

STATE OF MICHIGAN



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DEPARTMENT OF TRANSPORTATION

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March 1, 1991

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WILLIAM E. GEHMAN, DIRECTOR  
LH-0-1 (1/91)

NOTICE OF CHANGE

to

Holders of Bureau of Aeronautics  
Project Engineer's Manual  
and/or  
Construction Specifications and  
DBE Participation Proposals

Project Engineer's Manual

The sample acceptance certification on page 60 (Exhibit III, Appendix II) of the manual is hereby deleted and shall be replaced with the attached sample certification. This certificate shall be submitted at the end of all construction projects.

Proposals for Contracts Requiring DBE Participation

The consultant is asked to provide any information available concerning non-payment to subcontractors by the prime contractor and subcontract work on the project. That information should be put in the "Comment" section on the bottom of Form 146 as shown in the proposal.

The form should be forwarded to the Michigan Department of Transportation, Office of Small Business Liaison, P.O. Box 30050, Lansing, Michigan 48909.

Federal Requirements

The federal requirements, approved by the FAA on August 21, 1987, are hereby deleted in their entirety and shall be replaced with the attached federal requirements, dated January 25, 1991. These requirements will be included in all construction contracts beginning with the March 1991 bid opening.

General Provisions for Construction on Airports

Pages 22, 28 and 29 dated March 1, 1976, March 1, 1976, and March 1, 1979, respectively, are hereby deleted and shall be replaced with the attached pages 22, 28, 28A and 29 dated January 1, 1991, January 25, 1991, January 25, 1991, and January 1, 1991, respectively.

The change for page 22 begins with the second paragraph of Section 80-01 and continues through most of that section. The most significant change is that it allows the prime contractor to subcontract up to 60 percent of the work.

Page 28, regarding the process for documenting force account work on change order items for which no price could be agreed upon, was completely rewritten.

The change for page 29 begins with the third paragraph. Paragraphs four and five are new. These changes will alleviate delays in processing payments when contractors' consent of surety letters are delayed. Once a payment has been processed for more than 90 percent of the contract amount, the Department will send notice to the contractor of the need for the consent of surety and affidavit of liens. The payment will not be held, but a reduction in the retainage will not occur until the next payment is requested and the consent of surety is on file with the Department.

All of the changes to the General Provisions were made to make them more consistent with the Department's 1990 Standard Specifications for Construction of Highways. These changes will be incorporated in all construction contracts beginning with the March 1991 bid opening.

Sincerely,

*Wendell Proudfoot*  
for Oliver House, Administrator  
Airport Development Division  
BUREAU OF AERONAUTICS

Enclosures

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June 5, 1990

NOTICE OF CHANGE  
Bureau of Aeronautics  
Project Engineer's Manual

A recent audit, conducted by the Office of Inspector General throughout the country on Airport Construction Materials Conformance, revealed numerous deficiencies in the quality control testing and documentation. In an attempt to ensure improved adherence to quality control procedures, the FAA will be requiring certain additional documentation.

A Special Condition will be included in all FY-90 grant agreements which contain paving work estimated to be in excess of \$250,000. Paving work for the purposes of this program shall be interpreted as including the entire pavement section subgrade through surface course. The Special Condition requires the submission of a Construction Management Program prior to the start of construction and a final report at the completion of the project.

The Project Engineer's Manual dated July 1989 is hereby amended to include the enclosed attachment in appendix II. Consultants are reminded that their construction supervision contracts must include a clause indicating they will comply with the requirements of Bureau of Aeronautics Project Engineer's Manual as revised June 1990.



Richard Jackson, Acting Administrator  
Airport Development Division

(Attachment 5)

## CONSTRUCTION MANAGEMENT PROGRAM

On all contracts involving federal funds having paving work that costs in excess of \$250,000 the PE shall provide, in report form, the following information to AERO at the pre-construction meeting. (The \$250,000 shall apply to the entire paving section from subgrade through surface course)

- \* The name of the individual from the consulting firm representing the sponsor that will have responsibility for contract administration for the project and the authority to take necessary actions to comply with the contract
- \* The name of the testing lab that will be performing the quality assurance testing for the PE. If the PE's firm will be performing all of the in field quality assurance testing then it should indicate that in this report.
- \* An inspection report from a recognized national authority for each laboratory testing firm as evidence of its competence to perform the required tests or provide verification that personnel running tests have been certified by a recognized program such as the MDOT testing program.)
- \* A listing of and the qualifications of engineering supervision and construction inspection personnel that will be working on this contract. (e.g. Education, Professional License, certificates including date and issuing agency, experience, etc.)
- \* A copy of the applicable sheets from Appendix III herein with a listing of which lab or firm is responsible to perform each test.

The procedure for ensuring that:

- \* 1. The tests are taken in accordance with this Construction Management Program.
- \* 2. That they are documented as required.
- \* 3. That corrective actions, where necessary, are undertaken and documented.

At the final inspection the person named in the first paragraph above shall submit to the Sponsor, FAA and AERO a final test and quality control report documenting the results of all tests performed. The report shall highlight those tests that failed or did not meet the applicable standard and, where applicable, pay reductions applied and reasons for accepting any out-of-tolerance material.

STATE OF MICHIGAN



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LH-0-1 (5/89)

July 17, 1989

NOTICE OF CHANGE  
Bureau of Aeronautics  
Project Engineer's Manual

The primary purpose for this Notice is to transmit the revised Project Engineers Manual-to you. As a result of the latest revisions to Specification P-411 several changes were made to Appendix II, Attachment 2. Section 2.3 was deleted and there were some changes made to section 4.3.1-a.

The entire document has been entered on to our new word processor and has been reprinted. There were a few editorial changes that were made during the reprint but none of them significantly changed the document.

Our current list of firms holding a copy of the Project-Engineers Manual and Specifications has gotten quite extensive. A number of those firms have not done business with us for several years. Therefore we would like to update the list to make sure that all firms listed are still interested in receiving revisions to either the Project Engineers Manual or the Specifications. **IF YOU ARE INTERESTED IN CONTINUING TO RECEIVE REVISIONS TO EITHER THE PROJECT ENGINEER'S MANUAL OR THE SPECIFICATIONS PLEASE FILL OUT THE ATTACHED FORM AND RETURN IT TO US BY AUGUST 11, 1989.** All firms not responding will be removed from the list.

Another item that has been brought to our attention on a number of occasions is the problems inherent in combining electrical and civil work into the same construction contract. We feel that the problems associated with combining electrical and civil work in the same contract are more significant than those associated with separating them. Therefore, it is the policy of the Bureau of Aeronautics (AERO) that electrical and civil work shall not be included in the same construction contract without prior approval of AERO unless the dollar value of the electrical work comprises less than 5% of the contract.

Any questions or suggestions regarding revisions to either the Project Engineer's Manual or the Specifications should be directed to Ron Engel - 517/373-1834.

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF AERONAUTICS  
Capital City Airport  
Lansing, Michigan 48906

517 373-1834

## **PROJECT ENGINEER'S MANUAL**

July, 1989

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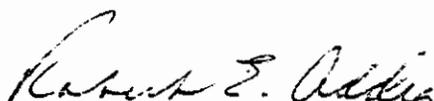
## FOREWORD

The primary purpose of this manual is to provide a guide and reference book to which engineers and architects can refer in carrying out their assignment as project engineers on airport construction projects in the State of Michigan.

In order to maintain consistency throughout our program we require all construction supervision contracts to reference this manual and indicate that the project engineer will adhere to all of the guidelines contained herein.

This manual is intended to be used as a guide in carrying out engineering and administrative responsibilities. It is not to be considered a substitute for good engineering judgement; however, when used as intended it will help to professionally accomplish all aspects of the projects.

We look forward to working with you to make Michigan aviation safer and more effective.

  
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Robert E. Addy, Administrator  
Airport Development Division  
BUREAU OF AERONAUTICS

## **GENERAL PROCEDURES**

## I. ENGINEER'S AND ARCHITECT'S GENERAL DUTIES AND RESPONSIBILITIES

The project engineer or architect, hereinafter referred to jointly as the PE, unless otherwise stated, represents the sponsor (airport owner) on all matters pertaining to the execution of the construction contract. At the beginning of the project, a copy of the construction contract and two complete sets of plans and specifications will be furnished to the PE by the Bureau of Aeronautics (referred to as AERO in this manual). The PE should familiarize himself completely with the plans, addendums, specifications and supplemental specifications pertinent to the various items of work in the contract.

All equipment and materials not covered in the detailed specifications or plans shall be installed in accordance with the manufacturer's recommendations which shall be furnished by the contractor upon request of the PE.

Any questions regarding the work proposed under this contract should be directed to the Project Manager, or authorized representatives, of AERO.

The PE assignment is essentially to supervise the engineering and inspection required on the job in order to monitor the contractor's conformance with all the terms of the construction contract, including the plans and specifications. In general, the PE duties and responsibilities are as follows:

- (1) To inspect the contractor's performance of the contract requirements to determine if the work conforms with the requirements of the contract plans and specifications.
- (2) Furnish the required engineering instruments, equipment and necessary personnel for construction stake-out and project control. Set construction stakes, supervise the engineering, perform the required inspection and be immediately available for consultation on project problems.
- (3) Prepare periodic cost estimates, change orders, start and stop orders, and recommendations for changes in work and submit them to AERO.
- (4) Conduct periodic inspections to determine if the project is overrunning the estimate and submit recommendations to AERO to adjust the work if, in the PE's opinion, it is advisable.
- (5) Perform all the testing, as required by the plans and specifications, to determine the contractor's conformance with plans and specifications.
- (6) Prepare and maintain an accurate written record of contract time expended on the project by the contractor throughout the life of the contract. This written record may be of paramount importance at the time of closing out the contract in order to determine whether the assessment of liquidated damages is justified in the event the contract time is exceeded by the contractor.

- (7) Compute all final quantities and prepare complete "as-constructed" plans following the guidelines in Appendix II.
- (8) Prepare a final contract report in accordance with the guidelines in Appendix II.
- (9) Update Master Plan to show any new construction and new runway end elevations. The approach sheet should also be updated if they were affected by any construction.

The PE shall manifest the spirit of cooperation at all times and is responsible for the following relationship to other personnel assigned to the project:

- (1) The PE shall act as liaison between the contractor, the owner, and AERO.
- (2) The PE shall cooperate with the contractor to the extent of obtaining workmanship conforming to acceptable industry standards, as per the contract plans and specifications.
- (3) When work is under construction on existing airports, the PE shall coordinate the work of the contractor with the activities of the airport in order to insure safety and a minimum of hindrance to all concerned. The PE shall inform the contractor any time temporary marking, lighting, flagging or barricading is not in accordance with the "Construction Safety/Phasing Plan." In accordance with Section 50-01 of the General Provisions for Construction on Airports, the PE has the authority to suspend work if the contractor fails to comply. In the event additional provisions are necessary or no safety plan is provided, the PE, in cooperation with the airport manager, shall designate areas to be closed to traffic, displaced thresholds, relocated thresholds, etc., with the proper markings so as to alleviate any conflict to safe traffic movements during the project and arrange for the issuance of appropriate Notices to Airman (NOTAM's). At lighted airports, the PE shall designate those areas where lighted barricades, warning signs, hazard markings, or other types of safety lights shall be placed (General Provisions 70-08 and 80-04).
- (4) The PE shall conduct inspections and engineering supervision in a manner which is both efficient and reliable.
- (5) The PE shall cooperate with the authorized construction engineers of AERO and the Federal Aviation Administration (FAA) and shall be available for consultation during their scheduled periodic construction inspections. The PE shall provide the authorized engineers access to all plans, inspection reports, files, notes, and any other information which is pertinent to the project.
- (6) All important instructions, irregularities, orders, rejection of work, etc., shall be transmitted to the contractor in writing. A copy of this transmittal letter should be forwarded immediately to AERO. In order not to delay the execution of the work, oral instructions may be given to the contractor, with the instructions confirmed promptly in writing.

In general, an architect's duties and responsibilities are essentially the same as those listed for the project engineer. However, there are several additional items which are more pertinent to building construction:

- (1) The architect shall check and approve all shop and working drawings furnished by the contractor.
- (2) The architect shall be available for consultation and advice during construction on project problems.
- (3) The architect shall make recommendations for changes in work, secure cost breakdown and provide plans for detail changes, if required.
- (4) The architect shall aid the sponsor on such details as selection of the color of paint and other details of similar nature not specifically covered in the documents.
- (5) The architect shall conduct daily inspections during the progress of major items of construction and determine that the contractor has had all the required tests performed and determine that all details meet the specifications. The architect shall check location of all fixtures, outlets, conduit, etc., to determine that all details conform to the plans and specifications.
- (6) The architect shall assist the contractor on equipment tests and determine that all mechanical, electrical, plumbing, etc., details meet the specifications.
- (7) The architect shall complete "as-constructed" plans showing all plan changes, including all change orders. The "as-constructed" plans shall show all major equipment with details such as size and manufacturer. The "as-constructed" plans shall show coding, tagging and other detail which will aid the owner in tracking down problems and making repairs. The plans shall show location details on all buried cables, conduit, pipe, fuel tanks, sewage system, etc., and their approximate depth below ground.
- (8) The architect shall secure from the contractor copies of equipment operation manuals, roof bonds, guarantees, waivers of lien, etc., as called for in the architectural specifications. One copy of these documents shall be submitted to the sponsor and one copy to AERO.
- (9) The architect shall submit a breakdown of all allowance costs, as established by the specifications, to AERO. If the cost of these allowances is more or less than that of the price established by the specifications, a change order must be prepared changing the contract price.

## **II. PRIOR TO NOTICE TO PROCEED**

After bids have been received and contracts have been executed by the contractor and sponsor, copies of the executed contract shall be distributed

by the Michigan Department of Transportation (MDOT) to the sponsor, contractor, engineer, bonding company and FAA (where applicable). These contracts will contain the job specifications, wage rates and unit prices for the contract items.

### Pre-Construction Meeting

A pre-construction meeting will be scheduled by AERO. The FAA requires a two-week notice of the pre-construction meeting in order to notify interested organizations. This meeting will be chaired by AERO and attended by representatives of the contractor, PE, FAA (where applicable), subcontractors, local officials and any other interested parties. Minutes will be recorded by the PE with a typed copy being sent to all in attendance.

The project schedule, as prepared by the prime contractor, shall be submitted in writing at this meeting. The schedule will incorporate any dates or times included in the plans and documents, and the proposed starting and completion dates for such major items of work as grading, paving, etc. The schedule may be revised at the pre-construction meeting, in which case a copy of the revised schedule should be submitted to the PE and AERO for approval. AERO will forward the revised schedule to the FAA.

### III. NOTICE TO PROCEED

Prior to start of construction operations by the contractor, an official "Notice to Proceed" will be issued to the contractor by AERO. A copy will be furnished to the PE. The "Notice to Proceed" specifies when the contractor is authorized to start work. The contractor is required to start work on this date or within ten calendar days thereafter. The PE shall begin calculating contract time from the actual starting date or 10 calendar days after the contractor is authorized to begin work, whichever is earliest. The actual starting date should appear on the first weekly report. The "Notice to Proceed" also specifies the number of calendar days allotted for the completion of the work. (Sometimes the contract time will be a definite calendar date.) Under certain circumstances, specific information concerning contract time allotted to particular items of work in the contract may be included in the "Notice to Proceed." The "Notice to Proceed" may also designate work areas and approved subcontractors. The PE shall be responsible for verifying that each subcontractor have an approved subcontract on file with AERO before the subcontractor is allowed to work at the site.

Start and Stop Orders. Stop Orders shall be issued only when it is in the public interest to stop the work. Stop Orders may be issued for strikes, lockouts, unusual delays in transportation, extensive period of unsuitable weather conditions, or any unusual delay over which the contractor has no control, or any suspensions ordered by the PE for causes not the fault of the contractor. Stop Orders will not be issued for the contractor's convenience.

Stop Orders are numbered in consecutive order; therefore, the first Stop Order issued will be labeled Stop Order No. 1. Each Stop Order shall indicate the reason for stopping construction operations, the specific work covered by this order if other phases of work are allowed to continue, and the effective date. The Stop Order shall also state when the work is expected to resume. The PE shall prepare five copies of the Stop Order. All copies shall be signed by the PE and the contractor. The contractor and PE shall each retain one copy with the PE forwarding three copies to AERO for processing with the FAA (where applicable).

Before the contractor is permitted to resume work which has been stopped by a Stop Order, the PE must issue a Start Order. Start Orders are numbered in consecutive order; therefore, the first Start Order issued after Stop Order No. 1 will be labeled No. 1. Each Start Order shall specify the effective date when work shall resume, the number of the Stop Order cancelled by this action, and the number of calendar days remaining for work completion. When the Stop and Start Orders affect all items of work, the time for completion can be easily computed. If the Stop and Start Orders affect only part of the items of work, then the PE should contact AERO for determination of contract time lost during the period work was stopped. The PE shall prepare five copies of the Start Order. All copies shall be signed by the PE and the contractor. The contractor and PE shall each retain one copy with the PE immediately forwarding three copies to AERO for processing with the FAA (where applicable).

Start and Stop Order formats are available from AERO.

#### IV. CONSTRUCTION

Construction Surveying. The PE is responsible for the construction surveying required to accomplish the contract work. This includes laying out the job, setting benchmarks and grade stakes, taking cross section elevations, and laying out the location and elevation of runway and taxiway lighting and navigational aids. It should be noted that no project engineering work shall be performed prior to the sponsor's acceptance of the Grant Offer.

The field method of staking is to be determined by the PE. Every project has specific problems and engineers have their own methods of staking. Methods are acceptable as long as adequate project control can be maintained.

At the completion of the project, permanent AERO bronze runway centerline monuments and approach surface markers shall be placed, by the contractor, at the runway alignment control points, and approach surface and clear zone locations set by the PE. Requirements for the locations and installation of these markers will be shown in the approved construction plans.

Inspection and Testing. The General Provisions of the contract documents state the authority of the PE relative to the quality and acceptability of materials, work performed and rate of progress. Work or materials not

meeting specification requirements may be designated for removal and replacement at the contractor's expense.

All operations of the contractor do not require full time inspection. However, the engineer/inspector should keep informed as to what activities are in progress, and be available and at the site when a problem arises or a major activity is to begin. The PE is expected to use good judgement in determining when it is necessary to be on the job. The PE is expected to conduct testing and project control inspections in such a manner that will be both reliable and efficient. The PE shall conduct tests and set stakes within a reasonable time after requested by the contractor. The PE shall exert all effort to conduct the tests and set stakes at such times and in such a manner that will cause the least delay to the contractor. As soon as tests are completed and results analyzed, the PE shall inform the contractor of the test results.

The PE will notify AERO of important construction activities (i.e., placement of subbase, base or surface course) by telephone a minimum of one day prior to the commencement. This will allow AERO and FAA to schedule field inspections during grading, paving, or other important operations.

Throughout the life of the construction contract, the PE and his crew will be required to perform numerous inspections and tests to determine if the contractor's work conforms to the plans and specifications. The inspections and tests are not only required by AERO and FAA, but are also desired and expected of the PE by the contractor. The contractor rightfully expects the PE to inform him if his work does not meet the specifications. It is not the duty or responsibility of the PE to tell the contractor how to do the work, but it is the duty and responsibility of the PE to tell the contractor whether the work conforms to the plans and specifications and, consequently, whether the work is accepted or rejected.

The PE is responsible for the field testing required by the contract specifications. The engineer and inspectors shall be familiar with the tests required and the method of performing each test. Lists of tests required, where to find the test procedure and the frequency of testing are included as Appendix III. One copy of each of all test reports, certifications, etc., will be submitted by the PE to AERO within five calendar days of the end of the contractor's work week in which the test was performed. One copy of the test report should be maintained at the job site. Test results will be submitted in a format which received approval of AERO and FAA before use. Results reported will contain the PE approval or disapproval of the results of the tests. Any acceptance of a failing test must be fully explained. These procedures are required to ensure that decisions made in the field can be supported at a later date.

The PE will furnish AERO and FAA copies of material tests required of the contractor in the contracts "Material Testing Requirements" which are included in Appendix III. Material samples will be taken by, or in the presence of, the PE or approved independent testing laboratory. The material tests and certifications shall be obtained prior to use of the material in the project. The PE shall show approval of all materials used in the contract.

Testing is one of the most important duties and responsibilities of the PE assignment. The material testing section of the contract documents details the tests which are the responsibility of the contractor. At the beginning of the project engineering assignment, the PE should examine each item of work listed on the plans and specifications and prepare a list of all the tests which are required to be performed. The list should include all the tests, even though some of the tests are the responsibility of the contractor, as denoted in the material testing section. The list of tests will provide a ready reference and checkoff list for the PE and will insure that all required tests have been performed.

The PE is required to perform the project control field testing as the job progresses for each item of work before allowing another item of work to start which would cover up the particular item of work being tested. No work shall be approved by the PE unless all of the required testing and inspection has been performed and it has been determined that the work conforms to all of the requirements of the contract documents, plans and specifications.

The PE can readily determine from an inspection of the work when items of construction are at a stage requiring on-the-job inspection to determine whether the contractor is performing his work according to the specifications. Obviously, there are certain items of construction work that will require the PE or his qualified inspector to be on the job constantly while that phase of construction work is completed.

If the PE is in doubt about a certain test or has a question regarding a construction problem, he should immediately contact the engineer within AERO assigned to the project.

Bituminous Inspection. To maintain good quality control of asphalt paving, the PE should have a minimum of two inspectors on the job at all times during active paving.

An experienced plant inspector should monitor the plant operation and be capable of performing bituminous extraction tests, field marshall tests, aggregate gradation, fineness modulus and percent crushed determinations. The plant inspector should also monitor the temperatures of the aggregates and asphalt cement. The tests and monitoring done at the plants should be recorded and submitted in a daily plant inspection report form. A prompt system of communication should exist between the plant inspector and the PE or field inspector. The field inspector, who on smaller jobs could be the PE, should be checking delivery and laydown temperatures, mat thickness, elevations and density tests.

Subbase and Base Inspection. The grade inspector should have a thorough knowledge of the grading and compacting of base and subbase materials. Required testing consists mainly of gradations, standard or modified proctors, moisture, density and thickness determinations.

Material Acceptance. The PE or inspector who accepts materials shall know the specification requirements for the contract. Before any material is used in the work, the proper independent laboratory test or manufacturer's

material certification shall be obtained from the contractor. Delivery and weigh slips for materials shall be retained by the PE in the project records. The PE shall review the documentation submitted by the contractor for compliance with the specifications, and show approval thereof by separate transmittal letter.

Reports and Records. The PE is responsible for the submission of all test documentation and material certification to AERO. The PE shall show approval or disapproval of all tests and materials. The acceptance of any failing test or material must be explained. Each test report or summary should be signed by the appropriate inspector and approved or disapproved by the PE.

A project diary shall be kept by the PE. The diary need not be submitted but must be available at the time of the field inspections by AERO and FAA, or upon request. The diary should be incorporated into the project records at the end of the project. Suggested entries include:

- (a) Weather
- (b) Communications with AERO, FAA, contractor, sponsor, etc.
- (c) Items of work in progress, estimated quantities, difficulties encountered and methods used in correcting them
- (d) Information concerning disputes with the contractor over work, quality or performance
- (e) List of equipment on site or in use, number and types of personnel, number of inspectors on job
- (f) Note any delays in progress and reason for same
- (g) Starting and completion dates of major items of work
- (h) The diary should be dated and signed

All test documentation, reports, diary, letters, etc., must be retained by the PE for a period of three years from the date of the last payment to the PE.

Weekly reports (FAA Form 5370-1) are to be submitted by the PE to AERO and FAA, simultaneously, within five (5) calendar days of the end of the contractor's work week. The form, shown in Appendix II, Attachment 3, is to be completed in its entirety, in a straightforward manner. If comment is not applicable, or no comment necessary, so indicate in each block by "None" or "Not Applicable." A hand written report is acceptable in the interest of timely submittal to AERO and FAA.

Payments to Contractors. The PE shall prepare periodic Construction Estimate Bi-Weekly Report (Form 1371A) for payments to the contractor. Forms to be used are supplied by AERO. The estimates must be signed by the contractor and PE and submitted in duplicate to AERO for processing. This form, with instructions for completing, is shown in Appendix I, Attachment 1.

At the time of preparing a periodic cost estimate for payment to the contractor for work performed to date, the PE or architect should not include any item of work for payment unless the required test reports have been received from the contractor for that item of work accomplished to date and the PE has verified that the results of these test reports conform

to the specifications. Likewise, the PE or architect shall have performed the tests required of him and verified that the work accomplished to-date does conform to the specification before recommending payment to the contractor for that item of work. Progress payments to the contractor for a particular item of work shall be made if the testing required to date verifies that item of work conforms to the specifications.

Contract Change Orders. The PE shall prepare change orders to adjust contract quantities, time and prices as may be required. Any changes shall have prior approval of AERO and FAA before the work is accomplished. The PE shall submit two copies of change orders, signed by the contractor and PE, to AERO for approval and processing. Instructions for Preparing change orders are given in Appendix I, Attachment 2.

Payroll Compliance. On contracts with federal participation, the PE shall submit payrolls with each pay estimate for the time period covered by the bi-weekly pay estimate. Payment to contractors will not be processed without payrolls for that time period. The instructions for completing payroll records are given in Appendix I, Attachment 3.

## **V. AFTER CONSTRUCTION**

Final Inspection. Upon notice from the contractor of presumptive completion of the contract, the PE shall conduct a semi-final inspection to assure that all of the inspection checks and various tests, required by the plans and specifications, have been performed. If, in the opinion of the PE, the results of these tests verify reasonable conformance to the plans and specifications, he shall request AERO to arrange a final inspection. All test reports, certifications, etc., not previously furnished, must be submitted at this time. A written statement should be prepared containing justification to support any extension of time and assessment of liquidated damages. Final quantities should be determined in time for the final inspection so that any substantial adjustments can be discussed.

If the semi-final inspection discloses any unsatisfactory work, the PE will give the contractor the necessary instructions (preferably in writing) for correction. Upon correction of the unsatisfactory work, the PE will request a final inspection. If the unsatisfactory work is of a minor nature (i.e., can be completed within a week), the PE should request the final inspection and indicate in writing those items of unsatisfactory work.

AERO will schedule the final inspection with the owner, PE, contractor, and FAA (where applicable). Every effort should be made by the PE to notify AERO such that the final inspection can be held within two weeks of contract completion. If all construction is found to be completed within reasonable conformance with the contract plans and specifications at this inspection, such inspection shall constitute the final inspection and final acceptance of the work.

If the final inspection reveals any unsatisfactory work, the PE shall so advise the contractor (copies to AERO, owner, and FAA) in writing. Upon correction of the work, another inspection will be made by the PE. If the work has been satisfactorily completed, the PE will make the final

acceptance and notify the contractor in writing of this acceptance as of the date of the final inspection (copies to owner, AERO and FAA).

The PE shall prepare a Final Contract Report and submit it to FAA and AERO preferably prior to the final inspection. The report shall be prepared in accordance with the guidelines in Appendix II, Attachment 4.

Project Closure. Within 30 days of the final inspection, the PE will submit the final cost estimate, final change order, and "as-constructed" contract plans and airport layout plan including the approach sheets and any other portion of the Master Plan that is affected. Instructions for completing the "as-constructed" plans are contained in Appendix V, Attachment 1.

Final Payment to Contractor. After the contractor's work has been approved by the engineers conducting the joint final inspection, the PE should submit to AERO the final contractor's payment request, final change order and all supporting data, including final breakdown of Federal and Non-Federal quantities and costs, pertinent to the final cost of the project. Final payment to the contractor or the PE will not be made until all test reports and payroll forms required for the contract have been approved by the PE and submitted to AERO. Upon completion of AERO's review of the final project papers, final payment to the contractor will be processed.

Project Engineer's Payment. Periodically, or when called for by the contract, during the life of the construction contract, the consulting PE should submit to the owner a statement of charges for his services to date. These should be approved by the owner and transmitted to AERO for payment.

Final payment to the PE will not be processed by AERO until such time as he submits to AERO all project notes, diary (if required), completed "as-constructed" plans, Updated Master Plan sheets, copies of test reports, final contract report when required, and other pertinent project papers. Invoices for engineering services received later than six months after final contract acceptance will not be paid by AERO.

**APPENDIX I**

(Attachment 1)  
**INSTRUCTIONS FOR COMPLETING  
CONSTRUCTION ESTIMATE BI-WEEKLY REPORT**

**DESCRIPTION AND PURPOSE.** Form 1371A is the document from which the computer estimate is generated.

The computer estimate is for the purpose of making progressive and final payments to the contractor for work as completed in conformance with requirements of the contract proposal and documents, and also from certain stockpiled material, as described in a later paragraph.

**PREPARING THE ESTIMATE.** The following steps should be followed in preparing and submitting a Construction Estimate Bi-Weekly Report. A construction Estimate Bi-Weekly Report form is attached. The numbers in the various areas on that report, correspond to the numbered paragraphs below. The information that is typed on the attached report will be included on all reports that you receive for a project (with the exception of the stockpiled material example). (The Bi-Weekly Report is not necessary every two weeks unless sufficient work has been accomplished):

1. **Date.** Use last day to be included in construction estimate. **Must be written in six digits.** Example: January 14, 1987 would be 01-14-87. (Must be within the approved contract time).
2. **Completion Date.** To be filled in only on final pay estimate. **Must be written as a six digit number.** Example: December 1, 1987 would be 12-01-87.
3. **Date of Estimate.** Date on which estimate is prepared. **Must be a six digit number.**
4. **Estimate Number.** The sequential number obtained from your last computer estimate. **This must be a three digit number.** Example: Estimate No. 1 would be written 001. The Final Estimate Number must be a three digit number beginning with 9. Example: Final Estimate No. 8 would be written 908.
5. **Project Start Date.** Enter date that work started. **Must be a six digit number as in 1 and 2 above.**
6. **Working Days.** Most contracts have a definite number of calendar days for completion instead of a calendar date. In such cases, each estimate submitted must show the number of calendar days chargeable to the contract for that estimate period. Example: Eight chargeable calendar days should be shown on the report as a three digit number (008). If the job has a definite completion date the space would be left blank.
7. **Extra Work.** When an extra item of work is reported for payment, entry must be preceded by the letter E entered in the Extra Column. Approval must be obtained in the form of an approved change order, before payment can be made for an extra. An extra is defined as a new item

which cannot be paid for under an original contract item. When payment is being made on a work item that the unit price has been adjusted by change order, then an "A" would be placed in this column.

8. Part Number. The Part Number is 01. This will be used for each item.

9. Work Item Code. Use only the 7 digit numbers shown on copy of the computer estimate furnished with your supply of Bi-Weekly Reports or the number established for an extra or adjustment by the engineer on an approved change order.

10. Quantity. Enter only the amount of contract work completed during the period of the Bi-Weekly Report. Do not include work item codes for items not included as pay items for the period being processed.

Stockpiled Material. Materials may be stored for any contract item provided they will not be incorporated into the project within the next 90 days. The quantity stored cannot be greater than the quantity for the contract item. Contractor's invoices that support the unit prices given must be sent with the payment request. The stockpiled material will be paid for at not more than 1/2 the unit price listed in the contract. All stockpiled material must be stored on the airport site, and be inspected and approved by the PE. An example is attached.

Percent Retainage. Each payment will automatically have a retainage taken out in accordance with Section 90-06 of the "General Provisions for Construction of Airports." The retainage can be reduced near the end of the project if the PE thinks it is justified. This can be done by noting on the Construction Estimate Bi-Weekly Report what retainage is desired (i.e., reduce retainage to \$1,000.00). If the retainage is being reduced to something less than what is shown in the contract, the PE must submit a letter along with the Construction Estimate giving the reason why it is being reduced.

Lump Sum Items. Lump sum items will be placed in the computer as a percentage of work complete. The vertical line in the quantity column should be used as a decimal point (e.g., if the bid price on a Lump Sum Item is \$1,000.00 and the contractor has completed \$250.00 worth of work covered by that item, you should enter 25 to the right of the vertical line in the quantity column).

11. Completion Time. The original completion time will be printed on the forms. If there is a change order to increase the time, draw one line through the number and write in the revised number.

12. Days Charged To Date. Enter the actual number of days worked or the number of calendar days from the project start date, if the contract time is given in calendar days. Do not include days when a stop order is in effect.

Extension of Time. Estimates that will require an extension of time should not be submitted until approval of the time extension, by a change order, is processed.

13. Number of Days Remaining. This is the completion time minus the number of days charged to date.

14. Actual Completion Date. Enter the date of the last chargeable working day or calendar day of the project. This should be filled in on the final estimate only.

15. % Physical Completion. Enter the amount of physical completion of the project in a percentage. One-hundred percent (100%) should be on the final estimate only.

16. A representative of the contractor must certify to the information contained on the Construction Estimate By-Weekly Report with an autograph signature.

17. If there are Disadvantaged Business Enterprise (DBE) requirements the contractor must be in compliance before payment can be processed. The box marked "In Compliance" or "Not Applicable," if there are no DBE requirements, must be marked before a payment can be made.

18. Before payment can be made on federally-funded projects, payroll records must be kept up-to-date with copies of payroll forms sent to AERO. The box marked Payroll Current on the form must be checked. On state/local projects the 'not applicable' box should be checked.

19. The PE must also certify to the information on the Construction Estimate Bi-Weekly Report. The PE signing the report must be a Registered Engineer in the State of Michigan.

20. Subcontractor. Enter subcontractors who perform work during the estimate period at the left side of space provided, leaving space for a four digit number to be added by the MDOT Contract Payment Unit.

21. Leave blank the spaces provided for Additional Copies and Total Copies. The number for Basic No. copies and Final Copies shown at the bottom left corner of the sheet should be ignored.

The PE shall mail two copies of the completed estimate with original signatures to the Michigan Department of Transportation, Bureau of Aeronautics, Capital City Airport, Lansing, Michigan 48906.



**CONSTRUCTION ESTIMATE BI-WEEKLY REPORT**  
(7 DIGIT WORK ITEM)



CONTRACTOR: Wallace Electric Inc.  
1704 Porter S.W.  
Wyoming, MI 49059

DATE: 1  
(17-22) FOR WORK PERFORMED ON OR BEFORE  
DATE: 2  
(47-52) ALL CONTRACT WORK COMPLETED

1-2 TRAN- CODE	3-6 KEYE	DATE OF ESTIMATE	23-25 EST. NO.	26-31 PROJ. START DATE	PROJECT NO.	JOB NO.	FEDERAL NO.
	3006	3	4	5	FM 11-1-C46	22533A	3-26-0012-0183

ITEM OF WORK USAGE								WORKING DAYS CHARGEABLE		
7	8-9	10-16	37-46		7	8-9	10-16	37-46	THIS PERIOD	(66-68)
EXTRA	PART	WORK ITEM CODE	QUANTITY		EXTRA	PART	WORK ITEM CODE	QUANTITY	6 (66-68)	
7	8	9	10						AIRPORT: Twin Cities Airport- Ross Field, Benton Harbor, SPONSOR: Cities of St. Joseph & Benton Harbor, Benton Harbor, Mi CONSULTANT: 49022 Peckham Engineering 4415 North Grand River Avenue Lansing, Michigan 48906 WORK DESCRIPTION: Taxiway Hold Signs, Wind Cone Beacon Rehabilitation, Radio Controls, Vault Modification	
		Stockpiled Material							ORIG. CONTRACT AMOUNT: \$29,934.00 COMPLETION 30 Calendar Days TIME: 11 DAYS CHARGED TO DATE: 12 NO. DAYS REMAINING: 13 ACTUAL COMPLETION DATE: 14 % PHYSICAL COMPLETION: 15	
	01	7007000	100 at \$2.00/ LF (Fencing)							

CERTIFICATION OF CONTRACTOR - I HEREBY CERTIFY that the work performed and the materials supplied to date, as shown on this bi-weekly cost estimate, represent the actual value of accomplishment under the terms of this contract in conformity with approved plans and specifications; that the quantities shown were properly determined and are correct; and that there has been full compliance with all labor provisions included in the contract identified above, and in all subcontracts made under the contract.

16

CONTRACTOR'S SIGNATURE \_\_\_\_\_ TITLE \_\_\_\_\_ DATE \_\_\_\_\_

MBE/WBE  IN COMPLIANCE  NON-COMPLIANCE  NOT APPLICABLE 17 PAYROLL  CURRENT  NOT CURRENT  NOT APPLICABLE 18

CONCURRENCE AND CERTIFICATION OF SPONSOR'S ENGINEER - I hereby certify that I have examined this bi-weekly cost estimate, and concur in the certificate of the contractor and certify that the materials used and the construction accomplished meet the requirements of the plans and specifications, as evidenced by certified test and inspection reports included in the project records.

19

SIGNATURE, SPONSOR'S ENGINEER \_\_\_\_\_ DATE \_\_\_\_\_

SUBCONTRACTOR = 1-2-NM: KEYE 62-65-0000

EXAMINED BY: \_\_\_\_\_

**BUREAU OF AERONAUTICS**  
APPROVED FOR PAYMENT

AIRPORT DEVELOPMENT DIVISION

DATE \_\_\_\_\_

BASIC NO. COPIES ( ) FINAL COPIES ( )  
ADDITIONAL COPIES ( ) TOTAL NO. COPIES ( )

21

(Attachment 2)  
**INSTRUCTIONS FOR COMPLETING CHANGE ORDER**

The PE is required to prepare a Change Order if the quantities of the various work items in the contract are increased or decreased from the original contract amount. Also, a Change Order is required when a new item of work is added to the contract, an item of work is deleted from the contract, the contract time is changed, or if there is a change in the plans or specifications.

In preparing the Change Order, be careful to make reference to the proper item code numbers, the original quantities, and the new quantities. Explain the reasons for making the changes at the end of the Change Order. On those Change Orders involving items of work other than normal overruns, (less than 5%), caused by discrepancies between field measurements and scaled measurements, a statement denoting the fact that the cost is considered reasonable should be included, along with a reason for making the change.

The PE must justify any items on the Change Order where the unit prices were not established through the bidding process. The justification should include a cost analysis prepared by the PE, independent from the one submitted by the contractor. The cost analysis should reflect the unit prices from other projects of similar size and scope. If comparable unit prices are not available the PE should give a full explanation of why the submitted costs are reasonable.

Prior approval must be obtained from the Bureau of Aeronautics and the Federal Aviation Administration (where applicable) before allowing the contractor to proceed with any item of work (other than reasonable overruns covered by the Change Order.

Normally, the items on a written Change Order have been discussed verbally with the authorized engineers from the State of Michigan the Federal Aviation Administration. If it has been determined that certain items or parts of certain items of work are ineligible for federal aid or state aid, then a breakdown of the quantities and the cost of each such item shall be denoted on the Change Order as ineligible for federal or state aid, as the case may be. This breakdown should appear with the reasons for changes at the end of the Change Order. If it is not known at the time the Change Order is prepared whether a certain item is eligible for federal or state aid, then the PE should not attempt to make a breakdown of eligibility.

The Change Order should be prepared in duplicate, one original and a copy. If plan sheets are revised, at least four (4) copies of each sheet shall be submitted with the Change Order. All copies shall be signed by the PE and the contractor and immediately forwarded to the Michigan Department of Transportation, Bureau of Aeronautics, Capital City Airport, Lansing, Michigan 48906. Attachments to Change Orders shall be submitted in duplicate.

**There are three types of changes:**

(1) **Changes to Contract Quantities.** This involves showing increases or decreases to original contract quantities.

The Authorization Number, which appears at the beginning of these changes will be in the form 10XX, with XX being the number of the Change Order (Example: Change Order 5 would have an authorization number 1005, Change Order No. 10 would have an authorization number 1010). The item code number will remain the same. Quantities will be changed as shown in Example I. A total dollar amount of change attributable to the change in contract quantities will be included. An explanation of why the changes were made should follow at the end of the Change Order.

(2) **Extras to the Contract.** These are new items of work which are added to the contract but cannot be paid for using contract item code numbers. Additional cost must be justified in terms of labor, materials, overhead and profit, and the Change Order must include any additions to plans and specifications.

The Authorization Number which precedes these extras will be in the form 20XX, with XX being the change order number as shown in **Change Order Example I**. The item number assigned to each new item will be 9007 XXX. The last three digits can be filled in as the PE wishes. A detailed justification should appear for each new item at the end of the Change Order. Once an item appears as an extra, it will always be considered an extra on any subsequent Change Order.

(3) **Adjustments to Unit Prices.** This is used when a unit price as bid needs to be changed.

These changes to the contract should appear on the written Change Orders as shown in the examples. Note the Authorization Numbers, which are different for each type of change.

In some instances it may be necessary to make adjustments to the original price of an item which is to be paid on a per-unit basis or by lump sum.

These adjustments are handled basically the same way as an extra except that the authorization number is 40XX. This lets the people reviewing the Change Order know that there is an adjustment being made to an item that was in the original contract. The new item number will be 9007XXX. The last 3 digits can be assigned at the PE's discretion; however, it is helpful if they are the same as the last 3 digits of the item being adjusted.

As an example of how an adjustment would be handled, assume that a contract involves 8,000 tons of asphalt and the unit price was bid at \$30 per ton. Through problems associated with air voids the contractor will now be paid at \$25 per ton for 3,000 tons and at the original contract price for the remaining asphalt. Let's also assume that the "as-constructed" quantity for the asphalt is 8,043 tons. **Change Order Example Number II** shows how this should be filled out.

Another example of where an adjustment might be used would be for a lump sum item such as "Furnish and Install Specified Electrical Vault Equipment," Item No. 1097530. Assume some unforeseen circumstances come up and the contractor is entitled to an additional \$300 compensation. **Change Order Example I shows how this would be handled.**

**Extension of Time.**

Contract time shall be increased proportionately to the increase in "as-constructed" cost per General Provision 80-07.

Justification for time other than the above note must be explained as to responsibility:

(a) Abnormal bad weather days compared to average for month or estimated on development of contract time and schedule.

(b) Added work.

(c) Delays in delivery of equipment or materials should be covered by appropriate Stop Orders if supported by written evidence of supplier.

This number can be found on the green Bi-Weekly pay estimate form \*

EXAMPLE I

Michigan Department of Transportation  
4063 (3/87)

# CHANGE ORDER

This information required by Act 327 of 1945 in order to legally modify contracts.

MAIL TO: MDOT, Bureau of Aeronautics, Capital City Airport, Lansing, Michigan 48906

KEY NO. *	PROJECT NO. 3-26-0051-0587 FEDERAL ITEM NO. AL 295	CONTRACT NO. FM 38-1-C59 JOB NO. 29775A	NAME OF AIRPORT Jackson County Airport Jackson, MI	DATE 2/20/87 SHEET 1 OF 1	CHANGE ORDER NO. 1
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CONTRACTOR/ADDRESS Best Contraction No Name Lane Oz, MI 48000	SPONSOR/ADDRESS Jackson County 3606 Wildwood Jackson, MI 49202	CONSULTANT/ADDRESS ACME Consulting Coyote Road Roadrunner, MI 49000
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AUTH NO./*	WORK ITEM NO.	DESCRIPTION	QUANTITY			UNIT PRICE	UNIT	DOLLAR AMOUNT +/-
			FROM	TO	CHANGE			
1001	1080530	Bare Counterpoise, #8 Stranded, In Trench Or Duct	4000	3750	-250	.40	L FT	- \$ 100.00
1001	1087589	Underground Cable 1/C, #8, 5KV, L824, In Trench Or Duct	14000	14500	+ 500	.80	L FT	+ \$ 400.00
2001	9007001	Runway Threshold Light with Lens and Lamp, Base Mounted	0	6	+ 6	450.00	EACH	+ 2,700.00
2001	9007100	Turfing & Mulching	0	1	+ 1	300.00	LSUM	+ 300.00
4001	9007530	Furnish & Install Specified Electrical Vault Equipment	0	1	+ 1	300.00	LSUM	+ 300.00

*CHG-Change (10XX)	EXT-Extra (20XX)	ADJ-Adjustments (40XX)	NOTE: Attach justification and/or sketches for any changes.	TOTAL CHANGE ORDER (+ or -) + \$ 3,600.00
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The foregoing is in accordance with your contract, dated 6/30/86, and the change and work affected thereby is subject to all contract stipulations and covenants. An equitable adjustment, for the changes ordered, is established as follows:

CONTRACT PRICE:	CONTRACT TIME:
Original Amount \$ 400,000.00	Original Contract Time 60 Days
Amount To Date \$ 400,000.00	Contract Time Thru C.O. 60 Days
This Change Order (+ or -) \$ + 3,600.00	This Change Order (+ or -) + 5 Days
New Contract Amount \$ 403,600.00	New Contract Time 65 Days

SUBMITTED:	ACCEPTED:	Bureau of Aeronautics	APPROVED:
Project Engineer and/or	Contractor	CHECKED BY:	Federal Aviation Administration
Sponsor	Title	APPROVED:	
DATE:	DATE:	Manager-Airport Programs	Airport District Office
		DATE:	DATE: Detroit

This number can be found on the green Bi-Weekly pay estimate form. \*

Example II

Michigan Department of Transportation  
4063 (3/87)

# CHANGE ORDER

This information required by Act 327 of 1945 in order to legally modify contracts.

MAIL TO: MDOT, Bureau of Aeronautics, Capital City Airport, Lansing, Michigan 48906

KEY NO. *	PROJECT NO. 3-26-0051-0587 FEDERAL ITEM NO. AL 295	CONTRACT NO. FM 38-1-C59 JOB NO. 29775 A	NAME OF AIRPORT Jackson County Airport Jackson, MI	DATE 3/30/87 SHEET 1 OF 1	CHANGE ORDER NO. 2
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CONTRACTOR/ADDRESS Best Contracting No Name Lane Oz, MI 48000	SPONSOR/ADDRESS Jackson County 3606 Wildwood Avenue Jackson, MI 49202	CONSULTANT/ADDRESS ACME Consulting Coyote Road Roadrunner, MI 49000
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AUTH. NO./*	WORK ITEM NO.	DESCRIPTION	QUANTITY			UNIT PRICE	UNIT	DOLLAR AMOUNT +/-
			FROM	TO	CHANGE			
1002	4117621	Bituminous Concrete, 60% Crushed	8000	8043	+ 43	\$30.00	TON	+ \$1,290.00
4002	9007621	Bituminous Concrete 60% Crushed	0	3000	+ 3000	- 5.00	TON	- 15,000.00

When the pay estimate form is processed, the entire amount for Item No. 4117621 would be submitted. When Item No. 9007621 is shown on the pay estimate form for 3000 TON, \$15,000 would be subtracted from the payment due the contractor as a result of the penalty. When an adjustment involves a decrease, it is best to process the adjusted item at the same time as the original item to avoid having the contractor owe the State money at the end of the contract.

*CHG-Change (10XX)	EXT-Extra (20XX)	ADJ-Adjustments (40XX)	NOTE: Attach justification and/or sketches for any changes.	TOTAL CHANGE ORDER (+ or -) - \$13,710.00
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The foregoing is in accordance with your contract, dated 6/30/86, and the change and work affected thereby is subject to all contract stipulations and covenants. An equitable adjustment, for the changes ordered, is established as follows:

CONTRACT PRICE:	CONTRACT TIME:
Original Amount \$ 400,000.00	Original Contract Time 60 Days
Amount To Date \$ 403,600.00	Contract Time Thru C.O. 65 Days
This Change Order (+ or -) \$ - 13,710.00	This Change Order (+ or -) 0 Days
New Contract Amount \$ 389,890.00	New Contract Time 65 Days
SUBMITTED:	ACCEPTED:
Project Engineer and/or	Contractor
Sponsor	Title
DATE:	DATE:
	Manager-Airport Programs
	DATE:
	APPROVED:
	Federal Aviation Administration
	APPROVED:
	Airport District Office
	DATE:
	Detroit

(Attachment 3)  
**INSTRUCTIONS FOR COMPLETING PAYROLL RECORDS**

After a contract is awarded, the prime contractor must forward copies of subcontracts to the MDOT, Financial Services Division, for approval. If at any time a change in subcontractors is proposed, the Bureau of Aeronautics must be notified in writing through the PE and approval solicited.

After the Notice to Proceed is issued to a contractor, it is his responsibility to submit payroll records from the date he is authorized to commence work to the date work is actually completed. Payrolls must be forwarded to the PE, who, in turn, will forward them to the Bureau of Aeronautics. When work has been completed, "FINAL PAYROLL" should be written on the last payroll form submitted to the PE.

Payrolls must be submitted on Form WH-347 (which can be obtained from the Bureau of Aeronautics) or on another form of the contractor's choosing, providing a statement of compliance with respect to the wages and fringes paid to each employee engaged in the work is attached (see attached sample). This statement must be identical in wording to the statement of compliance on the back of Form WH-347 (attached). The prime contractor must account for each week of the contract. This must be done with completed payroll forms or "no work" statement on payroll forms. Each subcontractor must submit completed payroll forms for each week they worked on the contract. Each contractor or subcontractor shall preserve his weekly payroll records for a period of three years from date of completion of the contract.

Properly filled out, this Form WH-347 will satisfy the requirements of Regulations, Parts 3 and 5 (29 CFR, Subtitle A) as to payrolls submitted in connection with contracts subject to the Davis-Bacon and related acts. This form meets needs resulting from the amendment of the Davis-Bacon Act to include fringe benefits provisions. Under this amended law, the contractor is required to pay not less than the benefits predetermined by the U.S. Department of Labor, in addition to payment of not less than the predetermined rates. The contractor or subcontractor's obligation to pay fringe benefits may be met either by payment of the fringes to the various plans, funds, or programs or by making these payments to the employee as cash in lieu of fringes. The contractor and subcontractor must pay their employees minimum wages or more plus fringe benefits as stipulated in the executed contract documents.

Detailed instructions concerning the preparation of the payroll follows:

1. Contractor or Subcontractor. Fill in your firm's name and check appropriate box.
2. Address. Fill in your firm's address.
3. Payrolls or no work certification must be numbered in consecutive order.
4. Week Ending. Prime contractor must account for all weeks of

contract time. List week ending. He is not responsible to submit payrolls for the period covered by Stop Orders.

5. Location of airport and type of project.

6. Project and contract numbers.

7. Name, Address, and Social Security Number of Employee. The employee's full name must be shown on the payroll covering the first week in which the employee works on the project.

8. Work Classification. List classification descriptive of work actually performed by employees (i.e., bulldozer operator, unskilled laborer, etc.). Consult classification and minimum wage schedule set forth in the contract documents.

9. If an employee is classified as an apprentice or trainee, it is the responsibility of his employer to forward a copy of an apprentice agreement to the Bureau of Aeronautics prior to use of the apprentice or trainee on covered work or attach an agreement to payroll for the first week apprentice worked at site. This agreement must indicate registration for the apprentice classification in a bona fide apprenticeship program registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training or with a State apprenticeship agency recognized by the Bureau.

This documentation must also include the appropriate approved and allowable ratio of apprentices or trainees to journeymen in each craft classification in which apprentices or trainees are used and the applicable rate of pay as a percentage of the journeyman's ratio to be paid the apprentice or trainee. To expedite submission of the required documentation, the U.S. Department of Labor, Bureau of Apprenticeship and Training, will confirm in writing the approved registration of each apprentice or trainee. For conjunction, the appropriate Bureau of Apprentice and Training must be provided the employee's name, social security number, craft specification, anticipated period of employment, rate of pay as percentage of journeyman's rate and proposed ratios.

10. Day and Dates. Enter regular and overtime hours for each day.

11. Hours Worked. Total regular and overtime hours. On all contracts subject to the Contract Work Hours Standard Act, enter as overtime hours all hours worked in excess of 40 hours a week.

12. Rate of Pay, Including Fringe Benefits. List actual hourly rate paid the employee for time worked plus any "cash" in lieu of fringes paid the employee. When recording the hourly rate, any cash paid in lieu of fringes may be shown separately from the basic rate, thus \$5.25/.40. This is of assistance in correctly computing overtime. Payment of not less than time and one-half the basic or regular rate paid is required for overtime under the Contract Work Hours Standard Act of 1962. THE RATE OF PAY AND FRINGE BENEFITS SHOULD NOT BE LESS THAN THAT STIPULATED IN THE EXECUTED CONTRACT DOCUMENTS.

13. Fringe Benefits (Contractors Who Pay All Required Fringe Benefits). A contractor who pays fringe benefits to approved funds or programs in amounts not less than were determined in the applicable wage decisions of the contract documents shall continue to show on the face of the payroll forms the basic cash hourly rate and overtime rate paid to his employees just as he has always done. Such a contractor shall check 4(a) of the statement on the reverse side of the payroll form to indicate that he is also paying to approved funds or programs not less than the amount predetermined as fringe benefits for each craft. Any exceptions shall be noted in Section 4(c).

Fringe Benefits (Contractors Who Pay No Fringe Benefits). A contractor who pays no fringe benefits shall pay to the employee, and insert in the hourly rate column of the payroll, an amount not less than the predetermined rate for each classification plus the amount of fringe benefits determined for each classification in the applicable wage decision.

In addition, the contractor shall check paragraph 4(b) of the statement on the reverse side of the payroll to indicate he is paying fringe benefits in cash directly to his employees. Any exceptions shall be noted in Section 4(c).

14. Gross Amount Earned. Enter gross amount earned on this project. If part of the employee's weekly wage was earned on projects other than the project described on this payroll, enter first the amount earned on the airport project and then the gross amount earned on all projects, thus \$112/\$220.

15. Deductions. Five columns are provided for showing deductions made (FICA, Withholding Tax, Other). Each deduction contained in the "other" column must be itemized. All deductions must be in accordance with the provisions written on the reverse side of the payroll form in Section 1 pertaining to permissible deductions.

16. Net Wages Paid for Week. Self-explanatory.

17. The spaces provided on the reverse side of the payroll should be completed by the contractor (name of company, dates, permissible deductions, fringe benefits, etc.).

18. Signature. All payrolls must be signed by the proper authority. The willful falsification of any of the statements on the payroll may subject the contractor or subcontractor to penalties provided by 18 U.S. Code 1001, namely possible imprisonment for five years or \$10,000 fine or both.

#### CONCLUSION:

If a contractor or subcontractor fails or refuses to comply with the labor provisions of the contract documents, further grant payments to the sponsor may be suspended or other actions, in accordance with FAR Part 152.65c, may be taken until the violations stop.

Any questions on payrolls can be answered by contacting the Michigan Department of Transportation, Bureau of Aeronautics, Capital City Airport,

Lansing, Michigan 48906, Telephone 517/373-1834.





Project No. \_\_\_\_\_ Airport Location \_\_\_\_\_ Contract No. \_\_\_\_\_

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

Date \_\_\_\_\_

I, \_\_\_\_\_ do hereby state:  
(Name of signatory party) (Title)

(1) That I pay or supervise the payment of the persons employed by \_\_\_\_\_ on  
(Contractor or subcontractor)  
the \_\_\_\_\_; that during the payroll period commencing on the \_\_\_\_ day of \_\_\_\_\_,  
(Building or work)  
19 \_\_\_\_, and ending the \_\_\_\_ day of \_\_\_\_\_, 19 \_\_\_\_, all persons employed on said project have been paid  
the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf of said  
\_\_\_\_\_ from the full weekly wages earned by any person and that no deductions have  
(Contractor or subcontractor)  
been made either directly or indirectly from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part 3 (29 CFR Subtitle A), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948.63 Stat. 108, 72 Stat. 967; 76 Stat. 357; 40 U.S.C. 276c), and described below:

(List Deductions):

(2) That any payrolls otherwise under this contract required to be submitted for the above period are correct and complete; that the wage rates for laborers or mechanics contained therein are not less than the applicable wage rates contained in any wage determination incorporated into the contract; that the classifications set forth therein for each laborer or mechanic conform with the work he performed.

(3) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship program registered with a State apprenticeship agency recognized by the Bureau of Apprenticeship and Training, United States Department of Labor, or if no such recognized agency exists in a State, are registered with the Bureau of Apprenticeship and Training, United States Department of Labor.

(4) That:

(a) WHERE FRINGE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR PROGRAMS

- In addition to the basic hourly wage rates paid to each laborer or mechanic listed in the above referenced payroll, payments of fringe benefits as listed in the contract have been or will be made to appropriate programs for the benefit of such employees, except as noted in Section 4(c) below.

(b) WHERE FRINGE BENEFITS ARE PAID IN CASH (List Below):

- Each laborer or mechanic listed in the above referenced payroll has been paid as indicated on the payroll, an amount not less than the sum of the applicable basic hourly wage rate plus the amount of the required fringe benefits as listed in the contract, except as noted in section 4(c) below.

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION
REMARKS	

NAME AND TITLE	SIGNATURE
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THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION. SEE SECTION 1001 OF TITLE 18 AND SECTION 231 OF TITLE 31 OF THE UNITED STATES CODE

## INSTRUCTIONS FOR PREPARATION OF STATEMENT OF COMPLIANCE

This statement of compliance meets needs resulting from the amendment of the Davis-Bacon Act to include fringe benefits provisions. Under this amended law, the contractor is required to pay fringe benefits as predetermined by the Department of Labor, in addition to payment of the minimum rates. The contractor's obligation to pay fringe benefits may be met by payment of the fringes to the various plans, funds, or programs or by making these payments to the employees as cash in lieu of fringes.

The contractor should show on the face of his payroll all monies paid to the employees whether as basic rates or as cash in lieu of fringes. The contractor shall represent in the statement of compliance that he is paying to others fringes required by the contract and not paid as cash in lieu of fringes. Detailed instructions follow:

### Contractors who pay all required fringe benefits:

A contractor who pays fringe benefits to approved plans, funds, or programs in amounts not less than were determined in the applicable wage decision of the Secretary of Labor shall continue to show on the face of his payroll the basic cash hourly rate and overtime rate paid to his employees, just as he has always done. Such a contractor shall check paragraph 4(a) of the statement to indicate that he is also paying to approved plans, funds, or programs not less than the amount predetermined as fringe benefits for each craft. Any exception shall be noted in Section 4(c).

### Contractors who pay no fringe benefits:

A contractor who pays no fringe benefits shall pay to the employee and insert in the straight time hourly rate column of his payroll an amount not less than the predetermined rate for each classification plus the amount of fringe benefits determined for each classification in the applicable wage decision. Inasmuch as it is not necessary to pay time and a half on cash paid in lieu of fringes, the overtime rate shall be not less than the sum of the basic predetermined rate, plus the half time premium on the basic or regular rate plus the required cash in lieu of fringes at the straight time rate. To simplify computation of overtime, it is suggested that the straight time basic rate and cash in lieu of fringes be separately stated in the hourly rate column, thus \$3.25/.40. In addition, the contractor shall check paragraph 4(b) of the statement to indicate that he is paying fringe benefits in cash directly to his employees. Any exceptions shall be noted in Section 4(c).

### Use of Section 4(c), Exceptions

Any contractor who is making payment to approved plans, funds, or programs in amounts less than the wage determination requires is obliged to pay the deficiency directly to the employees as cash in lieu of fringes. Any exceptions to Section 4(a) or 4(b), whichever the contractor may check, shall be entered in Section 4(c). Enter in the Exception column the craft, and enter in the Explanation column the hourly amount paid the employees as cash in lieu of fringes, and the hourly amount paid to plans, funds, or programs as fringes.

**APPENDIX II**

(Attachment 1)  
**PREPARATION OF "AS-CONSTRUCTED" PLANS**

One copy of the "as-constructed" contract plans prepared in accordance with the following instructions are to be submitted to AERO.

**Final Sections**

The PE is not required to take final elevations on earth grade where these earth grades were constructed within the tolerances of the plans and specifications, as originally bid by the contractor. The PE must record "as-constructed" elevations and compute final earthwork on borrow areas, areas where muck was removed, areas where stripping of unsuitable material was removed, areas where changes in grade or limits of work were made from that on the bid plans and specifications, and any other areas where a question could arise as to the true amount of excavation to be paid the contractor. Also, the PE is required to record "as-constructed" elevations and compute final earthwork figures on all earth grades where the original cross-sections were inadequate to determine a true figure for the excavation item or where, for one reason or another, a doubt exists as to the true quantity of earth excavated.

**General**

The PE is not required to take final "as-constructed" elevations of pavement sections if the pavement was constructed within the tolerances of the plans and specifications, as originally bid by the contractor. The PE is required to take final pavement elevations in those areas where a change in grade was made from the original plans and in those areas where, for one reason or another, the final grade is not within the tolerance of the specifications or a question arises as to what the final pavement elevation is in any designated area.

If the drainage pipe and drainage structures have been constructed to the grades and elevations as shown on the original plans, within the tolerance of the specifications, the PE is not required to record the "as-constructed" elevations of these structures and pipe on the "as-constructed" plans. The PE is required to show on the "as-constructed" plans all changes in drainage pipe and structure locations and any change in grade or invert elevations from that shown on the original plans.

Descriptions of all witness to control points and permanent bench marks should be noted on the final "as-constructed" plans. As mentioned in the beginning of this manual, the PE should set permanent runway alignment monuments. The bronze caps for these monuments are furnished by AERO. On the "as-constructed" plans, the PE should indicate the exact location and elevation of these monuments.

On the completion of the project, the engineer should review the "as-constructed" plans, sheet by sheet, to determine that all of the information for the final estimate, change orders and detail pertaining to change orders, cross-sections, computations, field notes, and any other source, has been correctly noted on these final plans. The final "as-constructed" plans shall

show the condition of the field as it actually is at the completion of the project. It is absolutely essential that complete and accurate "as-constructed" plans be submitted to AERO because they are the basis for design of all future work at the airport involved.

If the PE has also done the design for the project and has the original tracings in his files, then he should transfer the "as-constructed" plans to AERO. If the PE does not have the tracings in his files, then he shall submit the marked-up "as-constructed" set of plans to AERO. AERO engineers will transfer the "as-constructed" information to the original tracings. After receiving final approval of the "as-constructed" plans from everyone concerned, AERO will furnish the PE with a copy of the approved "as-constructed" plans for his files.

### Title Sheet

On the title sheet of the "as-constructed" plans, the following information should be shown: Name and address of prime contractor and all subcontractors, the type of work each contractor performed, the name and address of major material suppliers and the material they supplied, starting and completion dates for the contractor.

The title sheet shall also include the following statement and the PE's signature:

#### "AS-CONSTRUCTED" CERTIFICATION

All construction performed under this contract has been completed in reasonably close conformity with the drawings, notes and specifications contained in these plans. All changes from plans, as bid, known to the engineer, have been noted.

Project Engineer:

Date:

This "as-constructed" statement will eliminate the necessity of revising the "to be" and "shall be" notes on the plans from a proposed into an "as-constructed" connotation.

### Change Orders

The final "as-constructed" plans should reflect the changes in quantities of all items of work covered by the contract. All change orders shall be listed on the quantity sheet. Also, the quantity sheet should show the final contract quantities and the final breakdown of federal and non-federal quantities.

All addendums and changes from the original contract shall be noted on each sheet of the plans where the change occurred. This area of change should be enclosed by a prominent line and the change order number noted. Change orders adjusting final quantities need only be shown on the quantity sheet and such other sheet where the original quality had been shown.

Each change from the original plans presents its own problems of presentation. The end result must clearly show the accomplishment. This

may be done by striking out the original plan figure and writing in the revised figure for a simple dimension change. More extensive revisions may require a detail to be struck out and redrawn. Larger changes may require additional details to be added to the plans, or in some cases, a new sheet may be required to be added to the "as-constructed" plans. Under no circumstances shall items shown on the "as-bid" plans be erased from the "as-constructed" plans.

### Cross-Section

Cross-sections shall be revised to reflect all changes made from the original design cross-sections so that an accurate determination of final quantities can be determined by the PE. It is not necessary to submit final cross-sections with the "as-constructed" plans, but these final cross-sections must be available for review by AERO and the FAA (where applicable).

### Contours-Elevations

If changes in grade occurred during construction, then new final contours should be clearly shown on the "as-constructed" plans for those areas where changes occurred.

Each sheet of the plans should be examined carefully by the PE to determine if the elevations of earth, pavement, drainage, and other facilities, as shown on the original plans are "as-constructed" elevations within the tolerance of the specifications. If there are changes in elevations, then the PE shall draw a line through the original elevation and letter the correct "as-constructed" elevation above the crossed out elevation.

### Soils

Unusual features of soil conditions (or different soil conditions from the original plans) encountered on the project shall be noted on the "as-constructed" plans for future reference. Borrow pits and waste areas shall be noted on the plans.

### Structures and Utilities

Drawings must accurately locate all structures and utilities with reference to permanent unconcealed reference points. This location, when applicable, must include identifiable depth. Use of permanent buildings and pavement as reference points is preferable. In the case of pavement, this must include definite identification by stationing. Field structures on unpaved airports will prove more difficult to locate. In this case, permanent reference markers locating runways are necessary.

Where the contract drawings had included this information in the layout of staking plans, this item will be of little concern. Only field changes will need to be shown. Where location was dependent upon field developments, then the resultant information and final location must be shown.

## **Lighting**

All changes from the original plans in the location of underground duct, cable locations, runway and taxiway light fixture locations, floodlight locations, etc., shall be shown on the "as-constructed" plans. All changes in vault equipment or location of vault equipment shall be shown on the "as-constructed" plans.

On one sheet of the "as-constructed" plans, the PE shall list the manufacturer's name and serial number (if there is one) of each piece of lighting equipment used on this contract, such as runway and taxiway lights, various sizes of cable, time clock, regulator, control panel, beacon, beacon tower, wind cone, vault equipment, etc.

The PE shall supply the contractor with an "as-built" wiring diagram to be placed under glass in the vault.

## **Pavement**

If subgrade soils are encountered during construction which are different from that classification for which the pavement design was prepared, then the PE should bring this information to the attention of AERO and the FAA at the time when it was discovered.

If the original plans allowed the contractor to make a choice from several alternatives in paving materials, such as gradation of materials for subbase, base, concrete, bituminous surface course, etc., or the type of prime, tack or any other alternate, then the PE shall indicate on the "as-constructed" plans the actual alternate used on the job. Also, actual rates of application of materials used on the job shall be shown on the "as-constructed" plans.

## **Buildings**

As noted in the first part of this manual, the architect shall show on the "as-constructed" plans all major equipment with the details, such as size, manufacturer and serial number. These final plans shall show coding, tagging and other details which will aid the owner in tracking down problems and making repairs. The location of all buried cables, conduit, pipe, fuel tanks, sewage systems, etc., and their approximate depth below ground, should be shown. Special attention should be given to the location of mechanical items such as heat ducts, risers, radiators, vents, conduit, electrical circuits and outlets and water supply fixtures on the final "as-constructed" plans.

## **Airport Layout Plans**

The PE is required to update each sheet of the Airport Layout Plan (ALP) to show the construction accomplished under the project. If there is more than one contract in the project, then the PE should update the ALP within 30 days after all the contracts have been completed in the project. The "as-constructed" Airport Layout Plan may be submitted separately from the "as-constructed" plans for each contract. Two copies of the ALP are to be submitted to AERO and one copy to the airport sponsor.

If the PE did not design the Airport Layout plan, then the PE shall be furnished the set of original drawings of the ALP from either the airport sponsor or AERO. The original drawings shall be returned to AERO upon completion of the "as-constructed" update.

Should any of the constructed development differ in location, dimension, or height from the development as was proposed on the ALP, the PE shall reference the Airspace Case Number, indicating FAA approval of the development, which would result from FAA's review of the project safety/phasing plan.

(Attachment 2)  
**SPECIAL INSTRUCTIONS FOR BITUMINOUS PAVING PROJECTS**

**SECTION 1. DEFINITION OF TERMS**

The project engineer should be familiar with the meaning of the following terms as applied to Specifications P-411 and FAA Advisory Circular AC 150/5370-10.

Heavy Aircraft Pavements - Heavy aircraft pavements are those pavements which are subjected to gross aircraft weights of 130,000 pounds and greater, or pavements subjected to 3,000 or more annual operations by DC-9-30 aircraft.

Light Aircraft Pavements - Light aircraft pavements are those pavements which are subjected to gross aircraft weights of less than 130,000 pounds and are not subjected to more than 2,999 annual operations by DC-9-30 aircraft.

Bituminous Base Course - A bituminous base course is that portion of the bituminous pavement in excess of the top 4 inches for pavements with design loadings greater than 30,000 pounds gross aircraft weight. For pavements with design loadings of 30,000 pounds and less, the bituminous base course shall be that portion in excess of the top 2 inches of the bituminous pavement.

Bituminous Top Course - A bituminous top course is the last layer of bituminous pavement placed and exposed to direct contact by vehicle traffic.

Bituminous Levelling Course - A bituminous levelling course is the intermediate layers of the bituminous pavement which are placed above the bituminous base course and below the bituminous top course.

**SECTION 2. MATERIALS TESTING**

2.1 Aggregates. All aggregate samples required for testing are to be furnished by the contractor. Under the terms of each contract, the contractor is responsible for making arrangements with an independent laboratory to perform material acceptance tests. The contractor is obligated to pay all charges incurred in performing these tests, including shipping expenses to transport the test samples to the laboratory. The PE should verify that samples are taken by the contractor in accordance with procedures established in ASTM D75 (coarse and fine aggregates) and ASTM C183 (mineral filler).

No aggregate should be used in the production of mixtures unless it meets the specification requirements and the laboratory test reports have been approved by the PE. The PE should verify that all applicable test results have been indicated. Each report furnished must contain a definite statement by the testing laboratory indicating that the material tested does or does not meet the applicable specification.

The aggregate section of the bituminous mix design data form (Exhibit II) should be completed by the PE at the preconstruction meeting. The PE should submit the data form, the laboratory mix design, and aggregate test reports to AERO prior to the start of full production.

**2.2 Asphalt Cement.** During each day of production, the PE should obtain a minimum of one 16-ounce sample of the asphalt cement. The sample should be drawn from the plant by the contractor. The PE should direct the contractor to place the samples in sealed containers. The containers should be labeled as follows: Date, Site, Project No., Contract No., Contractor, Supplier, Grade of AC.

The PE should properly store the samples for a period of six months beyond the date of final acceptance of the contract. The samples will be held, should verification of the asphalt physical properties be necessary.

### **SECTION 3. JOB MIX FORMULA (PROJECT ENGINEER'S RESPONSIBILITIES)**

No bituminous mixture should be produced for payment until the contractor obtains a job mix formula acceptable to both the PE and the AERO. The job mix formula should be developed following the procedures of the Asphalt Institute's Manual Series No. 2 (MS-2) with the following modifications:

Compaction of the Marshall Specimen by means of a flat-faced, mechanical hammer. The optimum asphalt content shall be determined in accordance with Section 3.2 of the applicable specification.

The testing laboratory used to develop the job mix formula must meet ASTM D3666 requirements. Each testing laboratory which provides a mix design must first submit a certification form (see Exhibit I) for approval by AERO.

The PE should complete the appropriate section of the Bituminous Mix Data Form (Exhibit II) and present it to the contractor at the preconstruction meeting. This form should be attached to the laboratory mix design report when forwarded for approval by AERO.

An example bituminous mix design report is detailed in Exhibit III.

### **SECTION 4. JOB CONTROL**

**4.1 Field Extraction.** Extraction tests for bitumen content and gradation of aggregates will be required twice daily. The PE will perform these tests in accordance with ASTM D2172 for bitumen content and AASHTO T30 for aggregate gradation.

The aggregate gradation and bitumen content of the mixture should be maintained within the Range 1 limits in accordance with Table V of Specification P-411. Should a test indicate values outside of these limits, the contractor should be advised that modifications may be needed. Should two consecutive tests on one sieve or bitumen content fall outside of the

Range 1 limits, the contractor should be directed to suspend full production. Paving should not begin again until the contractor can provide mixture within the acceptable limits of the applicable specification.

In instances where the PE recommends rejection of bituminous mixture determined to be outside of specification tolerances, the contractor will be permitted to verify the test results at his expense. Only test data provided by the approved mix design laboratory will be accepted as verification of the test results. Where the PE's field data conflicts with the laboratory data, the laboratory data will be the basis for acceptance. It is recommended that a 30 lb. sample be taken for the extraction to permit at least 3 extraction tests to be run from one sample. Although a minimum of one test for each half day's production is required, this will provide sufficient material to permit verification of the original test results.

**4.2. Verification of Marshall Criteria.** On projects funded in part by grants from the Federal Aviation Administration, the PE will be required to test bituminous mixtures for conformance with the specified Marshall criteria (i.e. stability, flow, air voids, and VMA). Marshall testing will not be required on mixtures designed for aircraft weights of 12,500 lbs. or less.

**4.2.1. Frequency of Testing.** The frequency of Marshall testing will be as follows:

- (a) One sample from the first day of full production. Two Marshall specimens shall be prepared from the sample and the test values averaged.
- (b) One sample taken each day when mixture extractions are determined outside specification tolerances (Range 2). Two Marshall specimens shall be prepared from each sample and the test values averaged.

**4.2.2. Preparation and Testing Procedure.** Samples for the Marshall specimens should be taken at the plant or job site from the hauling units. The Marshall specimens will be prepared and tested in accordance with the procedures contained in Chapter III of the Asphalt Institute Manual Series No. 2 (MS-2), current edition. Compaction of the Marshall specimen shall be by means of a flat-faced mechanical hammer.

**4.2.3. Purpose and Intent.** The purpose of testing bituminous mixtures for Marshall properties is twofold. First, it gives the PE a check on whether the materials submitted for the mix design were representative of that being used during production. It is not intended that data obtained from field Marshalls is to be used as acceptance criteria of the mixture. However, large discrepancies between field data and that of the mix design should be investigated by the PE. If the discrepancy is due to a change in materials, the contractor shall be required to provide a new mix design which is representative and which meets specification criteria.

A second purpose of Marshall testing is to provide qualitative data on material produced outside of specification tolerances for gradation and/or bitumen content. The Marshall test data can be useful in determining the suitability of "out of spec" material to remain in-place.

**4.2.4 Reporting of Data.** The PE will report Marshall test data to AERO and the FAA-Airports District Office as soon as it is available. The information can be included with the weekly inspection report.

### **4.3 Compactions.**

**4.3.1 In-Place Air Voids (Pavements Designed for Aircraft Weights 12,500 lbs. and Over).** The compaction of pavements designated for aircraft weights of 12,500 lbs. and over will be determined on the basis of percent air voids in the completed pavement. Each bituminous paving project will be tested on a lot basis, as defined by the specification. Acceptance and payment of each lot is based upon the percentage of material within the in-place air voids specification limits (1%-7%). Since the specification is statistically based, it is mandatory that all material sampling be done at random.

(a) **Sampling Procedures for Determination of Mixture Maximum Specific Gravity.** Samples for determining the maximum specific gravity of the mixture should be taken from trucks delivering material to the job site. The maximum specific gravity of each sample will be determined in accordance with ASTM D2041 (Rice Test), using Type C or D containers.

Two tests shall be run on each sample taken from the first lot. If the results of the two tests run on each sample fall within the tolerance listed in ASTM D2041 for single operator precision, it is not necessary to run two tests on each sample taken from subsequent lots. If the tests do not fall in this tolerance without retesting, two tests shall be run on each sample taken from the next lot and so on until the technician doing the testing is able to show consistency in running the test for an entire lot. These procedures shall be followed for each technician running ASTM D2041 tests for this contract.

Selection of the hauling unit from which the sample is to be taken shall be based upon the procedures described in ASTM D3665, as is described below:

- (1) Determine the anticipated tonnage for a given lot and divide this tonnage into four equal parts.
- (2) Determine the anticipated number of truck loads of mixture which will deliver a completed subplot.
- (3) To determine which truck to sample, randomly pick a number from Table B by dropping a pencil on the sheet. The first two digits of the three digit number identifies the line number of the table. Repeat the procedure to select the vertical column number; however, use only the first digit. The intersection of the line and column numbers is the selected number.
- (4) Multiply the selected number by the total number of trucks in the subplot. This number is rounded off to the next whole number, and this is the number of the truck to be sampled.

TABLE II  
Determination of Sample Selection Times

n	1	2	3	4	5	6	7	8	9	
1	0.272	0.519	0.698	0.859	1.000	0.554	0.250	0.246	0.736	0.432
2	0.994	0.978	0.693	0.593	0.670	0.028	0.831	0.319	0.073	0.268
3	0.039	0.449	0.737	0.501	0.960	0.254	0.239	0.474	0.031	0.720
4	0.144	0.695	0.339	0.621	0.128	0.032	0.413	0.617	0.764	0.257
5	0.312	0.138	0.670	0.894	0.682	0.061	0.832	0.765	0.226	0.745
6	0.871	0.838	0.595	0.576	0.096	0.581	0.245	0.786	0.412	0.867
7	0.783	0.874	0.795	0.430	0.265	0.059	0.260	0.563	0.632	0.594
8	0.355	0.424	0.684	0.074	0.109	0.345	0.618	0.176	0.352	0.748
9	0.494	0.839	0.337	0.325	0.699	0.083	0.043	0.009	0.981	0.499
10	0.642	0.514	0.297	0.869	0.744	0.824	0.524	0.656	0.608	0.408
11	0.485	0.240	0.292	0.335	0.088	0.589	0.127	0.196	0.401	0.407
12	0.728	0.819	0.557	0.050	0.152	0.816	0.404	0.079	0.203	0.493
13	0.029	0.262	0.558	0.159	0.767	0.175	0.979	0.521	0.781	0.843
14	0.918	0.348	0.311	0.232	0.797	0.921	0.995	0.325	0.397	0.356
15	0.641	0.013	0.780	0.478	0.529	0.520	0.093	0.426	0.323	0.504
16	0.208	0.468	0.045	0.798	0.065	0.315	0.318	0.742	0.597	0.080
17	0.346	0.429	0.537	0.469	0.697	0.124	0.541	0.525	0.281	0.962
18	0.900	0.206	0.539	0.308	0.480	0.293	0.448	0.010	0.836	0.233
19	0.288	0.369	0.513	0.762	0.952	0.856	0.574	0.158	0.689	0.579
20	0.746	0.170	0.974	0.306	0.145	0.139	0.417	0.195	0.338	0.901
21	0.363	0.103	0.931	0.389	0.399	0.488	0.915	0.067	0.878	0.640
22	0.663	0.942	0.278	0.785	0.638	0.002	0.989	0.462	0.927	0.186
23	0.545	0.185	0.054	0.198	0.717	0.247	0.913	0.975	0.555	0.559
24	0.560	0.349	0.569	0.910	0.420	0.492	0.947	0.115	0.884	0.452
25	0.789	0.315	0.464	0.484	0.020	0.007	0.547	0.941	0.365	0.261
26	0.279	0.609	0.086	0.852	0.890	0.108	0.076	0.089	0.662	0.607
27	0.680	0.235	0.706	0.827	0.572	0.709	0.310	0.036	0.329	0.477
28	0.078	0.444	0.178	0.651	0.423	0.672	0.517	0.660	0.657	0.972
29	0.676	0.830	0.531	0.888	0.305	0.421	0.307	0.502	0.112	0.808
30	0.861	0.899	0.643	0.771	0.037	0.241	0.582	0.578	0.634	0.077
31	0.111	0.364	0.970	0.669	0.548	0.687	0.639	0.510	0.105	0.549
32	0.289	0.857	0.948	0.980	0.132	0.094	0.298	0.870	0.309	0.441
33	0.961	0.893	0.392	0.377	0.864	0.472	0.009	0.946	0.766	0.287
34	0.637	0.986	0.753	0.566	0.213	0.807	0.017	0.460	0.515	0.630
35	0.834	0.121	0.255	0.453	0.376	0.583	0.422	0.371	0.399	0.366
36	0.284	0.490	0.402	0.151	0.044	0.436	0.747	0.694	0.136	0.585
37	0.038	0.814	0.594	0.911	0.324	0.322	0.895	0.411	0.160	0.367
38	0.351	0.283	0.027	0.220	0.685	0.527	0.943	0.556	0.853	0.612
39	0.143	0.384	0.645	0.479	0.489	0.052	0.187	0.990	0.912	0.750
40	0.512	0.056	0.018	0.122	0.303	0.803	0.533	0.729	0.205	0.925
41	0.296	0.705	0.156	0.616	0.534	0.168	0.564	0.866	0.739	0.850
42	0.451	0.536	0.768	0.518	0.481	0.880	0.835	0.734	0.427	0.847
43	0.837	0.405	0.591	0.370	0.104	0.848	0.004	0.414	0.354	0.707
44	0.724	0.153	0.841	0.829	0.470	0.391	0.388	0.163	0.817	0.790
45	0.665	0.825	0.671	0.623	0.770	0.400	0.668	0.440	0.019	0.944
46	0.573	0.716	0.266	0.456	0.434	0.467	0.603	0.169	0.721	0.739
47	0.332	0.702	0.300	0.570	0.945	0.968	0.649	0.097	0.118	0.242
48	0.755	0.951	0.937	0.550	0.879	0.162	0.791	0.810	0.625	0.674
49	0.439	0.491	0.855	0.446	0.773	0.542	0.416	0.330	0.957	0.419
50	0.700	0.877	0.442	0.286	0.526	0.071	0.154	0.988	0.333	0.626
51	0.523	0.613	0.752	0.733	0.528	0.072	0.820	0.929	0.777	0.461
52	0.905	0.182	0.567	0.249	0.227	0.229	0.604	0.304	0.217	0.142
53	0.373	0.120	0.602	0.793	0.692	0.863	0.954	0.873	0.107	0.675
54	0.057	0.953	0.041	0.090	0.223	0.508	0.806	0.438	0.203	0.586
55	0.967	0.040	0.708	0.271	0.189	0.342	0.740	0.801	0.985	0.263
56	0.917	0.715	0.758	0.005	0.666	0.599	0.934	0.100	0.987	0.085
57	0.131	0.646	0.659	0.047	0.051	0.562	0.435	0.731	0.362	0.317
58	0.326	0.605	0.443	0.601	0.386	0.560	0.378	0.172	0.445	0.636
59	0.299	0.106	0.237	0.732	0.796	0.476	0.099	0.804	0.735	0.950
60	0.101	0.055	0.776	0.686	0.171	0.533	0.936	0.895	0.982	0.211
61	0.267	0.598	0.754	0.658	0.274	0.215	0.177	0.218	0.330	0.628
62	0.471	0.102	0.454	0.568	0.963	0.357	0.882	0.507	0.157	0.580
63	0.535	0.881	0.014	0.966	0.958	0.190	0.180	0.759	0.433	0.355
64	0.277	0.458	0.295	0.196	0.772	0.148	0.466	0.291	0.688	0.046
65	0.719	0.167	0.181	0.653	0.328	0.070	0.815	0.155	0.631	0.063
66	0.385	0.858	0.713	0.883	0.916	0.084	0.561	0.999	0.379	0.668
67	0.862	0.928	0.822	0.812	0.977	0.395	0.788	0.920	0.673	0.698
68	0.486	0.938	0.757	0.749	0.991	0.219	0.264	0.932	0.898	0.006
69	0.091	0.872	0.959	0.922	0.727	0.811	0.075	0.374	0.133	0.730
70	0.146	0.482	0.930	0.611	0.179	0.011	0.248	0.886	0.344	0.926
71	0.709	0.184	0.390	0.409	0.191	0.117	0.860	0.135	0.406	0.134
72	0.996	0.896	0.760	0.347	0.053	0.372	0.193	0.756	0.565	0.914
73	0.971	0.859	0.147	0.114	0.418	0.889	0.792	0.064	0.652	0.288
74	0.202	0.538	0.026	0.939	0.696	0.008	0.846	0.259	0.415	0.423
75	0.212	0.321	0.778	0.940	0.496	0.231	0.664	0.903	0.473	0.909
76	0.207	0.799	0.487	0.022	0.813	0.891	0.500	0.368	0.725	0.437
77	0.818	0.503	0.906	0.224	0.904	0.892	0.455	0.343	0.924	0.197
78	0.701	0.984	0.174	0.141	0.704	0.908	0.048	0.828	0.997	0.058
79	0.035	0.380	0.001	0.381	0.251	0.497	0.214	0.794	0.552	0.598
80	0.221	0.280	0.587	0.353	0.584	0.270	0.885	0.110	0.956	0.711
81	0.647	0.403	0.530	0.738	0.280	0.457	0.650	0.276	0.661	0.973
82	0.667	0.722	0.327	0.723	0.410	0.625	0.012	0.907	0.316	0.677
83	0.614	0.590	0.021	0.269	0.042	0.062	0.387	0.183	0.964	0.544
84	0.302	0.123	0.116	0.282	0.851	0.256	0.648	0.845	0.782	0.993
85	0.633	0.933	0.331	0.546	0.842	0.016	0.256	0.164	0.923	0.976
86	0.060	0.681	0.683	0.775	0.624	0.955	0.126	0.655	0.919	0.113
87	0.165	0.532	0.431	0.341	0.092	0.244	0.222	0.336	0.034	0.216
88	0.875	0.691	0.383	0.382	0.596	0.301	0.275	0.188	0.868	0.805
89	0.726	0.902	0.252	0.130	0.238	0.398	0.763	0.463	0.615	0.140
90	0.273	0.393	0.285	0.161	0.619	0.865	0.551	0.030	0.571	0.258
91	0.253	0.821	0.600	0.023	0.606	0.849	0.610	0.577	0.082	0.774
92	0.340	0.654	0.173	0.495	0.498	0.992	0.192	0.506	0.751	0.129
93	0.194	0.290	0.592	0.983	0.509	0.998	0.522	0.627	0.741	0.540
94	0.166	0.450	0.210	0.204	0.840	0.826	0.833	0.516	0.965	0.375
95	0.712	0.314	0.033	0.823	0.629	0.939	0.887	0.066	0.743	0.081
96	0.622	0.800	0.710	0.575	0.678	0.465	0.802	0.969	0.150	0.784
97	0.313	0.294	0.897	0.718	0.614	0.876	0.025	0.049	0.620	0.125
98	0.137	0.067	0.003	0.483	0.201	0.709	0.320	0.935	0.447	0.787
99	0.243	0.679	0.844	0.069	0.024	0.543	0.714	0.234	0.505	0.428
100	0.361	0.359	0.230	0.761	0.334	0.149	0.511	0.475	0.854	0.119

**Example:** The pointer selected 0.199 (or Row 19) and 0.623 (or Column 6). The intersection of Row 19 and Column 67 is the number 0.574. There are eight truck loads which make up one subplot for this example; therefore,  $0.574 \times 8 = 4.592$  or the fifth truck load would be sampled.

The following method may be used to obtain samples from the designated truckloads of material:

- (1) From two of the conical piles of mixture within the truck, two furrows 3 to 6 inches in depth will be dug extending from the top to the bottom of the pile. Each furrow will follow the slope of the pile and be formed as near its center as possible. Sampling in areas between piles will be avoided because of possible segregation.
- (2) Three scoops of approximately equal volumes of material will be due from each furrow, representing the top third, center third, and bottom third of the pile, and placed in a suitable container. The material will then be thoroughly mixed together to form one sample. When ready for use, very carefully remove the material so as to keep the sample representative.
- (3) All samples used for acceptance testing must be identified as to the time, date, and truck number from which they were taken.

(b) Sampling Procedure for Obtaining Bulk Specific Gravity of the In-Place Pavement. Locations of sampling sites for determining the compaction of in-place pavement shall be taken in accordance with the procedures listed in Appendix C of the Asphalt Institute Manual Series No. 1. An Acceptable procedure is outlined as follows:

- (1) From the contract specification, determine the lot size and the number of sublots per lot ( $n = 4$ ).
- (2) Determine the total length and width of the individual paving lanes placed in the subplot.
- (3) Select a column of random numbers in Table 1 by placing 28 one-inch square pieces of cardboard numbered 1 through 28 into a container (such as a bowl), shaking them until they are thoroughly mixed and drawing out one.
- (4) Go to the column of random numbers identified with the number drawn from the container. In sub-column A locate all numbers equal to and less than the number of sublots, i.e., 01, 02, 03, 04.
- (5) Multiply the total length of the paving lanes in the subplot by the decimal value obtained in sub-column B found opposite the number used from sub-column A. This is the longitudinal station of the sampling point from the beginning of the subplot.
- (6) Multiply the total width of the individual paving lanes by the decimal value in sub-column C opposite the number used from sub-column A.

This will be the sampling offset for the associated longitudinal station measured from the left edge of the paving lane.

- (7) Where Step 5 or 6 indicates the test will be taken at less than 2 feet from a joint, the test shall be taken at these minimum distances.
- (8) Go completely through a column before using the same number over. If, for example, the plan calls for four core sample increments per lot, the first time a column is used, the first four locations would correspond to numbers 01-04 in sub-column A; the second time that column is used, numbers 05-08 would be used; and so forth.

**Example:** A 12-1/2 foot paver places a 1600 foot lot of material in three adjacent lanes (See Figure 1). The contract specifications require four core measurements per lot (one per subplot).

1. The number 12 is drawn from the container.
2. The random numbers selected from Column 12 in Table 1 for a four sample subplot are as follows:

<u>Column No. 12</u>		
<u>A</u>	<u>B</u>	<u>C</u>
04	.153	.163
01	.320	.212
02	.489	.827
03	.542	.352

NOTE: The numbers shown in Column A are in the order found in Table 1, Column 12.

3. Divide the lot into four equal sublots (1600 divided by 4). The sampling locations are as follows:

<u>Sublot</u>	<u>Longitudinal Section (From the Beginning) of the Sublot</u>	<u>Offset *</u>
4	400' x .153 = 61'	12.5' x .163 = 2'
1	400' x .320 = 128'	12.5' x .212 = 3'
2	400' x .489 = 196'	12.5' x .827 = 10'
3	400' x .542 = 217'	12.5' x .352 = 4'

\* Station offsets referenced from left side of lanes.

Referring to Figure 1, sample increment #1 would be taken 128' from the start of subplot 1; #2 would be taken 196' from the start of subplot 2; #3 would be taken 217' from the start of subplot 3, and #4 would be taken 61' from the start of subplot 4.

**4.3.2 Pavement Density (Pavements Designed for Aircraft Weights Under 12,500 lbs.).** The density of pavements designed for aircraft weights under

12,500 lbs. will be determined by comparing the density of cores taken from the compacted pavement to the Theoretical Density of the bituminous mixture. The Theoretical Density shall be computed as follows:

$$\text{Theoretical Density} = \frac{100}{\frac{\% \text{ Aggregate by Weight}}{\text{Effective Sp. Gr. of Agg.}} + \frac{\% \text{ Bitumen by Weight}}{\text{Sp. Gr. of Bitumen}}}$$

The effective specific gravity of the aggregate shall be calculated based upon the maximum specific gravity of the mixture designated by the job mix formula.

The PE should follow the procedures listed in Appendix C of the Asphalt Institute Manual Series No. 1 to determine the core sampling locations. The procedure previously described in this manual (Section 4.3.1b) is acceptable.

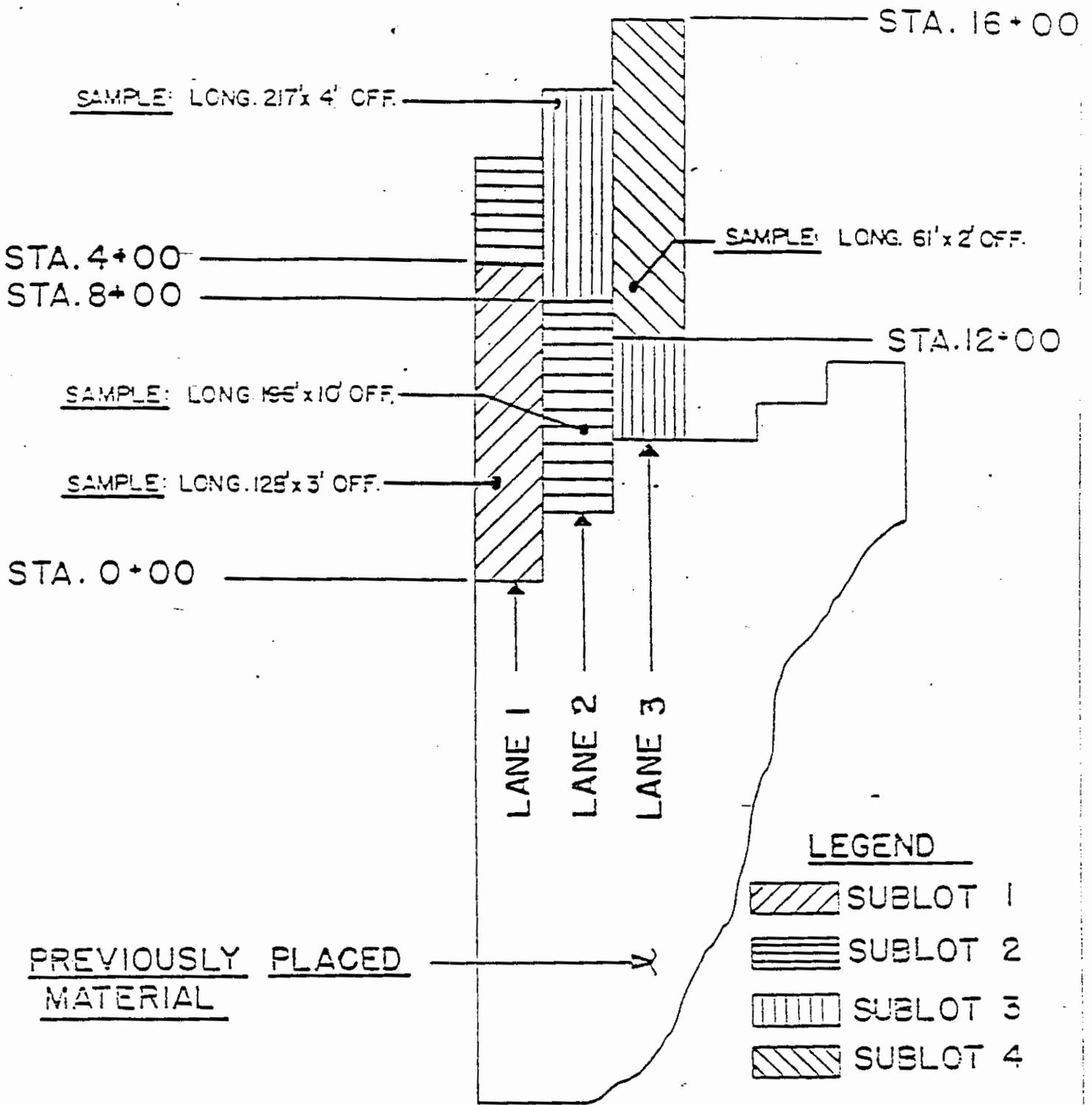


FIGURE 1  
MAT DENSITY SAMPLING  
N.T.S.

TABLE I  
RANDOM NUMBERS FOR GENERAL SAMPLING PROCEDURE

A	Col. No. 1			Col. No. 2			Col. No. 3			Col. No. 4			Col. No. 5			Col. No. 6			Col. No. 7		
	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	
15	.033	.576	05	.048	.879	21	0.13	.220	18	.089	.716	17	.024	.863	30	.030	.901	12	.029	.386	
21	.101	.300	17	.074	.156	30	.036	.853	10	.102	.330	24	.060	.032	21	.096	.198	18	.112	.284	
23	.129	.916	18	.102	.191	10	.052	.746	14	.111	.925	26	.074	.639	10	.100	.161	20	.114	.848	
30	.158	.434	06	.105	.257	25	.061	.954	28	.127	.840	07	.167	.512	29	.133	.388	03	.121	.656	
24	.177	.397	28	.179	.447	29	.062	.507	24	.132	.271	28	.194	.776	24	.138	.062	13	.178	.640	
11	.202	.271	26	.187	.844	18	.087	.887	19	.285	.899	03	.219	.166	20	.168	.564	22	.209	.421	
16	.204	.012	04	.188	.482	24	.105	.849	01	.326	.037	29	.264	.284	22	.232	.953	16	.221	.311	
08	.208	.418	02	.208	.577	07	.139	.159	30	.334	.938	11	.282	.262	14	.259	.217	29	.235	.356	
19	.211	.798	03	.214	.402	01	.175	.641	22	.405	.295	14	.379	.994	01	.275	.195	28	.264	.941	
29	.233	.070	07	.245	.080	23	.196	.873	05	.421	.282	13	.394	.405	06	.277	.475	11	.287	.199	
07	.260	.073	15	.248	.831	26	.240	.981	13	.451	.212	06	.410	.157	02	.296	.497	02	.336	.992	
17	.262	.308	29	.261	.087	14	.255	.374	02	.461	.023	15	.438	.700	26	.311	.144	15	.393	.488	
25	.271	.180	30	.302	.883	06	.310	.043	06	.487	.539	22	.453	.635	05	.351	.141	19	.437	.655	
06	.302	.672	21	.318	.088	11	.316	.653	08	.497	.396	21	.472	.824	17	.370	.811	24	.466	.773	
01	.409	.406	11	.376	.936	13	.324	.585	25	.503	.893	05	.488	.118	09	.388	.484	14	.531	.014	
13	.507	.693	14	.430	.814	12	.351	.275	15	.594	.603	01	.525	.222	04	.410	.073	09	.562	.678	
02	.575	.654	27	.438	.676	20	.371	.535	27	.620	.894	12	.561	.980	25	.471	.530	06	.601	.675	
18	.591	.318	08	.467	.205	08	.409	.495	21	.629	.841	08	.652	.508	13	.486	.779	10	.612	.850	
20	.610	.821	09	.474	.138	16	.445	.740	17	.691	.583	18	.668	.271	15	.515	.867	26	.673	.112	
12	.631	.597	10	.492	.474	03	.494	.929	09	.708	.689	30	.736	.634	23	.567	.798	23	.738	.770	
27	.651	.281	13	.499	.892	27	.543	.387	07	.709	.012	02	.763	.253	11	.618	.502	21	.753	.614	
04	.661	.953	19	.511	.520	17	.625	.171	11	.714	.049	23	.804	.140	28	.636	.148	30	.758	.851	
22	.692	.089	23	.591	.770	02	.699	.073	23	.720	.695	25	.828	.425	27	.650	.741	27	.765	.563	
05	.779	.346	20	.604	.730	19	.702	.934	03	.748	.413	10	.843	.627	16	.711	.508	07	.780	.534	
09	.787	.173	24	.654	.330	22	.816	.802	20	.781	.603	16	.858	.849	19	.778	.812	04	.318	.187	
10	.818	.837	12	.728	.523	04	.838	.166	26	.830	.384	04	.903	.327	07	.804	.675	17	.837	.353	
14	.895	.631	16	.753	.344	15	.904	.116	04	.843	.002	09	.912	.382	08	.808	.952	03	.354	.818	
26	.912	.376	01	.806	.134	28	.969	.742	12	.884	.582	27	.935	.162	18	.841	.414	01	.367	.133	
28	.920	.163	22	.878	.884	09	.974	.046	29	.926	.700	20	.970	.582	12	.918	.114	08	.915	.538	
03	.945	.140	25	.939	.162	05	.977	.494	16	.951	.601	19	.975	.327	03	.992	.399	23	.975	.584	

TABLE I  
RANDOM NUMBERS FOR GENERAL SAMPLING PROCEDURE

A	Col. No. 8			Col. No. 9			Col. No. 10			Col. No. 11			Col. No. 12			Col. No. 13			Col. No. 14		
	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	
09	.042	.071	14	.061	.935	26	.038	.023	.023	.779	16	.073	.987	.03	.033	.091	.26	.035	.175		
17	.141	.411	02	.065	.097	30	.066	.371	.371	.396	23	.078	.056	.07	.047	.391	17	.089	.363		
02	.143	.221	03	.094	.228	27	.073	.876	.876	.524	17	.096	.076	.28	.064	.113	10	.049	.681		
05	.162	.899	16	.122	.945	09	.095	.568	.568	.919	04	.153	.163	.12	.066	.360	28	.228	.075		
03	.285	.016	18	.158	.430	05	.180	.741	.741	.079	10	.254	.834	.26	.076	.552	13	.260	.767		
28	.291	.034	25	.193	.469	12	.200	.851	.851	.767	06	.284	.628	.30	.087	.101	24	.262	.366		
08	.369	.557	24	.224	.572	13	.259	.327	.327	.571	12	.305	.616	.02	.127	.187	08	.264	.651		
01	.436	.386	10	.225	.223	21	.264	.681	.681	.988	25	.319	.901	.06	.144	.068	18	.285	.311		
20	.450	.289	09	.233	.838	17	.283	.645	.645	.291	01	.320	.212	.25	.202	.674	02	.340	.131		
18	.455	.789	20	.290	.120	23	.363	.063	.063	.911	08	.416	.372	.01	.247	.025	29	.353	.478		
23	.488	.715	01	.297	.242	20	.364	.366	.366	.104	13	.432	.556	.23	.253	.323	06	.359	.270		
14	.496	.276	11	.337	.760	16	.395	.363	.363	.864	02	.489	.827	.24	.320	.651	20	.387	.248		
15	.503	.342	19	.389	.064	02	.423	.540	.540	.526	29	.503	.787	.10	.328	.365	12	.392	.694		
04	.515	.693	13	.411	.474	08	.432	.736	.736	.511	15	.518	.717	.27	.338	.412	.03	.408	.077		
16	.532	.112	20	.447	.893	10	.476	.468	.468	.357	28	.524	.998	.13	.356	.991	27	.440	.280		
22	.557	.357	22	.478	.321	03	.508	.774	.774	.306	03	.542	.352	.16	.401	.792	22	.461	.830		
11	.559	.620	29	.481	.993	01	.601	.417	.417	.197	19	.585	.462	.17	.423	.117	16	.527	.003		
12	.650	.216	27	.562	.403	22	.687	.917	.917	.524	05	.695	.111	.21	.481	.838	30	.531	.486		
21	.672	.320	04	.566	.179	29	.697	.862	.862	.572	07	.733	.838	.08	.560	.401	25	.678	.360		
13	.709	.273	08	.603	.758	11	.701	.605	.605	.101	11	.744	.948	.19	.564	.190	21	.725	.014		
07	.745	.687	15	.632	.927	07	.728	.498	.498	.428	18	.793	.748	.05	.571	.054	05	.797	.595		
30	.780	.285	06	.707	.107	14	.745	.679	.679	.674	27	.802	.967	.18	.587	.584	15	.801	.927		
19	.845	.097	28	.737	.161	24	.819	.444	.444	.928	21	.826	.487	.15	.604	.145	12	.836	.294		
26	.846	.366	17	.846	.130	15	.840	.823	.823	.529	24	.835	.832	.11	.641	.298	04	.854	.982		
29	.861	.307	07	.874	.491	25	.863	.568	.568	.294	26	.855	.142	.22	.672	.156	11	.884	.928		
25	.906	.874	05	.880	.828	06	.878	.215	.215	.470	14	.861	.462	.20	.674	.887	19	.886	.832		
24	.919	.809	23	.931	.659	18	.930	.601	.601	.524	20	.874	.625	.14	.752	.881	07	.929	.932		
10	.952	.555	26	.960	.365	04	.954	.827	.827	.718	30	.929	.056	.09	.774	.560	09	.932	.206		
06	.961	.504	21	.978	.194	28	.963	.004	.004	.722	09	.935	.582	.29	.921	.752	01	.970	.692		
27	.969	.811	12	.982	.183	19	.988	.020	.020	.872	22	.947	.797	.04	.959	.099	23	.973	.082		

TABLE I  
RANDOM NUMBERS FOR GENERAL SAMPLING PROCEDURE

	Col. No. 15			Col. No. 16			Col. No. 17			Col. No. 18			Col. No. 19			Col. No. 20			Col. No. 21		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
15	.023	.979	19	.062	.588	13	.045	.004	25	.027	.290	12	.052	.075	20	.030	.881	01	.010	.946	
11	.118	.465	25	.080	.218	18	.086	.878	06	.057	.571	30	.075	.493	12	.034	.291	10	.014	.939	
07	.134	.172	09	.131	.295	26	.126	.990	26	.059	.026	28	.120	.341	22	.043	.893	09	.032	.346	
01	.139	.230	18	.136	.381	12	.128	.661	07	.105	.176	27	.145	.689	28	.143	.073	06	.093	.180	
16	.145	.122	05	.147	.864	30	.146	.337	18	.107	.358	02	.209	.957	03	.150	.937	15	.151	.012	
20	.165	.520	12	.158	.365	05	.169	.470	22	.128	.827	26	.272	.818	04	.154	.867	16	.185	.455	
06	.185	.481	28	.214	.184	21	.244	.433	23	.156	.440	22	.299	.317	19	.158	.359	07	.227	.277	
09	.211	.316	14	.215	.757	23	.270	.849	15	.171	.157	18	.306	.475	29	.304	.615	02	.304	.400	
14	.248	.348	13	.224	.846	25	.274	.407	08	.220	.097	20	.311	.653	06	.369	.633	30	.316	.074	
25	.249	.890	15	.227	.809	10	.290	.925	20	.252	.066	15	.348	.156	18	.390	.536	18	.328	.799	
13	.252	.577	11	.280	.898	01	.323	.490	04	.268	.576	16	.381	.710	17	.403	.392	20	.352	.288	
30	.273	.088	01	.331	.925	24	.352	.291	14	.275	.302	01	.411	.607	23	.404	.182	26	.371	.216	
18	.277	.689	10	.399	.992	15	.361	.155	11	.297	.589	13	.417	.715	01	.415	.457	19	.448	.754	
22	.372	.958	30	.417	.787	29	.374	.882	01	.358	.305	21	.472	.484	07	.437	.696	13	.487	.598	
10	.461	.075	08	.439	.921	08	.432	.139	09	.412	.089	04	.478	.885	24	.446	.546	12	.546	.640	
28	.519	.536	20	.472	.484	04	.467	.266	16	.429	.834	25	.479	.080	26	.485	.768	24	.550	.038	
17	.520	.090	24	.498	.712	22	.508	.880	10	.491	.203	11	.566	.104	15	.511	.313	03	.604	.780	
03	.523	.519	04	.516	.396	27	.632	.191	28	.542	.306	10	.576	.659	10	.517	.290	22	.621	.930	
26	.573	.502	03	.548	.688	16	.661	.836	12	.563	.091	29	.665	.397	30	.556	.853	21	.629	.154	
19	.634	.206	23	.597	.508	19	.675	.629	02	.593	.321	19	.739	.298	25	.561	.837	11	.634	.908	
24	.635	.810	21	.681	.114	14	.680	.890	30	.692	.198	14	.749	.759	09	.574	.599	05	.696	.459	
21	.679	.841	02	.739	.298	28	.714	.508	19	.705	.445	08	.756	.919	13	.613	.762	23	.710	.078	
27	.712	.366	29	.792	.038	06	.719	.441	24	.709	.717	07	.798	.183	11	.698	.783	29	.726	.585	
05	.780	.497	22	.829	.324	09	.735	.040	13	.820	.739	23	.834	.647	14	.715	.179	17	.749	.916	
23	.861	.106	17	.834	.647	17	.741	.906	05	.848	.866	06	.837	.978	16	.770	.128	04	.802	.186	
12	.865	.377	16	.909	.608	11	.747	.205	27	.867	.633	03	.849	.964	08	.815	.385	14	.835	.319	
29	.882	.635	06	.914	.420	20	.850	.047	03	.883	.333	24	.851	.109	05	.872	.490	08	.870	.546	
08	.902	.020	27	.958	.856	02	.859	.356	17	.900	.443	05	.859	.935	21	.885	.999	28	.871	.539	
04	.951	.482	26	.981	.976	07	.870	.612	21	.914	.483	17	.863	.220	02	.958	.177	25	.971	.369	
02	.977	.172	07	.983	.624	03	.916	.463	29	.950	.753	09	.863	.147	27	.961	.980	27	.984	.252	

TABLE I  
RANDOM NUMBERS FOR GENERAL SAMPLING PROCEDURE

	Col. No. 22			Col. No. 23			Col. No. 24			Col. No. 25			Col. No. 26			Col. No. 27			Col. No. 28		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
12	.051	.032	.26	.051	.187	.08	.015	.521	.039	.005	.16	.026	.102	.21	.050	.952	.29	.042	.039		
11	.068	.980	.03	.053	.256	.16	.068	.994	.061	.599	.01	.033	.886	.17	.085	.403	.07	.105	.293		
17	.089	.309	.29	.100	.159	.11	.118	.400	.068	.054	.04	.088	.686	.10	.141	.624	.25	.115	.420		
01	.091	.371	.13	.102	.465	.21	.124	.565	.073	.812	.22	.090	.602	.05	.154	.157	.09	.126	.612		
10	.100	.709	.24	.110	.316	.18	.153	.158	.123	.649	.13	.114	.614	.06	.164	.841	.10	.205	.144		
30	.121	.744	.18	.114	.300	.17	.190	.159	.126	.658	.20	.136	.576	.07	.197	.013	.03	.210	.054		
02	.166	.056	.11	.123	.208	.26	.192	.676	.161	.189	.05	.138	.228	.16	.215	.363	.23	.234	.533		
23	.179	.529	.09	.138	.182	.01	.237	.030	.166	.040	.10	.216	.565	.08	.222	.520	.13	.266	.799		
21	.187	.051	.06	.194	.115	.12	.283	.077	.248	.171	.02	.233	.610	.13	.269	.477	.20	.305	.603		
22	.205	.543	.22	.234	.480	.03	.286	.318	.255	.117	.07	.278	.357	.02	.288	.012	.05	.372	.223		
28	.230	.688	.20	.274	.107	.10	.317	.734	.261	.928	.30	.405	.273	.25	.333	.633	.26	.385	.111		
19	.243	.001	.21	.331	.292	.05	.337	.844	.301	.811	.06	.421	.807	.28	.348	.710	.30	.422	.315		
27	.267	.990	.08	.346	.085	.25	.441	.336	.363	.025	.12	.426	.583	.20	.362	.961	.17	.453	.783		
15	.283	.440	.27	.382	.979	.27	.469	.786	.378	.792	.08	.471	.708	.14	.511	.989	.02	.460	.916		
16	.352	.089	.07	.387	.865	.24	.473	.237	.379	.959	.18	.473	.738	.26	.540	.903	.27	.461	.841		
03	.377	.648	.28	.411	.776	.20	.475	.761	.420	.557	.19	.510	.207	.27	.587	.643	.14	.483	.095		
06	.397	.769	.16	.444	.999	.06	.557	.001	.467	.943	.03	.512	.329	.12	.603	.745	.12	.507	.375		
09	.409	.428	.04	.515	.993	.07	.610	.238	.494	.225	.15	.640	.329	.29	.619	.895	.28	.509	.748		
14	.465	.406	.17	.518	.827	.09	.617	.041	.620	.081	.09	.665	.354	.23	.623	.333	.21	.583	.804		
13	.499	.651	.05	.539	.620	.13	.641	.648	.623	.106	.14	.680	.884	.22	.624	.076	.22	.587	.993		
04	.539	.972	.02	.623	.271	.22	.664	.291	.625	.777	.26	.703	.622	.18	.670	.904	.16	.689	.339		
18	.560	.747	.30	.637	.374	.04	.668	.856	.651	.790	.29	.739	.394	.11	.711	.253	.06	.727	.298		
26	.575	.892	.14	.714	.364	.19	.717	.232	.715	.599	.25	.759	.386	.01	.790	.392	.04	.731	.814		
29	.756	.712	.15	.730	.107	.02	.776	.504	.782	.093	.24	.803	.602	.04	.813	.611	.08	.807	.983		
20	.760	.920	.19	.771	.552	.29	.777	.548	.810	.371	.27	.842	.491	.19	.843	.732	.15	.833	.757		
05	.847	.925	.23	.780	.662	.14	.823	.223	.841	.726	.21	.870	.435	.03	.844	.511	.19	.896	.464		
25	.872	.891	.10	.924	.888	.23	.848	.264	.862	.009	.28	.906	.367	.30	.858	.299	.18	.916	.384		
24	.874	.135	.12	.929	.204	.30	.892	.817	.891	.873	.23	.948	.367	.09	.929	.199	.01	.948	.610		
08	.911	.215	.01	.937	.714	.28	.943	.190	.917	.264	.11	.956	.142	.24	.931	.263	.11	.976	.799		
07	.946	.065	.25	.974	.398	.15	.975	.962	.958	.990	.17	.993	.989	.15	.939	.947	.24	.978	.633		

EXHIBIT I

BITUMINOUS LABORATORY CERTIFICATION  
TO ASTM D3666 STANDARD

LABORATORY

Name \_\_\_\_\_  
Address \_\_\_\_\_  
Number of Years Engaged in Bituminous Paving Materials Testing \_\_\_\_\_  
Engineering Registration (State and Number) \_\_\_\_\_  
Management Supervisor Name \_\_\_\_\_

INSPECTION OF LABORATORY BY THE MATERIALS REFERENCE LABORATORIES OF THE NATIONAL BUREAU OF STANDARDS \*

Name of Inspecting Agency (if other than AMRL) \_\_\_\_\_  
Date of Inspection \_\_\_\_\_  
Copy of Inspection Report Available for Review \_\_\_\_ Yes \_\_\_\_ No

\* Inspection Report by the American Association for Laboratory Accreditation may be accepted in lieu of AMRL inspection.

AASHTO MATERIALS REFERENCE LABORATORY (REFERENCE SAMPLE TESTING)

Bituminous Concrete Reference Sample Program (Mix Design)

Date of Last Sample Tested \_\_\_\_\_  
Sample Numbers \_\_\_\_\_ (Attach Copy of Report)

Aggregate Reference Sample Program (Coarse and Fine Aggregate Testing)

Date of Last Sample Tested \_\_\_\_\_  
Sample Numbers \_\_\_\_\_ (Attach Copy of Report)

Bituminous Reference Sample Program (Asphalt Cement Testing)

Date of Last Sample Tested \_\_\_\_\_  
Sample Numbers \_\_\_\_\_ (Attach Copy of Report)

EVIDENCE OF ACCREDITATION BY AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION

(AALA)

Date of Latest Accreditation \_\_\_\_\_  
(Attach copy of Accreditation Certificate and copy of Letter of Accreditation.)

I CERTIFY THAT THE ABOVE INFORMATION IS TRUE AND CORRECT AND THAT THIS LABORATORY COMPLIES WITH THE ASTM D3666 STANDARD.

\_\_\_\_\_  
(Signature) (Title) (Date)

Approval of the above Certification by the MDOT-Bureau of Aeronautics:

\_\_\_\_\_  
(Signature) (Title) (Date)

Approval of this Certificate Expires on \_\_\_\_\_

EXHIBIT II  
BITUMINOUS MIX FORM

THIS SECTION TO BE COMPLETED BY PROJECT ENGINEER:

Airport \_\_\_\_\_  
 Project No. \_\_\_\_\_ Contract No. \_\_\_\_\_  
 Project Engineer/Address \_\_\_\_\_  
 \_\_\_\_\_ Telephone No. \_\_\_\_\_

MARSHALL TEST REQUIREMENTS

	<u>Type of Mixture(s)</u>	<u>Specification</u>	<u>Gross Loadings</u>	<u>No. Blows</u>	<u>Stability lb.</u>	<u>Asphalt Cement Grade</u>
1.	_____	_____	_____	_____	_____	_____
2.	_____	_____	_____	_____	_____	_____
3.	_____	_____	_____	_____	_____	_____

PHYSICAL TESTS NEEDED ON AGGREGATES

Coarse Aggregate:	_____	L.A. Abrasion	_____	Sodium Sulfate Soundness
	_____	% Crushed	_____	Flat and Elongated
	_____	Soft Particles	_____	Unit Weight (Slag)
Fine Aggregate:	_____	Liquid Limit	_____	Plasticity Index
	_____	Presence of Clay and Silt		
RAP:	_____	Extraction Test	_____	Recovery Test
	_____	Viscosity	_____	Physical Testings on
	_____	Penetration		Extracted Aggregate

THIS SECTION TO BE COMPLETED BY CONTRACTOR:

To Laboratory \_\_\_\_\_ Attention \_\_\_\_\_  
 Contractor/Address \_\_\_\_\_  
 \_\_\_\_\_ Telephone No. \_\_\_\_\_

Mix Design Needed By: \_\_\_\_\_ (Date)

MATERIALS SUBMITTED FOR DESIGN TESTS

	<u>Aggregates</u>	<u>Pit No.</u>	<u>Producer</u>	<u>Estimate % In Mix</u>
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
Mineral Filler	_____	_____	_____	_____
Reclaimed (RAP)	_____	_____	_____	_____
Asphalt Cement Supplier	_____	_____	_____	_____

Date Shipped \_\_\_\_\_ Via Carrier \_\_\_\_\_

Engineer's Signature \_\_\_\_\_ Date \_\_\_\_\_  
 Contractor's Signature \_\_\_\_\_ Date \_\_\_\_\_

EXHIBIT III  
REPORT OF BITUMINOUS MIX DESIGN

COVER SHEET

1. Date of report.
2. Name, address, telephone number of contact person for testing.
3. Material designation and source description of mixture components.
4. Statement regarding design method and procedures used.
5. Marshall design criteria and identification by the bituminous specification used (P-411).
6. Target placement temperature.

# REPORT OF BITUMINOUS MIX DESIGN

DATE \_\_\_\_\_

CONTRACTOR \_\_\_\_\_

TYPE OF MIX \_\_\_\_\_

PROJECT NO. \_\_\_\_\_ CONTRACT NO. \_\_\_\_\_

SPECIFICATION NO. \_\_\_\_\_

## SOURCE OF MATERIALS

Material

Source

## MARSHALL PROPERTIES AT OPTIMUM ASPHALT CONTENT

## JOB MIX FORMULA

Sieve Size

Percent Passing

Asphalt Content (Percent) \_\_\_\_\_

## AGGREGATE GRADATION - PERCENT PASSING

<u>Sieve Size</u>	<u>Coarse</u>	<u>Fine</u>	<u>Sand</u>	<u>Filler</u>	<u>Blend</u>	<u>Specification Limits</u>
-------------------	---------------	-------------	-------------	---------------	--------------	-----------------------------

Bulk Sp. Gr.	_____	_____	_____	_____	_____	---
--------------	-------	-------	-------	-------	-------	-----

## AGGREGATE AS USED IN LABORATORY TRIAL MIXES

Final Blend _____			
<u>General Characteristics</u>			
Weight Loose (lbs/Cu.Ft.) _____	Specific Gravity _____	Wear (%) _____	
Fractured Particles (%) _____	Absorption (%) _____	Liquid Limit _____	
Plasticity Index _____	Elongated Particles (%) _____		
Resistance to Stripping _____	Swell Test % _____		

REPORT OF BITUMINOUS MIX DESIGN (contd.)

---

**BITUMEN DATA**

Type \_\_\_\_\_ Source \_\_\_\_\_ Specific Gravity, 77/77°F. \_\_\_\_\_

---

AVERAGE MARSHALL TEST RESULTS: Mixed at \_\_\_\_\_ °F; \_\_\_\_\_ Blow Compaction

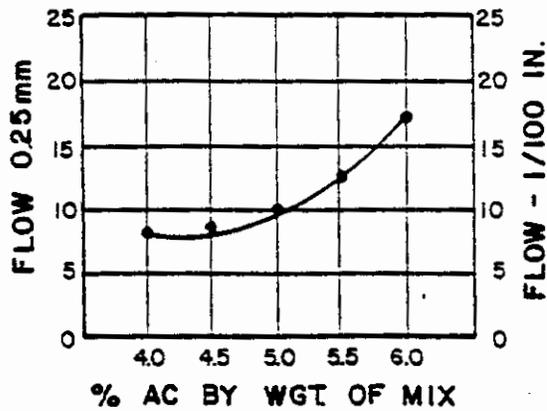
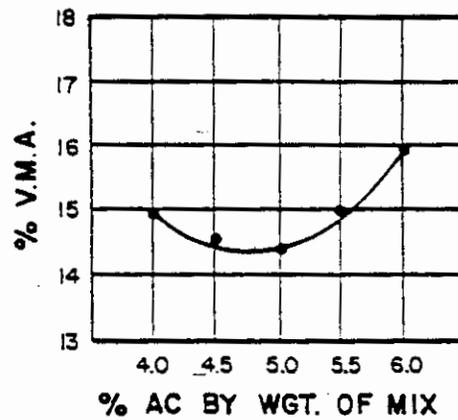
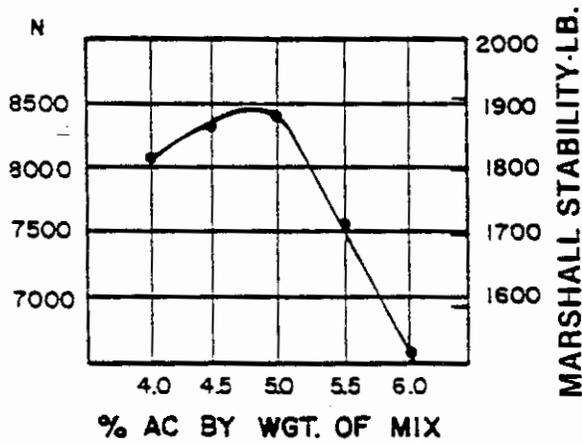
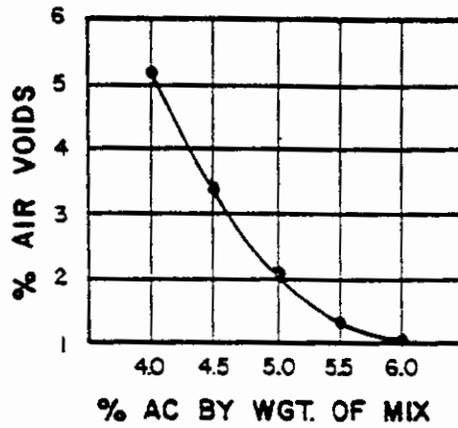
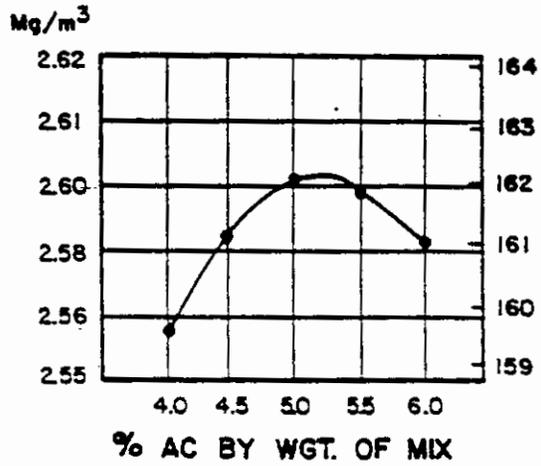
Bitumen % by Wt.	Sp. Gr. at 77°F.		Voids			Flow 0.01"	Stability @ 140°F. lb.
	Actual	Th. Max	Mix	VMA	Filled		

---

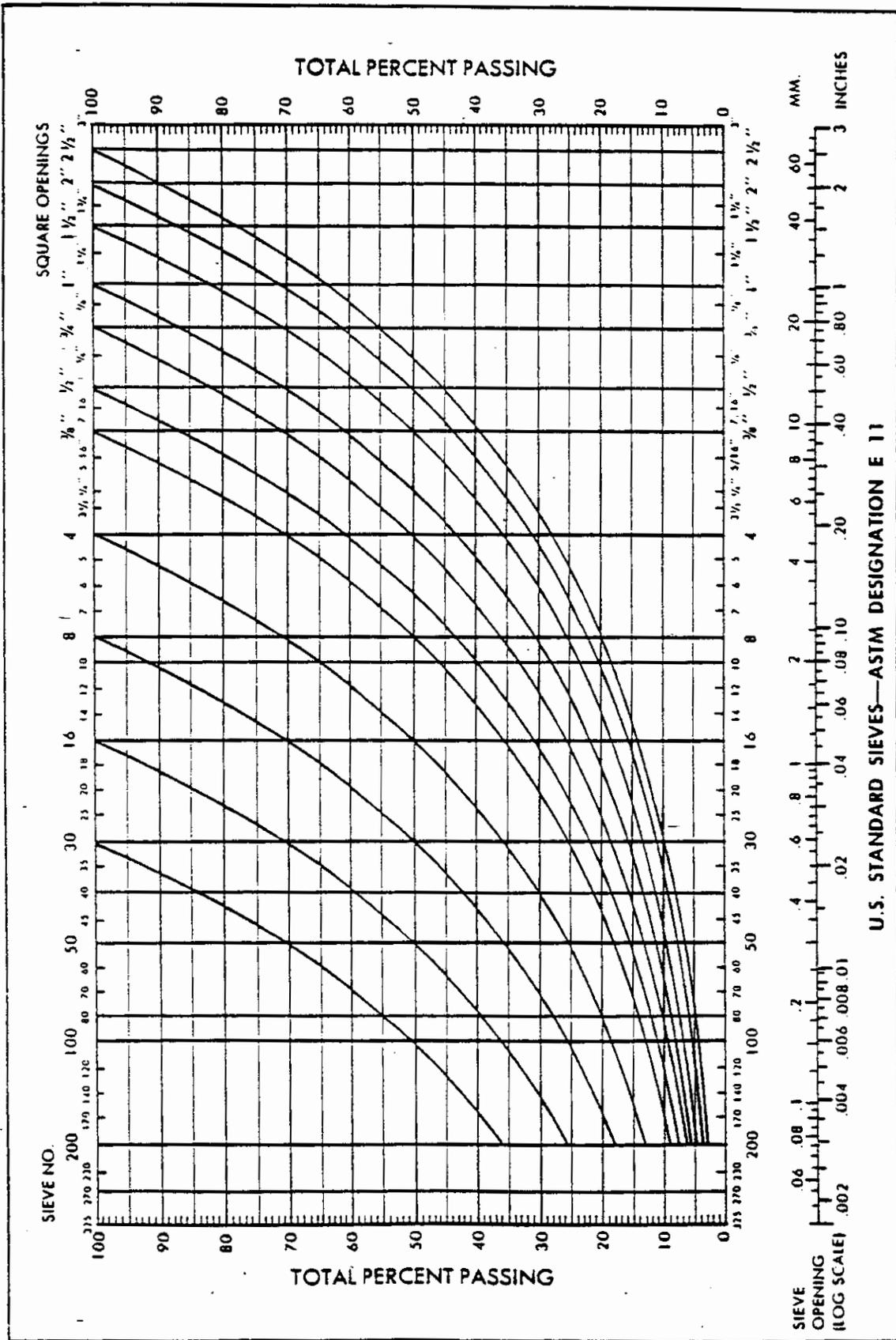
Target Placement Temperature \_\_\_\_\_ °F.

Laboratory Name \_\_\_\_\_

Signature \_\_\_\_\_ P.E. No. \_\_\_\_\_



Test property curves for hot-mix design data by the Marshall method



U.S. STANDARD SIEVES—ASTM DESIGNATION E 11

Fuller maximum density curves on standard semi-log grading chart



U.S. Department  
of Transportation  
Federal Aviation  
Administration

**CONSTRUCTION PROGRESS AND INSPECTION REPORT  
AIRPORT DEVELOPMENT AID PROGRAM**

PERIOD ENDING

ADAP PROJECT NUMBER

AIRPORT NAME

TYPE OF CONTRACT

CONTRACTOR'S NAME

1. ROUGH ESTIMATE OF PERCENT COMPLETION TO DATE OF CONSTRUCTION PHASES *(Include items such as clearing, grading, drainage, base, surface, lighting, etc.)*

2. BRIEF OUTLINE OF WORK COMPLETED OR IN PROGRESS THIS PERIOD

3. BRIEF WEATHER SUMMARY THIS PERIOD INCLUDING APPROXIMATE RAINFALL AND PERIODS OF BELOW FREEZING TEMPERATURE *(On earthwork jobs, include soil conditions)*

4. CONTRACT TIME

5. BRIEF SUMMARY OF LABORATORY AND FIELD TESTING THIS PERIOD

NO. DAYS  
CHARGED  
TO DATE

LAST WORK-  
ING DAY  
CHARGED  
(DATE)

6. DESCRIBE ANTICIPATED WORK BY CONTRACTOR FOR NEXT PERIOD

7. PROBLEM AREAS/OTHER COMMENTS *(Revisions to plans and specifications approved or denied, delays, difficulties, etc.)*

SPONSOR'S INSPECTOR OR REPRESENTATIVE

DATE

TYPED OR PRINTED NAME AND TITLE

SIGNATURE

INSTRUCTIONS FOR PREPARATION OF FAA FORM 5370-1 (11-81)

CONSTRUCTION PROGRESS AND INSPECTION REPORT  
AIRPORT DEVELOPMENT AID PROGRAM

This preaddressed form is to be filled out, with ballpoint pen or typewriter by the Sponsor's inspector on the ADAP project, folded with the return address out, fastened, and mailed to the address shown below. No postage is required since the postage has been prepaid by the Federal Aviation Administration.

Submit one copy for each report. If additional space is required to complete any of the items, continue on a separate sheet of plain paper, identifying it with the ADAP project number, fold and insert inside the report before mailing.

If additional blank copies of the form are required, submit your request to the address provided below.

1st  
Fold

2nd  
Fold

U.S. Department  
of Transportation  
**Federal Aviation  
Administration**

800 Independence Ave., S.W.  
Washington, D.C. 20591

Official Business  
Penalty for Private Use \$300

**BUSINESS REPLY MAIL**

FIRST CLASS PERMIT NO. 73173 WASHINGTON, D.C.

POSTAGE WILL BE PAID BY U.S. DEPT. OF TRANSPORTATION



NO POSTAGE  
NECESSARY  
IF MAILED  
IN THE  
UNITED STATES



(Attachment 4)  
THE FINAL CONTRACT REPORT

The Final Contract Report is the major source document for funding agencies, sponsors and engineers to evaluate the benefits and short falls of the construction methods and techniques utilized on a project so that future projects can benefit from the past experiences. Thus, the analysis and discussion required must be presented in an easily understood format and as concisely as possible for effective use. Content and format must be geared to the type and uniqueness of the work in the construction contract.

Conclusions and recommendations expressed in the text of the report must be supported by appropriate test data and/or recorded factual data. Referenced data should be incorporated into the text of the report or attached as an appendix.

The Final Contract Report is only required when requested by AERO or FAA and is specifically referenced in the engineering agreement.

The Final Contract Report is to be prepared by the PE and submitted preferably prior to the final inspection. It shall be developed consistent with the following guidelines:

- (a) The report should have a reference containing the airport name, location, project number, and contract number and begin with a section giving a generalized description of the contract work including a description of unique construction, work specialty equipment, or materials and construction problems.
- (b) A review of the unique construction work, specialty equipment or materials, construction problems, and construction alternatives should be presented. This review, as a minimum, should consider the following items:
  - (1) Summary of weather conditions and temperatures under which the construction activity took place. Daily weather data during unique or problem construction should be provided.
  - (2) Adequacy, type and size of construction equipment and work force including supervision utilized on the project. The rates of production and experience of the work force should also be analyzed.
  - (3) Construction techniques and practices utilized.
  - (4) Construction problems, if any, and how these problems were resolved. Also include any improvements or benefits that were derived from the construction procedures utilized.
  - (5) The PE should discuss whether or not unique materials specified were readily available. Also were unique construction methods easily attainable by the contractor.
  - (6) The PE should point out problem areas that were encountered that required large overruns in quantities. (e.g. If a substantial amount

of undercut was required due to unsuitable soils, these areas should be identified.)

- (7) Necessary sketches to clarify discussion items.
  - (8) Summary of cost of unique construction work including the cost of associated engineering and testing.
- (c) An analysis of the contract time to determine whether construction was accomplished within the limits of the specifications. This analysis should establish the basis for and the amount of liquidated damages that are to be assessed. The number of rain days in the estimate of contract time versus the actual number of rain days, changes in the work that changed the contract time and conditions beyond the contractor's control that justifies a time change should be included if appropriate. This contract time analysis should be summarized on the form attached as Exhibit "I".
  - (d) A summary of the Air Voids tests results for all asphalt pavements placed under the P-411 Specification shall be presented.

This summary shall include tonnage of each lot, location of each subplot core, unit weight of each core, unit weight of each plant sample and related average, density of each core, quality index, percent within tolerance (lot), pay factor (lot) and payment amount (lot). A sketch depicting the subplot core locations is recommended. The weather conditions, air temperature, surface temperature and placement temperature of the mix shall be included for each lot. A recommended format for presenting this data is included as Exhibit "II".

A summary of the marshall properties including stability, flow, air voids, and VMA and a copy of the mix design shall be included in this report.

- (e) A summary of the flexural strength test results for all concrete pavements placed under the P-501 Specification shall be presented. This summary shall include square yards of concrete of each lot, location of each subplot specimen, flexural strength of each subplot specimen, and average flexural strength of each lot.
- (f) A summary of the pavement thickness test results for all concrete pavements placed under the P-501 Specification shall be presented. This summary shall include square yards of concrete of each lot, location of each core in lot, thickness of each core, average thickness of lot, percent payment for lot, and payment amount for lot.
- (g) Acceptance Certifications by the Sponsor and Consultant shall be included. The format for the Certifications is included as Exhibit "III".
- (h) Conclusions developed during construction and recommendations for use on future projects shall be presented. Also, recommendations for maintenance of this facility should be provided.

- (i) This report shall be dated and signed by designated representative of consulting firm that prepared the report.

EXHIBIT I  
**CONTRACT COMPLETION SUMMARY**

Airport \_\_\_\_\_  
 Project No. \_\_\_\_\_  
 Contract No. \_\_\_\_\_

	<u>CALENDAR/WORKING</u> <u>DAYS</u>	<u>DATE</u>
1. Contract Time	_____	
2. Notice to Proceed (as of)	_____	_____
3. Actual Starting Date		_____
4. Stop Order No. 1		_____
5. Time Used	_____	
6. Start Order No. 1		_____
7. Stop Order No. 2		_____
8. Time Used	_____	
9. Start Order No. 2		_____
10. Stop Order No. 3		_____
11. Time Used	_____	
12. Start Order No. 3		_____
13. Project Completion		_____
14. Total Time Used	_____	
15. Contract Time Left Unused	_____	

**REMARKS** (If Item 15 is a negative number, describe reasons and proposed action):

EXHIBIT II  
**SAMPLE SUMMARY FOR AIR VOIDS TEST  
 RESULTS OF ASPHALT PAVEMENTS**

Lot No. \_\_\_\_\_

Type of Material and Course: \_\_\_\_\_  
 Date Placed: \_\_\_\_\_  
 Tonnage Placed: \_\_\_\_\_  
 Weather Conditions: \_\_\_\_\_  
 Air Temperature: \_\_\_\_\_  
 Surface Temperature: \_\_\_\_\_  
 Asphalt Placement Temperature: \_\_\_\_\_

Average Unit

<u>Sublot No.</u>	<u>Station Location Cores</u>	<u>Average of Sublot Maximum Specific Gravities</u>	<u>B u l k Specific Gravity of Core</u>	<u>Percent Air Voids of the Core</u>	<u>Remarks</u>
1.					
2.					
3.					
4.					

Percent Within Limits (Table IX) \_\_\_\_\_

Pay Factor (Table X) \_\_\_\_\_

Payment Amount = Tonnage x Pay Factor x  
 Unit Price = \_\_\_\_\_

Penalty Amount = Tonnage x (100 - Pay Factor)  
 x Unit Price = \_\_\_\_\_

EXHIBIT III

SAMPLE ACCEPTANCE CERTIFICATION

Mr. Robert Addy, Administrator  
Airport Development Division  
Michigan Aeronautics Commission  
Capital City Airport  
Lansing, Michigan 48906

Dear Mr. Addy:

Reference: Airport Name and Location  
Project: AIP Project Number  
Contract: Contract Number and Description of Work  
Subject: Sponsor and Engineer Acceptance Certification

The Contractor for the above referenced contract has acceptably completed all required contractual development.

In making this determination, a review was accomplished by the Project Engineer and Sponsor to determine that the development conforms to the specified testing, quality or dimensional, and administrative requirement of the plans and specifications.

This development:

(a) was completed in full conformity with the as-advertised plans except for changes in development which were authorized by written change order(s) excluding the following:

(no exclusions)

(b) was accomplished using only materials that met the pertinent specification requirement of the contract except for the following:

(no exceptions)

Therefore, based on reasonably close conformance to all contract requirements, the work is considered acceptable and sufficient in all aspects and is hereby accepted.

ACCEPTED BY:

(Project Engineer)

\_\_\_\_\_  
Name and Title

Date Accepted \_\_\_\_\_

(Sponsor)

\_\_\_\_\_  
Name and Title

Date Accepted \_\_\_\_\_

**APPENDIX III**

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-152	<u>EXCAVATION AND EMBANKMENT</u>	(All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing By Independent Laboratory</u>			
	None			
	<u>Items Requiring Certification</u>			
	None			
	<u>Items Requiring Field Testing</u>			
	Density:			
	Under Pavement Areas	As specified on plans	Min 1/3000 S YD/Layer	
	Outside of Pavement Areas	95% Non-Cohesive - AASHTO-T99	Min 1/3000 S YD/Layer 90% cohesive - AASHTO-T99	
	Surface Tests	± 1/2" when measured with 16'	As Required	straightedge

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-154	<u>SUBBASE COURSE</u>	(All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing By Independent Laboratory</u>			
	Gradation	See Table 1 - Also, not more	1/Source than 3% shall be finer than 0.02 mm in diameter, D422	
	Liquid Limit	25 Max - D423	1/Source	
	Plasticity Index	6 Max - D424	1/Source	
	<u>Items Requiring Certification</u>			
	None			
	<u>Items Requiring Field Testing</u>			
	Density/Moisture:			
	Less than 12.5K GAW	AASHTO T99 - 95% Density Min	1/3000 S YD/Layer	
	Less than 30K GAW	AASHTO T99 - 100% Density Min	1/3000 S YD/Layer	
	30K or more GAW	AASHTO T180 - 100% Density Min	1/3000 S YD/Layer	
	Gradation	See Table 1	1/6000 S YD/Layer	
	Thickness	Deficiencies in excess of 1/2"	1/3000 S YD must be corrected	
	Surface Test	± 1/2" when measured with a	As Required	16' straight edge.

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
F-160	<u>WIRE FENCE WITH WOOD POSTS</u>	(All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing By Independent Laboratory</u>			
	None			
	<u>Items Requiring Certification</u>			
	Wire	See Specification	1/Source	
	Gates and Hardware	See Specification	1/Source	
	Posts	See Specification	1/Source	
	<u>Items Requiring Field Testing</u>			
	None			

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
F-161	<u>WIRE FENCE WITH STEEL POSTS</u>	(All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing By Independent Laboratory</u>			
	None			
	<u>Items Requiring Certification</u>			
	Wire	See Specification	1/Source	
	Posts, Gates, Rails, Braces and Accessories	Federal Spec RR-F-183	1/Source	
	<u>Items Requiring Field Testing</u>			
	None			

SPEC. TITLE REQUIREMENT MINIMUM SAMPLE SELECTION REMARKS

F-162 CHAIN LINK FENCE (All Testing Requirements are ASTM unless noted otherwise.)

Items Requiring Material Testing By Independent Laboratory

None

Items Requiring Certification

- Fabric See Specification 1/Source
- Barbed Wire See Specification 1/Source
- Post Rails and Braces See Specification 1/Source
- Gates See Specification 1/Source
- Wire See Specification 1/Source

Items Requiring Field Testing

None

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-208	<u>AGGREGATE BASE COURSE</u>	(All Testing Requirements are ASTM unless noted otherwise.)		If slag is used, it must be air-cooled blast furnace slag.
	<u>Items Requiring Material Testing By Independent Laboratory</u>			
	Liquid Limit*	AASHTO T89 - 25 Max	1/Source	
	Plastic Limit*	AASHTO T90 - See PI	1/Source	
	Plasticity Index*	AASHTO T90 - 6 Max	1/Source	
	Abrasion:			
	Uncrushed CA	AASHTO T96 - 45 Max @ 500 Revolutions	1/Source	
	Crushed CA	AASHTO T96 - 50 Max @ 500 Revolutions	1/Source	
	Unit Weight (Slag)	AASHTO T19 - 70 lbs/C FT Min	1/Source	
	Gradation	AASHTO T11, T27 - Specification	1/Source	Obtain Composite Sample
	Material Finer than .02 mm	D422 - Max 3%	1/Source	Only required when specified on plans
	Fracturing	Specified on plans	1/Source	
	* Not applicable to slag			
	<u>Items Requiring Certification</u>			
	None			

SPEC. TITLE REQUIREMENT MINIMUM SAMPLE SELECTION REMARKS

**P-208 AGGREGATE BASE COURSE**

(contd.)

**Items Requiring Field Testing**

Density/Moisture:

Less than 30K GAW  
30K GAW or more

AASHTO T99 - 100% Density Min  
AASHTO T180 - 100% Density Min

1/3000 S YD/Layer  
1/3000 S YD/Layer

Materials:

Gradation

AASHTO T11, T27 - Specifications

1/1500 C YD

Liquid Limit \*

AASHTO T89 - 25 Max

As required by  
change in material

Plastic Limit

AASHTO T90 - See PI

As required by  
change in material

Plasticity Index \*

AASHTO T90 - 6 Max

As required by  
change in material

Thickness

Depth Check - Specification

1/3000 S YD

Smoothness

16' Straightedge or String  
± 3/8"

As required for  
acceptance

\* Not Applicable to Slag

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-209	<u>CRUSHED AGGREGATE BASE COURSE</u>	(All Testing Requirements are ASTM unless noted otherwise.)		If slag is used, it must be air-cooled blast furnace slag.
	<u>Items Requiring Material Testing By Independent Laboratory</u>			
	Thin and Elongated Aggregate	D693 15% Max	1/Source	
	Abrasion	C131 - 45 Max @ 500 Revolutions	1/Source	
	Soundness	C88 - 12% Max Loss, 5 CU Cycles	1/Source	
	Liquid Limit * D4318 - 25 Max	1/Source	1/Source	
	Plastic Limit *	D4318 - See PI	1/Source	
	Plasticity Index *	D4318 - 6 Max	1/Source	
	Sand Equivalent	D4219 - 35 Min	1/Source	
	Unit Weight (Slag)	C29 - 70 lbs/C FT Min	1/Source	Obtain Composite Sample
	Gradation	C117 and C136 - Specification	1/Source	
	Fracturing	Lab - Retained #4: 100% 1 Fractured Face 90% 2 Fractured Face	1/Source 1/Source	
	Particle Size Analysis	D422 - Max 3% Smaller than .02mm	1/Source	
	* Not Applicable to Slag			
	<u>Items Requiring Certification</u>			
	None			
	<u>Items Requiring Field Testing</u>			
	Density/Moisture:			

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS	
P-209 (contd.)	<u>CRUSHED AGGREGATE</u> <u>BASE COURSE</u>	Less than 60K GAW 60K GAW or More	D698 Method D - 100% Density Min D1557 Method D - 100% Density Min	1/3000 S YD/Layer 1/3000 S YD/Layer	Acceptance testing may be accomplished using a nuclear gauge if done in accordance with Section 3.5 of the Specification
	Thickness	Cores shall not be deficient by more than 1/2"	1/3000 S YD		
	Materials:				
	Liquid Limit *	D4318 - 25 Max	As required by change in gradation		
	Plastic Limit *	D4318 - See PI	As required by change in gradation		
	Plasticity Index *	D4318 - 6 Max	As required by change in gradation		
	Gradation	C177 - C136	1/1500 C YD		The job mix tolerances in Table I shall be applied to the job mix gradation determined by an independent laboratory. This will establish a job control grading band.
	Smoothness	16' Straightedge or String Line $\pm$ 3/8"	As Required for Acceptance		

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-304	<u>CEMENT TREATED BASE COURSE</u>	(All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing By Independent Laboratory</u>			
	Water	AASHTO T26	1/Source	Only required if quality of water is questionable.
	Aggregates:			
	Sulfates	C295	1/Source	Only required if injurious quantities of sulfates are suspected.
	Gradation	Table 1 in Specification	1/Source	
	Liquid Limit	D423 - 25 Max	1/Source	
	Plasticity Index	D424 - 6 Max	1/Source	
	Cement Content	Minimum compressive strength should be 750 psi when molded, broken, and cured in accordance with D560 and D1633	1/Source	
	<u>Items Requiring Certification</u>			
	Portland Cement	C150 Type 1	1/Source	
	Bituminous Material:			
	Cutback	D2088	1/Source	
	Emulsified:			
	RS-2, SS-1	D977	1/Source	
	CRS-1	D2397	1/Source	

SPEC. TITLE REQUIREMENT SAMPLE SELECTION MINIMUM REMARKS

**P-304 CEMENT TREATED BASE COURSE**  
(contd.)

Items Requiring Field Testing

Atmospheric Temperatures  
 Density

Min 40°F  
 Min 98% of Lab  
 Field Density - D558  
 Lab Density - D1556 or D2167

Daily  
 4/Lot (Lot = 1200 S YD)

Moisture Content:

Optimum  
 Field

D558  
 +2% of Optimum  
 See Table 1 in Specification

1/Source  
 4/Lot

Aggregate Gradation

Surface Tolerance

Finished surface shall not vary  
 more than 3/8" when tested with  
 a 16' straight edge.

1/1500 C YD  
 As Required

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-402	<u>POROUS FRICTION COURSE</u>	(All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing By Independent Laboratory</u>			
	Aggregate:			
	Flat or Elongated	Max 15% by Weight D693	1/Source	
	Percentage of Wear	Max 30% C131	1/Source	
	Weighted Average Loss	Max 9% after 5 Cycles in Sodium Sulfate C88	1/Source	
	Coated Area	Min 95% D1664	1/Source	
	Crushed Content	Min 75% Two Face Min 90% One Face	1/Source 1/Source	
	Unit Weight - Slag Only	Min 70 lbs/C FT - C29	1/Source	
	Gradation	See Table 1 in Specification C136	1/Source	
	Mineral Filler	D242	1/Source	
	Job Mix Formula (JMF)	The contractor is responsible for supplying the materials to an independent testing laboratory for preparation of the JMF. The PE is responsible for approving the JMF prior to production.		
	<u>Items Requiring Certification</u>			
	Latex	See Section 2.4 of the Specification	1/Source	
	Bituminous Material	See Table 1(A) of the Specification	1/Carload or equivalent shipped to the site	
	<u>ITEMS REQUIRING FIELD TESTING</u>			
	Placement Temperature	± 20°F of JMF Target Temperature		Periodically throughout the paving operation

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-402 (contd.)	<u>POROUS FRICTION COURSE</u>			
	Bituminous Content of Mix	± 4% of JMF - D2179	Once for plant run of 30 min or less. Twice for each 5 hours of plant operation.	
	Aggregate Gradation of Mix	AASHTO T30 No. 4 Sieve ±7% of JMF Target No. 8-30 ±4% of JMF Target No. 20 ±2% of JMF Target	Same as Bit Content	
	Gradation of Aggregate in Bin	C136 No. 4 Sieve ±7% of JMF Target No. 8-30 ±4% of JMF Target No. 20 ±2% of JMF Target	Twice Daily	
	Pavement Thickness	3/4" Aggregate - Target 1" (Max 1.5", Min .75") 1/2" Aggregate - Target .75" (Max 1.25", Min .50")	1/10000 S YD	

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-411	<u>BITUMINOUS BASE LEVELING AND TOP COURSES</u>	(All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing By Independent Laboratory</u>			The contractor is responsible for acquisition of all samples not acquired by independent testing laboratory. All materials shall be determined acceptable prior to use by contractor. Sample selection per ASTM D75. If slag is used it must be air-cooled blast furnace slag.
	Aggregates (Coarse):	All aggregate requirements apply to aggregate mixture if blended		
	Flat & Elongated Pieces	Laboratory - 8% Max	1/Source	
	Soft Pieces (Top Course Only)	Laboratory - 5% Max	1/Source	
	Clay Balls, etc.	Laboratory - None	1/Source	
	Crushed Content	See Table IV in P-411 Specification	1/Source	Depends on the type of material specified in the plans.
	Abrasion (+8 Screen):			
	Base Course	C131 - 50 Max @ 500 Revolutions	1/Source	
	Leveling/Top	C131 - 40 Max @ 500 Revolutions	1/Source	
	Slag - Base/Leveling/Top	C131 - 50 Max @ 500 Revolutions	1/Source	

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-411 (contd.)	<u>BITUMINOUS BASE, LEVELING AND TOP COURSE</u>			
	Soundness (+8 Screen):			
	(5 Cycle Sodium Sulfate)	C88 - 9% Max Loss	1/Source	
	Unit Weight (Slag)	C29 - 75 lb/C FT Min	1/Source	
	Bulk Specific Gravity	C127 - None	1/Source	F o r V M A Calculation
	Gradation	C136, C117 - See Table IV	1/Source	Obtain Composite Sample
	Aggregate Coating	D1664 - 95% Min	1/Source	
	Aggregates (Fine):			S a m p l e s Selection per D75
	Foreign Materials	Laboratory - None	1/Source	
	Liquid Limit	D423 - 25 Max	1/Source	Including Blended Filler
	Plastic Limit	D424 - See PI	1/Source	Including Blended Filler
	Plasticity Index	D424 - 6 Max	1/Source	Including Blended Filler
	Gradation	C136, C117 - See Table IV	1/Source	Obtain Composite Sample
	Specific Gravity	C128 - None	1/Source	F o r V M A Calculation
	Aggregates (Mineral Filler)	D242 - MDOT Certification for flyash is acceptable.	1/Source	

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-411 (contd.)	<u>BITUMINOUS BASE, LEVELING AND BASE COURSE</u>			
	Bituminous Material:			
	Asphalt Cement	See Specification Table I	1/Source	
	Bituminous Mixture	Marshall Requirements - See Section 3.2 of the Specification	An approved independent testing laboratory will develop a job mix formula (JMF) that will yield the required Marshall properties shown in Tables II & III of the Specification.	
	<u>Items Requiring Certification</u>			
	None			
	<u>Items Requiring Field Testing</u>			
	Plant Inspection	Specifications	Continuous Monitor	Daily Reports
	Temperature at Plant	325°F Max - Asphalt Cement	Record at least every 2 hours	
		350°F Max - Dried Aggregate	Record at least every 2 hours	
	Extractions	D2172/AASHTO T30 - Job Mix Formula (See Table V of Specification)	2/Day	Report All Screens JMF
		All mixtures furnished shall conform to the job mix formula within the tolerances listed in Table V of the Specification.		
	Materials:			
	Aggregates Stockpiles	Specification (JMF) AASHTO T11/AASHTO T27	As Required	Daily Report
	Thickness	Specifications		
	Temperature at Placement	± 20°F Target in JMF (Temperature of paver shall not fall below 250°F)	Continuous Monitor	Checked at Paver

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-411	<u>BITUMINOUS BASE, LEVELING</u>			
(contd.)	<u>AND BASE COURSE</u>			
	Surface Tests	± 1/4" from Plan Grade (Top and Leveling) ± 3/8" from Plan Grade (Base)	Continuous Monitor	16' Straight. Edge or String Line. Record finding in daily report.
	Quantity	Tonnage Used	Continuous Record	Record gross and tare of trucks. Periodically verify tare. (Weigh Slips)
	* Air Voids (12,500 lbs. GAW and over)	See Section 4.12	4/Lot	
	* Density (Under 12,500 lbs. GAW)	D2726 - 92% Theoretical	4/Lot	
	Test Section	See Section 3.3 of Specification		

\* Contractor responsible to cut cores.

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-501	<u>PORTLAND CEMENT CONCRETE PAVEMENT</u>	(All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing by Independent Laboratory</u>			
	Aggregates:			
	Fine:			
	General	C33	1/Source	
	Gradation	See Table 1 - Specification	1/Source	
	Course:			
	General	C33	1/Source	
	Gradation	See Table 2 - Specification	1/Source	
	Percentage of Wear	40% Max - C131 and C535	1/Source	
	Flat and Elongated	8% Max	1/Source	
	Mixed Proportions	Contractor shall submit test results from an independent lab verifying the proposed mix meets the requirements of Section 3.6 in the Specification.		
	<u>Items Requiring Certification</u>			
	Cement	C150 Types 1, 1A and 1P	1/Delivery to job site	
	Premolded Joint Filler:			
	Expansion Joints	D1751	1/Delivery to job site	
	Contraction joints	D1752	1/Delivery to job site	R e s i n - I m p r e g n a t e d

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-501 (contd.)	<u>PORTLAND CEMENT CONCRETE PAVEMENT</u>			
	Tie Bars	A615 or A616		See Section 2.7 for tie bars to be bent during construction.
	Dowel Bars	A615 or A617	1/Delivery to job site	
	<u>Items Requiring Certification</u>			PE may require the contractor to submit complete test reports.
	Cover Material for Curing:			
	Liquid Membrane - Forming Compound	C309 Type 2	1/Delivery to job site	
	White Polyethylene Film	C171	1/Delivery to job site	
	White Burlap-Polyethylene Sheeting	C171	1/Delivery to job site	
	Waterproof Paper	C171	1/Delivery to job site	
	<u>Items Requiring Material Testing By Independent Laboratory</u>			
	Admixtures:			
	Pozzolanic	C618	1/Delivery to job site	Maximum loss of ignition will be 6%.
	Air-Entraining	C260	1/Delivery to job site	

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-501 (contd.)	<u>PORTLAND CEMENT CONCRETE PAVEMENT</u>			
	Water-Reducing	C494 Type A or Type D	1/Delivery to job site	
	<u>Items Requiring Field Testing</u>			
	Flexural Test Beams - Molding	C31	8/Day(4/a.m.-4/p.m.)	
	Flexural Test Beams - Testing	C78	4/Day (one at 7 days from a.m. one at 28 days from a.m. one at 7 days from p.m. one at 28 days from p.m.) (Save other four molds in case of bad sample.)	
	Pavement Thickness - Coring	C174	1/1200 S YDS	
	Slump	C143	One per 2 loads	More, if problem
	Air Content	C173 or C231	One per 2 loads	More, if problem
	Surface Smoothness	P-501, Section 3.22	Random	.25 In./16 FT Horizontal

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-602	<u>BITUMINOUS PRIME COAT MATERIALS</u>	(All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing By Independent Laboratory</u>			
	None			
	<u>Items Requiring Certification</u>			
	RC-70/MC-70/SC-70	AASHTO M81/M82/M141	1/Vendor Tank	The contractor shall submit to the PE samples of the bituminous materials to be used on the project. The PE may require the samples to be tested by an independent lab.
	RC-250/MC-250/SC-250	AASHTO M81/M82/M141	1/Vendor Tank	
	RT-1/RT-3	AASHTO M-52	1/Vendor Tank	
	Emulsified Asphalt - MS - OP	D244	1/Vendor Tank	
	<u>Items Requiring Field Testing</u>			
	Application Temperature	As Specified in Section 2.1	Per Application	Record
	Application Rate	.25 to .50 GAL/S YD	Per Application	Record

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-603	<u>BITUMINOUS TACK COAT MATERIALS</u>	(All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing By Independent Laboratory</u>			
	None			
	<u>Items Requiring Certification</u>			
	Emulsified Asphalt:			
	SS-1	D977	1/Vendor Tank	
	SS-1h	D977	1/Vendor Tank	
	CSS-1	D2397	1/Vendor Tank	
	CSS-1h	D2397	1/Vendor Tank	
	Outback Asphalt:			
	RC-70	D2028	1/Vendor Tank	
	Tar:			
	RTCB5, RTCB6	AASHTO M52	1/Vendor Tank	
	<u>Items Requiring Field Testing</u>			
	Application Temperature	As Specified in Section 2.1	Per Application	
	Application Rate	.05 to .20 GAL/S YD	Per Application	

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-605	<u>JOINT SEALING FILLER</u>	(All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing By Independent Laboratory</u>			
	None			
	<u>Items Requiring Certification</u>			
	Joint Sealing Material	See Section 2.1 for various requirements	1/Lot Delivered to Job Site	
	Lubricant:			
	Average Weight	7.8 lbs.		
	Solids (Percent by Weight)	22-28 D1644 Method A	1/Lot Delivered to Job Site	
	Film Strength, psi	2300 Min D412		
	Elongation, Percent	750 Min D412		
	Storage Temperature	50°F - 80°F		
	<u>Items Requiring Field Testing</u>			
	Pavement Temperatures:			
	Preformed Joint Sealant	Minimum 40°F	1/Day	
	Poured Joint Sealant	Minimum 50°F	1/Day	

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-609	<u>SEAL COATS AND BITUMINOUS SURFACE TREATMENTS</u>	All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing By Independent Laboratory</u>			
	Aggregates:			
	Elongated or Flat Pieces	Max 8%	1/Source	
	Percent Wear	Max 40 @ 500 Revolutions AASHTO T96	1/Source	
	Soundness	12% - 5 Cycles AASHTO T104	1/Source	
	Gradation	See Table 2 - AASHTO T11 and T27	1/Source	S p e c i f i c aggregate to be used should be designated on the plans.
	Stripping	No Stripping - AASHTO T182	1/Source	
	Slag	Shall not weigh less than 70 lbs/C FT AASHTO T19	1/Source	
	<u>Items Requiring Certification</u>			
	Bituminous Material	See Section 2.2	1/Lot or Batch	The specific bituminous material to be used shall be designated on the plans.
	Rubber Compound:			
	Total Rubber Solids	45-72% by Weight	1/Source	
	Allowable Variations From Target Value for Total Rubber Solids	± 1%	1/Source	

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-602 (contd.)	<u>SEAL COATS AND BITUMINOUS SURFACE TREATMENTS</u>			
	Ash, % by Total Rubber Solids	Max 3.5 D297	1/Source	
	Viscosity	Max 2000	1/Source	
	<u>Items Requiring Field Testing</u>			
	Atmospheric Temperature	Min 70°F	1/Day	
	Quantity of Material Per Square Yard	See Table 1		Exact amount should be specified on plans.

**P-610** STRUCTURAL PORTLAND CEMENT CONCRETE

(All Testing Requirements are ASTM unless noted otherwise.)

Items Requiring Material Testing By Independent Laboratory

Aggregate:

Course:

AASHTO M80

Percentage of Wear

Max 45 @ 500 Revolutions  
AASHTO T96

Gradation Absorption

See Table 1 AASHTO T27  
AASHTO T85

Fine Aggregate:

AASHTO M6

Gradation Absorption

See Table 3 AASHTO T27  
AASHTO T85

Water

If Not Potable - AASHTO T26

Items Requiring Certification

When this specification is used for fence post footings, manholes, catch basins, inlets, headwalls, light bases, windcone and beacon footings, electrical duct, sidewalk, curbing, cable markers, and other non-critical structures, the requirements for testing will be waived if either the concrete is furnished by a reputable transit mix firm approved by the PE, or the materials are approved by the PE when the concrete is mixed on the site. However, when any items, such as electrical duct or poured manholes are placed in or under a pavement intended to support aircraft of 60,000 pounds or more gross weight, such tests may be required if so indicated on the plans.

When tests are waived the concrete shall be a standard 6 bag mix, with 1" maximum coarse aggregate, unless otherwise specified, and shall have a slump range of 2-5 inches.

Cement:

Portland Cement

AASHTO M85

Air-Entraining Portland Cement

AASHTO M134

Portland Blast Furnace Slag

AASHTO M151

1/Delivery to Job Site. (Typical for all certification items under P-610)

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-610 (contd.)	<u>STRUCTURAL PORTLAND CEMENT CONCRETE</u>			
	Air-Entraining Portland Blast Furnace Slag Cement		AASHTO M151	
	Admixtures:			
	Pozzolanic Admixtures:			
	Flyash		C350	
	Raw or Calcined Natural Pozolansq		C350	
	Air-Entraining Admixtures		AASHTO M154	
	Water-Reducing		C494 Type A or D	
	Premolded Joint Material		AASHTO M33 or M90 or M153 or M213	
	Joint Filler		See Specification P-605	
	Steel Reinforcement:			
	Deformed Bars:		AASHTO M137	
	Structural, Intermediate or Hardgrade Billet Steel		AASHTO M31	
	Rail Steel		AASHTO M42	
	Welded Wire Fabric		AASHTO M55	
	Calcium Chloride		AASHTO M144	
	Curing Materials:			
	Cotton Mats		AASHTO M73	
	Waterproof Paper		AASHTO M139	

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-610 (contd.)	<u>STRUCTURAL PORTLAND CEMENT CONCRETE</u>			
	Polyethylene Sheeting	AASHTO M171		
	Burlap Cloth	AASHTO M182		
	Liquid Membrane- Forming Compound	AASHTO M148		
	<u>Items Requiring Field Testing</u>			
	Air Content	3% - 6% AASHTO T121 or T152		
	Concrete Cylinders	Made in accordance with AASHTO T23		
	Slump Test	Tested in accordance with AASHTO T119		Strength and slump requirements will be designated on plans.
	Temperature	50°F - 100°F	Periodically during placement	The structure is to be maintained at 50°F until it reaches 60% of the design strength.

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS												
P-625	<u>COAT-TAR PITCH EMULSION SEALCOAT</u>	(All Testing Requirements are ASTM unless noted otherwise.)														
	<u>Items Requiring Material Testing By Independent Laboratory</u>															
	Coal-Tar	Federal Specification R-T-143	1/Vendor Tank													
	Coal-Tar Pitch Emulsion	Federal Specification R-D-355 (Except water content shall not exceed 50%)	1/Vendor Tank													
	Water	If known to be potable, then testing is not necessary.														
	<u>Items Requiring Certification</u>															
	Latex Rubber	See Section 2.4	1/Vendor Tank													
	<u>Items Requiring Field Testing</u>															
	Aggregate Gradation	<table border="1"> <thead> <tr> <th>Sieve No.</th> <th>Percent Passing</th> </tr> </thead> <tbody> <tr> <td>16</td> <td>97-100</td> </tr> <tr> <td>20</td> <td>85-100</td> </tr> <tr> <td>30</td> <td>15-85</td> </tr> <tr> <td>40</td> <td>2-15</td> </tr> <tr> <td>100</td> <td>0-2</td> </tr> </tbody> </table>	Sieve No.	Percent Passing	16	97-100	20	85-100	30	15-85	40	2-15	100	0-2		
Sieve No.	Percent Passing															
16	97-100															
20	85-100															
30	15-85															
40	2-15															
100	0-2															
	Application Rate	See Table 2		Specific rate to be designated on Plans.												
	Friction Test	Min 50 Mu Reading - E670	1/Job Site	Mu meter test should be done on test section if P-625 is going to be placed on runway.												

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
D-701	<u>PIPE FOR STORM DRAINS AND CULVERTS</u>	(All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing By Independent Laboratory</u>			
	None			
	<u>Items Requiring Certification</u>			
	Pipe	See Section 2.1 of the Specification for applicable testing requirements.	1/Source	
	<u>Items Requiring Field Testing</u>			
	Field Review of Joint Materials			

SPEC. TITLE REQUIREMENT MINIMUM SAMPLE SELECTION REMARKS

P-705 PIPE UNDERDRAINS FOR AIRPORTS  
 (All Testing Requirements are ASTM unless noted otherwise.)

Items Requiring Material Testing By Independent Laboratory

None

Items Requiring Certification

Pipe

See Sections 2.2-2.12 of the Specification for the applicable testing requirements.

1/Source

Items Requiring Field Testing

None

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
P-751	<u>MANHOLES, CATCH BASINS, LEACHING BASINS, INLETS AND INSPECTION HOLES</u>	(All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing By Independent Laboratory</u>			
	None			
	<u>Items Requiring Certification</u>			
	Brick and Block	See Section 2.1 of the Specification	1/Source	
	Precast Units	See Section 2.4 of the Specification	1/Source	
	Frames, Covers, Grates	See Section 2.6 of the Specification	1/Source	
	<u>Items Requiring Field Testing</u>			
	None			

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
D-752	<u>CONCRETE CULVERTS, HEADWALLS AND MISCELLANEOUS DRAINAGE STRUCTURES</u>	(All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing By Independent Laboratory</u>	None		
	<u>Items Requiring Certification</u>	None		
	<u>Items Requiring Field Testing</u>	None		

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
D-754	<u>CONCRETE GUTTERS, DITCHES AND FLUMES</u>	(All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing By Independent Laboratory</u>			
	None			
	<u>Items Requiring Certification</u>			
	None			
	<u>Items Requiring Field Testing</u>			
	None			

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
T-901	<u>SEEDING</u>	(All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing By Independent Laboratory</u>			
	None			
	<u>Items Requiring Certification</u>			
	Seed	Federal Specification JJJ-S-181	1/Lot	See Section 2.1 for information to be supplied on Certification.
	<u>Items Requiring Field Testing</u>			
	None			

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
T-904	<u>SODDING</u>	(All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing By Independent Laboratory</u>	None		
	<u>Items Requiring Certification</u>	None		
	<u>Items Requiring Field Testing</u>	None		

SPEC. TITLE REQUIREMENT SAMPLE SELECTION MINIMUM REMARKS

T-905 TOPSOILING (All Testing Requirements are ASTM unless noted otherwise.)

Items Requiring Material Testing By Independent Laboratory

Top Soil:

pH Range

5.5 to 7.6

1/Source

Organic Content

3% - 20% (Wet-Combustion Method Chromic Acid Reduction)

1/Source

Gradation

20%-80% Passing the 200 Sieve C117

1/Source

The contractor is not responsible for any tests, chemical or mechanical analysis or the results of such test or analyses for topsoil obtained "on site" or "owner" furnished. Material Testing Requirements may be waived by the PE if they are satisfied with the quality the contractor proposes to use.

Items Requiring Certification

None

Items Requiring Field Testing

None

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
T-907	<u>TILLING</u>	(All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing By Independent Laboratory</u>			
	None			
	<u>Items Requiring Certification</u>			
	None			
	<u>Items Requiring Field Testing</u>			
	None			

SPEC.	TITLE	REQUIREMENT	MINIMUM SAMPLE SELECTION	REMARKS
T-908	<u>MULCHING</u>	(All Testing Requirements are ASTM unless noted otherwise.)		
	<u>Items Requiring Material Testing By Independent Laboratory</u>			
	None			
	<u>Items Requiring Certification</u>			
	None			
	<u>Items Requiring Field Testing</u>			
	None			

