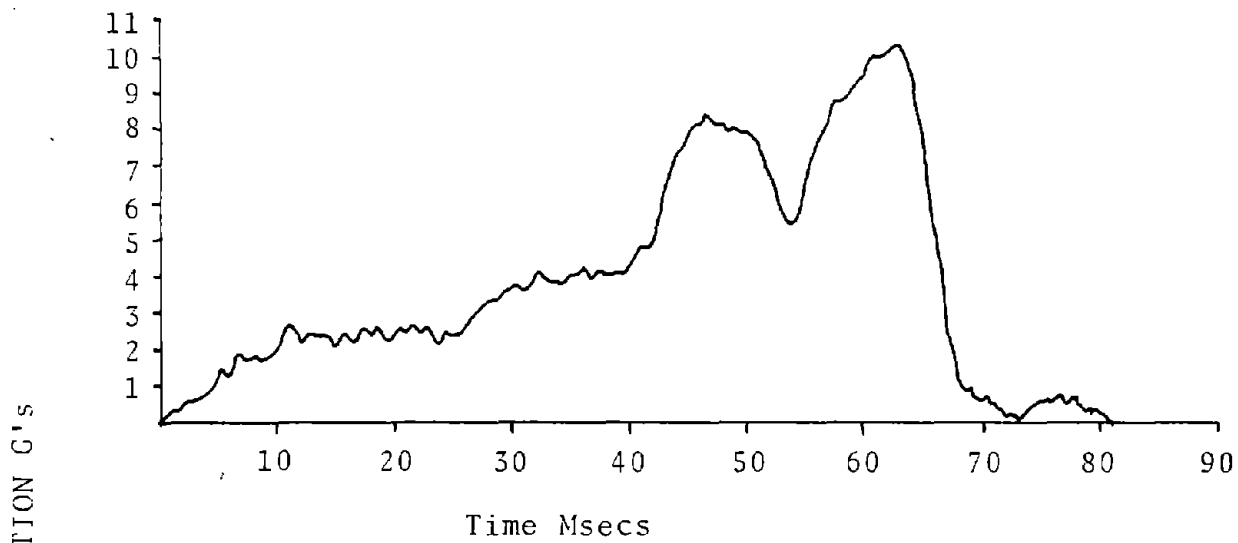


Fig. 134  
 Longitudinal Accelerometer for Test 1147-606

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-607  
Date : Mar 23, 1978  
Weather : Clear, warm  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 47 ft - 2 in (14.4 m)  
Base Diameter : 10 in (25.4 m)  
Weight : 407 lb (185 kg)

BASE:

Type : Couplings  
Manufacturer : Ameron/breakaway bolt  
Modifications : None

FASTENERS (Base):

Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 28.8 ft/sec (8.8 m/s)  
Exit Speed : 15.0 ft/sec (4.6 m/s)  
Momentum Change  
    Film : 985 lb-sec (4381 Ns)  
    Accelerometer : 1034 lb-sec (4500 Ns)  
Peak Deceleration : 20.0 g's

COMMENTS:

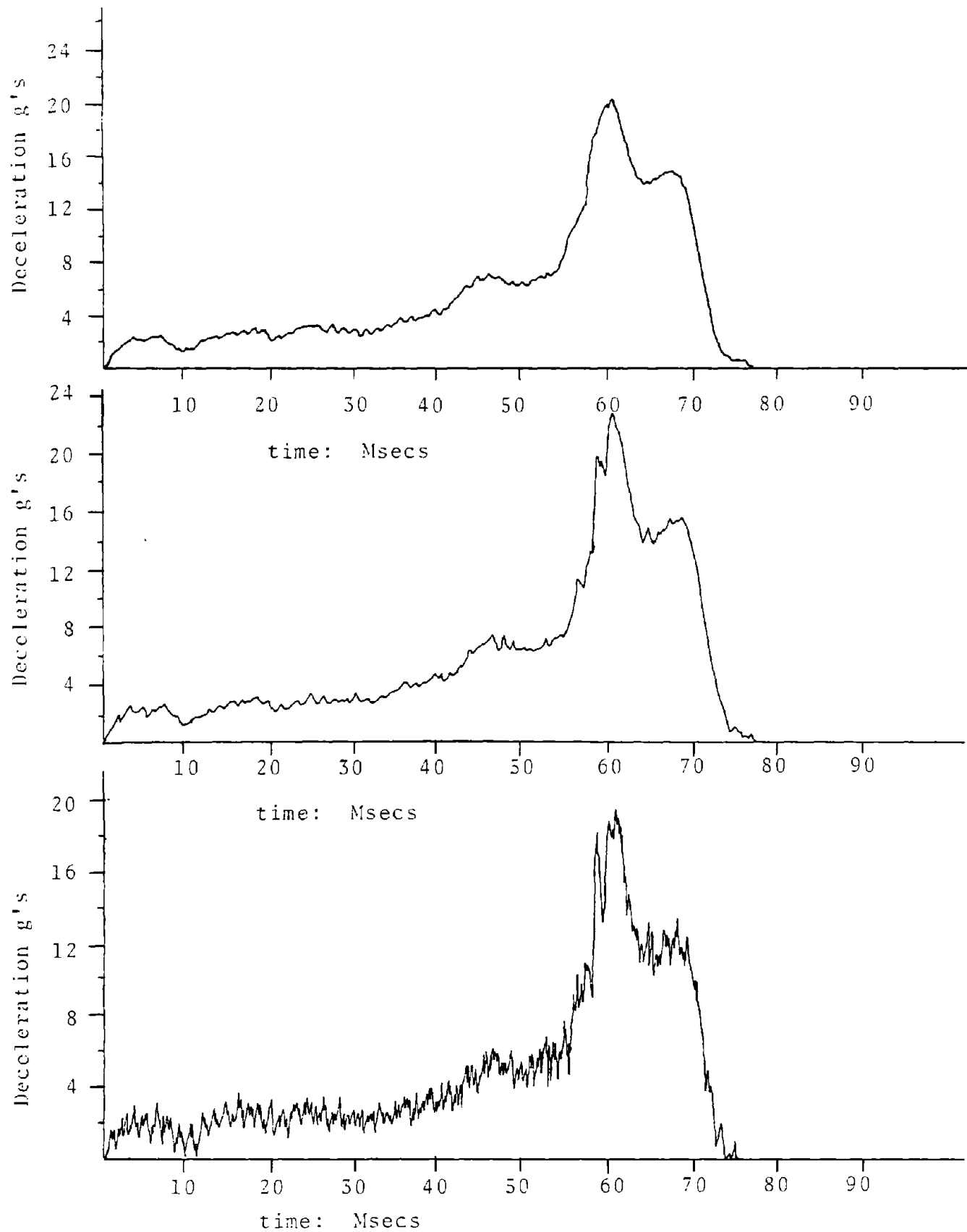


Fig. 135  
Longitudinal Accelerometer Traces for Test 607

## TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

### GENERAL:

Test Number : 1147-608  
Date : Jun 6, 1978  
Weather : Clear, warm  
Pendulum Mass : 2290 lb (1040 kg)

### SUPPORT:

Type : Tapered Octaflute steel pole  
Manufacturer : Millerbernd  
Height : 43 ft (13.1 m)  
Base Diameter : 8.6 in (22 cm)  
Weight : 384 lb (174 kg)

### BASE:

Type : Couplings  
Manufacturer : Ameron/breakaway bolt  
Modifications : None

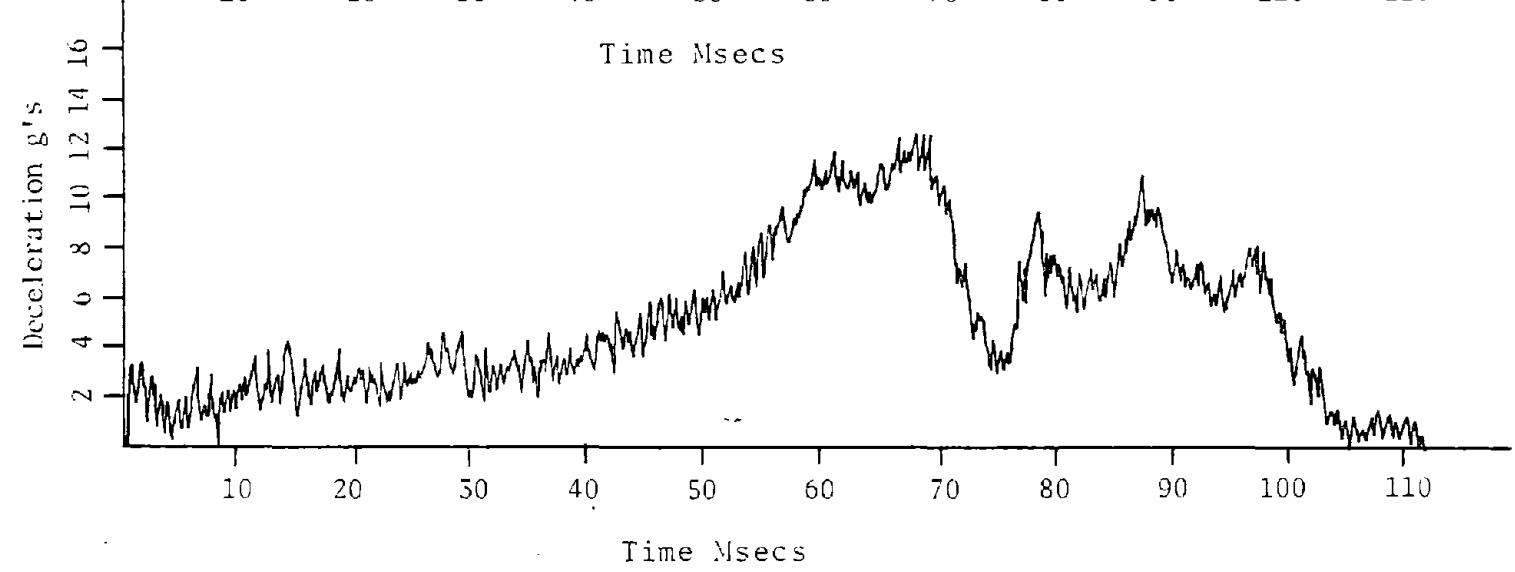
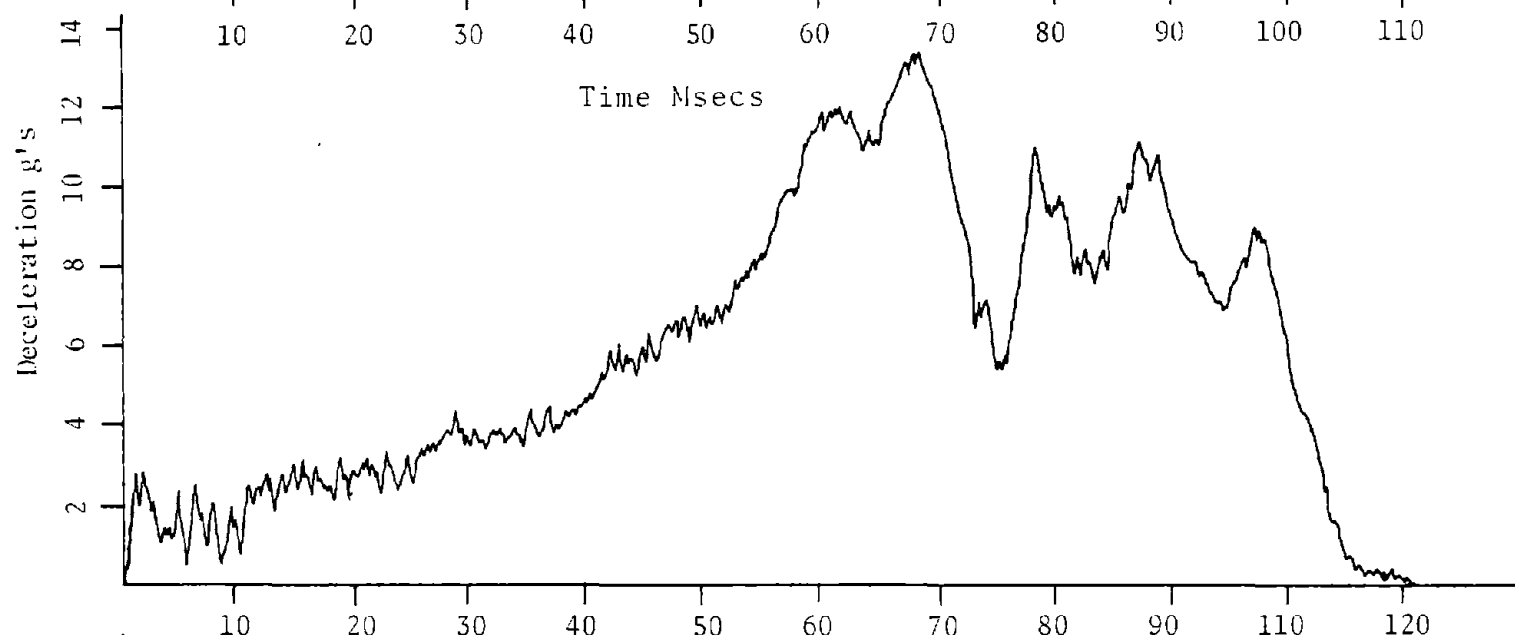
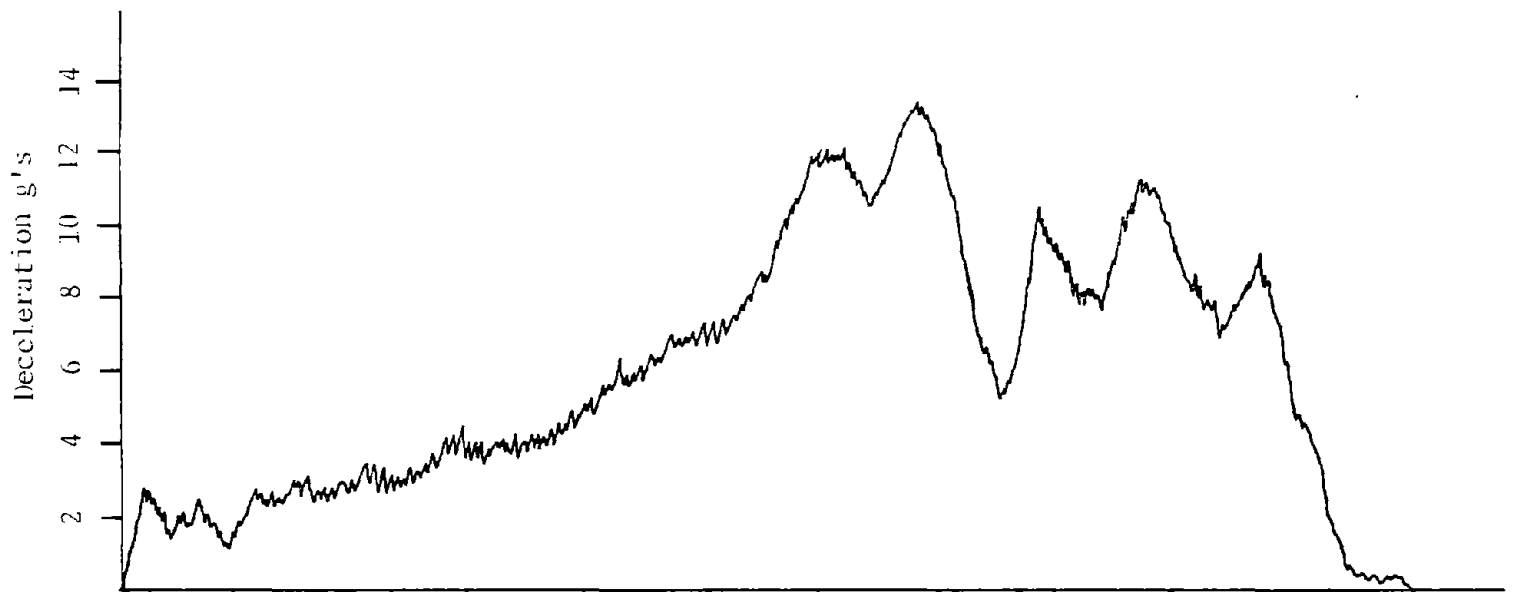
### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 28.9 ft/sec (8.8 m/s)  
Exit Speed : 7.4 ft/sec (2.3 m/s)  
Momentum Change  
  Film : 1533 lb-sec (6819 Ns)  
  Accelerometer : 1512 lb-sec (6725 Ns)  
Peak Deceleration : 12.6 g's

### COMMENTS:



Time Msecs

Fig. 156

Longitudinal Accelerometer Traces for Test 1147-608

TEST DESCRIPTION

TYPE: Pendulum Luminaire Support

GENERAL:

Test Number : 1147-701  
Date : Jul 10, 1978  
Weather : Hot, clear  
Pendulum Mass : 2290 lb (1040 kg)

SUPPORT:

Type : Tapered Fiberglass pole  
Manufacturer : Shakespeare/920-35  
Height : 35 ft (10.7 m)  
Base Diameter :  
Weight :

BASE:

Type : Flange  
Manufacturer : Shakespeare  
Modifications : None

FASTENERS (Base):

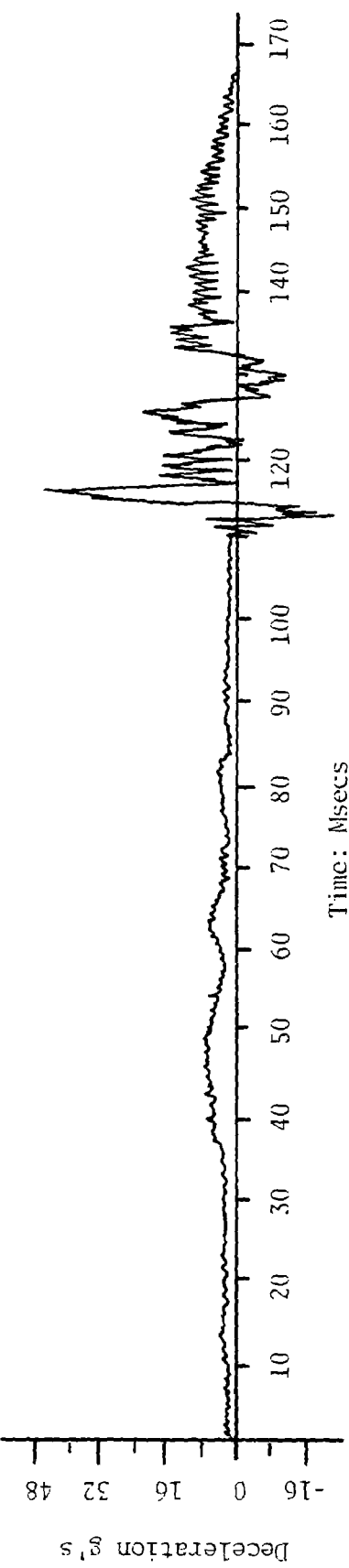
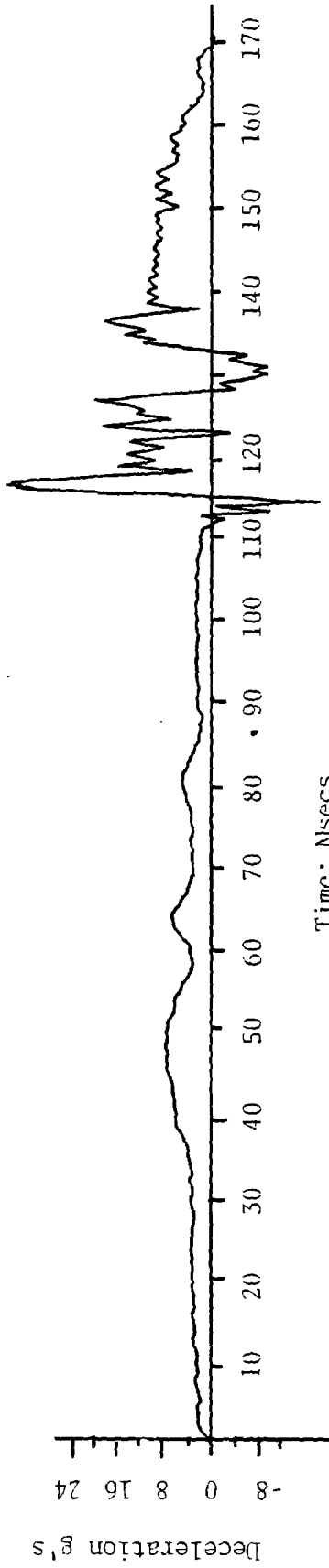
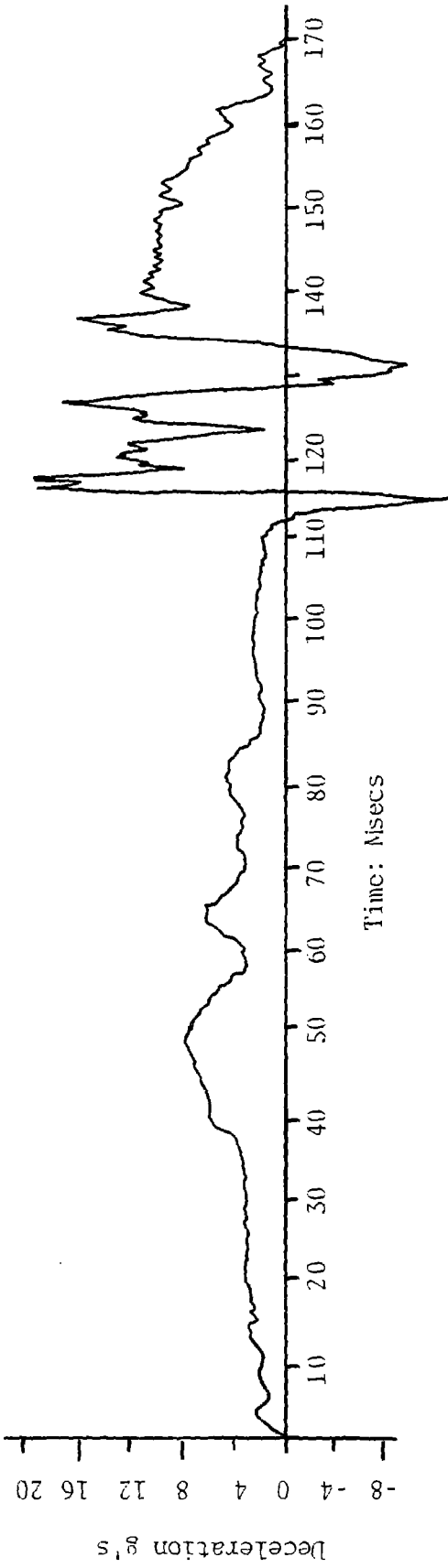
Type : N/A  
Load : N/A

TEST DATA:

Impact Speed : 29.7 ft/sec (9.1 m/s)  
Exit Speed : 0 ft/sec (0 m/s)  
Momentum Change  
Film : 2114 lb-sec (9403 Ns)  
Accelerometer : 1714 lb-sec (7624 Ns)  
Peak Deceleration : 7.6 g's (during main impact)

COMMENTS:





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Fig. 137

Longitudinal Accelerometer Traces for Test 1147-701

TEST DESCRIPTION

TYPE: Full Scale Dual-legged Sign Support

GENERAL:

Test Number : 1147-801A  
Date : Nov 29, 1978  
Weather : Cloudy  
Vehicle : Chevrolet Vega  
Vehicle Mass : 2275 lb (1033 kg)

SIGN/SUPPORT (see Fig 1B):

Blank : 10'x15'x5/8" (3.1m x 4.6m x 1.6 cm) wood  
Leg : 8WF20 steel  
Fasteners  
Base : 4-3/4" H.S. Bolts Torqued to  
62 lb-ft (84 Nm)  
Hinge : 2-3/4" H.S. Bolts Torqued to  
348 lb-ft (472 Nm)

TEST DATA:

Impact Speed : 86.5 ft/sec (26.4 m/s)  
Exit Speed : 81.5 f/s (24.9 m/s)  
Momentum Change  
Film : 358 lb-sec (1592 Ns)  
Accelerometer : 569 lb-sec (2531 Ns)  
Peak Deceleration  
(100 Hz filtered) : 18.6 g's  
Exit Angle : 0°

VEHICLE DAMAGE:

TAD : FC-3  
SAE, J244a : 12FCEN2

COMMENTS:

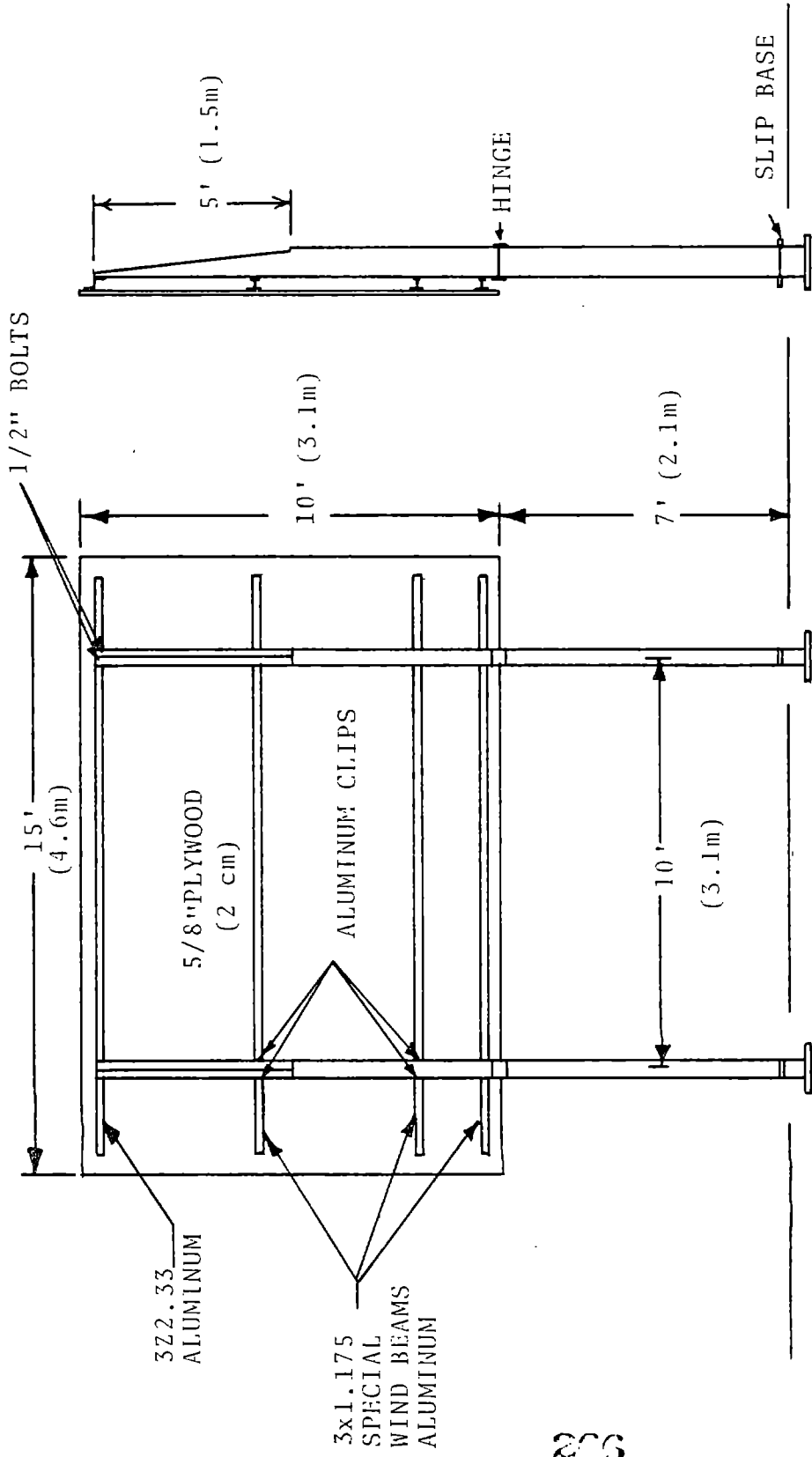
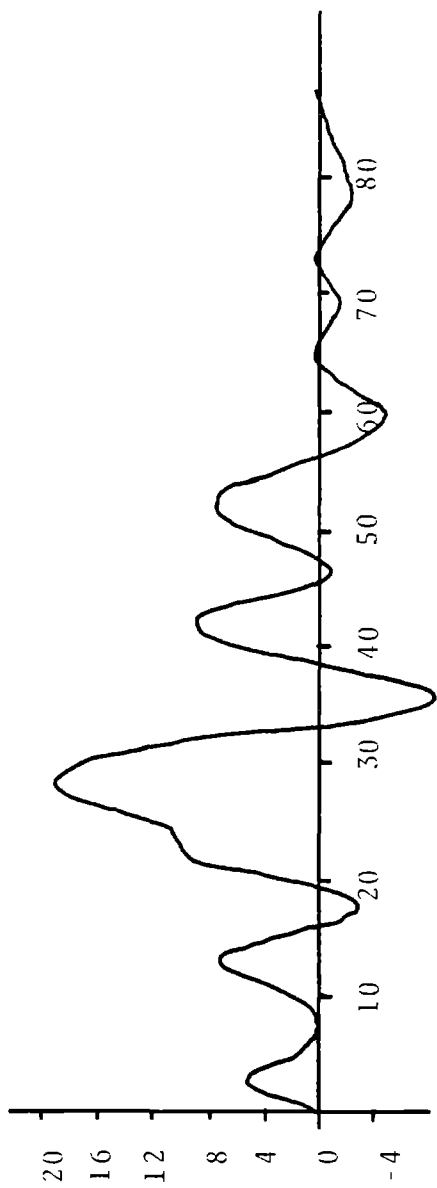
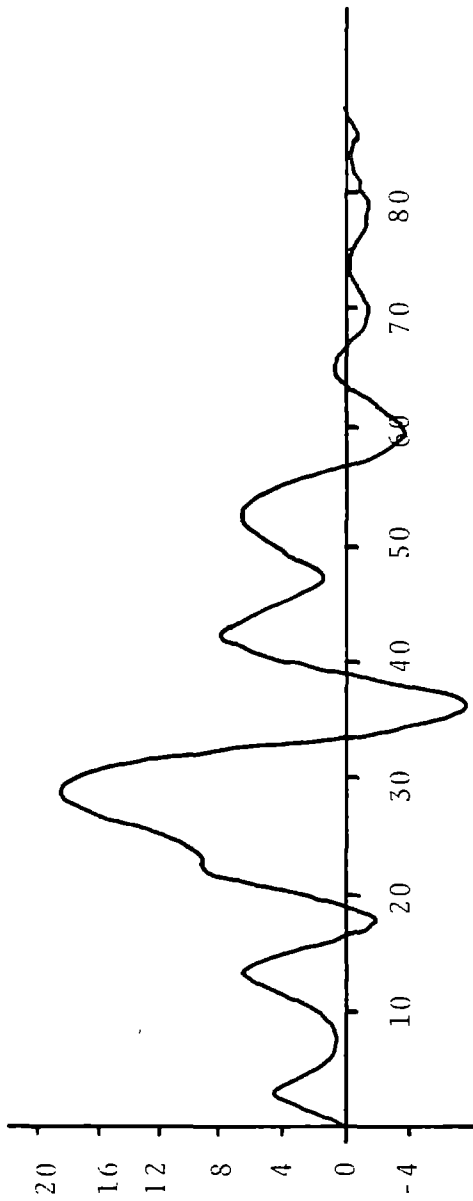


Fig. 138  
Breakaway Dual Legged Sign as Tested in Tests 801A-802-803



TIME: MSECS



TIME: MSECS

Fig. 139  
Deceleration vs. Time Traces For  
Test 1147-801A Filtered at 100Hz

## TEST DESCRIPTION

TYPE: Full Scale Dual-legged Sign Support

### GENERAL:

Test Number : 1147-802  
Date : Dec 5, 1978  
Weather : Cloudy  
Vehicle : Chevrolet-Vega  
Vehicle Mass : 2445 lb (1110 kg)

### SIGN/SUPPORT (see Fig 138):

Blank : 10'x15'x5/8" (3.1 m x 4.6 m x 1.6 cm)  
Leg : 8WF20  
Fasteners  
Base : 4-3/4" H.S. Bolts Torqued to  
62 lb-ft (84 Nm)  
Hinge : 2-3/4" H.S. Bolts Torqued to  
348 lb-ft (472 Nm)

### TEST DATA:

Impact Speed : 34.2 ft/sec (10.4 m/s)  
Exit Speed : 29.0 ft/sec (8.8 m/s)  
Momentum Change  
Film : 394 lb-sec (1753 Ns)  
Accelerometer : 319 lb-sec (1419 Ns)  
Peak Deceleration  
(100 Hz filtered) : 5.9 g's  
Exit Angle : 0°

### VEHICLE DAMAGE:

TAD : FC-3  
SAE, J224a : 12 FCEN2

### COMMENTS:

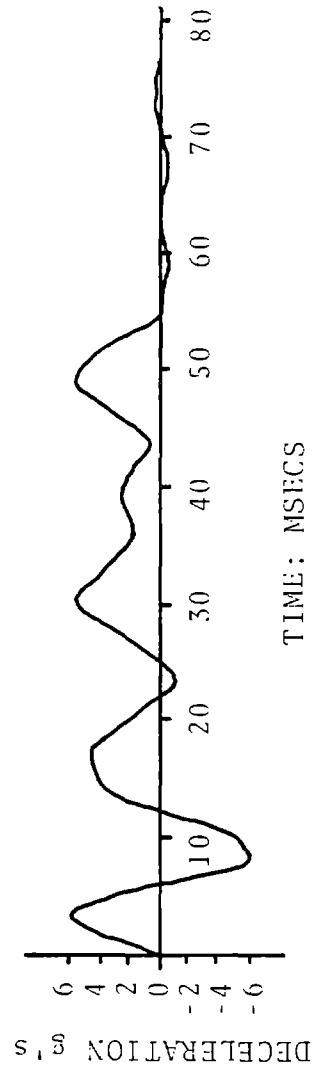
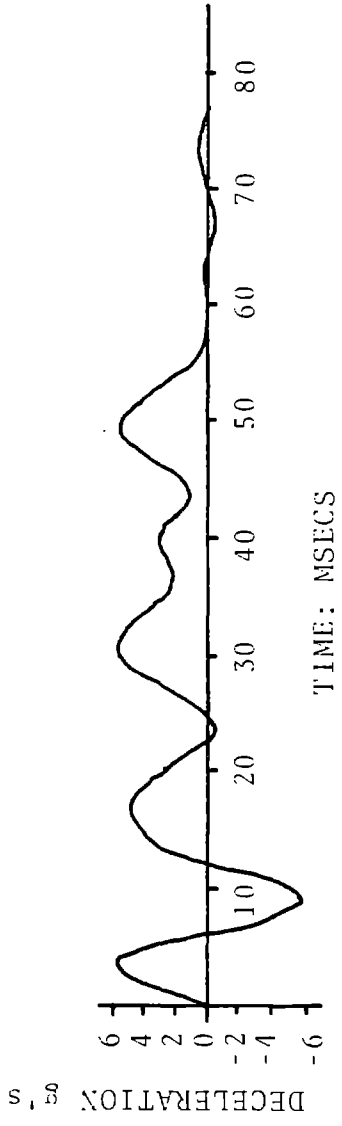


Fig. 140  
 Deceleration vs. Time Traces For  
 Test 1147-802 Filtered at 100Hz

## TEST DESCRIPTION

TYPE: Bogie Dual-legged Sign Support

### GENERAL:

Test Number : 1147-803  
Date : Feb 2, 1979  
Weather : Clear, cold  
Vehicle : 2252 lb (1022 kg)

### SIGN/SUPPORT (see Fig 138):

Blank : 10'x15'x5/8" (3.1m x 4.6m x 1.6 cm) wood  
Leg : 8WF20 steel  
Fasteners  
Base : 4-3/4" H.S. Bolts Torqued to  
62 lb-ft (84 Nm)  
Hinge : 2-3/4" H.S. Bolts Torqued to  
348 lb-ft (472 Nm)

### TEST DATA:

Impact Speed : 31.5 ft/sec (9.6 m/s)  
Exit Speed : 22.1 ft/sec (6.7 m/s)  
Momentum Change  
Film : 652 lb-sec (2900 Ns)  
Accelerometer : 463 lb-sec (2058 Ns)  
Peak Deceleration  
(100 Hz filtered) : 7.7 g's  
Exit Angle : 0°

### COMMENTS:

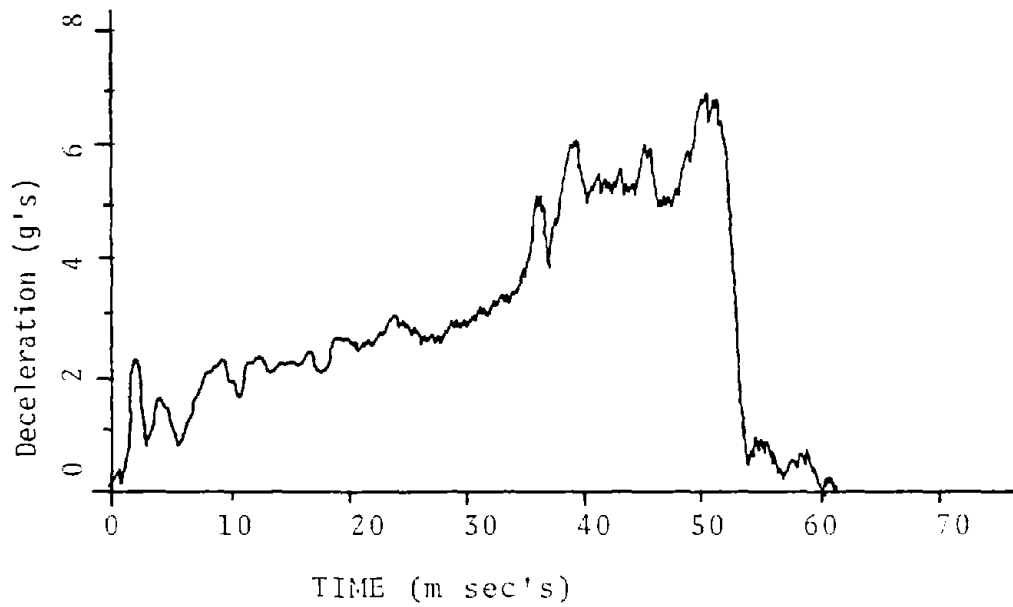
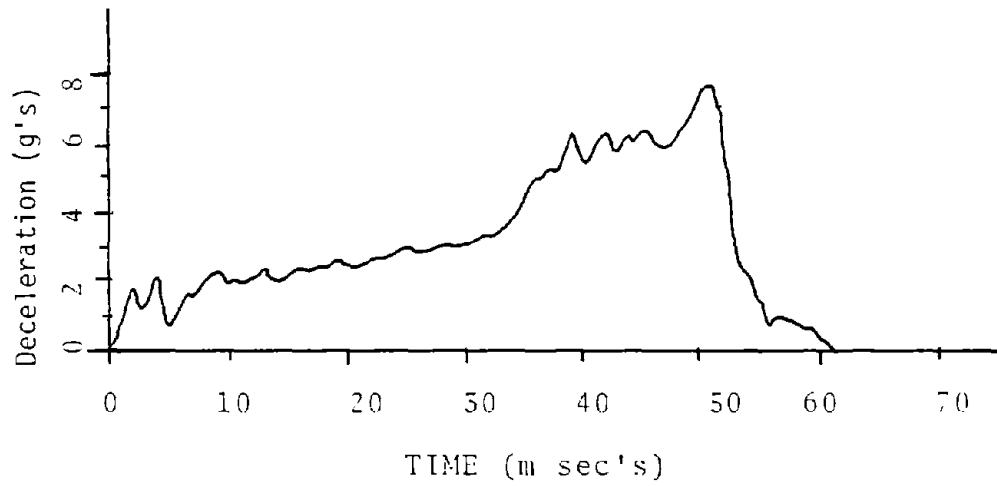


Fig. 141  
Longitudinal Accelerometer Traces for Test 1147-803



## TEST DESCRIPTION

TYPE: Bogie Luminaire Support

### GENERAL:

Test Number : 1147-901  
Date : Jan 11, 1979  
Weather : Cold, cloudy  
Bogie Mass : 2252 lb (1022 kg)

### SUPPORT:

Type : Tapered Aluminum Pole  
Manufacturer : Hapco  
Height : 50 ft-9 in (15.5 m)  
Base Diameter : 10 in (25.4 cm)  
Weight : 420 lb (191 kg)

### BASE:

Type : Couplings  
Manufacturer : Alcoa  
Modifications : None

### FASTENERS (Base):

Type : N/A  
Load : N/A

### TEST DATA:

Impact Speed : 250 ft-sec (7.6 m/s)  
Exit Speed : 15.6 ft-sec (4.8 m/s)  
Momentum Change  
  Film : 657 lb-sec (2922 Ns)  
  Accelerometer : 544 lb-sec (2420 Ns)  
Peak Deceleration : 8.4 g's

### COMMENTS:

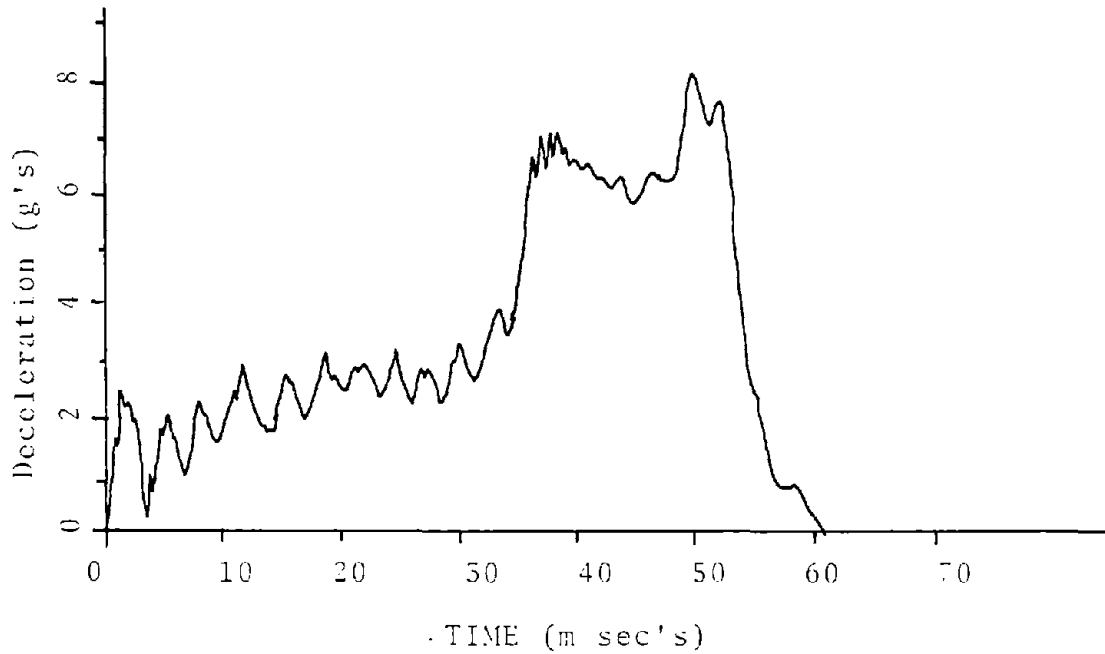
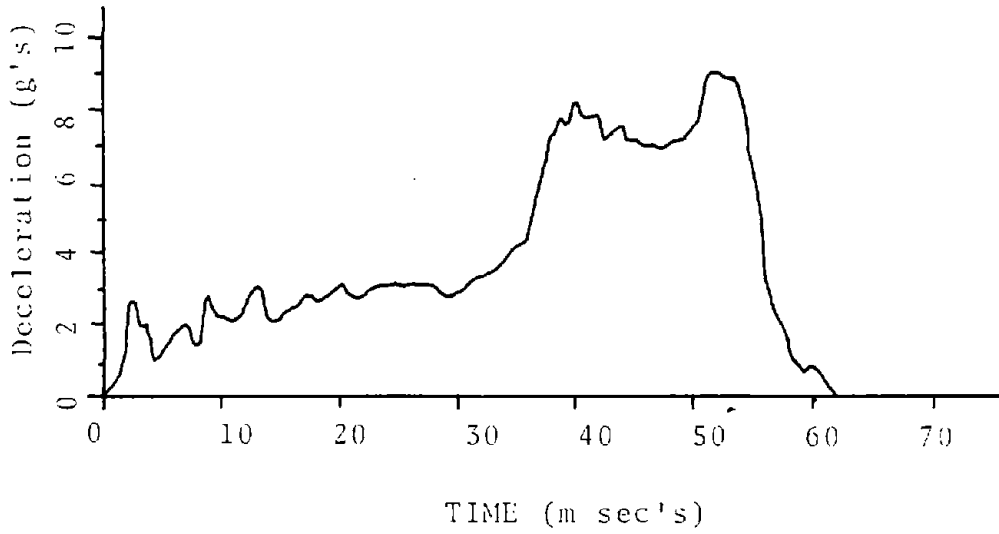
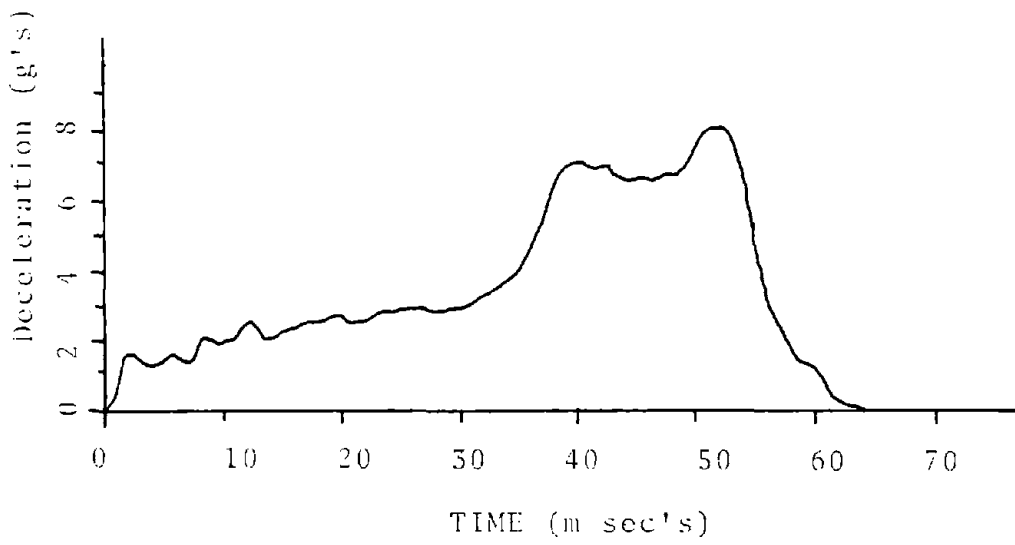


Fig. 142  
 Longitudinal Accelerometer Traces for Test 1147-901

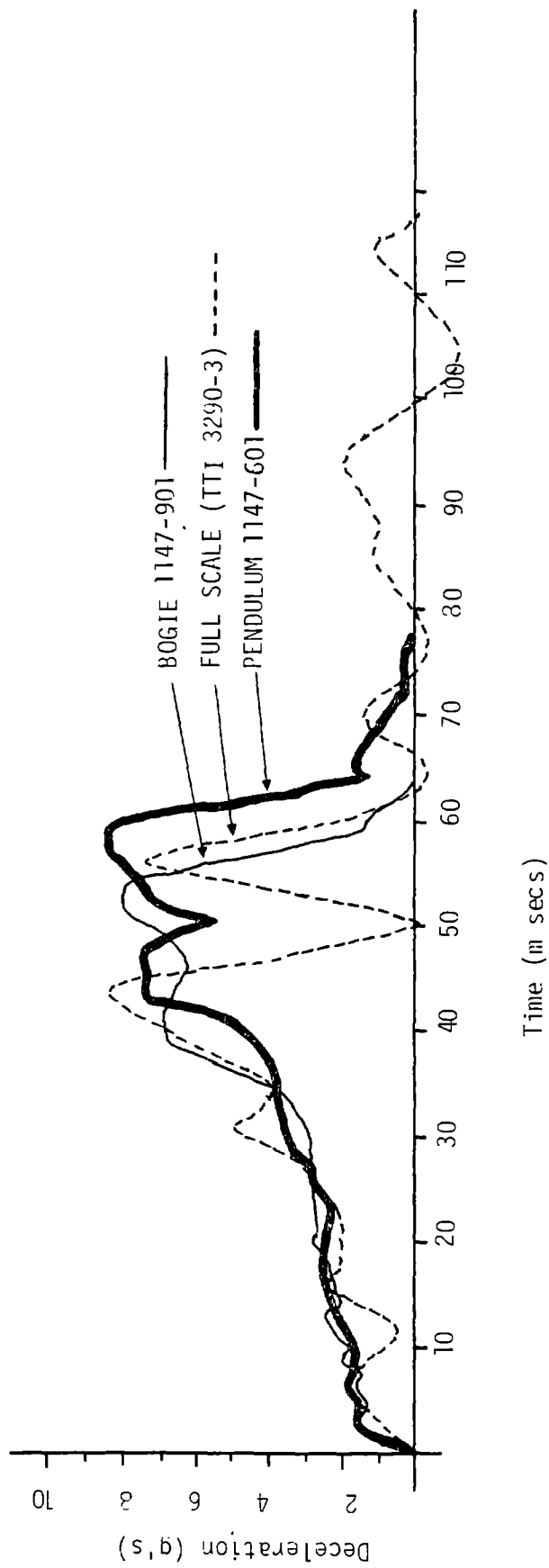


Fig. 143  
 Comparison of Longitudinal Accelerometer  
 Traces for TTI Test 3290 and ENSCO Tests 1147-601 & 901

TEST DESCRIPTION

TYPE: Bogie Dual-legged Sign Support

GENERAL:

Test Number : 1147-902  
Date : Jan 26, 1979  
Weather : Clear, cold  
Bogie Mass : 2252 lb (1022 kg)

SIGN/SUPPORT (See Fig 144)

Blank : 6'-8"x13'-0"x1", Aluminum faced  
honeycomb (2.0m x 4.0 m x 2.5 cm)  
Leg : 6"x8"x7' Wood (15.2 cm x 20.3 cm  
x 2.1 m)

TEST DATA:

Impact Speed : 28.9 ft/sec (8.8 m/s)  
Exit Speed : 0 ft/sec (0 m/s)  
Momentum Change  
Film : 2021 lb-sec (8989 Ns)  
Accelerometer\* : 1380 lb-sec (6138 Ns)  
Peak Deceleration : 6.3 g's  
Exit Angle : No exit

COMMENTS:

\*This value was found using the "duration of event"  
rule according to Transportation Research Circular,  
Number 191, Pg. 22, Paragraph H.

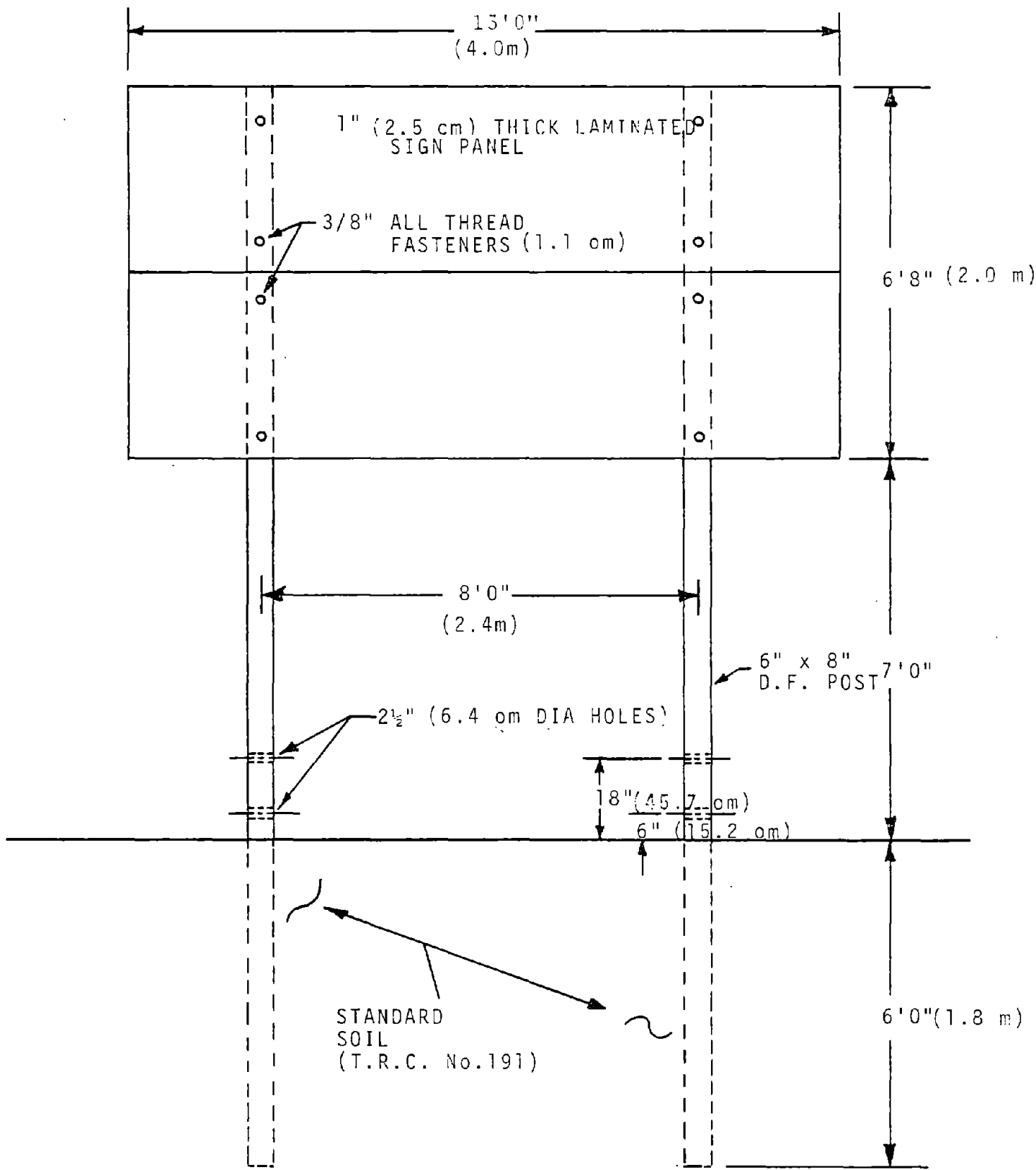


Fig. 144  
 Dual Legged Sign With Wood Post and Laminated  
 Sign Panel Tested in 1147-902

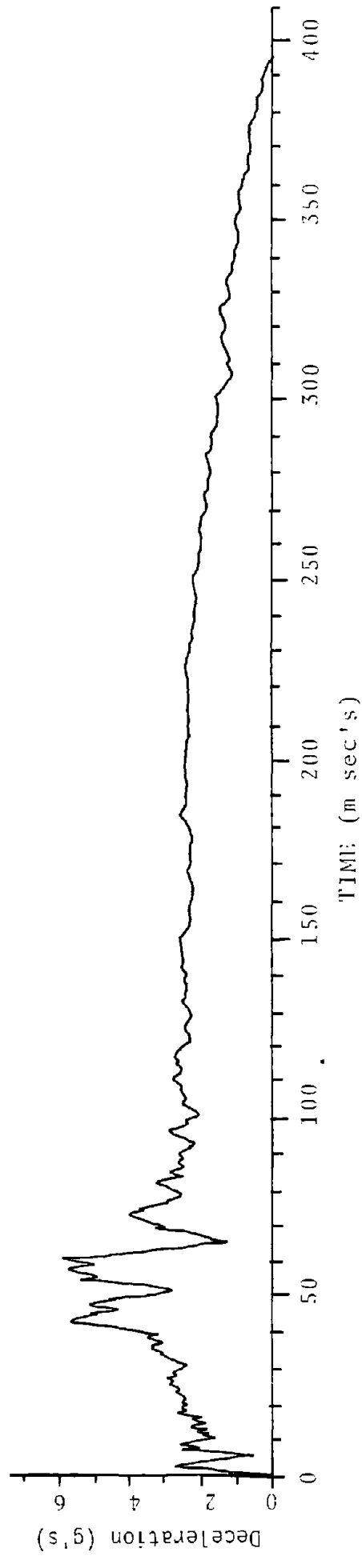
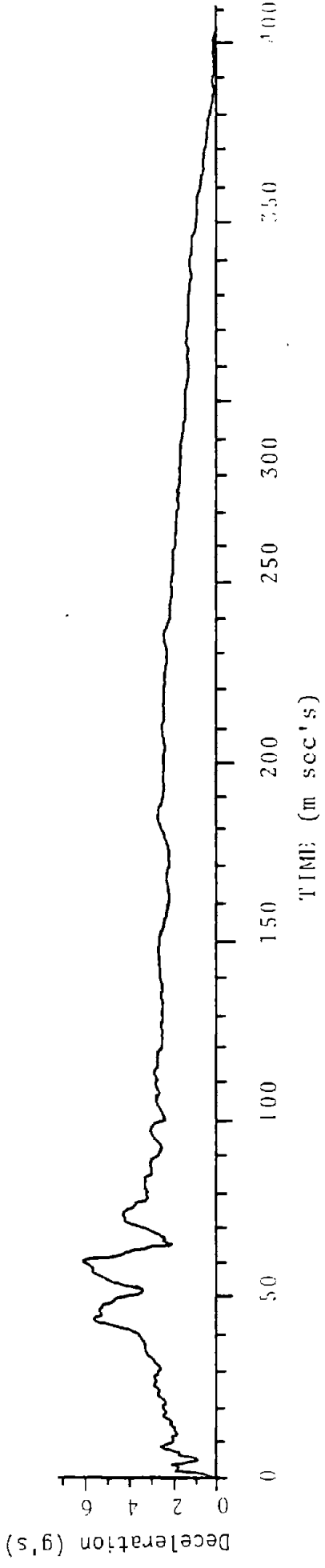


Fig. 145  
Deceleration vs. Time Traces for ENSCO Test 902

TEST DESCRIPTION

TYPE: Bogie Luminaire Support

GENERAL:

Test Number : 1147-903  
Date : Jan 30, 1979  
Weather : Clear, cold  
Bogie Mass : 2252 lb (1022 kg)

SUPPORT:

Type : Tapered Steel Pole  
Manufacturer : Union Metal  
Height : 35 ft (10.7 m)  
Base Diameter : 9 in (22.9 cm)  
Weight : 320 lbs (168 kg)

BASE:

Type : Slip/3 bolt  
Manufacturer : Union Metal  
Modifications : None

FASTENERS (Base):

Type : 1" Strain sert bolts  
Load : 15,000 lb each (66,720 N)

TEST DATA:

Impact Speed : 29.7 ft/sec (9.1 m/s)  
Exit Speed : 21.9 ft/sec (6.7 m/s)  
Momentum Change :  
  Film : 546 lb-sec (2429 Ns)  
  Accelerometer : 633 lb-sec (2816 Ns)  
Peak Deceleration : 9.3 g's

COMMENTS:

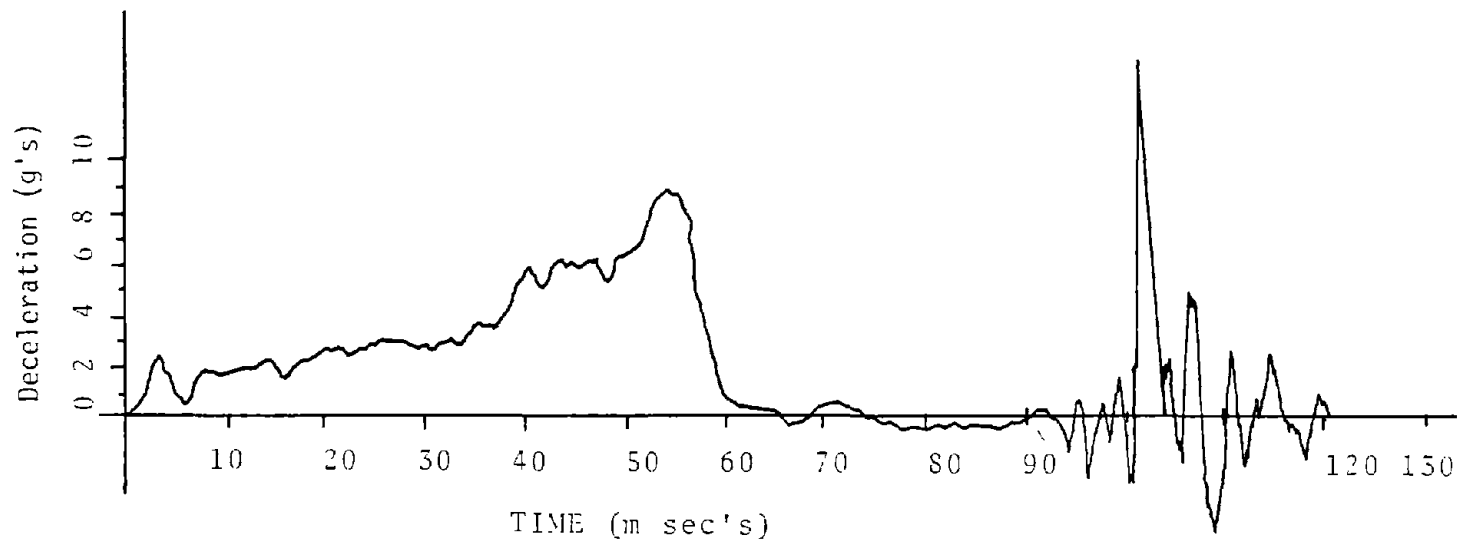
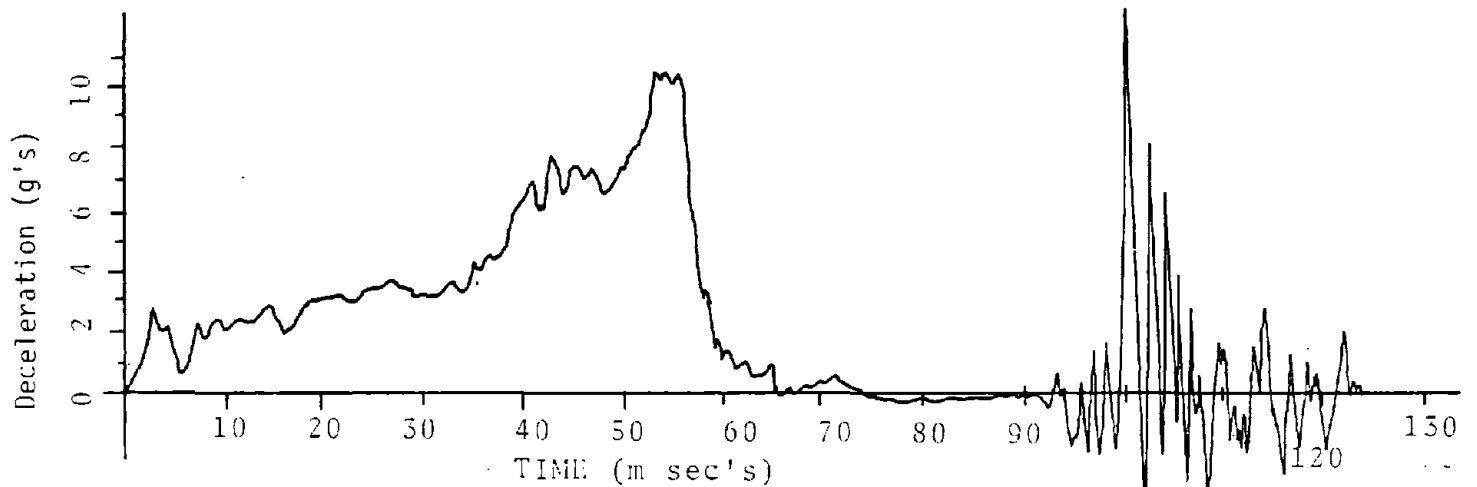
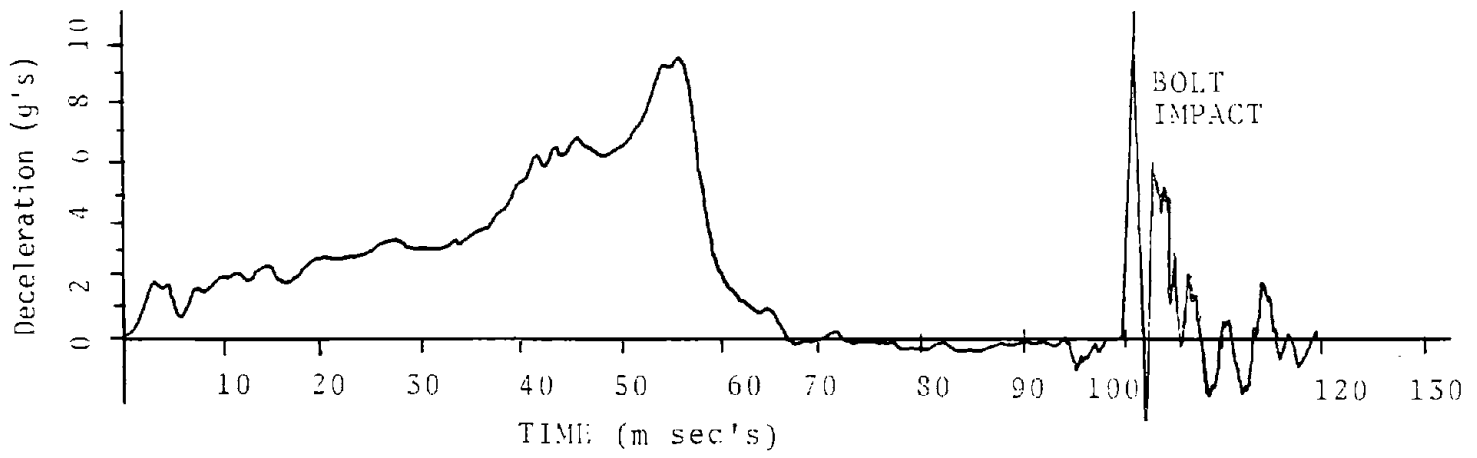


Fig. 146  
 Longitudinal Acceleration Traces for Test 1147-903



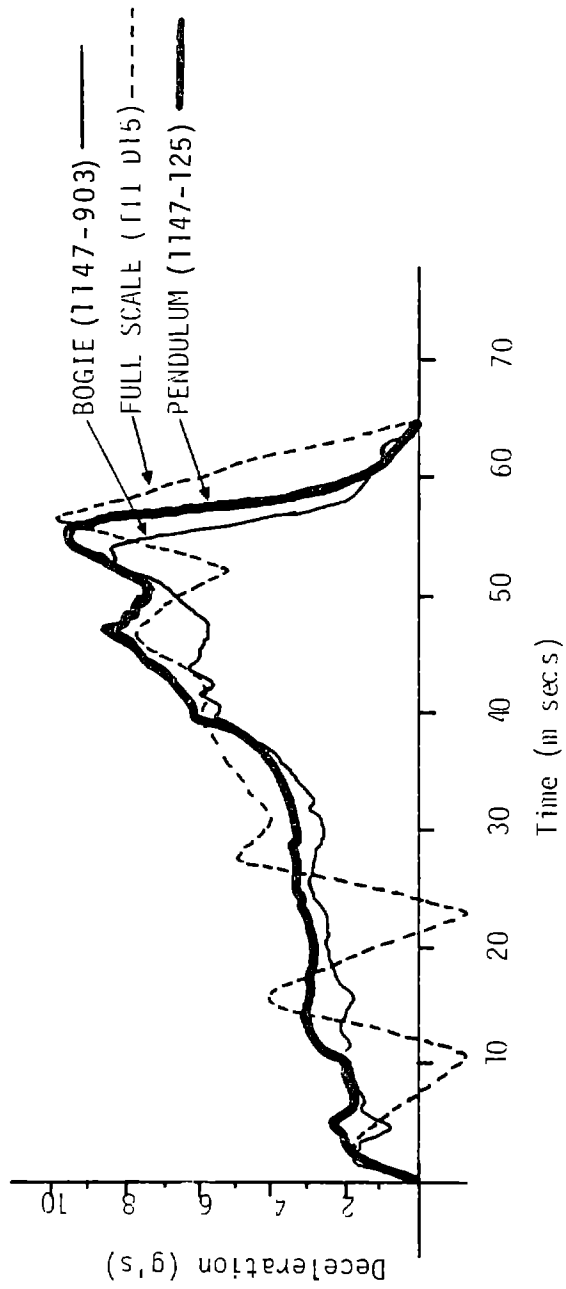


Fig. 147

Comparison of Longitudinal Accelerometer Traces for TTI Test D15 and ENSCO Tests 1147-125 & 1147-903 on Union Metal 3 Bolt Slip Base w/15 Kips Bolt Load

## TEST DESCRIPTION

TYPE: Full Scale Dual-legged Sign Support

### GENERAL:

Test Number : 1147-1001  
Date : Apr 5, 1979  
Weather : Warm, partly cloudy  
Vehicle : 1973 Chevrolet Vega Stationwagon  
Vehicle Mass : 2425 lb (1101 kg)

### SIGN/SUPPORT (see Fig 148):

Blank : 12'x24'x5/8" wood (3.7m x 7.3m x 1.6 cm)  
Leg : 12WF45 Steel  
Fasteners  
Base : 4-1" (2.5 cm) Strain Sert Bolts  
Loaded to 5000 lb each (22240 N)  
Hinge : 2-3/4" (1.9 cm) Strain Sert Bolts  
Loaded to 28000 lb each (124544 N)

### TEST DATA:

Impact Speed : 25.7 f/s (7.8 m/s)  
Exit Speed : 15.2 f/s (4.6 m/s)  
Momentum Change  
Film : 790 lb-sec (3514 Ns)  
Accelerometer : 710 lb-sec (3158 Ns)  
Peak Deceleration  
(100 Hz filtered) : 10 g's  
Exit Angle : 2° to left

### VEHICLE DAMAGE:

TAD : 12 FC 2  
SAE, J224a : 12 FCEN 2

### COMMENTS:

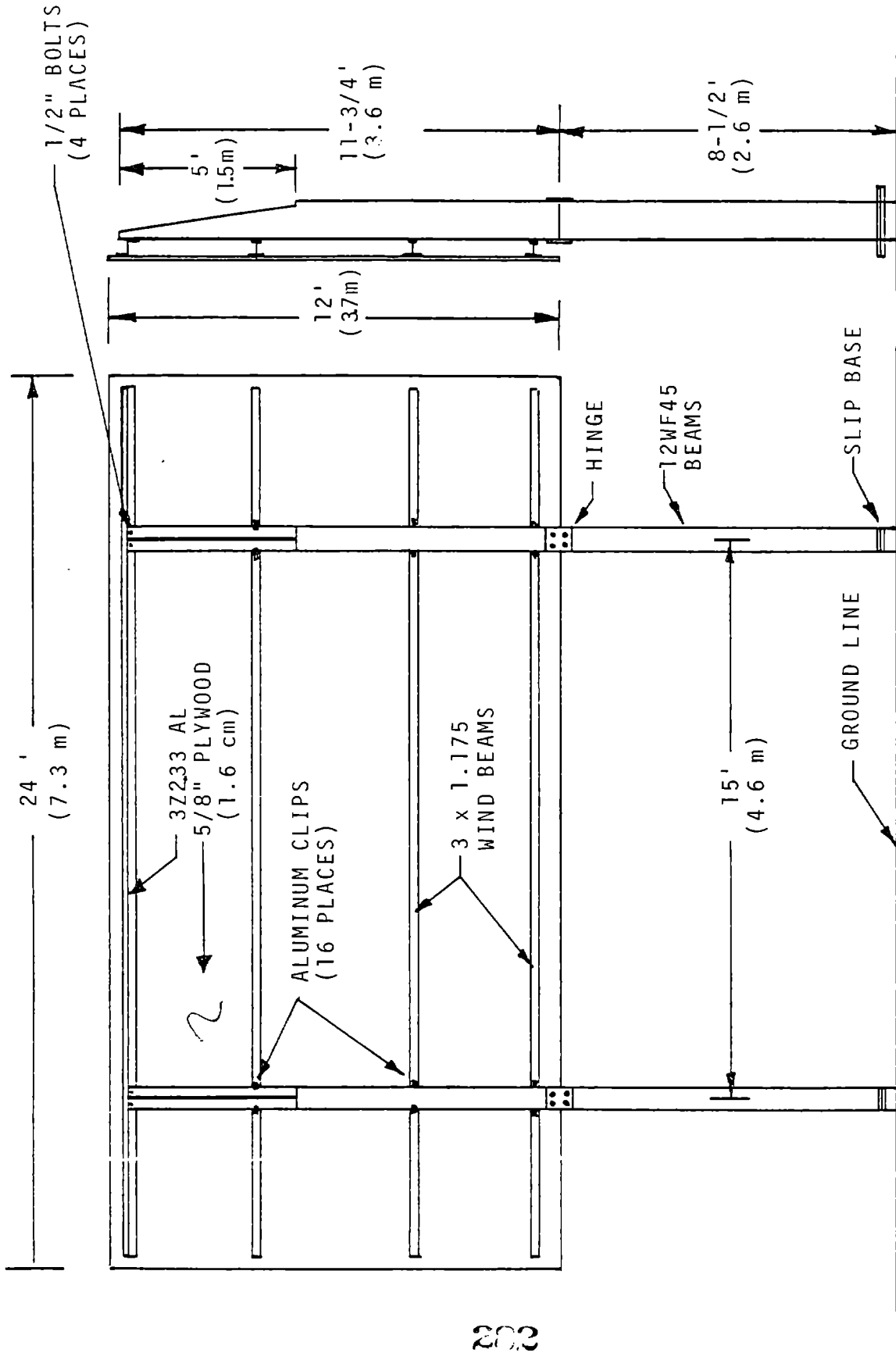
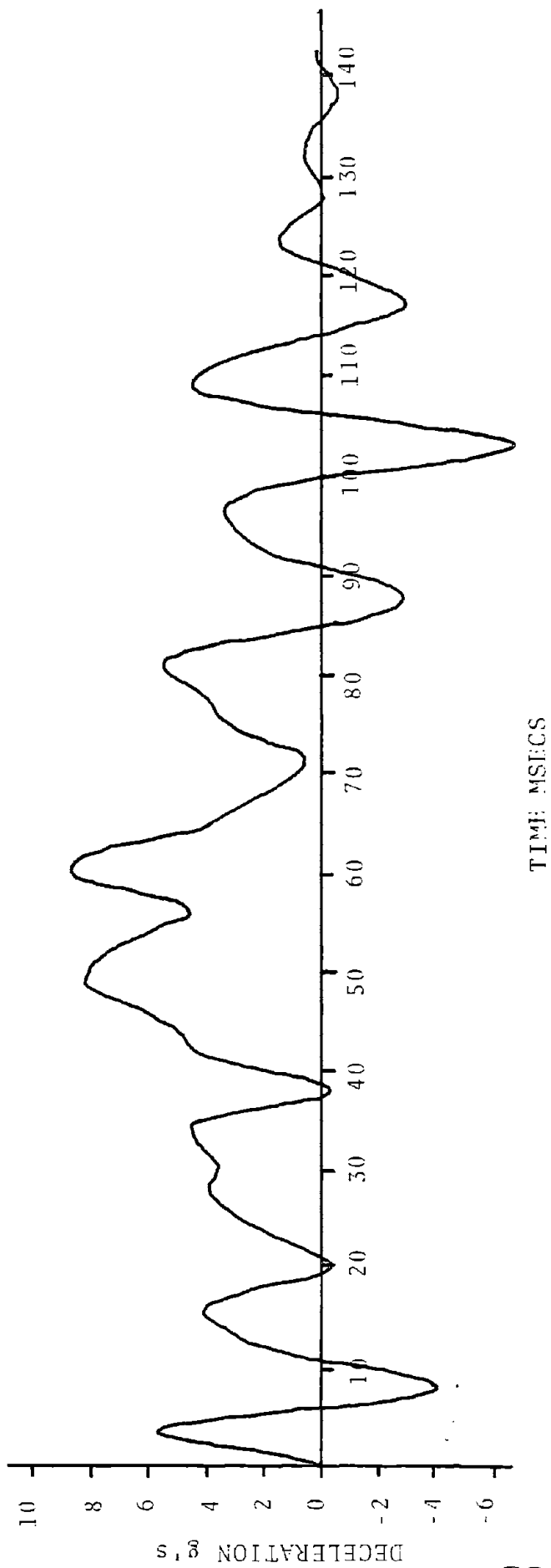


Fig. 148  
Breakaway Dual-legged Sign Tested in 1000 Series Tests



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Fig. 149  
Longitudinal Accelerometer Traces for Test 1147-1001

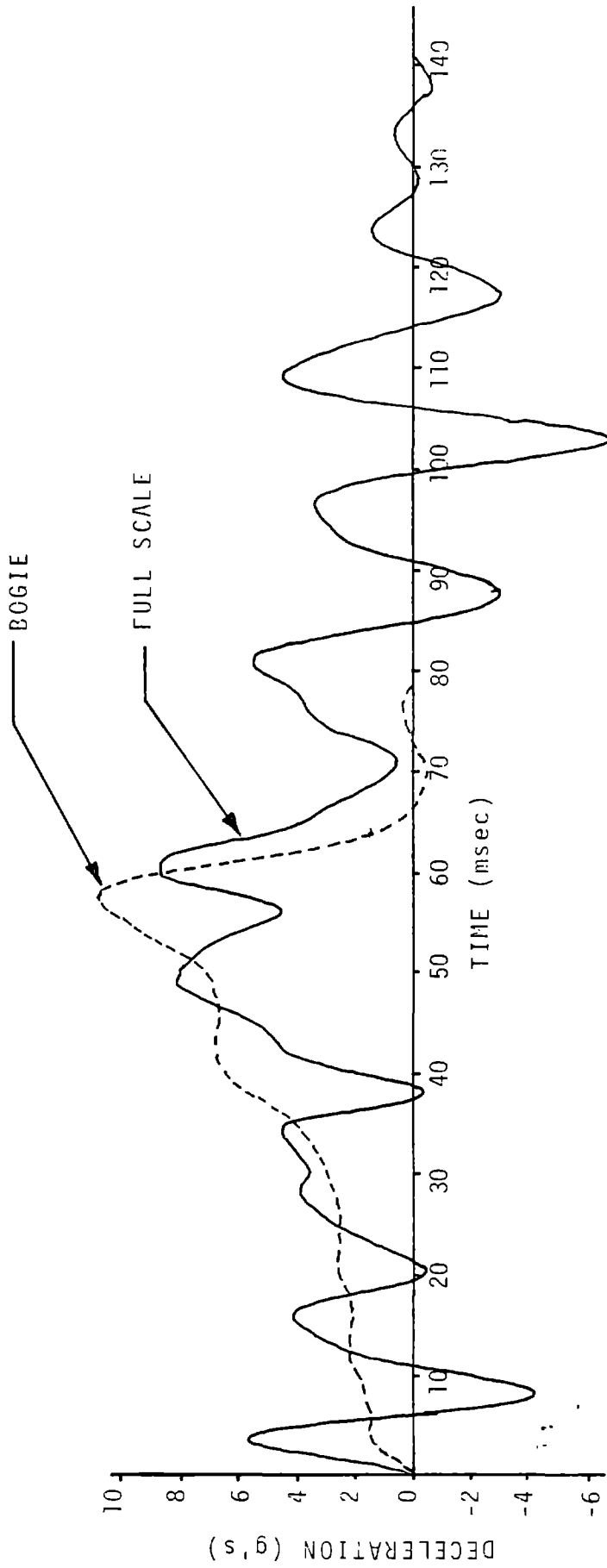


Fig. 150  
 Comparison of Longitudinal Accelerometer Traces for ENSCO Tests  
 1147-1001 (Full Scale) and 1147-1003 (Bogie) Filtered at 100 Hz

## TEST DESCRIPTION

TYPE: Bogie Dual-legged Sign Support

### GENERAL:

Test Number : 1147-1002  
Date : Apr 11, 1979  
Weather : Warm, clear  
Bogie Mass : 2360 lb (1071 kg)

### SIGN/SUPPORT (see Fig. 148):

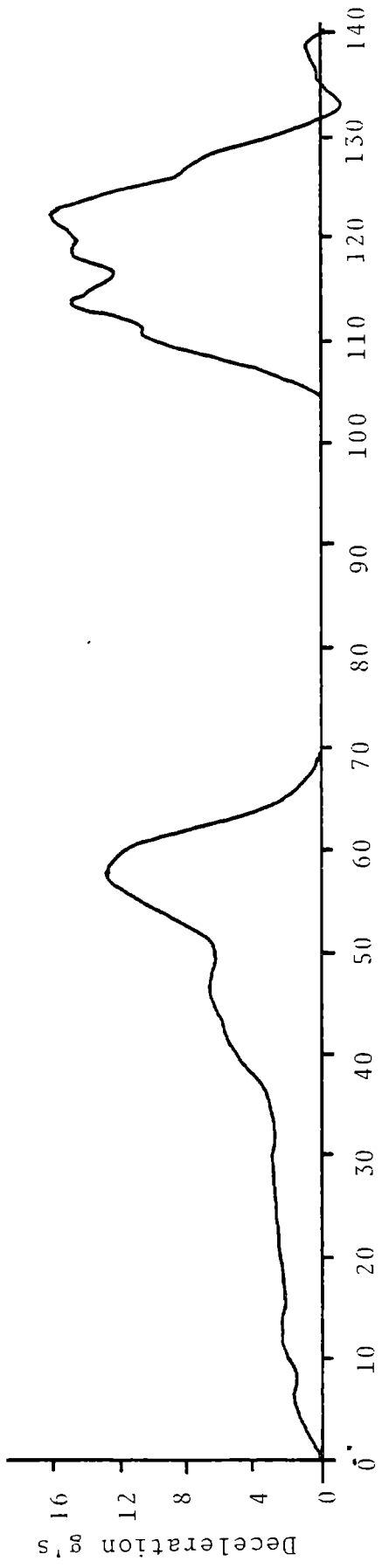
Blank : 12'x24'x5/8" Wood (3.7m x 7.3m x 1.6 cm)  
Leg : 12WF45 Steel  
Fasteners  
Base : 4-1" (2.5 cm) Strain Sert Bolts  
Loaded to 5000 lb each (22240 N)  
Hinge : 2-3/4" (1.9 cm) Strain Sert Bolts  
loaded to 28000 lb each (124544 N)

### TEST DATA:

Impact Speed : 29.7 f/s (9.1 m/s)  
Exit Speed : 0 f/s (0 m/s)  
Momentum Change  
Film : 2177 lb-sec (9684 Ns)  
Accelerometer : 2177 lb-sec (9684 Ns)  
Peak Deceleration : 17.5 g's  
Exit Angle : No exit

### COMMENTS:

Sweeper plate on bogie hit sign leg base



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TIME MSECS

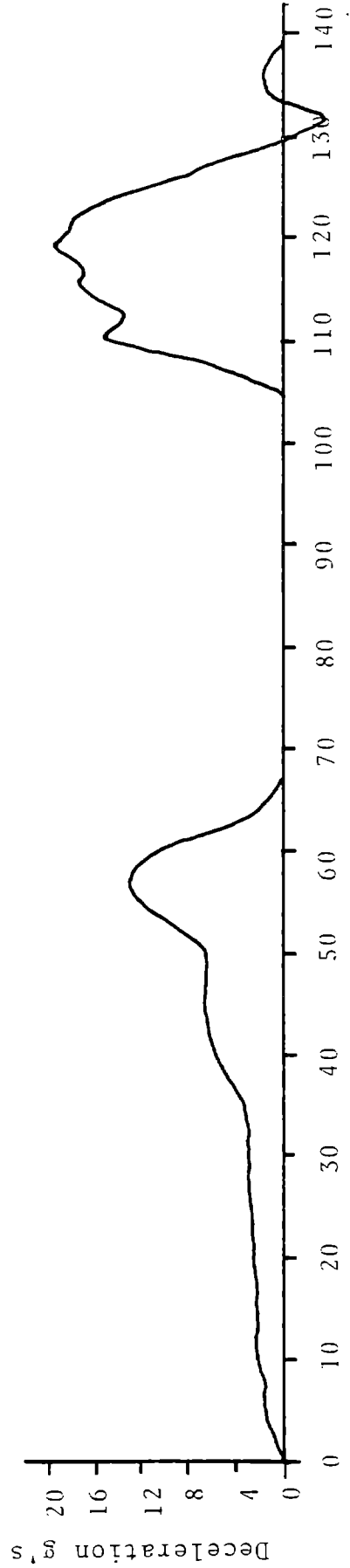


Fig. 151

Longitudinal Accelerometer Traces for Test J147-1002 Filtered at 100Hz

## TEST DESCRIPTION

TYPE: Bogie Dual-legged Sign Support

### GENERAL:

Test Number : 1147-1003  
Date : Apr 17, 1979  
Weather : Cloudy  
Bogie Mass : 2360 lb (1071 kg)

### SIGN/SUPPORT (see Fig. 148):

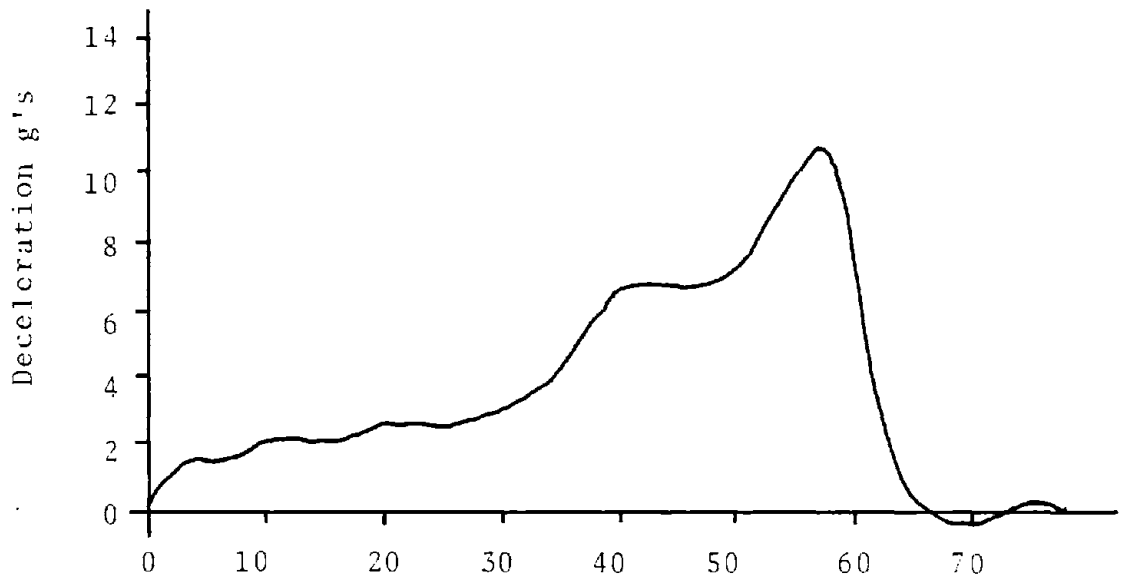
Blank : 12'x24'x5/8" Wood (3.7m x 7.3m x 1.6 cm)  
Leg : 12WF45 Steel  
Fasteners  
Base : 4-1" (2.5 cm) Strain Sert Bolts  
Loaded to 5000 lb each (22240 N)  
Hinge : 2-3/4" (1.9 cm) Strain Sert Bolts  
Loaded to 28000 lb each (124544 N)

### TEST DATA:

Impact Speed : 29.4 ft/sec (9.0 m/s)  
Exit Speed : 20.2 ft/sec (6.2 m/s)  
Momentum Change  
Film : 626 lb-sec (2784 Ns)  
Accelerometer : 687 lb-sec (3056 Ns)  
Peak Deceleration : 11.3 g's  
Exit Angle : 6° to left

### COMMENTS:





TIME MSECS

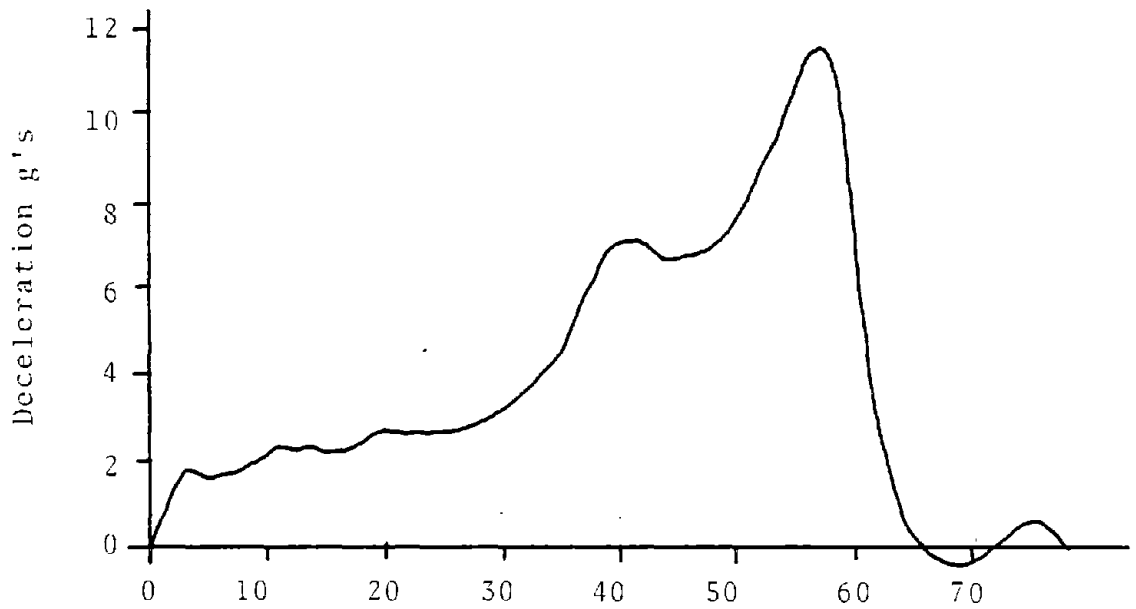


Fig. 152

Longitudinal Accelerometer Traces for Test 1147-1003 Filtered at 100Hz

## TEST DESCRIPTION

TYPE: Bogie Dual-legged Sign Support

### GENERAL:

Test Number : 1147-1004  
Date : Apr 19, 1979  
Weather : Clear, warm  
Bogie Mass : 2260 lb (1026 kg)

### SIGN/SUPPORT (see Fig. 148):

Blank : 12'x24'x5/8" wood (3.7m x 7.3m x 1.6 cm)  
Leg : 12WF45 Steel  
Fasteners  
Base : 4-1" (2.5 cm) Strain Sert Bolts  
Loaded to 5000 lb each (22240 N)  
Hinge : 2-3/4" (1.9 cm) Strain Sert Bolts  
loaded to 28000 lb each (124,544 N)

### TEST DATA:

Impact Speed : 30.7 ft/sec (9.4 m/s)  
Exit Speed : 21.4 ft/sec (6.5 m/s)  
Momentum Change  
Film : 656 lb-sec (2918 Ns)  
Accelerometer : 700 lb-sec (3114 Ns)  
Peak Deceleration : 12.7 g's  
Exit Angle : 9° to left

### COMMENTS:

Bogie impacted sign at a 15° angle

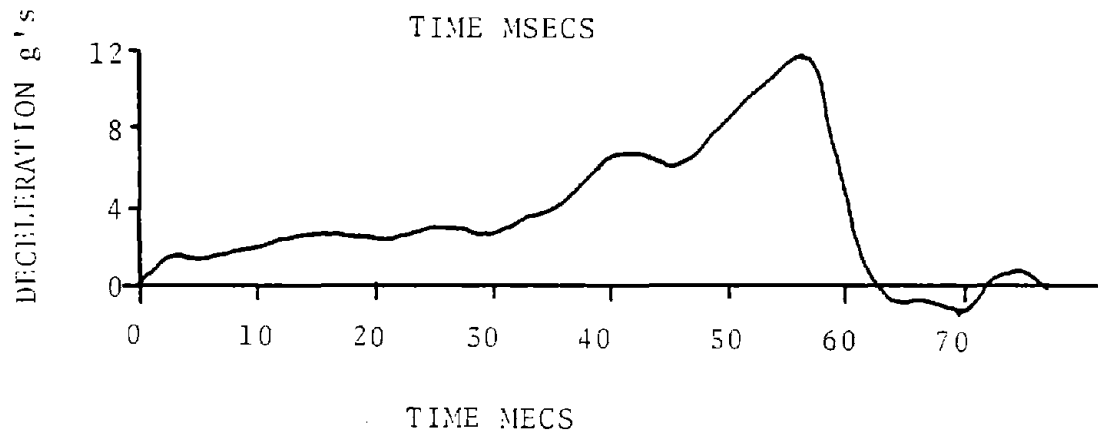
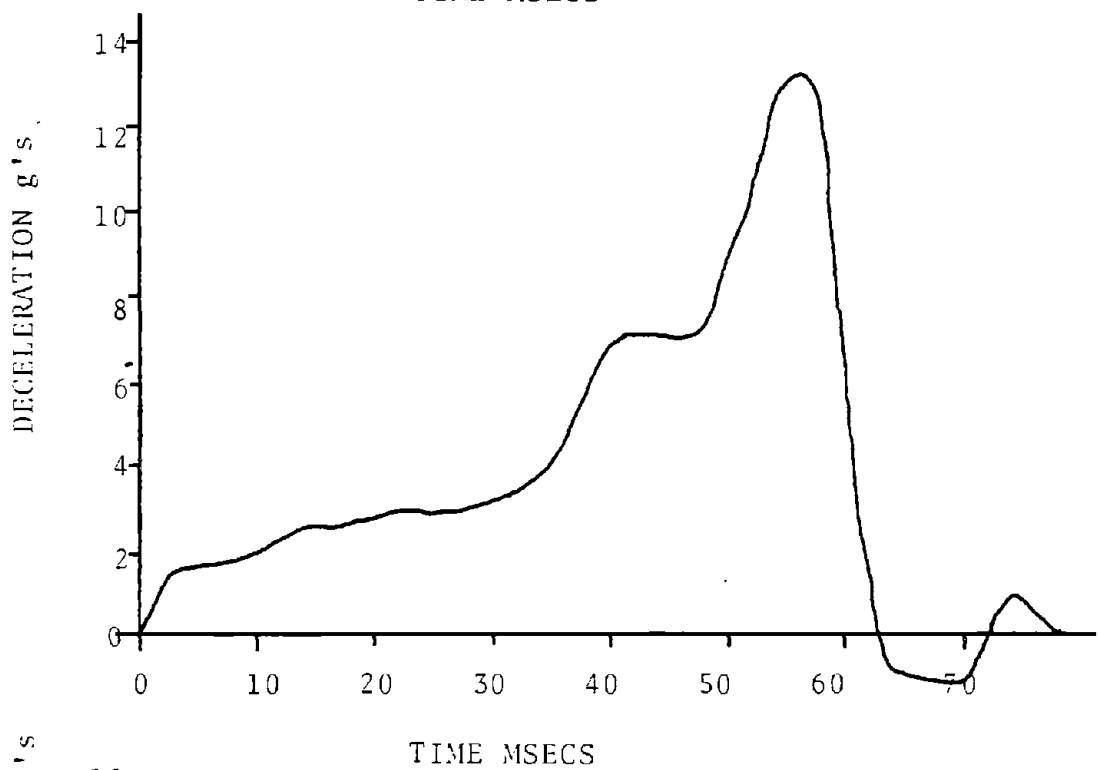
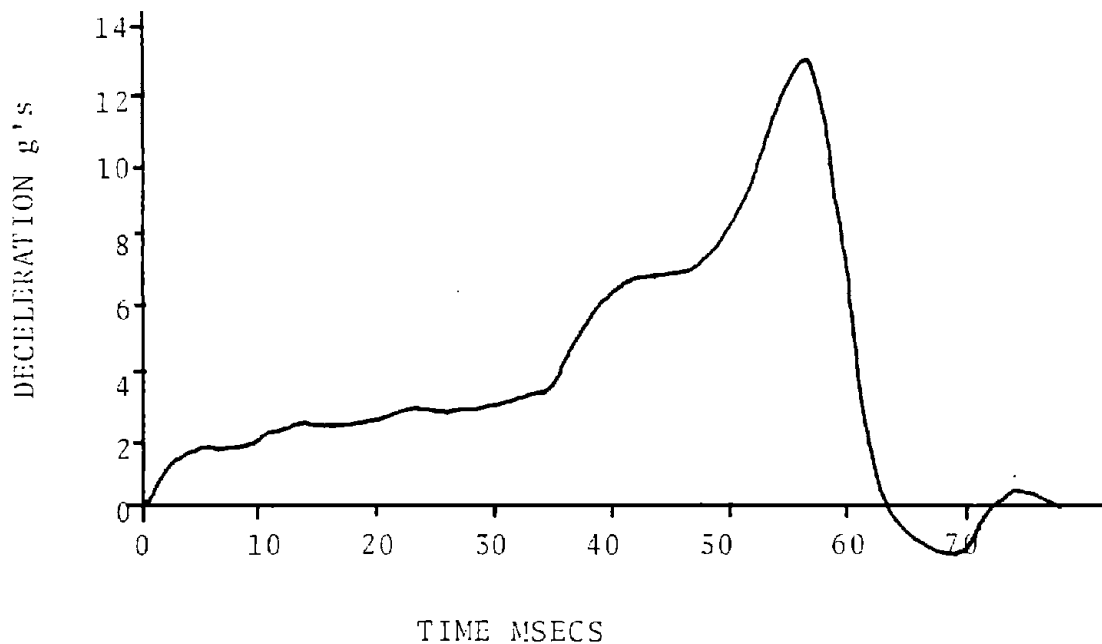


Fig. 153  
 Longitudinal Accelerometer Traces for Test 1147-1004 Filtered at 100Hz

## TEST DESCRIPTION

TYPE: Bogie Dual-legged Sign Support

### GENERAL:

Test Number : 1147-1005  
Date : Apr 23, 1979  
Weather : Clear  
Bogie Mass : 2260 lb (1026 kg)

### SIGN/SUPPORT (see Fig. 148):

Blank : 12'x24'x5/8" Wood (3.7m x 7.3m x 1.6 cm)  
Leg : 12WF45 Steel  
Fasteners  
Base : 4-1" (2.5 cm) Strain Sert Bolts  
loaded to 5000 lb each (22240 N)  
Hinge : 2-3/4" (1.9 cm) Strain Sert Bolts  
loaded to 28000 lb each (124,544 N)

### TEST DATA:

Impact Speed : 32.9 f/s (10.0 m/s)  
Exit Speed : 22.9 f/s (7.0 m/s)  
Momentum Change  
Film : 704 lb-sec (3133 Ns)  
Accelerometer : 677 lb-sec (3011 Ns)  
Peak Deceleration : 13.1 g's  
Exit Angle : 26° to left

### COMMENTS:

Bogie impacted sign at a 30° angle

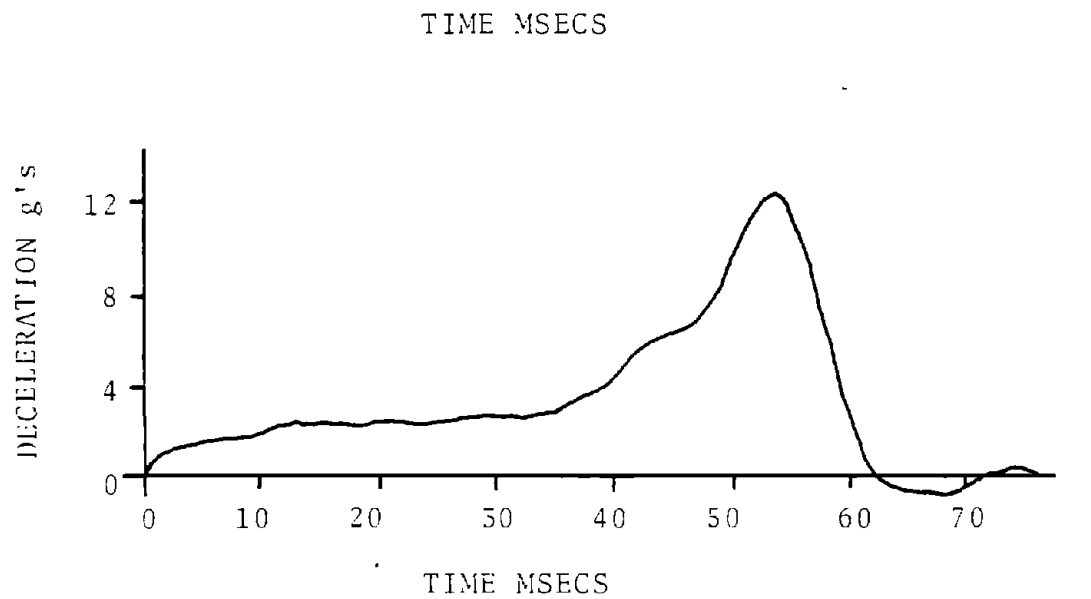
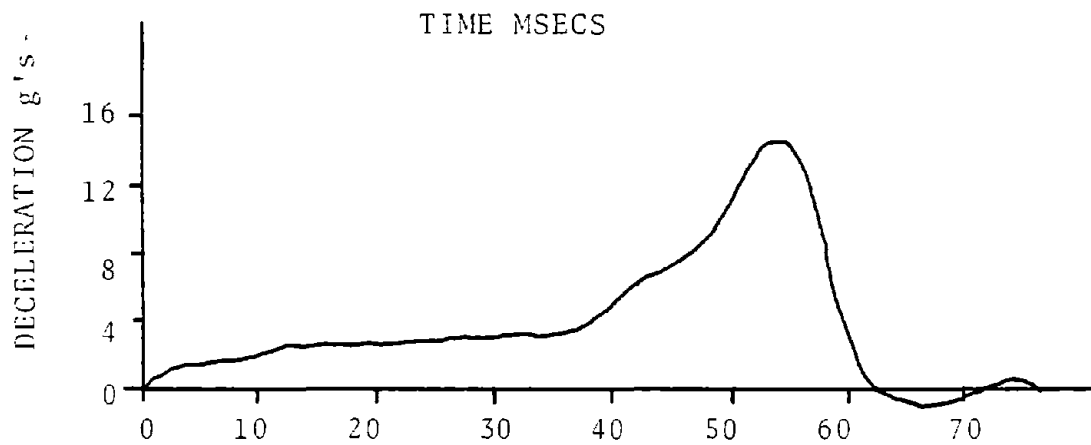
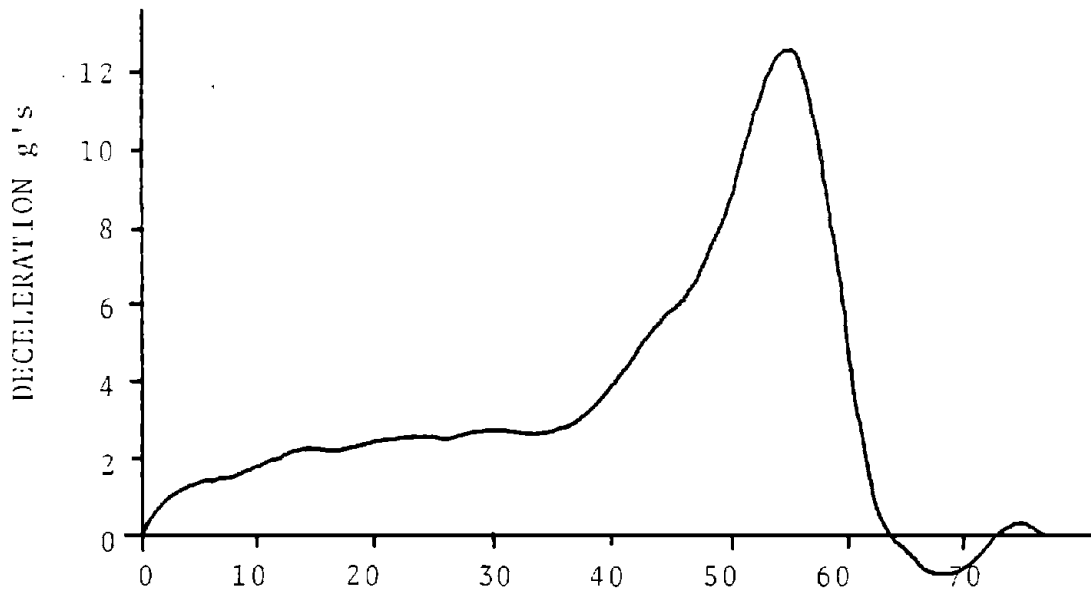


Fig. 154.  
 Longitudinal Accelerometer Traces for Test 1147-1105 Filtered at 100Hz

TEST DESCRIPTION

TYPE: Bogie Dual-legged Sign Support

GENERAL:

Test Number : 1147-1006  
Date : May 1, 1979  
Weather : Clear  
Bogie Mass : 2260 lb (1026 kg)

SIGN/SUPPORT (see Fig. 155):

Blank : 12'x24'x5/8" wood (3.7m x 7.3m x 1.6 cm)  
Leg : 12WF45 Steel  
Fasteners  
Base : 4-1" (2.5cm) Strain Sert Bolts  
Loaded to 5000 lb each (22240 N)  
Hinge : Balanced

TEST DATA:

Impact Speed : 31.3 f/s (9.5 m/s)  
Exit Speed : 20.8 f/s (6.3 m/s)  
Momentum Change  
Film : 731 lb-sec (3251 Ns)  
Accelerometer : 697 lb-sec (3100 Ns)  
Peak Deceleration : 12.5 g's  
Exit Angle : 15° to left

COMMENTS:

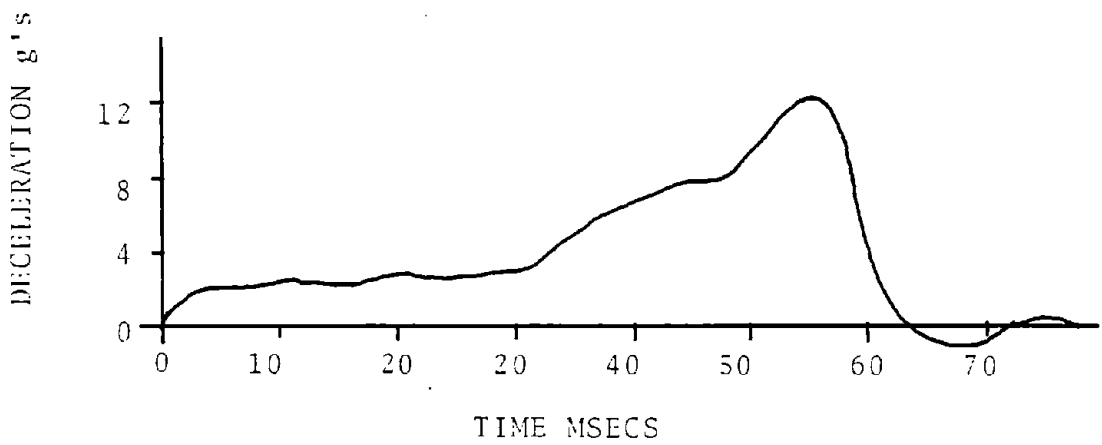
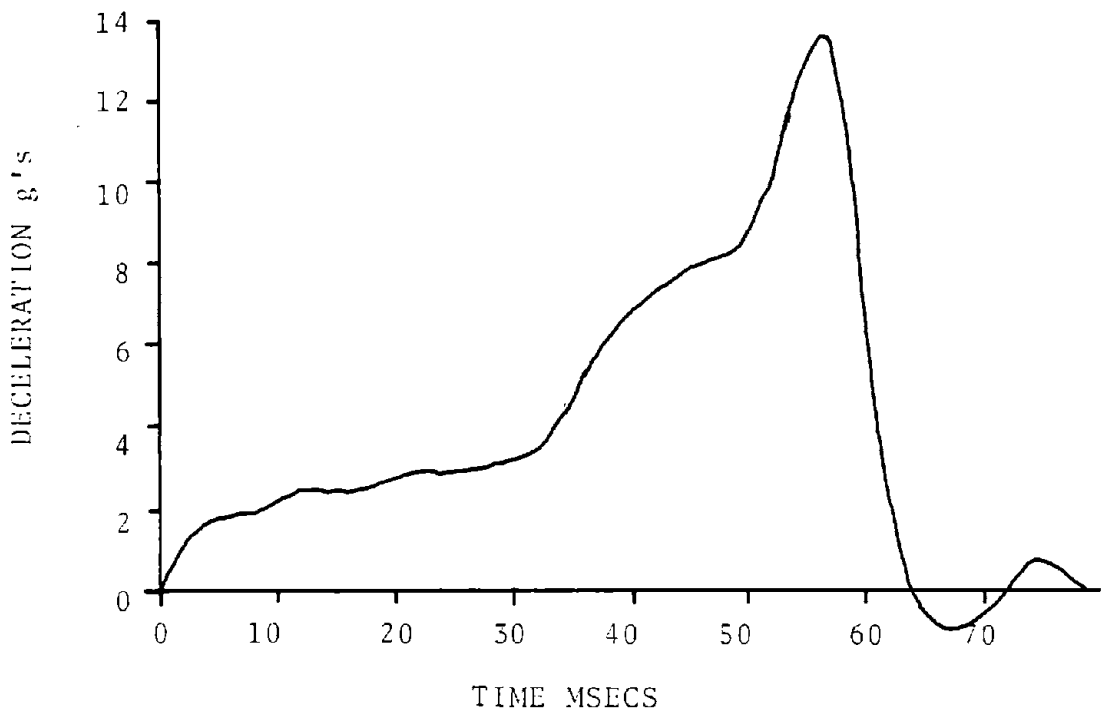
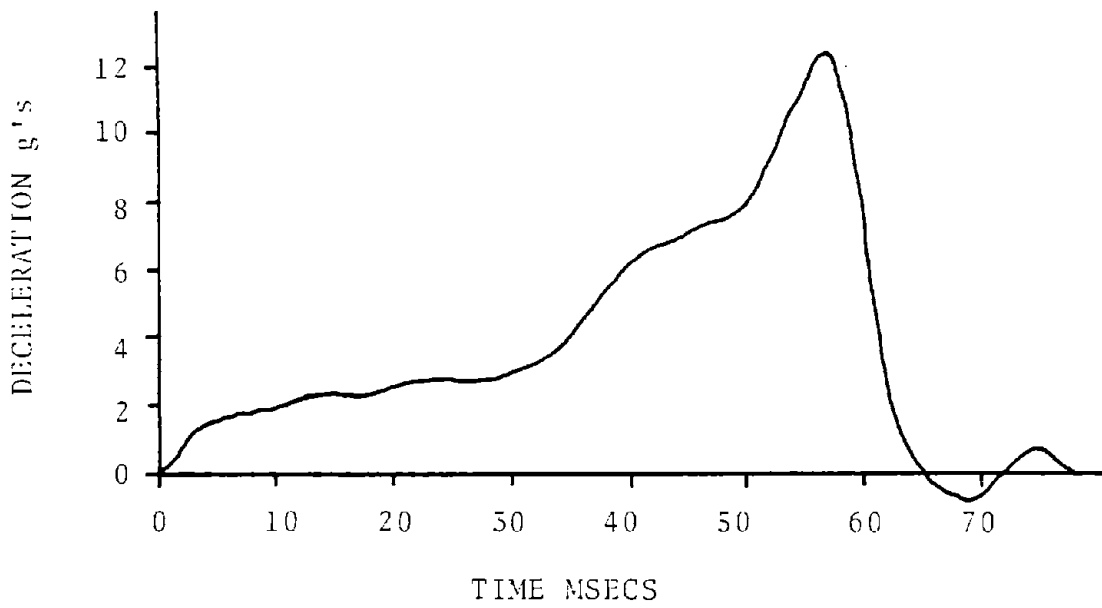


Fig. 156

Longitudinal Accelerometer Traces for Test 1174-1006 Filtered at 100Hz

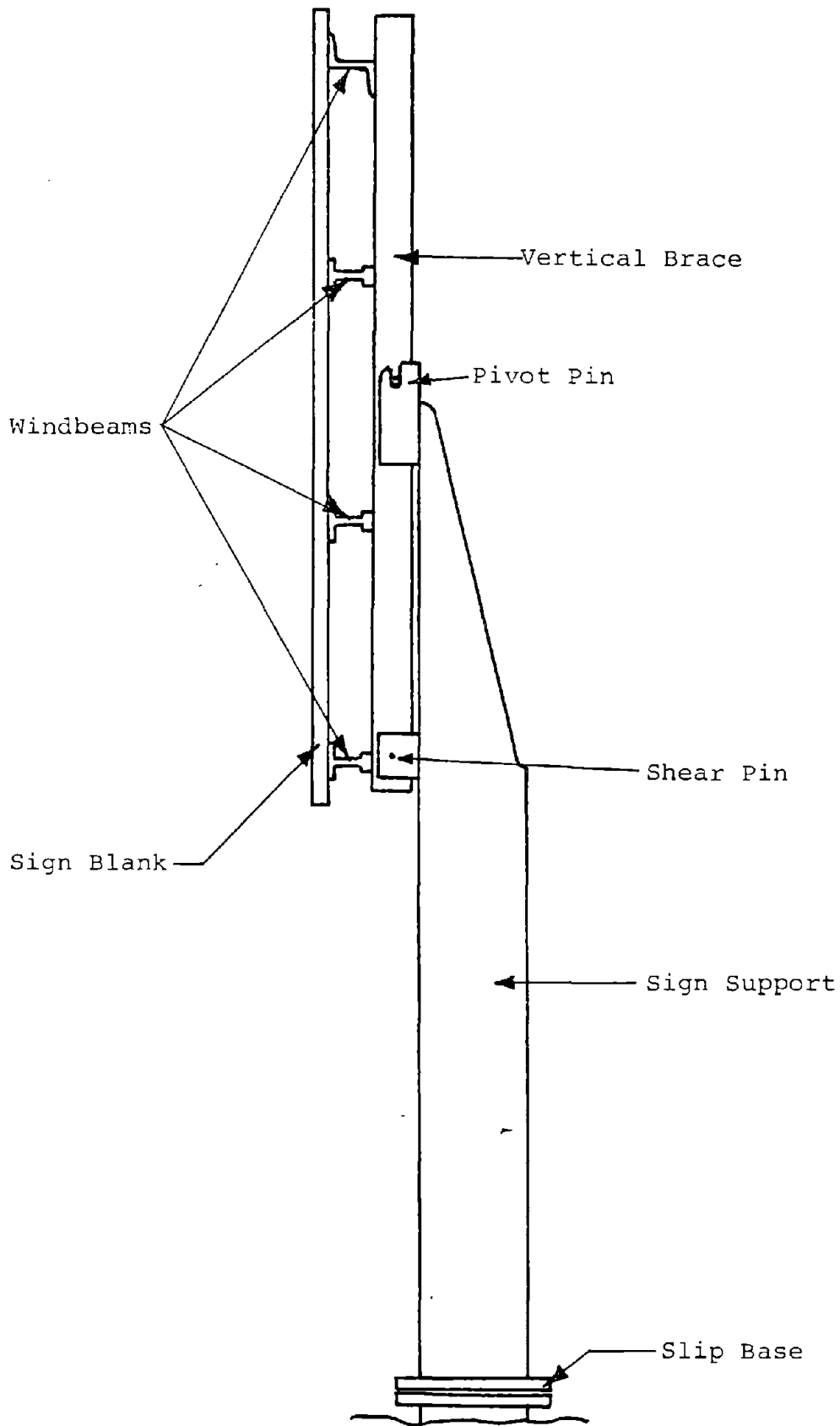


Fig. 155  
Balanced Hinge Sign Prototype for ENSCO Tests 1147-1006 & 1147-1007



## TEST DESCRIPTION

TYPE: Bogie Dual-legged Sign Support

### GENERAL:

Test Number : 1147-1007  
Date : May 3, 1979  
Weather : Warm  
Bogie Mass : 2260 lb (1026 kg)

### SIGN/SUPPORT (see Fig. 155):

Blank : 12' x 24'x5/8" Wood (3.7m x 7.3m x 1.6 cm)  
Leg : 12WF45 Steel  
Fasteners :  
  Base : 4-1"(2.5 cm) Strain Sert Bolts  
          Loaded to 5000 lb each (22240 N)  
  Hinge : Balanced

### TEST DATA:

Impact Speed : 28.4 ft/sec (8.7 m/s)  
Exit Speed : 18.4 ft/sec (5.6 m/s)  
Momentum Change :  
  Film : 702 lb-sec (3123 Ns)  
  Accelerometer : 665 lb-sec (2956 Ns)  
Peak Deceleration : 11.0 g's  
Exit Angle : 15° to left

### COMMENTS:

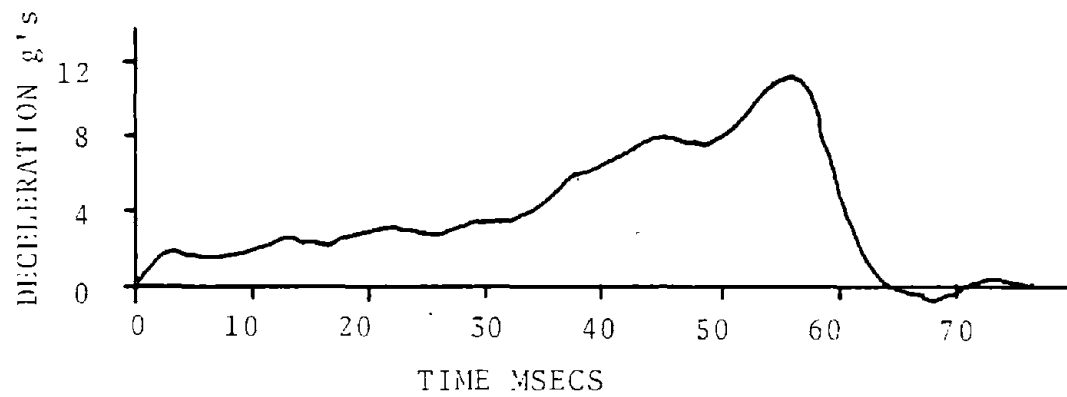
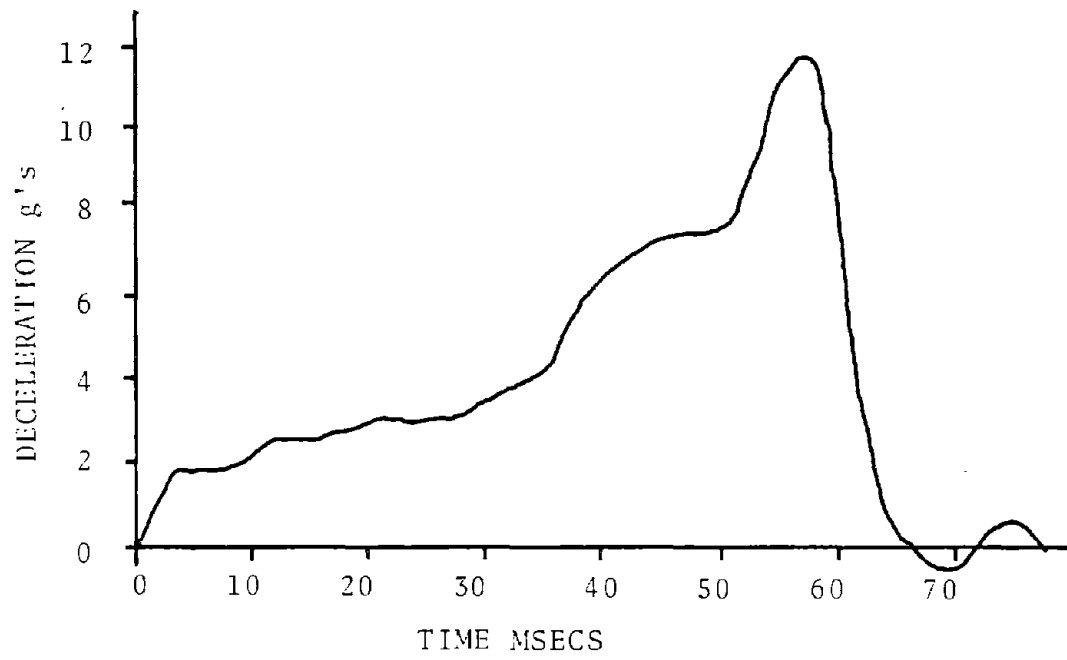
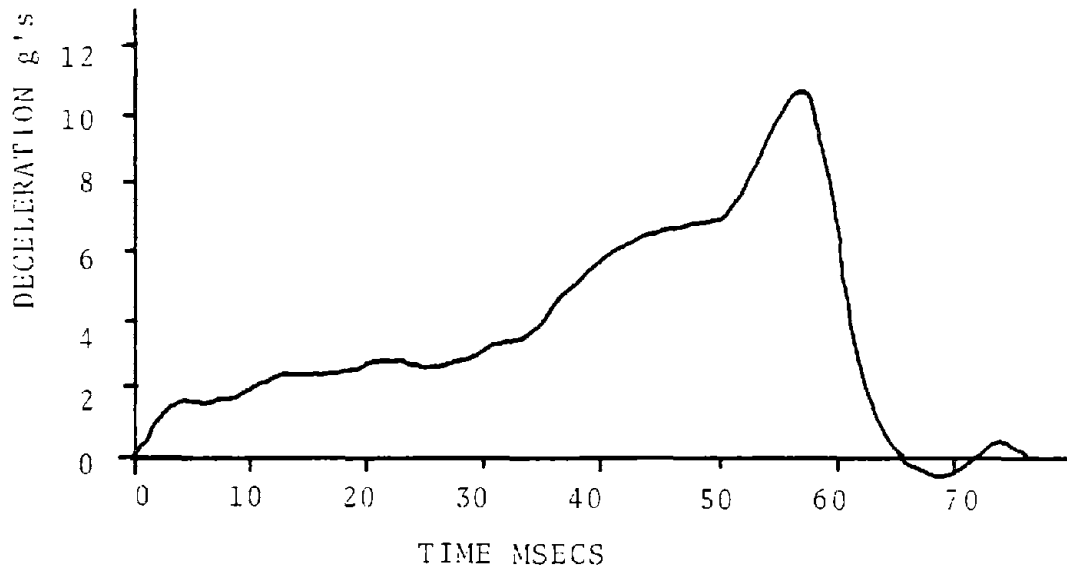


Fig. 157

Longitudinal Accelerometer Traces for Test 1147-1007 Filtered at 100Hz

## TEST DESCRIPTION

TYPE: Full Scale Dual-legged Sign Support

### GENERAL:

Test Number : 1147-1008  
Date : May 30, 1979  
Weather : Clear  
Vehicle : 1973 Chevrolet Vega Hatchback  
Vehicle Mass : 2477 lb (1125 kg)

### SIGN/SUPPORT (see Fig 148):

Blank : 12'x24'x5/8" Wood (3.7m x 7.3m x 1.6 cm)  
Leg : 12WF45 Steel  
Fasteners  
Base : 4-1" (2.5cm) Strain Sert Bolts  
Loaded to 5000 lb each (22240 N)  
Hinge : 2-3/4" (1.9cm) Strain Sert Bolts  
Loaded to 28000 lb each (124544 N)

### TEST DATA:

Impact Speed : 84.0 f/s (25.6 m/s)  
Exit Speed : 75.4 f/s (23.0 m/s)  
Momentum Change  
Film : 627 lb-sec (2789 Ns)  
Accelerometer : 672 lb-sec (2989 Ns)  
Peak Deceleration  
(100 Hz filtered) : 15.6 g's  
Exit Angle : 0° w/ no rotation

### VEHICLE DAMAGE:

TAD : 12 FR 3  
SAE , J224a : 12 FREN 2

### COMMENTS:

12½ in (31.8 cm) off center right hit

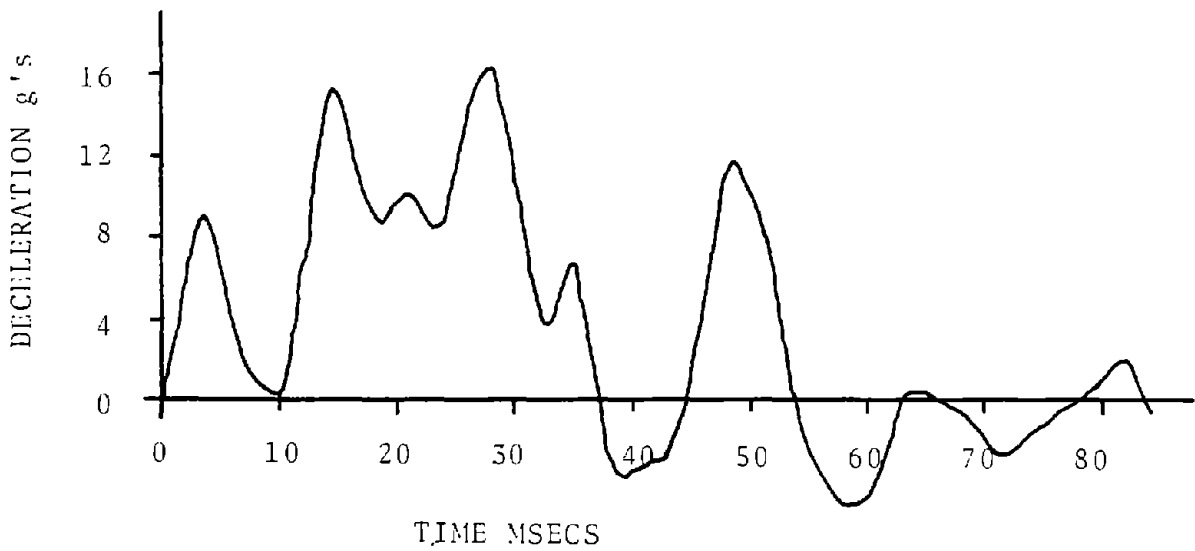
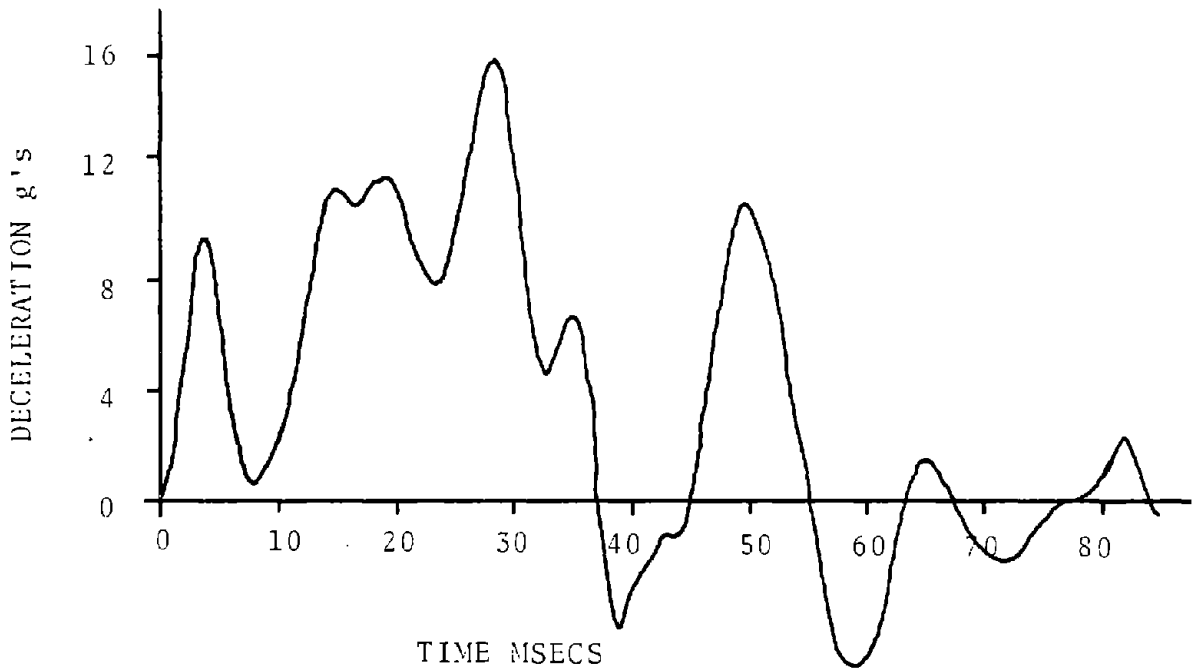
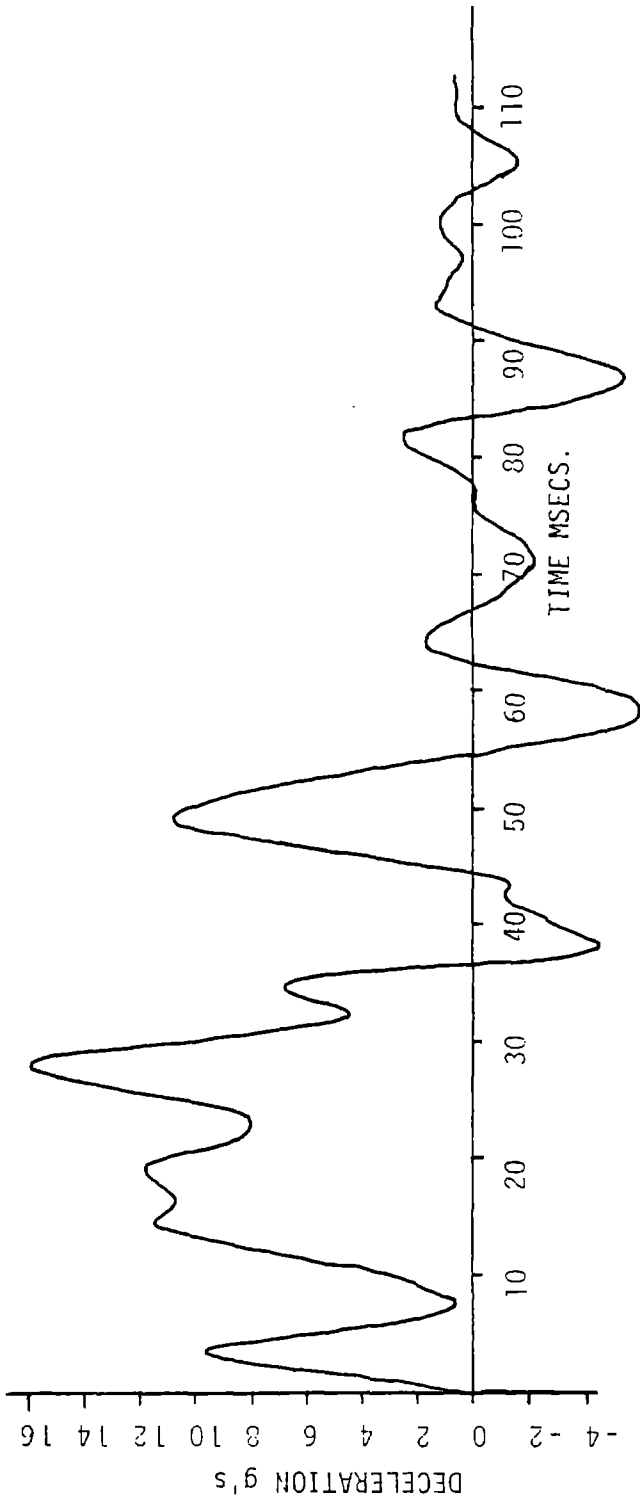


Fig. 158

Longitudinal Accelerometer Traces for Test 1147-1008 Filtered at 100Hz



003

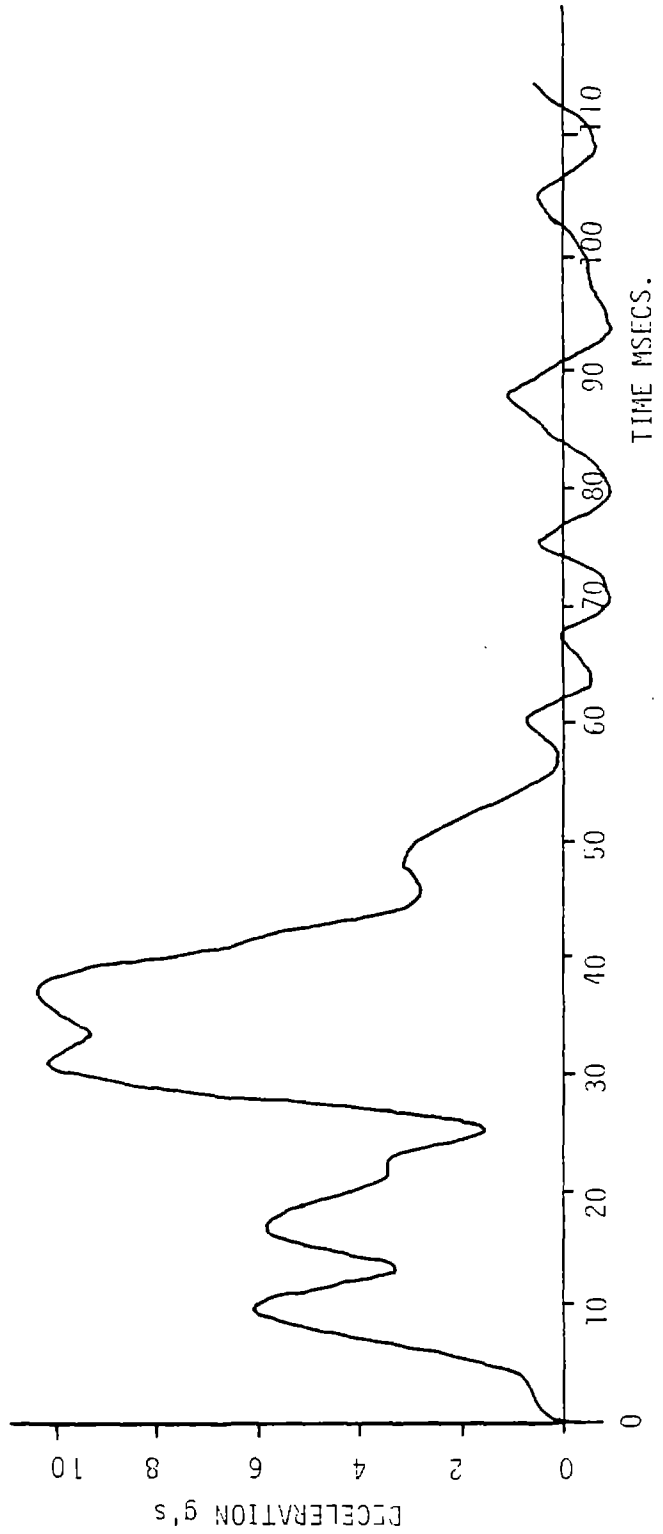


Fig. 159 .  
 Comparison of Longitudinal Accelerometer Traces for ENSCO Test 1147-1008  
 (above) with Vega and 1147-1009 (below) with Honda

## TEST DESCRIPTION

TYPE: Full Scale Dual-legged Sign Support

### GENERAL:

Test Number : 1147-1009  
Date : Jun 6, 1979  
Weather :  
Vehicle : 1974 Honda Civic Sedan  
Vehicle Mass : 1516 lb (688 kg)

### SIGN/SUPPORT (see Fig 148):

Blank : 12'x24'x5/8" Wood (3.7m x 7.3m x 1.6 cm)  
Leg : 12WF45 Steel  
Fasteners  
Base : 4-1" (2.5 cm) Strain Sert Bolts  
Loaded to 5000 lb each (22240 N)  
Hinge : 2-3/4" (1.9cm) Strain Sert Bolts  
Loaded to 28000 lb each (124544 N)

### TEST DATA:

Impact Speed : 89.7 f/s (27.4 m/s)  
Exit Speed : 78.9 f/s (24.1 m/s)  
Momentum Change  
Film : 508 lb-sec  
Accelerometer : 369 lb-sec  
Peak Deceleration : 10.3 g's  
(100 Hz filtered)  
Exit Angle : 0° w/ 120° rotation

### VEHICLE DAMAGE:

TAD : 12 FR 3  
SAE, J224a : 12 FREN 2

### COMMENTS:

16 in (38.1 cm) off center right hit

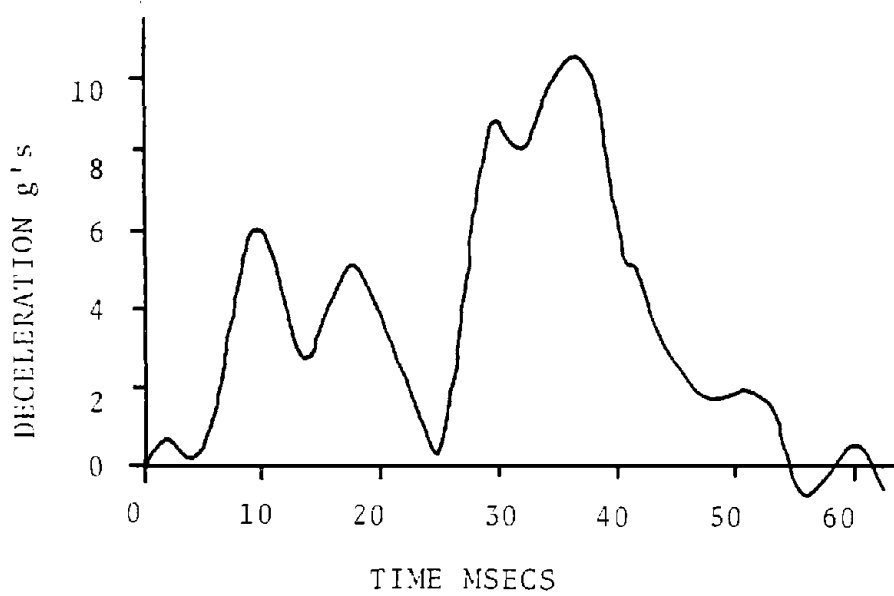
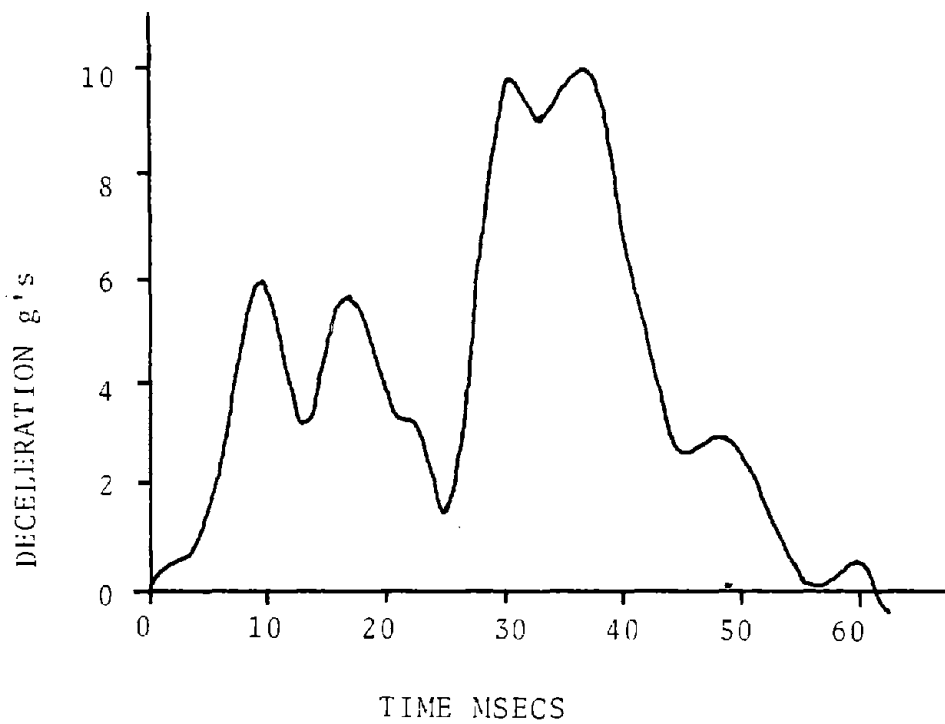


Fig. 160

Longitudinal Accelerometer Traces for Test 1147-1009 Filtered at 100Hz

## TEST DESCRIPTION

TYPE: Full Scale Dual-legged Sign Support

### GENERAL:

Test Number : 1147-1010  
Date : Jun 15, 1979  
Weather : Clear, warm  
Vehicle : 1974 Honda Civic Hatchback  
Vehicle Mass : 1617 lb (734 kg)

### SIGN/SUPPORT (see Fig 148):

Blank : 12'x24'x5/8" Wood (3.7m x 7.3m x 1.6 cm)  
Leg : 12WF45 Steel  
Fasteners  
Base : 4-1" (2.5cm) Strain Sert Bolts  
Loaded to 5000 lb each (22240 N)  
Hinge : 2-3/4" (1.9 cm) Strain Sert Bolts  
Loaded to 28000 lb each (124544 N)

### TEST DATA:

Impact Speed : 30.2 f/s (9.2 m/s)  
Exit Speed : 19.7 f/s (6.0 m/s)  
Momentum Change  
Film : -- \*  
Accelerometer : 496 lb-sec (2206 Ns)  
Peak Deceleration  
(100 Hz filtered) : 15.2 g's  
Exit Angle : 60° to left

### VEHICLE DAMAGE:

TAD : 12 FC 2  
SAE, J224a : 12 FCEN 2

### COMMENTS:

Film system not functioning

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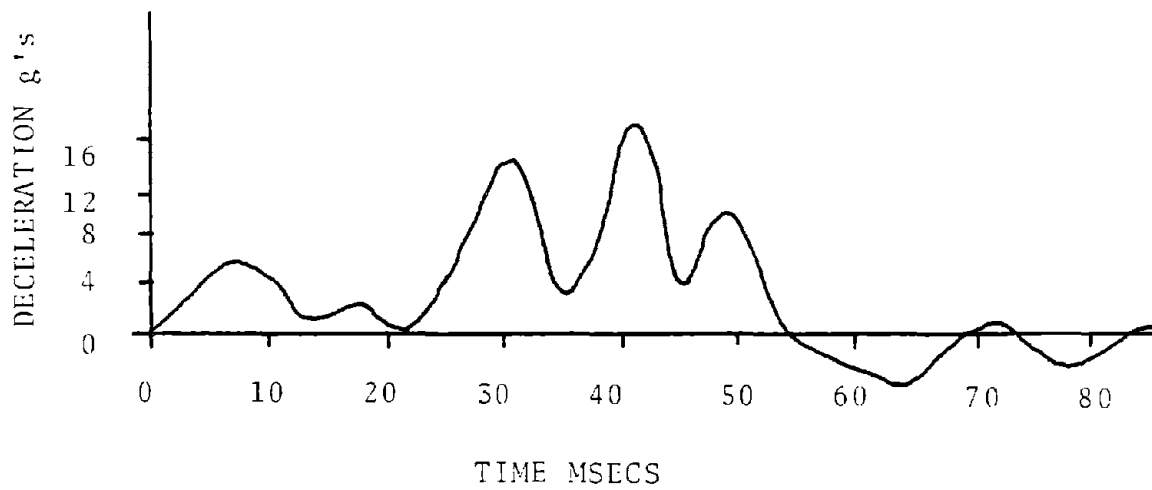
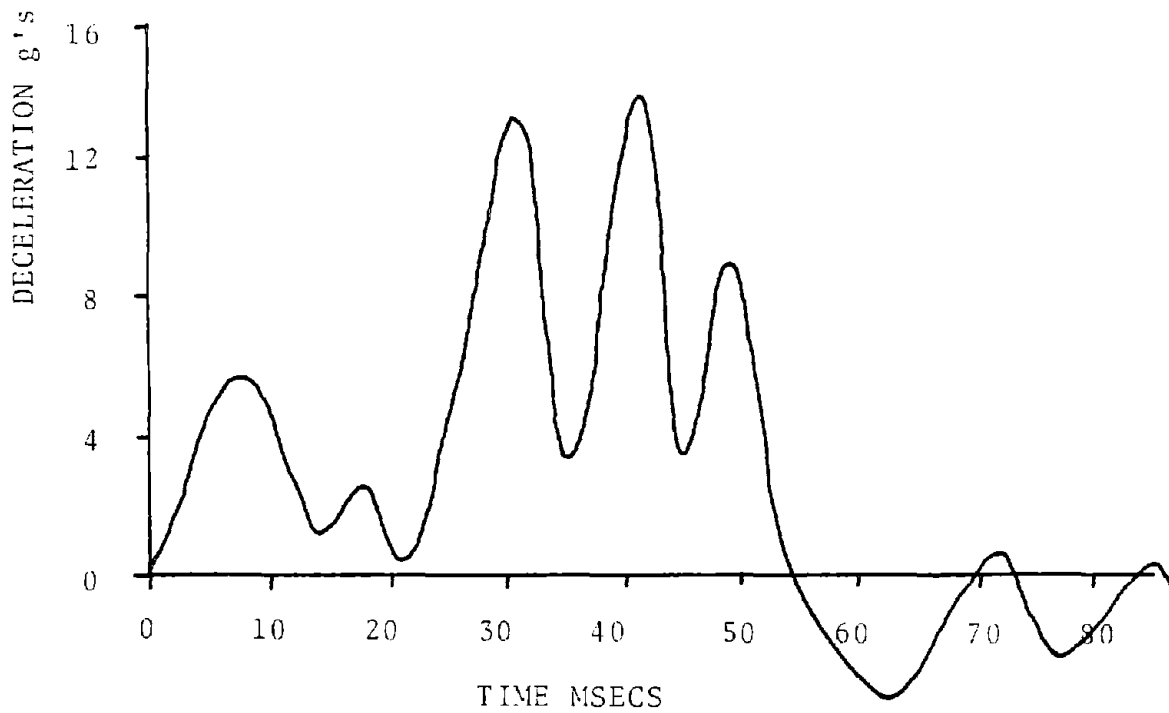


Fig. 161  
 Longitudinal Accelerometer Traces for Test 1147-1010 Filtered  
 at 100Hz

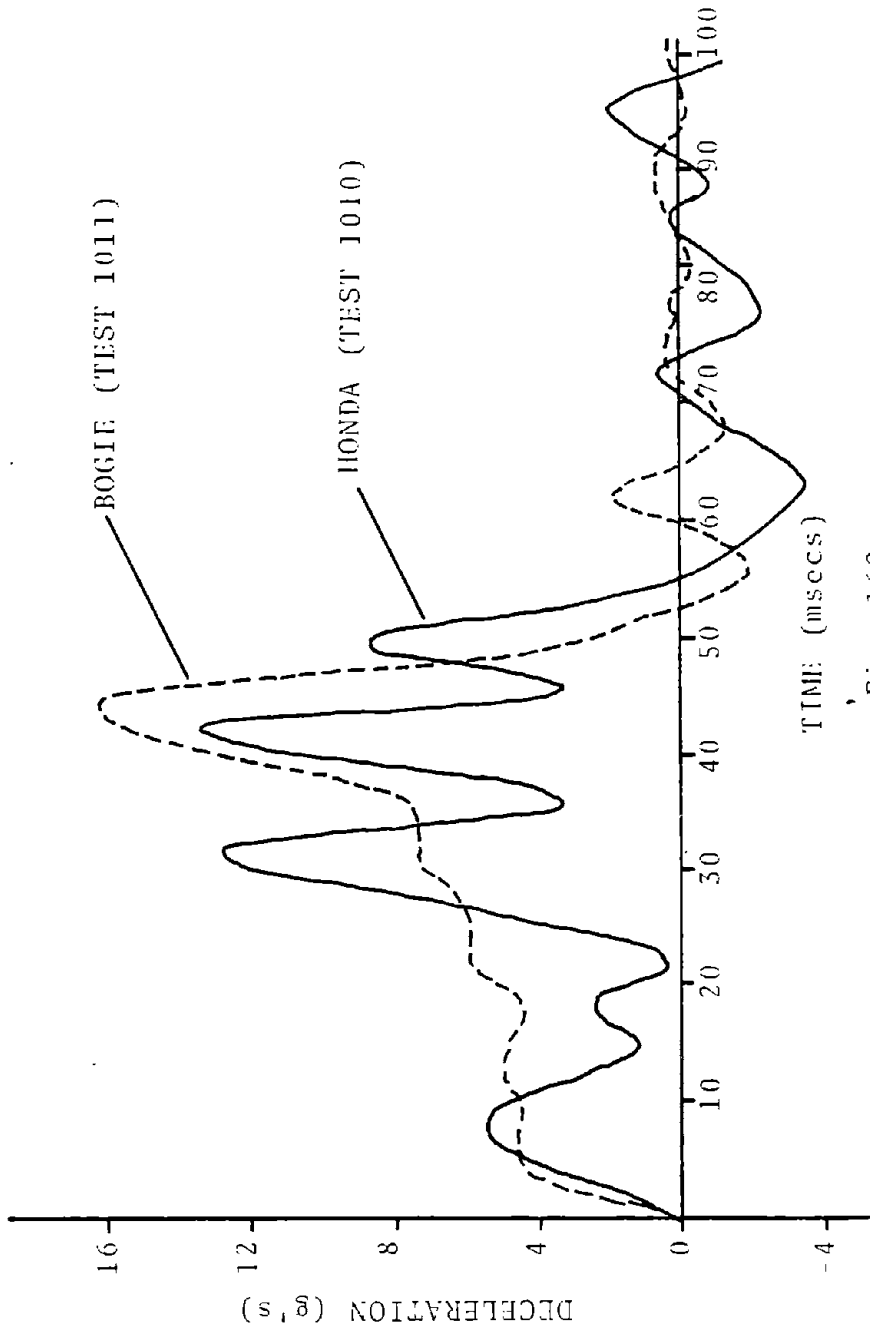


Fig. 162

Deceleration vs Time Traces for Test 1147-1010 and 1147-1011, Filtered at 100 Hz

303a



## TEST DESCRIPTION

TYPE: Bogie Dual-legged Sign Support

### GENERAL:

Test Number : 1147-1011  
Date : Jun 25, 1979  
Weather : Clear  
Bogie Mass : 1735 lb (788 kg)

### SIGN/SUPPORT (see Fig. 148):

Blank : 12'x24'x5/8" wood (3.7m x 7.3m x 1.6 cm)  
Leg : 12WF45 Steel  
Fasteners  
Base : 4-1" (2.5 cm) Strain Sert Bolts  
Loaded to 5000 lb each (22240N)  
Hinge : 2-3/4" (1.9 cm) Strain Sert Bolts  
Loaded to 28000 lb each (124,544 N)

### TEST DATA:

Impact Speed : 30.5 ft/sec (9.3 m/s)  
Exit Speed : 16.5 ft/sec (5.0 m/s)  
Momentum Change  
Film : 756 lb-sec (3363 Ns)  
Accelerometer : 614 lb-sec (2731 Ns)  
Peak Deceleration : 16.7 g's  
Exit Angle : 6° to left

### COMMENTS:

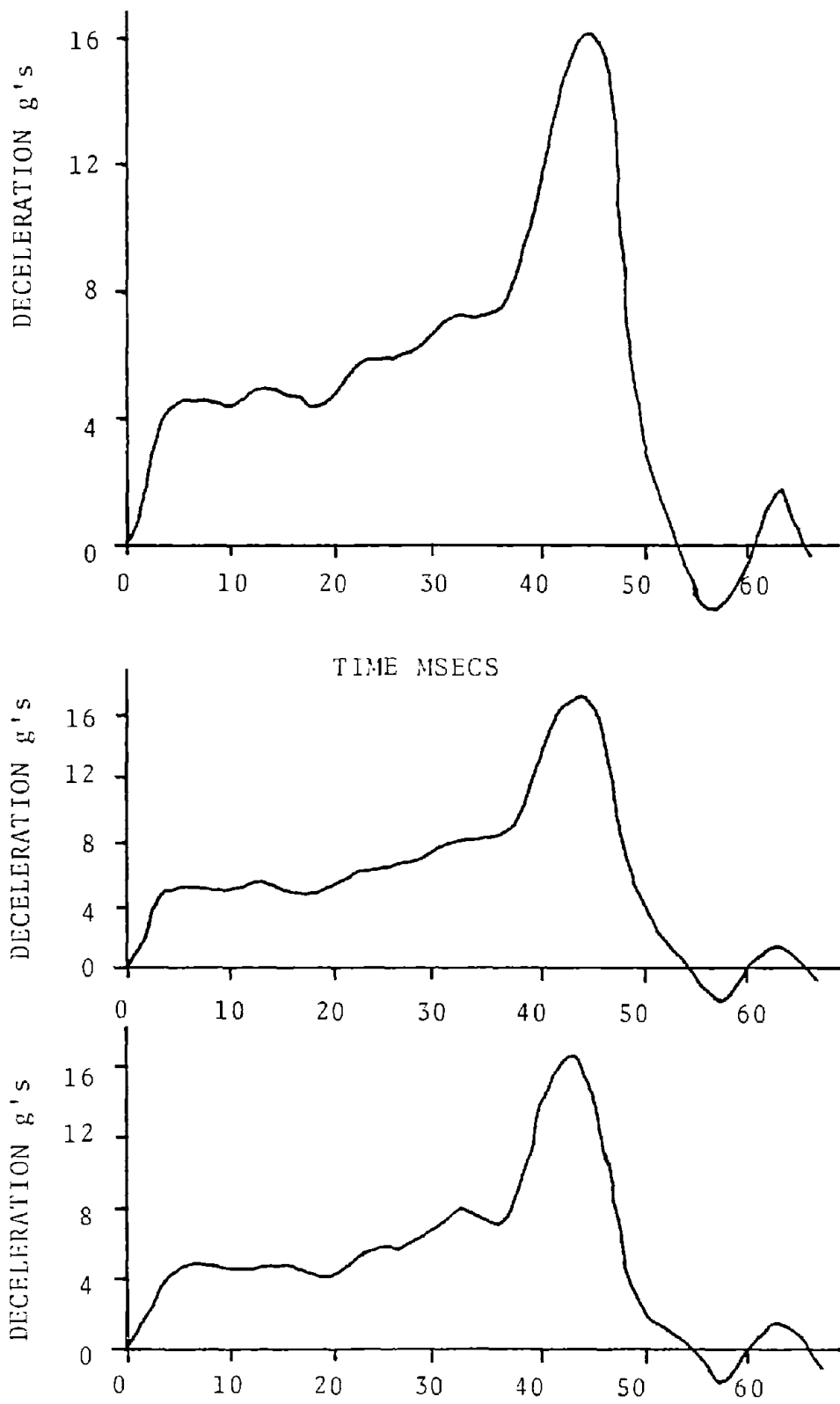


Fig. 163  
 Longitudinal Accelerometer Traces for Test 1147-1011 Filtered at 100Hz

