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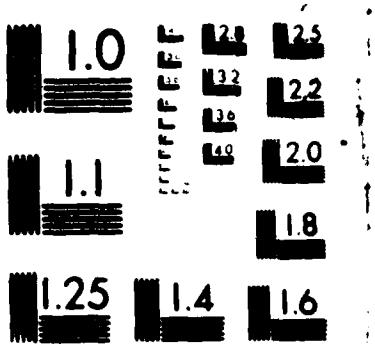
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PROJECT REPORT
AMC 4-87

JUNE 1987

LOCATION PLACARD (DA FORM 3779) FOR OUTSIDE STORAGE LOCATIONS

PREPARED BY:

US ARMY
MATERIEL COMMAND

7177

PACKAGING, STORAGE, AND CONTAINERIZATION CENTER

TOBYHANNA, PENNSYLVANIA 18466-5097

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For this project, the U.S. Army Materiel Command Packaging, Storage, and Containerization Center performed accelerated weatherometer testing on reusable plastic placards, one-time use plastic placards, protective placard holders for use with paper placards, and markers for plastic placards. The purpose was to determine techniques available to improve the durability of location placards now being used for outside storage with the Army.

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LOCATION PLACARD (DA FORM 3779) FOR OUTSIDE STORAGE LOCATIONS

AMC Project Report 4-87

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1. Introduction. This project was established to determine the possibility of replacing the present DA Form 3779 with a placard of weather-resistant material for items stored outside, and to investigate techniques available to improve the durability of the location placards now being used. It is estimated that there are 40,000 outside locations in the Depot System Command.

2. Discussion. a. Background. Some depots have reported they are experiencing problems with location placards placed on items stored outside for extended periods of time. Information on the placards becomes difficult, if not impossible, to read due to the weather. These problems were verified by Center visitors to the various depots during Outreach Program visits. As a result of these visits, the Center determined that a study should be initiated to investigate alternatives to the present location placard system. Tests were performed on the following items:

(1) Reusable plastic placards.

(2) One-time-use plastic placards.

(3) Protective placard holders for use with paper placards.

(4) Markers used with plastic placards.

b. Test Method. An accelerated weathering (weatherometer) test was performed on the above items. Test specimens were exposed for a total of 300 hours in a type BH weathering apparatus (weatherometer) according to the procedures of ASTM G26, Method A (continuous exposure to light and intermittent exposure to water spray). The weathering apparatus was equipped with a water-cooled, 6500 watt, xenon arc tube with borosilicate glass inner and outer optical filters. The apparatus was operated using the conventional 2-hour program cycle of 102 minutes of light, followed by 18 minutes of light and water spray.

c. Test Results. (1) Markers. The following seven markers were evaluated in conjunction with the testing of protective placard holders and weatherable plastic placard materials:

(a) Action marker No. 55 (black). Sources: Marking Development Corporation, P.O. Box 921, Hillside, NJ 07205; Mark Tex Corporation, 161 Coolidge Avenue, Englewood, NJ 07631; Technical Products Company, RUB-CO Industrial Mall, Shoemakersville, PA 19555.

(b) Dri Mark 360 (black). Source: Dri Mark, 15 Harbor Park Drive, Port Washington, NY 11050.

(c) Dri Mark 450 (black). Source: Dri Mark, 15 Harbor Park Drive, Port Washington, NY 11050.

(d) Solid paint marker (black). Source: John P. Nissen, Jr., Company, P.O. Box 188, Glenside, PA 19038.

(e) Skilcraft wide-tip marker (black). Source: Tobyhanna Army Depot (TOAD) Self-Service Supply Store.

(f) Skilcraft felt-tip fine-point pen (black). Source: TOAD Self-Service Supply Store.

(g) PHC China marking pencil (black). Source. TOAD Self-Service Supply Store.

(2) Protective placard holders for use with paper placards. DA Forms 3779 were marked with each of the seven markers listed above and placed into plastic placard holders intended to protect the placard and markings from the adverse effects of weathering. Observations were as follows:

(a) Vinyl weatherproof envelope, chemically treated for ultraviolet light protection (Navarm Class I fold and lock document holder). Source: Navarm, 5252 Atlantic Boulevard South, P.O. Box 100, Maywood, CA 90270. This is a foldover type envelope, secured by snap fasteners. The estimated cost is $.76 each. No discoloration or loss of flexibility of the plastic envelope was noted. The location placard remained dry. All markings were readable with minimum fading.

(b) Polyethylene (4 mil) bag (Zip Lip). Source: Franklin, Fibre-Lamitex Corporation, 903 East 13th Street, Wilmington, DE 19899. This is a zip-lock type envelope. The estimated cost is $.05 each. No discoloration or loss of flexibility of the plastic envelope was noted. The location placard faded, but remained dry. All markings, except those of the Skilcraft fine-point pen, were readable.

(c) Plastic envelope with pressure-sensitive adhesive coating on the back (ADM Poly Envelope #GSA-30 Blank Back Loader). Source: Technical Products Company, RUB-CO Industrial Mall, Shoemakersville, PA 19555. This is a fold-over, adhesive-sealed type envelope. The estimated cost is $.10 each. No discoloration or loss of flexibility of the plastic envelope was noted. The location placard faded, but remained dry. All markings were readable.

(d) Clear plastic envelope, open on one side. Source: Plasticraft Products, 29643 West Eight Mile Road, Livonia, MI 48152. The estimated cost of this envelope is $.19 each. No

discoloration or loss of flexibility of the plastic envelope was noted. The location placard was faded and water stained. Water was allowed to enter the envelope through the open side. All markings were readable, although the Skilcraft fine-point pen markings were significantly faded.

(e) Table 1 provides rankings and derived benefits from use of protective placard holders.

Table 1. Rankings and Features of Protective Placard Holders

Type	Ranking	Features
Vinyl weatherproof envelope (Navarm)	1	Chemically treated to prevent fading, placard remained dry. Least deterioration to envelope and placard of items tested. Its only negative factor is the cost, $.76 ea.
Polyethylene bag (Fibre-Lamitex Corp.)	2	Placard remained dry, but faded. Little deterioration to envelope.
Envelope with pressure sensitive adhesive-coated backing (Technical Products Co.)	3	Placard remained dry, but faded. Little deterioration, but more than the vinyl weatherproof envelope or polyethylene bag.
Clear plastic envelope, open on one side (Plasticraft Products)	4	Little deterioration to envelope, but water entered through open side damaging the placard.

(3) Plastic placard, one-time use. Samples of plastic placard materials were marked with each of the seven markers listed above and subjected to accelerated weathering. These materials were intended for the fabrication of weatherable, one-time-use location placards. Observations were as follows:

(a) Plastic tag with clear, plastic overlaminate (LEM Lama Tag). Sources: LEM Products, Inc., P.O. Box 190, Doylestown, PA 18901 and Technical Products Co., RUB-CO Industrial Mall, Shoemakersville, PA 19555. No discoloration or signs of degradation of the placard material were noted. All markings were unaffected.

(b) White vinyl material (0.010 mil), matte finish. Source: Brandywine Fibre Products Co., 15th and Poplar Sts., Wilmington, DE 19801. The placard material exhibited

a slight yellowing with no other signs of degradation. The Skilcraft fine-point pen markings were completely faded. All other markings were readable.

(c) White plastic material, matte finish. Source: Plastic Manufacturers, Inc., 3510-30 Scotts Lane, Box 5677, Philadelphia, PA 19129-0677. No discoloration of the placard material was noted, but signs of degradation (surface embrittlement) were evident. The Skilcraft fine-point pen markings were completely faded. All other markings were readable.

(d) White, opaque, high-impact polystyrene, matte finish. Source: Commercial Plastics and Supply Corp., 342 Fourth St., Trenton, NJ 08638. The placard material exhibited a light yellow discoloration and signs of degradation (surface embrittlement). The Skilcraft fine-point pen markings were completely faded. All other markings were readable, although those of the Skilcraft wide-tip marker were slightly faded.

(4) Plastic placards, reusable. Samples of plastic placard materials were marked with each of the seven markers listed above, and subjected to accelerated weathering. These materials were intended for the fabrication of weatherable, reusable location placards. Observations were as follows:

(a) Blue plastic material, gloss finish. Source: Plastic Manufacturers, Inc., 3510-30 Scotts Lane, Box 5677, Philadelphia, PA 19129-0677. The placard material exhibited a light yellowing which changed the color of the material to a greenish-blue. No other signs of degradation were noted. The Skilcraft fine-point pen markings were completely faded. All other markings were readable, although those of the Skilcraft wide-tip marker were very faded. None of the remaining markings, including those of the PHC China marking pencil, could be removed mechanically by rubbing with a dry gauze pad.

(b) Yellow polished rigid vinyl, gloss finish. Source: Commercial Plastics and Supply Corp., 342 Fourth St., Trenton, NJ 08638. The placard material exhibited fading, but no other signs of degradation. The Skilcraft fine-point pen markings were completely faded. All other markings were readable, although those of the Skilcraft wide-tip marker were slightly faded. None of the remaining markings, including those of the PHC China marking pencil, could be removed mechanically by rubbing with a dry gauze pad.

(c) White polished vinyl (0.010 mil), gloss finish. Source: Brandywine Fibre Products Co., 15th and Poplar Sts., Wilmington, DE 19801. The placard material exhibited a slight yellowing with no other signs of degradation. The Skilcraft

fine-point pen markings were completely faded. All other markings were readable. None of the remaining markings, including those of the PHC China marking pencil, could be removed mechanically by rubbing with a dry gauze pad.

(d) Vinyl weatherproof envelope, chemically treated for ultraviolet light protection of the envelope (Navarm Class I fold and lock document holder). Source: Navarm, 5252 Atlantic Blvd. South, P.O. Box 100, Maywood, CA 90270. The test specimen consisted of a DA Form 3779 placed inside the weatherproof envelope. The markings were applied to the exterior of the envelope using the PHC China marking pencil. These markings could not be completely removed mechanically by rubbing with a dry gauze pad.

(5) Cleanability of reusable plastic placards using solvents. Following accelerated weathering, a test was conducted to determine the cleanability of the reusable plastic placards, using four common solvents: methyl alcohol, acetone, methyl ethyl ketone (MEK), and 1,1,1-trichloroethane. An attempt was made to remove the markings from the placard material by rubbing with a gauze pad saturated with one of these solvents. Results of this test were as follows:

(a) Blue plastic material, gloss finish (Plastic Manufacturers, Inc.). The methyl alcohol removed all of the markings without damaging the placard material. The acetone and MEK removed all of the markings, but also attacked the placard material, dulling its surface finish. The trichloroethane removed only the markings of the Nissen solid paint marker and the PHC China marking pencil.

(b) Yellow polished rigid vinyl, gloss finish (Commercial Plastics and Supply Corp.). The methyl alcohol removed only the markings of the Nissen solid paint marker, the Dri Mark 360 marker, and the Dri Mark 450 marker. The acetone and MEK removed all of the markings, but also attacked the placard material. The trichloroethane removed only the markings of the PHC China marking pencil.

(c) White polished vinyl (0.010 mil), gloss finish (Brandywine Fibre Products Co.). The methyl alcohol removed all of the markings without damaging the placard material. The acetone and MEK removed all of the markings, but also attacked the placard material. The trichloroethane removed only the markings of the Nissen solid paint marker and the PHC China marking pencil.

(d) Vinyl weatherproof envelope, chemically treated for ultraviolet light protection of the envelope (Navarm Class I fold and lock document holder). Only the PHC China marking pencil was used to apply markings to the exterior surface of

the envelope. The methyl alcohol did not remove the markings. The acetone and MEK removed the markings, but also attacked the plastic envelope. The trichloroethane removed the markings without damaging the plastic envelope.

3. Conclusions. a. All tested markers, with the exception of the Skilcraft felt-tip, fine-point writing pen, were readable on the reusable and non-reusable plastic placard materials following accelerated weathering.

b. The use of sealing-type plastic placard holders provides a feasible method of protecting the current DA Form 3779 from the effects of weathering in outside storage locations.

c. Plastic placard materials are susceptible to embrittlement and progressive deterioration when exposed to sunlight and other outdoor weathering conditions, unless treated with an ultraviolet light inhibitor.

d. To be reusable, plastic placards must have a gloss finish to facilitate removal of prior markings.

e. Plastic placards designed for one-time use require a clear, plastic overlaminate to protect the markings and the plastic placard material from degradation due to long-term exposure to outdoor weathering conditions.

f. Markings should be removed from reusable plastic placards with either methyl alcohol or trichloroethane depending on the type of marking.

g. Neither acetone nor MEK should be used to remove prior markings from a reusable plastic placard since these solvents will attack and damage the plastic placard material.

h. After exposure to sunlight and weathering conditions, previous markings cannot be readily removed from the reusable plastic placards without the aid of an organic solvent.

i. Reusable plastic placard materials have shown signs of embrittlement during testing, indicating limited use under long-term exposure to sunlight and outdoor weathering conditions.

4. Recommendations. a. That reusable plastic placards not be used in outside storage locations.

b. That the current DA Form 3779 be enclosed in protective plastic placard holders for protection from the effects of weathering.

c. That the protective holders be chemically treated for ultraviolet light resistance.

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