WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE

STANDARD METHOD FOR DETERMINING THE STABILITY OF PORTABLE SIGN STANDS

1. PURPOSE

1.1. To establish a procedure for determining the stability (acceptable wind resistance) for portable sign stands.

2. SCOPE

2.1. This procedure shall apply to all portable sign stands submitted for inclusion on the Division's Approved Products List (APL).

2.2. This testing shall be done in addition to the MASH testing as described in the Specifications.

3. REFERENCED DOCUMENTS

3.1. MP 106.00.02 - Procedure for Evaluating Products/Processes for Use in Highway Construction.

3.2. MP 106.00.21 - Acceptance Procedure for MASH Compliant Roadside Departure Hardware.

4. SUBMISSION OF PRODUCTS

4.1. Prospective Producers/Suppliers shall complete form HL-468[1] , as per MP 106.00.02 indicating intention to be included on the WVDOH APL.

5. TESTING PROCEDURE FOR 36-IN SIGN

5.1. The manufacturer's portable sign stand shall be assembled according to the manufacturer's instructions on a firm concrete or asphalt surface with legs contracted (for 36-inch (0.9 m) signs).

5.1.1. The testing technician shall inspect the device to ensure that it is functioning properly as per the manufacturer's standards.

5.2. Stands shall be secured such that there is no potential for sliding. This securing mechanism shall in no way alter the stability of the stand.

5.3. Attach the dynamometer force gauge to the top of the sign stand 60 inches (1.5 m) above the bottom of the sign. If the stand does not have a solid mast at that height,

[1] https://transportation.wv.gov/highways/mcst/Pages/tbox.aspx

insert a testing rod into the stand for a solid anchor point. With an even motion, parallel to the ground surface at a 90-degree angle to the back of the sign, measure the force required to “tip-over” the sign.

5.3.1. A final pulling force shall be recorded as the maximum force exerted before the sign becomes unstable and falls.

5.4. Repeat the above step two more times and calculate the average of the 3 readings.

5.5. The acceptable minimum value shall be 7 lbf. (29.42 N).

5.5.1. The associated wind speed with 7 lbf is approximately 17.4 mph. This calculation is shown in Attachment 1.

6. TESTING PROCEDURE FOR 48-IN SIGN

6.1. The manufacturer’s portable sign stand shall be assembled according to the manufacturer's instructions on a firm concrete or asphalt surface with legs fully extended (for 48-inch (1.2 m) signs).

6.1.1. The testing technician shall inspect the device to ensure that it is functioning properly as per the manufacturer's standards.

6.2. Stands shall be secured such that there is no potential for sliding. This securing mechanism shall in no way alter the stability of the stand.

6.3. Attach the dynamometer force gauge to the top of the sign stand 60 inches (1.5 m) above the bottom of the sign. If the stand does not have a solid mast at that height, insert a testing rod into the stand for a solid anchor point. With an even motion, parallel to the ground surface at a 90-degree angle to the back of the sign, measure the force required to “tip-over” the sign.

6.3.1. A final pulling force shall be recorded as the maximum force exerted before the sign becomes unstable and falls.

6.4. Repeat the above step two more times and calculate the average of the 3 readings.

6.5. The acceptable minimum value shall be 18 lbf. (80.41 N).

6.5.1. The associated wind speed of 18 lbf is approximately 21.0 mph. This calculation is shown in Attachment 1.

7. APPROVAL OF PORTABLE SIGN STANDS

7.1. The results of the described test as well as the MASH testing results shall be presented to the Roadway Departure Task Force. The approval of these items shall be at the discretion of this Task Force as described in MP 106.00.21.

Michael Mance

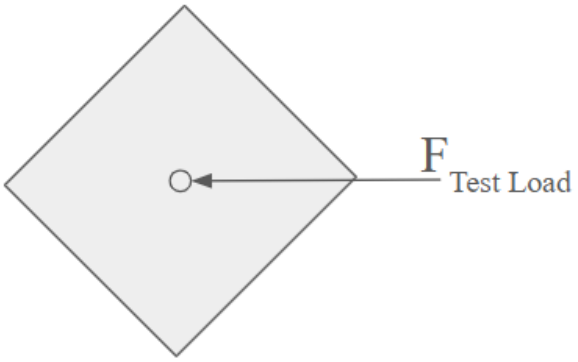
Digitally signed by Michael Mance
Date: 2026.01.07 14:54:51 -05'00'

Michael A. Mance, P.E.
Director
Materials Control, Soils & Testing Division

MP 715.09.20 Steward – Traffic Certification Section
MM:Bb
ATTACHMENT

Attachment 1: Conversion between Test Force and Associated Wind Speed

Assuming uniform density in the sign, symmetry, and the test force is applied at center of sign such that:



Then:

$$F_{Test\ Load} = p_{dynamic\ air\ pressure} \cdot A_{Sign}$$

$$F_{Test\ Load} = 0.5 \cdot \rho_{air\ density} \cdot v^2_{air\ speed} \cdot A_{Sign}$$

$$v_{air\ speed} = \sqrt{\frac{2 \cdot F_{Test\ Load} \cdot 32.174}{\rho_{air\ density} \cdot A_{Sign}}} = \left(\sqrt{\frac{2 \cdot F_{Test\ Load}}{\rho_{air\ density} \cdot A_{Sign}}}\right)$$

*Note that the 32.174 is an imperial units only conversion factor not used in the metric version in parenthesis

For a 36 in. x 36 in. sign's minimum allowable maximum test force/load:

Assuming air density = 0.0765 lbm/ft^3 (1.225 kg/m^3)

Force$_{\text{Test Load}}$ = 7 lbf (3 kg = 29.42 N)
Area$_{\text{Sign}}$ = 36 in. x 36 in. = 9 ft^2 (0.836 m^2)

$v_{\text{air speed}}$ = 25.6 ft/s = 17.4 mph (7.58 m/s = 27.29 kmph)

For a 48 in. x 48in. Sign's minimum allowable maximum test force/load:

Assuming air density = 0.0765 lbm/ft^3 (1.225 kg/m^3)

Force$_{\text{Test Load}}$ = 18 lbf (8.2 kg = 80.41 N)
Area$_{\text{Sign}}$ = 48 in. x 48 in. = 16 ft^2 (1.486 m^2)

$v_{\text{air speed}}$ = 30.8 ft/s = 21.0 mph (9.40 m/s = 33.84 kmph)

*Note that air density changes with temperature, pressure, and humidity; these calculations are general approximations.