R-439

OFFICE MEMORANDUM

MICHIGAN
STATE HIGHWAY DEPARTMENT
JOHN C. MACKIE, COMMISSIONER

October 9, 1963

To: E. A. Finney, Director
Research Laboratory Division

From: R. C. Mainfort

Subject: Progress Report on Salt Stabilized Sections of M 46 (Howard City to Newaygo): 1963 Surveys and Testing. Research Project R-57 E-15. Research Report R-439.

The ten test sections of the experimental salt stabilization project on M 46 between Newaygo and Howard City were sampled and inspected in April and September 1963. Construction operations and the project objectives were described in R. L. Greenman's paper presented at the 1960 convention of the American Road Builders Assn. ("Michigan Experiments with Sodium Chloride Stabilization"), and Mr. Greenman reported on performance in 1960-61 in a paper at the 1961 Michigan Highway Conference. In addition, the Research Laboratory updated the performance record with a brief memorandum dated May 28, 1962.

This project is now four years old and has been through four winters with no indication of frost damage or structural failure. Testing and inspection during this year show all test sections to be in excellent condition.

Figs. 1 through 3 show periodic values for certain physical properties of the test sections as obtained during the spring seasons of the past four years. These values represent averages obtained from at least three samples for each condition shown. Roughness values represent averages from the four wheel tracks for each condition. Densities were obtained by the Rainhart method. Spot checking of densities by the use of cores, taken in June 1961, showed a good comparison between densities obtained in the field by the Rainhart method and those obtained in the laboratory from the cores.

One of the questions arising during this project concerns the apparent loss of sodium chloride from the base course, even though there has been little change in the moisture content. To check this further, samples of the sand subbase were taken at the same time as those from the base course, and each were checked for salt content. Table 1 shows a comparison between the salt content of the base course and the corresponding sample from the sand subbase directly beneath the sampled base. These data show that a considerable portion of the salt has migrated into the sand subbase and possibly beyond.

In order to determine whether the normal method of measuring the quantity of salt in a sample (ASTM Designation 0-1411-56T) was satisfactory, an additional test was made on a selected number of samples in which the sodium content was determined by flame photometry methods and the values converted to sodium chloride contents. Table 2 shows how the two methods checked. Some of the values are quite close but others are not. In both methods, quantities were determined only on the chemicals as extracted from the soil by water or ammonium acetate. Any residual amount, bound in the soil in such a manner as to remain unaffected by the extraction process, would not be measured. Considerably more detailed quantitative analysis is necessary before the entire picture of the sodium chloride-soil complex is made clear. The feasibility of such work is being explored.

Results of this study to date show that:

1. Densities of the base courses have remained high especially in those sections containing the larger percentage of fines. Certain variations are apparent but these could be due to sampling and testing error. There appears to be no trend to indicate that the density is affected by the quantity of salt present.

2. The salt contents of the treated bases have diminished with time. Some of this loss is due to migration of salt into the porous subbase.

3. Moisture content of the base has remained practically constant over the testing period.

4. Surface roughness, although showing a slight increase during the past two years, is satisfactory with no indications of base course deterioration.

OFFICE OF TESTING AND RESEARCH

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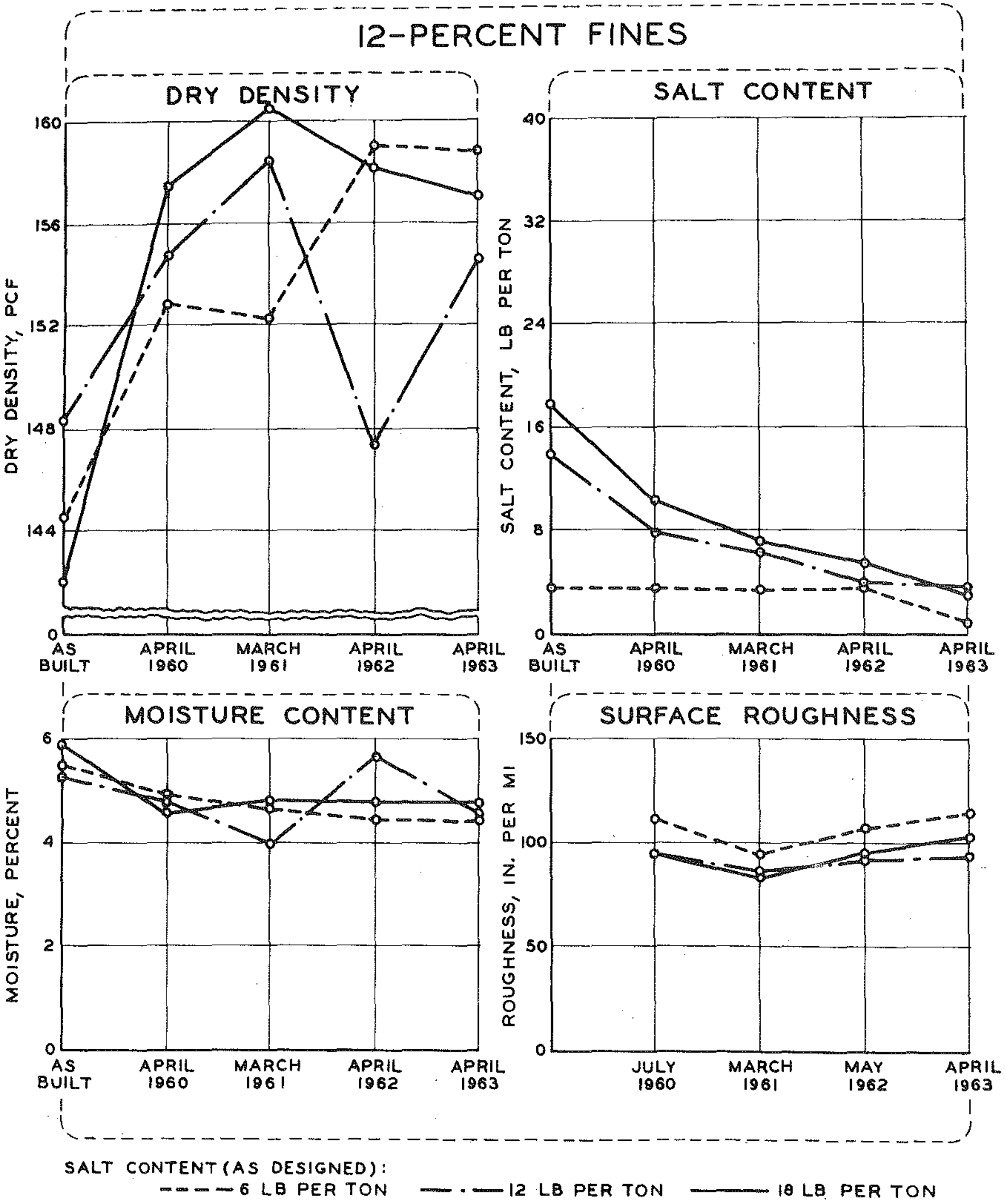

Figure 1. Yearly variation in base and surface properties.
(Sections 1-2-3)

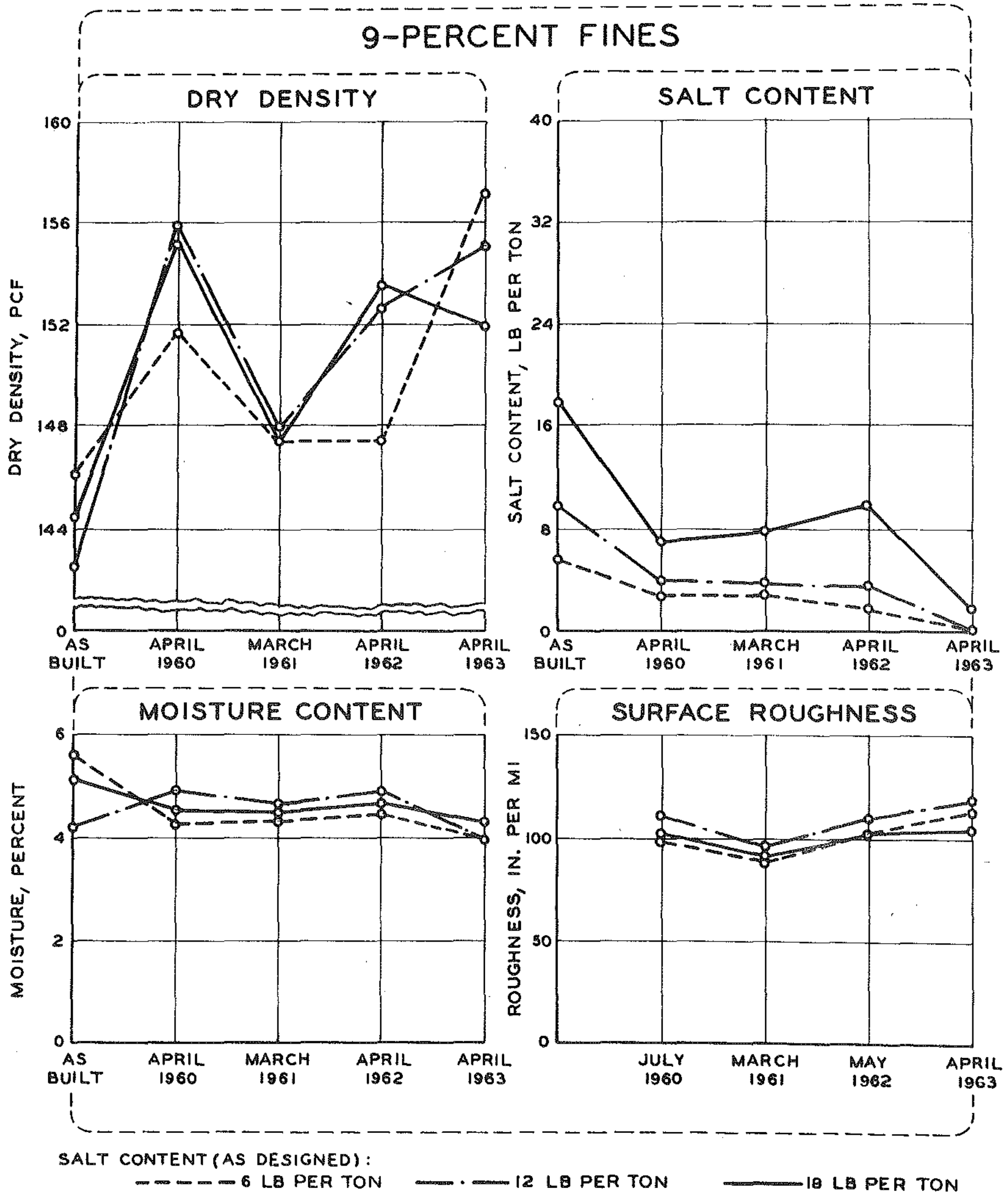

Figure 2. Yearly variation in base and surface properties.
(Sections 4-5-6)

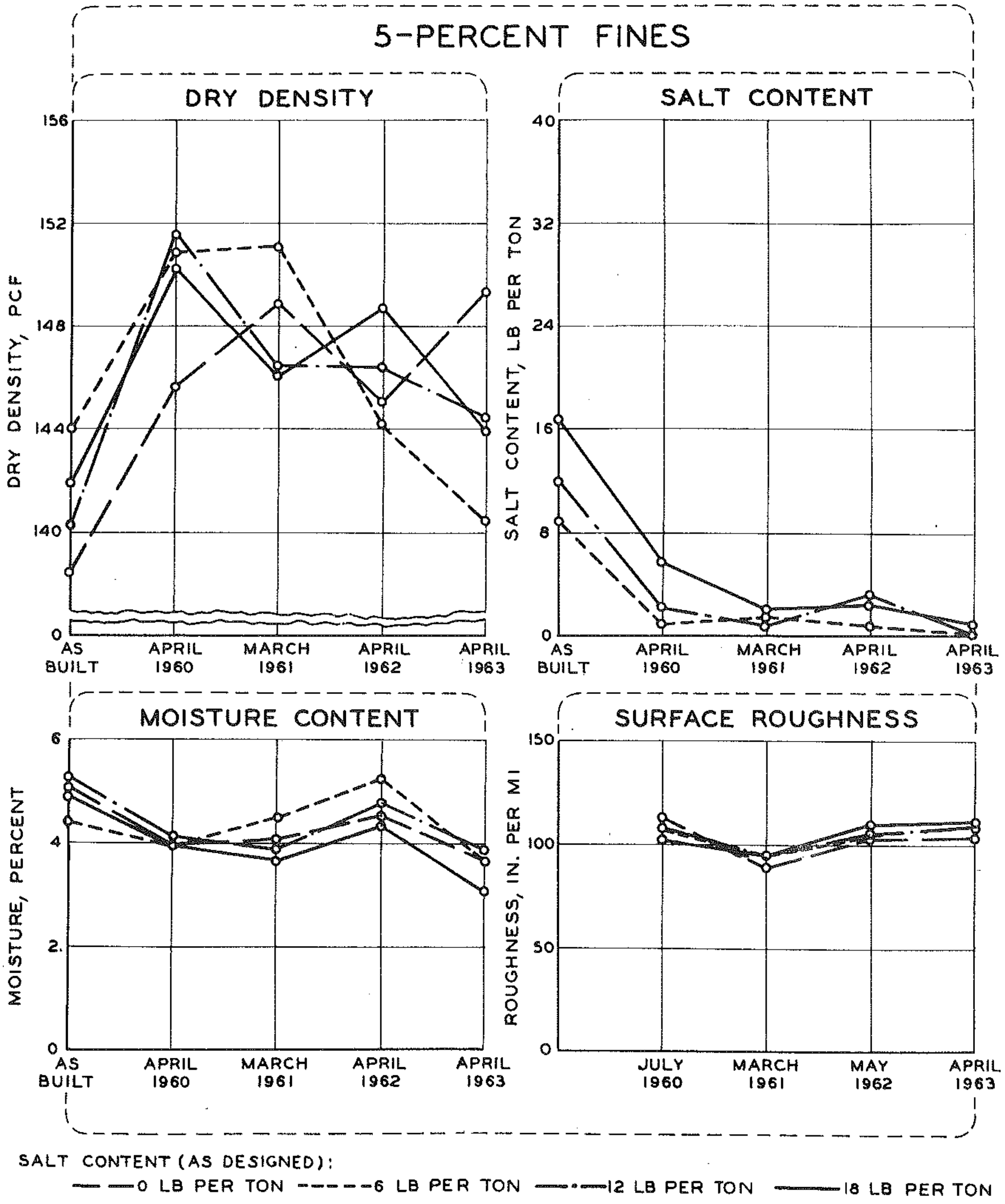

Figure 3. Yearly variation in base and surface properties.
(Sections 9-10-11-12)

TABLE 1
SALT AND MOISTURE CONTENTS OF THE BASE AND SUBBASE PORTIONS OF THE TEST SECTIONS

Section	Salt Content, lb per ton		Percent Moisture	
	Base	Subbase	Base	Subbase
1	3.1	1.9	4.8	5.0
2	3.6	4.0	5.5	3.2
3	1.1	1.1	4.6	4.0
4	2.0	3.5	4.3	3.2
5	0.5	3.0	4.0	3.4
6	0.2	0.7	4.2	3.4
9	0.8	1.1	3.9	4.8
10	0.4	0.4	3.9	4.2
11	0.7	0.7	3.7	4.3
12	0.2	0.4	3.7	4.5

TABLE 2
COMPARISON OF ASTM AND FLAME PHOTOMETRY METHODS FOR DETERMINING SALT CONTENTS OF SAMPLES

Sample	Salt Content, lb per ton	
	ASTM	Flame Photometry
2G	2.4	3.7
3G	1.2	1.0
4G	2.5	2.2
6G	0.6	0.1
9G	2.3	1.4
2S	4.6	4.9
3S	1.4	1.3
4S	3.1	3.2
6S	0.6	0.3
9S	3.1	2.8