



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

1200 New Jersey Ave., SE
Washington, D.C. 20590

February 9, 2018

In Reply Refer To:
HSST-1/ WZ-357

Troy Tapley
MDI Worldwide
38271 W. Twelve Mile Road
Farmington Hills, MI 48331

Dear Mr. Tapley:

This letter is in response to your October 18, 2017 request for the Federal Highway Administration (FHWA) to review a roadside safety device, hardware, or system for eligibility for reimbursement under the Federal-aid highway program. This FHWA letter of eligibility is assigned FHWA control number WZ-357 and is valid until a subsequent letter is issued by FHWA that expressly references this device.

Decision

The following devices are eligible, with details provided in the form which is attached as an integral part of this letter:

- 4860M-LT

Scope of this Letter

To be found eligible for Federal-aid funding, new roadside safety devices should meet the crash test and evaluation criteria contained in the American Association of State Highway and Transportation Officials' (AASHTO) Manual for Assessing Safety Hardware (MASH). However, the FHWA, the Department of Transportation, and the United States Government do not regulate the manufacture of roadside safety devices. Eligibility for reimbursement under the Federal-aid highway program does not establish approval, certification or endorsement of the device for any particular purpose or use.

This letter is not a determination by the FHWA, the Department of Transportation, or the United States Government that a vehicle crash involving the device will result in any particular outcome, nor is it a guarantee of the in-service performance of this device. Proper manufacturing, installation, and maintenance are required in order for this device to function as tested.

This finding of eligibility is limited to the crashworthiness of the system and does not cover other structural features, nor conformity with the Manual on Uniform Traffic Control Devices.

Eligibility for Reimbursement

Based solely on a review of crash test results and certifications submitted by the manufacturer, and the crash test laboratory, FHWA agrees that the device described herein meets the crash test and evaluation criteria of the American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware (MASH). Therefore, the device is eligible for reimbursement under the Federal-aid highway program if installed under the range of tested conditions.

Name of system: 4860M-LT

Type of system: Work Zone Traffic Control Devices

Test Level: MASH Test Level 3

Testing conducted by: KARCO

Date of request: October 18, 2017

Date of completed package: November 6, 2017

FHWA concurs with recommendation of the accredited crash testing laboratory as stated within the attached form on determination of eligibility for the sign substrate that was physically tested (48" x 48" [1219 mm x 1219 mm] diamond shape or up to 16 sq. ft. [1.5 sq. m] vinyl roll up signs). This determination of eligibility does not apply to other sign substrates not physically tested, but recommended by the laboratory. If an eligibility letter is requested on these other sign substrates, this will require successful physical crash testing as per 2016 AASHTO MASH.

Full Description of the Eligible Device

The device and supporting documentation, including reports of the crash tests or other testing done, videos of any crash testing, and/or drawings of the device, are described in the attached form.

Notice

This eligibility letter is issued for the subject device as tested. Modifications made to the device are not covered by this letter and will need to be tested in accordance with all recommended tests in AASHTO's MASH as part of a new and separate submittal.

You are expected to supply potential users with sufficient information on design, installation and maintenance requirements to ensure proper performance.

You are expected to certify to potential users that the hardware furnished has the same chemistry, mechanical properties, and geometry as that submitted for review, and that it will meet the test and evaluation criteria of AASHTO's MASH.

Issuance of this letter does not convey property rights of any sort or any exclusive privilege. This letter is based on the premise that information and reports submitted by you are accurate and correct. We reserve the right to modify or revoke this letter if: (1) there are any inaccuracies in the information submitted in support of your request for this letter, (2) the qualification testing

was flawed, (3) in-service performance or other information reveals safety problems, (4) the system is significantly different from the version that was crash tested, or (5) any other information indicates that the letter was issued in error or otherwise does not reflect full and complete information about the crashworthiness of the system.

Standard Provisions

- To prevent misunderstanding by others, this letter of eligibility designated as FHWA control number WZ-357 shall not be reproduced except in full. This letter and the test documentation upon which it is based are public information. All such letters and documentation may be reviewed upon request.
- This letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented system for which the applicant is not the patent holder.
- If the subject device is a patented product it may be considered to be proprietary. If proprietary systems are specified by a highway agency for use on Federal-aid projects: (a) they must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with the existing highway facilities or that no equally suitable alternative exists; or (c) they must be used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes. Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411.

Sincerely,



Michael S. Griffith
Director, Office of Safety Technologies
Office of Safety

Enclosures

Request for Federal Aid Reimbursement Eligibility of Highway Safety Hardware

Submitter	Date of Request:	October 13, 2017	<input checked="" type="radio"/> New <input type="radio"/> Resubmission
	Name:	Troy Tapley	
	Company:	MDI Worldwide	
	Address:	38271 W. Twelve Mile Road, Farmington Hills, MI 48331	
	Country:	United States	
	To:	Michael S. Griffith, Director FHWA, Office of Safety Technologies	

I request the following devices be considered eligible for reimbursement under the Federal-aid highway program.

Device & Testing Criterion - Enter from right to left starting with Test Level

!-!-!

System Type	Submission Type	Device Name / Variant	Testing Criterion	Test Level
'WZ': Crash Worthy Work Zone Traffic Control Devices	<input checked="" type="radio"/> Physical Crash Testing <input type="radio"/> Engineering Analysis	4860M-LT	AASHTO MASH	TL3

By submitting this request for review and evaluation by the Federal Highway Administration, I certify that the product(s) was (were) tested in conformity with the AASHTO Manual for Assessing Safety Hardware and that the evaluation results meet the appropriate evaluation criteria in the MASH.

Individual or Organization responsible for the product:

Contact Name:	Troy Tapley	Same as Submitter <input checked="" type="checkbox"/>
Company Name:	MDI Worldwide	Same as Submitter <input checked="" type="checkbox"/>
Address:	38271 W. Twelve Mile Road, Farmington Hills, MI 48331	Same as Submitter <input checked="" type="checkbox"/>
Country:	United States	Same as Submitter <input checked="" type="checkbox"/>

Enter below all disclosures of financial interests as required by the FHWA 'Federal-Aid Reimbursement Eligibility Process for Safety Hardware Devices' document.

Marketing Displays, Inc., doing business as MDI Worldwide ("MDI"), whose principal place of business is 38271 West Twelve Mile Road, Farmington Hills, Michigan 48331-3041, and Karco Engineering, LLC., whose principal place of business is 9270 Holly Road, Adelanto, CA 92301 share no (\$0.00) financial interests between the two organizations. This includes no (\$0.00) financial interest but not limited to:

- i. Compensation, including wages, salaries, commissions, professional fees, or fees for business referrals (dollar values are not needed);
- ii. Consulting relationships;
- iii. Research funding or other forms of research support;
- iv. Patents, copyrights, and other intellectual property interests;
- v. Licenses or contractual relationships; or
- vi. Business ownership and investment interest.

PRODUCT DESCRIPTION

New Hardware or Significant Modification
 Modification to Existing Hardware

Product Description of 4860M-LT
(Reference drawing ZA-07734-01)

The 4860M-LT temporary sign support is a work-zone traffic control device used in displaying light weight sign substrates; primarily 48" x 48" [1219 mm x 1219 mm] diamond shape or up to 16 sq. ft. [1.5 sq. m] vinyl roll up signs.

Further description:

The 4860M-LT temporary sign support is a portable/fold-up sign stand manufactured with two vertically mounted wind deflecting steel coil springs. The sign stand consists of a .188" [5 mm] thick steel base, four aluminum legs, two aluminum telescoping uprights and two vertically mounted steel springs attaching the base to the uprights. The legs are constructed of square aluminum tubing 1.25" x 1.25" x .10" [32 mm x 32 mm x 2.5 mm]. The two piece telescoping uprights are constructed of 1.25" x 1.25" x .10" [32 mm x 32 mm x 2.5 mm] and 1.00" x 1.00" x .10" [25 mm x 25 mm x 2.5mm], respectively. A roll up sign is attached to the telescoping mast with the use of an adjustable roll up sign bracket. The sign can be raised and lowered to the desired height. The bottom upright has a scored "breakaway section" at approximately 18" [457 mm] above grade when stand is fully deployed.

The overall height of the stand is 138" [3505 mm]. The bottom of the sign is mounted 84" [2134 mm] above grade. The total weight of the stand is approximately 37.5 lbs [17.0 kg], which includes the stand of 30.0 lbs [13.6 kg] and the sign (including sign bracket) of 7.50 lbs [3.4 kg]. Sand bags can be placed on the legs as needed for ballast.

CRASH TESTING

By signature below, the Engineer affiliated with the testing laboratory, agrees in support of this submission that all of the critical and relevant crash tests for this device listed above were conducted to meet the MASH test criteria. The Engineer has determined that no other crash tests are necessary to determine the device meets the MASH criteria.

Engineer Name:	Alex Beltran	
Engineer Signature:	Alex Beltran	Digitally signed by Alex Beltran DN: cn=Alex Beltran, o=KARCO Engineering, ou=Testing Laboratory, email=abeltran@karco.com, c=US Date: 2017.10.16 12:37:57 -07'00'
Address:	9270 Holly Road Adelanto, CA. 92301	Same as Submitter <input type="checkbox"/>
Country:	United States	Same as Submitter <input type="checkbox"/>

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-70 (1100C)	Designed to evaluate the ability of a small vehicle to activate any breakaway, fracture, or yielding mechanism. Is considered optional for work-zone traffic control devices weighing less than 220 lb (100 kg).	Non-Relevant Test, not conducted

Required Test Number	Narrative Description	Evaluation Results
3-71 (1100C)	<p>A 2,435.0 lb (1,104.5 kg) small car approached the test article at an impact speed of 61.79 mph (99.44 km/h) with a critical impact angle between 0° and 90°. For this test, two 4860M-LT sign stands were impacted. The first article was aligned at 90° and the second was aligned to 0° to the test vehicle's direction of travel.</p> <p>Upon impact the 4860M-LT vertical mast yielded and fractures from the spring base assemble in a predictable manner in both the 90° and 0° positions.</p> <p>The mast and roll up sign rotated over the top of the vehicle and did not contact the windshield or roof. The test vehicles occupant compartment was not penetrated by the test articles. Debris from the test articles did not cause a hazard to the driver's vision. The vehicle remained upright and did not exceed 75° roll angle throughout the test. The vehicle did not leave its lane and its trajectory was stable after both sign stands were impacted.</p>	PASS
3-72 (2270P)	<p>A 5,008.8 lb (2,272.0 kg) pickup truck approached the test article at an impact speed of 62.97 mph (101.34 km/h) with a critical impact angle between 0° and 90°. For this test, two 4860M-LT sign stands were impacted. The first article was aligned at 90° and the second was aligned to 0° to the test vehicle's direction of travel.</p> <p>Upon impact the 4860M-LT vertical mast yielded and fractures from the spring base assemble in a predictable manner in both the 90° and 0° positions.</p> <p>The mast and roll up sign from the first article rotated over the top of the vehicle and did not contact the windshield or roof. The mast and roll up sign from the second article contacted the windshield and the sign grazed the roof before clearing the occupant compartment. The test vehicles occupant compartment deformation limits were not exceeded. Debris from the test articles did not cause a hazard to the driver's vision. The vehicle remained upright and did not exceed 75° roll angle throughout the test. The vehicle did not leave its lane and its trajectory was stable after both sign stands were impacted.</p>	PASS

Full Scale Crash Testing was done in compliance with MASH by the following accredited crash test laboratory (cite the laboratory's accreditation status as noted in the crash test reports.):

Laboratory Name:	KARCO Engineering, INC	
Laboratory Signature:	Alex Beltran	<small>Digitally signed by Alex Beltran DN: cn=Alex Beltran, o=KARCO Engineering, ou=Testing Laboratory, email=abeltran@karco.com, c=US Date: 2017.10.16 12:44:01 -07'00'</small>
Address:	9270 Holly Rd. Adelanto, CA. 92301	Same as Submitter <input type="checkbox"/>
Country:	United States	Same as Submitter <input type="checkbox"/>
Accreditation Certificate Number and Dates of current Accreditation period :	TL-371; December 18, 2015 through December 18, 2017	

Submitter Signature*:

 Digitally signed by Troy Tapley
Date: 2017.10.13 15:08:27 -04'00'

Submit Form

ATTACHMENTS

Attach to this form:

- 1) Additional disclosures of related financial interest as indicated above.
- 2) A copy of the full test report, video, and a Test Data Summary Sheet for each test conducted in support of this request.
- 3) A drawing or drawings of the device(s) that conform to the Task Force-13 Drawing Specifications [Hardware Guide Drawing Standards]. For proprietary products, a single isometric line drawing is usually acceptable to illustrate the product, with detailed specifications, intended use, and contact information provided on the reverse. Additional drawings (not in TF-13 format) showing details that are relevant to understanding the dimensions and performance of the device should also be submitted to facilitate our review.

FHWA Official Business Only:

Eligibility Letter		
Number	Date	Key Words

MASH Test 3-71 Summary

90° Orientation

0° Orientation



0.000 s

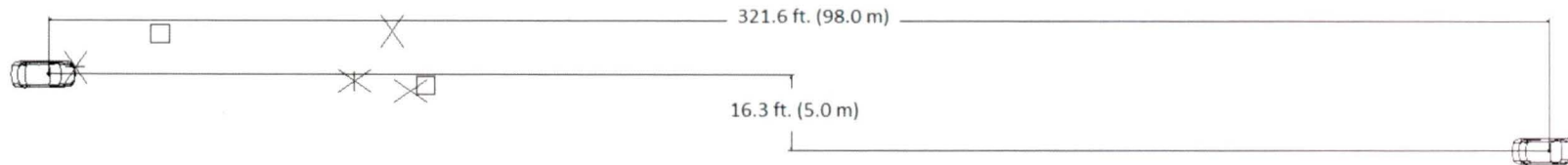
0.080 s

0.200 s

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General Information	
Test Agency.....	KARCO Engineering, LLC.
KARCO Test No.....	P37305-01
Test Designation.....	3-71
Test Date.....	08/17/17
Test Article	
Name / Model.....	4860M-LT Temporary Sign Support
Type.....	Work-Zone Traffic Control Device
Installation Length.....	Signs 60 ft. (18.2 m) apart
Overall Height.....	152.0 in. (3.9 m)
Road Surface.....	Concrete
Test Vehicle	
Type / Designation.....	1100C
Year, Make, and Model.....	2014 Kia Rio
Curb Mass.....	2,435.0 lbs (1,104.5 kg)
Test Inertial Mass.....	2,435.0 lbs (1,104.5 kg)
Gross Static Mass.....	2,629.0 lbs (1,192.5 kg)

Impact Conditions	
Impact Angle WZ1.....	90°
Impact Angle WZ2.....	0°
Impact Velocity (90°).....	61.79 mph (99.44 km/h)
Impact Velocity (0°).....	59.79 mph (96.22 km/h)
WZ1 Impact Location.....	Offset 16.9 in. (429mm) Left
WZ2 Impact Location.....	Offset 16.9 in. (429mm) Right
Kinetic Energy (90°).....	310.8 kip-ft (421.4 kJ)
Kinetic Energy (0°).....	291.0 kip-ft (394.5 kJ)
Exit Conditions	
Exit Velocity (90°).....	60.74 mph (97.75 km/h)
Exit Velocity (0°).....	58.76mph (94.57 km/h)
Exit Angle (90°).....	0°
Exit Angle (0°).....	0°
Final Vehicle Position.....	321.6 ft. (98.0 m) downstream 16.3 ft. (5.0 m) Right

Occupant Risk*	
Longitudinal OIV.....	N/A
Lateral OIV.....	N/A
Longitudinal RA.....	N/A
Lateral RA.....	N/A
THIV.....	N/A
PHD.....	N/A
ASI.....	N/A
Test Article Deflections	
Maximum Debris Field.....	67.9 ft. (20.7 m) downstream 7.9 ft. (2.4 m) left
Vehicle Damage	
Vehicle Damage Scale.....	N/A
CDC.....	N/A
Maximum Intrusion.....	No measureable deformation

*Not Applicable, device weighs less than 220 lb (100 kg)

Figure 2 Summary of Test 3-71

MASH Test 3-72 Summary

90° Orientation



0.000 s



0.100



0.300 s



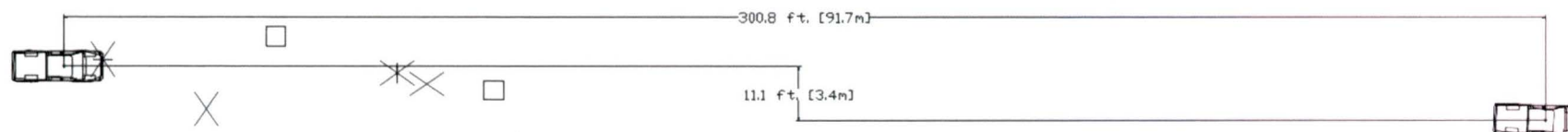
0.000 s



0.127 s



0.327 s



General Information	
Test Agency.....	KARCO Engineering, LLC.
KARCO Test No.....	P37305-02
Test Designation.....	3-72
Test Date.....	08/17/17
Test Article	
Name / Model.....	4860M-LT Temporary Sign Support
Type.....	Work-Zone Traffic Control Device
Installation Length.....	Signs 60 ft. (18.2 m) apart
Sign Height.....	152.0 in. (3.9 m)
Road Surface.....	Concrete
Test Vehicle	
Type / Designation.....	2270P
Year, Make, and Model.....	2012 RAM 1500
Curb Mass.....	5,014.3 lbs (2,274.5 kg)
Test Inertial Mass.....	5,008.8 lbs (2,272.0 kg)
Gross Static Mass.....	5,008.8 lbs (2,272.0 kg)

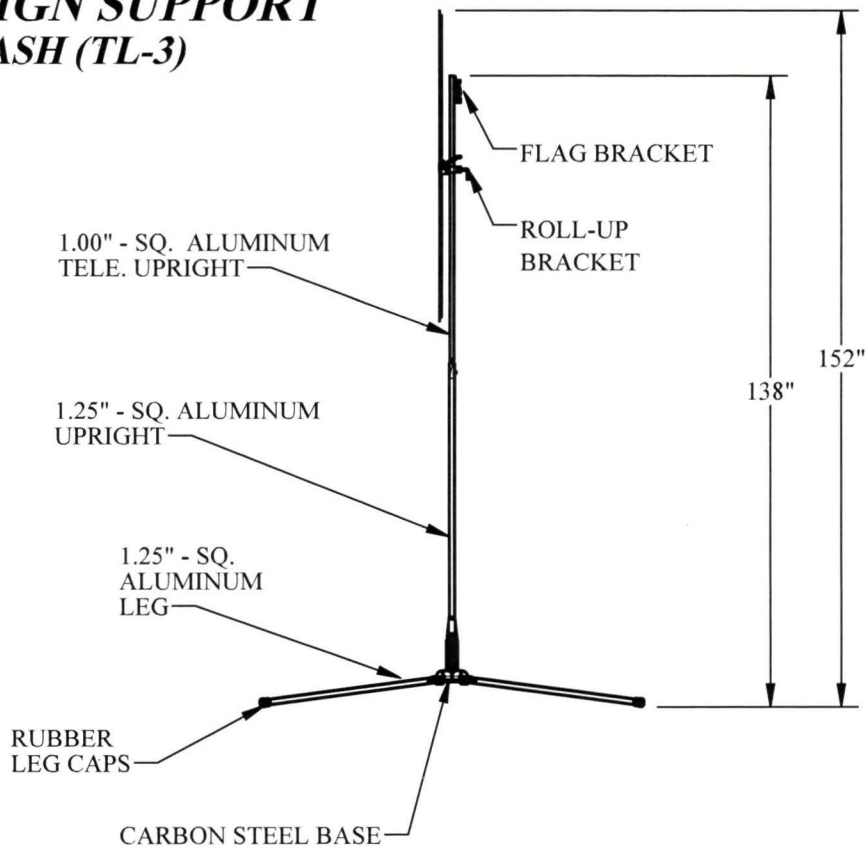
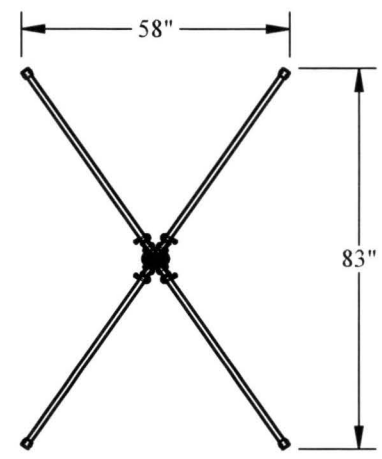
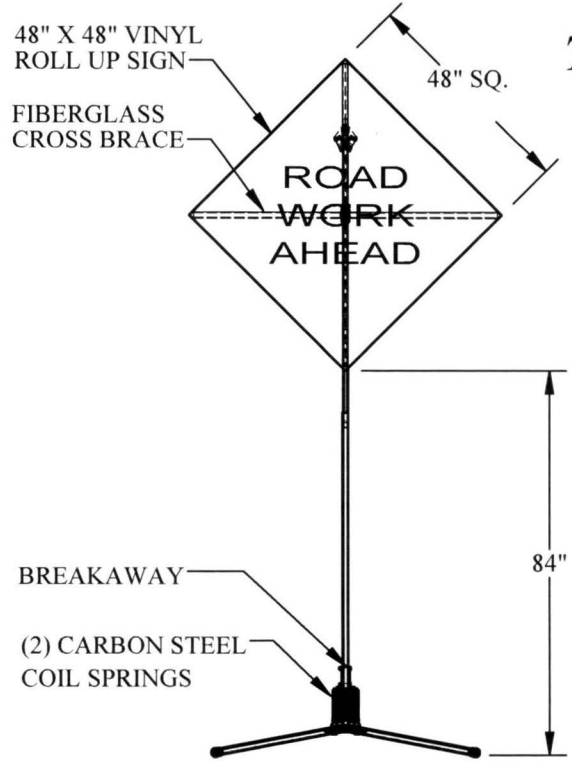
Impact Conditions	
Impact Angle WZ1.....	90°
Impact Angle WZ2.....	0°
Impact Velocity (90°).....	62.97 mph (101.34 km/h)
Impact Velocity (0°).....	60.73 mph (97.74 km/h)
WZ1 Impact Location.....	19.7 in. (500 mm) offset
WZ2 Impact Location.....	19.7 in. (500 mm) offset
Kinetic Energy (90°).....	900.2 kJ (663.9 kip-ft)
Kinetic Energy (0°).....	837.3 kJ (617.5 kip-ft)
Exit Conditions	
Exit Velocity (90°).....	61.83 mph (99.51 km/h)
Exit Velocity (0°).....	59.44 mph (95.66 km/h)
Exit Angle (90°).....	0°
Exit Angle (0°).....	0°
Final Vehicle Position.....	300.8 ft. (91.7 m) downstream 11.1 ft. (3.4 m) Right

Occupant Risk*	
Longitudinal OIV.....	N/A
Lateral OIV.....	N/A
Longitudinal RA.....	N/A
Lateral RA.....	N/A
THIV.....	N/A
PHD.....	N/A
ASI.....	N/A
Test Article Deflections	
Maximum Debris Field.....	37.2 ft. (11.3 m) downstream 6.7 ft. (2.1 m) Left
Vehicle Damage	
Vehicle Damage Scale.....	N/A
CDC.....	N/A
Maximum Intrusion.....	No measurable deformation

**Not Applicable, device weighs less than 220 lb (100 kg)*

Figure 2 Summary of Test 3-72

MODEL: 4860M-LT TEMPORARY SIGN SUPPORT AASHTO MASH (TL-3)



NOTES:
-DIMENSIONS SHOWN ARE PER THE DESIGN INTENT AND ARE SHOWN FOR REFERENCE ONLY.



4860M-LT SIGN STAND
OVERALL WEIGHT: APPROX. 30.0 lbs. (NO SIGN)
OVERALL DIMENSIONS: APPROX. 58" X 83" X 138"