



Progressive Engineering Inc.

A&M SYSTEMS

FMVSS/CMVSS 217 Test on
Two (2) Bus Entry Doors

4/7/2005



This test report contains eleven (11) pages, including the cover sheet. Any additions to, alterations of, or unauthorized use of excerpts from this report are expressly forbidden.

2005-692

1. TITLE

Window retention test per the Federal Motor Vehicle Safety Standard (FMVSS) and Canadian Motor Vehicle Safety Standard (CMVSS) No. 217 as stated in the Code of Federal Regulations Title 49, Volume 5, Section 571.217. (10-1-03 Edition)

2. OBJECTIVE

To determine the window retention ability, per the aforementioned safety standard, of the Entry doors as installed by A&M Systems.

The test results pertain only to the designated test specimen furnished for testing. The manufacturer is responsible for certification of the manufactured product.

3. MANUFACTURER

A&M Systems
1845 Fieldhouse
Elkhart, IN 46517

4. TESTING ORGANIZATION

Progressive Engineering, Inc.

58640 State Road 15
Goshen, IN 46528
www.p-e-i.com

See IAS Evaluation Report TL - 178 for ISO 17025 Accreditation

5. TESTING PERSONNEL

Test Engineer	- Timothy A. Baldrige, P.E.
Director of Testing	- Greg A. Weeden
Laboratory Manager	- Jason R. Holdeman
Technician	- Rodd Lehman

Tests witnessed by Jim Miller of A&M Systems.

6. TEST SPECIMEN

The tests were conducted on two (2) windows in Entry doors manufactured by A&M Systems.

The Entry doors were installed in a door frame test buck which was supplied by A&M Systems. Window part numbers and drawings were supplied to PEI by A&M Systems.

7. TEST SET-UP

The load was applied to the window by a head form specified in Figure 4 of FMVSS 217 and as shown on the attached drawing. The head form was attached to a hydraulic ram, which was attached to an 8" steel beam. The head form and hydraulic ram were set perpendicular to the window and centered in the window glazing. See attached fixture drawings for further details.

8. TEST PROCEDURE

The head form was pressed against the center of the glazing area on the inside of the window at an approximate rate of 2 inches per minute. The load was measured by a calibrated pressure transducer. A dial indicator was set, in the center of the glazing area, on the outside of the window in order to measure the window deflection.

9. TEST REQUIREMENTS

FMVSS/CMVSS 217 Section 5.1

The head form is used to show the prevention of a hole large enough under a force of 5 lbs. to allow a 4" diameter sphere to pass through. The window frame and surrounding structure must hold until any one of the following events occur:

- (a) A force of 1200 lbs. is reached.
- (b) At least 80% of the window glazing thickness is cracked or shattered.
- (c) There is a movement of the window glazing relative to the window frame that equals $1/2$ the square root of the minimum surface dimension.

10. TEST RESULTS

See page no. 3 of this report for test data.

11. CONCLUSION

The windows and the wall structure tested provided adequate structural integrity to meet the requirements of FMVSS/CMVSS Standard No. 217.

Progressive Engineering, Inc.
Window Retention Test

Date: 4/7/2005

Client: A&M Systems

Project Number: 2005-692

Test No.	Specimen Details			Test Details			
	Window Location	Window Size ¹	Glazing Size ³	Allowable Deflection ²	Ultimate Load at allowable deflection	Max. Load Applied	Comments or Observations
1	Entry Door	21.75" x 95"	17.75" x 88.75"	2.106"	181 lbs.	234 lbs.	The glazing was not taken to failure it was loaded just beyond the deflection limit. Once the load was released the door panel almost recovered to its original position.
2	Entry Door	12.88" x 86"	8.75" x 80"	1.479"	180 lbs.	249 lbs.	The glazing was not taken to failure it was loaded just beyond the deflection limit. Once the load was released the door panel almost recovered to its original position.

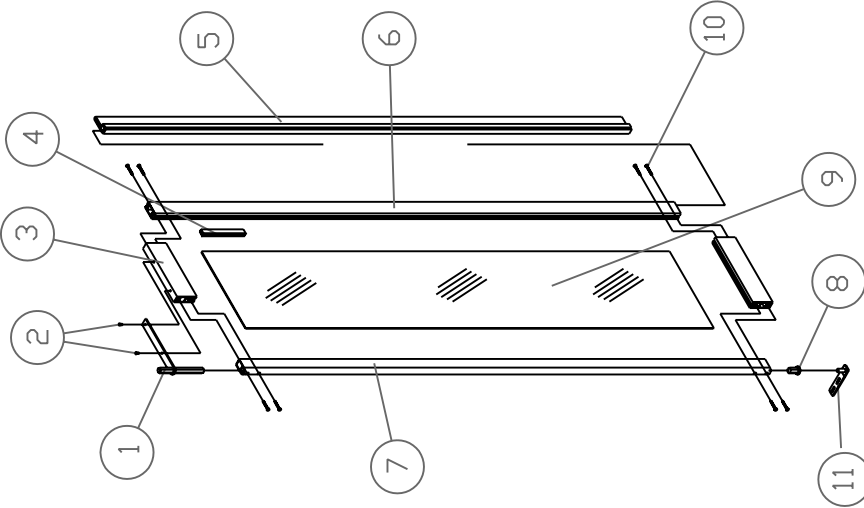


1 - The dimension shown is the dimension of one door panel.
 2 - As stated in Section 5.1c of FMVSS 217. Defined as one-half of the square root of the minimum glazing surface dimension.
 3 - The dimensions shown reflect the inner glazing size.
 4 - The deflection was measured relative to the door frame's surrounding structure.



Models: 162886, 164695

Index No.	Part No.	Description	No Req'd
1	AR1012	Torque Arm	1
2	76801158	Rivet	2
3	8485-162886	End Rail	2
	8485-164695	End Rail	2
4	X-D1800	Window Glazing	20 FT.
5	21218-162886	Center Seal	1
	21218-164695	Center Seal	1
6	8487-162886	Seal Side Extrusion	1
	8487-164695	Seal Side Extrusion	1
7	8486-162886	Hinge Side Extrusion	1
	8486-164695	Hinge Side Extrusion	1
8	1544	Lower Hex Bushing	1
9	162886G	Glass Panel	1
	164695G	Glass Panel	1
10	31998	Screw, self tapping	8
11	1541.1	Lower Hinge Bracket	1



TITLE: *Door Leaf*

MAT'L SPEC.

PART NUMBER

PAGE OF

REV.	BY	DATE	DESCRIPTION

RELEASE TO PRODUCTION

DESCRIPTION

TOLERANCE UNLESS SPECIFIED

DRAWING INFORMATION

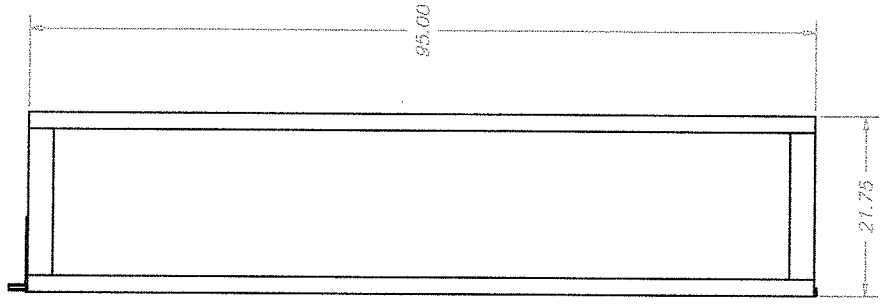
Fractions: $\pm 1/32$ CKD.:
 Decimals: ± 0.000 ± 0.005 DATE: 2/26/04 SIZE:
 Angles: ± 1 Deg. SCALE: WT.:

NEXT ASSY.:

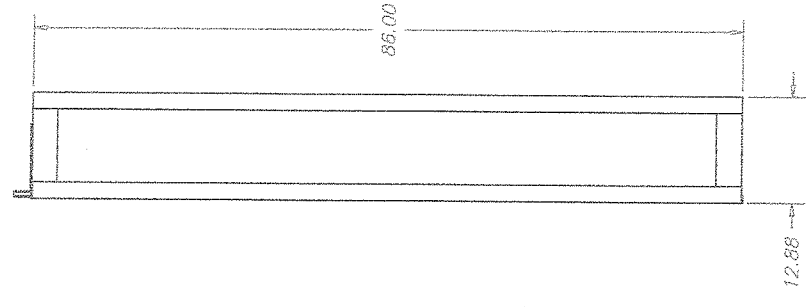
SUPERSEDES:

DO NOT SCALE DRAWING

THIS DRAWING IS THE PROPERTY OF A&M SYSTEMS, INC. AND IS NOT TO BE DUPLICATED OR USED IN ANY WAY DETRIMENTAL TO THEIR BEST INTEREST.



5/N 167606




5/N 167606

NEXT ASSY.:
 SUPERSEDES:
 DO NOT SCALE DRAWING

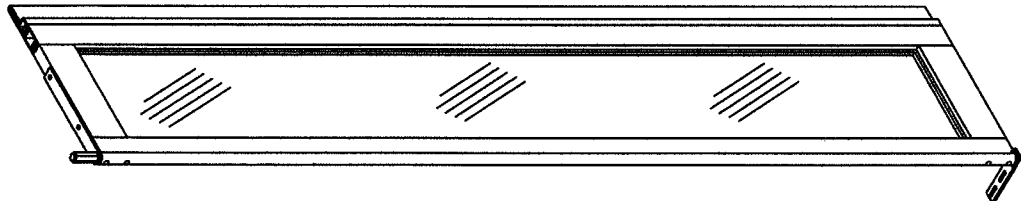
THIS DRAWING IS THE PROPERTY OF A&M SYSTEMS, INC.
 AND IS NOT TO BE DUPLICATED OR USED IN ANY WAY
 DETRIMENTAL TO THEIR BEST INTEREST.

REV.	BY	DATE	DESCRIPTION	DRAWING INFORMATION		
			RELEASE TO PRODUCTION	DRAWN:	CKD.:	PAGE
				DATE:	SIZE:	OF
				SCALE:	WT.:	



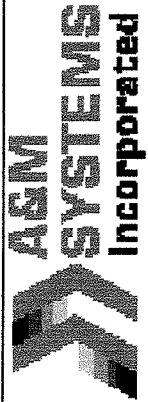
TITLE: *201 Coord - Test Data*

MAT'L SPEC.



NEXT ASSY:
 SUPERSEDES:
 DO NOT SCALE DRAWING

THIS DRAWING IS THE PROPERTY OF A&M SYSTEMS, INC.
 AND IS NOT TO BE DUPLICATED OR USED IN ANY WAY
 DETRIMENTAL TO THEIR BEST INTEREST.

				
TITLE: <i>Door Assembly Drawing</i>				
MAT'L SPEC.				
REV.	BY	DATE	DESCRIPTION	DRAWING INFORMATION
			RELEASE TO PRODUCTION	DRAWN: _____ DATE: _____ SCALE: _____
TOLERANCE UNLESS SPECIFIED Fractions: $\pm \frac{1}{32}$ Decimals: $\pm .005$ Angles: ± 1 Deg.			CKD.: _____ SIZE: _____ WT.: _____	PAGE _____ OF _____
				PART/DRAWING NUMBER <i>0024</i>

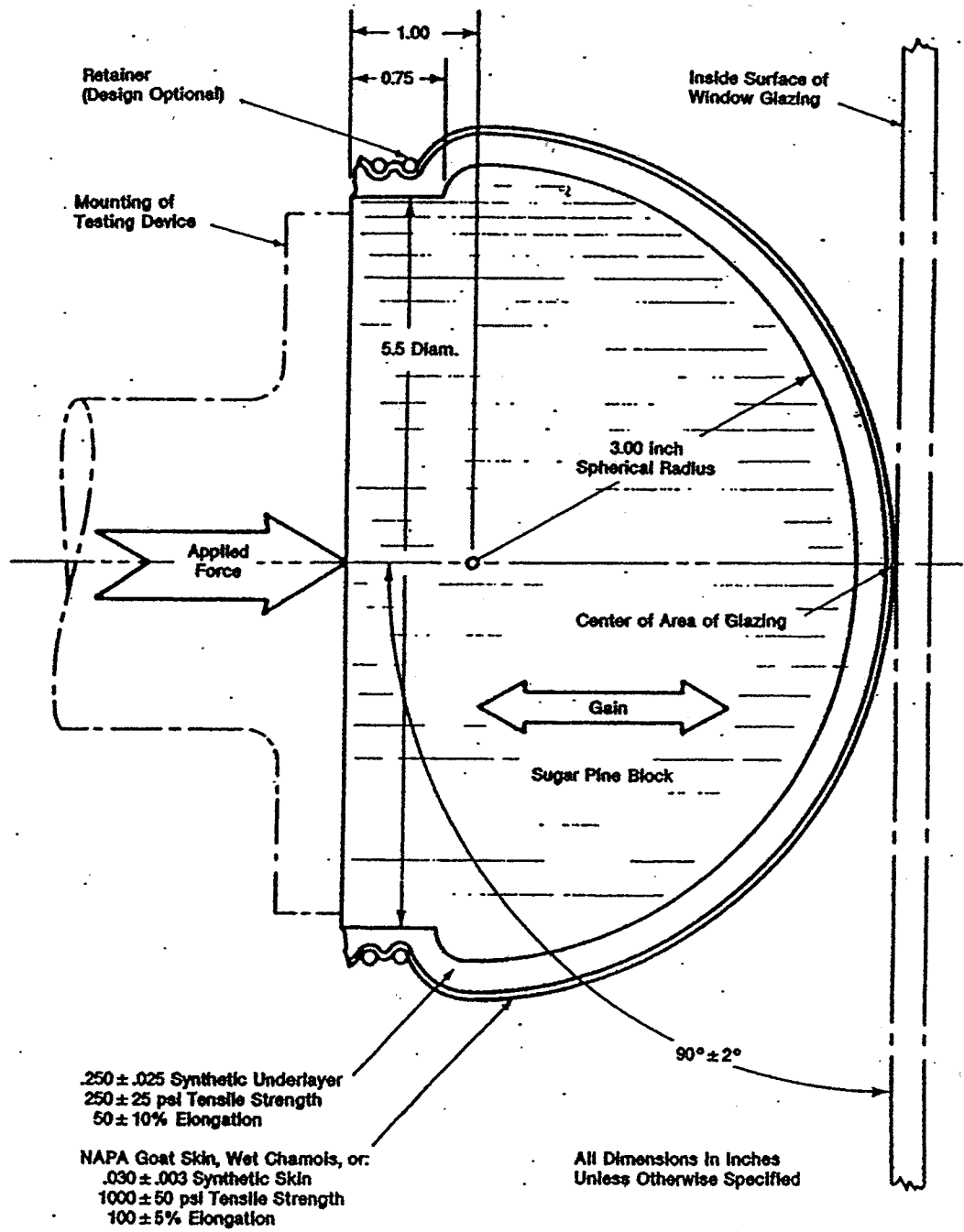
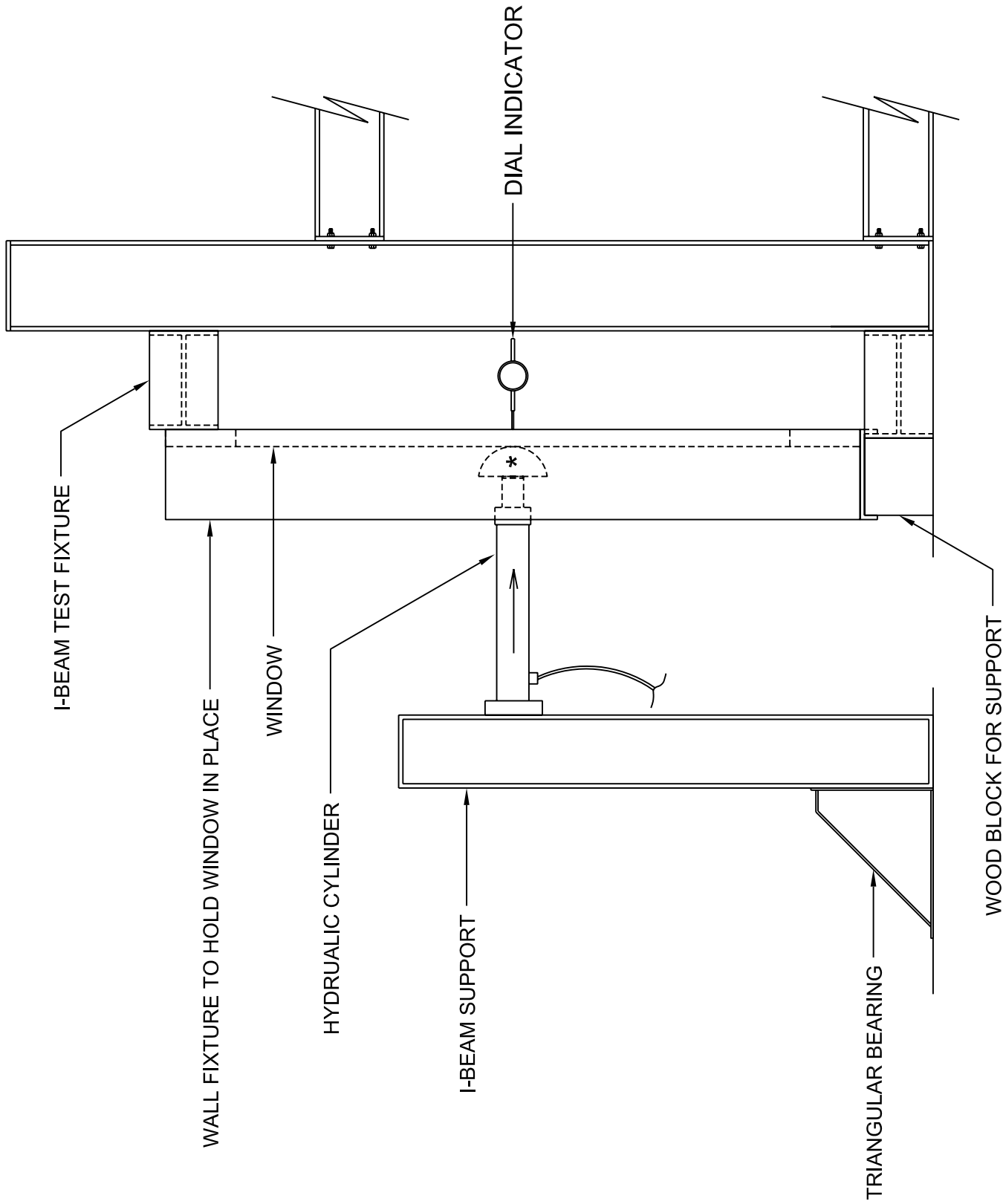


Figure 4



NOTE:

- * FOAM HEAD FORM AS SHOWN IN FIGURE NO. 4 OF FEDERAL MOTOR VEHICLE SAFTEY STANDARD NO. 217

DRAWN BY: A. BENDER	This drawing and all information contained herein is the property of PROGRESSIVE ENGINEERING, INC. and is not to be reproduced without the written permission of P.E.I. assumes no responsibility for unauthorized use of this drawing.
DATE: 4/7/05	
SCALE:	
DRAWING NUMBER	

F1194

TEST SET-UP



Progressive Engineering Inc.
 58640 State Road 15
 Goshen, IN 46528
 Phone (574) 533-0337
 Fax (574) 533-9736
 www.p-e-i.com



Test Set-up



Entry Door #1 When Allowable Deflection Was Met



Test Set-up



Entry Door #2 When Allowable Deflection Was Met