

111a

MICHIGAN
STATE HIGHWAY DEPARTMENT
Charles M. Ziegler
State Highway Commissioner

111a

STUDY OF SCOTCHLITE REFLECTIVE MATERIAL

by

C. C. Rhodes

and

L. L. Peterson

LAST COPY
DO NOT REMOVE FROM LIBRARY

Research Project 47 G-19

Research Laboratory
Testing and Research Division
Report No. 111 A
May 20, 1948

STUDY OF SCOTCHLITE REFLECTIVE MATERIAL

At the request of the Planning and Traffic Division in December 1947, the Research Laboratory of the Testing and Research Division undertook an investigation of Scotchlite reflective material to determine its reflective properties, resistance to fungus and durability.

The subject material has been tested and the results show that all samples of material submitted are satisfactory in regard to reflectivity and durability. The light colored materials, white and yellow, were immune to fungus, but the camouflage black and the adhesive actively supported mold growth.

Reflective Properties

Samples of the material were mounted in the regular way on 12 by 18 inch panels and tested qualitatively in a dark room with a flashlight at a distance of about 25 feet. Both in these tests and those made with the Hunter Night Visibility meter in connection with accelerated weathering tests, the reflectivity was satisfactory as indicated by the divergence angle and meter readings.

Durability Tests

The materials were tested for durability in two ways: (1) by standard exposure to normal weathering out of doors; and (2) by exposure to accelerated weathering in a Weatherometer.

Normal Weathering: Panels 12 by 18 inches were installed on wooden racks at an exposure of 45 degrees south on the roof of Olds Hall at Michigan State College on February 24, 1948. Reflectance readings were taken with

the Hunter Night Visibility Meter before installation and companion specimens were reserved in the laboratory for comparison at periodic intervals of the test. An inspection of the panels on March 22, 1948 revealed very little change in appearance and no significant difference in the performance of the materials. It is much too early to expect definite indications from this test, which will be continued in order to gain possible further information on durability.

Accelerated Weathering: Duplicate panels 2-7/8 by 6 inches for each type of the materials available were installed in the weatherometer at Ann Arbor on January 21, 1948. The weathering cycle consisted of 22-1/2 hours of exposure to ultraviolet light and periodic water spray at 130° F. followed by one hour in a cold room at 0° F. Reflectance readings were taken before starting the test and reference panels of the original material were reserved for later comparisons.

The test panels have been examined weekly for change in reflective properties, loss of beads, flaking of the sheet, and spalling or loosening at the edges. The last examination was made at the end of 31 cycles on March 4, 1948, and up to that time no appreciable change of condition in regard to bead loss, flaking or spalling was noted. There was a progressive decrease in reflectance of all materials, however, and a record of the Hunter Meter readings is given in Table I. From microscopic examination of the panels, the loss of reflectance seems to be due mostly to salt films deposited from the tap water used in the spray.

In comparing the several types of material it should be kept in mind that the yellow and one of the blacks were of wide-angle construction which

show initial reflectance values considerably higher than the ordinary type. Otherwise there seems to be little to choose between the materials as far as durability is concerned.

Mold Incubation

Specimens of each type of material including the adhesive were subjected to a mold incubation test by inoculation with three different varieties of fungus and storing over water in Petri dishes at room temperature. The specimens were about 2 inches square and consisted of the material alone, material mounted on steel panels primed with red lead paint, and plywood-mounted material. Adhesive was applied alone on a primed steel panel also. Fungi used for inoculation were one light colored variety, *Penicillium Italicum*, and two blacks, *Rhizopus Nigricans* and *Aspergillus Niger*.

The photographs of Figure 1 show that the camouflage black and the adhesive supported considerable mold growth but that the white and yellow were immune. For some unknown reason, no growth appeared on any of the wood-mounted specimens.

Summary

Tests on several types of Scotchlite reflectorized material indicate that all of the samples submitted were satisfactory in regard to reflectivity and durability. The camouflage black and the adhesive failed in the mold incubation test, but the two whites and the yellow were not attacked.

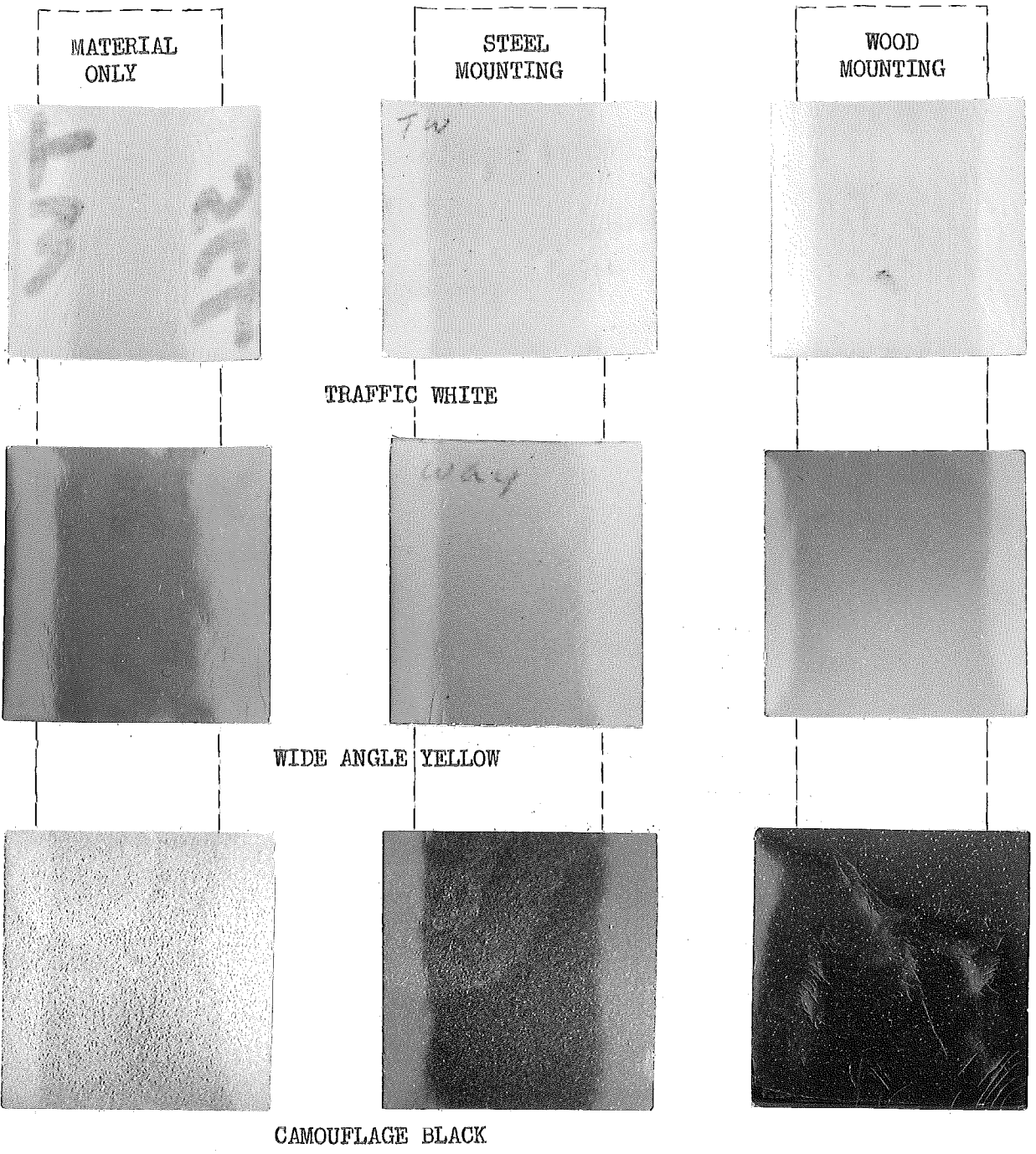
TABLE I

SUMMARY OF REFLECTANCE DATA IN WEATHEROMETER TEST

Brand of Material	Type*	Spec. No.	Reflectance						
			0 Cycles	6 Cycles	11 Cycles	15 Cycles	21 Cycles	26 Cycles	31 Cycles
ScotchLite	TW	1	50	30	40	18	8	2.3	1.6
		2	45	28	25	18	8	4.8	2.1
	CW	1	150	175	250	150	125	90	50
		2	150	200	200	175	125	65	35
	CB	1	500	400	250	200	100	35	20
		2	500	400	300	225	150	50	75
	WAB	1	750	250	250	175	175	150	40
		2	800	275	450	200	175	120	70
	WAY	1	55	45	25	10.0	3.0	1.0	0.6
		2	65	45	25	7.5	1.0	0.6	0.8

* Abbreviations have the following meanings:

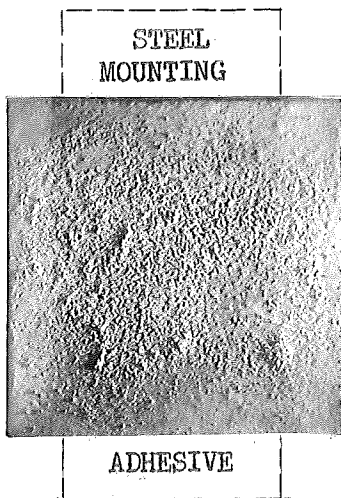
TW - Traffic white
 CB - Camouflage black
 WAB - Wide-angle black
 WAY - Wide-angle yellow
 CW - Camouflage white



TRAFFIC WHITE

WIDE ANGLE YELLOW

CAMOUFLAGE BLACK



PRIMED WITH RED LEAD

MOLD GROWTH
ON SCOTCHLITE MATERIAL

Figure 1