U.S. Department of Transportation
Federal Highway Administration

1200 New Jersey Ave., S.E.
Washington, DC 20590

March 3, 2008

In Reply Refer To: HSSD/WZ-268

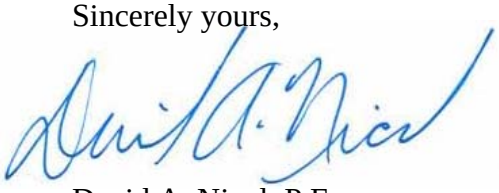
Mr. John Pasakarnis
Dicke Safety Supply
1201 Warren Avenue
Downers Grove, IL 60515

Dear Mr. Pasakarnis:

In your letters of February 5, 2008 you requested Federal Highway Administration (FHWA) acceptance of your company's T155, AFC48, and P100 portable sign stands as crashworthy traffic control devices for use in work zones on the National Highway System (NHS). Accompanying your letter was the FHWA Office of Safety Design form and test report documentation including a CD compilation of relevant crash tests conducted by Karco Engineering, LLC. A summary of the test results that includes a drawing and specifications for each device are enclosed as a reference. You requested that we find these portable sign stands acceptable for use on the NHS under the provisions of National Cooperative Highway Research Program Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

This letter is the acknowledgement of the FHWA's acceptance of your requests, including the additional requests outlined in your letters. It is important to note the T155 portable sign stand is acceptable for use with 0.125 inch thick aluminum, 4 foot by 4 foot by 5/8 inch plywood substrate with a minimum radius of the corners equal to three inches, and other substrates as outlined in your requests. The test data indicated that the radius corners help minimize the potential for windshield damage and occupant compartment penetration. The original completed forms for each portable sign stand have been modified by the addition of the FHWA acceptance letter number WZ-268. The forms, which are enclosed for reference, will be posted on our Web site in the near future.

Sincerely yours,



David A. Nicol, P.E.
Director, Office of Safety Design
Office of Safety

Enclosures

MOVING THE AMERICAN ECONOMY

Attachment 1

| Page 1 | **FEDERAL HIGHWAY ADMINISTRATION**<br>**OFFICE OF SAFETY DESIGN**<br>**Category 2 Work Zone Device Acceptance Letter** | Letter Number<br>WZ-268<br>Date<br>2/22/08 |
|---|---|---|
| Contact Info | Petitioner / Developer Name and Address:<br>Dicke Safety Supply<br>1201 Warren Avenue<br>Downers Grove, IL 60515 | |
| | I herby certify that the device(s) covered by this Acceptance Letter meet(s) the crash – worthiness test and evaluation requirements of the FHWA and NCHRP Report 350. | |
| Signature | John M Pavlaums | |
| Telephone # | (630) 969-0050 | |
| Email Address | john@dicketool.com | |
| | Laboratory / Engineer Name and Address<br>KARCO Engineering, LLC<br>9270 Holly Road<br>Adelanto, CA 92301 | |
| ☑ | I hereby certify that the testing that supports this Acceptance Letter was conducted in accordance with NCHRP Report 350 guidelines, that the device(s) tested is/are accurately described on this form, and that the test results indicate that the device meets all applicable NCHRP Report 350 evaluation criteria. | |
| ☐ | I have evaluated the requested modifications to these devices previously found acceptable by the FHWA in Acceptance Letter WZ-___, and hereby certify that, in my opinion, the modifications do not adversely affect the crash performance of the devices. I also certify that these devices are accurately described on this form. | |
| Signature | (See attached report) | |
| Telephone # | (760) 246-1672 | |
| Email Address | kchiu@karco.com | |
| Keywords: | T155 Tri-pod portable sign system | |
| | Type of Device (See page 3)<br>Tripod Sign Stand | |
| | Composition of Sign or Rail substrate (See Page 3)<br>Wood / Lumber | |
| | Thickness of substrate (inches): 0.625 | |
| | Height of sign from the ground (inches), if applicable: (See Page 3)<br>Low: 12 to 18 inches above the pavement | |
| | Flags and or lights present during test? Indicate number of each:<br># of flags: 3 # of lights: 0 Weight of lights: 0.00 ea. | |
| Device Name | | |
| Detailed Desc. Of Device, Materials, sizes, Fasteners, Substrates Foundation, Aux. Features Ballast, etc. | (May be attached on separate page(s)<br>(See attached letter from Dicke Safety Products) | |

| Page 2 | **FEDERAL HIGHWAY ADMINISTRATION**<br>**OFFICE OF SAFETY DESIGN**<br>**Category 2 Work Zone Device Acceptance Letter** | | Letter Number<br>WZ 268<br>Date<br>2/22/08 |
|---|---|---|---|
| | **Mandatory Attachments** | | |
| | **Attachment # 1**: Test data summary page(s) | | |
| | Attach. #1a | Test # P27238-01 | |
| | Attach. #1b | Test # | |
| | Attach. #1c | Test # | |
| | Attach. #1d | Test # | |
| Alternative | **Attachment # 1:** Description and discussion of modification(s) to crash tested and/or accepted device. | | |
| | Date: | | |
| | **Attachment # 2**: PDF drawing(s) of device(s) | | |
| | Attach. #2a | Drawing Title: Tri-pod Comparison | |
| | | Drawing #: T155-1(a-e) | |
| | Attach. #2b | Drawing Title: Sign Impact Analysis | |
| | | Drawing #: T155-2(a-e) | |
| | Attach. #2c | Drawing Title: | |
| | | Drawing #: | |
| | Attach. #2d | Drawing Title: | |
| | | Drawing #: | |
| | Attach. #2e | Drawing Title: | |
| | | Drawing #: | |
| | Attach. #2f | Drawing Title: | |
| | | Drawing #: | |
| | Attach. #2g | Drawing Title: | |
| | | Drawing #: | |

| Page 3 | **FEDERAL HIGHWAY ADMINISTRATION**<br>**OFFICE OF SAFETY DESIGN**<br>**Category 2 Work Zone Device Acceptance Letter** | Letter Number<br>WZ 268<br>Date<br>2/22/08 |
|---|---|---|

**Please select from the following Keywords for "Type of Device":**

Longitudinal Channelizing Barricade
Curb (Curb channelizer system with or without road tubes or other channelizers)
Drum
H-Footprint Sign Stand
X-Footprint Sign Stand
Trailer Mounted Signs (Does not include arrow boards or variable message signs or other Category 4 trailer mounted devices.)
Automated Flagger Device (not trailer mounted)
Tripod Sign Stand
Type I Barricade
Type II Barricade
Type III Barricade
Vertical Panel
Intrusion Detector
Ballast (Action relates to ballast on one or more devices)
Channelizer (Individual units unlike cones, road tubes, or drums)

**Please select from the following Keywords for "Sign Substrate":**

Roll-up / Fabric (with fiberglass spreaders – aluminum or steel spreaders are not allowed.)
Plywood
Aluminum – Solid
Aluminum – Laminate
Corrugated Plastic
Extruded Plastic
Waffleboard Plastic
Wood / Lumber

**Please select from the following Keywords for "Height of Sign":**

The distance to the lowest point on the sign is:

| | |
|---|---|
| Low | 12 to 18 inches above the pavement |
| Mid-A | 20 to 24 inches above the pavement |
| Mid-B | 25 to 36 inches above the pavement |
| Mid-C | 37 to 59 inches above the pavement |
| Tall | 60 to 71 inches above the pavement |
| Oversized | 72 inches and taller |

| Page 4 | FEDERAL HIGHWAY ADMINISTRATION<br>OFFICE OF SAFETY DESIGN<br>Category 2 Work Zone Device Acceptance Letter | Letter Number<br>WZ-268<br>Date<br>2-22-08 |
|---|---|---|

Please note the following standard provisions that apply to FHWA letters of acceptance:

- Our acceptance is limited to the crashworthiness characteristics of the devices and does not cover their structural features, or conformity with the Manual on Uniform Traffic Control Devices.
- Any changes that may adversely influence the crashworthiness of the device will require a new acceptance letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals unacceptable safety problems, or that the device being marketed is significantly different from the version that was crash tested, it reserves the right to modify or revoke its acceptance.
- You will be expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- You will be expected to certify to potential users that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as that submitted for acceptance, and that they will meet the crashworthiness requirements of FHWA and NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance shall not be reproduced except in full. This letter, and the test documentation upon which this letter is based, is public information. All such letters and documentation may be reviewed at our office upon request.
- If the subject of this letter is a patented device it is considered "proprietary." The use of proprietary work zone traffic control devices in Federal-aid projects is generally of a temporary nature. They are *selected by the contractor* for use as needed and removed upon completion of the project. Under such conditions they can be presumed to meet requirement "a" given below for the use of proprietary products on Federal-aid projects. On the other hand, if proprietary devices are *specified by a highway agency* for use on Federal-aid projects they: (a) must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with 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, a copy of which is enclosed.
- This Acceptance Letter shall not be construed as authorization or consent by the Federal Highway Administration to use, manufacture, or sell any patented device for which the applicant is not the patent holder. The Acceptance Letter is limited to the crashworthiness characteristics of the candidate device, and the FHWA is neither prepared nor required to become involved in issues concerning patent law. Patent issues, if any, are to be resolved by the applicant.

DICKE Since 1886

# DICKE SAFETY PRODUCTS

1201 Warren Avenue • Downers Grove, IL 60515 • Ph: 877.891.0050 • Fax: 630.969.3973

February 5, 2008

Mr. Matt Lupes, P.E.
Highway Engineer
Federal Highway Administration
Office of Safety Design - Room E71-107
1200 New Jersey Avenue, SE
Washington, DC 20590

Matt,

Enclosed is information regarding the new T155 portable tri-pod sign stand that will require acceptance and issuance of a WZ letter, under NCHRP-350 (High Speed).

I am submitting high speed crash test information, analysis of results and product comparisons for your review in order to determine what our next step in the process will be.

The T155 sign stand is a portable tri-pod sign system capable of displaying rollup and rigid signs. The mast is constructed of steel tube 25 mm x 25 mm x 1.6 mm. The legs are also constructed of steel tube 30 mm x 30 mm x 1.6 mm. The T155 Sign Stand was tested with a 1219.2 mm x 1219.2 mm sign made of 15.88 mm thick plywood with square corners. The sign is captured on the bottom by two steel rod hooks on the top by a steel bracket attached to the mast. When deployed the bottom of the sign is a nominal 324 mm above ground level.

There are three similar devices in the marketplace that have been approved. I have enclosed illustrations and a comparison drawing of ours and two others to show how similar these products are. The WZ-207 video shows that the crash test performance of the stand manufactured by Traffix was nearly identical to that of our stand in regards to hood damage and windshield impact. A comparison of the two videos and review of the detailed impact drawings, appears to confirm our contention that the pass / fail was due to the radius sign corners. Upon your review of this information we request acceptance of our stand based on the fact that the only discernable difference is the corner configuration of the sign material used.

Request #1:
We are seeking acceptance with the tested 48" x 48" x 5/8" plywood, including signs of smaller size and thinner / lighter material. It is our opinion that this and future acceptance should include a note

referring to the sign corners and the need for them to have a radius (the typical industry standard radius is 3" radius).

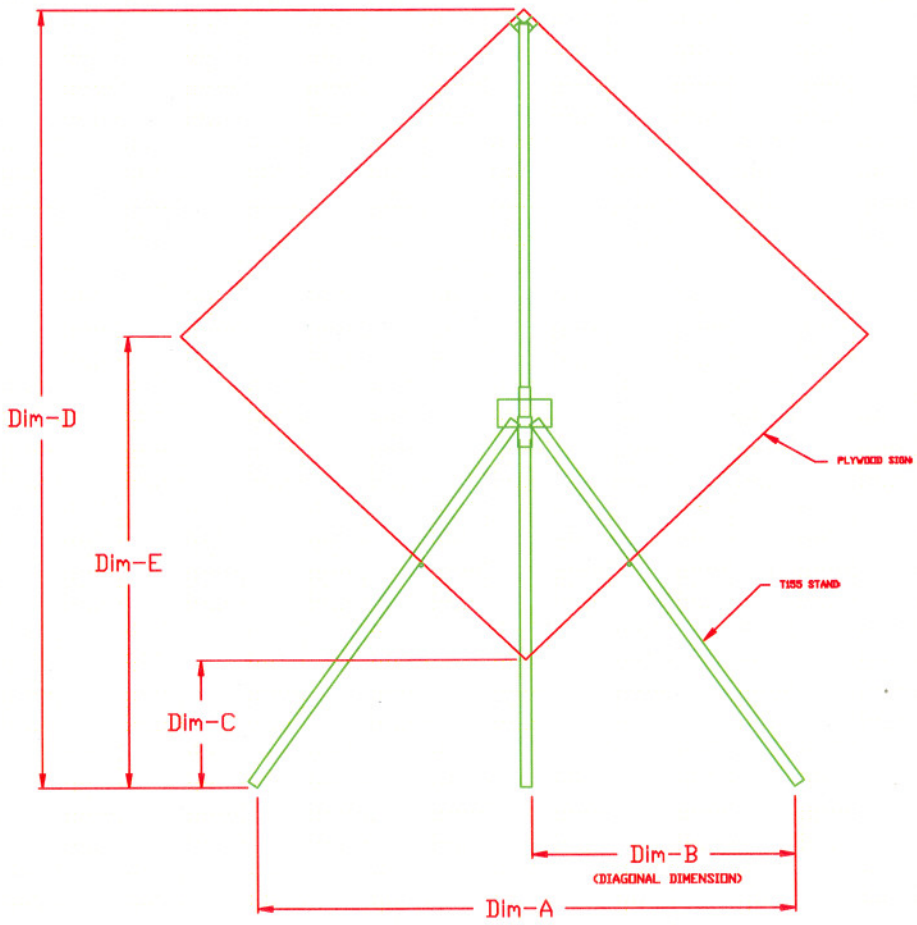
Request #2:
Based on this and previous test data, we are seeking acceptance of these additional materials:

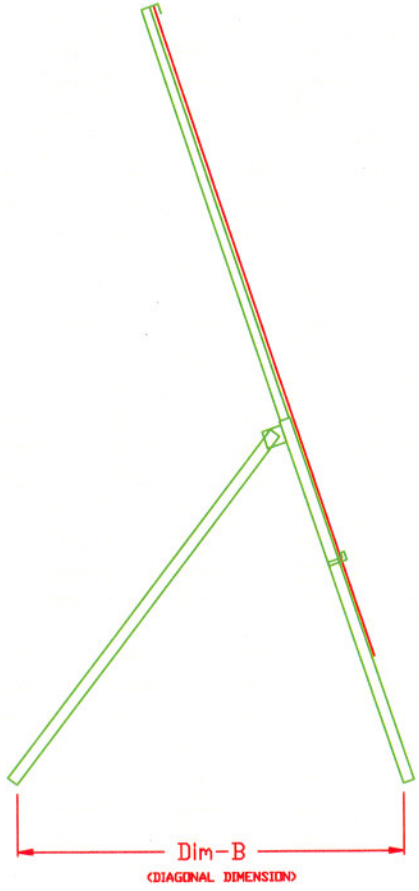
1) Sign sizes for all approved material up to 48" x 48"
2) 0.080, 0.100 and 0.125 inch thick aluminum
3) 2 mm and 3 mm aluminum laminates such as Alpolic, Dibond, and Reynolite
4) 10 mm to 16 mm corrugated plastic
5) Center-hinged 6.35 mm solid ABS plastic signs
6) Roll-up signs with fiberglass bracing

Should you need any further documentation, please let me know.

Sincerely,

John M. Pasakarnis
Dicke Tool Company
630-969-0050 x28
john@dicketool.com
www.dicketool.com




TESTED SPECIFICATIONS:

| | Dicke | Trafflx | E.Metals |
|---|---|---|---|
| Sign Stand | 16.0 lb | 14.4 lb | 18.0 lb |
| Dim.- A | 53.0" | 53.0" | 48.0" |
| Dim.- B | 46.0" | 46.0" | 47.5" |
| Dim.- C | 12.75" | 13.0" | 15.0" |
| Dim.- D | 77.5" | 73.0" | 73.5" |
| Dim.- E | - | - | - |

MEASURED SPECIFICATIONS:

| | Dicke | Trafflx | E.Metals |
|---|---|---|---|
| Sign Stand | 16.0 lb | 14.4 lb | 18.0 lb |
| Dim.- A | 53.0" | 49.0" | 46.0" |
| Dim.- B | 46.0" | 42.25" | 50.25" |
| Dim.- C | 12.75" | 13.0" | 15.0" |
| Dim.- D | 77.5" | 77.375" | 74.0" |
| Dim.- E | 45.125" | 45.25" | - |

TITLE: TRI-POD STAND COMPARISON

CUSTOMER REF. NO.:

DRAWN: JNP

CHECK:

MATERIAL: PAINTED STEEL

TOLERANCES: X +/- 0.030; X.X +/- 0.010; X.XX +/- 0.005; X.XXX +/- 0.002; ANGULAR +/- 1.0°

DATE: 12-19-07

SCALE: NTS

SHT 1 OF 1

| REV | DATE | BY | DESCRIPTION |
|---|---|---|---|

DICKE TOOL Co.

1201 WARREN AVE. DOWNERS GROVE, IL 60515

THIS DOCUMENT AND THE INFORMATION THEREIN IS CONFIDENTIAL AND MAY NOT BE USED OR DISCLOSED WITHOUT WRITTEN CONSENT

DRAWING/PART No.: T155-1a

ISSUE: 0

## DATA SHEET NO. 3

## SUMMARY OF RESULTS FOR TEST NO. 3-71

| GENERAL INFORMATION | | OCCUPANT RISK VALUES | |
|---|---|---|---|
| TEST AGENCY | KARCO ENGINEERING, LLC | FLAIL SPACE VELOCITY (m/sec) | |
| TEST NO. | 3-71 | X-DIRECTION | 2.3 |
| DATE | 12/11/07 | Y-DIRECTION | 0.0 |
| TEST ARTICLE | | THIV (optional) | N/A |
| TYPE | Dicke Safety Products T155 Tripod Stand With 5/8" 4X4 Plywood Substrate | RIDEDOWN ACCELERATION (g's) | |
| INSTILLATION LENGTH (m) | | X-DIRECTION | -0.3 |
| SIZE AND/OR DIMENSION OF KEY ELEMENTS | 20.0 kg (44.0 lbs) each | Y-DIRECTION | -0.1 |
| SOIL TYPE AND CONDITION | Concrete | PHD (optional) | N/A |
| TEST VEHICLE | 820C | ASI (optional) | N/A |
| TYPE | PRODUCTION | TEST ARTICLE DEFLECTIONS (m) | |
| DESIGNATION | 3-71 | DYNAMIC | N/A |
| MODEL | 1995 GEO METRO | PERMANENT | N/A |
| MASS (CURB) | 836 kg (1842 lbs) | VEHICLE DAMAGE | |
| MASS (TEST INERTIAL) | 840 kg (1852 lbs) | EXTERIOR | |
| DUMMY(s) MASS | 75 kg (165 lbs) | VDS | 12-FC-4 |
| GROSS STATIC WEIGHT | 916 kg (2020 lbs) | CDC | 12FCAN4 |
| IMPACT CONDITIONS | | INTERIOR | |
| SPEED (km/h) | 98.7 km/h (61.3 mph)/98.31 km/h (61.1 mph) | OCDI | FS0100011 |
| ANGLE (Deg.) | 90 / 0 | | |
| IMPACT SEVERITY (kJ) | 315.6 | POST-IMPACT VEHICULAR BEHAVIOR | |
| EXIT CONDITIONS | | MAXIMUM ROLL ANGLE (Deg.) | * |
| SPEED (km/h) | 94.8 km/h (58.9 mph) | MAXIMUM PITCH ANGLE (Deg.) | * |
| ANGLE (Deg.) | 90 / 0 | MAXIMUM YAW ANGLE (Deg.) | * |

*Values not calculated due to occupant not contacting the vehicle's interior.

Attachment 1

| Page 1 | **FEDERAL HIGHWAY ADMINISTRATION**<br>**OFFICE OF SAFETY DESIGN**<br>**Category 2 Work Zone Device Acceptance Letter** | Letter Number<br>WZ-268<br>Date<br>2/22/08 |
|---|---|---|
| Contact Info | Petitioner / Developer Name and Address:<br>Dicke Safety Supply<br>1201 Warren Avenue<br>Downers Grove, IL 60515 | |
| | I herby certify that the device(s) covered by this Acceptance Letter meet(s) the crash – worthiness test and evaluation requirements of the FHWA and NCHRP Report 350. | |
| Signature | John M. Paraskevas | |
| Telephone # | (630) 969-0050 | |
| Email Address | john@dicketool.com | |
| | Laboratory / Engineer Name and Address<br>KARCO Engineering, LLC<br>9270 Holly Road<br>Adelanto, CA 92301 | |
| ☑ | I hereby certify that the testing that supports this Acceptance Letter was conducted in accordance with NCHRP Report 350 guidelines, that the device(s) tested is/are accurately described on this form, and that the test results indicate that the device meets all applicable NCHRP Report 350 evaluation criteria. | |
| ☐ | I have evaluated the requested modifications to these devices previously found acceptable by the FHWA in Acceptance Letter WZ-___, and hereby certify that, in my opinion, the modifications do not adversely affect the crash performance of the devices. I also certify that these devices are accurately described on this form. | |
| Signature | (See attached report) | |
| Telephone # | (760) 246-1672 | |
| Email Address | kchiu@karco.com | |
| Keywords: | AFC48 A-Frame portable sign system | |
| | Type of Device (See page 3)<br>A-Frame sign stand | |
| | Composition of Sign or Rail substrate (See Page 3)<br>Aluminum – Solid | |
| | Thickness of substrate (inches): 0.080 | |
| | Height of sign from the ground (inches), if applicable: (See Page 3)<br>Low: 12 to 18 inches above the pavement | |
| | Flags and or lights present during test? Indicate number of each:<br># of flags: 0 # of lights: 0 Weight of lights: 0.00 ea. | |
| Device Name | | |
| Detailed Desc. Of Device, Materials, sizes, Fasteners, Substrates Foundation, Aux. Features Ballast, etc. | (May be attached on separate page(s)<br>(See attached letter from Dicke Safety Products) | |

| Page 2 | **FEDERAL HIGHWAY ADMINISTRATION**<br>**OFFICE OF SAFETY DESIGN**<br>**Category 2 Work Zone Device Acceptance Letter** | Letter Number<br>WZ-268<br>Date<br>2/22/08 |
|---|---|---|
| | **Mandatory Attachments** | |
| | **Attachment # 1**: Test data summary page(s) | |
| | Attach. #1a — Test # P27239-01 | |
| | Attach. #1b — Test # | |
| | Attach. #1c — Test # | |
| | Attach. #1d — Test # | |
| Alternative | **Attachment # 1:** Description and discussion of modification(s) to crash tested and/or accepted device. | |
| | Date: | |
| | **Attachment # 2**: PDF drawing(s) of device(s) | |
| | Attach. #2a — Drawing Title: | |
| | Drawing #: | |
| | Attach. #2b — Drawing Title: | |
| | Drawing #: | |
| | Attach. #2c — Drawing Title: | |
| | Drawing #: | |
| | Attach. #2d — Drawing Title: | |
| | Drawing #: | |
| | Attach. #2e — Drawing Title: | |
| | Drawing #: | |
| | Attach. #2f — Drawing Title: | |
| | Drawing #: | |
| | Attach. #2g — Drawing Title: | |
| | Drawing #: | |

| Page 3 | **FEDERAL HIGHWAY ADMINISTRATION**<br>**OFFICE OF SAFETY DESIGN**<br>**Category 2 Work Zone Device Acceptance Letter** | Letter Number<br>WZ 268<br>Date<br>2/22/08 |
|---|---|---|

**Please select from the following Keywords for "Type of Device":**

Longitudinal Channelizing Barricade
Curb (Curb channelizer system with or without road tubes or other channelizers)
Drum
H-Footprint Sign Stand
X-Footprint Sign Stand
Trailer Mounted Signs (Does not include arrow boards or variable message signs or other Category 4 trailer mounted devices.)
Automated Flagger Device (not trailer mounted)
Tripod Sign Stand
Type I Barricade
Type II Barricade
Type III Barricade
Vertical Panel
Intrusion Detector
Ballast (Action relates to ballast on one or more devices)
Channelizer (Individual units unlike cones, road tubes, or drums)

**Please select from the following Keywords for "Sign Substrate":**

Roll-up / Fabric (with fiberglass spreaders – aluminum or steel spreaders are not allowed.)
Plywood
Aluminum – Solid
Aluminum – Laminate
Corrugated Plastic
Extruded Plastic
Waffleboard Plastic
Wood / Lumber

**Please select from the following Keywords for "Height of Sign":**

The distance to the lowest point on the sign is:

| | |
|---|---|
| Low | 12 to 18 inches above the pavement |
| Mid-A | 20 to 24 inches above the pavement |
| Mid-B | 25 to 36 inches above the pavement |
| Mid-C | 37 to 59 inches above the pavement |
| Tall | 60 to 71 inches above the pavement |
| Oversized | 72 inches and taller |

| Page 4 | FEDERAL HIGHWAY ADMINISTRATION<br>OFFICE OF SAFETY DESIGN<br>Category 2 Work Zone Device Acceptance Letter | Letter Number<br>WZ 268 |
|---|---|---|
| | | Date<br>2/22/08 |

Please note the following standard provisions that apply to FHWA letters of acceptance:

- Our acceptance is limited to the crashworthiness characteristics of the devices and does not cover their structural features, or conformity with the Manual on Uniform Traffic Control Devices.
- Any changes that may adversely influence the crashworthiness of the device will require a new acceptance letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals unacceptable safety problems, or that the device being marketed is significantly different from the version that was crash tested, it reserves the right to modify or revoke its acceptance.
- You will be expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- You will be expected to certify to potential users that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as that submitted for acceptance, and that they will meet the crashworthiness requirements of FHWA and NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance shall not be reproduced except in full. This letter, and the test documentation upon which this letter is based, is public information. All such letters and documentation may be reviewed at our office upon request.
- If the subject of this letter is a patented device it is considered "proprietary." The use of proprietary work zone traffic control devices in Federal-aid projects is generally of a temporary nature. They are *selected by the contractor* for use as needed and removed upon completion of the project. Under such conditions they can be presumed to meet requirement "a" given below for the use of proprietary products on Federal-aid projects. On the other hand, if proprietary devices are *specified by a highway agency* for use on Federal-aid projects they: (a) must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with 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, a copy of which is enclosed.
- This Acceptance Letter shall not be construed as authorization or consent by the Federal Highway Administration to use, manufacture, or sell any patented device for which the applicant is not the patent holder. The Acceptance Letter is limited to the crashworthiness characteristics of the candidate device, and the FHWA is neither prepared nor required to become involved in issues concerning patent law. Patent issues, if any, are to be resolved by the applicant.

DICKE Since 1886

# DICKE SAFETY PRODUCTS

1201 Warren Avenue • Downers Grove, IL 60515 • Ph: 877.891.0050 • Fax: 630.969.3973

February 5, 2008

Mr. Matt Lupes, P.E.
Highway Engineer
Federal Highway Administration
Office of Safety Design - Room E71-107
1200 New Jersey Avenue, SE
Washington, DC 20590

Matt,

Enclosed is information regarding the new AFC48 portable sign stand that will require acceptance and issuance of a WZ letter, under NCHRP-350 (High Speed).

I am submitting all of the crash test information for your review in order to determine what our next step in the process will be.

The AFC48 sign stand is a portable sign system featuring an "A-Frame" upright support. The stand has four 30.0 mm x 3.0 mm thick formed angle iron steel uptight legs interconnected with spread bars of similar construction. The uprights are "hinged" with 12.0 mm (grade 8.8) zinc plated bolts with lock nuts. The uprights, spread bars and sign connect with 8.0 mm (grade 8.8) diameter fasteners of the same type.

The AFC48 Sign Stand features a 1219.2 mm x 1219.2 mm sign made of 2.0 mm thick aluminum with 76.2 mm radius corners. The sign is bolted to the uprights with (4) 8.0 mm diameter grade 8.8 hex fasteners with special 38.1 mm outside diameter rubber encased flat washers that increase the bearing area and help to prevent sign damage. When deployed the bottom of the sign is a nominal 479 mm above ground level.

Request #1:
We are seeking acceptance with the tested 48" x 48" x 0.080" aluminum sign, including signs of smaller size and lighter weight material.

Request #2:
Based on this and previous test data, we are seeking acceptance of these additional materials:

1) Sign sizes for all approved materials up to 48" x 60"
2) 0.100, and 0.125 inch thick solid aluminum
3) 2 mm and 3 mm aluminum laminates such as Alpolic, Dibond, and Reynolite
4) 10 mm to 16 mm corrugated plastic
5) Roll-up signs with fiberglass braces, all sizes up to 60" x 60"

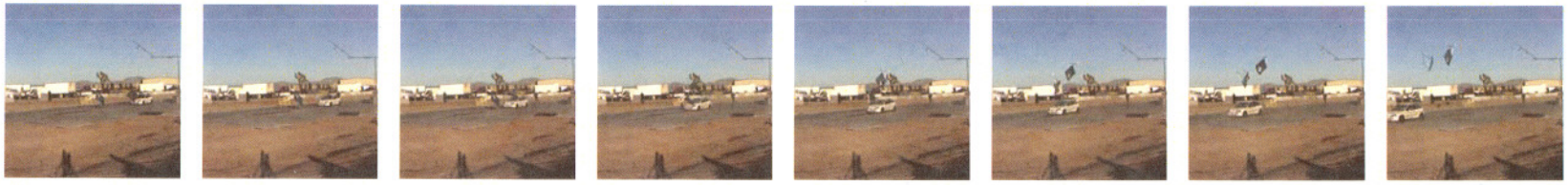
Should you need any additional documentation, please let me know.

Sincerely,

John M. Pasakarnis
Dicke Tool Company
630-969-0050 x28
john@dicketool.com
www.dicketool.com

## DATA SHEET NO. 3

## SUMMARY OF RESULTS FOR TEST NO. 3-71



| GENERAL INFORMATION | | OCCUPANT RISK VALUES | |
|---|---|---|---|
| TEST AGENCY | KARCO ENGINEERING, LLC | FLAIL SPACE VELOCITY (m/sec) | |
| TEST NO. | 3-71 | X-DIRECTION | N/A |
| DATE | 12/11/07 | Y-DIRECTION | N/A |
| TEST ARTICLE | | THIV (optional) | N/A |
| TYPE | Dicke Safety Products A-Frame Stand | RIDEDOWN ACCELERATION (g's) | |
| INSTILLATION LENGTH (m) | | X-DIRECTION | N/A |
| SIZE AND/OR DIMENSION OF KEY ELEMENTS | 17.2 kg (38.0 lbs) | Y-DIRECTION | N/A |
| SOIL TYPE AND CONDITION | Concrete | PHD (optional) | N/A |
| TEST VEHICLE | 820C | ASI (optional) | N/A |
| TYPE | PRODUCTION | TEST ARTICLE DEFLECTIONS (m) | |
| DESIGNATION | 3-71 | DYNAMIC | N/A |
| MODEL | 1999 GEO METRO | PERMANENT | N/A |
| MASS (CURB) | 792 kg (1746 lbs) | VEHICLE DAMAGE | |
| MASS (TEST INERTIAL) | 833 kg (1836 lbs) | EXTERIOR | |
| DUMMY(s) MASS | 75 kg (165 lbs) | VDS | 12-FC-4 |
| GROSS STATIC WEIGHT | 909 kg (2004 lbs) | CDC | 12FCAN4 |
| IMPACT CONDITIONS | | INTERIOR | |
| SPEED (km/h) | 98.5 km/h (61.2 mph)/95.9 km/h (59.6 mph) | OCDI | FS0100011 |
| ANGLE (Deg.) | 90 / 0 | | |
| IMPACT SEVERITY (kJ) | 311.9 | POST IMPACT VEHICULAR BEHAVIOR | |
| EXIT CONDITIONS | | MAXIMUM ROLL ANGLE (Deg.) | * |
| SPEED (km/h) | 92.9 km/h (57.8 mph) | MAXIMUM PITCH ANGLE (Deg.) | * |
| ANGLE (Deg.) | 90 / 0 | MAXIMUM YAW ANGLE (Deg.) | * |

*Values not calculated due to occupant not contacting the vehicle's interior.

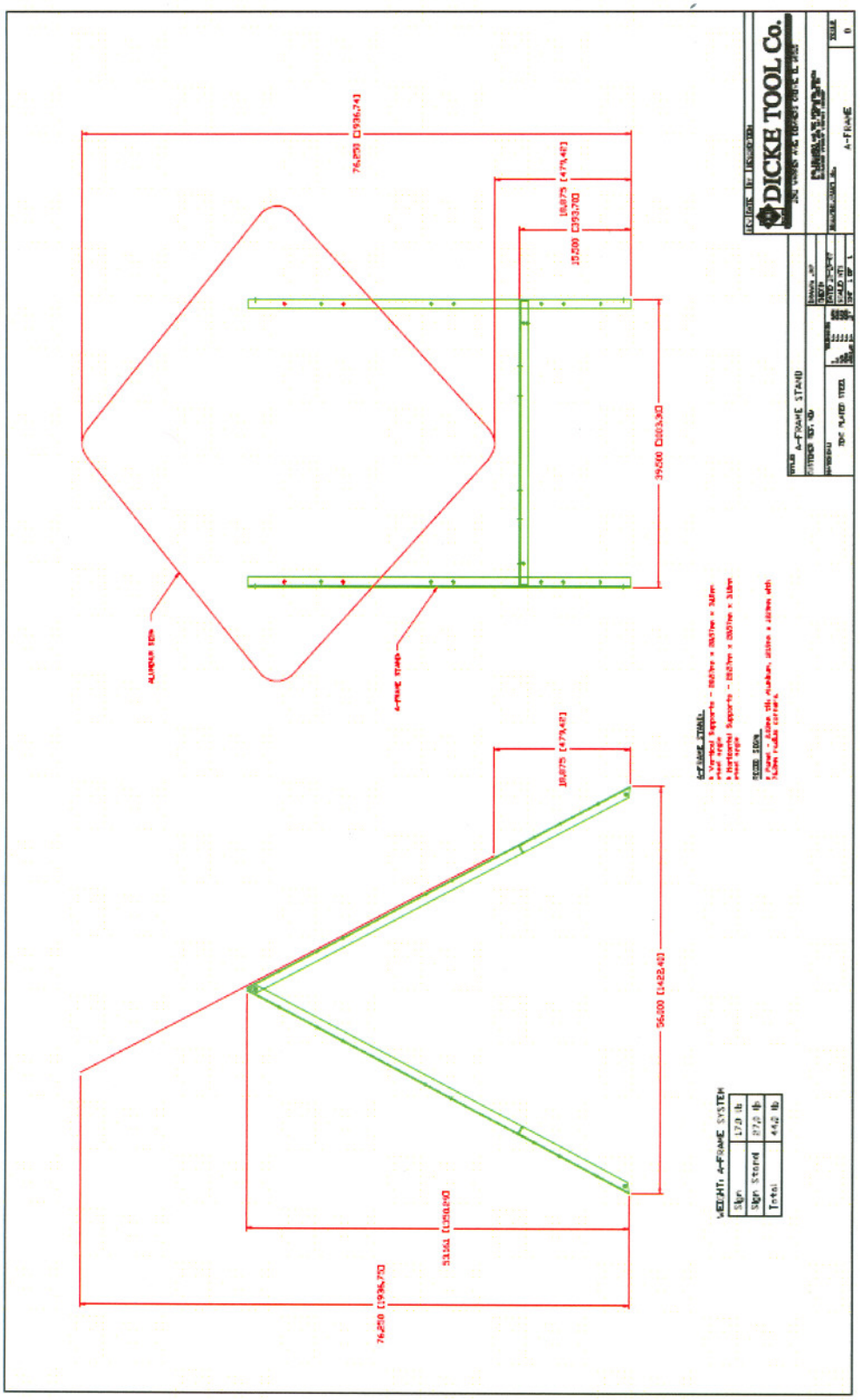



FIGURE 30: Manufacturer's Drawing of Test Article.

Attachment 1

| Page 1 | **FEDERAL HIGHWAY ADMINISTRATION**<br>**OFFICE OF SAFETY DESIGN**<br>**Category 2 Work Zone Device Acceptance Letter** | Letter Number<br>WZ-268<br>Date<br>2/22/08 |
|---|---|---|
| Contact Info | Petitioner / Developer Name and Address: | |
| | Dicke Safety Supply<br>1201 Warren Avenue<br>Downers Grove, IL 60515 | |
| | I herby certify that the device(s) covered by this Acceptance Letter meet(s) the crash – worthiness test and evaluation requirements of the FHWA and NCHRP Report 350. | |
| Signature | John M. Paradaris | |
| Telephone # | (630) 969-0050 | |
| Email Address | john@dicketool.com | |
| | Laboratory / Engineer Name and Address | |
| | KARCO Engineering, LLC<br>9270 Holly Road<br>Adelanto, CA 92301 | |
| ☑ | I hereby certify that the testing that supports this Acceptance Letter was conducted in accordance with NCHRP Report 350 guidelines, that the device(s) tested is/are accurately described on this form, and that the test results indicate that the device meets all applicable NCHRP Report 350 evaluation criteria. | |
| ☐ | I have evaluated the requested modifications to these devices previously found acceptable by the FHWA in Acceptance Letter WZ-___, and hereby certify that, in my opinion, the modifications do not adversely affect the crash performance of the devices. I also certify that these devices are accurately described on this form. | |
| Signature | (see attached report) | |
| Telephone # | (760) 246-1672 | |
| Email Address | kchiu@karco.com | |
| Keywords: | P100 Step-in-ground portable sign system | |
| | Type of Device (See page 3) | |
| | Step-in-ground sign stand | |
| | Composition of Sign or Rail substrate (See Page 3) | |
| | Roll-up / Fabric (with fiberglass spreaders – aluminum or steel spreaders are not allowed | |
| | Thickness of substrate (inches): | |
| | Height of sign from the ground (inches), if applicable: (See Page 3) | |
| | Low: 12 to 18 inches above the pavement | |
| | Flags and or lights present during test? Indicate number of each: | |
| | # of flags: 0 # of lights: 0 Weight of lights: 0.00 ea. | |
| Device Name | | |
| Detailed Desc. Of Device, Materials, sizes, Fasteners, Substrates Foundation, Aux. Features Ballast, etc. | (May be attached on separate page(s)<br>(See attached letter from Dicke Safety Products) | |

| Page 2 | **FEDERAL HIGHWAY ADMINISTRATION**<br>**OFFICE OF SAFETY DESIGN**<br>**Category 2 Work Zone Device Acceptance Letter** | Letter Number<br>WZ-268<br>Date<br>2/22/08 |
|---|---|---|
| | **Mandatory Attachments** | |
| | **Attachment # 1**: Test data summary page(s) | |
| | Attach. #1a — Test # P27232-01 | |
| | Attach. #1b — Test # | |
| | Attach. #1c — Test # | |
| | Attach. #1d — Test # | |
| Alternative | **Attachment # 1:** Description and discussion of modification(s) to crash tested and/or accepted device. | |
| | Date: | |
| | **Attachment # 2**: PDF drawing(s) of device(s) | |
| | Attach. #2a — Drawing Title: | |
| | Drawing #: | |
| | Attach. #2b — Drawing Title: | |
| | Drawing #: | |
| | Attach. #2c — Drawing Title: | |
| | Drawing #: | |
| | Attach. #2d — Drawing Title: | |
| | Drawing #: | |
| | Attach. #2e — Drawing Title: | |
| | Drawing #: | |
| | Attach. #2f — Drawing Title: | |
| | Drawing #: | |
| | Attach. #2g — Drawing Title: | |
| | Drawing #: | |

| Page 3 | **FEDERAL HIGHWAY ADMINISTRATION**<br>**OFFICE OF SAFETY DESIGN**<br>**Category 2 Work Zone Device Acceptance Letter** | Letter Number<br>WZ-268<br>Date<br>2/22/08 |
|---|---|---|

**Please select from the following Keywords for "Type of Device":**

Longitudinal Channelizing Barricade
Curb (Curb channelizer system with or without road tubes or other channelizers)
Drum
H-Footprint Sign Stand
X-Footprint Sign Stand
Trailer Mounted Signs (Does not include arrow boards or variable message signs or other Category 4 trailer mounted devices.)
Automated Flagger Device (not trailer mounted)
Tripod Sign Stand
Type I Barricade
Type II Barricade
Type III Barricade
Vertical Panel
Intrusion Detector
Ballast (Action relates to ballast on one or more devices)
Channelizer (Individual units unlike cones, road tubes, or drums)

**Please select from the following Keywords for "Sign Substrate":**

Roll-up / Fabric (with fiberglass spreaders – aluminum or steel spreaders are not allowed.)
Plywood
Aluminum – Solid
Aluminum – Laminate
Corrugated Plastic
Extruded Plastic
Waffleboard Plastic
Wood / Lumber

**Please select from the following Keywords for "Height of Sign":**

The distance to the lowest point on the sign is:

| | |
|---|---|
| Low | 12 to 18 inches above the pavement |
| Mid-A | 20 to 24 inches above the pavement |
| Mid-B | 25 to 36 inches above the pavement |
| Mid-C | 37 to 59 inches above the pavement |
| Tall | 60 to 71 inches above the pavement |
| Oversized | 72 inches and taller |

| Page 4 | **FEDERAL HIGHWAY ADMINISTRATION** | Letter Number |
|---|---|---|
| | **OFFICE OF SAFETY DESIGN** | WZ-268 |
| | **Category 2 Work Zone Device Acceptance Letter** | Date |
| | | 2/22/08 |

Please note the following standard provisions that apply to FHWA letters of acceptance:

- Our acceptance is limited to the crashworthiness characteristics of the devices and does not cover their structural features, or conformity with the Manual on Uniform Traffic Control Devices.
- Any changes that may adversely influence the crashworthiness of the device will require a new acceptance letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals unacceptable safety problems, or that the device being marketed is significantly different from the version that was crash tested, it reserves the right to modify or revoke its acceptance.
- You will be expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- You will be expected to certify to potential users that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as that submitted for acceptance, and that they will meet the crashworthiness requirements of FHWA and NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance shall not be reproduced except in full. This letter, and the test documentation upon which this letter is based, is public information. All such letters and documentation may be reviewed at our office upon request.
- If the subject of this letter is a patented device it is considered "proprietary." The use of proprietary work zone traffic control devices in Federal-aid projects is generally of a temporary nature. They are *selected by the contractor* for use as needed and removed upon completion of the project. Under such conditions they can be presumed to meet requirement "a" given below for the use of proprietary products on Federal-aid projects. On the other hand, if proprietary devices are *specified by a highway agency* for use on Federal-aid projects they: (a) must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with 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, a copy of which is enclosed.
- This Acceptance Letter shall not be construed as authorization or consent by the Federal Highway Administration to use, manufacture, or sell any patented device for which the applicant is not the patent holder. The Acceptance Letter is limited to the crashworthiness characteristics of the candidate device, and the FHWA is neither prepared nor required to become involved in issues concerning patent law. Patent issues, if any, are to be resolved by the applicant.

In-Ground" upright support. The stand has one 31.75 mm x 3.2 mm thick formed angle iron steel uptight leg with a horizontal step bar of similar construction. The sign is supported from a 25.4 mm x 3.2 mm formed angle iron frame which is attached to the leg. Two steel spring clips on this frame hold the horizontal fiberglass bar of the sign. The P100 Sign Stand features a 1219.2 mm x 1219.2 mm vinyl sign. The vinyl sign face is attached to a 31.75 mm x 6.35 mm thick horizontal and a 31.75 mm x 4.76 mm vertical fiberglass bar. The horizontal bar is then held to the stand frame by the two steel spring clips. When deployed the bottom of the sign is a nominal 192 mm above ground level.

Request #1:
We are seeking acceptance with the tested 48" x 48" roll-up sign.

Request #2:
We are seeking acceptance of additional roll-up signs: 60" x 60" and smaller.

Should you need any further documentation, please let me know.

## DATA SHEET NO. 3

## SUMMARY OF RESULTS FOR TEST NO. 3-70

| GENERAL INFORMATION | | OCCUPANT RISK VALUES | |
|---|---|---|---|
| TEST AGENCY | KARCO ENGINEERING, LLC | FLAIL SPACE VELOCITY (m/sec) | |
| TEST NO. | 3-70 | X-DIRECTION | * |
| DATE | 12/11/07 | Y-DIRECTION | * |
| TEST ARTICLE | | THIV (optional) | N/A |
| TYPE | Dicke Safety Products P100 In-Ground Stand with 4X4 Roll Up Sign | RIDEDOWN ACCELERATION (g's) | |
| INSTILLATION LENGTH (m) | | X-DIRECTION | * |
| SIZE AND/OR DIMENSION OF KEY ELEMENTS | 2.7 kg (6.0 lbs) each | Y-DIRECTION | * |
| SOIL TYPE AND CONDITION | Road Base/Native Soil Mixture | PHD (optional) | N/A |
| TEST VEHICLE | 820C | ASI (optional) | N/A |
| TYPE | PRODUCTION | TEST ARTICLE DEFLECTIONS (m) | |
| DESIGNATION | 3-70 | DYNAMIC | N/A |
| MODEL | 1997 GEO METRO | PERMANENT | N/A |
| MASS (CURB) | 780 kg (1720 lbs) | VEHICLE DAMAGE | |
| MASS (TEST INERTIAL) | 822 kg (1812 lbs) | EXTERIOR | |
| DUMMY(s) MASS | 75 Kg (165 lbs) | VDS | 12-FC-4 |
| GROSS STATIC WEIGHT | 898 kg (1980 lbs) | CDC | 12FCAN4 |
| IMPACT CONDITIONS | | INTERIOR | |
| SPEED (km/h) | 34.1 km/h (21.2 mph)/33.1 km/h (20.5 mph) | OCDI | FS0100011 |
| ANGLE (Deg.) | 90 / 0 | | |
| IMPACT SEVERITY (kJ) | 36.9 | POST IMPACT VEHICULAR BEHAVIOR | |
| EXIT CONDITIONS | | MAXIMUM ROLL ANGLE (Deg.) | * |
| SPEED (km/h) | 32.6 km./h (20.3 mph) | MAXIMUM PITCH ANGLE (Deg.) | * |
| ANGLE (Deg.) | 90 / 0 | MAXIMUM YAW ANGLE (Deg.) | * |

*Values not calculated due to occupant not contacting the vehicle's interior.

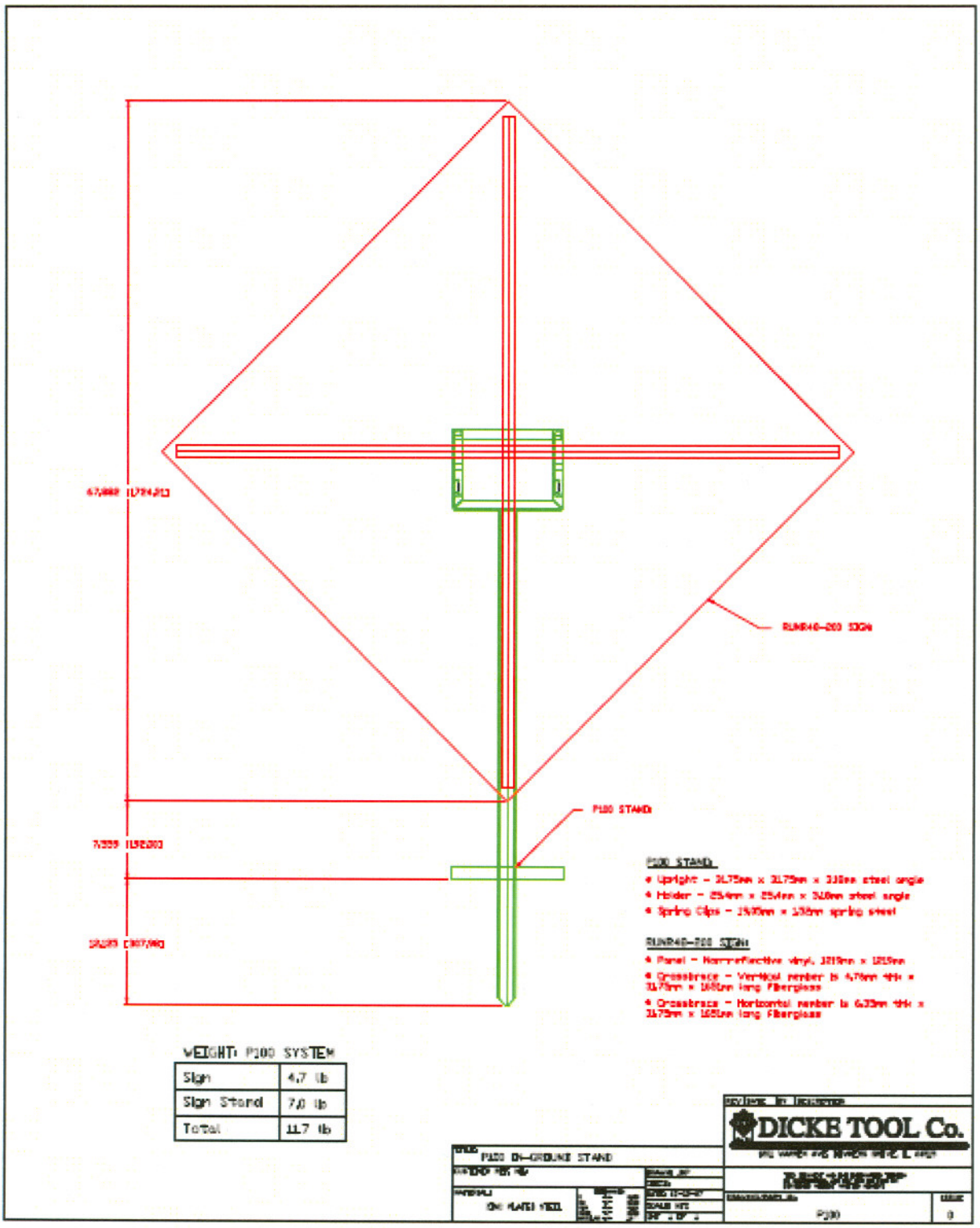
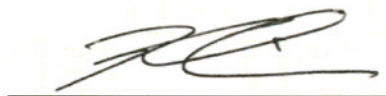
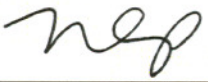



Figure 30: Manufacturer's Drawing of Test Article.

KARCO Engineering, LLC compiled this publication for information gathering only. The opinions, findings and conclusions expressed in this publication are those of the authors and not necessarily those of any other organization. KARCO Engineering, LLC provides test services only and is not involved in consulting, product design or the manufacturing of any automotive products. KARCO does not warrant, supervise or monitor compliance of products or services except as specifically agreed to in writing. By their very nature, testing, analysis and other KARCO services are limited in scope and subject to expected measurement variability. No activity by KARCO Engineering, LLC can release a manufacturer from product or any other liability.

Tested By: 

Kelsey A. Chiu, Project Engineer

Approved By: 

Michael L. Dunlap, Director of Operations

Approval Date: December 11, 2007