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TESTING OF MATERIALS FOR FEDERAL AID SECONDARY PROJECTS

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Prepared for Presentation to  
The Northern Michigan Road Commission Association  
Cadillac, September 5 and 6, 1963

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Office of Testing and Research  
Michigan State Highway Department  
John C. Mackie, Commissioner

## TESTING OF MATERIALS FOR FEDERAL AID SECONDARY PROJECTS

The purpose of this discussion is clarification of the framework of Federal regulations and State requirements involved in testing of materials for Federal Aid Secondary projects. The discussion includes consideration of 1) the reasons for testing of materials, 2) procedures followed in the testing program, 3) methods of charging for testing services, and 4) certain related subjects. In addition, a collection of pertinent basic documents is appended for ready reference.

### The Reasons for Testing of Materials

To state the matter simply, materials are tested to determine their compliance with specifications. Specifications were defined well by Charles P. Dudley, an early president of the American Society for Testing and Materials, as "an attempt on the part of the consumer to tell the producer what he desires." Specifications are developed through experience and are constantly being changed to reflect the findings of research, in order to obtain materials that will provide the best service. Further-- and this is where the Counties become involved--testing must be performed to meet the requirements of State specifications and in conformance with the policies and procedures of the Bureau of Public Roads.

### Procedures Followed in the Testing Program

We do not have a choice in establishing procedures to carry out our responsibilities with respect to testing on Federal Aid projects. We operate under definite instructions issued by the Bureau of Public Roads, and under specifications that must receive its approval. As to the requirements for testing of materials on Federal Aid Secondary projects, these are the same that apply to all projects administered by the Bureau.

When I came to the State Highway Department 30 years ago, we operated under the Bureau's General Administrative Order No. 273, "Schedule of Minimum Requirements Governing Tests of Materials used in Federal Aid Road Construction," which was issued in 1922, revised in 1930, and further revised a final time in 1945. This memorandum's

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foreword, setting forth the scope of Federal Aid road testing, read as follows:

"A revised schedule of minimum requirements relative to the frequency of sampling and testing materials used in Federal-aid road construction is given below and supersedes all previous schedules.

"These minimum requirements must be followed in all cases, except that the Division Engineer may waive: (a) any of the requirements regarding determinations for quality if, in his opinion, the quantity of the material involved is too small or the structure is not sufficiently important to warrant such requirements; and (b) the requirements regarding determinations of size of aggregates if, in his judgment, the products being furnished are from dependable commercial sources of supply. It should be understood, however, that these are in reality minimum requirements and should be waived only in exceptional cases, and furthermore, that additional or more frequent sampling and testing may and should be required in certain cases. Division Engineers should insist upon such additional testing at any time when, in their judgment, it is advisable to do so.

"In all cases where the schedule of minimum requirements conflicts with existing approved State specifications, the provisions of the specifications shall govern. The Division Engineers are requested to secure, if possible, such revisions in all future specifications as will prevent conflicts with the schedule of minimum requirements.

"Each sample taken in accordance with this schedule shall be tested to determine whether the material meets in full the requirements of approved State specifications covering the project or contract."

The full text of this memorandum is given in Appendix A, along with a supplement containing approved changes and additions regarding minimum requirements for testing.

In 1954, Memorandum No. 273 was superseded by a new directive, revised in 1960 and 1962, and known in its current form as Policy and Procedure Memorandum 20-6.2, "Inspection of Construction Projects

(Sampling and Testing)." Its current version, dated January 26, 1962, also supersedes the Bureau's Instructional Memoranda 20-5-60 and 20-5-60(1), which covered additional responsibilities of the Bureau's Division Engineers. This "PPM" is now in force and is presented in full in Appendix B. The PPM's purpose and objective are stated as follows:

"Purpose

"The purpose of this memorandum is to prescribe the policies and procedures relating to sampling and testing of materials and construction in connection with the inspection of Federal and Federal-aid highway construction projects.

"Objective

"The objective of the sampling and testing performed on highway construction projects is to ascertain whether materials used or proposed for use and the construction work accomplished or in progress conform with plans and specification requirements and to alert the contractor and supervising engineers to the need for corrective action in case of nonconformity. Sufficient sampling and testing should be done as prescribed herein to assure that the objective is accomplished."

It should be noted that PPM 20-6.2 does not carry over the specific minimum requirements for testing listed in GAM 273. We have the Bureau's approval, however, for continued application of the 1945 requirements, with the supplementary changes and additions mentioned (Appendix A), and these also are now in force.

C. B. Laird, Chief Construction Engineer, and I met with the Bureau's Divisional and Regional representatives, and on the basis of understandings reached, appropriate instructions dated July 11, 1960, and November 2, 1960, were prepared for those concerned. Copies of these instructions as distributed to all County Road Commissioners by S. T. Byam, Federal Aid Secondary Engineer, are included in Appendix C; it should be noted that the November 1960 memorandum is the one currently in effect, but that the July 1960 memorandum includes certain supplementary information that is still of interest.

With regard to State certification of the quality of materials on Federal

Aid Secondary projects, attention is directed to paragraph 12 of PPM 20-6.2:

"a. A certificate conforming in substance to that indicated (herein) is to be submitted by the State for each highway construction project in which Federal funds participate and that is constructed under State supervision or under another agency responsible to the State, including projects constructed under the Secondary Road Plan. The certification... is to be based on the results of all sampling and testing performed in connection with the project.... The certification... is to be based on record samples and tests only as described (herein), and is to certify: (1) whether or not the results of the tests on record samples indicated that the materials and work conform to the plans and specifications, and (2) whether or not such results are reasonably representative of the materials incorporated in the work as shown by the results of job control sampling and testing.

"b. A materials certificate similar to that indicated in the attachment but modified to fit the conditions is to be submitted for all projects under direct Public Roads supervision.

"c. The materials certificate is to accompany the final voucher and become a part thereof. A copy of the certificate is to be furnished as soon as available as a basis for final acceptance of the project and is to be attached to or incorporated in the final construction inspection report."

The Office of Testing and Research has been given the responsibility for making this certification. In its preparation, all testing is audited to ascertain that the required samples have been taken to cover the quantities used and that the test results obtained conform to the Bureau's policies and the Department's specification requirements. In those instances where materials were accepted which received less than the State's usual requirements for sampling and testing, a complete explanation must be made indicating the conditions under which the materials were accepted.

This materials certificate accompanies the final voucher and is used as a basis for final acceptance of the project. It is attached to or incorporated in the Bureau's final construction inspection report for the project.

No payment on any Federal Aid project will be made by the Bureau of Public Roads until it has received the "Letter of Certification." The

Office of Testing and Research will not certify any material that has been included in a project without sufficient tests or a full explanation of the reasons for including the material without the required sampling and testing. Sample copies of the certifications used by the Department and "Final Material Report" are in Appendix D.

Finally, in addition to the responsibilities set forth in PPM 20-6.2, we must take random samples, according to the procedures covered in detail in the November 1960 memorandum (Appendix C).

#### Charges for Testing Services

Most testing for Michigan Federal Aid Secondary projects is done at the Department's Testing Laboratory Division at the University of Michigan, Ann Arbor. This agency was established in 1916 by agreement between the Department and the Regents of the University. Over the years there has developed a mutually satisfactory, coordinated use of jointly shared facilities, involving both Departmental personnel and University civil engineering students and staff. The rates charged for testing services have been carefully established and maintained during this period, by accounting for the average man-hours required for testing each individual sample of material. These fees are checked against commercial laboratory charges to keep them at reasonable and realistic levels. In recent years, the rates have increased somewhat, due to higher costs for salaries and equipment. Current rates are summarized in Appendix E.

The County Engineer submitting a sample of a material to the Laboratory for test will be billed for testing charges by the Department's Finance Division, in a monthly statement. This billing procedure requires the Laboratory to send a copy of the test report, with testing charges noted, to the Finance Division, which in turn debits this amount to the project, County, maintenance section, or purchase order noted on the report. Charges for shipments from tested stock (Appendix E) for that period are added. To avoid any misunderstanding regarding these charges, a copy of the monthly report as prepared by the Laboratory and forwarded to the Finance Division is also sent to the County Road Commission. At present these charges are subject to a 6-percent laboratory overhead.

The highway program has increased tremendously in recent years and the testing volume, of course, has kept pace. In 1962, a total of 27,178 samples were received by the Ann Arbor Laboratory, and in the first seven months of 1963, the volume of samples received ran nearly a

thousand more than the comparable period a year earlier.

The Laboratory's aim is to test and report samples promptly, so as to avoid unnecessary delay. The main factors contributing to such delays are incomplete sample identifications and insufficient sample size. These deficiencies, however, are found not only for materials from Federal Aid Secondary projects, but for all types of samples from all types of projects.

The reverse side of the Sample Identification Form (Appendix C) gives instructions for selecting and shipping samples, and for the size and number of samples required. Supplies of this form may be obtained on request to the Testing Laboratory Division, P.O. Box 619, Ann Arbor, Michigan.

### Related Problems

The full scope of inspection responsibilities is illustrated in the Bureau of Public Roads' PPM 20-6.1, "Inspection of Construction Projects (Exclusive of Sampling and Testing)." This memorandum's paragraphs on purpose and objective read as follows:

#### "Purpose

"The purpose of this memorandum is to prescribe the policies and procedures relating to inspections of Federal-aid highway construction projects and projects under the direct supervision of the Bureau of Public Roads, and to the preparation and submission of reports pertaining thereto. . . .

#### "Objective of Inspection

"a. The principal objective of construction inspection by Public Roads engineers is to ascertain whether or not the construction is being performed in full conformity with the approved plans and specifications and if not, to arrange for the necessary remedial action to be taken. The inspection should cover the quality of materials and workmanship, conformity with dimensional requirements, need for changes or extra work not included in the original contract, adequacy of supervision, inspection and other controls, progress of the work, conditions justifying time extensions or price adjustments, compliance with labor provisions, adequacy of safety measures, adequacy of quantity and payment con-

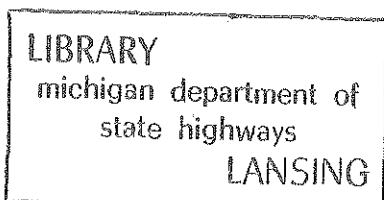
trols, new or improved methods and equipment, experimental construction, and other features of importance or interest.

The inspecting engineer should also analyze the project carefully at the time of his inspections to ascertain whether there is indication that certain changes in design or construction practices should be made for future projects to provide a highway that will (1) better serve traffic needs, (2) be of higher quality, (3) cost less to construct and maintain without adversely affecting the quality of the work, or (4) eliminate or reduce delays and hazards in performing the construction. To the maximum extent feasible within the limitations of time that can be devoted to the work, the inspections should be made with sufficient frequency and thoroughness to assure that these objectives are accomplished.

"b. With respect to the final inspection, the principal objective is to determine whether the construction has been completed in accordance with the approved plans and specifications including approved changes and extra work, and is acceptable to Public Roads for Federal participation in the cost in accordance with the terms of the project agreement and modifications thereof."

Paragraph 15 of this memorandum, covering inspection-in-depth, is the one you have probably heard most about:

"It is recognized that because of manpower and time limitations, it will not be possible to make thorough inspections of all active projects at frequent intervals. From time to time, however, the division engineer, after consultation with the district and area engineers, should designate a number of representative projects upon which comprehensive, thorough, complete, and detailed inspections and analyses of the selected phase or phases of the construction and engineering are to be made. The primary purpose of such inspections-in-depth and analyses of the findings is to provide a continuing basis for evaluating the accuracy, adequacy, and effectiveness of procedures, methods, controls, and operations used by the contractor and the engineer to assure performance of high quality construction, accurate determination of quantities upon which payment is to be made, and correct payment in accordance with the contract provi-





sions. The findings on such inspections should disclose any need for better controls, better supervision, and improvements in specifications and procedures on these particular projects or generally on all projects. If any such need is found, appropriate remedial action should be initiated."

The information furnished in this discussion and the appendices I hope will provide you with a convenient compilation of documents pertaining to inspection requirements on Federal Aid projects, and will possibly explain some actions on the part of State Highway personnel which may have seemed to you to have been arbitrary.

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PUBLIC ROADS ADMINISTRATION  
FEDERAL WORKS AGENCY  
WASHINGTON 25

General Administrative Memorandum No. 273

(Original Issue)

Date: April 5, 1945

Subject: Schedule of Minimum Requirements for Testing

The schedule of minimum requirements governing tests of materials used in Federal-aid road construction, originally issued in 1922 and last revised in 1930, has been further revised and copies of the revised schedule are attached.

The schedule, as revised, supersedes the schedule of minimum requirements dated May 1, 1930, and is effective April 1, 1945.

Thos. H. MacDonald  
Commissioner of Public Roads

Attachments

April 1, 1945

SCHEDULE OF MINIMUM REQUIREMENTS  
GOVERNING TESTS OF MATERIALS  
USED IN FEDERAL-AID ROAD CONSTRUCTION<sup>1/</sup>

FOREWORD

A revised schedule of minimum requirements relative to the frequency of sampling and testing materials used in Federal-aid road construction is given below and supersedes all previous schedules.

These minimum requirements must be followed in all cases, except that the Division Engineer may waive: (a) Any of the requirements regarding determinations for quality if, in his opinion, the quantity of the material involved is too small or the structure is not sufficiently important to warrant such requirements; and (b) the requirements regarding determinations of size of aggregates if, in his judgment, the products being furnished are from dependable commercial sources of supply. It should be understood, however, that these are in reality minimum requirements and should be waived only in exceptional cases, and furthermore, that additional or more frequent sampling and testing may and should be required in certain cases. Division Engineers should insist upon such additional testing at any time when, in their judgment, it is advisable to do so.

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1. Supersedes Schedule of Minimum Requirements dated May 1, 1930.

In all cases where the schedule of minimum requirements conflicts with existing approved State specifications, the provisions of the specifications shall govern. The Division Engineers are requested to secure, if possible, such revisions in all future specifications as will prevent conflicts with the schedule of minimum requirements.

Each sample taken in accordance with this schedule shall be tested to determine whether the material meets in full the requirements of approved State specifications covering the project or contract.

#### Number of Samples Required

##### 1. Portland Cement

- a. Portland cement shall be sampled in accordance with the requirements of A.A.S.H.O. Method T-127.

##### 2. Bituminous Materials

- a. One sample shall be obtained from each car or equivalent.
- b. Material in bulk storage shall be sampled in accordance with the provisions of A.A.S.H.O. Method T-40.
- c. Samples for consistency and specific gravity tests shall be taken from each car or equivalent when material is drawn from a pretested storage tank.
- d. If less than 2,000 gallons is used on a contract, the manufacturer's certificate of compliance with specification requirements may be accepted at the discretion of the State.

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### 3. Bituminous Mixtures

- a. One sample of each type of mixture shall be obtained from each day's run at plants under State inspection. Where more than one shift in plant operation embraces the day's run, a sample of the mixture shall be taken daily for each shift.
- b. For mixtures prepared at plants without State inspection, and for natural or processed rock asphalt, one sample shall be obtained from each car or equivalent.
- c. Samples for density, thickness, and composition determinations shall be taken from the completed pavement placed by each shift each day with hot-laid mixtures of bituminous concrete or sheet asphalt types.
- d. For mixed-in-place construction, one composite sample shall be taken from the pavement laid by each shift each day.

### 4. Stone

- a. One sample for tests of quality shall be taken from non-commercial deposits prior to use.
- b. At least one sample for tests of quality shall be taken each year from commercial quarries.
- c. One composite sample for tests for size shall be taken from each shipment of aggregate prepared for use in cement concrete or bituminous mixtures. No sample shall represent more than 100 cubic yards.

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- d. Daily samples of the total mineral aggregate used in bituminous concrete and sheet asphalt shall be obtained for test for size.

5. Mineral Filler

- a. One sample for tests for size shall be taken from each shipment of 50 tons or less.

6. Slag

- a. One sample for tests of quality shall be taken prior to use.
- b. Samples for tests for size shall be taken as required in 4c and 4d.

7. Gravel and Sand

- a. One sample for tests of quality shall be taken from non-commercial deposits prior to use.
- b. At least one sample for tests of quality shall be taken each year from commercial plants.
- c. These requirements for sampling may be waived for concrete aggregates if less than 10 cubic yards of concrete are involved in the contract.
- d. One sample for tests for quality shall be taken from each 500 cubic yards of road gravel or sand or gravel for concrete when the material is obtained from a non-commercial source.
- e. Samples for test for size shall be taken as required in 4c and 4d.

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**8. Concrete**

- a. One set of 3 cylinders or beams shall be obtained from the base or surface concrete placed each day.
- b. One set of 3 cylinders shall be obtained from each 100 cubic yards or less of each class of structural concrete placed each day.

**9. Water for Concrete**

- a. One sample shall be obtained prior to use from each source of water which is of questionable quality.

**10. Paving Brick**

- a. One sample shall be taken from the first 10,000 brick furnished and one sample from each subsequent 50,000 brick.

**11. Stabilized Base or Surface Materials**

- a. One sample for tests for plasticity and size shall be taken from each 100 cubic yards of material.
- b. One sample for tests of quality of aggregate shall be taken from each source prior to use.
- c. One sample of binder soil shall be taken from each 100 cubic yards used in plant- or road-mix construction.
- d. One check or control sample shall be taken from each 500 lineal feet of completed plant- or road-mix construction.
- e. One field test for density shall be made for each 1,500 lineal feet of completed construction prior to application of surface treatment.

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12. Corrugated Metal Pipe

- a. The requirements given in A.A.S.H.O. Specification M 36 shall govern.
- b. For sectional or arch culverts, or for pipe on a project where less than 100 lineal feet of a size is used, certified test results from the manufacturer may be accepted at the discretion of the State.

13. Concrete, Clay and Cast Iron Pipe

- a. The requirements given in the following A.A.S.H.O. Specifications shall govern:

Concrete pipe - M 41, M 86, and M 87

Clay pipe - M 65

Cast iron pipe - M 64

Drain tile - M 66

14. Reinforcing Steel

- a. One sample of each size of bar or wire shall be taken from each shipment from a source.
- b. One sample of fabricated reinforcement (welded wire fabric or bar mats) shall be taken from each shipment from a source.
- c. In lieu of (a) or (b), steel may be sampled at the mill in which case the provisions of A.A.S.H.O. Specifications M 31, M 32, M 42, M 53, M 54, and M 55 shall govern.

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## 15. Paint

- a. One sample of each kind of paint specified shall be obtained.
- b. When the quantity of paint involved does not justify the expense of a test, a certified analysis from the manufacturer may be accepted.

## 16. Structural Steel

- a. A certified mill test report showing chemical analysis and physical properties is required.
- b. An inspection report showing that the material furnished has been identified as that represented in the certified mill test report is required.

## 17. Treated Timber and Piling

- a. A copy of an inspection report of treated timber is required.
- b. One sample of each grade of creosote or other agent used in timber treatment on each project is required.

## 18. Special Curing Agents

- a. One sample shall be taken from each shipment of any special curing agent used.

## 19. Expansion Joint Filler

- a. One sample of each thickness of preformed filler in each shipment shall be obtained.
- b. For poured fillers, one sample of each ingredient as shipped to the project shall be obtained from each shipment.

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20. Asphalt Plank

- a. One sample of each thickness of plank shall be taken from each shipment.

21. Guard Rail and Fittings

- a. One sample shall be obtained from each shipment of cable, band, or wire fabric.
- b. One sample shall be obtained of each type and size of fitting used on contract.

22. Castings, Iron or Steel

- a. The requirements of A.A.S.H.O. Specifications M 103, M 104, M 105, and M 106 shall govern.

General Administrative Memorandum No. 273, states, "where the schedule of minimum requirements conflicts with existing approved State specifications, the provisions of the specifications shall govern." In this respect, the following procedures have been established in the sampling and testing of portland cement, and pipe and tile.

Portland cement is accepted for use on the basis of certification from the producer and is check tested on the basis of composite samples submitted from each of the Districts. The number of samples submitted being dependent on the amounts being used for each project within the particular District.

Pipe and Tile (Concrete and Clay) is sampled and tested on the basis of one percent of the number of pieces of each size for Reinforced Concrete Culvert Pipe, Non-Reinforced Concrete Culvert Pipe, and Reinforced Concrete Sewer Pipe represented in a shipment.

One percent of the number of pieces, but not less than 2 pieces, of each size for Concrete Sewer Pipe and all clay pipe except that at the option of the Department the following schedule applies for 4" to 24" diameter sewer pipe for quantities of 500 pieces or more:

500 pieces to 1000 pieces-----	5 samples
1001 pieces to 2000 pieces-----	8 samples
2001 pieces to 5000 pieces-----	10 samples
Over 5000 pieces-----	2 samples
	per 1000 pieces or fraction thereof.

One percent of the number of pieces but not less than 5 pieces of each size for drain tile (concrete and vitrified clay) except that at the option of the Department the following schedule applies for quantities of 500 pieces or more:

500 pieces to 1000 pieces-----	5 samples
1001 pieces to 2000 pieces-----	8 samples
2001 pieces to 5000 pieces-----	10 samples
Over 5000 pieces-----	2 samples
	per 1000 pieces or fraction thereof.

In addition to those materials listed in the General Administrative Memorandum No. 273 the following requirements have been established for job control sampling and

testing for the items indicated:

Barbed Wire is sampled and tested on the basis of one sample from each project consignment.

Calcium chloride is sampled and tested on the basis of one sample for each shipment.

Concrete block for manholes, catch basins, etc., are sampled and tested on the basis of one sample of 5 whole blocks taken at random from each 10,000 blocks or less represented in a shipment.

Delineators are sampled and tested on the basis of 10 delineators of each size and color represented in a shipment.

Fencing material is sampled and tested on the basis of one sample from each project consignment.

Glass beads are sampled and tested on the basis of one sample from each batch or run represented in a shipment.

Masonry brick is sampled and tested on the basis of one sample of 10 whole brick from each 50,000 or less represented in a shipment.

Rubber-Type Joint Sealing Compound is sampled and tested on the basis of one sample from each batch number represented in a shipment.

Seed is sampled and tested on the basis of one sample from each variety of each shipment.

Signs (wood, aluminum sheet, aluminum extruded) are inspected for conformance to specification and design requirements after fabrication for each project consignment.

Steel Beam Guard Rail is sampled and tested on the basis of, either, one sample for each heat number, or, one sample for each consignment of 10,000 lineal feet or less.

Stress-relieved wire for prestressed beams is sampled and tested: (a), at the steel plant on the basis of one sample for each 10 tons, (5 reels approximately) or less, for each consignment, or, (b), at the prestress fabricating plant on the basis of one sample for each reel (12,000 to 15,000 feet approximately dependent on the strand size).

Overhead Sign Structures (Aluminum, steel) are inspected for workmanship and conformance to design requirements after fabrication for each project consignment. Required welding is done by qualified welders only. Qualification based on laboratory tests.

Waterproofing fabric is sampled and tested on the basis of one sample from each shipment.

Steel Fence Posts are sampled and tested on the basis of 5 pieces of each size for each consignment.

Sign Posts are sampled and tested in accordance with the following procedure and schedule:

The weight per lineal foot is determined by measuring and weighing at least 5 posts taken at random. If the weight per lineal foot meets the specification requirements one section of post, without holes, at least 30 inches in length per type represents the following quantities:

100 to 1000 lineal feet-----1 sample  
1001 to 3000 lineal feet-----2 samples  
3000 to 5000 lineal feet-----3 samples  
Over 5000 lineal feet per consignment - 4 samples.

Delineator Posts - Same as under "Sign Posts."

Wood Guard Rail Posts are sampled and tested on the basis of field inspections for quality and treatment for each treatment charge.

Guy Wire is sampled and tested on the basis of one - 2 ft. length per shipment if sampled after delivery. If sampled at the source the number of lengths to be taken is the cube root of the number of coils in the lot with a minimum of five lengths to be submitted.

Snow Fence Ties are sampled and tested on the basis of five ties per shipment if sampled after delivery. If sampled at the source the number of ties to be taken is the cube root of the bundles in the lot with a minimum of five ties to be submitted.

Incidental construction items, such as, brine, pipe joint sealers, mineral fillers, etc., are sampled and tested on the basis of the individual item requirements for each lot or project consignment.

<p>U. S. DEPARTMENT OF COMMERCE Bureau of Public Roads</p>	<p>POLICY AND PROCEDURE MEMORANDUM 20-6.2 Date of issuance: January 26, 1962</p>
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PROGRAM AND PROJECT PROCEDURES

Subject: Inspection of Construction Projects (Sampling and Testing)

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Supersedes: IM 20-5-60, dated April 29, 1960, and IM 20-5-60(1) dated January 16, 1961

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1. PURPOSE

The purpose of this memorandum is to prescribe the policies and procedures relating to sampling and testing of materials and construction in connection with the inspection of Federal and Federal-aid highway construction projects.

2. OBJECTIVE

The objective of the sampling and testing performed on highway construction projects is to ascertain whether materials used or proposed for use and the construction work accomplished or in progress conform with plans and specification requirements and to alert the contractor and supervising engineers to the need for corrective action in case of nonconformity. Sufficient sampling and testing should be done as prescribed herein to assure that the objective is accomplished.

3. DEFINITION OF CENTRAL LABORATORY

a. For the purposes of this memorandum the term "central laboratory," when used in connection with projects constructed under State supervision, should be construed to refer (1) to State highway department central laboratory, and (2) to division or district laboratories in States where materials control functions have been decentralized to such levels. It does not include materials control facilities under supervision of the engineers in direct charge of the project or of materials control activities on the project. When the State uses the facilities of other public agencies or of private testing laboratories to supplement its own facilities, these will be considered as a part of the State's central laboratory for the purposes of this memorandum.

b. When the term "central laboratory" is used in connection with projects constructed under Public Roads supervision, it means whatever laboratory, other than one under supervision of project personnel, performs the testing for the project.



PPM 20-6.2, page 2  
January 26, 1962

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#### 4. CLASSES OF SAMPLES AND TESTS

Two different classes of samples and tests are required for each project. They are "job control samples and tests" and "record samples and tests." The latter class is subdivided into "progress samples and tests" and "final samples and tests."

#### 5. JOB CONTROL SAMPLES AND TESTS

These are samples taken and tests made for control of the construction operations by ascertaining on a day-to-day basis whether the quality of the materials being incorporated or proposed for incorporation in the work, and the quality of the construction work being produced, conform to the plans and specifications. They are of four different types:

a. Samples of materials or construction work taken and tested at the construction site by project personnel.

b. Samples of materials or construction work taken at the construction site by project personnel and tested at the central laboratory with numerical results obtained for each of the required tests reported to the project personnel.

c. Samples of materials taken by central laboratory personnel at the production or processing plant, shipping point, or other source of origin remote from the project and tested at the central laboratory with numerical results obtained for each of the required tests reported to the project personnel.

d. Samples taken and tested by the manufacturer or supplier with certificates as to conformity with specifications being sent to the project and central laboratory personnel.

#### 6. PROGRESS SAMPLES AND TESTS

a. These are random samples taken and tested as an independent spot check on the results shown by job control samples. The progress samples are to be taken from materials delivered but not incorporated in the work and from construction work in progress. The taking of the samples is to be performed by either, (1) central laboratory personnel, preferably but not necessarily, in the presence of, and at the locations indicated by, the Public Roads area engineer; or (2) by project personnel at the locations indicated by, and in the presence of, either central laboratory personnel or the Public Roads area engineer, or both. Progress samples may be selected by Public Roads or central laboratory personnel from samples taken for job control purposes provided such samples have been taken under their observation and control. The progress samples taken are to be continuously in the custody or under the observation of the central laboratory engineer or Public Roads engineer until they are shipped or delivered to the central laboratory for testing.

PPM 20-6.2, page 3  
January 26, 1962

b. The testing of progress samples is to be done at the central laboratory. If and when requested by Public Roads, it is also to be done in the presence of the Public Roads area engineer. The numerical results obtained for each of the required tests are to be sent to the project personnel so that: (1) Actual test results obtained by the central laboratory can be compared with test results obtained by project personnel on similar material and evaluation made as to the accuracy of the project testing; and (2) when materials are of a marginal nature numerical test values sent to the project will alert project inspectors as to the necessity for closer inspection, control and possible corrective action. The results of these tests are also to be certified to the Public Roads division engineer.

c. The State is to notify the Public Roads division engineer as to when progress sampling and testing are to be done on projects under State supervision so that he may arrange for the area engineer to be present if feasible. If after such notification the area engineer cannot be present, the sampling and testing may proceed without his being present. It is intended that the area engineer will be present whenever he can reasonably arrange to do so.

d. Actual operations of progress sampling and testing on projects under State supervision are to be performed by State personnel. Whenever Public Roads area engineers collaborate in sampling or testing operations they should, (1) designate, or concur in selection of, the specific materials or construction to be sampled and tested, (2) indicate or concur as to where samples should be taken, (3) observe sampling and testing processes, (4) report findings with recommendations for corrective actions, if necessary, and (5) report on measures carried out to effect corrective actions.

## 7. FINAL SAMPLES AND TESTS

a. These are random samples taken from completed construction work or completed portions thereof by the same personnel and under the same requirements and procedures as for progress samples. These samples are taken and tests made for the following purposes:

(1) To verify conformity with such plans and specification requirements as are applicable to the completed construction as distinguished from those requirements that are applicable to materials before they are incorporated into the work. In this respect final samples and tests serve the same purpose as progress samples and tests.

(2) To furnish information relative to the amounts of change in properties of the materials used in the work. In this respect final samples and tests are for physical research purposes to ascertain the need and bases for possible improvements in future designs and specifications.

(3) To reveal any wide change in properties or numerous substantial deviations from the specified requirements that would indicate the need for determination of the reasons therefor. In this respect the final samples

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January 26, 1962

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and tests serve to indicate whether previously unknown or unsuspected conditions may exist on the project that have a detrimental effect on the completed construction, or whether control of the construction materials and operations may have been inadequate.

b. Final samples should be taken of each individual stage of the construction work as it is completed and before it is covered or disturbed by a subsequent construction stage, in order to minimize damage to finished work and facilitate the procurement of satisfactory samples.

c. Whenever it appears that changes may have occurred in the gradation, plastic limit, or liquid limit of untreated aggregate base or subbase materials because of processing, contamination or other reason after the materials were incorporated in the construction, check tests for these factors shall be made on the final samples and reported with explanation therefor.

#### 8. RECORDS OF SAMPLING AND TESTING

The results of all job control sampling and testing are to be kept in the files in the project engineer's office and shall be made available for examination by the area engineer when he makes his inspection. The records should also show the source of the samples and where, when and by whom the sampling and testing was done. These records are to become a part of the permanent project records of the construction agency. The same procedures apply to the results of progress and final record sampling and testing except that (1) complete records of the samples taken and results of tests thereon are to be made available in both the central laboratory files and the project engineer's files for examination by the Public Roads inspecting engineer; and (2) the results of the tests are to be certified to Public Roads as provided in paragraph 12.

#### 9. SUSPENSION OF PROGRESS PAYMENTS

If, in the case of a project under the supervision of a State or one of its subdivisions, the materials test reports and other reports necessary to show whether the quality of the materials delivered and workmanship being performed conform with the approved plans and specifications, are not all on file and available for review by the area engineer, he shall recommend to the division engineer that consideration be given to deferring payment of progress vouchers until the situation has been corrected.

#### 10. APPLICATION OF SPECIFICATION REQUIREMENTS

Specification requirements relative to materials are generally to be considered as applying to the materials before they are mixed with other materials or so processed that their characteristics are changed. The exception will be when the specifications or established practices of the State specifically provide that the requirements are applicable to the completed work after the materials have been processed and incorporated therein. Samples for quality control are to be taken at the stage at which the quality requirements are applicable.

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## 11. AREA ENGINEER'S FUNCTIONS

It is the responsibility of the Public Roads area engineer to perform the following functions with respect to sampling, testing and reporting on materials and workmanship.

- a. Review all available job control, progress, and final test reports at each inspection.
- b. Make visual inspection of materials and of materials sources at or near project site to judge, (1) whether tests reports appear to correctly depict the true character of the materials; and (2) whether uniformly good materials can be expected to be produced from the source in the required quantity.
- c. Observe job control sampling and testing performed by project personnel.
- d. Observe methods and inspect workmanship.
- e. Arrange, whenever feasible, for taking of progress and final samples under his observation and at locations indicated by him.
- f. Obtain information concerning progress and final samples taken during his absence by or under direction of central laboratory personnel.
- g. Observe testing of job control, progress and final samples at central laboratory whenever feasible, and review test reports thereon.
- h. Ascertain adequacy of coverage of sampling, testing and reporting and evaluate reliability of results obtained.
- i. Ascertain whether results from progress and final sampling and testing are reasonably representative of results from job control sampling and testing.
- j. Incorporate findings relative to above items in regular inspection reports, or in special supplemental reports if appropriate, calling attention to any deficiencies or nonconformity in materials or workmanship, other unusual problems, need for corrective action, recommendations made and corrective actions taken with respect thereto.
- k. Follow up and report on whether unsatisfactory or undesirable conditions have been corrected or improved.
- l. Review State's certificates relative to materials and workmanship, report findings calling attention to any nonconformity with plans and specifications, and make recommendations relative to acceptance of project.

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January 26, 1962

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## 12. MATERIALS CERTIFICATION

a. A certificate conforming in substance to that indicated in Attachment 1 is to be submitted by the State for each highway construction project in which Federal funds participate and that is constructed under State supervision or under another agency responsible to the State, including projects constructed under the Secondary Road Plan. The certification in paragraph 1 of the attachment is to be based on the results of all sampling and testing performed in connection with the project and in accordance with paragraphs 5, 6, and 7. The certification in paragraph 2 of the attachment is to be based on record samples and tests only as described in paragraphs 6 and 7, and is to certify: (1) whether or not the results of the tests on record samples indicated that the materials and work conform to the plans and specifications, and (2) whether or not such results are reasonably representative of the materials incorporated in the work as shown by the results of job control sampling and testing.

b. A materials certificate similar to that indicated in the attachment but modified to fit the conditions is to be submitted for all projects under direct Public Roads supervision.

c. The materials certificate is to accompany the final voucher and become a part thereof. A copy of the certificate is to be furnished as soon as available as a basis for final acceptance of the project and is to be attached to or incorporated in the final construction inspection report.

## 13. APPLICATION

The principles and procedures of this memorandum apply to all Federal-aid projects, except that for projects constructed under the Secondary Road Plan the area engineer's functions will be limited to final record samples. Those principles and procedures that are applicable to Federal-aid projects in general are also applicable to, (1) projects constructed under State supervision with Federal participation in the cost from funds other than Federal-aid funds, that are authorized under Federal-aid highway legislation, such as public lands funds, forest highway funds, and defense access funds; and (2) projects constructed under direct Bureau supervision, with necessary adjustments made to substitute Bureau personnel and facilities for State personnel and facilities. The provisions of this memorandum do not apply to Indian reservation road and bridge projects constructed under the direct supervision of the Bureau of Indian Affairs and the general supervision of Public Roads.



F. C. Turner  
Assistant Federal Highway Administrator  
and Chief Engineer

PPM 20-6.2, Attachment 1  
January 26, 1962

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(GUIDE LETTER OF CERTIFICATION BY STATE ENGINEER)

Date \_\_\_\_\_

Division Engineer  
Bureau of Public Roads

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Dear Sir:

Project No. \_\_\_\_\_

This is to certify that:

1. All of the materials used on the above project substantially met pertinent specification requirements of the contract. All of the materials, except those listed on the back hereof, were properly covered by samples tested and accepted by the State Highway Testing Laboratory or associate laboratory. The items listed on the back of this certification which received less than the State's usual requirements for sampling and testing, were accepted under the conditions stated.
2. The results of the tests on record samples indicate that: (a) the materials and construction work substantially conform to the plans and specifications, and (b) such results are reasonably representative of the materials incorporated in the work and of the construction work as shown by the results of job control sampling and testing. Exceptions to this certification are explained on the back hereof (or on attached sheet).

Laboratory reports covering tests of materials used on the project are on file by project number in the State Laboratory at \_\_\_\_\_.

Very truly yours,

Director of Laboratory  
or other  
Appropriate State Official

USCOMM--DC

## OFFICE MEMORANDUM



MICHIGAN  
STATE HIGHWAY DEPARTMENT

JOHN C. MACKIE, COMMISSIONER

November 2, 1960

TO: Road Construction Engineer  
 Bridge Construction Engineer  
 Federal Aid Secondary Engineer  
 District Engineers  
 Project Engineers  
 Michigan State Highway Testing Laboratory  
 Materials Engineer  
 District Materials Supervisors

FROM: C. B. Laird, Chief Construction Engineer  
 W. W. McLaughlin, Testing and Research Engineer

SUBJECT: Instructional Memorandum 20-5-60 - Superseding Instructions issued to the District and Area Engineers of the Bureau of Public Roads by N. E. MacDougall, Division Engineer, dated August 16, 1960.

Transmitted, herewith, are copies of a superseding memorandum and pertinent correspondence relative to the Bureau of Public Roads Instructional Memorandum 20-5-60 covering the responsibilities of the Bureau of Public Roads Division Engineers regarding inspection of materials. In order for them to carry out these instructions, it will be necessary to obtain the full cooperation of the Highway Department personnel concerned. This memorandum, which supersedes our memorandum dated July 11, 1960, is, therefore, written to clarify the assignment of certain responsibilities to Highway personnel and to furnish revised instructions concerning procedures which require new interpretation.

In general, it should be pointed out that the Bureau of Public Roads requires information on both the materials incorporated into the work, and the finished work. Samples taken from the former have been termed "occasional samples" and are taken at random from the material in production or during placement. Samples taken from the latter have been termed "record samples." In lieu of "record samples" of base courses and subbases, depth measurements will be made as described below.

Comments below are listed in order of numbered paragraphs in the Bureau memorandum:

Paragraph 1

The Project Engineer is to keep a separate file for all test results in accordance with Mr. C. B. Laird's memorandum of May 3, 1960.

Where concrete is being furnished from a transit mix plant or by a contractor who is furnishing more than one project, disposition of Tested and Accepted Cement Slip, Form No. 1911, will be noted on Weekly Cement Distribution Report, Form No. 529, prepared by the Field Testing Division and will be sent to all of the Project Engineers concerned.

Paragraph 2

(a) Concrete Cores. In order that the Bureau representatives will have an opportunity to observe this operation, the tentative itineraries of the core machine operators will be furnished to the Bureau in writing by the Field Testing Division on Wednesday of each week, and confirmation or changes will be given to the Bureau on Monday morning before 9:00 a. m.

(b) Bituminous Cores. Cores will not be taken from bituminous pavement. A composite sample of the mix for a day's production will be taken in a normal manner. When the Bureau representative inspects the project, he will observe the taking of these samples. He may also request an "occasional sample" from the trucks, the paver, or the surface prior to rolling. A copy of the laboratory report on the composite sample or the "occasional sample" will be sent to the Bureau.

Paragraph 3Record Samples

Bridge projects with no approaches, RR flasher projects, Signing projects, Railroad or utility relocation work

Bureau procedures do not require "record samples" on the project.

Bridge and approach projects

"Record samples" will be taken on the approaches.

Bituminous surfacing and resurfacing projects

"Record samples" of bituminous mixtures will be taken prior to compaction by the District Materials Supervisor. When they are to be taken, the District Materials Supervisor will notify the Bureau area engineer and, depending on his schedule, he may or may not be present.

G & DS and bituminous pavement

In accordance with Mr. N. E. MacDougall's letter to Mr. Howard E. Hill, dated September 26, 1960, laboratory analysis of composite samples for aggregate base cores and surface cores be discontinued and the cores be considered thickness determinations only.

The depth of the base course and subbase will be determined by averaging the three measurements for each item. These measurements will be made under the direction of the District Materials Supervisor. When depth determination of the base course is to be made, the Bureau area engineer will be notified by the District Materials Supervisor and, depending on his schedule, he may or may not be present.



- 3 -

"Record samples" of the bituminous mixes will not be taken. "Occasional samples" requested by Bureau representatives may or may not be considered as "record samples."

Concrete paving projects

Concrete paving cores mentioned above will be considered as records for samples for concrete pavement.

FAS projects

Same instructions apply as to other Federal Aid projects.

The District Materials Supervisors will make arrangements with Project Engineers to get necessary contract labor to obtain required depth determinations and this contract labor will be paid for on force account.

"Occasional samples" of various materials taken at random by Bureau of Public Roads area engineers from projects and sent to the Laboratory will be identified as Bureau of Public Roads samples and copies of laboratory results covering them will be made for the Bureau.

At 11:00 a. m. each working day, the Laboratory will send to Lansing, by teletype, a list of all Bureau of Public Roads samples received during the previous 24 hours. Information to be included in the list will be the name of the material, the project number, and the name of the sampler.

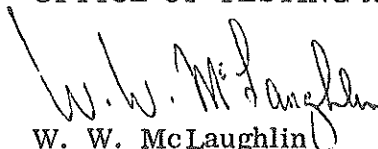
We appreciate the large amount of work you are all asked to do but, inasmuch as failure to comply with these regulations will delay payment to the State of Federal funds, it is important that we have your full cooperation.

OFFICE OF CONSTRUCTION



C. B. Laird  
Chief Construction Engineer

OFFICE OF TESTING AND RESEARCH



W. W. McLaughlin  
Testing and Research Engineer

WWM:BI

cc: Howard E. Hill  
John E. Meyer

COPYForm CD-121  
(9-22-59)UNITED STATES GOVERNMENT  
MEMORANDUMU. S. Department of Commerce  
Bureau of Public Roads

TO: District and Area Engineers, Lansing, Michigan DATE: August 16, 1960

FROM: N. E. MacDougall, Division Engineer, Lansing, Michigan

SUBJECT: Instructional Memorandum 20-5-60. Inspection, Sampling and Testing  
of Materials on Construction Projects. (Supersedes Memorandum  
dated 7-5-60)

As the result of numerous discussions with Messrs. Laird and McLaughlin, some new procedures have been developed which will enable us to comply with the above memorandum without serious disruption of the State's sampling and testing procedures and without burdening you with an impossible task during the State's tremendously expanded program. Project engineers and field testing personnel are being issued new instructions which we hope will permit scheduling their field sampling and testing to conform with your inspections and thereby minimize extra sampling and testing.

Since the State has not finished rewriting their construction manual and since some sampling and testing procedures have changed, we have reviewed current procedures and are attaching a synopsis which may be of value in your field review of the control of materials. Also attached is a copy of Mr. McLaughlin's memorandum of February 10, 1955 describing the four different categories of laboratory reports.

The following comments and interpretations apply to the three numbered paragraphs of the Instructional Memorandum:

Paragraph #1.

This paragraph provides for the review of test reports on each of your inspections and the inclusion of comments concerning your reviews in inspection reports. To facilitate our review of current test reports, project engineers have been requested to hold current test reports in a temporary file until reviewed by the Area Engineer. In the event that the status of work on a project is such that no materials have been used or none have been used since your last inspection, a comment in this regard would be appropriate.

COPY

District and Area Engineers  
Lansing, Michigan

- 2 -

August 16, 1960

Paragraph #2.

In accordance with the first sentence of this paragraph, you should check thicknesses and widths of bases and pavements during each inspection and report conformity with the plans or any deviation therefrom, considering tolerances allowed by the specifications. This paragraph also provides for random sampling of materials being placed on the project and a test report for our files on such samples. Unless job conditions indicate further sampling is advisable, samples of only major materials such as aggregates, cement, bitumen and bituminous mixes should be considered. These samples should be taken once during the life of a project except that resampling may be advisable, if a project extends into a second construction season. This sampling should be coordinated with the job sampling by the State's aggregate, plant and pavement inspectors so that the State's regular sampling can, in many cases, serve our purpose by the preparation of an additional copy of the laboratory report. Field tests for embankment compaction, entrained air, aggregate gradation, bituminous extraction, concrete beams, etc. should also be observed as time permits and commented on in your reports.

Paragraph #3.

General. The requirement that record samples of the finished work in place be taken during or prior to the final inspection is interpreted to cover only base and pavement items. For concrete paving projects, this will involve only the standard coring procedure but for bituminous projects some record samples of the base will be necessary. The schedule for coring and the taking of other record samples will be arranged by the State but, in each case, the Bureau will be notified so that you may be present for the sampling. For the various types of projects, record samples will be taken about as follows:

Bridge projects with no approaches, RR flasher projects, Signing projects, Railroad or utility relocation work or similar projects - The State's certification will state that record samples are not feasible and that none were taken. Your report covering acceptance should include a statement that Bureau procedures do not require record samples on the project.

Bridge and approach projects - Record samples will be taken on approaches.

Bituminous surfacing and resurfacing projects - Samples of the bituminous mixture will be taken prior to compaction.

COPY

District and Area Engineers - 3 -  
Lansing, Michigan

August 16, 1960

G & DS and bituminous pavement - Samples of the aggregate base will be taken at the rate of 3 per mile and composited for a laboratory test. Also, samples will be taken of the bituminous mixes prior to compaction.

Concrete paving projects - The State's standard coring procedure will be followed and the core reports submitted in the usual manner. Inspections should be arranged whenever possible so that the coring may be observed and results included in your inspection report.

FAS projects - Record samples are required for these projects except for bridge projects, flasher installations and projects involving grading only. The State District Materials Engineer will arrange for the taking of record samples and notify the Bureau when the sampling will be done. You should observe the sampling whenever time permits and should include appropriate comments regarding them in your final report. An intermediate inspection report dated to coincide with your visit to the project to observe the taking of record samples will not be necessary.

Testing of record samples will be performed at the Ann Arbor laboratory. This office will be notified by teletype each day of the record samples arrival at the laboratory. It is planned that an Area Engineer will visit the laboratory periodically to observe testing of samples from projects in his area and other areas. He will then report to other area engineers on the tests witnessed.

Attached: Synopsis of State Testing Procedures  
Mr. McLaughlin's Memorandum dated 2-10-55

## OFFICE MEMORANDUM



MICHIGAN  
STATE HIGHWAY DEPARTMENT  
JOHN C. MACKIE, COMMISSIONER

October 19, 1960

To: District Road Engineers  
Road Project Engineers

From: Chas. S. Lundberg, Road Construction Engineer

Subject: Aggregate bases on federal aid projects

At the request of the Bureau of Public Roads, aggregate depth measurements will be made by representatives of the Office of Testing and Research on all federal aid aggregate base projects; interstate, primary, and secondary. A minimum of three measurements will be made in each mile. A copy of the record of aggregate depth measurements will be given to the Project Engineer or his field office representative at the time the measurements are completed.

On each project where the depth record indicates aggregate depths less than plan thickness (selected subbase plus base course), the Project Engineer shall:

1. Determine by additional soundings the area of roadway to which each recorded deficiency applies.
2. Direct the addition of aggregate base to obtain a plan minimum depth throughout each determined deficient roadway area.
3. Submit to the Engineer of Materials (J. C. Brehler), Office of Testing and Research, both a record of additional soundings obtained defining each thickness deficiency area and a record of either the additional aggregate added to correct the depth or measurements of final depths of aggregate in the base course after corrections have been completed.

Whenever federal aid aggregate base construction is approaching completion and depth measurements have not been obtained, the Project Engineer should notify the District Engineer or District Materials Engineer sufficiently in advance of base completion to allow ample opportunity for obtaining depth measurements and for correcting deficiencies. Base construction contractors should not be released, nor should bituminous surfacing be started, before the foregoing required records insure minimum plan aggregate depths.

CSL-WAS:ban

cc Bureau of Public Roads  
C. B. Laird  
W. W. McLaughlin  
S. T. Byam (84)

*Chas. S. Lundberg*  
CHAS. S. LUNDBERG  
Road Construction Engineer

COPY

04-20

Lansing, Michigan  
September 26, 1960

CS 83-47, C5  
CS 62-47, C3

Mr. Howard E. Hill  
Managing Director  
Michigan State Highway Department  
Lansing, Michigan

Dear Mr. Hill:

Reference is made to Mr. Brehler's letter of August 26, 1960, relative to samples of aggregate base courses taken after compaction on Michigan Projects Nos. S-255(5) and S-1028-1.

Grading analyses of samples obtained from the grade vary somewhat from the average grading shown on daily reports and raise a question of the value of a sieve analysis of a sample from the compacted grade. Apparently there is some breakdown of the aggregate during compaction.

In view of the results on these and other projects, we concur in your proposal that laboratory analysis of composited samples from aggregate base and surface cores be discontinued and that the cores be considered thickness determinations only.

We note a rather wide variation in base thicknesses on these projects indicating a need for closer inspection. It is understood that the contractor has been required to place more aggregate to obtain proper depth.

Very truly yours,

/s/ N. E. MacDougall  
Division Engineer

Division (2)  
D. E. Jones

DEJ:gkl

## OFFICE MEMORANDUM



MICHIGAN  
 STATE HIGHWAY DEPARTMENT  
 JOHN C. MACKIE, COMMISSIONER

July 11, 1960

TO: Road Construction Engineer  
 Bridge Construction Engineer  
 Federal Aid Secondary Engineer  
 District Engineers  
 Project Engineers  
 Michigan State Highway Testing Laboratory  
 Materials Engineer  
 District Materials Supervisors

FROM: C. B. Laird, Chief Construction Engineer  
 W. W. McLaughlin, Testing and Research Engineer

SUBJECT: Bureau of Public Roads Instructional Memorandum 20-5-60 -  
 Inspection of Construction Projects  
 Supplements Policy and Procedure Memorandum 20-6, dated May 21, 1956  
 Instructions issued to the District and Area Engineers of the  
 Bureau of Public Roads by N. E. MacDougall, Division Engineer

Transmitted, herewith, are copies of the subject memorandum which covers additional responsibilities of the Bureau of Public Roads Division Engineers regarding the inspection of materials. In order for them to carry out these instructions, it will be necessary to obtain the full cooperation of Highway Department personnel concerned. This memorandum is written to assign certain responsibilities to Highway personnel and to furnish detailed instructions concerning procedures which require interpretation. Comments below are listed in order of numbered paragraphs in the Bureau memorandum:

Paragraph 1 - The Project Engineer is to keep a separate file for all test results in accordance with Mr. C. B. Laird's memorandum of May 3, 1960 (copy attached). For a clearer understanding of the laboratory method of reporting, there is also attached a copy of a letter dated February 10, 1955, from Mr. W. W. McLaughlin to Mr. H. J. Rathfoot.

Where concrete is being furnished from transit mix plant or by a contractor who is furnishing more than one project, disposition of cement delivery ticket, form No. 1911, will be noted on report, form No. 529, prepared by Field Testing Division and will be sent to all of the Project Engineers concerned (copies of forms Nos. 1911 and 529 attached).

Paragraph 2 - Concrete Cores. In order that the Bureau representatives will have an opportunity to observe this operation, the tentative itineraries of the core machine operators will be furnished to the Bureau in writing by the Field Testing Division on Wednesday of each week, and confirmation or changes will be given to the Bureau on Monday morning before 9:00 a.m.

Bituminous Cores. Cores will not be taken from bituminous pavement. Composite sample mix for day's production will be taken in a normal manner. When Bureau representative inspects project, he will observe the taking of these samples and a copy of the laboratory report covering mix placed that day will be sent to the Bureau.

Paragraph 3 - Concrete Pavement. Cores mentioned above will be considered as record samples for concrete pavement.

Bituminous pavement samples described in Paragraph 2 are not considered as record samples. In lieu of record samples of the material, prior to surfacing, samples will be taken of the aggregate base and subbase. These will be taken at the rate of three per mile under the direction of the District Materials Supervisor. Depth of base course and subbase will be determined by averaging each of the three measurements. The three base course samples will be composited and sent to the Laboratory. When sampling of the base course is to be done, the Bureau area engineer will be notified by the District Materials Supervisor and, depending on his schedule, he may or may not be present. This notification may be given by teletype to Office of Testing and Research, in Lansing, who will notify the Bureau area engineer.

The District Materials Supervisors will make arrangements with Project Engineers to get necessary contract labor to obtain required samples and this contract labor will be paid for on force account.

Both record samples and occasional samples taken at random by Bureau of Public Roads area engineers from projects and sent to the Laboratory will be identified as Bureau of Public Roads samples and copies of laboratory results covering them will be made for the Bureau. Those record samples taken by the District Materials Supervisors, when the Bureau area engineer is not present, will also be identified as Bureau of Public Roads samples.

At 11:00 a.m. each working day, the Laboratory will send to Lansing, by teletype, a list of all Bureau of Public Roads samples received during the previous 24 hours. Information to be included in the list will be the name of the material, the project number, and the name of the sampler.

We appreciate the large amount of work you are all asked to do but, inasmuch as failure to comply with these regulations will delay payment to the State of Federal funds, it is important that we have your full cooperation.

OFFICE OF CONSTRUCTION

*C. B. Laird*

C. B. Laird  
Chief Construction Engineer

OFFICE OF TESTING AND RESEARCH

*W. W. McLaughlin*

W. W. McLaughlin  
Testing and Research Engineer

WWM:MW

cc: Howard E. Hill  
John E. Meyer



U.S. DEPARTMENT OF COMMERCE  
BUREAU OF PUBLIC ROADS

Washington 25, D.C.

April 29, 1960  
(April 29, 1961, expiration)

## INSTRUCTIONAL MEMORANDUM 20-5-60

**SUBJECT:** Inspection of Construction Projects  
Supplements Policy and Procedure Memorandum 20-6, dated May 21, 1956

The Bureau's continuous reviews of its policies and procedures which are established to attain high quality results on every project in the Federal-aid highway program, indicate that still further attention should be given to the matter of testing the quantity and quality of materials incorporated into such projects. Three revisions of current procedures are therefore being instituted with the issuance of this memorandum.

1. In addition to the presently prescribed responsibility of the Division Engineer or his representative to inspect the material test reports during his visits to projects, he shall hereafter report for the Bureau's permanent project records the findings from such reviews and any actions taken regarding the materials and workmanship being incorporated into the job. Furthermore, in addition to his present responsibility of observing the methods by which these materials are being incorporated into the job, should the State at any such inspection not have on file all material test reports and other reports necessary to reflect the quality of workmanship required by the approved plans and specifications, then appropriate steps should be taken to defer payment of progress vouchers on the project until the necessary corrective action has been taken. This procedure shall become effective on the receipt of this memorandum.
2. Thickness or other lineal measurements of some or all materials in place on the project must be made at random points during each Bureau inspection and the results stated in the inspection report. Additionally a sample will occasionally be taken during such construction inspections at random locations chosen by the Bureau inspecting engineer of any of the materials being placed in the project. Such samples shall be taken in accordance with approved standard procedures, appropriately identified, and packaged for delivery to the State central laboratory for check test which shall be reported to the Bureau's Division Engineer. This procedure will be instituted with receipt of this memorandum.
3. At the time of the final inspection of each project or prior thereto, record samples of the finished work in place

- 2 -

shall be taken for certification purposes on such items as may be selected by the Bureau's Division Engineer. These shall be obtained at random locations and in sufficient number to be reasonably representative of the completed work. Such record samples shall be taken and tested by highway department central materials laboratory representatives. The Bureau's Division Engineer shall be notified prior thereto in order that he or his representative may be present during both the sampling and testing. The results of the tests of such record samples shall then be certified to by the duly authorized State representative, as to conformity with the governing plans and specifications and whether the results of the record sample tests are reasonably representative of the materials incorporated in the project as shown by the regular testing and sampling done on the project as work progressed. This certified report of the record samples, together with certification of all other materials used in the work, will accompany the final voucher when submitted for payment, and no final voucher will be paid without a certification showing conformance with the governing plans and specifications. This procedure will be made effective on all projects for which final inspection is made on and after June 1, 1960.

The provisions of this memorandum will be applicable to all Federal-aid projects except those being constructed under the 1954 Secondary Road Plan, for which projects, paragraph number 3 only will be applicable.

ELLIS L. ARMSTRONG  
Commissioner of Public Roads

UNITED STATES GOVERNMENT

U. S. Department of Commerce  
Bureau of Public Roads

MEMORANDUM

July 5, 1960

To: District and Area Engineers

From: N. E. MacDougall, Division Engineer, Lansing, Michigan

Subject: Instructional Memorandum 20-5-60 - Inspection, Sampling and Testing of Materials on Construction Projects

As the result of numerous discussions with Messrs. Laird and McLaughlin, some new procedures have been developed which will enable us to comply with the above memorandum without serious disruption of the State's sampling and testing procedures and without burdening you with an impossible task during the State's tremendously expanded program. Project engineers and field testing personnel are being issued new instructions which we hope will permit scheduling their field sampling and testing to conform with your inspections and thereby minimize extra sampling and testing.

Since the State has not finished rewriting their construction manual and since some sampling and testing procedures have changed, we have reviewed current procedures and are attaching a synopsis which may be of value in your field review of the control of materials. Also attached is a copy of Mr. McLaughlin's memorandum of February 10, 1955 describing the four different categories of laboratory reports.

Paragraph #1 of Instructional Memorandum 20-5-60

As noted in the attached synopsis, the State has taken steps to see that the project engineer's files will be complete regarding tests for materials being used. To facilitate our review of current test reports, project engineers will be requested to hold current test reports in a temporary file until reviewed by the Area Engineer.

Paragraph #2 of Instructional Memorandum 20-5-60

In addition to the reporting of thicknesses and other measurements, this paragraph requires sampling during our inspections and a test report on such samples from the laboratory. Unless job conditions indicate further sampling is advisable, samples of only major materials in the category of aggregates and bituminous mixes should be considered. This sampling should be coordinated with the job sampling by the State's aggregate, plant and pavement inspectors so that the State's regular sampling can, in many cases, serve our purpose by the preparation of an additional copy of the laboratory report. Field tests for embankment compaction, entrained air, aggregate gradation, bituminous extraction, concrete beams, etc. should also be observed as time permits and commented on in your reports.

-2-

Paragraph #3 of Instructional Memorandum 20-5-60

General - The requirement that record samples of the finished work in place be taken during or prior to the final inspection is interpreted to cover only pavement items. For concrete pavements, this will involve only the standard coring procedure, but for bituminous projects we have agreed that the record samples should come from the base to avoid cutting into the finished surface for samples which will be less representative of the bituminous mixture than the State's regular "day's run" samples. For the various types of projects, record samples will be taken about as follows:

Bridge projects with no approach work - The State's certification will state that record samples are not feasible and that none were taken.

Bridge and approach projects - Record samples will be taken on approaches.

Bituminous paving projects - Record samples will be taken from the new base or base widening. Concrete bases will be cored in the usual manner and record samples of aggregate bases will be taken during our inspection or under the direction of the District Materials Engineer if the start of bituminous work necessitates taking these samples prior to our inspection.

Concrete paving projects - State will notify us as early as possible of the date when coring will be started. Inspections should be arranged whenever feasible so that the coring operation may be observed.

FAS projects - The State District Materials Engineer or one of his assistants will arrange for the taking of record samples, the testing thereof, and submission of reports to the Bureau. These samples will be taken from the finished surface or base as noted above. When the FAS project is for bituminous surfacing only, the record samples will come from the base, whether constructed with Federal aid or without.

Testing of record samples will be performed at the Ann Arbor laboratory. This office will be notified by teletype each day of the record samples arrival at the laboratory. It is planned that an Area Engineer will visit the laboratory periodically to observe testing of samples from projects in his area and other areas. He will then report to other area engineers on the tests witnessed.

Record samples for previously completed projects which were given a final field inspection in June will involve a special problem. Please give Mr. Jones a list of these projects immediately in order that further arrangements may be made with the State.

## Synopsis of State Testing Procedures

General

Although, in previous seasons, the project engineers' files have not been complete in respect to test reports covering materials tested for several projects, steps have been taken to correct this condition for this construction season by making additional copies of these reports. The project files should include test reports for all materials tested specifically for the project and test certificates for materials such as cement, bituminous materials, culvert pipe, etc. shipped from tested stock. The latter materials are sampled at the producer's plant and, after testing, a card inventory is kept by the State showing the current quantity of tested stock at each producer's plant. Shipments from tested bituminous stocks are checked by the Chicago Testing Laboratory who notifies the project engineer and the Ann Arbor laboratory of the shipment. Likewise, cement shipments are checked at the plant by a representative of the State and reports sent to the project engineer and to the main office. The card inventory of tested material on hand at the producer's plant is maintained through these shipping reports. The project engineer does not generally have copy of the laboratory test report on materials from tested stock.

Commercial laboratories are hired to perform inspection and testing of structural steel but most other testing is performed in the Ann Arbor laboratory and in the field.

Aggregates

Aggregates for paving, structures, etc. are tested at the pit during production by an aggregate inspector and are further tested at the Ann Arbor laboratory during production by running a test once a week on a composite sample sent in by the aggregate inspector.

Prior to the start of production at a new pit the laboratory runs a physical test for abrasion and soundness on a bank run sample and if this test indicates the material is well within the specification and is checked as satisfactory by another sample of produced material no further tests are run unless a change in type of material is noted at the pit. If the preliminary test is close to specification limits, additional tests for abrasion and soundness are run each week by the laboratory on the composite weekly samples. Pits which are known to be sources of excellent materials are checked at least once a year for abrasion and soundness.

Procedures followed by the aggregate inspectors involve a sieve analysis and tests as required by Section 7:02 of the specifications, except abrasion and soundness. A sample for these tests is taken for each 150 tons produced. A portion of each sample is retained and sent into Ann Arbor once a week as a composite sample for the week's production. Test reports for both field testing and laboratory testing should be in the project engineer's files.

In addition to the above sampling and testing during production, check samples are occasionally taken from stockpiles at the plant on the project and are sent to the laboratory for complete tests.

Page 2: Synopsis of State Testing Procedure.

Bituminous Materials and Mixtures

Bituminous materials are sampled at the producer's plant and shipped with Chicago Testing Laboratory certificate that material comes from tested stock. At the contractor's plant, the material is again sampled each day from the asphalt bucket to guard against contamination in shipment and to provide a direct basis of comparison of daily tests for penetration and ductility of recovered asphalt against the original asphalt.

The bituminous plant inspector runs numerous extraction tests to check the percentage of asphalt in the mix and also runs gradation checks on sand and aggregates. Stone gradation is checked at the hot bin to check efficiency of screens so that prompt adjustments can be made in the mix if grading varies from specification limits.

The plant inspector also takes numerous small samples of the mixture from trucks throughout the day which are accumulated into a "day's run" sample for the laboratory at Ann Arbor. He also takes a sample of the asphalt from the bucket each day for testing at the laboratory.

On FAS projects, a county employee is generally trained to serve as plant inspector. He is assisted during the first day or so of paving by a travelling inspector from the Ann Arbor laboratory. The plant inspector does not generally perform any field extraction but prepares "day's run" samples for testing at the laboratory. He also performs calibration tests on the plant by comparing truckload weights against the weight of bituminous material used in the load.

Tests at the laboratory on field samples consist of an extraction test to determine asphalt content and a sieve analysis of the recovered aggregate. Asphalt cements extracted from the mixture are tested for penetration and ductility for comparison with tests on the field sample of asphalt cement for the same day's run.

Concrete

Aside from compression tests on pavement cores, laboratory tests in connection with concrete construction consists primarily of cement and aggregate tests. Other tests include reinforcing steel, curing compounds, joint material, etc. all of which should be covered by test reports or test certificates in the project engineer's files. Field tests include air checks, slump tests and test beams.

## OFFICE MEMORANDUM



MICHIGAN  
STATE HIGHWAY DEPARTMENT  
JOHN C. MACKIE, COMMISSIONER

COPY

May 3, 1960

To: Senior District Engineers  
District Road and Bridge Engineers  
Road and Bridge Project Engineers

From: C. B. Laird  
Chief Construction Engineer

Subject: Test Reports on Materials

Some time ago the Office of Testing and Research was advised that the Bureau of Public Roads Division Office would no longer require copies of test reports on materials used on federal aid construction projects.

As a result, transmittal of this information was discontinued and as a substitute measure a certification has been made upon completion of individual federal aid projects stating that the materials used conform to specification requirements.

New regulations issued by the Bureau of Public Roads require that, in addition to the certification regarding acceptability of materials, area engineers will be required to review reports on material tests when they are visiting federal aid projects.

To implement this procedure, projects engineers should maintain a separate file for material reports so that they may be readily available at the time the area engineers make periodical construction inspections.

Your cooperation will be appreciated.

C. B. Laird  
CHIEF CONSTRUCTION ENGINEER

CBL:fs

cc: N. E. MacDougall (15)  
Howard E. Hill  
John E. Meyer  
C. S. Lundberg  
P. A. Nordgren  
W. W. McLaughlin

## OFFICE MEMORANDUM



MICHIGAN  
STATE HIGHWAY DEPARTMENT  
JOHN C. MACKIE, COMMISSIONER

COPY

February 10, 1955

To: H. J. Rathfoot  
Construction Engineer

From: W. W. McLaughlin

Subject: Construction Division meeting February 1, 1955  
Questions on Laboratory Report No. 54B-493, Project  
F 2-1 05 R

Transmitted, herewith, is a copy of an interoffice communication from Ward K. Parr furnishing complete information about the recommendation made under "Remarks" by the Laboratory on the subject report. For your convenience, a copy of the laboratory report is also being sent.

The method of reporting laboratory test results is covered in the Construction Manual, and, inasmuch as no change has been made in our procedure since 1936, it is presumed that all field personnel are fully informed; however, in view of the misunderstanding under discussion, it would be timely to follow in detail the complete processing of reports through the Laboratory. Upon completion of the tests on a material the work sheets are referred to the Laboratory Office for checking and review. The reports fall in four categories - the first being those that cover materials which comply in all respects with the specification requirements. These are immediately released for typing and distribution. The report under "Remarks" will carry the word, "Approved." In cases where the results are urgently needed they are sent by wire or telephoned to the Project Engineer.

The second category covers reports on materials that essentially comply with the specifications but with some item outside of the limits. If the deviation is considered to be minor, the Laboratory, in concurrence with the Lansing Office, will approve the use of the material and the following note will appear under "Remarks" - "Recommended for use," and attention will be called to the deviation.

The third category covers reports on materials which fail to meet specification requirements by a wider margin than in second but warrant consideration for use under certain field conditions. These test results are referred to the Lansing office who, in turn, discuss them with the Construction, Bridge or Maintenance Division, as the case may be, and their recommendations are accepted and noted on the report. These are the cases where the judgment and experience of the men in charge of the work decide, first, if the job conditions warrant use of the material and, second, if it is to be used, whether or not any limitations will be required. These recommendations will be carried on the report under "Remarks."



COPY

H. J. Rathfoot

- 2 -

February 10, 1955

The fourth category covers reports on materials that definitely fail to meet the specification requirements and, after discussion with the Lansing office, are reported out under "Remarks" as "Rejected," with attention called to the reason or reasons. These results are also given to the Project Engineer by wire or telephone if the information is urgent.

While the procedure followed in reporting out the test results on the car of emulsion under discussion appears to me to be perfectly clear, apparently, such was not the case to others. If you have any recommendations to make concerning laboratory reporting which will clarify such cases for the Construction personnel, please advise. It is suggested that whenever information on laboratory reports appears obscure to men in the field that this office be notified as soon as possible.

W. W. McLaughlin  
Testing and Research Engineer

WWM:BI

cc: C. A. Weber  
J. A. Wills  
W. K. Parr

MICHIGAN STATE HIGHWAY DEPARTMENT  
OFFICE OF TESTING AND RESEARCH  
TESTING LABORATORY DIVISION  
Ann Arbor, Michigan

Form 1911

**TESTED AND ACCEPTED CEMENT**

The cement shipment identified below is from tested stock approved for State Highway use.

Date of shipment \_\_\_\_\_ Brand \_\_\_\_\_

Consigned to \_\_\_\_\_

Destination \_\_\_\_\_

Proj. No. \_\_\_\_\_

Car Number or  
Truckload No. \_\_\_\_\_ Seal No's \_\_\_\_\_

No. of barrels \_\_\_\_\_ Bin or Silo No. \_\_\_\_\_

Signed by \_\_\_\_\_

Sampler



**MICHIGAN STATE HIGHWAY DEPARTMENT  
OFFICE OF TESTING AND RESEARCH**

 Form 1923  
Rev. 11/59

Lansing, Michigan

**SAMPLE IDENTIFICATION**

Project No. \_\_\_\_\_

Pur. Order No. \_\_\_\_\_

Date Sampled \_\_\_\_\_

Lab. No. \_\_\_\_\_ Date Rec'd. \_\_\_\_\_

Name of Material \_\_\_\_\_

Source \_\_\_\_\_ Manufacturer \_\_\_\_\_

Address \_\_\_\_\_ Address \_\_\_\_\_

Sampled from \_\_\_\_\_ Pit Name &amp; No. \_\_\_\_\_

Give car number and initial, if rail shipment. If sampled at pit, give ¼ section, section, town line and range or pit number.

Quantity of Material Represented by Sample \_\_\_\_\_

Consigned to: \_\_\_\_\_

If sampled at source, state to whom and where material is to be shipped.

Sampled by \_\_\_\_\_

Name Title

Submitted by \_\_\_\_\_

Name Title Address

Intended Use \_\_\_\_\_

Specification \_\_\_\_\_ Sender's Identification \_\_\_\_\_

Remarks \_\_\_\_\_ County \_\_\_\_\_

Consign Samples to State Highway Laboratory 1224 E. Engr. Bldg., Ann Arbor, Michigan.

**NOTE: PLEASE OBSERVE SAMPLING INSTRUCTIONS ON REVERSE SIDE**

Form 1923R

**INSTRUCTIONS FOR SELECTING AND SHIPPING SAMPLES**

The following instructions will apply unless otherwise specified:

1. Samples should be selected with care and should be representative of the material sampled.
2. Pack to withstand rough shipment. Mark pipe and tile conspicuously "Handle with care. Fragile."
3. Place this sheet in the accompanying tag envelope, which should be securely attached to the container in which the sample is shipped. Also, inclose duplicate identification sheet inside wrapping, or if shipped in cloth sack, inside the sack.
4. When immediate report is not required, ship samples by freight.
5. Cloth bags, screw top cans and friction top cans may be obtained from the Laboratory.

**SIZE AND NUMBER OF SAMPLES REQUIRED AND TYPE OF CONTAINERS**

**PORTLAND CEMENT AND MINERAL FILLER**—8 to 12 lb. A composite sample is obtained by taking a portion from one sack in every forty and should be representative of 500 bbl., or less. Ship in closely woven bag, can or tight box.

**SAND**—40 to 60 lb. A sample should represent not more than 100 cu. yd. Use a closely woven bag, or tight box. Do not use sacks which have contained sugar, grain, or other organic matter.

**GRAVEL OR CRUSHED STONE**—80 to 100 lb. A sample should represent not more than 100 cu. yd. Use a closely woven bag or tight box. For abrasion, sample must be all retained on a No. 4 sieve.

**WATER**—One quart. A sample should be sent in from each source to be used in concrete. Ship in screw top can.

**REINFORCING STEEL**—Two pieces 27 in. long of each size from each consignment of 10 tons or less. For mesh reinforcement, two samples 30" x 30", with each gauge wire represented, from each carload or its equivalent.

**PIPE AND TILE**—Reinforced Concrete Culvert and Sewer Pipe—one per cent of each size. Nonreinforced Concrete Culvert and Sewer Pipe—one per cent of each size but not less than 2 pieces. Vitrified Clay Culvert and Sewer Pipe—one per cent of each size, but not less than 2 pieces. Drain tile (Concrete and Vitrified Clay)—one per cent of each size, but not less than 5 pieces.

**CORRUGATED METAL PIPE**—Three pieces approximately 6 in. square from each 20 culverts of each heat and gauge number of each size. Ship in small cloth sack or box.

**ASPHALT AND TAR**—One quart. A sample should represent one carload, or in case of barrel shipment, the consignment. If material is a solid, clean surface thoroughly before selecting sample. Ship liquids in screw top cans and solids in friction top cans. Cans must be clean and dry.

**ASPHALT EMULSION**—One gallon for each carload and two quarts from each barrel shipment. Ship in glass container, properly packed.

**BITUMINOUS PAVEMENT SAMPLES**—If taken from the loose mixture, about 10 lb. Samples should represent the day's run. If taken from the rolled pavement, approximately 12 in. square. Ship in well wrapped package.

**GUARD RAIL CABLE**—One sample at least 4 ft. long from each 1000 ft. or less.

**PREMOLED JOINT FILLER**—For pavements, one sample 2 ft. long and full depth of joint from each consignment. For Structures—One square foot of material, sample to be at least 5 inches wide.

**PAVING BRICK**—10 bricks from each 15,000 or less.

**MASONRY BRICK**—10 bricks from each 50,000 or less.

**PAINT AND LACQUER**—One pint sample from each consignment. Mix paint thoroughly before sampling.

**CALCIUM CHLORIDE**—One quart in air-tight Mason jar for each shipment.

## STATE OF MICHIGAN



## HIGHWAY DEPARTMENT

STEVENS T. MASON BUILDING

LANSING 26

JOHN C. MACKIE • COMMISSIONER

HOWARD E. HILL  
MANAGING  
DIRECTORJOHN E. MEYER  
DIRECTOR  
FOR ENGINEERINGFREDERICK E. TRIPP  
DIRECTOR  
FOR ADMINISTRATION

Mr. N. E. MacDougall  
Division Engineer  
Bureau of Public Roads  
P. O. Box 147  
Lansing, Michigan

Dear Mr. MacDougall:

This is to certify that all of the materials used on the above project met pertinent specification requirements of the contract. All of the materials, except those listed on the back hereof, were properly covered by samples tested and accepted by the State Highway Testing Laboratory or an associate laboratory. The items listed on the back of this certification, which received less than the State's usual requirements for sampling and testing, were accepted under the conditions noted.

Tests of the record samples indicate conformity with the plans and specifications; these record samples are reasonably representative of the materials incorporated in the project as shown by our regular sampling and testing program.

Test reports covering materials used on the project are on file in the Office of Testing and Research, Lansing, Michigan.

Disposition of test results on record samples taken is as indicated:

Attached

Previously submitted

Very truly yours,

OFFICE OF TESTING AND RESEARCH

W. W. McLaughlin  
Testing and Research Engineer



## ADVISORY BOARD

J. CARL McMONAGLE  
EAST LANSINGSTACEY DeCAMP  
FLINTJ. PAUL SMITH  
BIRMINGHAMGEORGE N. HIGGINS  
FERNDALEE. J. EAGEN  
MENOMINEE

## STATE OF MICHIGAN



## HIGHWAY DEPARTMENT

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DIRECTOR  
FOR ADMINISTRATION

Mr. N. E. MacDougall  
Division Engineer  
Bureau of Public Roads  
P. O. Box 147  
Lansing, Michigan

Dear Mr. MacDougall:

This is to certify that all of the materials used on the above project met pertinent specification requirements of the contract. Testing was done either by the Michigan State Highway Department or an associate laboratory.

Tests of the record samples indicate conformity with the plans and specifications; these record samples are reasonably representative of the materials incorporated in the project as shown by our regular sampling and testing program.

Test reports covering materials used on the project are on file in the Office of Testing and Research, Lansing, Michigan.

Disposition of test results on record samples taken is as indicated:

Attached  Previously submitted

Very truly yours,

OFFICE OF TESTING AND RESEARCH

W. W. McLaughlin  
Testing and Research Engineer



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EAST LANSING

STACEY DeCAMP  
FLINT

J. PAUL SMITH  
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FERNDALE

E. J. EAGEN  
MENOMINEE

CONTRACTOR \_\_\_\_\_

MICHIGAN  
STATE HIGHWAY DEPARTMENT  
OFFICE OF TESTING AND RESEARCH

PROJECT \_\_\_\_\_

RECORD SAMPLES -  
PREVIOUSLY SENT \_\_\_\_\_

F. A. NUMBER \_\_\_\_\_

NOT REQUIRED \_\_\_\_\_

CONTRACT DATE \_\_\_\_\_

ATTACHED \_\_\_\_\_

COMPLETION DATE \_\_\_\_\_

OTHER \_\_\_\_\_

FINAL MATERIAL REPORT

MATERIAL	QUANTITY	NO. OF TESTS REQUIRED	NO. OF TESTS MADE	SOURCES OF MATERIALS
CEMENT				
FINE AGGREGATE				
COARSE AGGREGATE				
BAR REINFORCEMENT				
MESH REINFORCEMENT				
CULVERT A				
CULVERT B				
SEWER PIPE				
CORR. METAL PIPE				
STEEL BEAM GUARD RAIL				
FENCING MATERIALS				
JOINT MATERIAL				
HOT-POURED RUBBER ASP. FILLER				
JOINT WATERPROOFING				
AGGREGATE APPROACHES				
AGGREGATE BASE COURSE				
BITUMINOUS PRIME COAT				
BITUMINOUS BOND COAT				
POROUS MATERIAL GRADE A				
POROUS MATERIAL GRADE B				
BIT. CONC. WEAR. CRS.				
BIT. CONC. LEVEL. CRS.				
BIT. BINDER CRS.				
BIT. AGG. SURF. 4.11				
ASPHALT CEMENT				
SEEDING				

REMARKS:

-57-

TESTING LABORATORY DIVISION  
CHARGES FOR LABORATORY TESTS  
Effective April 1, 1961

Name of Test	Charge
<b>AGGREGATE LABORATORY</b>	
1A Mechanical Analysis of Aggregate	\$12.00
2A Abrasion Determination - Deval or Los Angeles	15.00
3A Soundness Determination - Fine or Coarse Aggregates	20.00
4A Absorption and Specific Gravity of Aggregates	7.00
5A Fine Aggregates - MA, Organic, Mortar Strength	15.00
6A Drain Tile	9.00
7A Sewer Pipe	9.00
8A Reinforced Concrete Pipe - Complete	18.00
9A Absorption Only - Pipe or Tile	5.00
10A Bar Mat or Wire Mesh Reinforcement	15.00
11A Steel Reinforcing Bars	5.00
12A Fence Posts - Complete	30.00
13A Fence Posts - Weight and Measurement Only	15.00
14A Fence and R. O. W. Wire, Including Spelter Coat Test	15.00
15A Wire Cable Guard Rail, Including Spelter Coat Test	28.00
16A Uncoated Stress-Relieved Prestressing Wire Strand (ASTM A 416)	30.00
17A Weld Specimen - Steel (Welder Qualification Test)	35.00
18A Weld Specimen - Aluminum (Welder Qualification Test)	65.00
19A Steel Beam Guard Rail - Complete with Spelter Coat Test	90.00
20A Steel Beam Guard Rail - Complete except for Splice Test	50.00
21A Steel Beam Guard Rail Posts - Without Spelter Coat Test	10.00
22A Grader Blade Cutting Edges	20.00
23A Brick (5) Complete - Absorption, Measurement, Compression	20.00
24A Concrete Block	4.00
25A Structural Tile (5) - Measurement and Absorption	12.00
26A Concrete Cores - Pavement, Reinforced Concrete Pipe, etc.	5.00
27A Concrete Cylinders Made and Tested in Laboratory	7.00
28A Concrete Cylinders - Compression Test Only	3.50
29A Concrete Beams Made in Laboratory	10.00
30A Concrete Beams - Flexural Test Only	5.00
31A Concrete Beams - Compression Test Only	6.00
32A Aggregate Freeze-Thaw Durability	200.00
33A Joint Dowel Hook Bolts	15.00



## APPENDIX E

## BITUMINOUS LABORATORY

1B	Asphaltic Oil	20.00
2B	Creosote Oil and Tar	15.00
3B	Fuel Oil	40.00
4B	Lubricating Oil	30.00
5B	Cold Tar Pitch	30.00
6B	Asphalt Cement - Complete	15.00
7B	Asphalt Cement - Penetration and Ductility	7.00
8B	Asphalt Cement - Penetration Only	4.00
9B	Asphalt Emulsion - Complete	28.00
10B	Bituminous Mixtures - Complete	44.00
11B	Bituminous Mixtures - MA and Bitumen Content	12.00
12B	Bituminous Mixture Design	35.00
13B	Bituminous Mixtures - Density and Void Determination	12.00
14B	Asphalt Recovery Including Penetration and Ductility	32.00
15B	Bituminous Material - Viscosity Only	3.00
16B	Bituminous Concrete Briquets Made and Tested	18.00
17B	Marshall and Sheet Asphalt Cores Made and Tested	18.00
18B	Mineral Filler - Gradation Only	4.00
19B	Asphalt Mastic (Mastic Cake)	20.00
20B	Asphalt Plank	35.00
21B	Joint Filler - Premolded Bituminous, Cork, or Fiber	15.00
22B	Joint Sealer - Hot Poured or Cold Applied	30.00
23B	Pipe Joint Sealer - Cold Applied	15.00
24B	Wiping Cloths	5.00
25B	Trichloroethylene Complete	30.00
26B	Trichloroethylene Partial	15.00
27B	Stripping Test for Bituminous Mixtures	5.00
28B	Distillation Only on Asphalt Emulsions	10.00
29B	Black Pavement Marking Paint	30.00

## CEMENT LABORATORY

1C	Cement - Physical Tests - Single Samples	15.00
2C	Cement - Air Content Check	5.00
3C	Cement - Inspection and Testing (Per Barrel)	0.04

## CHEMICAL LABORATORY

1CH	Paint - Complete Analysis - Spec. 1A, 2A, AV3 Varnish	45.00
2CH	Paint - Complete Analysis - All Other Spec.	60.00
3CH	Paint - Complete Physical Analysis	30.00
4CH	Paint - Pigment, Vehicle, Weight per Gallon, and Drying Time	20.00
5CH	Paint - Weight per Gallon and Drying Time	7.00
6CH	Varnish - Complete Analysis, 16A, 16B	25.00
7CH	Varnish - Partial Analysis	20.00

8CH	Thinner and Paint Solvent	20.00
9CH	Aluminum Paste	20.00
10CH	Cement - Chemical Analysis	50.00
11CH	Chloride Brine (Calcium and Sodium)	45.00
12CH	Chloride Solids - Flake or Pellet (Calcium and Sodium)	10.00
13CH	Concrete Curing Compound	30.00
14CH	Corrugated Galvanized Metal	8.00
15CH	Spelter Coat Test for Other Than Corrugated Metal	25.00
16CH	Sheet Copper - Weight and Gauge	4.00
17CH	Water for Concrete Mixing	15.00
18CH	Waterproofing Fabric, Felt, or Fiberglass	20.00
CONCRETE MIX DESIGN		
1MV	Concrete Proportioning Charts - Original	30.00
2MV	Concrete Proportioning Charts - Duplicate	10.00
SOILS LABORATORY		
1S	Mechanical Analysis of Soil	12.00
2S	Plasticity Index (Liquid Limit)	8.00
3S	Specific Gravity - Soil	7.00
4S	Shrinkage Limit (Shrinkage Ratio)	5.00
5S	Permeability Coefficient - Cohesive Soils	25.00
6S	Permeability Coefficient - Granular Soils	15.00
7S	Capillary Rise	10.00
8S	Compaction and Density of Soils	25.00
9S	Cone Density	7.00
10S	Vibrated Density	7.00
11S	Field Moisture Equivalent	7.00
12S	Centrifuge Moisture Equivalent	15.00
13S	California Bearing Ratio	30.00
14S	Mineral Filler - Water Preferential and Swell Test	20.00
15S	Mineral Filler - Water Preferential Test Only	10.00
16S	Mineral Filler - Sub-Sieve Particle Size Determination	12.00
17S	Loss on Ignition	5.00
18S	Organic Content Determination	10.00
19S	Transverse Shear Test	10.00
20S	Unconfined Compression Test	2.00
21S	Volumetric Analysis (Natural Density and Natural Moisture)	4.00
22S	Shear Analysis Charts	9.00
X	Miscellaneous	Variable

(Approved in office memorandum from Mr. A. H. Lawrence to  
Mr. W. W. McLaughlin dated March 28, 1961.)

SURFACING AGGREGATE CASE  
Standard Equipment  
1963

1	1" Square hole plate sieve, 10 in. diam., full height	\$10.45
1	3/4" Square hole plate sieve, 10 in. diam., full height	10.45
1	3/8" Square hold plate sieve, 10 in. diam., full height	10.45
1	No. 4 Woven wire cloth sieve, 10 in. diam.	12.90
1	No. 10 Woven wire cloth sieve, 10 in. diam.	12.90
1	No. 40 Woven wire cloth sieve, 10 in. diam.	12.90
1	Bottom Pan	6.90
1	Counter Brush	1.53
3	Wash Pans, 12" x 7 3/4" x 4 1/4" @ \$2.15	6.45
1	Two-burner Gasoline Stove	9.67
1	Robervahl Balance, 9" pans	64.50
1	Set of Weights, 1-gm. to 1-kg. with box	10.73
1	Extra Kg. Weight	3.50
1	Scoop	1.00
1	Spoon, large, stainless steel	0.55
1	Sampling Bucket	8.25
10	Sample sacks, large, 17" x 26" @ 0.55	5.50
5	Sample sacks, small @ 0.22	1.10
1	Mason Trowel, 10"	2.75
1	Gasoline Can, 1 gal. cap.	0.90
1	First Aid Kit	0.98
1	Stencil Brush	0.70
1	Pair of Goggles	1.10

TESTING LABORATORY DIVISION  
ANN ARBOR, MICHIGAN

Tested Stock Unit Charges

Asphalt Cement (60-70, 85-100, 150-175)	.001 per gallon
Asphalt Cement & Asphaltic Oil (A. C. WOA, A. O. RC-1, RC-2)	.02 per gallon
Asphaltic Oil (MC-0; SC, RC-4, MC-1, MC-2, MC-3)	.001 per gallon
Asphalt Emulsion AE-3A, AE-2, AE-1M, AE-1P, SS-1S	.002 per gallon
Bituminized & Fiberglass Fabric	.30 per roll
Concrete Curing Compound	.025 per gallon 1.25 per drum
Paint	.10 per gallon
Joint Filler (Hot-Poured)	.25 per sack or pail
(Cold-Applied)	.01 per pound
(Cold-Applied)	.50 per drum
Tar	.001 per gallon

U. S. DEPARTMENT OF COMMERCE Bureau of Public Roads	POLICY AND PROCEDURE MEMORANDUM 20-6.1 Date of issuance: January 29, 1962
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## PROGRAM AND PROJECT PROCEDURES

Subject: Inspection of Construction Projects (Exclusive of Sampling and Testing)

Supersedes: PPM 20-b, dated May 21, 1956, and Amendment 20-b(1) dated May 15, 1957

## 1. PURPOSE

The purpose of this memorandum is to prescribe the policies and procedures relating to inspections of Federal-aid highway construction projects and projects under the direct supervision of the Bureau of Public Roads, and to the preparation and submission of reports pertaining thereto.

## 2. DEFINITION

For the purposes of this memorandum, the word "project" means the several phases of work in active construction status on a section of a designated highway route as a single stage of construction. All such work may be included under a single contract or individual phases of the work may be under separate contracts that are in progress more or less simultaneously. It does not include separate stages of construction that are undertaken successively within the same project limits. The same definition applies when part or all of the work is performed on a force account basis by a public agency, public utility or railroad company, or other such organization.

## 3. OBJECTIVE OF INSPECTION

a. The principal objective of construction inspection by Public Roads engineers is to ascertain whether or not the construction is being performed in full conformity with the approved plans and specifications and if not, to arrange for the necessary remedial action to be taken. The inspection should cover the quality of materials and workmanship, conformity with dimensional requirements, need for changes or extra work not included in the original contract, adequacy of supervision, inspection and other controls, progress of the work, conditions justifying time extensions or price adjustments, compliance with labor provisions, adequacy of safety measures, adequacy of quantity and payment controls, new or improved methods and equipment, experimental construction, and other features of importance or interest. The inspecting engineer should also analyze the project carefully at the time of his inspections to ascertain whether there is indication that certain changes in design or construction practices should be made for future projects to provide a highway that will (1) better serve traffic needs, (2) be of higher quality, (3) cost less to construct and maintain without adversely affecting the quality

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of the work, or (4) eliminate or reduce delays and hazards in performing the construction. To the maximum extent feasible within the limitations of time that can be devoted to the work, the inspections should be made with sufficient frequency and thoroughness to assure that these objectives are accomplished.

b. With respect to the final inspection, the principal objective is to determine whether the construction has been completed in accordance with the approved plans and specifications including approved changes and extra work, and is acceptable to Public Roads for Federal participation in the cost in accordance with the terms of the project agreement and modifications thereof.

#### 4. FREQUENCY OF INSPECTIONS

a. Highway construction projects involving Federal funds administered by Public Roads and highway projects constructed under Public Roads supervision for another Federal agency are to be inspected by Public Roads engineers in accordance with the following schedule:

(1) Projects constructed under the Secondary Road Plan are to be given a final inspection only which is to be in accordance with the provisions of PPM 20-5 and PPM 20-6.2.

(2) All other projects constructed under State supervision and involving Federal funds require initial and final inspections, supplemented by such additional inspections as may be desirable in accordance with the provisions of paragraph 4b.

(3) Projects constructed under direct Public Roads supervision should be inspected once during each month of active construction status including initial and final inspections, supplemented by such additional inspections as may be desirable to adequately cover job conditions and maintain administrative control of the work.

b. It is the responsibility of the division engineer to determine the number and timing of construction inspections to be made on each project of the classes covered in paragraphs 4a(2) and (3) in addition to the specified minimum. Sufficient inspections shall be made, however, so that the division office will be kept informed regarding the progress and quality of the work and the pertinent job conditions. Projects involving major structures, tunnels, urban conditions, unusual types of construction, experimental features, complex or unusually difficult engineering or construction problems, or conditions that may or do develop into controversy, major changes or important extra work will require inspections once a month and in some cases more often. In general, all Interstate construction projects will require inspection at least once each month in which any substantial amount of construction work is performed.

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## 5. BY WHOM INSPECTIONS ARE TO BE MADE

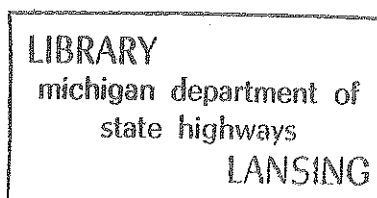
The prescribed inspections are to be made as a rule by the area engineer in whose assigned area the project is located. When necessary because of emergency conditions, to balance workloads, or for other reasons, arrangements may be made for other area engineers to inspect the projects. Additional inspections by the division bridge engineer should be made whenever important matters relating to the construction of structures are encountered. Occasionally inspections should be made by the district or division engineer or by engineers from the regional or Washington office.

## 6. PARTICIPATION BY OTHER AGENCIES

a. Inasmuch as the area engineer cannot ordinarily make sufficiently frequent inspections of projects under State supervision to have a personal knowledge of all details, he must of necessity rely to some extent upon the State engineers for information regarding accomplishments on the project, problems that arise and their solutions, quality and quantity control of the construction, and other items of importance that transpire in the interims between his inspections. It is therefore essential that he develop strong cooperative working relations and a high degree of mutual confidence and respect with the State engineers supervising the project. The area engineer should arrange to be accompanied on his inspections by the resident engineer, project engineer, or other appropriate engineer designated by the State who is sufficiently familiar with the project to furnish desired information concerning it and who has sufficient authority to make decisions and take action on matters that are found to need attention. Such authority to make decisions and take action would not necessarily extend to unusually difficult or controversial problems that should be given consideration at higher levels. When an engineer of the State highway department is unable to accompany the area engineer on his inspection, or when it is found that the State's representative cannot spend as much time on a joint inspection as the area engineer desires to devote to it, the area engineer should make part or all of his inspection unaccompanied.

b. When inspecting a project being constructed under direct Public Roads supervision, the area engineer should arrange for the project engineer to be present during the inspection, whenever feasible.

c. When the project is being constructed under the supervision of another agency such as a county or city, the Bureau of Indian Affairs, or the Corps of Engineers, or when the project is being constructed under State or Public Roads supervision but another Federal agency, a county or city, or a railroad or public utility company, has a financial or other interest in the project, arrangements should be made for its representatives to be present during and participate in inspections to whatever extent may be appropriate.



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## 7. INSPECTION COVERAGE

a. The inspection should cover all phases of the work involved in the project regardless of whether the work is performed under one overall contract, under separate contracts for various phases of stage construction, under specialty contracts or subcontracts for certain items, or by utility, railroad or State forces. Unusual features such as building demolition, utility adjustments, railroad protective devices, landscaping, lighting, and signs, should be given special attention. Inspection should also be made as to the adequacy of provisions for safety and for handling traffic.

b. When making his inspection, the area engineer, in addition to inspecting the materials and workmanship, should review the adequacy of project records with respect to such items as:

(1) Documentation of dimensional checks made by project personnel and others.

(2) Documentation of quantities and qualities of materials delivered and used or rejected and of construction work performed.

(3) Methods and frequency of checks on accuracy of scales for weighing materials and on calibration of other measuring devices for controlling quantities used and determination of pay quantities.

(4) Adequacy of field notes and diaries.

## 8. SAMPLING AND TESTING

Sampling and testing of materials and construction are to be accomplished in accordance with the provisions of PPM 20-6.2.

## 9. DIMENSIONAL CHECKS

The area engineer is to take dimensional measurements of work in progress and of completed work, if any, on a spot check or random basis. The measurements are to be made by the inspecting engineer personally with assistance of project personnel or accompanying engineers if needed. Some measurements should be made at the time of each inspection unless the work has not advanced sufficiently to produce any element to be measured. It is intended that during the period the project is under construction sufficient measurements will be made to spot check the dimensions of all important construction features that are susceptible to measurement including but not necessarily limited to: (1) depth of layers of embankment being compacted; (2) the width and thickness of stabilized subgrades, subbases, bases and surface courses; (3) dimensions of shoulders, medians and curbs; (4) sizes of representative pipe and box culverts; and (5) dimensions of major structures. The location and nature of each measurement made and the results thereof are to be recorded in the construction inspection reports.



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#### 10. COMPLIANCE WITH LABOR PROVISIONS

The area engineer is to fulfill his obligations with respect to compliance with labor provisions of the contract as prescribed in PPM 20-10.1 for Interstate projects and as prescribed in the applicable standard specifications for projects under direct Public Roads supervision.

#### 11. SUBCONTRACTING AND ASSIGNING

A check should be made at each inspection as to whether there has been any violation of Section 1.21(a) of the Federal-aid regulations which requires that at least 50 percent of the construction, exclusive of specialty items, be performed by the contractor to whom the contract was awarded. A similar check should be made for compliance with the subcontracting limitations contained in standard specifications applicable to projects under direct supervision of Public Roads.

#### 12. CHANGES AND EXTRA WORK

The need for changes or extra work to satisfactorily complete the construction should be investigated at each inspection and in so far as possible agreement should be reached at the time as to what, if any, changes are to be made or extra work authorized, and as to the basis of payment therefor. In the case of major changes or major extra work, approval of appropriate higher authorities will, of course, be necessary. Full explanation of the changes and extra work is to be given in the construction inspection report.

#### 13. PROGRESS OF CONSTRUCTION

The progress of the construction as compared to the percentage of contract time consumed should be analyzed and investigation made as to the causes of delays if the work is behind schedule and as to the justification for time extensions if any have been either granted or proposed. The progress should generally be rated as unsatisfactory when the percent of contract time elapsed is substantially greater than the percent of work completed on a dollar value basis. If it appears, however, that adequate time extensions may be justified, or if the contractor is engaged in certain necessary activities that are time-consuming but relatively unproductive of completed construction, or if the work is being performed with due diligence and there is reason to consider that the work will soon be brought up to schedule, then the situation should be described but the progress should not be reported as unsatisfactory.

#### 14. QUALITY OF WORK

If any unsatisfactory or questionable material or workmanship is evident or suspected, thorough investigation should be made and, if possible, the causes should be ascertained. Agreement should also be reached as to remedial measures that should be taken. Whether or not the quality of work for the project as a whole should be rated as satisfactory or unsatisfactory will depend upon the nature and extent of the unsatisfactory conditions and the expected effectiveness of corrective action.

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#### 15. INSPECTION-IN-DEPTH

It is recognized that because of manpower and time limitations, it will not be possible to make thorough inspections of all active projects at frequent intervals. From time to time, however, the division engineer, after consultation with the district and area engineers, should designate a number of representative projects upon which comprehensive, thorough, complete, and detailed inspections and analyses of all aspects of the engineering and construction are to be made. The primary purpose of such inspections-in-depth and analyses of the findings is to provide a continuing basis for evaluating the accuracy, adequacy, and effectiveness of all procedures, methods, controls, and operations used by the contractor and the engineer to assure performance of high quality construction, accurate determination of quantities upon which payment is to be made, and correct payment in accordance with the contract provisions. The findings on such inspections should disclose any need for better controls, better supervision, and improvements in specifications and procedures on these particular projects or generally on all projects. If any such need is found, appropriate remedial action should be initiated.

#### 16. PROMPTNESS AND THOROUGHNESS OF FINAL INSPECTION

Final inspection by the appropriate representatives of the State, Public Roads, and other interested agencies should be made as soon after physical completion of the project as reasonably possible. The final inspection must be sufficiently thorough so that the area engineer can assure himself that all phases of the work have been completed in substantial conformity with the plans and specifications. If any deviations or deficiencies are found, their extent and effect and the reasons therefor should be thoroughly investigated and reported with recommendations for remedial action. The amount of work and time required for the final inspection will vary according to the nature of the project but will also be determined quite largely by the frequency and thoroughness of previous inspections. If the area engineer has kept in close touch with all phases of the work as they progressed and, to the maximum extent feasible, has disposed of all problems at the time they arose, the final inspection should require little time. At the time of the final inspection, the area engineer must to the maximum extent practicable, obtain all information not previously obtained that is necessary to document the records and close out the project. This will include agreement on items that have previously been unsettled, agreement on allowable time extensions and justification for overruns and deviations from plans.

#### 17. INSPECTION REPORTS

a. Inspection reports numbered in sequence for each project should be prepared for each inspection made in conformity with paragraph 3. All initial reports are to be prepared on Form PR-33A(1), (see Attachment 1). Intermediate

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and final reports are to be prepared on Form PR-33A, (see Attachment 2) except that the final and only report for projects constructed under the Secondary Road Plan is to be prepared on Form PR-33C. (see PPM 20-5.) The information to be contained in the reports, as herein provided, is the minimum required. The division or regional offices may require the inclusion of such additional information as they consider essential for their purposes.

b. Single copies of reports of all inspections made on projects under direct Public Roads supervision should be sent to the regional and Washington offices, except that for park projects, an additional copy should be submitted to Washington. For all other projects, the regional and Washington offices are to be sent single copies of all initial and final inspection reports and of all intermediate inspection reports on: (1) all Interstate projects; (2) primary Federal-aid projects for which the contract amount is more than about \$500,000; and (3) projects involving tunnels or bridges costing more than about \$750,000. Single copies should also be furnished the regional and Washington offices of all reports on inspections in depth and of each intermediate inspection report that contains information of special interest in connection with items such as those listed in paragraph 19.

c. Inspection reports prepared for projects on which more than one contract is under construction simultaneously within its limits, or for contracts covering more than one project, may report the project or contract on one inspection report with such additional copies submitted as may be required to provide one for each project.

d. When Federal-aid projects involving multiple simultaneous contracts, or contracts involving multiple projects, are reported, the whole only, whether it be project or contract, should be reported in the blocks provided on Form PR-33A and any breakdown or segregation of projects or contracts involved should be shown under remarks, except as provided in paragraph 21d when individual portions of a multi-contract project or a multi-project contract are accepted separately. For projects under direct supervision of Public Roads, a separate report is to be submitted for each contract.

e. The division engineer should furnish copies of inspection reports to the State and other cooperating agencies to whatever extent is mutually agreed upon as being desirable, except as provided in paragraph 17f.

f. Items or situations may arise from time to time that should be reported but the discussion would not be appropriate for inclusion in reports to be given general distribution within either the Bureau of Public Roads or the State highway department. Such items or situations should be omitted from reports for general distribution and be covered in separate reports for consideration by appropriate top level officials only. Some situations may be so delicate that they should be handled through oral discussions only. The same principles are applicable to reports on inspections-in-depth. In addition, however, it will generally be desirable in all but routine cases to discuss the findings of the inspection-in-depth with top level State people before the final draft of the report is prepared.

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## 18. INITIAL REPORTS

Each project whether for complete or stage construction, except when constructed under the Secondary Road Plan, is to be inspected and the initial inspection report is to be prepared as soon as practicable after active construction work commences. The initial report is to include the following information as a minimum:

(1) Project designation and name, State, county, city (if applicable), National Park or Forest (if applicable), and termini as related to features identifiable on a map (including stationing for Federal projects).

(2) Description of improvement including type of construction, code number, roadbed width, base and surfacing widths and thicknesses. The length and type of each major structure should be shown separately and if more than one code type is involved in the roadway portion, the length of each type should be shown separately.

(3) Name and headquarters address of each contractor and subcontractor, or in case of a force account job, the name of the constructing agency such as State, county, parish, etc. When more than one prime contractor or other constructing agency is involved in the construction of a project the code type of the portion to be constructed by each should be shown.

(4) Date of award or force account authority, amount of contract or force account agreement, date contract time started, date actual construction work started and time allowed for completion. When more than one contract or force account agreement is covered by the report, these data should be given for each as they become available.

(5) List of experimental features, if any.

(6) Such additional information as may be appropriate relative to existing and prospective equipment, materials, construction organization, job conditions, progress, and plans of operation. (For projects under the direct supervisor of Public Roads, the initial report shall contain a list of all construction equipment on the project.)

(7) General statements as to the actual and anticipated adequacy of engineering supervision of the construction.

## 19. INTERMEDIATE REPORTS

a. Reports of inspections made between the initial and final inspections need not contain information relative to project location, type, etc., in the heading of the report nor follow any set pattern, but should contain in addition to the status of the project, such of the types of information listed below as may be appropriate to mention at the time. It is not expected that each item will be commented upon in each report nor on every project:

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- (1) Factors adversely affecting progress of the work, such as lack of right-of-way or right-of-entry, delay in utility adjustments, shortages of labor, materials or equipment; strikes, changes in plans and/or specifications, poor management and unusually severe weather conditions.
  - (2) Unsatisfactory conditions encountered and remedial actions proposed or taken.
  - (3) Conditions that may necessitate changes or extra work or that may give rise to controversy or claims. The proposed methods of handling the situations and the proposed basis of payment or settlement should be described. Any indication on the part of the contractor of an intention to file a claim should be reported and the nature and purported basis for the claim should be explained.
  - (4) Inadequacy of plans, specifications and estimates with recommendation for improving them for future work of a similiar nature.
  - (5) Unusual or particularly difficult engineering, construction or traffic problems involved and their solution.
  - (6) Experimental features incorporated in the work with discussion of technical aspects, methods, anticipated comparative costs, conclusions reached, and other items of interest.
  - (7) New or unusual construction methods, equipment, or materials with their relative costs and effectiveness.
  - (8) Unusually lax or exceptionally effective safety precautionary measures with respect to protecting construction workmen, the traveling public and abutting property from injury or damage as a result of the construction operations.
  - (9) Right-of-way, public utility and public carrier problems.
  - (10) Adequacy of engineering supervision.
  - (11) Features recommended for special attention during the post-construction and maintenance periods.
  - (12) Quality of work produced.
  - (13) Degree of compliance of materials and construction methods with specifications, progressively during the construction period.
  - (14) Unusual overruns or underruns in quantities or time with explanations therefor.

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(15) Adequacy of provisions for movement of traffic as safely, expeditiously and conveniently as practicable either through or alongside the construction operations or around them by means of detours.

(16) Details relative to dimensional checks made as required by paragraph 9 of this PPM.

(17) Report of reviews made, of resulting findings, and of corrective actions taken when necessary in accordance with the provisions of paragraph 9 of PPM 20-6.2.

(18) Extent of subcontracting, including name of each subcontractor and the items covered, contract value and date of approval of each subcontract. The total percentage sublet to date should also be shown.

(19) Contract time elapsed, percent of work completed and time extensions granted, proposed or requested with recommendations and justification.

(20) Equipment brought on project or removed from project since previous report.

b. Developments with respect to problems or undesirable conditions discussed in one inspection report should be followed up in subsequent reports until their final solution or disposition.

c. When shutdown periods of long duration occur the date and reason for the shutdown and the estimated date operations will be resumed should be reported. When work is resumed the date should be promptly reported.

## 20. REPORT OF FINAL INSPECTION

A report covering the final inspection of the completed project is to be prepared immediately after the final inspection is made. It is to state that the physical construction of the project has been completed in substantial conformity with the approved plans and specifications subject to the findings resulting from record sampling and testing procedures. (See PPM 20-6.2) The report is also to contain as much of the information listed under paragraph 21 as is available at the time and should set forth any further work that must be performed or other conditions that must be met before the project will be ready for final acceptance. This report may be omitted whenever conditions are such that the final report described in paragraph 21 can be issued immediately after the final inspection is made.

## 21. FINAL REPORTS

a. A final report should be issued for each project as soon as all requirements have been met and the project is ready for final and unconditional acceptance. To avoid confusion with the report of final inspection described in paragraph 20 the printed title on the Form PR-33A(1) used for the final report should be stricken and the title "Final Report" inserted immediately above or below. The final report, except when the project has been constructed under the Secondary

Road Plan, should contain the following information unless it has been included in the report described in paragraph 20:

(1) A definite statement signed by the area engineer that the project has been completed in substantial conformity with the approved plans and specifications, including authorized changes and extra work, and that acceptance of the project is recommended. There may be an occasional instance in which it is determined to be in the public interest to accept a project despite some deviations from substantial conformity with respect to certain construction items. In such cases, a full explanation should be given in the report of (1) the nature and extent of such deviations, (2) the justification for acceptance, (3) the basis of settlement with the contractor, and (4) the extent of Federal participation and basis therefor.

(2) A statement of the date of physical completion of the work, of the total time consumed in completing the project, and of the total contract time allowed including extensions approved by Public Roads. The justification for approved time extensions is to be given unless it has been included in earlier reports or otherwise documented in the permanent project records in which case reference should be made to such documentation.

(3) For all projects, the final lengths, code types, widths and thicknesses should be shown if they vary from those given in the initial report.

(4) Such information relating to the items listed in paragraph 18 as may be pertinent and not previously reported.

(5) Explanation of large overruns or underruns in quantities.

(6) For Interstate projects and those covering work under Federal contracts, a statement that all contract requirements relative to wage rates, payroll submissions, and other labor provisions have been met.

(7) A statement that the PR-47 report has been submitted as required by PPM 20-2.

(8) A certificate that there is full compliance with those provisions of PPM 21-6.3 pertaining to encroachments on the right-of-way.

b. Final reports for projects involving cooperating agencies other than the State or Public Roads should include the date of acceptance by such agencies.

c. Final reports for projects constructed under the Secondary Road Plan are to be prepared on Form PR-33C and will in general be limited to the data indicated thereon but additional comments may be included when circumstances justify.

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January 29, 1962

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d. A copy of the certification required by paragraph 12 of PPM 20-6.2 is to be attached to the report.

e. In the case of multi-contract projects or multi-project contracts, a separate final report may be issued for any individual contract or project that has been completed ahead of the others, provided that such individual contract or project represents a separate and independent physical entity and provided the quantities can be segregated.

f. In addition to the statement required by paragraph 21a(1), the final report is to include a statement signed by the division engineer accepting the project for Public Roads.

## 22. SPECIAL REPORTS

Information relative to new types of equipment, new construction methods and devices, and new materials, is desired. These items should be described briefly in current inspection reports and if considered of sufficient importance they should be discussed more fully in supplemental special reports on Form PR-33 with appropriate photographs and sketches.

## 23. PHOTOGRAPHS

The submission of photographs to supplement construction inspection reports is desirable but they should in general be limited to those illustrating unusual, complex or particularly difficult types of construction, equipment or methods, conditions from which controversy might be expected to develop, experimental features, and other items of special interest.

## 24. RELATIONS WITH STATE

Public Roads engineers inspecting projects constructed under State supervision will not deal directly with the contractor or his employees, or with the State or local agency employees assigned to the project except as stated in paragraph 6a, and as necessary to conduct interviews with workmen in connection with wage rate compliance determinations, but will submit their comments and recommendations through the State engineers accompanying them on the inspections, or through the State district offices or other appropriate channels.

## 25. DOCUMENTING RECORDS

All important matters should be adequately but concisely documented in the project records. Matters to be documented will include but not be limited to: (1) unusual problems encountered and their solutions; (2) changes, extra work and time extensions and their justification; (3) unsatisfactory or questionable materials, workmanship or conditions encountered and corrective actions taken; (4) results of review of materials tests reports and of dimensional checks; (5) any situation that indicates noncompliance with the plans, specifications, contract provisions, or prescribed policies and procedures; and (6) any controversial matters.



F. C. Turner  
Assistant Federal Highway Administrator  
and Chief Engineer



Michigan

PFM 20-6.1, Attachment 1  
January 29, 1962

Form PR-33A(1) (1-59)		U. S. DEPARTMENT OF COMMERCE BUREAU OF PUBLIC ROADS						
<b>INITIAL AND FINAL CONSTRUCTION INSPECTION REPORT</b>								
Region No.	Report No.	County	State					
Date of inspection	Inspection made by		Project No.					
In company with								
Description of improvement								
Contractor name and address								
Award date	Contract amount	Time allowed	Time started	Work started				
Quality of work	Progress of work	Time elapsed	Work completed	Est. compl. end of month				
		%	%	%				
Roadbed (Width _____ Feet 0. to 0. of shoulders)			Structures over 20-foot span					
Type	Type code no.	Net length (Miles)	Base Surfacing			Type	Type code no.	Net length (Miles)
			Thickness		Width (Feet)			
			Edge (Inches)	Center (Inches)				
Remarks								

Form PR-33A (Rev. 5-60)		U. S. DEPARTMENT OF COMMERCE BUREAU OF PUBLIC ROADS			
<b>INTERMEDIATE CONSTRUCTION INSPECTION REPORT</b> <i>(PPM 20.6)</i>					
Region No.	Report No.	County		State	
Date of inspection	Inspection made by			Project No.	
In company with					
Quality of work	Progress of work	Time elapsed	%	Work completed	%
					%
Remarks: (1) Completed work; (2) Work in progress; (3) Comments and recommendations					

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U. S. DEPARTMENT OF COMMERCE      BUREAU OF PUBLIC ROADS  
**POLICY AND PROCEDURE MEMORANDUM**

March 14, 1962  
 20-6.1(1)

**INSPECTION OF CONSTRUCTION PROJECTS**  
 (Exclusive of Sampling and Testing)

Policy and Procedure Memorandum 20-6.1, dated January 29, 1962, is amended as follows:

Paragraph 15 is revised to read:

15.    **INSPECTION-IN-DEPTH**

It is recognized that because of manpower and time limitations, it will not be possible to make thorough inspections of all active projects at frequent intervals. From time to time, however, the division engineer, after consultation with the district and area engineers, should designate a number of representative projects upon which comprehensive, thorough, complete, and detailed inspections and analyses of \*the selected phase or phases\* of the construction and engineering are to be made. The primary purpose of such inspections-in-depth and analyses of the findings is to provide a continuing basis for evaluating the accuracy, adequacy, and effectiveness of procedures, methods, controls, and operations used by the contractor and the engineer to assure performance of high quality construction, accurate determination of quantities upon which payment is to be made, and correct payment in accordance with the contract provisions. The findings on such inspections should disclose any need for better controls, better supervision, and improvements in specifications and procedures on these particular projects or generally on all projects. If any such need is found, appropriate remedial action should be initiated.

Paragraph 17a is revised to read:

a.    Inspection reports numbered in sequence for each project should be prepared for each inspection made in conformity with paragraph 3. \*All initial and final reports are to be prepared on Form PR-33A(1), (see Attachment 1.) Intermediate reports are to be prepared on Form PR-33A, (see Attachment 2) except that the final and only report for projects constructed under the Secondary Road Plan is to be prepared on Form PR-33C (see

PPM 20-5.)\* The information to be contained in the reports, as herein provided, is the minimum required. The division or regional offices may require the inclusion of such additional information as they consider essential for their purposes.

Paragraph 21a(8) is revised to read:

(8) A statement that indicates there is full compliance with those provisions in paragraph 23 of PPM 21-6.3 pertaining to encroachments on the right-of-way.

Paragraph 21d is revised to read:

d. A statement indicating that the materials certificate required by paragraph 12 of PPM 20-6.2 is attached to the division copy of the final report.



F. C. Turner  
 Assistant Federal Highway Administrator  
 and Chief Engineer