CHAPTER 1 - INTRODUCTION

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CHAPTER 1 - INTRODUCTION

1.00 GENERAL

This manual has been developed to provide construction project personnel with information and guidance for field inspection, sampling, and testing necessary to determine the quality of the material being used in the work. This manual is applicable to all construction projects administered by Federal Lands Highway (FLH).

This manual complements the *Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects (FP)*. When the guidelines or directions set forth in this manual conflict with an FLH contract, the contract shall govern.

1.01 Policy. It is the policy of FLH to use nationally developed standard sampling and testing procedures that are current as of the solicitation issuance date (See Block 3 of SF 1442).

The primary source for standard sampling and testing procedures used in FLH is the American Association of State Highway and Transportation Officials (AASHTO). AASHTO sampling and testing procedures are adopted and published in the *Standard Specifications for Transportation Materials and Methods of Sampling and Testing, Part II Tests.* Other standard sampling and testing procedures used by FLH include American Society for Testing and Materials (ASTM) standards, Federal Specifications and Standards (FSS), and industry standards.

If standard sampling and testing procedures are unavailable, FLH sampling and testing procedures are developed. FLH sampling and testing procedures are referenced in the current FP or are referenced in the special contract requirements of applicable projects. FLH sampling and testing procedures, which may or may not be field tests, are included in appendix A of this manual. These sampling and testing procedures are made available to prospective bidders and contractors on FLH projects.

If standard sampling and testing procedures are supplemented or revised by FLH, the supplement or revision is included in the current FP or is included in the special contract requirements of applicable projects. In addition, the FLH supplemented or revised sampling and testing procedures may be documented in appendix B of this manual.

FLH sampling and testing procedures are identified by "FLH T-" followed by a sequencing number starting with "501-" and ending with the last 2 digits of the year adopted or updated. They are cross referenced to nationally developed sampling and testing procedures when appropriate. Example: FLH T 532-91 (Revised AASHTO T 141). When an FLH testing procedure is updated, the updated testing procedure will be identified by adding the last 2 digits of the year of the update to the sequencing number. For example, if FLH T 532-91 is updated in 1994 the new number is FLH T 532-94.

It is FLH policy to use standard report forms and worksheets. FHWA has allocated a block of numbers (FHWA 1600 - 1799 for FLH forms). This manual contains the report forms and worksheets approved for FLH use. FLH contractors should be encouraged to use standard FHWA report forms and worksheets.

The procedure for developing or updating a standard sampling and testing procedure, report form, or worksheet is described in subpart 1.05.

1.02 Technical Guidance. Appendix C contains an explanation of FLH statistical acceptance. The statistical calculations are computerized in the FLH Quality Level Pay (QL-PAY) program. Appendix C also contains the documentation for QL-PAY.

Appendix D is reserved for miscellaneous field material items, such as specific correspondence and examples, which expound on the guidelines contained in this manual.

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A bibliography is located at the back of this manual. The bibliography contains a list of the references that provide the policy, guidance, advisory, and regulatory procedures used in the development of this manual.

The bibliography also contains a list of many nationally recognized technical associations that can provide the Project Engineer with additional information relative to material specifications, testing methods, and procedures to supplement the information provided.

1.03 Role of the Project Engineer. The contract provides that all material for which tests are specified shall be inspected, tested, and accepted. The specific requirements for the material are identified in the contract.

It is the Project Engineer's responsibility to ensure that all material incorporated into the work is inspected and accepted in accordance with standards and quality requirements in the contract and FLH policy and procedural guides including this manual.

A. Review of Contract. Prior to start of work, the Project Engineer should review the materials requirements of the contract.

Copies of all preliminary materials reports (soil profiles, boring logs, information on local material sources, borrow area diagrams, use permits, test reports, etc) should be reviewed and filed at the project field office.

B. Testing and Inspection. Material that is used in the work can generally be considered to be in one of the following categories:

- Commercially manufactured products such as culvert pipe, reinforcing steel, turf establishment material, traffic control devices, paint, etc., which are purchased by the contractor and transported to the site for incorporation into the work.
- Material manufactured or produced on-site or off-site by the contractor or contractor's suppliers such as mineral aggregates, asphalt concrete paving mixtures, portland cement concrete, etc.

Although material may have previously been inspected and tested, project personnel should check the material against its Certification of Compliance and test reports. This will verify quality and quantity as well as ensure that the material was not damaged during shipment. When testing and inspection of commercial products is required, the Project Engineer should coordinate with the Construction Operations Engineer to assure appropriate off-site inspection and testing is performed.

Testing of material produced at the project site will normally be accomplished on site, although some may be tested at a Federal Lands Highway Division (FLHD) laboratory on samples submitted by the Project Engineer.

Submit samples for verification of acceptance testing procedures to the appropriate FLHD laboratory in a timely manner.

Review material test reports and certifications for compliance with contract specifications.

Contact the Division Materials Engineer immediately if any material is suspected of not conforming to contract requirements.

C. Acceptance of Material. Methods of accepting material are described in FP Section 106. Acceptance or rejection of construction material can generally be described as one of three cases:

1. Material that conforms to the contract requirements is accepted and paid for at the contract price.

2. Material that is not in conformance with the contract requirements, but that the contractor demonstrates will serve its intended purpose, may be accepted at a reduced price if the Contracting Officer elects to do so.

3. Material that is not in conformance with the contract requirements, and that the Government has determined will not serve its intended purpose at reduced payment, is rejected and must be corrected or replaced by the contractor at no additional cost to the Government.

When material is accepted pursuant to a statistically based acceptance plan, that plan encompasses all three cases above. That is, the plan (1) defines what conformance with the contract is, (2) sets a limit on the quality of material that is not in conformance, yet is presumed to be adequate to serve its intended purpose, and (3) specifies the price adjustments the Government assigns to the material.

Statistically based acceptance plans are based on the premise that the material is produced from a process which is in control, and the only defects are ones resulting from the normal variations in that process. If this is not true, i.e., if there are known process breakdowns or isolatable segments of defective material, then the Government has the right to and should test that material produced outside the plan. The contract may provide that the contractor does not have the right to produce in the lower ranges of the acceptance plan, i.e., 0.9 pay factor. Below that level the contractor is obligated to improve the process rather than to proceed on a reduced payment basis. If the material quality is outside the limits of the acceptance plan, it is rejected (Case 3 above).

See Subpart 2.41 of this manual for the statistical procedures that are used in the evaluation of material for acceptance.

For material accepted when there is no acceptance plan in the contract, the Government must make the determination as to (1) whether it is in conformance with the contract (Case 1), if it is not then whether it can be accepted at reduced payment (Case 2), or if it must be rejected (Case 3).

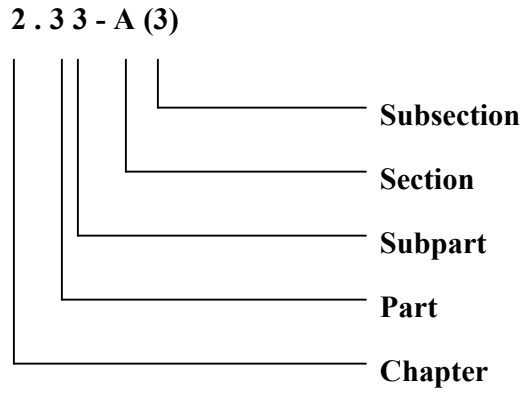
Acceptance should be made only after determining that the material will serve its intended purpose and after receiving a written request with supporting justification from the contractor requesting the Government to accept the material at a reduced price. The contractor should be notified in writing of all rejected material.

Material deviating from the specifications to the extent that it will not satisfactorily serve the intended purpose must be removed and replaced with specification material. The Government may approve a contractor proposed alternate solution to bring the material into compliance or correct the material so it will serve the intended purpose. All additional work is at the contractor's expense.

When determining the amount by which prices are to be reduced for nonconforming material, a judgment will be required. This will be based on estimated service life, engineering and contractual considerations, past practice, and the particular circumstances of each situation. The specified range of quality levels and reduced payment in the FP for material where there is an acceptance plan can be used as a guide for material where no plan is specified.

1.04 Format. The manual consists of chapters, appendixes, and a bibliography. Each chapter has a table of contents and is subdivided into parts. The loose leaf binder, with index tabs, is designed for expansion with approved revisions and interim FLHD revisions.

Format and subdivisions of this manual:



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1.05 Manual Revisions and Supplements. Maintenance of this manual is the responsibility of the Materials Technology Team (MTT). Periodically, the MTT will review selected chapters or sections for adequacy and determine if there is a need for revision.

Users of this manual are encouraged to submit suggestions to make this manual more useful and practical. Bring recommended revisions or supplements to the manual to the attention of an FLHD MTT member.

Any MTT member may submit a proposed supplement or revision to all the MTT members. Include a concise description of the reason for the revision or supplement and supporting data as appropriate. The MTT members may comment on the proposed supplement or revision to the submitting member with a copy of the comments going to all other MTT members. The MTT will either:

A. Approve for FLH-Wide Use. If approved, the submitting MTT member will address all the MTT comments and distribute a draft of the proposed supplement or revision to the MTT members. The Federal Lands Highway Office (FLHO) will finalize the draft and will issue a master copy of the affected pages to each FLHD. Each FLHD will make copies and distribute the supplement or revision.

If a new test or a revision to an AASHTO test procedure is approved, the MTT may inform the AASHTO Subcommittee on Materials, and when appropriate, pursue adoption of the modification by AASHTO.

B. Accept for FLHD Use. If a proposed supplement or revision is rejected for FLH-wide use, but is accepted for FLHD use, the FLHD may issue the proposed change as a FLHD supplement or revision under the following procedures.

FLHD supplements and revisions shall be printed on a soft pastel color paper suitable for printing text. The color shall conform to the following:

- Eastern FLH Division - Pink
- Central FLH Division - Blue
- Western FLH Division - Ivory

Send a copy of each FLHD supplement or revision to all the MTT members.

1. **FLHD revisions and supplements to the manual text.** The change shall be issued by itself on a separate page or shall be inserted into the manual text and clearly indicated using WordPerfect Redline and Strikeout. Minor changes may be made using Pen and Ink revisions.

   Supplements shall be inserted opposite the page or text being modified or shall be added using one of the reserved sections.

   FLHD supplements and revisions to the manual text shall have appropriate page numbers and be dated. An example would be if EFLHD had a revision to Subpart 2.44 on page 2-27. The new page would be identified as 2-27E or if the revision is more than one page 2-27E-1, 2-27E-2, etc. See Exhibit 1.1 for a sample division transmittal form and Exhibit 1.2 for a sample revision.

2. **FLHD revisions and supplements to sampling and test procedures.** FLHD supplemented, revised, or new sampling and testing procedures shall be identified by "EFLHD T-, CFLHD T-, or WFLHD T-" followed by a sequencing number and ending with the last 2 digits of the year adopted or updated. They are cross referenced to FLH or nationally developed sampling and testing procedures when appropriate. Example: EFLHD T 514-98 (Modified FLH T 514) or CFLHD T 141-97 (Modified AASHTO T 141). When a testing procedure is revised, the revised testing procedure will be identified by adding the last 2 digits of the year of revision to the sequencing number. For example, if EFLHD T 532-91 is revised in 1998 the new number is EFLHD T 532-98.

Revised and supplemented sampling and test procedures shall be added to and documented in Appendix B of this manual.

3. **FLHD revisions to report forms and worksheets.** Revised report forms and worksheets shall be numbered with the prefix "EFLHD, CFLHD, or WFLHD" and dated. They are cross referenced to FHWA or FLH report forms and worksheets when appropriate. Example: Form CFLHD 1620 (Modified Form FHWA 1620) (9-94). The use of Redline and Strikeout is not required for forms and worksheets.

   Revised report forms and worksheets shall be inserted opposite the page being modified or shall be added to Chapter 1.

If the proposed supplement or revision warrants further FLH evaluation before FLH-wide adoption the MTT will establish an evaluation plan with a timetable for reevaluation.

C. Reject for FLHD Use. If the proposed supplement or revision is contrary to FLH or MTT policy, the MTT may reject the change and prohibit any FLHD from adopting the change.

MTT decisions may be appealed to and are subject to approval by the FLH Executive Quality Council (EQC).

1.10 GLOSSARY

The following is a list of the most common abbreviations and word/phrase definitions used throughout the manual. Additional acronyms and terms are identified in Section 101 of the *Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects* and in chapter 1, section 1.4 of the *Federal Lands Highway Project Development and Design Manual*.

1.11 Abbreviations. When these abbreviations are used, they will have the following meaning.

- ♦ AA - Aluminum Association
- ♦ AASHTO - American Association of State Highway and Transportation Officials
- ♦ ACI - American Concrete Institute
- ♦ ADT - Average Daily Traffic
- ♦ AI - Asphalt Institute
- ♦ AISI - American Iron and Steel Institute
- ♦ AMRL - AASHTO Materials Reference Laboratory
- ♦ ARTBA - American Road and Transportation Builders Association
- ♦ ASA - American Standards Association
- ♦ ASLA - American Society of Landscape Architects
- ♦ ASTM - American Society for Testing and Materials
- ♦ AWPA - American Wood-Preservers' Association
- ♦ AWS - American Welding Society
- ♦ CCRL - Cement and Concrete Reference Laboratory
- ♦ CFLHD - Central Federal Lands Highway Division
- ♦ CFR - Code of Federal Regulations
- ♦ CHP - Chemical Hygiene Plan
- ♦ CQCP - Contractor Quality Control Plan
- ♦ CQCS - Contractor Quality Control System
- ♦ DOT - Department of Transportation
- ♦ EFLHD - Eastern Federal Lands Highway Division
- ♦ EPA - Environmental Protection Agency
- ♦ FAR - Federal Acquisition Regulations
- ♦ FHWA - Federal Highway Administration
- ♦ FLH - Federal Lands Highway
- ♦ FLHD - Federal Lands Highway Division
- ♦ FLHO - Federal Lands Highway Office
- ♦ FLHP - Federal Lands Highway Program
- ♦ FP - Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects (The current year of issuance is 1996)
- ♦ GBL - Government Bill of Lading
- ♦ JMF - Job Mix Formula
- ♦ MSDS - Material Safety Data Sheet
- ♦ MUTCD - Manual on Uniform Traffic Control Devices for Streets and Highways
- ♦ NHTSA - National Highway Traffic Safety Administration
- ♦ NIST - National Institute of Standards and Technology (formally National Bureau of Standards)

- NRC - Nuclear Regulatory Commission
- OSHA - Occupational Safety and Health Administration
- PCA - Portland Cement Association
- PCI - Prestressed Concrete Institute
- PS&E - Plans, Specifications and Estimates
- SHA - State Highway Agency
- SNRA - State Natural Resources Agency
- SSPC - Steel Structures Painting Council
- TAR - Department of Transportation Acquisition Regulations
- U.S.C. - United States Code
- USACE - United States Army Corps of Engineers
- VPH - Vehicles per Hour
- WFLHD - Western Federal Lands Highway Division

1.12 Definitions. When the following terms are used in this manual, they will mean:

« A »

Abrasion - Wearing away by friction or impact by a rubbing agent.

Abrasive - Sharp granular material used to reduce or prevent slippery road surfaces.

Absorption - The process by which a liquid is drawn into a solid body through its pores. The increase in weight of a porous body resulting from the penetration of a liquid into its permeable pores.

Accuracy - The degree of agreement between a measured value and a true value.

Acidity - The degree of strength of an acid. A material is considered acid if it has a pH factor less than seven.

Adhesion - Molecular attraction exerted between the surfaces of two bodies; the force by which different substances cling to one another.

Admixture (Additive) - A substance added to a mixture to impart a specific characteristic, such as water reducer in concrete, anti-stripping agent in asphalt mix, and calcium chloride or sodium chloride in clay.

Aeolian Deposits - Wind deposited material such as dune sands and loess deposits.

Aggregates - An aggregation of sand, gravel, crushed stone, slag, or other mineral material used either alone or in combination with other material to form asphalt and portland cement concrete, mortar, plaster, etc.

Aggregates (Coarse) - Aggregates predominantly retained on the No. 4 sieve.

Aggregates (Fine) - Aggregates passing the No. 4 sieve, and predominantly retained on the No. 200 sieve.

Aggregate Size, Maximum - The smallest sieve opening through which all of the aggregate **SHALL** pass.

Aggregate Size, Nominal - **(1)** The smallest sieve opening through which the entire amount of the aggregate is permitted to pass (ASTM D 8). **(2)** The largest sieve that retains any of the aggregate particles but generally not more than 10 percent for the larger sized aggregates. **(3)** The largest sieve size listed in the applicable specification upon which any material is permitted to be retained (AASHTO T 2). **(4)** One size larger than the first sieve to retain more than 10 percent of the total aggregate.

Air-Dry Material - Materials dried by a natural method such as exposure under ambient atmospheric conditions or by an artificial method which simulates exposure to the atmosphere.

Air Entraining Agent - An admixture used in portland cement concrete to entrain air in the mixture.

Air-Voids - The space in a material not filled with solids or liquids.

Alkalinity - The degree of strength of an alkali. A material is considered alkaline if it has a pH factor greater than seven.

Alluvial - Deposits of alluvium such as silts, sands, gravels or similar material that has been transported by running water.

Alluvium - Soil, the constituents of which have been transported in suspension by flowing water and subsequently deposited by sedimentation.

Angle of Internal Friction - The angle whose tangent is the ratio between the resistance offered to sliding along any plane in the soil and the component of the applied force acting normal to that plane. Values are given in degrees.

Angle of Repose - The angle between the horizontal and the maximum slope that a soil assumes through natural processes. For dry granular soils the effect of the height of slope is negligible; for cohesive soils the effect of height of slope is so great that the angle of repose is meaningless.

Anhydrous - Free from water.

Anti-Stripping Additive - An additive used with asphalt products to increase the adhesion to aggregates and reduce the effect of water in breaking the bond between the aggregates and the asphalt.

Aromatic Solvents - A chemical group of organic solvents which includes benzene, naphtha, and xylene.

Asphalt - A dark brown to black cementitious material; solid, semisolid, or liquid in consistency; in which the predominating constituents are bitumens which occur in nature as such or which are obtained as residue in refining petroleum.

Asphaltenes - The components of the bitumen in petroleums, petroleum products, and asphalt cements which are soluble in paraffin naphthas.

Asphalt Cement - An asphalt especially prepared as to quality and consistency for direct use in asphalt concrete pavements.

Asphalt Overlay - An asphalt concrete paving course placed over an existing surface.

Asphalt Surface Treatment - The application of liquified asphalt material and aggregate to an existing road surface.

Asphalt Concrete - A combination of dense-graded mineral aggregates and asphalt cement, mixed in a central plant which is usually mixed, laid, and compacted while hot.

Atterberg Limits - Four states of soil consistency as defined by the liquid limit, plastic limit, shrinkage limit, and field moisture equivalent tests.

« B »

Balance - A weighing device or instrument used for weighing an unknown mass by comparing the unknown mass with known standard masses.

Ballast - Gravel, broken stone, granular materials, etc., used to provide added stability.

Base - The layer or layers of material placed on a subbase or subgrade to support a surface course.

Beaker - A flat bottomed, cylindrical vessel usually with a pouring lip used especially for testing purposes.

Bedrock - An in-situ geological formation consisting of any solid rock exposed at the surface of the earth or overlain by unconsolidated material.

Binder - Material used to stabilize or bind together loose soil or aggregates.

Biodegradable - A substance, which will rot or decay under the action of weather, bacteria, or other natural agents.

Bitumen - A hydrocarbon material which may be obtained from natural asphalts or refined petroleum that is completely soluble in carbon disulfide and found in asphalts and tars.

Bituminous Material - A material that contains bitumen.

Bleeding (Asphalt) - The flushing to the surface of excess asphalt in asphalt concrete pavements generally caused by heat or the use of excessive quantities of asphalt material in construction, patching, or resurfacing.

Bleeding (Concrete) - The flow of water toward the surface of plastic (freshly placed) concrete or mortar.

Blotter - A fine aggregate used to blot up excess asphalt on a roadbed surface.

Borrow Excavation - Material used for embankment construction that is obtained from outside the roadway prism.

Boulder - A rock fragment, usually rounded by weathering or abrasion, with an average diameter of 12 inches or more.

Brinell Hardness Test - An indentation hardness test using calibrated machines to force a hard ball, under specified conditions, into the surface of the material under test and to measure the diameter of the resulting impression after removal of the load.

« C »

Calcareous - Material containing or similar to calcium carbonate or lime.

Calcium Chloride - A white salt, in the form of flakes, pellets, or granules which is soluble in water and is used to lay dust, or to stabilize gravel surfaces.

Calibrate - (1) To compare with a standard or check the graduations of a gauge or other measuring devices. (2) To determine plant settings that will provide correct proportions of the components of plant-mixed materials.

California Bearing Ratio (CBR) - The ratio, expressed as a percent, of the force required to penetrate a soil mass with a circular piston to the force required to penetrate a mass of high quality crushed stone with the same piston. The rate of penetration in both cases is identical.

Capillary Moisture - Moisture that clings to soil particles by surface tension and reaches the particles by surface tension either when free water passes through the soil or by capillary attraction from a wetter stratum. Within limits, it can move in any direction.

Cationic Emulsion - An emulsion in which the emulsifying system establishes a predominance of positive charged particles that are attracted to a negative electrode (cathode).

Chips - Small angular fragments of aggregate containing no dust.

Clay - A fine-textured soil (finer than 2 μm), usually plastic and sticky when wet, which usually breaks into hard lumps when dry. When the moist soil is pinched between the thumb and finger, it will form a long, flexible ribbon.

Cobble - A rock fragment, usually rounded by weathering or abrasion, with an average diameter greater than 80 mm, but less than 300 mm.

Cohesion - That property of material that tends to make its particles stick together.

Cohesionless Soil - A soil that, when unconfined, has little or no strength when air dried, and little or no cohesion when submerged. Sand is an example of cohesionless soil.

Cohesive Soil - A soil that when unconfined has considerable strength when air dried and that has significant cohesion when submerged.

Cold Patch - A mixture of asphalt material and aggregate used for maintenance pavement patching and applied at ambient temperatures.

Colloids - The portion of the soil finer than 1 μm.

Compressibility - The property of a material relative to its decrease in volume when subjected to a load.

Concrete (Portland Cement) - A mixture of portland cement, water, fine aggregate, and coarse aggregate with or without an admixture.

Concrete Accelerator - An additive used to provide rapid increase in the strength of portland cement concrete.

Concrete Retarder - An additive used to retard the time of set of portland cement concrete permitting longer time for placement.

Consistency - The degree of cohesiveness or resistance of a material to flow, deformation, or shear. Some of the terms used to express consistency are slump, viscosity, firm, hard, sticky, or soft.

Consolidate - Reduction in volume resulting from increased compressive forces.

Contract Document Hierarchy - There are five essential parts to a contract and a requirement occurring in one is as binding as if occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, numerical dimensions will prevail over scaled dimensions and the parts of the contract will prevail in the following order:

(1) Contract Clauses, 48 CFR, Chapters 1 and 12.
(2) Special Contract Requirements.
(3) Plans.
(4) Supplemental Specifications.
(5) Standard Specifications (FP).

Contractor Quality Control Plan - A plan developed by the contractor in compliance with the contract that outlines a process quality control program to be used for a project. The plan contains specific and detailed procedures on how the process quality control of project materials and work will be accomplished.

Course - (1) A layer of road material separately compacted, used as a wearing surface or as a base for a wearing surface. (2) One element of the pavement structure of finite depth such as a asphalt wearing course.

Crack Filler - A material used to fill and seal cracks.

Creep - The slow movement of a material under stress usually imperceptible except to observations of long duration.

Crushed Gravel - The product resulting from the crushing of gravel.

Crushed Stone - The product resulting from the crushing of fragments of bedrock or large stones with substantially all faces resulting from the crushing operations.

Curing Material - A material, such as saturated burlap, polyethylene sheets, or a sprayable compound, that produces a moist environment favorable to cement hydration.

Cutback Asphalt - A mixture of asphalt cement and a diluent blended to provide viscosities suitable for spraying at relatively low temperatures. The diluents vary from naphtha and gasoline for rapid curing cutbacks, to kerosene for medium curing cutbacks to low volatile oils for slow curing mixtures.

« D »

Decant - To separate a liquid from a sediment by carefully pouring or siphoning off the liquid from one vessel to another without disturbing the sediment or lower liquid level.

Degradation - A reduction of particle size by chemical or physical processes.

Degree of Saturation - The ratio, expressed as a percentage, of the volume of absorbed water to the total volume of voids in a material.

Dehydrate - To remove water from a solid.

Deleterious - Harmful.

Dense Graded - A uniformly graded aggregate with sufficient fine material to nearly fill all voids.

Density - Mass per unit volume of a material.

Desiccator - A glass jar fitted with an airtight cover and containing a drying agent (desiccant).

Direct Shear Test - A shear test in which soil under an applied normal load is stressed to failure by moving one section of the soil container relative to the other section.

Dry Masonry - Stone laid without mortar.

Ductility (Asphalt) - The measured distance which an asphalt sample of standard dimensions will elongate before breaking when pulled apart at specified conditions of temperature and speed.

Ductility (Steel) - The ability of a material to deform plastically under tensile forces before fracturing.

Durability - A general term relating a material's ability to resist deterioration over an extended period of time.

Dust Palliative - Any material used to control dust.

« E »

Elastic Limit - The greatest stress that a material is capable of sustaining without any permanent deformation remaining upon complete release of the stress.

Elasticity - That property of a material that permits it to return approximately to its original dimensions upon the removal of an applied load.

Elongation - The increase in gage length of a tension test specimen, usually expressed as a percentage of the original gage length.

Embankment - A raised structure of soil, soil-aggregate, or broken rock between the embankment foundation and the subgrade on which the roadway pavement structure is placed. Commonly referred to as fill.

Embankment Foundation - The material below the original ground surface, the physical characteristics of which affect the support of the embankment.

Emulsified Asphalt - A mixture of asphalt cement and water mixed with an emulsifying agent.

Emulsified Asphalt Break - Coalescence (uniting) of asphalt globules. The time required for asphalt to separate from the water phase is called breaking or setting time.

Emulsified Asphalt Treated Base - A base consisting of a mixture of mineral aggregate and emulsified asphalt spread on a prepared surface.

Emulsion - A suspension of small droplets of one liquid material in another, the two liquids being mutually insoluble, in the presence of an emulsifying agent.

Engineer - See Project Engineer.

Entrained Air - Air bubbles of extremely small size in diameter ranging from about 0.02 to 0.08 mm which are usually incorporated into a portland cement concrete mix through the use of an air entraining agent.

Erosion - A wearing away of the surface by natural action of wind or water.

« F »

f'_c - The 28-day compressive strength of portland cement concrete specified in a construction contract.

f_{cr} - The 28-day mix design compressive strength of portland cement concrete.

False Set - The rapid development of rigidity in a mixed portland cement paste, mortar, or concrete which can be dispelled by further mixing without the addition of water.

Family of Curves - A group of similar moisture-density curves assuming a characteristic shape. The heavier the soil or soil-aggregate material the steeper the slope. The lighter weight soils or soil-aggregate material assume a conical shape of curve with higher optimum moisture contents.

Federal Lands Highway Division - A Federal Lands Highway office, responsible for the administration of direct FHWA involvement in the Federal Lands Highway Program within a predetermined geographic area.

- EFLHD - The Eastern Federal Lands Highway Division headquartered in Sterling, Virginia.
- CFLHD - The Central Federal Lands Highway Division headquartered in Denver, Colorado.
- WFLHD - The Western Federal Lands Highway Division headquartered in Vancouver, Washington.

Federal Lands Highway Office (FLHO) - An FHWA headquarters office located in Washington, D.C. responsible for the Federal Lands Highway Program.

Filtrate - Liquid that has passed through a filter.

Fineness Modulus - An empirical factor obtained by adding total percentages of a sample of aggregate retained on each of a specified series of sieves and dividing by 100. The sieve sizes used are: No. 100 (150 µm), No. 50 (300 µm), No. 30 (600 µm), No. 16 (1.18 mm), No. 8 (2.36 mm), No. 4 (4.75 mm), 3/8 in. (9.5 mm), 3/4 in. (19.0 mm), 1 1/2 in. (38.1 mm), and larger, increasing in the ratio of 2 to 1.

Flash Point - The minimum temperature at which a material gives off a flammable vapor in sufficient quantity that when mixed with air will ignite and burn.

Fog Seal - A thin application of asphalt material without cover aggregate.

Footing - Portion of the foundation of a structure that transmits loads directly to the soil.

Foundation - Lower part of a structure that transmits loads directly to the soil.

Free Water - Water that can move through a material by force of gravity. A moisture content of a material (soil, aggregate, etc.) that is above the saturated surface dry condition.

Friable Soil - A soil that can be easily broken and crushed by moderate finger pressure.

« G »

Gap-Graded - Graded aggregate of predominantly two distinct sizes with little or no in-between sizes.

Gradation - A general term used to describe the distribution of particle size of an aggregate, soil, or other granular material. Gradation is usually expressed as the proportions (percents) of the aggregate that will pass each of several sieves of different sizes.

Grade - (1) The profile of the center of the roadway, or its rate of ascent or descent. **(2)** To shape or reshape an earth road by means of cutting or filling. **(3)** To arrange according to size. **(4)** Elevation.

Grading - (1) Construction of the earthwork portion of the road. **(2)** Planning or smoothing the surface of various parts of a roadbed.**(3)** Separating a material according to size.

Gravel - Rounded or semi-rounded particles of rock that will pass a 3 inch (75 mm) sieve and be retained on a No. 10 (2.00 mm) sieve. Aggregate composed of hard, durable stones or pebbles, crushed or uncrushed, often intermixed with sand.

Ground Cover - Herbaceous vegetation and low-growing woody plants that form an earth cover.

Ground Water - Water contained in the zone below the water table.

Grout - Mortar, composed of sand, cement, water and sometimes admixtures of such consistency that it can be easily worked.

Gunite - A type of portland cement mortar blown into place by compressed air. Generally, the material is mixed while being forced through a nozzle.

« H »

Hardpan - Layer of extremely dense soil.

Herbaceous - Vegetation that is non-woody.

Horizon (Soils) - One of the layers of the soil profile, distinguished principally by its texture, color, structure, and chemical contents.

Hot Mix - A general term used for hot plant mixed asphalt concrete mixtures.

Humidity (Relative) - The amount of moisture in the air compared with the amount that the air could hold if saturated at that temperature.

Humus - A brown or black material formed by the partial decomposition of vegetable or animal matter; the organic portion of soil.

Hveem Stabilometer - A laboratory instrument used to measure the lateral pressure transmitted by a soil, aggregate, or asphalt mixture when subjected to a vertical load. The pressure thus obtained is used to compute the "R" value or "S" value of that material.

Hydrate - To combine water with a compound or substance.

Hydrated Lime - A dry powder obtained by treating quick-lime with enough water to satisfy its chemical affinity for water under the conditions of its hydration.

Hydrometer - A floating instrument used for determining the specific gravity of liquids and solutions.

Hydrophilic - Tending to attract water.

Hydrophobic - Tending to repel water.

Hydrostatic Pressure - The pressure exerted by a liquid at rest. The product of the unit weight of the liquid and the difference in elevation between the given point and the free water elevation.

Hygroscopic Moisture (Water) - The physical property of a material by which it tends to absorb moisture from the atmosphere. Moisture retained by soil in the form of a very thin film that has both a physical and chemical affinity for the soil grain. Sometimes known as the air dry moisture content.

« I »

Impervious - Resistant to the penetration of a liquid or gas.

Infiltration - The flow of a fluid into a substance through pores or small openings. It connotes flow into a substance in contradistinction to the word percolation, which connotes flow through a porous substance.

In Place - In the final position after construction. Applied to a rock, soil, or paving mixture when occurring in the place in which it was constructed.

In Situ - In the natural or original position. Applied to a rock, soil, or fossil when occurring in the situation in which it was originally formed or deposited.

Internal Friction - The resistance to sliding within a mass.

« J »

Job Mix Formula (JMF) - The identification and documentation of the exact proportions of all material and other components of a mixture that is to be used in highway construction.

« K »

Kinematic Viscosity - A measure of the resistance to flow of a liquid under gravity. A measure of the time for a fixed volume of liquid to flow through a calibrated capillary tube at a specified temperature.

« L »

Landscaping - Enhancing the natural features of the land through the design and use of vegetation and other material.

Ledge Rock - A relatively thick layer of in-situ rock.

Leveling Course - The layer of material placed on an existing surface to eliminate irregularities prior to placing an overlaying course.

Lime - A general term that includes the various chemical and physical forms of quicklime, hydrated lime, and hydraulic lime.

Liquid Asphalt - See Cutback asphalt.

Liquid Limit - The percent moisture (water content) of a soil at which the soil passes from a plastic state to a liquid state.

Loam - A mixture of sand, silt or clay, or a combination of any of these with organic matter. It is sometimes called topsoil in contrast to the subsoils that contain little or no organic matter.

Loess - A uniform windblown deposit of silty material having an open structure and relatively high cohesion due to cementation of clay or calcareous material at grain contacts.

Logo - A distinctive emblem, symbol or trademark that identifies a product, service, or organization.

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« M »

Mandrel - A molding tool used in making bend tests by applying the bending force to the inside surface of the bend.

Marshall Stability - The maximum load sustained by a Marshall sample when tested at a specified temperature. Generally at 140 °F (60 °C) for asphalt concrete specimens.

Matting - Material used as a surface protector in conjunction with seeding that protects the surface until vegetation becomes established.

Mechanical Analysis (Soils) - Finding the gradation of a soil by the use of specified sieves and a hydrometer.

Mesh - The square opening of a sieve.

Mineral Filler - A fine inert mineral matter such as limestone dust or portland cement, used in asphalt concrete mixtures.

Modulus of Elasticity - The ratio of stress to strain for a material under given loading conditions.

Modulus of Rupture - A measure of the strength necessary to break a specimen of specified dimensions using appropriate apparatus.

Moisture Content - The percentage, by weight, of water contained in a material, usually based on the dry weight. In asphalt concrete mixtures, the moisture content is expressed as a percent of the weight of the total mixture.

Mortar - A mixture of cement, sand, lime/fly ash, and water.

Muck - An organic soil of very soft consistency.

Mulch - Material placed on exposed earth to provide more desirable moisture and temperature relationships for plant growth. It is also used to control the occurrence of unwanted vegetation.

« N »

Naphtha - An inflammable liquid produced from petroleum. Solvent Naphtha is used in the production of rapid cure (RC) cutback asphalts.

Nutrient - Material that nourishes and promotes plant growth.

« O »

Open-Graded Aggregate - A graded aggregate, containing little or no fines, with a high percentage of voids.

Open-Graded Asphalt Friction Course -A combination of open-graded mineral aggregate and asphalt material mixed in a central plant, laid and compacted while hot. This type of course is usually laid in very thin layers and is used as a surface course.

Optimum - The best quantity, number, or condition.

Optimum Moisture Content - The water content at which a soil, using a specified compactive effort, can be compacted to its maximum dry unit weight.

Overburden - The organic or mineral material that overlies a usable source of rock, gravel, or other road materials.

« P »

Pavement Design - The arrangement of material in depth to best accommodate the anticipated environment and traffic loading.

Peat - A fibrous mass of organic matter in various stages of decomposition.

Permeability - The property of material that permits the passage of any fluid and depends on grain size, void ratio, shape and arrangement of pores.

Penetration - **(1)** The consistency of an asphalt material expressed as the distance that a standard needle vertically penetrates a sample of the material under known conditions of loading, time, and temperature. **(2)** A method of applying asphalt binder to gravel or crushed stone courses by spreading liquid bitumen over the surface and allowing it to seep into, or penetrate, the surface.

pH - A scale of values from 0 to 14 that indicate the acidity or alkalinity of a solution. Numbers below seven indicate acidity and values above seven alkalinity.

Pigment - Any substance used to impart color; specifically, an insoluble, dry coloring matter that, when mixed with a suitable medium, forms a paint.

Pipe, Clay - Pipe made of shale and fired clay, unglazed, or glazed and vitrified, with or without bells. Generally used for drainfields, edge drains, sewers, etc.

Pipe, Concrete - Pipe made of concrete with or without steel reinforcement.

Pipe, Corrugated - Pipe fabricated from corrugated metal or plastic.

Pipe, Perforated - Pipe fabricated from metal, plastic, or concrete with holes or slots on approximately 1/2 of the periphery and used as underdrains to collect and drain off water trapped in the soil.

Pipe, Plastic - Pipe fabricated from plastic, generally polyethylene (PE), polyvinyl chloride (PVC), or acrylonitrile-butadiene-styrene (ABS).

Pipet - A small calibrated glass tube used to measure and transfer an exact volume of liquid.

Plant Mix - A term describing the mixing of mineral aggregate and binder in a mechanical mixer, after which the finished mix is transported and placed. The proportioning of material is closely controlled.

Plastic - Property of a material that exhibits no recovery when an applied load is removed.

Plastic Limit - The lowest percent of moisture (water content) at which a soil remains plastic.

Plasticity Index [Soil] (PI) - The range of percent moisture (water content) within which the material is in a plastic state. The numerical difference between a soil's liquid limit (LL) and a soil's plastic limit (PL).

Pollution - Contamination of any component of the total environment by harmful substances, sounds, smells, or sights degrading or injurious to humans and other living organisms.

Porous - Having many small openings, through which liquids may pass.

Portland Cement - A hydraulic cement consisting of compounds of silica, lime and alumina. Named because of its resemblance in color when set, to the Portland stone of England.

Portland-Pozzolan Cement - An intimate and uniform blend of portland cement and fine pozzolan, produced by either intergrinding portland cement clinker and pozzolan or by blending portland cement and finely divided pozzolan.

Pozzolan - A siliceous or siliceous and aluminous material that in itself possesses little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties. Pozzolans may be natural material, such as certain types of finely divided calcined clays or volcanic ashes, or they may be by-products, such as fly ash.

Precision - The accuracy of a measurement. The degree of variance from repeated measurements of a characteristic from their average.

Precast Concrete - Concrete that is cast into forms, cured, and then removed from the forms and placed into final position.

Premix - To mix aggregate prior to the introduction of asphalt or portland cement.

Prestressed Concrete (Pretensioned) - Reinforced concrete in which bars, wires, or cables are held in a stretched condition during placing of the plastic concrete until the concrete has hardened. Then as the tension on the reinforcing steel is released, it compresses the concrete.

Prestressed Concrete (Post-tensioned) - Reinforced concrete in which the prestressing wires or tendons are placed in tubes before the concrete is cast. After the concrete has hardened the wires or tendons are stretched to a predetermined tension by jacking and are wedged in this position. The tubes may also be pressure-grouted.

Prime Coat - An asphalt material of low viscosity that when applied to an absorbent surface such as an aggregate base or subbase will penetrate the base course for the purpose of hardening the surface and promoting adhesion between it and the superimposed construction.

Process Control - A continuous on-going activity such as inspection, sampling, and testing that is normally performed by the contractor to make timely adjustments in construction operations and processes to ensure the continued quality of the work.

Project Engineer - The duly authorized representative of the Contracting Officer who is delegated the responsibility for administration of the project.

« Q »

Quality Assurance - The total system of activities that is designed to ensure that the quality of the construction material is acceptable with respect to the specification under which it was produced.

Quality Control - The total effort to produce a product within specification limits, including tests or inspections made to assure that the specifications are met.

Quarry - A place from which stone is excavated, as by blasting, for construction purposes.

Quartering - Dividing a quantity of material into four equal parts so that each part is representative of the whole. Applied generally to sampling.

Quicklime - A calcined material, the major part of which is calcium oxide or calcium oxide in natural association with a lesser amount of magnesium oxide, capable of slaking with water.

« R »

R-Value - A method to determine the load bearing capacity of a material (AASHTO T 190).

Random - Without bias or regularity.

Random Sample - A sample of material chosen in such a manner that each increment of a population (lot) of material has an equal probability of being selected.

Ravelling - The progressive loosening of the aggregate in the surface course of a road.

Rebars or Reinforcing Bars - Steel bars used as reinforcement in concrete.

Reclamation - The restoration of borrow and aggregate pits to a natural form that may include replacement of topsoil and vegetation (seeding).

Recycling - The reuse, usually after some processing, of a material that has already served its first intended purpose.

Reflection Crack - A crack appearing in a resurface or overlay caused by movement at joints or cracks in underlying base or surface.

Reflux - To boil under a condenser so that the condensed vapors return to the original container.

Reinforced Concrete - Concrete where reinforcement (usually steel) is embedded so that the reinforcement and concrete act together in resisting stress.

Repeatability - The degree to which the same operator, procedure, and apparatus can duplicate the results of a test or measurement on the same material.

Representative - Typical of a larger number of items or quantity.

Representative Sample - A non-random sample taken on a judgment basis and which, in the opinion of the sampler, represents an average condition of a material or an item of construction.

Reproducibility - The degree to which different operators or different laboratories can duplicate the results of a test using the same procedures and with similar equipment.

Resurfacing - The placing of one or more new courses on an existing surface.

Rigid Pavement - A pavement structure that distributes loads to the subgrade with a course of portland cement concrete having a relatively high bending resistance.

Riprap - A protective covering of graded stones, with or without mortar, to prevent erosion.

Roadbed - The graded portion of a highway prepared as a foundation for the pavement structure and shoulders.

Road Mix - A method of combining surfacing material, such as mineral aggregate combined with cutback or emulsified asphalt in which the material is mixed on the road by approved methods.

Roadside - All area within the right-of-way excluding the traveled way and shoulders.

Roadway - The portion of a highway within the limits of construction.

Rockwell Hardness Test - An indentation hardness test using a calibrated machine to force a diamond penetrator or a hard steel ball, under specified conditions, into the surface of the material under test in two operations, and to measure the difference in depth of the impression under the specified conditions of minor and major loads.

« S »

S-Value - A method to determine resistance to deformation/cohesion of a compacted asphalt mixture (AASHTO T 246).

Sand, Natural - A fine granular material, that results from the natural disintegration and abrasion of rock.

Sand, Manufactured - A fine granular material that is produced by crushing rock, gravel, iron blast-furnace slag, or hydraulic-cement concrete.

Sand Seal - An application of asphalt material covered with fine aggregate.

Sand Equivalent - The ratio, expressed as a percentage of the height of a sand column to the height of a colloidal clay column in suspension in the same solution. The higher the value, the more sand in the material in proportion to the clay.

Sample - A portion of material or product intended to represent the whole.

Sample Splitter - A device used to reduce the size of a sample proportionally to an amount suitable for testing.

Saybolt Furol Viscosity - The efflux time in seconds for 60 milliliters of sample to flow through a calibrated furol orifice under specified conditions.

Seal Coat - A thin asphalt coating, sometimes with cover aggregate, that is applied to a surface of a pavement for the purpose of waterproofing and improving the surface texture. The principle types of seal coats are aggregate seals, fog seals, emulsion slurry seals, and sand seals.

Segregation - The separation of portions of a mixture or mass. The localization of sizes or portions within a mixture or mass.

Set - (1) The strain remaining after complete release of the load producing the deformation. **(2)** The initial hardening of portland cement concrete.

Shrink - The reduction in volume caused by compaction or reduction in moisture content.

Shrinkage limit - The maximum water content at which a reduction in water content will not cause a decrease in volume of the soil mass.

Shoulder - The portion of the roadway contiguous to the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of the pavement structure.

Shrub - A small woody, multistemmed plant.

Side Slopes - Slopes along the side of the roadway identified by their distance from the traveled way, their slope rate, and their height.

Sieve - See AASHTO M 92.

Sieve Analysis - The quantitative determination of the particle size distribution of fine and coarse soils and aggregates using specific sieves.

Significant Digit - That digit in a calculated number which represents the highest acceptable level of accuracy obtainable from the numbers used in the calculation.

Silt - A fine soil that passes a 75 µm (No. 200) sieve but is larger than 2 µm, is nonplastic or very slightly plastic, and exhibits little or no strength when air dried.

Skip-Graded Aggregate - An aggregate which lacks one or more intermediate sizes of material.

Sliver Fill - A thin embankment slope that is roughly parallel to the natural slope of the hillside.

Slope - Any ground whose surface makes an angle with the plane of the horizon. Vertical rise divided by horizontal distance.

Slope Ratio - Usually the ratio of horizontal measurement to a unit of vertical measurement. The steepness of a slope.

Slump - The measure of the consistency of portland cement concrete by consolidating in a slump cone, removing the cone, and allowing the concrete to settle under its own mass.

Slurry - A suspension of solids in water.

Slurry Seal - A seal coat consisting of a semifluid mixture of asphalt emulsion and fine aggregate.

Soil - Sediments or other unconsolidated accumulation of solid particles produced by the natural physical and chemical disintegration of rocks, and which may or may not contain organic matter.

Soil Classification - The arrangement of soils into classes according to their physical properties.

Soil Stabilization - Mechanical or chemical treatment designed to increase or maintain the stability of a mass of soil or otherwise improve its engineering properties.

Soil Strength - The ability of a soil to resist displacement during cyclic or repetitive loading as compared with static loading.

Soil Support Value - A number which expresses the relative ability of a soil aggregate mixture to support traffic loads under the pavement structure.

Solubility - The amount of a substance that will dissolve in a liquid. It is usually expressed as a percent.

Solvent - A liquid used for dissolving another substance.

Spalling - The separation of macroscopic particles from a surface in the form of flakes or chips.

Specific Gravity - The ratio of the weight in air of a solid to the weight of an equal volume of water at a standard temperature.

Specific Gravity, Apparent - The specific gravity in which only those voids or pores that cannot be penetrated by water are included in the volume.

Specific Gravity, Bulk - Specific gravity in which the voids or pores in the material that can be penetrated by water are included in the volume.

Specifications - The written requirements for performing work.

Stability - That property of a material which determines its resistance to deformation when subjected to external loading.

Stabilization - Modification of soils or aggregates by incorporating material that will increase load-bearing capacity, firmness, and resistance to weathering or displacement.

Standard - Something having recognized and usually permanent values and established as a model or criteria.

Stone - Rock material produced from a quarry. A nongravel type of material.

Strain - The change in length per unit of length in a given direction.

Strength Coefficient - A factor used for expressing relative strength, or substitution value, of layers, one to the other, for conversion purposes in a pavement structure.

Stress - The force per unit area acting within a mass.

Stress-Strain Diagram - A diagram where corresponding values of stress and strain are plotted.

Structural Section - The planned layers of specified material that normally consist of a subbase, base, and surface course placed over a subgrade.

Subbase - The layer or layers of material placed on a subgrade to support a base.

Subgrade - The top surface of a roadbed upon which the pavement structure, shoulders, and curbs are constructed.

Suitable Material - Rock or earth material that will provide stable foundations, embankments, or roadbeds, and is reasonably free of organic matter, roots, muck, sod, or other detrimental material.

Surcharge Material - Material placed above subgrade grade to accelerate the consolidation or displacement of the underlying material by virtue of the excess weight.

Surface Course (Wearing Course) - The top layer or layers of a pavement structure designed to accommodate the traffic load and resist skidding, traffic abrasion, and weathering.

Surface Treatment - An application of asphalt material and cover aggregate.

Swelling - (1) The increase in volume of a material due to manipulation such as rock that bulks upon being excavated or damp sand bulks if loosely deposited. This is because the apparent cohesion prevents movement of the particles to form a reduced volume. **(2)** The increase in volume and dimensions caused by the absorption of a liquid into a material.

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« T »

Tack Coat - An application of asphalt material to an existing surface to provide bond with a superimposed course.

Titration - The volumetric addition of a solution to another solution to determine the endpoint of a reaction.

Toe of Slope - The intersection of a roadway embankment side slope with the original ground surface.

Top of Cut - The point where a cut slope intersects the natural ground.

Toxic - Poisonous.

Traveled Way - The portion of the roadway designated for the movement of vehicles, exclusive of shoulders.

« U »

Underdrain - Porous or perforated pipe, or graded aggregate installed under a roadway or shoulder to provide subsurface drainage.

Undisturbed Sample - A sample that has been obtained by methods in which every precaution has been taken to minimize disturbances to the sample.

Uniformly Graded - Material with a uniform gradation from coarse to fine.

Unstable - Natural or processed material which readily yield to relatively small loads.

Unsuitable Material - Material that is earth, gravel, or sand not adequate (i.e. stability, drainage, etc.) to use in the construction of stable foundations, embankments, or roadbeds.

Untreated Aggregate Course - The layer or layers of aggregate course processed only with water.

« V »

Viscosity - The property of a fluid to resist flow under stress.

Visual Inspection - Inspection for defects which can be seen.

Vitrified Clay - Clay that has been fired to produce a glassy or glass like surface, usually used in pipe and tile.

« W »

Waterbound - Bonded with the aid of water.

Water Table - The elevation or depth below ground surface at which water stands or the soil is saturated.

Water-Cement Ratio - The ratio of the amount of water, exclusive only of that absorbed by the aggregates, to the amount of cement in a concrete or mortar mixture.

Weathering - The decomposition of rock, shale, etc., because of the action of the weather.

Weephole - A hole through an abutment or retaining wall to relieve hydrostatic pressure.

Well Graded - Aggregate material of varying particle sizes which produce maximum density when mixed.

Wetting Agent - A substance which, when mixed with water, produces a solution of increased ability to wet surfaces by reducing surface tension.

Wipe Test - The method used to monitor the external surface of a nuclear instrument for radioactive contamination caused by leakage of the radioactive contents.

Work - The furnishing of all labor, material, equipment, and other incidentals necessary to successfully complete the project according to the contract.

« Y »

Yield - The ratio of the volume of a mixture produced to that which theoretically should have been produced.

Yield Strength - The stress at which a material exhibits a specified limiting deviation from the proportionality of stress to strain.

1.20 BUY AMERICAN REGULATIONS

FLH construction contracts contain FAR clause 52.225-5, Buy American Act - Construction Materials, requiring contractors, subcontractors, and suppliers to provide only domestic construction material unless foreign material is specifically approved at the time of award, or unless a specific exception provided by law or regulation applies. These exceptions change from time to time; and a referral to Legal Counsel through the Construction Operations Engineer may be necessary to confirm that it applies.

There are exceptions based on certain countries, e.g., Canada, but which apply only above a certain dollar threshold. There are also exceptions for certain materials listed in the FAR Part 25.108, reproduced herein as Exhibit 1.3.

Buy American applies to material as it is delivered to the site regardless of how it is paid for under the contract. If the material is manufactured in the United States then at least 50% of the value of all components must be of domestic origin. For example if complete sign panels are what is delivered to the site, and they contain foreign made reflective sheeting, that is acceptable as long as the value of the reflective sheeting is less than the value of the other components of the panel. But, if the contractor is installing the reflective sheeting at the site, the same foreign made sheeting is not acceptable because then the sheeting is a separate material delivered to the site.

When material is manufactured in the U.S. such that its components are no longer identifiable, the 50% rule no longer applies. For example steel products might be made in the U.S. entirely from Canadian iron ore, but since the iron ore has been transformed into steel in the U.S., the product is considered 100% domestic. Likewise ready mix concrete may be delivered to the site containing foreign made cement regardless of its value, but if the cement is delivered to the site it is not acceptable.

The Project Engineer should be alert to the presence of foreign material being used in the work. Evidence of Buy America violations may be apparent in markings on packaging; tags or stamps on the material itself, or test reports and certifications.

Once an apparent violation is identified, the Project Engineer should coordinate with the Construction Operations Engineer for a determination as to whether it is a legitimate exception. At this point the Contractor should be asked to explain the apparent violation, or otherwise provide additional information to help FLH make a determination. Often, allegations of Buy America violations will come from competing contractors, subcontractors, or suppliers. These incidents should also be coordinated with the Construction Operations Engineer before taking adverse action.

Material certifications of compliance are required to identify the place of manufacture, however compliance with the Buy American Act is sometimes more complicated and therefore they cannot always be used to make this determination.

1.30 FORMS (master copies)

FLH has developed check list forms, report forms, and worksheets for use with the procedures set forth in this manual.

The field laboratory check list forms for the inspection and verification of a field laboratory facility and equipment inventory are listed in Table 1-1. See Section 2.21.C. These forms are for inventory purposes. They do not cover quality or conformity of equipment to specified standards.

The report forms and worksheets for use with the acceptance procedures set forth in Chapter 2 and with the test procedures set forth in Chapter 3 are listed in Table 1-2.

Blank master copies of these forms are included herein for copying purposes. Additional copies may be obtained from the FLHO. Do not alter or revise these check list forms, report forms, and worksheets, except as provided for under Subpart 1.05 of this manual.

Table 1 - 1
FLH Field Laboratory Equipment Check List Forms [1]

Test Procedure	Check List Revision Date	Description
General, page 1	3-94	General
General, page 2	3-94	General continued
General, page 3	3-94	General continued
AASHTO T 11	3-94	Amount of Material Finer Than 75 µm Sieve
AASHTO T 19	3-94	Unit Weight and Voids in Aggregate
AASHTO T 22	3-94	Compressive Strength of Cylindrical Concrete Specimens
AASHTO T 23	3-94	Making and Curing Concrete Test Specimens in the Field
AASHTO T 24	3-94	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
AASHTO T 27	3-94	Sieve Analysis of Fine and Coarse Aggregates
AASHTO T 30	3-94	Mechanical Analysis of Extracted Aggregate
AASHTO T 37	3-94	Sieve Analysis of Mineral Filler
AASHTO T 87	3-94	Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T 89	3-94	Determining the Liquid Limit of Soils
AASHTO T 90	3-94	Plastic Limit and Plasticity Index of Soils
AASHTO T 99	3-94	Moisture-Density Relations of Soils Using a 2.54 kg Rammer and a 305 mm Drop
AASHTO T 110	3-94	Moisture or Volatile Distillates In Bituminous Mixtures
AASHTO T 119	10-96	Slump of Portland Cement Concrete
AASHTO T 121	10-96	Mass Per Cubic Meter, Yield, and Air Content (Gravimetric) of Concrete
AASHTO T 152	3-94	Air Content of Freshly Mixed Concrete by the Pressure Method

Table 1 - 1
FLH Field Laboratory Equipment Check List Forms [1]

Test Procedure	Check List Revision Date	Description
AASHTO T 164	3-94	Quantitative Extraction of Bitumen from Bituminous Paving Mixtures (Method E)
AASHTO T 166	3-94	Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens
AASHTO T 176	3-94	Sand Equivalent Test
AASHTO T 180	3-94	Moisture-Density Relations of Soils Using a 4.54 kg Rammer and an 457 mm Drop
AASHTO T 191	3-94	Density of Soil In-Place by the Sand-Cone Method
AASHTO T 196	3-94	Air Content of Freshly Mixed Concrete by the Volumetric Method
AASHTO T 209	3-94	Maximum Specific Gravity of Bituminous Paving Mixtures
AASHTO T 245	3-94	Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
AASHTO T 248	3-94	Reducing Field Samples of Aggregate to Testing Size
AASHTO T 255	3-94	Moisture Content of Aggregate by Drying
AASHTO T 265	3-94	Laboratory Determination of Moisture Content of Soils
FLH T 502	3-94	Flow of Grout Mixtures Using a Flow Cone
FLH T 503	3-94	Determining the Presence of Antistripping Compound in Asphalt Material
FLH T 505	3-94	Determining the Effect of Water on Asphalt-Coated Aggregate
FLH T 506	3-94	Determining Multiple Fractured Faces on Coarse Aggregates
FLH T 507	3-94	Determining Fractured Faces on Coarse Aggregates
FLH T 508	10-96	Determining the Flakiness Index and Average Least Dimension of Aggregates
FLH T 509	3-94	Drying Soil and Aggregate Samples Using a Microwave Oven
FLH T 510	3-94	Determining the Natural Cementation of Aggregate Fines
FLH T 514	3-94	Extracting Asphalt from Asphalt Concrete Paving Mixtures Using Biodegradable Solvents
FLH T 515	3-94	Determining Moisture Content in Asphalt Concrete Paving Mixtures Using a Microwave Oven
FLH T 516	3-94	Determining Asphalt Content Using a Troxler 3241-B Nuclear Instrument
FLH T 517	3-94	Determining Asphalt Content Using a Troxler 3241-C Nuclear Instrument
FLH T 520	3-94	Determining the Roundness of Large Glass Beads

Note:[1] In the table, the parenthetical number at the end of the description identifies the number of pages in the exhibit when there is more than one page.

Table 1 - 2
FLH Construction/Material Report Forms and Worksheets[1]

FHWA Form No.	Description
1600C (3-94)	CFLHD Request for Laboratory Tests (2)
1600E (Rev 10-96)	EFLHD Request for Laboratory Tests (2)
1600W (Rev 6-98)	WFLHD Request for Laboratory Tests (2)
1601 (Rev 3-94)	Aggregate Source Construction Report
1602 (3-91)	Material On-Site Inspection Record
1603 (Rev 10-96)	Field Inspection Report (Metal Conduit for Roadway Drainage)
1604 (Rev 3-94)	Ultimate Pay Factor Worksheet
1605 (Rev 3-94)	Worksheet for Hand Calculating Statistical Parameters (4)
1606 (Rev 10-96)	Minor Portland Cement Concrete Mix Design Trial Batch Summary
1607 (Rev 10-96)	Worksheet for a Hveem Asphalt Concrete Mix Design - AASHTO T 246 (5)
1608 (Rev 10-96)	Portland Cement Concrete Mix Design Trial Batch Summary (6)
1609 (Rev 3-94)	Shipper's Certification for Radioactive Material
1610 (Rev 3-94)	Worksheet for Determining Operator Retention Factor for Extraction of Asphalt from Asphalt Paving Mixtures - FLH T 519
1611 (Rev 10-96)	Worksheet for Determining Bulk Specific Gravity of Compacted Bituminous Mixtures - AASHTO T 166
1612 (3-91)	Worksheet for Reporting Miscellaneous Tests
1613 (Rev 10-96)	Worksheet for Determining Median Size of Aggregate - FLH T 508
1614 (Rev 10-96)	Worksheet for Determining Average Least Dimension - FLH T 508
1615 (Rev 10-96)	Flakiness Index Worksheet - FLH T 508
1616 (9-90)	Worksheet for Determining Moisture Content of Soil and Aggregates Using a Microwave Oven - FLH T 509
1617 (Rev 3-94)	Cementation Test Worksheet - FLH T 510
1618 (Rev 3-94)	Worksheet for In-Place Nuclear/Moisture Density Testing - FLH T 513, AASHTO T 238 and AASHTO T 239
1619 (Rev 10-96)	Worksheet for Determining Gradation and Asphalt Content of Asphalt Concrete - FLH T 514, T 515, T 516, and T 517
1620 (Rev 10-96)	Worksheet for Determining Longitudinal Surface Smoothness Using a Profilograph - FLH T 504 (3)
1621 (Rev 10-96)	Worksheet for Sieve Analysis of Fine and Coarse Aggregate - AASHTO T 11 and T 27
1622 (Rev 10-96)	Worksheet for a Marshall Asphalt Concrete Mix Design - AASHTO T 245 (6)
1623 (Rev 3-94)	Worksheet for Determining Gradation and Asphalt Content of Asphalt Concrete - AASHTO T 30, T 110, and T 164
1624 (Rev 3-94)	Worksheet for Determining Liquid Limit and Plastic Limit of Soils - AASHTO T 89, Method A or B and T 90
1625 (Rev 3-94)	Worksheet for Determining the Moisture/Density Relationships - AASHTO T 99 and T 180
1626 (Rev 10-96)	Worksheet for Determining Sand Equivalent - AASHTO T 176
1627 (3-94)	Worksheet for Sieve Analysis of Fine Aggregate, Coarse Aggregate and Mineral Filler - AASHTO T 11, T 27, and T 37
1628 (3-94)	Worksheet for Determining Maximum Specific Gravity of Bituminous Paving Mixtures - AASHTO T 209 and T 269 (Flask Determination)
1629 (Rev 3-94)	Worksheet for Determining Maximum Specific Gravity of Bituminous Paving Mixtures - AASHTO T 209 and T 269 (Bowl Determination)
1630 (Rev 10-96)	Worksheet for Determining Marshall Stability and Flow of Bituminous Mixtures - AASHTO T 245

1 In the table, the parenthetical number at the end of the description identifies the number of pages in the exhibit when there is more than one page.

Revised 6/10/98

Table 1 - 2
FLH Construction/Material Report Forms and Worksheets[1]

FHWA Form No.	Description
1631 (Rev 10-96)	Worksheet for Calibration of Nuclear Asphalt Content Gauges (Troxler 3241-B or 3241-C) - FLH T 516 and T 517
1632 (Rev 3-94)	Worksheet for Calibration of Moisture Correction for Nuclear Asphalt Content Gauges (Troxler 3241-B or 3241-C) - FLH T 516 and T 517
1633 (9-90)	Worksheet for Determining a Concrete Unit Weight Correction Factor - FLH T 518
1634 (9-90)	Worksheet for Determining a Concrete Water/Cement Correction Factor - FLH T 518
1635 (3-94)	Worksheet for Determining Calibration Weights for Nuclear Asphalt Content Gauge - FLH T 516 and T 517
1636 (3-94)	Worksheet for Determining Correction for Coarse Particles in the Soil Compaction Test - AASHTO T 224 (2)
1637 (3-94)	FLH Construction Project Material Certification
1638 (Rev 3-94)	Worksheet for Determining Concrete Batch Moisture/Absorption Corrections
1639 (6-00)	Worksheet for Determining Gradation and Asphalt Content of Asphalt Concrete - AASHTO T 308, T 30, and FLH T515
1640 (6-00)	Worksheet for Determining Ignition Furnace Aggregate Correction Factor - AASHTO T 308
1727 (Rev 10-96)	Report of Compressive Strength of Cylindrical Concrete Specimens

[1] In the table, the parenthetical number at the end of the description identifies the number of pages in the exhibit when there is more than one page.

Sections 1.40 through 1.90 Reserved

Revised 6/7/00

FIELD LABORATORY CHECK LIST

Project: _____

Inspected by: _____ Date of Inspection: _____

Laboratory Furnished by: ☐ FLH ☐ Contractor ☐ Subcontractor ☐ Other

Name:_____

Location: _____

GENERAL

I. Basic Laboratory Requirements:

	Yes	No[1]	N/A[2]
1. Laboratory temperature controlled? (Range 20° - 25° C)	☐	☐	☐
2. Work areas large enough to accommodate testing?	☐	☐	☐
3. Work area lighting adequate?	☐	☐	☐
4. Water quality, quantity, and pressure acceptable?	☐	☐	☐
5. Laboratory properly ventilated?	☐	☐	☐
6. AASHTO Materials volumes, parts I and II, current?	☐	☐	☐
7. FLH Field Materials Manual	☐	☐	☐
8. Laboratory diary containing equipment calibration & certification?	☐	☐	☐
9. Chemical hygiene plan?	☐	☐	☐

II. Basic Support Requirements:

	Yes	No[1]	N/A[2]
1. Adequate storage facilities for hazardous materials?	☐	☐	☐
2. Containment and disposal systems set up for waste materials?	☐	☐	☐
3. Required safety documents and warning posters displayed?	☐	☐	☐
4. Sufficient storage available for retaining samples?	☐	☐	☐
5. Adequate fire extinguishers?	☐	☐	☐
6. First aid kit?	☐	☐	☐
7. Sufficient and appropriate shipping containers?	☐	☐	☐

[1] *If no to any of the above, give details and explain action taken under Remarks on page 2.*

[2] *Not Applicable*

(continued on page 2)

FIELD LABORATORY CHECK LIST

GENERAL (continued from page 1)

	Conforms to Contract Requirements			Condition and Quantity Acceptable	
III. Support Equipment and Supplies:					
	Yes	**No**[1]	**N/A**[2]	**Yes**	**No**[1]
1. Working pans	☐	☐	☐	☐	☐
2. Thermometers	☐	☐	☐	☐	☐
3. Gloves	☐	☐	☐	☐	☐
4. Scoops, spoons, shovels	☐	☐	☐	☐	☐
5. Funnels, spatulas, brushes, brooms	☐	☐	☐	☐	☐
6. Wash bottles/containers	☐	☐	☐	☐	☐
7. Sample containers	☐	☐	☐	☐	☐
8. Measuring cup	☐	☐	☐	☐	☐
9. Tape or ruler	☐	☐	☐	☐	☐
10. Hand trowel	☐	☐	☐	☐	☐
11. Rags	☐	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Not Applicable*

(continued on page 3)

FIELD LABORATORY CHECK LIST

GENERAL (continued from page 2)

IV. Field Laboratory Equipment Check Forms for Individual Tests:

When reviewing test equipment in a field laboratory, include in the report along with pages 1, 2, and 3 the appropriate individual check list forms for applicable tests that will be performed. This will provide project documentation of the condition and serviceability of the test equipment.

FLH Field Laboratory Test Equipment Check List Forms

Test Procedure	Test Procedure	Test Procedure	Test Procedure
AASHTO T 11	AASHTO T 99	AASHTO T 196	FLH T 507
AASHTO T 19	AASHTO T 110	AASHTO T 209	FLH T 508
AASHTO T 23	AASHTO T 119	AASHTO T 245	FLH T 509
AASHTO T 24	AASHTO T 121	AASHTO T 248	FLH T 510
AASHTO T 27	AASHTO T 152	AASHTO T 255	FLH T 514
AASHTO T 30	AASHTO T 164	AASHTO T 265	FLH T 515
AASHTO T 37	AASHTO T 166	FLH T 502	FLH T 516
AASHTO T 87	AASHTO T 176	FLH T 503	FLH T 517
AASHTO T 89	AASHTO T 180	FLH T 505	FLH T 520
AASHTO T 90	AASHTO T 191	FLH T 506	

Remarks: _____

_____

_____

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 11
AMOUNT OF MATERIAL FINER THAN 75 µm SIEVE

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Balance[2]	☐	☐	☐	☐
2. Sieve[3], 1.18 mm	☐	☐	☐	☐
3. Sieve[3], 75 µm	☐	☐	☐	☐
4. Oven (maintain 110 ^{o}C ± 5 ^{o}C)	☐	☐	☐	☐
5. Containers	☐	☐	☐	☐
6. Wetting Agent	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *An appropriate-sized general purpose balance conforming to AASHTO M 231.*
[3] *Sieves shall conform to AASHTO M 92.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 19
UNIT WEIGHT AND VOIDS IN AGGREGATE

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Balance[2]	☐	☐	☐	☐
2. Measuring device	☐	☐	☐	☐
3. Tamping rod	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Balance shall have a sensitivity capable of providing both weight and volume values to at least four figures.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 22
COMPRESSIVE STRENGTH OF CYLINDRICAL CONCRETE SPECIMENS

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Water bath (maintain 23 °C ± 1.7 °C)	☐	☐	☐	☐
2. Caps (AASHTO T 231)	☐	☐	☐	☐
3. Appropriate measuring devices	☐	☐	☐	☐
4. Appropriate testing machine[2]	☐	☐	☐	☐
5. Suitable capping device	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Testing machines shall conform to AASHTO T 22.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 23
MAKING AND CURING CONCRETE TEST SPECIMENS IN THE FIELD

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Appropriate molds	☐	☐	☐	☐
2. Tamping rods	☐	☐	☐	☐
3. Vibrators	☐	☐	☐	☐
4. Mallet	☐	☐	☐	☐
5. Slump apparatus	☐	☐	☐	☐
6. Mixing pans/containers	☐	☐	☐	☐
7. Air content apparatus	☐	☐	☐	☐
8. Small tools[2]	☐	☐	☐	☐
9. Cylinder covers	☐	☐	☐	☐
10. Water bath (maintain 23 °C ± 1.7 °C)	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Miscellaneous tools, such as shovels, pails, trowels, scoops, floats, etc.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 24
OBTAINING AND TESTING DRILLED CORES
AND SAWED BEAMS OF CONCRETE

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Core drill	☐	☐	☐	☐
2. Saw	☐	☐	☐	☐
3. Water bath (maintain 23 °C ± 1.7 °C)	☐	☐	☐	☐
4. Cap equipment (AASHTO T 231)	☐	☐	☐	☐
5. Appropriate measuring devices	☐	☐	☐	☐
6. Appropriate testing machine[2]	☐	☐	☐	☐
7. Suitable capping device	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Testing machines shall conform to AASHTO T 22.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 27
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Appropriate sieves[2]	☐	☐	☐	☐
2. Balance[3]	☐	☐	☐	☐
3. Oven (maintain 110 ^{o}C ± 5 ^{o}C)	☐	☐	☐	☐
4. Mechanical sieve shaker	☐	☐	☐	☐
5. Containers	☐	☐	☐	☐
6. Appropriate timing device	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Sieves shall conform to AASHTO M 92.*
[3] *An appropriate-sized general purpose balance conforming to AASHTO M 231.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 30
MECHANICAL ANALYSIS OF EXTRACTED AGGREGATE

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Appropriate sieves[2]	☐	☐	☐	☐
2. Mechanical sieve shaker	☐	☐	☐	☐
3. Balance[3]	☐	☐	☐	☐
4. Oven (maintain 110 ^{o}C ± 5°C)	☐	☐	☐	☐
5. Pans/containers	☐	☐	☐	☐
6. Appropriate utensils[4]	☐	☐	☐	☐
7. Appropriate timing device	☐	☐	☐	☐
8. Wetting agent	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Sieves shall conform to AASHTO M 92.*
[3] *An appropriate-sized general purpose balance conforming to AASHTO M 231.*
[4] *Miscellaneous items, such as brushes, scoops, trowels, etc.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 37
SIEVE ANALYSIS OF MINERAL FILLER

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Appropriate sieves[2]	☐	☐	☐	☐
2. Balance[3]	☐	☐	☐	☐
3. Oven (maintain 110 ^{o}C ± 5 ^{o}C)	☐	☐	☐	☐
4. Containers	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Sieves shall conform to AASHTO M 92.*
[3] *A balance conforming to AASHTO M 231, class G2.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 87
DRY PREPARATION OF DISTURBED SOIL AND
SOIL AGGREGATE SAMPLES FOR TEST

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Drying apparatus[2]	☐	☐	☐	☐
2. Appropriate sieves[3]	☐	☐	☐	☐
3. Balance[4]	☐	☐	☐	☐
4. Pulverizing apparatus	☐	☐	☐	☐
5. Sample splitter	☐	☐	☐	☐
6. Appropriate containers	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Temperature not to exceed 60 °C.*
[3] *Sieves shall conform to AASHTO M 92.*
[4] *An appropriate-sized balance conforming to AASHTO M 231.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 89
DETERMINING THE LIQUID LIMIT OF SOILS

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Liquid limit device	☐	☐	☐	☐
2. Grooving tool	☐	☐	☐	☐
3. Gage	☐	☐	☐	☐
4. Balance (AASHTO M 231 class C)	☐	☐	☐	☐
5. Oven (maintain 110 ^{o}C ± 5 ^{o}C)	☐	☐	☐	☐
6. Porcelain dish	☐	☐	☐	☐
7. Spatula	☐	☐	☐	☐
8. Appropriate containers	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 90
PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Rolling surface	☐	☐	☐	☐
2. Balance (AASHTO M 231 class C)	☐	☐	☐	☐
3. Oven (maintain 110 °C ± 5 °C)	☐	☐	☐	☐
4. Porcelain dish	☐	☐	☐	☐
5. Spatula	☐	☐	☐	☐
6. Containers	☐	☐	☐	☐
7. Rod, 3.2 mm diameter	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 99
MOISTURE-DENSITY RELATIONS OF SOILS USING
A 2.54 kg RAMMER AND A 305 mm DROP

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Balance[2]	☐	☐	☐	☐
2. Balance[3]	☐	☐	☐	☐
3. Metal rammer	☐	☐	☐	☐
4. Appropriate molds	☐	☐	☐	☐
5. Sample extruder	☐	☐	☐	☐
6. Oven (maintain 110 ^{o}C ± 5 ^{o}C)	☐	☐	☐	☐
7. Appropriate sieves[4]	☐	☐	☐	☐
8. Straight edge	☐	☐	☐	☐
9. Appropriate containers	☐	☐	☐	☐
10. Appropriate utensils[5]	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Balance shall conform to AASHTO M 231 class G20.*
[3] *Balance shall conform to AASHTO M 231 class G2.*
[4] *Sieves shall conform to AASHTO M 92.*
[5] *Miscellaneous items, such as spoons, trowels, spatulas, scoops, etc.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 110
MOISTURE OR VOLATILE DISTILLATES IN BITUMINOUS MIXTURES

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Metal Still	☐	☐	☐	☐
2. Condenser	☐	☐	☐	☐
3. Glass trap	☐	☐	☐	☐
4. Heating device[2]	☐	☐	☐	☐
5. Appropriate solvent	☐	☐	☐	☐
6. Balance[3]	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *A suitable source of heat capable of maintaining a rate of distillation of 85 to 95 drops per minute.*
[3] *Appropriate balance conforming to AASHTO M 231.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 119
SLUMP OF PORTLAND CEMENT CONCRETE

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Metal form (mold)	☐	☐	☐	☐
2. Tamping rod	☐	☐	☐	☐
3. Measuring ruler[2]	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *A linear measuring device in millimeters with at least 5-millimeter increments.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 121
MASS PER CUBIC METER, YIELD, AND
AIR CONTENT (GRAVIMETRIC) OF CONCRETE

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:				
	Yes	**No**[1]	**Yes**	**No**[1]
1. Balance or scale[2]	☐	☐	☐	☐
2. Measure container[3]	☐	☐	☐	☐
3. Tamping rod	☐	☐	☐	☐
4. Vibrator	☐	☐	☐	☐
5. Strike-off plate	☐	☐	☐	☐
6. Plate glass[4]	☐	☐	☐	☐
7. Appropriate mallet[5]	☐	☐	☐	☐
8. Heavy lubricant[6]	☐	☐	☐	☐

Remarks: _____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Instrument shall be accurate to within 0.3 percent of a load ranging from the mass of the container empty to the mass of the container plus its contents at 2600 kilograms per cubic meter.*
[3] *A cylindrical metal container fabricated from steel or other suitable metal.*
[4] *At least 6 millimeters thick and 25 millimeters larger in diameter than the measure container.*
[5] *Head must be rubber or rawhide.*
[6] *Water pump or chassis grease.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 152
AIR CONTENT OF FRESHLY MIXED CONCRETE
BY THE PRESSURE METHOD

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:				
	Yes	**No**[1]	**Yes**	**No**[1]
1. Appropriate air meter	☐	☐	☐	☐
2. Sieves[2]	☐	☐	☐	☐
3. Cover assembly	☐	☐	☐	☐
4. Tamping rod	☐	☐	☐	☐
5. Vibrator[3]	☐	☐	☐	☐
6. Calibration vessel	☐	☐	☐	☐
7. Spray tube	☐	☐	☐	☐
8. Strike-off bar	☐	☐	☐	☐
9. Appropriate utensils[4]	☐	☐	☐	☐
10. Containers	☐	☐	☐	☐

Remarks: _____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Sieves shall conform to AASHTO M 92.*
[3] *Vibrator shall conform to AASHTO T 126.*
[4] *Miscellaneous items, such as trowels, tamping rods, mallets, funnels, etc.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 164 - Method E
QUANTITATIVE EXTRACTION OF BITUMEN
FROM BITUMINOUS PAVING MIXTURES

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Vacuum extractor	☐	☐	☐	☐
2. Vacuum pipe	☐	☐	☐	☐
3. Oven (maintain 110 ^{o}C ± 5 ^{o}C)	☐	☐	☐	☐
4. Electric hot plate[2]	☐	☐	☐	☐
5. Flat pan	☐	☐	☐	☐
6. Graduated cylinders	☐	☐	☐	☐
7. Balance[3]	☐	☐	☐	☐
8. Ignition dish	☐	☐	☐	☐
9. Desiccator	☐	☐	☐	☐
10. Appropriate reagents	☐	☐	☐	☐
11. Appropriate utensils[4]	☐	☐	☐	☐

Remarks: _____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Hot plate heating rate shall be adjustable.*
[3] *An appropriate-sized general purpose balance conforming to AASHTO M 231.*
[4] *Miscellaneous items, such as spatulas, trowels, beakers, flasks, brushes, etc.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 166
BULK SPECIFIC GRAVITY OF COMPACTED BITUMINOUS
MIXTURES USING SATURATED SURFACE-DRY SPECIMENS

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Water bath[2]	☐	☐	☐	☐
2. Balance[3]	☐	☐	☐	☐
3. Drying apparatus[4]	☐	☐	☐	☐
4. Thermometer[5]	☐	☐	☐	☐
5. Appropriate volumeter	☐	☐	☐	☐
6. Containers/pans	☐	☐	☐	☐
7. Appropriate timing device	☐	☐	☐	☐
8. Towels	☐	☐	☐	☐

Remarks: _____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Appropriately sized for specimen and equipped with an overflow outlet.*
[3] *Appropriate balance conforming to AASHTO M 231.*
[4] *Drying apparatus shall maintain 52 ^{o}C ± 3 ^{o}C.*
[5] *Thermometer with a range of 19 to 27 ^{o}C with 0.1^{o} increments.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 176
SAND EQUIVALENT TEST

Required Testing Equipment:	Equipment On Site?		Condition Acceptable?	
	Yes	**No**[1]	**Yes**	**No**[1]
1. Mechanical shaker	☐	☐	☐	☐
2. Balance[2]	☐	☐	☐	☐
3. Oven (maintain 110 °C ± 5 °C)	☐	☐	☐	☐
4. Calcium chloride solution	☐	☐	☐	☐
5. Graduated plastic cylinders	☐	☐	☐	☐
6. Graduated measure, 100 ml	☐	☐	☐	☐
7. Irrigator tube	☐	☐	☐	☐
8. Weighted foot assembly	☐	☐	☐	☐
9. Siphon assembly	☐	☐	☐	☐
10. Spatula	☐	☐	☐	☐
11. Containers with covers (85 ml)	☐	☐	☐	☐
12. Rubber stoppers	☐	☐	☐	☐
13. Containers, 4 liter +	☐	☐	☐	☐
14. Timing devices	☐	☐	☐	☐
15. Funnel	☐	☐	☐	☐
16. Canvas Blanket or Splitting Cloth	☐	☐	☐	☐

Remarks: _____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *An appropriate-sized general purpose balance conforming to AASHTO M 231.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 180
MOISTURE-DENSITY RELATIONS OF SOILS USING
A 4.54 kg RAMMER AND A 457 mm DROP

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Balance[2]	☐	☐	☐	☐
2. Balance[3]	☐	☐	☐	☐
3. Metal rammer	☐	☐	☐	☐
4. Appropriate molds	☐	☐	☐	☐
5. Sample extruder	☐	☐	☐	☐
6. Oven (maintain 110 ^{o}C ± 5 ^{o}C)	☐	☐	☐	☐
7. Appropriate sieves[4]	☐	☐	☐	☐
8. Straight edge	☐	☐	☐	☐
9. Appropriate containers	☐	☐	☐	☐
10. Appropriate utensils[5]	☐	☐	☐	☐

Remarks: _____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Balance conforming to AASHTO M 231 class G20.*
[3] *Balance conforming to AASHTO M 231 class G2.*
[4] *Sieves shall conform to AASHTO M 92.*
[5] *Miscellaneous items, such as spoons, trowels, spatulas, scoops, etc.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 191
DENSITY OF SOIL IN-PLACE BY THE SAND-CONE METHOD

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Density apparatus	☐	☐	☐	☐
2. Balance[2]	☐	☐	☐	☐
3. Balance[3]	☐	☐	☐	☐
4. Appropriate drying equipment	☐	☐	☐	☐
5. Sand	☐	☐	☐	☐
6. Thermometer[4]	☐	☐	☐	☐
7. Appropriate utensils[5]	☐	☐	☐	☐
8. Moisture proof containers	☐	☐	☐	☐

Remarks: _____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Balance conforming to AASHTO M 231 class G20.*
[3] *Balance conforming to AASHTO M 231 class G2.*
[4] *To determine water temperature.*
[5] *Miscellaneous items, such as small pick, chisels, spoons, buckets, brushes, pans, etc.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 196
AIR CONTENT OF FRESHLY MIXED CONCRETE
BY THE VOLUMETRIC METHOD

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Airmeter device	☐	☐	☐	☐
2. Appropriate funnel	☐	☐	☐	☐
3. Tamping rod	☐	☐	☐	☐
4. Strike-off bar	☐	☐	☐	☐
5. Mallet[2]	☐	☐	☐	☐
6. Isopropyl alcohol	☐	☐	☐	☐
7. Appropriate utensils[3]	☐	☐	☐	☐

Remarks: _____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Head shall be rubber or rawhide.*
[3] *Miscellaneous items, such as syringes, containers, trowels, scoops, etc.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 209
MAXIMUM SPECIFIC GRAVITY OF BITUMINOUS PAVING MIXTURES

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Balance[2]	☐	☐	☐	☐
2. Vacuum pump or water aspirator	☐	☐	☐	☐
3. Containers	☐	☐	☐	☐
4. Water bath	☐	☐	☐	☐
5. Appropriate timing device	☐	☐	☐	☐
6. Appropriate thermometer	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Balance shall have a sensitivity capable of providing both weight and volume values to at least four figures.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 245
RESISTANCE TO PLASTIC FLOW OF BITUMINOUS
MIXTURES USING MARSHALL APPARATUS

Required Testing Equipment:	Equipment On Site?		Condition Acceptable?	
	Yes	**No**[1]	**Yes**	**No**[1]
1. Marshall flow meter	☐	☐	☐	☐
2. Specimen mold assembly	☐	☐	☐	☐
3. Specimen extractor	☐	☐	☐	☐
4. Compaction hammer	☐	☐	☐	☐
5. Compaction pedestal	☐	☐	☐	☐
6. Specimen mold holder	☐	☐	☐	☐
7. Breaking head	☐	☐	☐	☐
8. Loading jack	☐	☐	☐	☐
9. Ring dynamometer	☐	☐	☐	☐
10. Heating device[2]	☐	☐	☐	☐
11. Mixing apparatus	☐	☐	☐	☐
12. Balance (AASHTO M 231, cl. G2)	☐	☐	☐	☐
13. Balance (AASHTO M 231, cl. G20)	☐	☐	☐	☐
14. Water bath[3]	☐	☐	☐	☐
15. Air bath[4]	☐	☐	☐	☐
16. Appropriate thermometers[5]	☐	☐	☐	☐
17. Containers	☐	☐	☐	☐
18. Appropriate utensils[6]	☐	☐	☐	☐

Remarks: _____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Thermostatically controlled to maintain temperatures within 5 °F.*
[3] *Thermostatically controlled to 140 °F ± 2 °F (60 °C ± 1 °C).*
[4] *Thermostatically controlled to 77 °F ± 2 °F (25 °C ± 1 °C).*
[5] *Two thermometers. One 50 - 400 °F (9.9 - 204 °C) with 5 °F (2.8 °C) increments and one 68 - 158 °F (20 - 70 °C) with 0.4 °F (0.2 °C) increments.*
[6] *Miscellaneous items, such as trowels, spoons, scoops, marking crayons, gloves, etc.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 248
REDUCING FIELD SAMPLES OF AGGREGATE TO TESTING SIZE

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Mechanical sample splitter	☐	☐	☐	☐
2. Canvas blanket (2 m by 2.5 m ±)	☐	☐	☐	☐
3. Appropriate tools[2]	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Miscellaneous items, such as a straightedged trowel or shovel, spoons, scoops, etc.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 255
MOISTURE CONTENT OF AGGREGATE BY DRYING

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Balance[2]	☐	☐	☐	☐
2. Oven (maintain 110 °C ± 5 °C)	☐	☐	☐	☐
3. Containers	☐	☐	☐	☐
4. Metal spoon or spatula	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *An appropriate-sized general purpose balance conforming to AASHTO M 231.*

FIELD LABORATORY EQUIPMENT CHECK LIST

AASHTO T 265
LABORATORY DETERMINATION OF MOISTURE CONTENT OF SOILS

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Oven (maintain 110 °C ± 5 °C)	☐	☐	☐	☐
2. Balance[2]	☐	☐	☐	☐
3. Suitable containers	☐	☐	☐	☐
4. Appropriate utensils[3]	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *An appropriate-sized general purpose balance conforming to AASHTO M 231.*
[3] *Miscellaneous items, such as brushes, spoons, scoops, etc.*

FIELD LABORATORY EQUIPMENT CHECK LIST

FLH T 502
FLOW OF GROUT MIXTURES USING A FLOW CONE

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Flow cone device	☐	☐	☐	☐
2. Timing device[2]	☐	☐	☐	☐
3. Appropriate containers	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *A stop-watch with at least a 0.2 second readout.*

FIELD LABORATORY EQUIPMENT CHECK LIST

FLH T 503
DETERMINING THE PRESENCE OF
ANTISTRIPPING COMPOUND IN ASPHALT MATERIAL

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Balance[2]	☐	☐	☐	☐
2. Glass bottle, 60 ml with cap	☐	☐	☐	☐
3. Metal pan or ceramic bowl	☐	☐	☐	☐
4. White paper towels or blotters	☐	☐	☐	☐
5. Standard ottawa sand[3]	☐	☐	☐	☐
6. Clean potable water	☐	☐	☐	☐
7. Kerosene or naphtha	☐	☐	☐	☐
8. Spoons, spatulas, etc.	☐	☐	☐	☐
9. Appropriate containers	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Balance shall conform to AASHTO M 231, class G2.*
[3] *Sand conforming to ASTM C 190, 600 µm to 850 µm mesh.*

FIELD LABORATORY EQUIPMENT CHECK LIST

FLH T 505
DETERMINING THE EFFECT OF WATER
ON ASPHALT-COATED AGGREGATE

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Heating device[2]	☐	☐	☐	☐
2. Suitable glass or metal beakers	☐	☐	☐	☐
3. Thermometers[3]	☐	☐	☐	☐
4. Appropriate utensils[4]	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Hot plate, camp stove, torch, etc., capable of boiling water.*
[3] *Low distillation type with a range of -2 to 300 °C, with 1 °C graduations.*
[4] *Miscellaneous items, such as pans, scoops, shovels, brushes, etc.*

FIELD LABORATORY EQUIPMENT CHECK LIST

FLH T 506
DETERMINING MULTIPLE FRACTURED FACES ON COARSE AGGREGATES

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Balance[2]	☐	☐	☐	☐
2. Sieve, 4.75 mm size[3]	☐	☐	☐	☐
3. Splitting device[4]	☐	☐	☐	☐
4. Appropriate utensils[5]	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *An appropriate-sized general purpose balance conforming to AASHTO M 231.*
[3] *Sieves shall conform to AASHTO M 92.*
[4] *Sample splitter shall conform to AASHTO T 248.*
[5] *Miscellaneous items, such as pans, containers, brushes, etc.*

FIELD LABORATORY EQUIPMENT CHECK LIST

FLH T 507
DETERMINING FRACTURED FACES ON COARSE AGGREGATES

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Balance[2]	☐	☐	☐	☐
2. Sieve, 4.75 mm size[3]	☐	☐	☐	☐
3. Splitting device[4]	☐	☐	☐	☐
4. Appropriate utensils[5]	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *An appropriate-sized general purpose balance conforming to AASHTO M 231.*
[3] *Sieves shall conform to AASHTO M 92.*
[4] *Sample splitter shall conform to AASHTO T 248.*
[5] *Miscellaneous items, such as pans, containers, brushes, etc.*

FIELD LABORATORY EQUIPMENT CHECK LIST

FLH T 508
DETERMINING THE FLAKINESS INDEX
AND AVERAGE LEAST DIMENSION OF AGGREGATES

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Balance[2]	☐	☐	☐	☐
2. Metal slotted plate	☐	☐	☐	☐
3. Sieves[3]	☐	☐	☐	☐
4. Drying device[4]	☐	☐	☐	☐
5. Brushes, scoops, etc.	☐	☐	☐	☐
6. Appropriate containers	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *An appropriate sized general purpose balance conforming to AASHTO M 231.*
[3] *Sieves shall conform to AASHTO M 92.*
[4] *Drying apparatus capable of maintaining 110 °C ± 5 °C.*

FIELD LABORATORY EQUIPMENT CHECK LIST

FLH T 509
DRYING SOIL AND AGGREGATE SAMPLES
USING A MICROWAVE OVEN

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Balance[2]	☐	☐	☐	☐
2. Microwave oven[3]	☐	☐	☐	☐
3. Drying pans[4]	☐	☐	☐	☐
4. Appropriate utensils[5]	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *An appropriate-sized general purpose balance conforming to AASHTO M 231.*
[3] *Oven shall have 1,000 watts minimum of continuous variable power output from 0 to 100 % of maximum power.*
[4] *Drying pans shall be suitable for use in the microwave oven.*
[5] *Miscellaneous items, such as spatulas, spoons, brushes, etc.*

FIELD LABORATORY EQUIPMENT CHECK LIST

FLH T 510
DETERMINING THE NATURAL CEMENTATION OF AGGREGATE FINES

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:				
	Yes	**No**[1]	**Yes**	**No**[1]
1. Testing machine[2]	☐	☐	☐	☐
2. Oven (maintain 110 °C ± 5 °C)	☐	☐	☐	☐
3. Balance[3]	☐	☐	☐	☐
4. Sieves[4]	☐	☐	☐	☐
5. Mechanical splitter[5]	☐	☐	☐	☐
6. Specimen molds[2]	☐	☐	☐	☐
7. Tamping device	☐	☐	☐	☐
8. Straightedge, 100-150 mm blade	☐	☐	☐	☐
9. Appropriate containers	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *The testing machine and specimen molds shall conform to AASHTO T 106.*
[3] *Balance shall conform to AASHTO M 231, class G2.*
[4] *Sieves shall be a 4.75 mm and a 2.00 mm conforming to AASHTO M 92.*
[5] *Mechanical splitter shall conform to AASHTO T 248.*

FIELD LABORATORY EQUIPMENT CHECK LIST

FLH T 514
EXTRACTING ASPHALT FROM ASPHALT CONCRETE
PAVING MIXTURES USING BIODEGRADABLE SOLVENTS

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Balance[2]	☐	☐	☐	☐
2. Graduated cylinders	☐	☐	☐	☐
3. Sieves[3]	☐	☐	☐	☐
4. Appropriate reagents[4]	☐	☐	☐	☐
5. Appropriate utensils[5]	☐	☐	☐	☐
6. Appropriate containers	☐	☐	☐	☐
7. Sieve pan[6]	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Balance shall conform to AASHTO M 231, class G5.*
[3] *Sieves (1.18 mm and 75 µm) shall be 305 mm diameter and conform to AASHTO M 92.*
[4] *Approved biodegradable solvents.*
[5] *Miscellaneous items such as plastic wash bottle, spoons, spatulas, scoops, brushes, etc.*
[6] *A framed container to hold the sieves during decanting operations and having a 8 to 40 liter capacity.*

FIELD LABORATORY EQUIPMENT CHECK LIST

FLH T 515
DETERMINING MOISTURE CONTENT IN ASPHALT
CONCRETE PAVING MIXTURES USING A MICROWAVE OVEN

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Balance[2]	☐	☐	☐	☐
2. Microwave oven[3]	☐	☐	☐	☐
3. Drying pans[4]	☐	☐	☐	☐
4. Appropriate utensils[5]	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *An appropriate-sized general purpose balance conforming to AASHTO M 231.*
[3] *Oven shall have 1000 watts minimum of continuous variable power output from 0 to 100 % of maximum power.*
[4] *Drying pans shall be suitable for use in the microwave oven.*
[5] *Miscellaneous items, such as spatulas, spoons, scoops, brushes, etc.*

FIELD LABORATORY EQUIPMENT CHECK LIST

FLH T 516
DETERMINING ASPHALT CONTENT
USING A TROXLER® 3241-B NUCLEAR INSTRUMENT

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Nuclear test instrument[2]	☐	☐	☐	☐
2. Balance[3]	☐	☐	☐	☐
3. Quartering device	☐	☐	☐	☐
4. Drying unit[4]	☐	☐	☐	☐
5. Compaction device[5]	☐	☐	☐	☐
6. Straightedge, 300 mm ± blade	☐	☐	☐	☐
7. Appropriate utensils[6]	☐	☐	☐	☐
8. Appropriate containers/pans	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *The nuclear test instrument is Troxler® model 3241-B.*
[3] *Balance shall conform to AASHTO M 231, class G20.*
[4] *Drying device shall be capable of maintaining 110 °C ± 5 °C.*
[5] *The 4.54 kg compaction rammer and sleeve shall conform to AASHTO T 180. The compaction plate is shown in figure 1 of FLH T 516.*
[6] *Miscellaneous items such as spoons, mixing bowls, scoops, spatulas, brushes, etc.*

FIELD LABORATORY EQUIPMENT CHECK LIST

FLH T 517
DETERMINING ASPHALT CONTENT
USING A TROXLER® 3241-C NUCLEAR INSTRUMENT

	Equipment On Site?		Condition Acceptable?	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Nuclear test instrument[2]	☐	☐	☐	☐
2. Balance[3]	☐	☐	☐	☐
3. Quartering device	☐	☐	☐	☐
4. Drying unit[4]	☐	☐	☐	☐
5. Compaction device[5]	☐	☐	☐	☐
6. Straightedge, 300 mm ± blade	☐	☐	☐	☐
7. Appropriate utensils[6]	☐	☐	☐	☐
8. Appropriate containers/pans	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *The nuclear test instrument is Troxler® model 3241-C.*
[3] *Balance shall conform to AASHTO M 231, class G20.*
[4] *Drying device shall be capable of maintaining 110 °C ± 5 °C.*
[5] *The 4.54 kg compaction rammer and sleeve shall conform to AASHTO T 180. The compaction plate is shown in figure 1 of FLH T 516.*
[6] *Miscellaneous items such as spoons, mixing bowls, scoops, spatulas, brushes, etc.*

FIELD LABORATORY EQUIPMENT CHECK LIST

FLH T 520
DETERMINING THE ROUNDNESS OF LARGE GLASS BEADS

	Conforms to Contract Specifications		Condition Acceptable	
Required Testing Equipment:	**Yes**	**No**[1]	**Yes**	**No**[1]
1. Microfiche reader w/ 20 mm lens[2]	☐	☐	☐	☐
2. Microscope slides	☐	☐	☐	☐
3. Transparencies[3]	☐	☐	☐	☐
4. Standard 1.5 reflective index liquid[4]	☐	☐	☐	☐
5. 1/1 mini-splitter	☐	☐	☐	☐
6. Clear transparent adhesive tape	☐	☐	☐	☐
7. 3 cc Syringe w/0.32±0.07 mm ID needle	☐	☐	☐	☐
8. Miscellaneous items[5]	☐	☐	☐	☐

Remarks: _____

_____

_____

_____

[1] *If no to any of the above, give details and explain action taken under Remarks.*
[2] *Bell and Howell Model ABR VIII or equivalent.*
[3] *Transparencies that define a 1.2:1 aspect ratio for 1.70, 1.40, 1.18, 1.00, and 0.850 mm bead sizes.*
[4] *A Wesson® cooking oil or equivalent with an approximate 1.5 refractive index is acceptable.*
[5] *Appropriate containers or pans, scoops, spoons, brushes, etc.*

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

Laboratory Control No._____

REQUEST FOR LABORATORY TESTS

Project Name: _____ Project Number: _____

Agency: _____ Account Number: _____ State: ____ County: _____

Submitted by: _____ Address: _____
Phone Number: _____ _____
Fax Number: _____ _____

Field Sample Number: _____ Sampled by: _____ Date Sampled: _____
Number & Type Containers: _____ Witnessed by: _____ Date Shipped: _____
Quantity Represented: _____ Intended Use: _____
Sample Type (Acceptance, Process Control, IAS, CVS, etc.): _____

Source Name: _____ Source Number: _____
Source Location: _____

Material Description: _____ Contractor/Owner: _____
Invoice Number: _____ Sample Location: _____
Station: _____ Offset: _____ Milepost: _____ Hole Number: _____ Depth: _____

QL-PAY ID: _____ Item No: _____ Lot No: _____ QL-PAY Sample No: _____

List Tests To Be Performed:
(See Reverse For Tests)

Project Specifications and Field Test Results

Parameters/Sieves	Specifications	Test Results	Target Values
37.5 mm			
25.0 mm			
19.0 mm			
12.5 mm			
9.5 mm			
4.75 mm			
2.36 mm			
2.00 mm			
1.18 mm			
600 µm			
425 µm			
300 µm			
150 µm			
75 µm			
Liquid Limit			
PI			
T99/T180			
Fractured Faces			
Asphalt Content			
Density			
Flakiness Index			
Concrete Strength			

Special Instructions:
(Continue On Reverse)

Portland Cement Concrete Data

Air Content (%): _____ Slump:

Break Date: _____ Age(Days): ____

INSTRUCTIONS FOR SUBMITTING SAMPLE

1. Completely fill out the transmittal form (use "NK" for not known) and make three copies.
2. Place one copy in a waterproof envelope and attach to the outside of the container.
3. Address the envelope to the Laboratory.
4. Place a second copy of the transmittal inside a waterproof envelope and place inside the container.
5. Mai1 the third copy of the transmittal directly to the Laboratory.
6. Retain the original transmittal form for your records.

NOTE: For tests not listed below, contact the Central Federal Lands Highway Division Laboratory.

LISTING OF TESTS TO BE PERFORMED (CIRCLE):

: Routine Identification of Soil or Aggregate: 1, 2 & 3
: Complete Soil Evaluation: 1, 2, 3, 4, & 5 or 6
: Preliminary Aggregate Source Evaluation: 1, 2, 6, 7, 8, 9, 10, 11 & 21
: Complete Concrete Aggregate Evaluation: 1, 2, 8, 9, 10, 11, 12, 13, 14, 15, 21
: Liquid Asphalt Identification
: Liquid Asphalt Complete Analysis

1. Sieve Analysis (AASHTO T 11 & T 27)
2. Liquid and Plastic Limit (AASHTO T 89 & T 90)
3. Classification (AASHTO M 145)
4. R-Value, (AASHTO T 190)
5. Compaction (AASHTO T 99, Method C)
6. Compaction (AASHTO T 180, Method D)
7. Fractured Faces (FLH T 506)
8. Los Angeles Abrasion (AASHTO T 96)
9. Sodium Sulfate Soundness (AASHTO T 104)
10. Durability Index (AASHTO T 210)
11. Adherent Fines (FLH T 512)
12. Specific Gravity, Absorption of Coarse Aggregate (AASHTO T 85)
13. Specific Gravity, Absorption of Fine Aggregate (AASHTO T 84)
14. Organic Impurities (AASHTO T 21)
15. Unit Weight (AASHTO T 19)
16. Cementation (FLH T 510)
17. Resistivity (AASHTO T 288)
18. pH (AASHTO T 289)
19. Zinc Coating (AASHTO T 65)
20. Flakiness Index (FLH T 508)
21. Sand Equivalent (AASHTO T 176)
22. Unconfined Compression of Soil (AASHTO T 208)
23. Concrete Cylinder Compressive Strength (AASHTO T 22)
24. Asphalt Extraction and Sieve Analysis (AASHTO T 164 & T 30)
25. Asphalt Concrete Core Density (AASHTO T 166)
26. Asphalt Concrete Mix Design
27. Other Testing, Specify Below

Special Instructions (continued):

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

Laboratory Control No. _____

REQUEST FOR LABORATORY TESTS

Project name: _____ Project number: _____
Agency: _____ Account number: _____ State: ____ County: _____
Submitted by: _____ Address: _____
Phone number: _____ _____
Fax number: _____ _____

Field sample number: _____ Sampled by: _____ Date sampled: _____
Number & type containers: _____ Witnessed by: _____ Date shipped: _____
Quantity represented: _____ Intended use: _____
Sample type (acceptance, process control, IAS, CVS, etc.): _____

Source name: _____ Source number: _____
Source location: _____

Material description: _____ Contractor/owner: _____
Invoice number: _____ Sample location: _____
Station: _____ Offset: _____ Reference post: _____ Hole number: _____ Depth: _____

QL-PAY ID: _____ Item no: _____ Lot no: _____ QL-PAY sample no: _____

List Tests To Be Performed:
(See Reverse For Tests)

Project Specifications and Field Test Results

Parameters/ Sieves	Specification	Test Results	Target Values
37.5 mm			
25.0 mm			
19.0 mm			
12.5 mm			
9.5 mm			
4.75 mm			
2.36 mm			
2.00 mm			
1.18 mm			
600 µm			
425 µm			
300 µm			
150 µm			
75 µm			
Liquid limit			
Plasticity index			
Sand equivalent			
Fractured faces			
Asphalt content			
Density			
Flakiness index			
Concrete strength			

Special Instructions:
(Continue On Reverse)

Portland Cement Concrete Data

Air content (%): _____ Slump (mm): _____

Break age in days (7, 14, 28, other): _____

INSTRUCTIONS FOR SUBMITTING SAMPLE

1. Completely fill out the transmittal form (use "NK" for not known) and make three copies.
2. Place one copy in a waterproof envelope and attach to the outside of the container.
3. Address the envelope to the laboratory.
4. Place a second copy of the transmittal inside a waterproof envelope and place inside the container.
5. Mail, e-mail, or fax the third copy of the transmittal directly to the laboratory.
6. Retain the original transmittal form for your records.

NOTE: For tests not listed below, contact the Eastern Federal Lands Highway Division Laboratory.

LISTING OF AVAILABLE TESTS:

1. Sieve Analysis (AASHTO T 11 & T 27)
2. Liquid and Plastic Limit (AASHTO T 89 & T 90)
3. Classification (AASHTO M 145)
4. Particle Size by Hydrometer (AASHTO T 88)
5. Specific Gravity of Soil (AASHTO T 100)
6. Organic Content of Soil (AASHTO T 267)
7. Resistivity (AASHTO T 288)
8. pH (AASHTO T 289)
9. California Bearing Ratio (AASHTO T 193)
10. Compaction (AASHTO T 99, Method C)
11. Compaction (AASHTO T 180, Method D)
12. Los Angeles Abrasion (AASHTO T 96)
13. Sodium Sulfate Soundness (AASHTO T 104)
14. Sand Equivalent (AASHTO T 176)
15. Specific Gravity and Absorption of Coarse Aggregate (AASHTO T 85)
16. Specific Gravity and Absorption of Fine Aggregate (AASHTO T 84)
17. Fractured Faces (FLH T 506)
18. Organic Impurities (AASHTO T 21)
19. Unit Weight (AASHTO T 19)
20. Flakiness Index (FLH T 508)
21. Concrete Cylinder Compressive Strength (AASHTO T 22)
22. Asphalt Extraction and Sieve Analysis (AASHTO T 164 & T 30)
23. Asphalt Concrete Core Density (AASHTO T 166)
24. Maximum Specific Gravity of Asphalt Concrete Mix (AASHTO T 209)
25. Marshall Stability and Flow (AASHTO T 245)
26. Immersion-Compression (AASHTO T 165)
27. Stripping of Asphalt-Coated Aggregates (FLH T 505)
28. Asphalt Concrete Mix Design
29. Penetration of Asphalt Cement (AASHTO T 49)
30. Viscosity of Asphalt Cement (AASHTO T 202)
31. Asphalt Cement Complete Analysis
32. Emulsified Asphalt Complete Analysis
33. Cut-back Asphalt Complete Analysis

Special Instructions (continued):

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

Laboratory Control No. _____

REQUEST FOR LABORATORY TESTS

Project Name: _____ Project Number: _____
Agency: _____ Account Number: _____ State: _____ County: _____

Submitted by: _____ Address: _____
Phone Number: _____ _____
Fax Number: _____ _____

Field Sample Number: _____ Sampled by: _____ Date Sampled: _____
Number & Type Containers: _____ Witnessed by: _____ Date Shipped: _____
Quantity Represented: _____ Intended Use: _____
Sample Type (Acceptance, PC, IAS, CVS, etc.): _____ Date Results Needed: _____

Source Name: _____ Source Number: _____
Source Location: _____

Material Description: _____ Contractor/Owner: _____
Invoice Number: _____ Sample Location: _____
Station: _____ Offset: _____ Milepost: _____ Hole Number: _____ Depth: _____

QL-PAY ID: _____ Item No: _____ Lot No: _____ QL-PAY Sample No: _____

List Tests To Be Performed:
(See Reverse For Tests)

Project Specifications and Field Test Results

Parameters/Sieves	Specifications	Test Results	Target Values
37.5 mm			
25.0 mm			
19.0 mm			
12.5 mm			
9.5 mm			
4.75 mm			
2.36 mm			
2.00 mm			
1.18 mm			
600 µm			
425 µm			
300 µm			
150 µm			
75 µm			
Liquid Limit			
PI			
Sand Equivalent			
Fractured Faces			
Asphalt Content			
Density			
Flakiness Index			
Concrete Strength			

Special Instructions:
(Continue On Reverse)

Portland Cement Concrete Data

Air Content (%): _____ Slump: _____

Break Age In Days (7, 14, 28, other): _____

INSTRUCTIONS FOR SUBMITTING SAMPLE

1. Fill out the transmittal completely, (use "NK" for not known).
2. Make three copies of the transmittal.
3. Place the first transmittal inside a waterproof envelope and place inside the container.
4. Place a second transmittal in a waterproof envelope and attach to the outside of container.
5. Address the envelope to the Laboratory.
6. Mail the third transmittal directly to the Laboratory.
7. Keep the original copy of the transmittal for your records.

NOTE: For tests not listed below, contact the WFLHD laboratory.

TESTS ON SUBBASE, BASE, & SURFACING AGGREGATES:

AG-PG Complete Preliminary Testing On Gravel.
AG-1 to 10, 12 & 13

AG-PQ Complete Preliminary Testing On Quarries.
AG-4 to 10, 12 & 13

AG-EV Base or Subbase Evaluation.
AG-1 to 6 & 16

AG-1 Sieve Analysis as received. AASHTO T 11 & T 27
AG-2 Plasticity Index as received. AASHTO T 89 & T 90
AG-3 SE as received, Referee Method. AASHTO T 176
AG-4 Durability. AASHTO T 210
AG-5 Apparent Specific Gravity, Fine & Coarse.
AG-6 Los Angeles Abrasion. AASHTO T 96
AG-7 Fine Aggregate Angularity
AG-8 Soundness by Sodium Sulfate. AASHTO T 104
AG-9 Accelerated Weathering, EG & DMSO
AG-10 Immersion Compression. AASHTO T 165
AG-11 Cement Treated Base, Mix Design.
AG-12 Plasticity Index, Lab Manufactured. AASHTO T 89 & T 90
AG-13 SE, Lab Manufactured, Referee Method. AASHTO T 176
AG-14 Specific Gravity, Coarse. AASHTO T 85
AG-15 Specific Gravity, Fine. AASHTO T 84
AG-16 R-Value, 300 PSI Exudation. AASHTO T 190
AG-17 Humphre's Granular Compaction.
AG-18 Fractured Faces. FLH T 507
AG-19 Unit Weight. AASHTO T 19
AG-20 Flat and Elongated Particles

TESTS ON SOILS:

SO-PS Complete Preliminary Testing Soils.
SO-1 to 5

SO-RI Routine Identification of Soils.
SO-1 & 2

SO-1 Mechanical Analysis to 0.02 mm.
AASHTO T 88
SO-2 Plasticity Index. AASHTO T 89 & T 90
SO-3 Specific Gravity. AASHTO T 100
SO-4 R-Value, 300 PSI Exudation.
AASHTO T 190
SO-5 AASHTO Structural Design, Flexible
SO-6 Complete Hydrometer. AASHTO T 88
SO-7 Natural Moisture Content. AASHTO T 265
SO-8 Moisture Density. AASHTO T 99
SO-9 Moisture Density. AASHTO T 180
SO-10 SE, Referee Method. AASHTO T 176
SO-11 Unconfined Compression.
SO-12 Ignition Loss.
SO-13 Triaxial "Q" Test.
SO-14 Triaxial "R" Test.
SO-15 Triaxial "S" Test.
SO-16 Permeability Constant Head.
SO-17 Permeability Variable Head.
SO-18 Shrinkage Limit. AASHTO T 92
SO-19 Consolidation.
SO-20 Additive Stabilization, Specify Type.
SO-21 California Bearing Ratio. AASHTO T 193
SO-22 PH of Soil. AASHTO T 289
SO-23 Zinc Coating, Iron or Steel. AASHTO T 65

TESTS ON CONCRETE AGGREGATES AND CONCRETE:

CO-1 Sieve Analysis. AASHTO T 11 & T 27
CO-2 Sand Equivalent. AASHTO T 176
CO-3 Los Angles Abrasion. AASHTO T 96
CO-4 Soundness by Sodium Sulfate. AASHTO T 104
CO-5 Specific Gravity, Coarse & Fine. AASHTO T 85 & T 84
CO-6 Unit Weight. AASHTO T 19
CO-7 Organic Impurities. AASHTO T 21
CO-8 Clay Lumps. AASHTO T 112
CO-9 Lightweight Pieces. AASHTO T 113
CO-10 Mortar Strength. AASHTO T 71
CO-11 Compressive Strength, Cylinders. AASHTO T 22

TESTS ON BITUMINOUS MATERIALS:

AC-MD Hot Mix Design, Consult w/ Laboratory.

AC-IC Preliminary Immersion Compression

AB-CC Complete Classification of Liquid Asphalt

AB-VG Verification of Liquid Asphalt Grading

AB-RI Routine Identification of Liquid Asphalt

AB-EA Tests on Emulsified Asphalts

AC-1 Dispose of Unneeded Backup Samples
AC-2 Bulk SG & Air Voids. AASHTO T 166
AC-3 Sieve Analysis. AASHTO T 30
AC-4 Immersion Compression. AASHTO T 165
AC-5 Asphalt Content, specify Ignition or Extraction
AC-6 Resilient Modulus.
AC-7 CKE, Hveem. AASHTO T 270

Special Instructions (continued):

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

AGGREGATE SOURCE CONSTRUCTION REPORT

Project: _____ Date: _____

Contractor: _____ Contract designated source ☐ Yes ☐ No

Material source ID: _____ Source owned by: _____

Location of source: _____

_____ (m^3 or t) of (sand/gravel/stone) have been produced from this (quarry/gravel deposit) source at an estimated cost of $ _____ during the period _____ to _____. Overburden depth: _____ m. Disposition of overburden: _____.

Water encountered? ☐ Yes ☐ No If Yes, at what depth: _____ m

Crushing required? ☐ Yes ☐ No

Scalping required? ☐ Yes ☐ No If Yes, Screen size _____ Quantity scalped _____%

Washing necessary? ☐ Yes ☐ No If Yes, water source: _____

Source depleted? ☐ Yes ☐ No If No, quantity or area remaining _____ (hm^2 or m^3)

Area restored? ☐ Yes ☐ No Describe[1]: _____

_____

Additional comments: _____

_____

_____

Note:[1] Describe condition of source upon completion. If photographs are attached, be sure they are identified and dated.

Submitted by: _____

Title: _____

Distribution
Orig: Materials Engineer
Copy: Division files

Form FHWA 1601 (Rev 3-94)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

MATERIALS ON-SITE INSPECTION RECORD

Page ___ of ___

Project: _____ Contractor: _____

Project Engineer: _____ Supplier: _____

Material or Product: _____ Date certification received: _____

Inspected by: _____ Date of inspection: _____

Basic certification components:

	Conforms to Contract Requirements		
	Yes	**No**[1]	**N/A**
1. Project identified	☐	☐	☐
2. Contractor identified	☐	☐	☐
3. Supplier identified	☐	☐	☐
4. Kind of material	☐	☐	☐
5. Quantity of material	☐	☐	☐
6. Specifications	☐	☐	☐
7. Compliance statement	☐	☐	☐
8. Tests reports attached	☐	☐	☐
9. Materials have I.D. markings	☐	☐	☐
10. Buy American statement	☐	☐	☐
11. Original binding signature	☐	☐	☐

Comments: _____

_____

_____

_____

[1] *If no, give details and explain action taken under Comments.*

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

FIELD INSPECTION REPORT
(METAL CONDUIT FOR ROADWAY DRAINAGE)

Project:_____ Date: _____

Purchased by: _____ Fabricated by: _____

Address: _____ Address: _____

City/state/zip: _____ City/state/zip: _____

☐ Culvert pipe
☐ Structural plate
☐ Steel
☐ Aluminum

☐ Helical lock seams
☐ Helical continuous welded seams
☐ Riveted
☐ Spot welded

☐ Zinc coated
☐ Aluminized coated
☐ Aluminum/zinc alloy coated
☐ Asphalt coated
☐ Asphalt-coated/paved invert
☐ Other _____

Conforms to *Buy American Act* ☐ Yes ☐ No

DESCRIPTION

Brand	Heat No.	Lab Report No.	Total Length	Diameter	Thickness	Workmanship

- Rivet size (if applicable): _____
- Rivet spacing: circumferential _____ longitudinal _____
- Corrugation size: _____ by _____
- Pipe elongated: ☐ Yes ☐ No ☐ Not required
- Asphalt coating ≥ 1.3 mm thick ☐ Yes ☐ No ☐ Not required
- Asphalt-paved invert ≥ 3.2 mm thick ☐ Yes ☐ No ☐ Not required

Remarks: _____

_____

_____

(Record any damages identified and whether replacement or repair is required.)

Original to: FLHD files
Copy to: Project files

Inspected by: _____

Form FHWA 1603 (Rev 10-96)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

ULTIMATE PAY FACTOR WORKSHEET

Project: _____ Quantity Represented: _____ Item No: _____ Lot No: _____

TEST VALUES USED: ☐ Contractor ☐ Government ☐ Other: _____

Computed By: _____ Date: _____ Checked By: _____

Quality Charact-eristic	Category I or II	$\overline{X}$	s	**N**	Target Value	Allow-able Devia-tion	USL	Q_U $\frac{USL-\overline{X}}{s}$	LSL	Q_L $\frac{\overline{X}-LSL}{s}$	* P_U	* P_L	Percent Defective P_U+P_L	** PAY FACTOR

* Use Table 106-1 in the Standard Specifications to obtain P_U or P_L from the calculated value of Q_U or Q_L, respectively.
** Use Table 106-2 in the Standard Specifications to obtain the pay factor from the calculated quality level.

Ultimate Pay Factor ☐

Project Engineer: _____ Contractor: _____ Date: _____

Form FHWA 1604 (Rev 3-94)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR HAND CALCULATING STATISTICAL PARAMETERS

Project _____ Lot No. _____

Where sampled _____ Sample of _____

Computed by _____ Date _____ Checked by _____ Date _____

☐ All Sample Case ☐ Split Sample Case

TEST PARAMETER _____

Test Number	(A) Project Test Results X_C	(B) Project Test Results Squared X_C^2	(C) Central Lab Matching Tests X_G	(D) Central Lab Matching Tests Squared X_G^2
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
$\sum$ or carry over				

WORKSHEET FOR HAND CALCULATING STATISTICAL PARAMETERS (Continued)

☐ All Sample Case ☐ Split Sample Case

Lot No. _____ Item No. _____ Page_____of_____

TEST PARAMETER _____

Test Number	(A) Project Test Results X_C	(B) Project Test Results Squared X_C^2	(C) Central Lab Matching Tests X_G	(D) Central Lab Matching Tests Squared X_G^2
$\sum$ of page				
Brought Forward				
Total $\sum$ or carry over				

WORKSHEET FOR HAND CALCULATING STATISTICAL PARAMETERS (Continued)

☐ All Sample Case ☐ Split Sample Case

Lot No. _____ Item No. _____ Test parameter _____

N_C = Number of project tests = _____ N_G = Number of central laboratory tests = _____

The mean or average of the project tests:

$$\overline{X}_C = \frac{\sum \text{of Column (A)}}{N_C} = _____ = \boxed{\overline{X}_C =} \text{ ANSWER 1}$$

The mean or average of the central laboratory tests:

$$\overline{X}_G = \frac{\sum \text{of Column (C)}}{N_G} = _____ = \boxed{\overline{X}_G =} \text{ ANSWER 2}$$

The standard deviation of the project tests:

$$S_C = \sqrt{\frac{N_C\,(\sum \text{of Column (B)}) - (\sum \text{of Column (A)})^2}{N_C\,(N_C - 1)}}$$

$$S_C = \sqrt{\frac{(\qquad) - (\qquad)^2}{(\quad)}} = \boxed{S_C =} \text{ ANSWER 3}$$

The standard deviation of the central laboratory tests:

$$S_G = \sqrt{\frac{N_G\,(\sum \text{of Column (D)}) - (\sum \text{of Column (C)})^2}{N_G\,(N_G - 1)}}$$

$$S_G = \sqrt{\frac{(\qquad) - (\qquad)^2}{(\quad)}} = \boxed{S_G =} \text{ ANSWER 4}$$

WORKSHEET FOR HAND CALCULATING STATISTICAL PARAMETERS (Continued)

☐ All Sample Case ☐ Split Sample Case

Lot No. _____ Item No. _____ Test parameter _____

N_C = Number of project tests = _____ N_G = Number of central laboratory tests = _____

Determine the t-statistic using the following formula:

$$t = \frac{|\overline{X}_C - \overline{X}_G|}{\sqrt{\frac{1}{N_c}C + \frac{1}{N_G}}\sqrt{\frac{(N_C - 1)(S_C)^2 + (N_G - 1)(S_G)^2}{N_C + N_G - 2}}}$$

Start with the denominator and let ANSWER 5 equal the following:

$$\text{ANSWER 5} = \sqrt{\frac{(N_C - 1)(\text{ANSWER 3})^2 + (N_G - 1)(\text{ANSWER 4})^2}{N_C + N_G - 2}}$$

$$\text{ANSWER 5} = \sqrt{\frac{(\quad)(\qquad)^2 + (\quad)(\qquad)^2}{+\quad - 2}} = \boxed{\qquad}_{\text{ANSWER 5}}$$

Let ANSWER 6 equal the following:

$$\text{ANSWER 6} = \sqrt{\frac{1}{N_C} + \frac{1}{N_G}} = \sqrt{\frac{1}{(\quad)} + \frac{1}{(\quad)}} = \boxed{\qquad}_{\text{ANSWER 6}}$$

Let the t-statistic equal the following:

$$t = \frac{|\overline{X}_C - \overline{X}_G|}{(\text{ANSWER 6})(\text{ANSWER 5})} = \frac{|\qquad - \qquad|}{(\qquad)(\qquad)}$$

$$\boxed{t = \qquad}$$

Based on ____ degrees of freedom, the critical t value obtained from Table A is _____.

Note: The project test results are considered invalid if the calculated value of t is greater than the critical t-value obtained from Table A.

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

MINOR PORTLAND CEMENT CONCRETE MIX DESIGN TRIAL BATCH SUMMARY

Project: _____ Date: _____

Contractor: _____ Concrete for: _____

Concrete producer: _____ Class of concrete: _____

_____ Mix designation: _____

● COMPRESSIVE STRENGTH (28 DAY)

Minimum average strength required [1] (f_{cr}) _____ megapascals (MPa)

Design strength specified (f_c') _____ MPa

● PROPORTIONS

Material	Specific Gravity (SSD)	SSD Mass per m^3 (kg)	Absolute Volume (m^3)	Tolerance % (±)	Admixtures	Dosage per m^3 (mL)
Cement [2]	3.15	_____	_____	1	Air entrainment	_____
Water	1.00	_____	_____	1	Water reducer	_____
Coarse aggregate	_____	_____	_____	2	Retarder	_____
Fine aggregate	_____	_____	_____	2	Color	_____
Total air			_____		Accelerator	_____
Other _____	_____	_____	_____		Other_____	_____

Totals: _____kg _____m^3

[1] See ACI 214.
[2] The water/cement ratio for modified concrete is the ratio of the mass of water to the combined masses of portland cement and cement substitute.

● SIGNATURES

Contractor: _____

Mix Designer: _____

Form FHWA 1606 (Rev 10-96)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR A HVEEM ASPHALT CONCRETE MIX DESIGN AASHTO T 246

Project: _____ Date: _____

Contractor: _____ Class of mixture: _____

Asphalt supplier: _____ Grade of asphalt: _____

Sources for: Aggregates: _____ , Mineral filler: _____

Admixtures: _____ , _____

Testing laboratory name: _____ Phone: _____

Testing performed by: _____

Testing reported by: _____

SUMMARY OF THE PROPOSED JOB-MIX-FORMULA

1. Percent asphalt by mass of total mix[1] _____
2. Percent asphalt by mass of aggregate _____
3. Air voids _____
4. Voids in mineral aggregate (VMA) _____
5. Maximum specific gravity (AASHTO T 209 _____
6. Recommended plant mixing temperature, °C _____
7. Effective specific gravity of aggregate _____
8. Stabilometer value (AASHTO T 246)
9. Specific gravity of asphalt _____
10. Specific gravity of mineral filler _____
11. Dust/asphalt ratio _____
12. Immersion compression test results:
    a. Dry strength, kPa _____
    b. Wet strength, kPa _____
    c. Index of retained strength, % _____

GRADATION TARGET VALUES AND ALLOWABLE DEVIATIONS			SPECIFIC GRAVITY AND ABSORPTION			CKE
Sieve Sizes	Target Value [2] % by Mass Passing	Allowable Deviation [3] %		Fine Aggregate (AASHTO T 84)	Coarse Aggregate (AASHTO T 85)	Centrifuge Kerosene Equivalent (AASHTO T 270)
_____	_____		Bulk SG	_____	_____	Surface Area:
_____	_____					_____ m^2/kg
_____	_____	_____	Bulk SSD SG	_____	_____	
_____	_____	_____				
_____	_____	_____	Apparent SG	_____	_____	Asphalt % by CKE:
_____	_____	_____				_____ %
_____	_____	_____	Absorption	_____%	_____%	
_____	_____	_____				
_____	_____	_____				

[1] Asphalt cement content (percent by mass of mix) shall be established to the nearest 0.01 percent.
[2] Target values to be established by the contractor as part of the JMF. Target values shall be established to the nearest 0.1 percent.
[3] Allowable deviations plus or minus from established target values.

WORKSHEET FOR A HVEEM ASPHALT CONCRETE MIX DESIGN (Continued)

	Stockpile Description	Quantity Represented	Blend Ratio
Stockpile A	_____	_____	_____ %
Stockpile B	_____	_____	_____ %
Stockpile C	_____	_____	_____ %
Stockpile D	_____	_____	_____ %
Stockpile E	_____	_____	_____ %

Stockpile Gradation

Sieve Size	Stockpile A _____%	Stockpile B _____ %	Stockpile C _____ %	Stockpile D _____ %	Stockpile E _____ %	Blended Stockpile Gradation	Target Values	Specification Limits
_____								100.0
_____								97.0 - 100.0
_____								
_____								
_____								
_____								
_____								
_____								
_____								

Remarks: _____

_____

_____

_____

WORKSHEET FOR A HVEEM ASPHALT CONCRETE MIX DESIGN (Continued)

Trial Number[1]	1			2			3		
% Asphalt by mass of total mix									
% Asphalt by mass of aggregate									
Specimen height in millimeters									
Stabilometer value									
Bulk specific gravity									
Bulk unit mass (kg/m^3)									
Max. specific gr. (AASHTO T 209)									
Max. unit mass (AASHTO T 209)									
Dust/asphalt ratio									
% Air voids									
Voids in mineral aggregate (VMA)									

Trial Number[1]	4			5			6		
% Asphalt by mass of total mix									
% Asphalt by mass of aggregate									
Specimen height in millimeters									
Stabilometer value									
Bulk specific gravity									
Bulk unit mass (kg/m^3)									
Max. specific gr. (AASHTO T 209)									
Max. unit mass (AASHTO T 209)									
Dust/asphalt ratio									
% Air voids									
Voids in mineral aggregate (VMA)									

[1] Three test trials are required for each asphalt content.

Test Results for Each of the Individual Immersion Compression Test Specimens

Percent asphalt cement: _____

Specimen ID		Specimen Height (mm)		Bulk Specific Gravity		Air Voids (%)		Compressive Strength (kPa)	
Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
			Averages						

Index of retained strength: _____%

WORKSHEET FOR A HVEEM ASPHALT CONCRETE MIX DESIGN (Continued)

Design Curves for Proposed Job Mix Formula (JMF)

AIR VOIDS

Percent total voids

% Asphalt cement

UNIT MASS

Kilograms per cubic meter

% Asphalt cement

STABILOMETER

Stabilometer values

% Asphalt cement

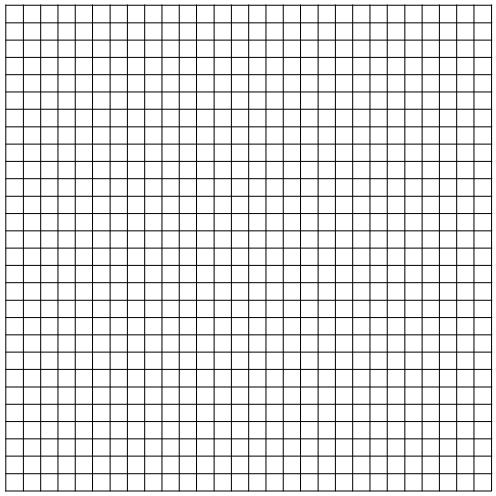
VMA

Voids in mineral aggregate

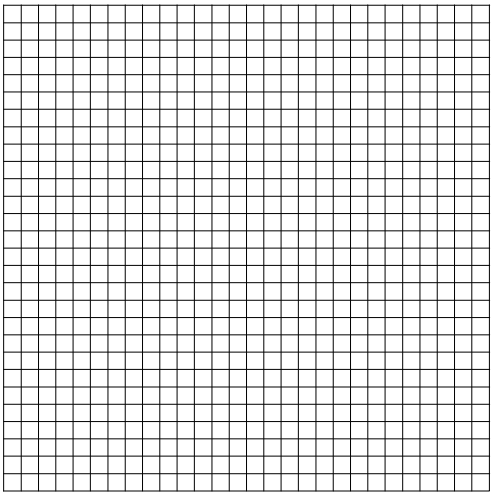
% Asphalt cement

WORKSHEET FOR A HVEEM ASPHALT CONCRETE MIX DESIGN (Continued)

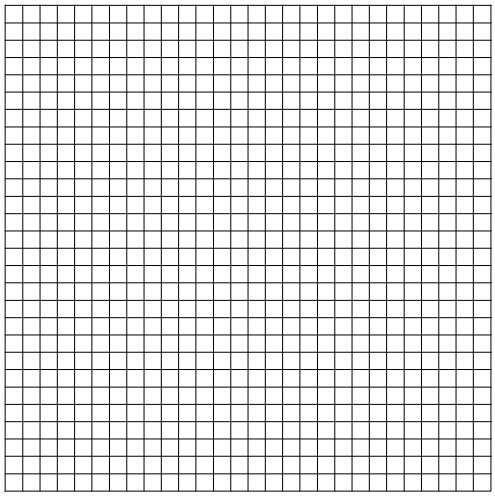
Design Curves for Proposed Job Mix Formula (JMF)



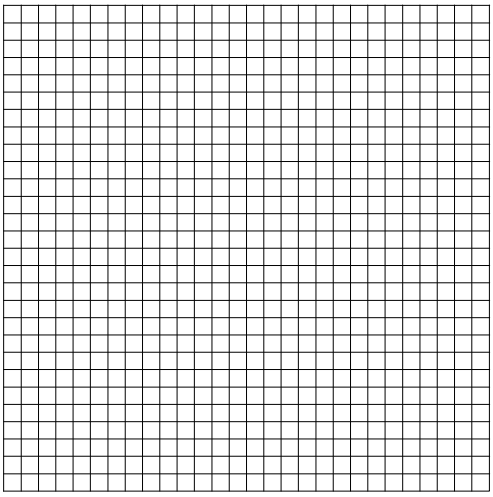
% Asphalt cement



% Asphalt cement



% Asphalt cement



% Asphalt cement

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

PORTLAND CEMENT CONCRETE MIX DESIGN[1]
TRIAL BATCH SUMMARY

Project: _____ Date: _____

Contractor: _____ Concrete for: _____

Concrete producer: _____ Class of concrete: _____

_____ Mix designation: _____

● COMPRESSIVE STRENGTH (28 DAY)

Minimum average strength required[2] (f_{cr}) _____ megapascals (MPa)

Design strength specified (f_c') _____ MPa

● PROPORTIONS

Material	Specific Gravity (SSD)	SSD Mass per m^3 (kg)	Absolute Volume (m^3)	Tolerance % (±)
Cement	3.15	_____	_____	1
Water	1.00	_____	_____	1
Coarse aggregate[3]	_____	_____	_____	2
Fine aggregate[3]	_____	_____	_____	2
Total air			_____	
Other _____	_____	_____	_____	
Totals		_____kg	_____m^3	

Admixtures	Dosage per m^3 (mL)
Air entrainment	_____
Water reducer	_____
Retarder	_____
Color	_____
Accelerator	_____
Other_____	_____

● PROPERTIES

Water/cement ratio (by mass)[4] _____

Measured unit mass _____ kg/m^3

Theoretical unit mass _____ kg/m^3

Measured air content _____ percent

Measured slump _____mm

● MEASURED COMPRESSIVE STRENGTH

Individual 7-day, MPa _____, _____, _____. Average (7 day): _____ MPa

Individual 28-day, MPa _____, _____, _____. Average (28 day): _____ MPa

[1] For normal mass portland cement concrete (2300 - 2500 kg/m^3).
[2] See page 5.
[3] Bulk SSD.
[4] The water/cement ratio for modified concrete is the ratio of the mass of water to the combined masses of portland cement and cement substitute.

● SIGNATURES

Contractor: _____

Mix Designer: _____

PORTLAND CEMENT CONCRETE MIX DESIGN[1] (Continued)
MATERIALS SOURCE SUMMARY

- **CEMENT (AASHTO M 85)**

Name and address of cement producer: _____

Source of manufacture: _____

_____

Type of cement: _____ Materials certification attached: ☐ Yes ☐ No

- **WATER (725.01 and AASHTO T 26)**

Water potable: ☐ Yes ☐ No If no, provide the following:

Water pH number	_____
Chloride concentration	_____ (ppm)
Sulphate ion concentration	_____ (ppm)
Total solids content	_____ (%)

- **ADMIXTURES**

Material	Producer and Product Designation	Certification Attached Yes	Certification Attached No
Air entraining admixture	_____	☐	☐
Water reducing admixture, type A	_____	☐	☐
Retarding admixture, type B	_____	☐	☐
Accelerating admixture, type C	_____	☐	☐
Water reducing and retarding admixture, type D	_____	☐	☐
Water reducing and accelerating admixture, type E	_____	☐	☐
Water reducing, high range admixture, type F	_____	☐	☐
Fly ash, type___	_____	☐	☐
Ground iron blast-furnace slag	_____	☐	☐
Silica fume (microsilica)	_____	☐	☐
Color additive	_____	☐	☐
Other:_____	_____	☐	☐

[1] For normal mass portland cement concrete (2300 - 2500 kg/m^3).

PORTLAND CEMENT CONCRETE MIX DESIGN[1] (Continued)
MATERIALS SOURCE SUMMARY

- **COARSE AGGREGATE (703.02 AND AASHTO M 80)**

Name of supplier/producer: _____

Location of material source: _____

Material type: ☐ Gravel ☐ Crushed gravel ☐ Crushed stone ☐ Crushed blast furnace slag

Grading no.:

Sieve Analysis:

Sieve Designation	Percent Passing	Specification
50 mm	_____	_____
37.5 mm	_____	_____
25.0 mm	_____	_____
19.0 mm	_____	_____
12.5 mm	_____	_____
9.5 mm	_____	_____
4.75 mm	_____	_____
2.36 mm	_____	_____
1.18 mm	_____	_____

Properties:

(1) Coal and lignite _____ (%) (0-0.5)[3]
(2) Deleterious chert _____ (%) (0-3)[3]
(3) Sodium sulfate soundness[2] _____ (%)(0-12)[3]
(4) Clay lumps and friable particles _____ (%) (0-2)[3]
(5) LA abrasion _____, grading _____, _____ % loss (0-40)[3]
(6) Bulk specific gravity _____
(7) Absorption _____ (%)
(8) Bulk SSD specific gravity _____
(9) Dry rodded unit mass _____ (kg/m^3)
(10) Minus 75 µm _____ (%) (0-1)[3]
(11) Adherent fines _____ (%) (0-1)[3]
(12) Other_____

- **FINE AGGREGATE (703.01 AND AASHTO M 6)**

Name of supplier/producer:

Location of material source:

☐ Manufactured sand ☐ Natural sand ☐ Blend

Sieve Analysis:

Sieve Designation	Percent Passing	Accumulative Percent Retained
9.5 mm	_____	_____
4.75 mm	_____	_____
2.36 mm	_____	_____
1.18 mm	_____	_____
600 µm	_____	_____
300 µm	_____	_____
150 µm	_____	_____

Fineness modulus: _____

Properties:

(1) Clay lumps _____ (%) (0-3)[3]
(2) Coal and lignite _____ (%) (0-1)[3]
(3) Sodium sulfate soundness[2] _____ (%) (0-10)[3]
(4) Sand equivalent value, alt. 2 _____ (>75)[3]
(5) Bulk specific gravity _____
(6) Bulk SSD specific gravity _____
(7) Absorption _____ (%)
(8) Organic impurities _____
(9) Minus 75 µm _____ (%) (0-3)[3]
(10) Other _____

[1] For normal mass portland cement concrete (2300 - 2500 kg/m^3).
[2] At five cycles.
[3] Specification limits.

PORTLAND CEMENT CONCRETE MIX DESIGN[1] (Continued)
DATA FOR COMPUTING THE COEFFICIENT OF VARIATION OF BATCHES

Batch No.	Date Batched	7-Day Compressive Strength (Mpa)				28-Day Compressive Strengths (MPa)			
		Cyl. 1	Cyl. 2	Cyl. 3	Average ($\bar{x}$)	Cyl. 1	Cyl. 2	Cyl. 3	Average ($\bar{x}$)
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

[1] For normal mass portland cement concrete (2300 - 2500 kg/m^3).

$$\overline{X} = \frac{\sum X}{N} = \frac{____}{N} = ____ \text{ (MPa)} \qquad s = \sqrt{\frac{N\sum(X^2) - (\sum X)^2}{N(N-1)}} = ____$$

Where:

X = The 28-day batch average of at least 2 cylinders (3 preferred).

$\overline{X}$ = The mean of the averages of 28-day compressive results.

s = The sample standard deviation of the 28-day batch averages.

N = The number of batches sampled.

PORTLAND CEMENT CONCRETE MIX DESIGN[1] (Continued)
DETERMINATION OF MINIMUM MIX DESIGN COMPRESSIVE STRENGTH

- **MINIMUM MIX DESIGN COMPRESSIVE STRENGTH (f_{cr})**

Computed values from page 4:

$\overline{X}$ = _____ (MPa) s = _____

Where:

s = The sample standard deviation of the 28-day compressive strength test results from page 4.

$\overline{X}$ = The mean of the 28-day compressive strength test results from page 4.

V = The *coefficient of variation*[2] expressed as a decimal and calculated as follows:

$$V = \frac{s}{\overline{X}} = \frac{\qquad}{\qquad} = _____ \text{ or } 0.15$$

$$f_{cr} = \frac{f'_C}{1 - kV} = \frac{\qquad}{1 - 1.28\,(\qquad)} = _____ \text{ (Mpa)}$$

Where:

f'_C = The 28-day design compressive strength specified in the contract.

k = A constant (1.28) for a probability that not more than 1 in 10 tests will fall below the specified compressive strength (f'C).

---

[1] For normal mass portland cement concrete (2300 - 2500 kg/m^3).
[2] Use 0.15 for the coefficient of variation when there is insufficient test data available.

PORTLAND CEMENT CONCRETE MIX DESIGN[1] (Continued)
LABORATORY TRIAL BATCH MIX DESIGN SUMMARY

Description	Equivalent Batch Masses (SSD mass/m^3)				
Materials:	Batch 1	Batch 2	Batch 3	Batch 4	Batch 5
Cement (kg)					
Water (kg)					
Coarse aggregate (kg)					
Fine aggregate (kg)					
Air entrainer (mL)					
Water reducer (mL)					
High range water reducer (mL)					
Other _____					
Properties:					
Water/cement ratio					
Theoretical unit mass (kg/m^3)					
Measured unit mass (kg/m^3)					
Measured air content (%)					
Measured slump[2] (mm)					
Ambient temperature (°C)					
Concrete temperature (°C)					
Measured Compressive Strengths (MPa):					
Individual 7-day					
Individual 7-day					
Individual 7-day					
Average (7-day)					
Individual 28-day					
Individual 28-day					
Individual 28-day					
Average (28-day)					

[1] For normal mass portland cement concrete (2300 - 2500 kg/m^3).
[2] Measure slump values on concrete before and after addition of high range water reducer if used.

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

SHIPPER'S CERTIFICATION FOR RADIOACTIVE MATERIAL

This is to certify that the contents of this consignment are properly classified, described, packaged, marked, and labeled and are in proper condition for transportation according to U.S. Department of Transportation regulations.

U.S. DOT shipping name: RADIOACTIVE MATERIAL, SPECIAL FORM - N. O. S.
Identification number: UN 2974

Nature and Quantity of Material			Package		
Radioactive Nuclide	Activity	Description: Encapsulated Solid	Label Category	Package Type	Transport Index
Cesium-137	≤ 0.37 GBq	Special Form	Yellow - II	RQ: Type A	0.5
Americium-241 Beryllium	≤ 1.85 GBq	Special Form	Yellow - II	RQ: Type A	0.5
Americium-241 Beryllium	≤ 11.10 GBq	Special Form	Yellow - II	RQ: Type A	0.5

Radioactivity reading _____ mr/hr Date _____ Location _____

Instrument serial No. _____

Shipped from: _____ Shipped to: _____

_____ _____

_____ _____

Signature: _____ Date: _____

Shipped from: _____ Shipped to: _____

_____ _____

_____ _____

Signature: _____ Date: _____

NOTE: Original shipping papers must be maintained in the hauling vehicle within the immediate reach of a driver being restrained by a seat belt. Normally, a vehicle's glove compartment does not meet this requirement.

In the event of an emergency, contact the NRC operations center in Washington D.C. at 1-800-368-5642.

cc: Copy for Project Engineer
Copy enclosed with instrument for consignee
Copy for Transporter
Copy for Division Radiation Safety Officer

Form FHWA 1609 (Rev 3-94)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR DETERMINING OPERATOR RETENTION FACTOR FOR EXTRACTION OF ASPHALT FROM ASPHALT PAVING MIXTURES FLH T 519

Project _____ Source _____

Where sampled: _____ Sample of: _____

Sampled by _____ Date _____ Tested by _____ Date _____

Sample Number		1	2	3
(A) Weight of hot, dry aggregate sample plus heated bowl and spoon	[g]			
(B) Tare weight of bowl and spoon	[g]			
(C) Target asphalt content [1] by weight of mix	[%]			
(D) Target weight of asphalt cement {C x (A - B)} ÷ (100 - C)	[g]			
(E) Actual weight of asphalt cement	[g]			
(F) Actual asphalt content 100 x {E ÷ (A - B + E)}	[%]			
(G) Total weight of aggregate, bowl, spoon, and asphalt cement	[g]			
(H) Total weight of sample prepared (G - B)	[g]			
(I) Weight of filter paper plus filtering aid after extraction	[g]			
(J) Weight of aggregate after extraction	[g]			
(K) Total tare weight of filter paper plus filtering aid	[g]			
(L) Total weight of extracted aggregate (I + J - K)	[g]			
(M) Weight of extracted asphalt cement (H - L)	[g]			
(N) Percent extracted asphalt cement by weight of mix 100 x {M ÷ (M + L)}	[%]			
(O) Retention factor based on percent asphalt cement by weight of mix (F - N)	[%]			

Mean retention factor by weight of mix: _____ **USE** [2] ☐

[1] The percent asphalt by weight of mix from the job mix formula.
[2] Round the mean to the nearest 0.01 percent according to the *Rounding-Off Procedures* in AASHTO R 11.

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR DETERMINING BULK SPECIFIC GRAVITY OF COMPACTED BITUMINOUS MIXTURES AASHTO T 166

Project: _____ Source: _____

Where sampled: _____ Quantity represented: _____

Sample of: _____ Lot no.: _____

Sampled by: _____ Date: _____ Tested by: _____ Date: _____

(A) Mix Design Maximum Specific Gravity, AASHTO T 209 =

Sample No.	Height (mm)	Station	(B) Dry Mass in Air (g)	(C) Saturated Surface Dry Mass (g)	(D) Mass in Water (g)	(E) Volume (C - D) (cm^3)	(F) Bulk Specific Gravity (B / E)	(G) Percent Compaction (F/A * 100) (%)

Remarks: _____

_____

_____

Form FHWA 1611 (Rev 10-96)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR REPORTING MISCELLANEOUS TESTS

Project _____ Source _____

Where sampled _____ Quantity represented _____

Sample of _____ Lot No. _____ Sample No. _____

Sampled by _____ Date _____ Tested by _____ Date _____

TEST: ☐ FLH ☐ AASHTO ☐ OTHER _____ Test No. _____
(identify)

Remarks: _____

_____

_____

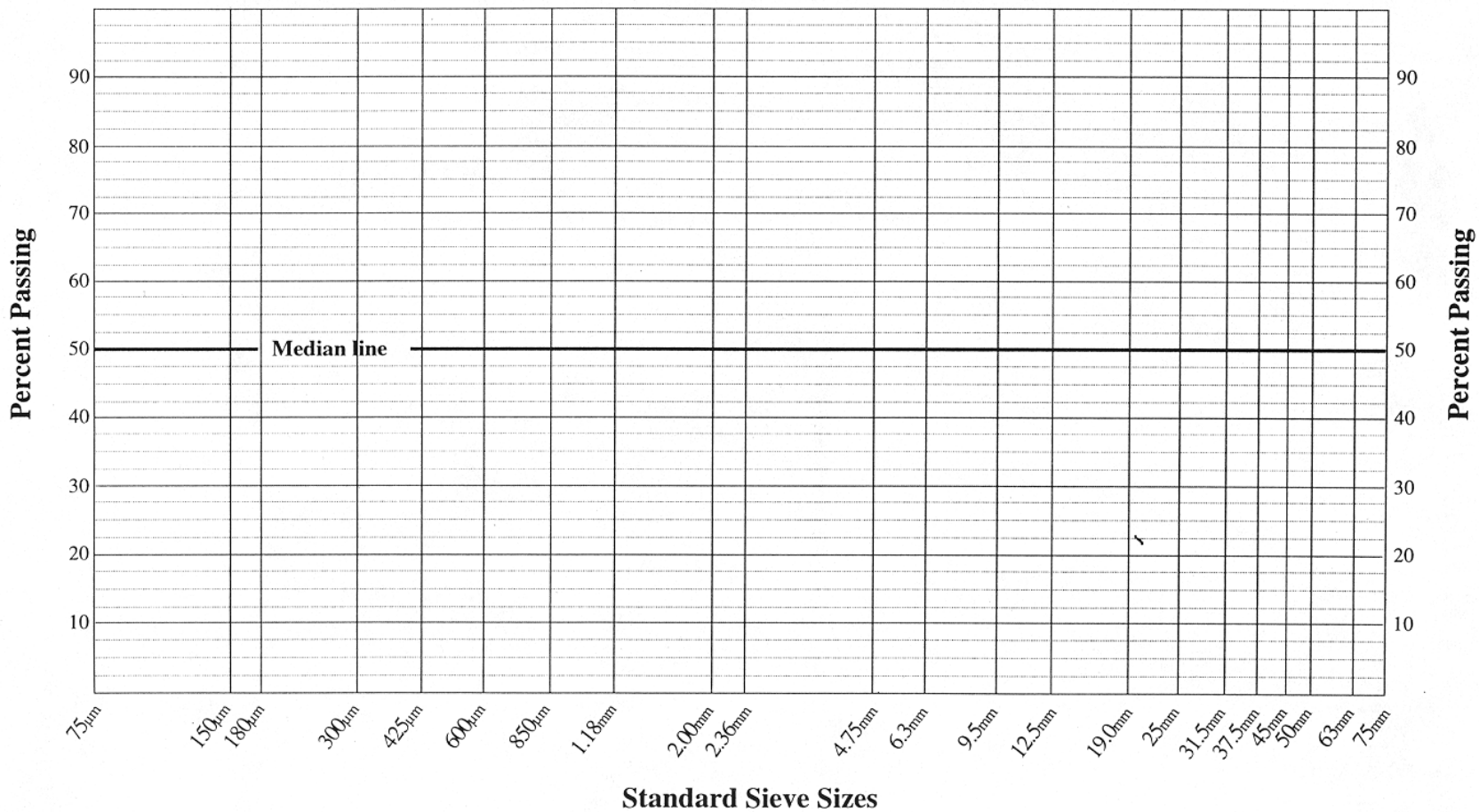
Form FHWA 1612 (3-91)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR DETERMINING MEDIAN SIZE OF AGGREGATE
FLH T 508

Project: _____ Source: _____ Where sampled: _____ Quantity represented: _____

Sample of: _____ Lot no.: _____ Sample no.: _____ Sampled by: _____ Date: _____ Tested by: _____ Date: _____



Form FHWA 1613 (Rev. 10-96)

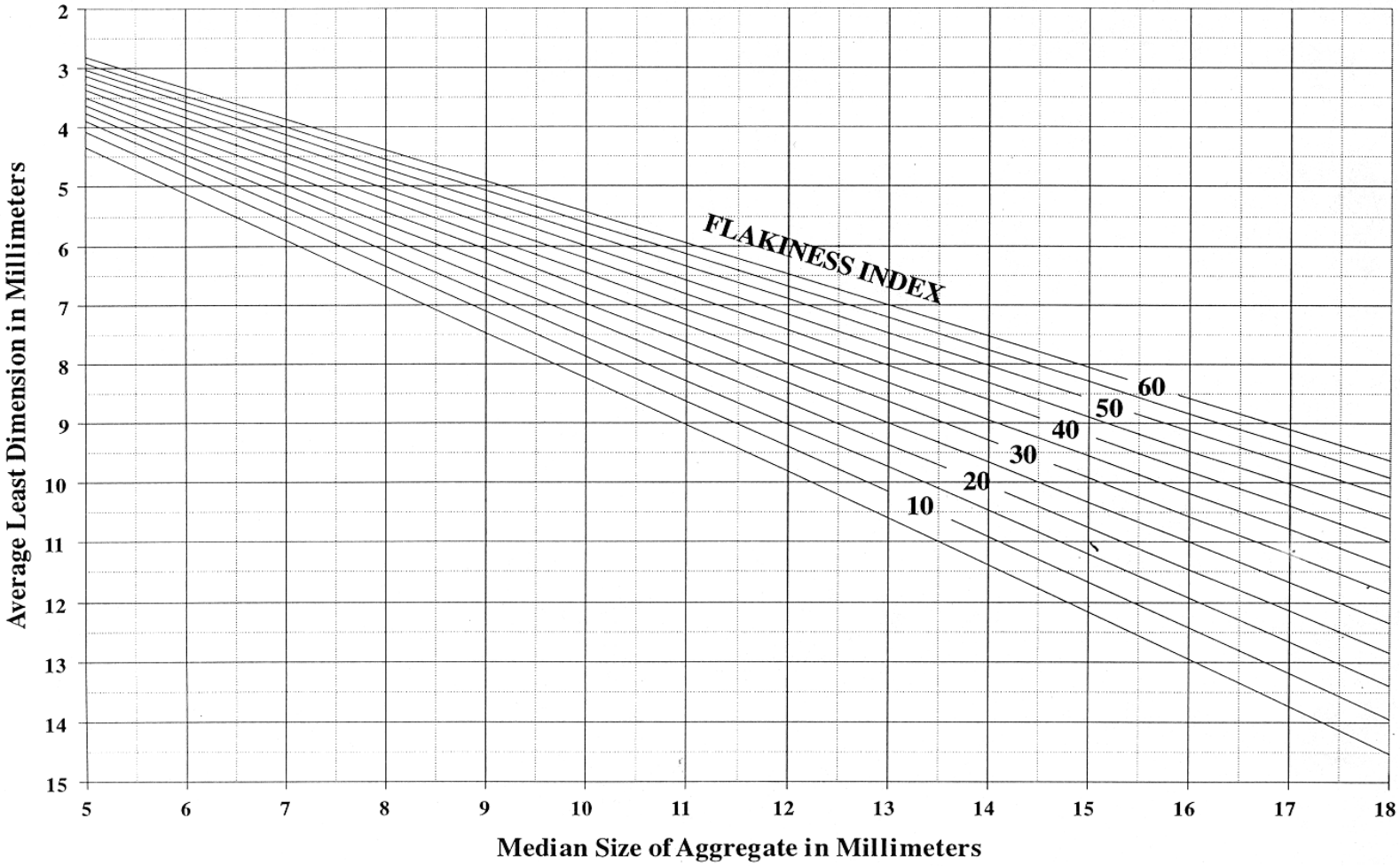
Median Size (millimeters) = _____

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR DETERMINING AVERAGE LEAST DIMENSION
FLH T 508

Project: _____ Source: _____ Where sampled: _____ Quantity represented: _____

Sample of: _____ Lot no.: _____ Sample no.: _____ Sampled by: _____ Date: _____ Tested by: _____ Date: _____



Form FHWA 1614 (Rev. 10-96)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

FLAKINESS INDEX WORKSHEET
FLH T 508

Project: _____ Source: _____

Where sampled: _____ Quantity represented: _____

Sample of: _____ Lot no.: _____ Sample no.: _____

Sampled by: _____ Date: _____ Tested by: _____ Date: _____

Aggregate Gradation			Data for Determination of Flakiness Index			
	A[1]	B	C	D	E	F[1]
Sieve Size (mm)	Mass Retained (g)	Total Passing (g)	Flakiness Plate Slot Size Identification	Mass Retained on Flakiness Plate (g)	Mass Passing Slot on Flakiness Plate (g)	Total Mass (D + E) (g)
25.0			25.0 to 19.0			
19.0			19.0 to 12.5			
12.5			12.5 to 9.5			
9.5			9.5 to 6.3			
6.3			6.3 to 4.75			
4.75			TOTAL			
TOTAL						

$$\textbf{Flakiness Index}^{2} = \frac{\text{Total of Column E}}{\text{Total of Column F}} = _____ \ (100) = \boxed{}$$

[1] For each size aggregate tested for flakiness, the total mass tested (Column F) should be the same as the mass retained (Column A) for the corresponding size of aggregate.

[2] Rounded to the nearest whole percent.

Form FHWA 1615 (Rev 10-96)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR DETERMINING MOISTURE CONTENT OF SOIL AND AGGREGATES USING A MICROWAVE OVEN FLH T 509

Project _____ Source _____

Where sampled _____ Quantity represented _____

Sample of _____ Lot No. _____ Sample No. _____

Sampled by _____ Date _____ Tested by _____ Date _____

Sample No.				
A. Original weight + dish				
B. Dry weight + dish				
C. Dish tare weight				
D. Loss (A-B)				
E. % Loss $\frac{D}{(B-C)}$ 100				

NOTE: All weights in grams.

Remarks: _____

_____

_____

_____

_____

Form FHWA 1616 (9-90)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

CEMENTATION TEST WORKSHEET
FLH T 510

Project _____ Source _____

Where sampled _____ Quantity represented _____

Sample of _____ Lot No. _____ Sample No. _____

Sampled by _____ Date _____ Tested by _____ Date _____

I. DETERMINE WEIGHT OF WATER TO BE ADDED:

$W = wt_t - wt_d =$ _____ – _____ = _____ grams.

Where: wt_t = Total weight of sample:

= $A(1 + C) =$ _____ (1._____) = _____ grams.

A = Dry weight of material passing the 2.00 mm sieve.

C = Percent of moisture to be added, divided by 100.

wt_d = Oven dry weight of sample.

II. DETERMINE CEMENTATION VALUE (C_v):

$$C_v = \frac{\overline{X}}{2.5^*} = \frac{_____}{2.5} = _____ \text{ kilopascals.}$$

Where: C_v = Compressive strength of material in kilopascals.

$\overline{X}$ = Mean of the compressive test results in newtons:

$$= \frac{a + b}{2} = \frac{_____}{2} = _____ \text{ newtons.}$$

a. Cube No. 1 = _____ newtons.

b. Cube No. 2 = _____ newtons.

* The cross sectional area of the test specimen is 2500 square millimeters.

U.S. Department of Transportation
Federal Highway Administration
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Worksheet for In-Place Nuclear/Moisture Density Testing
FLH T 513, AASHTO T 238 and AASHTO T 239

Project: _____ Source: _____ Quantity represented: _____

Item No. _____ Lot No. _____ Gauge No. _____ Tested by _____ Date _____

Test No.									
Station									
Offset									
Elevation									
Mode-Depth									
Density Count									
Wet Density									
Moisture Count									
Moisture									
Dry Density									
% Moisture									
Max. Dry Density									
T 99 / T 180									
Optimum Moisture									
% Relative Compaction									
Moisture Correction									
Classification									

Density Standard	**Moisture Standard**

Remarks: _____

_____

_____

Form FHWA 1618 (Rev 3-94)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR DETERMINING GRADATION AND ASPHALT CONTENT OF ASPHALT CONCRETE FLH T 514, FLH T 515, FLH T 516, AND FLH T 517

Project:_____ Item no.:_____Lot no.:_____Sample no.:_____

Where sampled: _____Quantity represented: _____Sampled by: _____Date: _____

Calibration no.: _____Background count (16 min): ____Tested by: _____ Checked by: _____

Notes: _____

A Measured total percent liquids by nuclear method (AC gauge) _____%

B. Measured count (MC) by nuclear method (4 min) _____MC

C. Moisture count (N x O) _____MC

D. MC corrected for moisture (B - C) _____MC

E. Calculated asphalt content (D (Slope) + Intercept*): Slope[3]_____

*Remember, you are adding a negative number. Intercept _____

F. Original mass of sample _____g

G. Computed dry aggregate mass of sample (F (1.00 - 0.01A)) _____g

Sieve Size	Mass Retained	Mass Passing	% Passing	Job Mix. Spec.
25.0 mm				
19.0 mm				
12.5 mm				
9.5 mm				
4.75 mm				
2.36 mm				
2.00 mm				
600 µm				
425 µm				
300 µm				
75 µm				
Pan				
Wash (J)				
Total [1]				

WASH TEST:

H. Computed aggregate mass (G) _____ g

I. Final mass (after wash) _____ g

J. Mass of loss (H - I) _____ g

K. Percent loss [2] ((100)J ÷ H) _____%

MOISTURE DETERMINATION:

L_1. Mass of asphalt mixture _____ g

L_2. Dry mass of asphalt mixture _____ g

M. Moisture loss (L_1 - L_2) _____ g

N. Percent moisture ((100)M ÷ L_2) _____ %

O. MCC from FHWA 1631 _____MC

[1] Total mass should be within 0.2 percent of the mass of extracted aggregate before wash (H).

[2] $\frac{K}{\%\ \text{passing}\ 75\ \mu m} > 0.85$

[3] Slope = decimal equivalent of 10^{-3} before calculating AC content.

Form FHWA 1619 (Rev 10-96)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR DETERMINING LONGITUDINAL SURFACE SMOOTHNESS USING A PROFILOGRAPH
FLH T 504

Project: _____ Item no.: _____ Lot no.: _____ Date and time:_____

Beginning station: _____ Ending station: _____ Length of mainline paving: _____ kilometers

Operators: _____ Equipment: _____ Weather: _____

Sublot No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Lane Left/Right	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R
No. of bumps > 10 mm in 7.62 m or less															
Roughness value (mm/km)															

Sublot No.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Lane Left/Right	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R
No. of bumps > 10 mm in 7.62 m or less															
Roughness value (mm/km)															

Sublot No.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Lane Left/Right	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R
No. of bumps > 10 mm in 7.62 m or less															
Roughness value (mm/km)															

Lot no.: _____ Sheet ___ of __

WORKSHEET FOR DETERMINING LONGITUDINAL SURFACE SMOOTHNESS USING A PROFILOGRAPH

FLH T 504

(Continuation Sheet)

Sublot No.															
Lane Left/Right	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R
No. of bumps > 10 mm in 7.62 m or less															
Roughness value (mm/km)															
Sublot No.															
Lane Left/Right	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R
No. of bumps > 10 mm in 7.62 m or less															
Roughness value (mm/km)															
Sublot No.															
Lane Left/Right	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R
No. of bumps > 10 mm in 7.62 m or less															
Roughness value (mm/km)															
Sublot No.															
Lane Left/Right	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R	L R
No. of bumps > 10 mm in 7.62 m or less															
Roughness value (mm/km)															

Lot no.: _____ Sheet __ of __

Total sublots: _____

WORKSHEET FOR DETERMINING LONGITUDINAL SURFACE SMOOTHNESS USING A PROFILOGRAPH

FLH T 504

(Continuation Sheet)

CALCULATIONS

$\sum x$	**n**	$\bar{x}$	**s**	USL	Q_U	P_U	PF
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)

Where:

(a) Sum of roughness values for each 0.1 km sublot (mm/km)

(b) Total number of sublots

(c) Arithmetic mean of roughness values (a÷b)

(d) Standard deviation (FP-96, Subsection 106.05)

(e) Upper specification limit (see contract)

(f) Upper quality index (FP-96, Subsection 106.05)

(g) Estimated percent of work outside USL (FP-96, Subsection 106.05 and Table 106 - 1)

(h) Pay factor for surface smoothness (FP-96, Subsection 106.05 and Table 106 - 2)

• • • ADJUSTMENT TO CONTRACT • • •

A = 12000(PF - 1.00)(L) = 12000 (_____)(_____) = $

Where:

A = Adjustment to contract payment in dollars for pavement smoothness.

L = Total project length in lane kilometers of traveled way. Measure project length to 3 decimal places.

PF = Pay factor as determined above for pavement smoothness.

Computed by: _____ Date: _____

Checked by: _____ Date: _____

_____ Engineer

_____ Contractor

Date: _____

Form FHWA 1620 (Rev 10-96)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR SIEVE ANALYSIS OF FINE AND COARSE AGGREGATE AASHTO T 11 AND AASHTO T 27

Project: _____ Source: _____ Sample no.: _____

Sample of: _____ Quantity represented: _____ Lot no.: _____

Sampled by: _____ Date: _____ Tested by: _____ Date: _____

MOISTURE DETERMINATION			PERCENT PASSING 75 μm SIEVE (P-75) WASH		
Moisture Content	**Coarse**	**Fine**	**P-75 Content**	**Coarse**	**Fine**
Mass of wet aggregate			Mass of wet aggregate		
Mass of dry aggregate			Mass of dry aggregate		
Mass of water			Mass of washed dry aggregate		
Moisture (%)			Mass of 75 μm minus		

REMARKS:

Coarse Aggregate Sieve Size	Retained			Total Passing (%)	Spec's
	Mass Wet	Mass Dry	%		
mm					
mm					
mm					
mm					
mm					
mm					
4.75 mm					
4.75 mm minus					
Total sample mass					

Fine Aggregate Sieve Size	WASHED FROM COARSE				DRY 4.75 mm MINUS				Total Passing (%)	Spec's
	Retained		Percent Passing	Adjusted (%) Passing	Retained		Percent Passing	Adjusted (%) Passing		
	Mass Dry	%			Mass Dry	%				
4.75 mm										
Pan										
Mass P-75										
Total P-75										
Orig. dry mass										

Form FHWA 1621 (Rev 10-96)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR A MARSHALL ASPHALT CONCRETE MIX DESIGN AASHTO T 245

Project: _____ Date: _____

Contractor: _____ Grade of asphalt cement: _____

Asphalt mix producer: _____ Type of mixture: _____

Sources for: Aggregates: _____ , _____
Additives: _____ , _____

SUMMARY OF THE PROPOSED JOB-MIX-FORMULA

1. Percent asphalt by weight of total mix [1] _____
2. Air voids _____
3. Voids in mineral aggregate (VMA) _____
4. Maximum specific gravity (AASHTO T 209) _____
5. Effective specific gravity of aggregate _____
6. Marshall stability (AASHTO T 245) _____
7. Marshall flow (AASHTO T 245) _____
8. Specific gravity of asphalt _____
9. Dust/asphalt ratio _____

10a. Immersion compression test results:
   a. Dry strength, kPa _____
   b. Wet strength, kPa _____
   c. Index of retained strength, _____

10b. Root-Tunnicliff (ASTM D 4867) test results:
   a. Dry tensile strength, kPa _____
   b. Wet tensile strength, kPa _____
   c. Tensile strength ratio, % _____

GRADATION TARGET VALUES AND ALLOWABLE DEVIATIONS			SPECIFIC GRAVITY AND ABSORPTION			
Sieve Sizes	Target Value [2] % by Mass Passing	Allowable Deviation [3] %		Fine Aggregate (AASHTO T 84)	Coarse Aggregate (AASHTO T 85)	Combined Aggregate
_____	_____	_____	Bulk SG	_____	_____	_____
_____	_____	_____				
_____	_____	_____	Bulk SSD SG	_____	_____	_____
_____	_____	_____				
_____	_____	_____	Apparent SG	_____	_____	_____
_____	_____	_____				
_____	_____	_____	Absorption	_____%	_____%	_____%
_____	_____	_____				
_____	_____	_____				

[1] Asphalt cement content (percent by mass of mix) shall be established to the nearest 0.1 percent.
[2] Target values to be established by the contractor as part of the JMF. Target values shall be established to the nearest whole number except for the 75 µm sieve which should be to the nearest 0.1 percent.
[3] Allowable deviations plus or minus from established target values.

WORKSHEET FOR A MARSHALL ASPHALT CONCRETE MIX DESIGN (Continued)

	Aggregate Description	Blend Percent
Stockpile A	_____	_____ %
Stockpile B	_____	_____ %
Stockpile C	_____	_____ %
Stockpile D	_____	_____ %
Stockpile E	_____	_____ %

Aggregate Gradation

Sieve Size	Stockpile A _____ %	Stockpile B _____ %	Stockpile C _____ %	Stockpile D _____ %	Stockpile E _____ %	Blended Stockpile Gradation	Target Values	Specification Limits
_____								
_____								
_____								
_____								
_____								
_____								
_____								
_____								
_____								

Remarks: _____

_____

_____

_____

WORKSHEET FOR A MARSHALL ASPHALT CONCRETE MIX DESIGN (Continued)

Trial Number[1]	1			2			3		
% Asphalt by mass of total mix									
Specimen height (mm)									
Marshall stability (kN)									
Marshall flow (0.25 mm)									
Bulk specific gravity									
Unit mass (kg/m^3)									
Max. specific gr. (AASHTO T 209)									
Dust/asphalt ratio									
Air voids (%)									
Voids in mineral aggregate (VMA)									
Average Marshall stability (kN)									
Average Marshall flow (0.25 mm)									
Average bulk specific gravity									
Average unit mass (kg/m^3)									
Average air voids (%)									
Average VMA									

Trial Number[1]	4			5			6		
% Asphalt by mass of total mix									
Specimen height (mm)									
Marshall stability (kN)									
Marshall flow (0.25 mm)									
Bulk specific gravity									
Unit mass (kg/m^3)									
Max. specific gr. (AASHTO T 209)									
Dust/asphalt ratio									
Air voids (%)									
Voids in mineral aggregate (VMA)									
Average Marshall stability (kN)									
Average Marshall flow (0.25 mm)									
Average bulk specific gravity									
Average unit mass (kg/m^3)									
Average air voids (%)									
Average VMA									

[1] Three test trials are required for each asphalt content.

WORKSHEET FOR A MARSHALL ASPHALT CONCRETE MIX DESIGN (Continued)

- **TEST RESULTS FOR INDIVIDUAL IMMERSION COMPRESSION (AASHTO T 165) SPECIMENS**

Percent asphalt cement: _____

Specimen ID		Specimen Height (mm)		Bulk Specific Gravity		Air Voids (%)		Compressive Strength (kPa)	
Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Averages									

Index of retained strength: _____%

– OR –

- **TEST RESULTS FOR INDIVIDUAL ROOT-TUNNICLIFF TEST (ASTM D 4867) SPECIMENS**

Percent asphalt cement: _____

Specimen ID		Specimen Height (mm)		Bulk Specific Gravity		Air Voids (%)		Tensile Strength	
Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Averages									

Tensile strength ratio: _____%

WORKSHEET FOR A MARSHALL ASPHALT CONCRETE MIX DESIGN (Continued)

Design Curves for Proposed Job Mix Formula (JMF)

AIR VOIDS

Percent Air Voids

% Asphalt cement

UNIT MASS

Kilograms per Cubic Meter

% Asphalt cement

MARSHALL FLOW

0.25 Millimeters

% Asphalt cement

VMA

Percent Voids in Mineral Aggregate

% Asphalt cement

WORKSHEET FOR A MARSHALL ASPHALT CONCRETE MIX DESIGN (Continued)

Design Curves for Proposed Job Mix Formula (JMF)

MARSHALL STABILITY

Kilonewtons

% Asphalt cement

_____

% Asphalt cement

_____

% Asphalt cement

_____

% Asphalt cement

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR DETERMINING GRADATION AND ASPHALT CONTENT OF ASPHALT CONCRETE AASHTO T 30, AASHTO T 110, AND AASHTO T 164

Project _____ Source _____

Sample of _____ Lot No. _____ Sample No. _____

Where sampled _____ Time sample was taken _____

Sampled by _____ Date _____ Tested by _____ Date _____

VACUUM EXTRACTION (AASHTO T-164)

A. Wt of extracted aggregate + filter blanket [1] _____
B. Wt of filter paper + diatomaceous silica aid _____
C. Wt of extracted aggregate [A - B] _____
D. Wt of sample before extraction _____
E. Wt of bitumen and moisture [D - C] _____
F. Wt of moisture [(D)(O) ÷ 100] _____
G. Wt of bitumen [E - F] _____
H. % Bitumen by wt of aggregate [100(G ÷ C)] _____
I. Retention factor [2] _____
J. Adjusted % bitumen by wt of aggregate [H + I] _____
K. % Bitumen by wt of mix 100[J ÷ (100 + J)] _____

SIEVE ANALYSIS (AASHTO T-30)

Sieve Size	Wt.[1] Retained	% Retained	% Passing	Target Values	Allowable Deviations
Pan					
Fines in Filter					
Total [3]					
Extracted Wt. (C)					

MOISTURE CONTENT (AASHTO T-110)

L. Weight of sample _____
M. Volume of solvent (mL) 200
N. Volume of water (mL) _____
O. Moisture content (%) [100N ÷ L] _____

[1] All weights are in grams.
[2] Individual tester retention factor.
[3] Total weight should be within 0.2% of the weight of extracted aggregate (C).

REMARKS: _____

Form FHWA 1623 (Rev 3-94)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

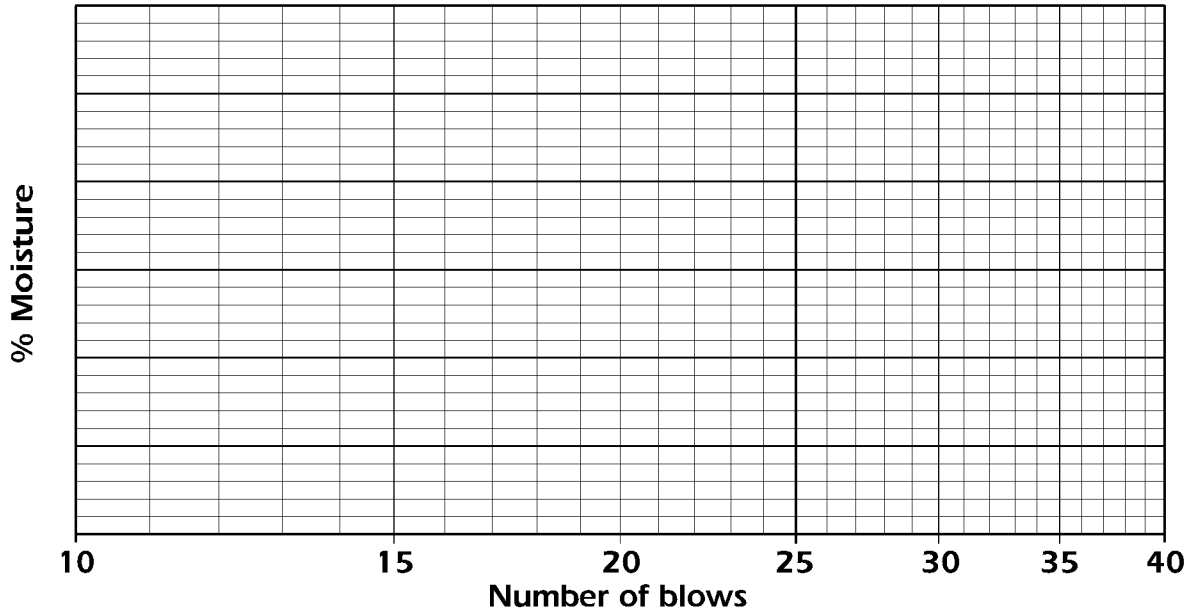
Worksheet for Determining Liquid Limit and Plastic Limit of Soils
AASHTO T 89, Method A or B and AASHTO T 90

Project: _____ Source: _____ Sample of: _____ Quantity represented: _____

Lot No. _____ Sample No. _____ Sampled by: _____ Date: _____ Tested by: _____ Date: _____

Liquid Limit AASHTO T 89				
Determination No.	1	2	3	4
Number of blows				
Container No.				
Wt. of container & wet soil				
Wt. of container & dry soil				
Weight of water				
Weight of container				
Weight of dry soil				
Water content (%)				
Liquid limit				
Final liquid limit (LL):				

Plastic Limit AASHTO T 90				
Determination No.	1	2	3	4
Container No.				
Wt. of container & wet soil				
Wt. of container & dry soil				
Weight of water				
Weight of container				
Weight of dry soil				
Water content (%)				
Plastic limit				
Final plastic limit (PL):				



CALCULATIONS

Plasticity Index = _____ (LL) - _____ (PL) =_____

Form FHWA 1624 (Rev 3-94)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

Worksheet for Determining Moisture/Density Relationships
AASHTO T 99 AND AASHTO T 180

Project: _____ Source: _____

Where sampled: _____ Quantity represented: _____

Sample of: _____ Lot No. _____ Sample No. _____

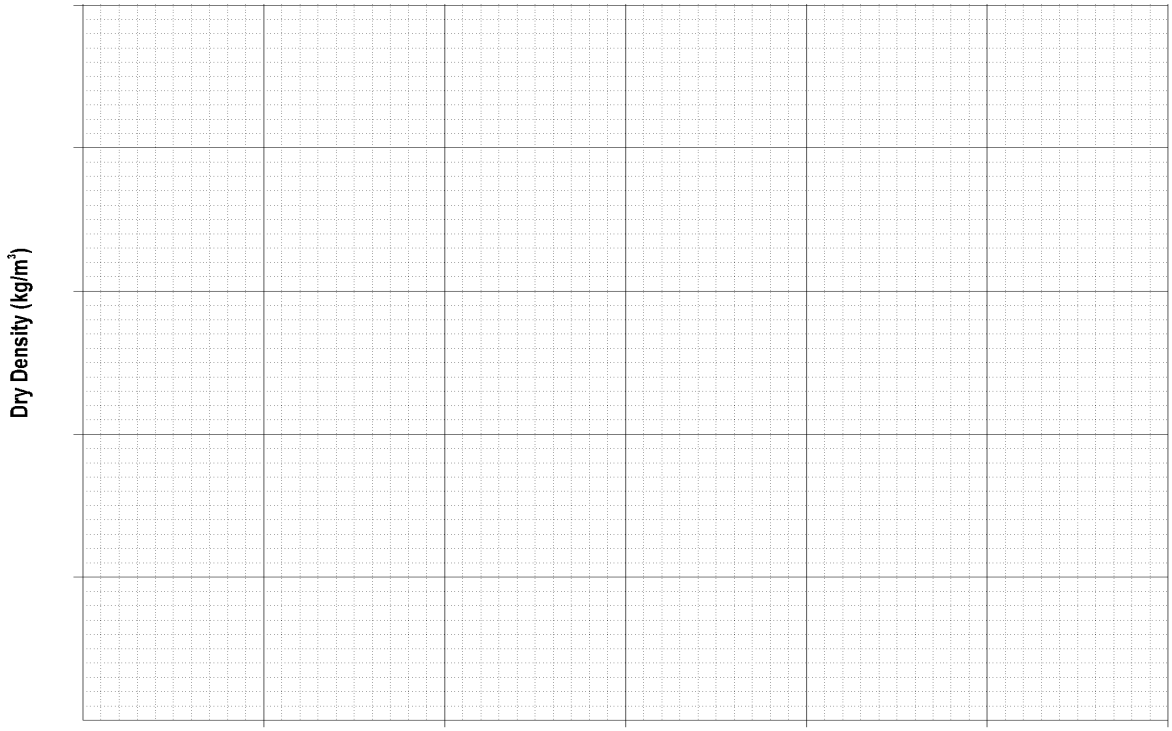
Sampled by: _____ Date: _____ Tested By: _____ Date: _____

AASHTO T 99 ☐ AASHTO T 180 ☐ Method ☐A ☐B ☐C ☐D

Test No. →							
(a) Wet soil + mold tare [kg]							
(b) Mold tare [kg]							
(c) [a - b] Wet wt. [kg]							
(d) Wet density (*)c [kg/m^3]							
Dry density $\left(\frac{d}{1+0.01W}\right)$ [kg/m^3]							

* For molds within tolerance, use a constant factor 1059.43 for methods A and C or 470.74 for methods B and D.

Pan No. →							
(r) Wet soil wt. + tare [g]							
(s) Dry soil wt. + tare [g]							
(t) Tare [g]							
(u) Dry soil wt. [s - t] [g]							
(v) Water wt. [r - s] [g]							
(w) Moisture $\left(\frac{v}{u}(100)\right)$ [%]							



Maximum Dry Density:
_____ kg/m^3

Optimum Moisture:
_____ %

Form FHWA 1625 (Rev 3-94)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR DETERMINING SAND EQUIVALENT
AASHTO T 176

Project: _____ Source: _____

Where sampled: _____ Quantity represented: _____

Sample of: _____ Lot no.: _____ Sample no.: _____

Sampled by: _____ Date: _____ Tested by: _____ Date: _____

The following method was used to prepare the sample: ☐ Air dry ☐ Pre-wet ☐ Oven dried

NOTE: In each cylinder, place about 85 mL by volume of quartered material passing the 4.75-mm sieve.

Soaking Time (10 minutes ± 1 minute)				Sedimentation Period (20 minutes ± 15 seconds)			
Determination	1	2	3	Determination	1	2	3
Cylinder no.				Cylinder no.			
Starting time				Starting time			
Finish time				Finish time			
				Sand reading			
				Clay reading			
				Sand equivalent (SE) values [1]			

CALCULATIONS: $SE = \frac{Sand\ Reading}{Clay\ Reading} * 100$

Sand Equivalent (mean) [2] = ☐

Remarks: _____

_____

_____

_____

[1] Mathematically round calculated value to nearest 0.1. After rounding to nearest 0.1, then round the result up to a whole number and record.

[2] Mathematically round calculated SE mean to nearest 0.1. After rounding to nearest 0.1, then round the result up to a whole number and record that as the SE value of the sample.

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR SIEVE ANALYSIS OF FINE AGGREGATE, COARSE AGGREGATE AND MINERAL FILLER AASHTO T 11, T 27 AND T 37

Project _____ Source _____

Where sampled _____ Quantity represented _____

Sample of _____ Lot No. _____ Sample No. _____

Sampled by _____ Date _____ Tested by _____ Date _____

SIEVE SIZE	WEIGHT RETAINED			COMBINED			TV or Range
	+4.75mm Wash	- 4.75mm Wash	- 4.75 mm Calculated	Weight Retained	Weight Passing	% Passing	
25.0 mm							
19.0 mm							
12.5 mm							
9.5 mm							
4.75 mm							
2.36 mm							
2.00 mm							
1.18 mm							
600 µm							
425 µm							
300 µm							
180 µm							
150 µm							
75 µm							
Pan							
Wash							
Total							

	+ 4.75mm Moisture	- 4.75mm Moisture
Pan No.		
Orig. Wt.		
Final Wt.		
Loss		
% Loss		

Total Wet Weight (+ 4.75mm)	
Total Dry (corrected) (+4.75mm)	
Total Wet Weight (-4.75mm)	
Total Dry (corrected) (-4.75mm)	
Total Dry Sample Weight	

	+ 4.75mm Wash	- 4.75mm Wash
Orig. Wt.		
Dry Wt.		
Final Wt.		
Loss		
% Loss		

-4.75 mm Wash Test Factor:

$$\frac{\text{Total Dry Wt. } - \text{ 4.75 mm}}{\text{Dry Wt. - 4.75 mm Wash}} = ____ = ____$$

Form FHWA 1627 (3-94)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR DETERMINING MAXIMUM SPECIFIC GRAVITY OF BITUMINOUS PAVING MIXTURES AASHTO T 209 AND AASHTO T 269 (FLASK DETERMINATION)

Project _____ Source _____

Where sampled _____ Quantity represented _____

Sample of _____ Lot No. _____ Sample No. _____

Sampled by _____ Date _____ Tested by _____ Date _____

Sample Number						
Location/Station						
(A) Asphalt-% by wt. of mix						
(B) Wt. of mix and flask (g)						
(C) Wt. of flask (g)						
(D) Wt. of mix (g) [B - C]						
(E) Wt. of flask filled with water at 25°C (g)						
(F) Wt. of flask filled with water and mix at 25°C (g)						
(H) Wt. of mix, air dried to constant wt. (g)						
(J) Wt. of water absorbed by aggregate (g) [H - D]						
(K) Volume of mix (cm^3) [D+E - F+J]						
(L) Max specific gravity of mixture [D / K]						

AIR VOIDS ANALYSIS OF COMPACTED MIXTURES AASHTO T 269

(M) Bulk specific gravity.[1]						
(N) Air voids (%) $\left[100 - \frac{100\,(M)}{(L)}\right]$						

[1] See Form FHWA 1611

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR DETERMINING MAXIMUM SPECIFIC GRAVITY OF BITUMINOUS PAVING MIXTURES AASHTO T 209 AND AASHTO T 269 (BOWL DETERMINATION)

Project _____ Source _____

Where sampled _____ Quantity represented _____

Sample of _____ Lot No. _____ Sample No. _____

Sampled by _____ Date _____ Tested by _____ Date _____

Sample Number						
Location/Station						
(A) Asphalt-% by wt. of mix						
(B) Wt. of mix and bowl (g)						
(C) Wt. of bowl (g)						
(D) Wt. of mix (g) [B - C]						
(E) Wt. of bowl and mix in water (g)						
(F) Wt. of bowl in water (g)						
(G) Wt. of mix in water (g) [E - F]						
(H) Wt. of mix, air dried to constant wt. (g)						
(J) Wt. of water absorbed by aggregate (g) [H - D]						
(K) Volume of mix (cm^3) [D - G+J]						
(L) Max specific gravity of mixture [D / K]						

AIR VOIDS ANALYSIS OF COMPACTED MIXTURES AASHTO T 269

(M) Bulk specific gravity.[1]						
(N) Air voids (%) $\left[100 - \frac{100\,(M)}{(L)}\right]$						

[1] See Form FHWA 1611

Form FHWA 1629 (Rev 3-94)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR DETERMINING MARSHALL STABILITY AND FLOW OF BITUMINOUS MIXTURES AASHTO T 245

Project: _____ Source: _____

Where sampled: _____ Quantity represented: _____

Sample of: _____ Lot no.: _____ Sample no.: _____

Sampled by: _____ Date: _____ Tested by: _____ Date: _____

Number of blows used: [ ] (75 or 50) Compaction temperature[1]: [ ] °C

Specimen number				
Thickness or volume[2]				
Correction factor (CF)				
Measured stability (MS)				
Flow[2] (0.25 mm)				
Stability = (MS)(CF)				

[1] Temperature from applicable asphalt temperature/viscosity curve
[2] Average

Remarks: _____

_____

_____

_____

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR CALIBRATION OF NUCLEAR ASPHALT CONTENT GAUGES

(Troxler® 3241-B or 3241-C)

FLH T 516 AND FLH T 517

Project: _____ Sample of: _____ From: _____

Gauge no.: _____ Calibration no.: _____ Background count (16 min): _____

Stat test: _____ Calibration temp: _____ Calibration performed by: _____ Date: _____

CALIBRATION RECORD

BLANK PREPARATION

Mass of aggregate and pan = _____ g

Specimen pan tare = _____ g

Net specimen mass (M_1) = _____ g 1/2 Net specimen mass ($M_1 \div 2$) = _____ g

CALIBRATION PAN No. 1 - Asphalt content (TV - 1.00%) = _____ % MC = _____ (8 min)

CALIBRATION PAN No. 2 – Asphalt content at the TV = _____ % MC = _____ (8 min)

CALIBRATION PAN No. 3 - Asphalt content (TV + 1.00%) = _____ % MC = _____ (8 min)

RECORD FOR FUTURE REFERENCE:

Fit coefficient _____

Intercept (A1) - _____

Slope (A2) _____ (10^{-3})

MOISTURE CURVE RECORD

Percent Moisture	Gauge MC(4 min)	Corrected Moisture MC
0.0%	(A) _____	[A-A] 0
0.5%	(B) _____	[B-A] _____
1.0%	(C) _____	[C-A] _____

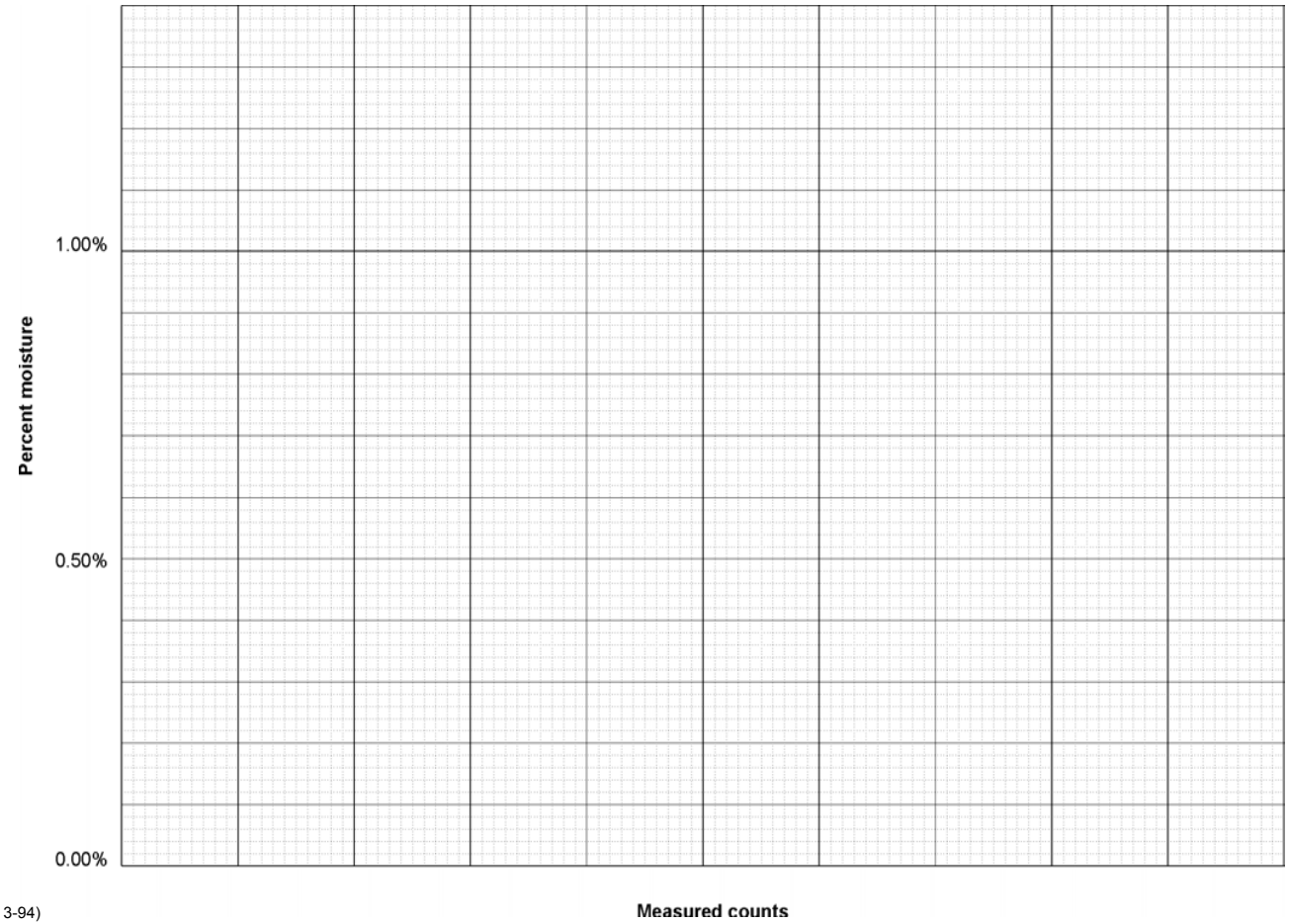
MEASURED COUNT CORRECTION (MCC) FOR 1% MOISTURE FROM GRAPH - FORM FHWA 1632 _____

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

Worksheet for Calibration of Moisture Correction for Nuclear Asphalt Content Gauges (Troxler 3241-B or 3241-C) FLH T 516 and FLH T 517

Project _____ Sample of _____ Gauge No._____

Calibration No. _____ Background count _____ Calibration performed by _____ Date_____



Form FHWA 1632 (Rev 3-94)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

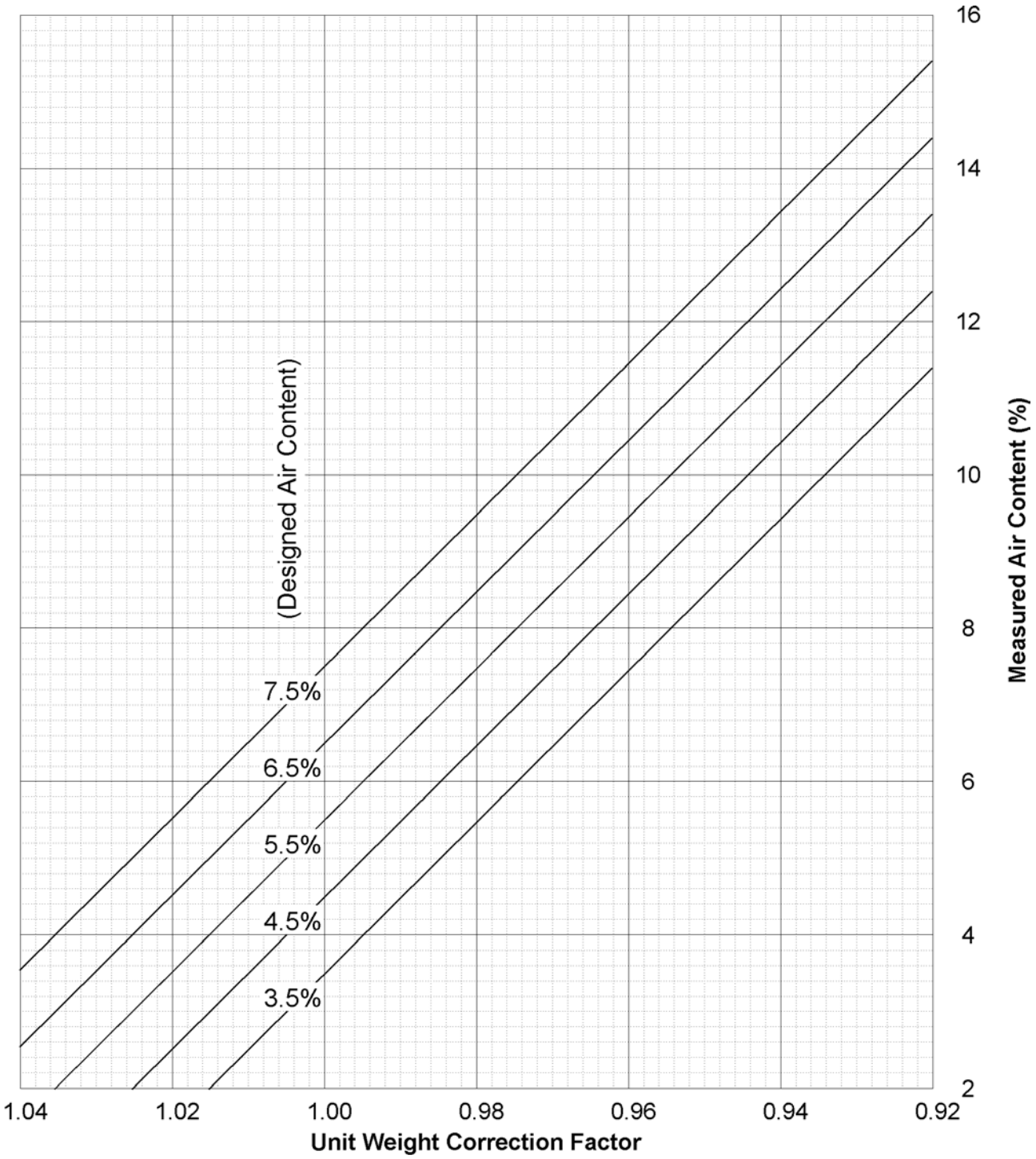
Worksheet for Determining a Concrete Unit Weight Correction Factor
FLH T 518

Project _____ Source _____

Where Sampled _____ Quantity Represented _____

Sample Of _____ Lot No. _____ Sample No. _____

Sampled By _____ Date _____ Tested By _____ Date _____



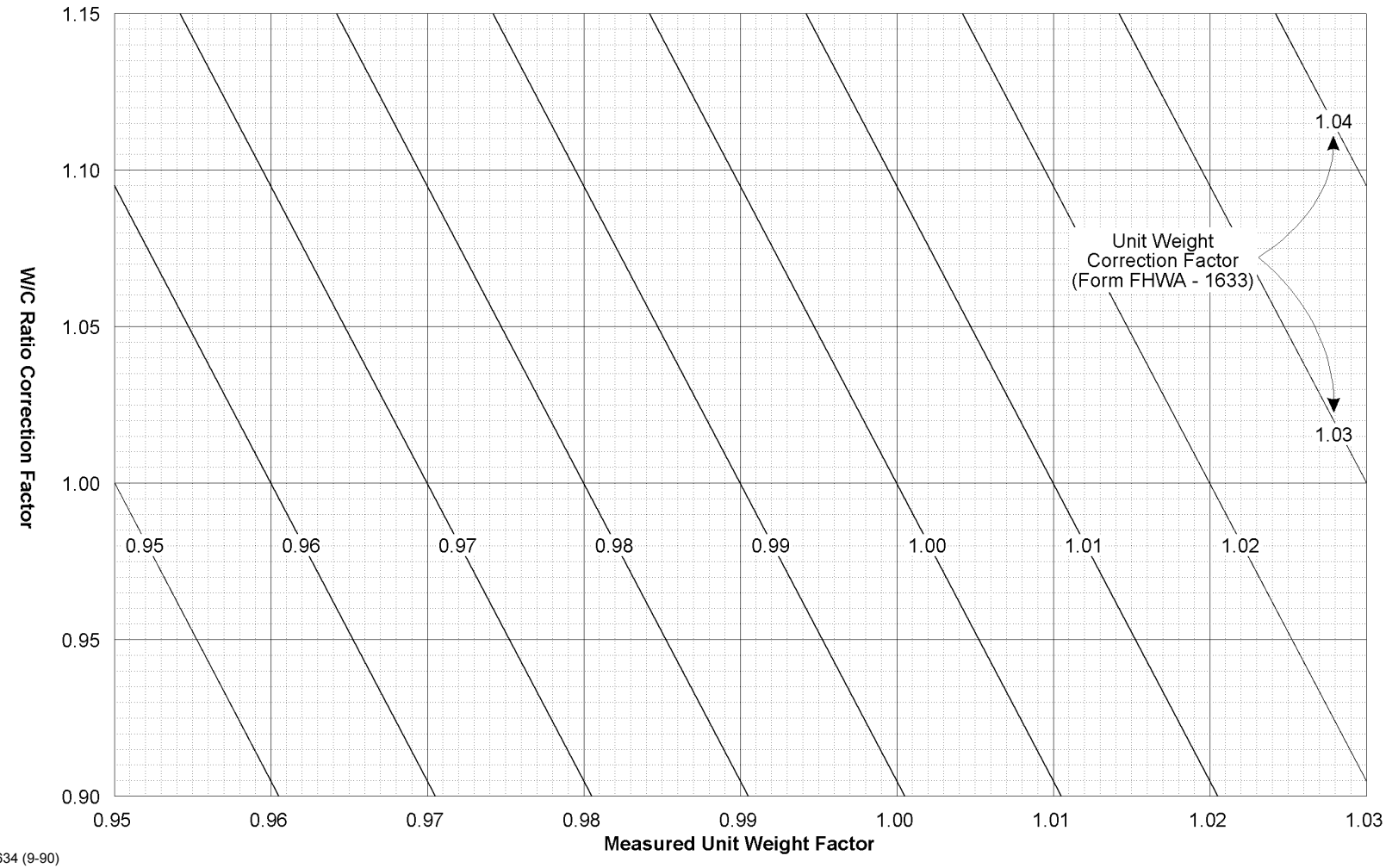
Form FHWA 1633 (9-90)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

Worksheet for Determining a Concrete Water/Cement Correction Factor
FLH T 518

Project: _____ Source: _____ Where Sampled: _____ Quantity Represented: _____

Sample of: _____ Lot No. _____ Sample No. _____ Sampled By: _____ Date: _____ Tested By: _____ Date: _____



Form FHWA 1634 (9-90)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR DETERMINING CALIBRATION WEIGHTS FOR NUCLEAR ASPHALT CONTENT GAUGE FLH T 516 and FLH T 517

Project _____ Gauge No. _____

Calculated by _____ Date _____

Part I: Aggregate batch weights are based on bin or stockpile combinations from approved mix design.

Dry aggregate calibration sample weight[1] (A) = _____ g

Material type or stockpile	Dry aggregate sample (batch) Wt (A)	Percent used (B)	Weight per stockpile (A) x (B)
Total aggregate sample weight[1] (A)			

Note [1]: If these numbers are not identical, use the total aggregate sample wt for (A) in Part II.

Part II: Asphalt content (AC) calculations based on target value (TV) from approved mix design.

Calibration sample No. 1: (B) = TV(%) - 1% AC
(A) _____ ÷ [1.00 - 0.01 (B) _____] = (C) _____ Total Wt of AC = (C) - (A) = _____

Calibration sample No. 2: (D) = TV(%)
(A) _____ ÷ [1.00 - 0.01 (D) _____] = (E) _____ Total Wt of AC = (E) - (A) = _____

Calibration sample No. 3: (F) = TV(%) + 1% AC
(A) _____ ÷ [1.00 - 0.01 (F) _____] = (G) _____ Total Wt of AC = (G) - (A) = _____

Part III: Moisture Calculations for the Moisture Curve Record.

Total wet Wt (H)(I)(J) = Net specimen wt (K)[1.000 + (0.01)(percent of water)]

(H) = (K) _____ (1.000) = _____ Total Wt of water (H - K) = 0.00
(I) = (K) _____ (1.005) = _____ Total Wt of water (I - K) = _____
(J) = (K) _____ (1.010) = _____ Total Wt of water (J - K) = _____

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR DETERMINING CORRECTION FOR COARSE PARTICLES IN THE SOIL COMPACTION TEST
AASHTO T 224

Project: _____ Sample of: _____

Where Sampled: _____ Quantity Represented: _____ Lot No. _____ Sample No. _____

Sampled by: _____ Date: _____ Tested by: _____ Date: _____

Identify Laboratory Moisture - Density Relations used:

AASHTO T 99 ☐ AASHTO T 180 ☐ Method ☐ A ☐ B ☐ C ☐ D

Method A or Method B (see Figure 1, AASHTO T 224)

Maximum dry density (passing the 4.75 mm sieve): $\mathbf{D_{max}}$ = _____ kg/m^3 [from Form FHWA 1625]

1000 x [bulk specific gravity (oven-dry basis)] of the particles retained on the 4.75 mm sieve: $\mathbf{D_c}$ = _____ kg/m^3 [Sp. Gr. from Central lab]

Sample data from in-place density test:

Percent by wt of coarse particles retained on 4.75 mm sieve in the field sample, expressed as a decimal: $\mathbf{P_{cf}}$ = 0.

Corrected maximum field dry density: $\mathbf{D_{cor}}$ = $[(1.00 - P_{cf})D_{max}] + [0.9P_{cf}D_c]$

D_{cor} = [(1.00 -) ( ) + [0.9 ( ) ( )] = _____ kg/m^3

Method C or Method D - Case 1 (see Figure 2, AASHTO T 224)

Maximum dry density (passing the 19.0 mm sieve): $\mathbf{D_{max}}$ = _____ kg/m^3 [from Form FHWA 1625]

Percent by wt of coarse particles retained on 4.75 mm sieve in laboratory sample including coarse particles replaced in T 99 or T 180, expressed as a decimal: $\mathbf{P_{cl}}$ = 0.

1000 x [bulk specific gravity (oven-dry basis)] of the particles retained on the 4.75 mm sieve: $\mathbf{D_c}$ = _____ kg/m^3 [Sp. Gr. from Central lab]

Corrected maximum laboratory dry density: $\mathbf{D_{lab}}$ = $\dfrac{D_{max} - (0.9 P_{cl} D_c)}{1.00 - P_{cl}}$

$$D_{lab} = \frac{(\quad) - 0.9(\quad)(\quad)}{1.00 - (\quad)} = _____ \text{ kg/m}^3$$

(continued on back)

(continued)

Sample data from in-place density test:

Percent by wt of coarse particles retained on 4.75 mm sieve in the field sample, expressed as a decimal: $\mathbf{P_{cf}}$ = _____0.

Corrected maximum field dry density: $\mathbf{D_{cor}} = [(1.00 - P_{cf})D_{lab}] + [0.9P_{cf}D_c]$

D_{cor} = [(1.00 -) ( ) + [0.9 ( ) ( )] = _____ kg/m^3

Method C or Method D - Case 2 (see Figure 3, AASHTO T 224)

Maximum dry density (passing the 19.0 mm sieve): $\mathbf{D_{max}}$ = _____ kg/m^3 [from Form FHWA 1625]

1000 x [bulk specific gravity (oven-dry basis)] of the particles retained on the 19.0 mm sieve: $\mathbf{D_c}$ = _____ kg/m^3 [Sp. Gr. from Central lab]

Sample data from in-place density test:

Percent by wt of coarse particles retained on 19.0 mm sieve in the field sample, expressed as a decimal: $\mathbf{P_{cf}}$ = _____0.

Corrected maximum field dry density: $\mathbf{D_{cor}} = [(1.00 - P_{cf})D_{max}] + [0.9P_{cf}D_c]$

D_{cor} = [(1.00 -) ( ) + [0.9 ( ) ( )] = _____ kg/m^3

Remarks:_____

_____

_____

_____

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

Federal Lands Highway Construction Project Material Certification

State _____ Project No. _____ Project Name _____

Part I - Field Control

It is certified (1) that all material accepted pursuant to this contract complies with the terms of the contract as documented by the project records in accordance with Federal Lands standards; or (2) that material not complying with the terms of the contract was accepted in accordance with FAR Clause 52.246-12 based on a technical evaluation of the material documented in the project records.

It is further certified (1) that the results of verification tests taken during construction confirm the validity of acceptance tests according to Federal Lands standards; or (2) that inconsistencies between verification and acceptance tests were responded to in accordance with Federal Lands standards and so documented in the project records.

It is further certified (1) for material accepted by manufacturer's certification of compliance, such certifications and accompanying test result (when required) indicate compliance with the terms of the contract; and (2) that if verification tests of such material were taken, the tests confirmed the validity of the certifications, or the discrepancies were responded to in accordance with Federal Lands standards and so documented in the project records.

Project Engineer _____ Date _____

Construction Operations Engineer _____ Date _____

Part II - Final Review

It is certified (1) that the results of verification tests taken during construction confirm the validity of the job site acceptance testing and/or manufacturer's certificates; or (2) that inconsistencies are appropriately documented together with the technical basis of acceptance of the material.

Materials Engineer _____ Date _____

It is certified that the records for this project have been reviewed and confirmed that the acceptance and documentation of all materials complied with Federal Lands standards.

Construction Engineer _____ Date _____

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway Office

WORKSHEET FOR DETERMINING CONCRETE BATCH MOISTURE/ABSORPTION CORRECTIONS

Project _____ Computed by _____

Concrete for _____ Date _____

Approved Mix Design Information

Cement content (kg/m^3) = _____ Maximum water/cement ratio = _____

Maximum water (kg/m^3)	A =		Fine aggregate (kg/m^3, SSD)	E =	
Coarse aggregate (kg/m^3, SSD)	B =		Fine aggregate, total moisture (%) [1]	F =	
Coarse aggregate, total moisture (%) [1]	C =		Fine aggregate absorption (%)	G =	
Coarse aggregate absorption (%)	D =		Batch size (m^3/batch)	H =	

NOTE [1] Calculated from AASHTO T 255 or FLH T 509

Dry Aggregate Weight Calculation

I = Dry Weight - Coarse Aggregate = B / [1.0 + (D / 100)] = _____ kg/m^3

J = Dry Weight - Fine Aggregate = E / [1.0 + (G / 100)] = _____ kg/m^3

K = Coarse Aggregate Batch Weight = I x [1.0 + (C / 100)] = _____ kg/m^3

Weight of Coarse Aggregate per Batch = H x K = _____kg/batch

L = Fine Aggregate Batch Weight = J x [1.0 + (F / 100)] = _____kg/m^3

Weight of Fine Aggregate per Batch = H x L = _____kg/batch

M = Water Batch Weight = A - [(K - B) + (L - E)] = _____ kg/m^3

Volume of Water per Batch = H x M x (1 L/kg) = _____L/batch

Form FHWA 1638 (3-94)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway

WORKSHEET FOR DETERMINING GRADATION AND ASPHALT CONTENT OF ASPHALT CONCRETE AASHTO T 308, AASHTO T 30, AND FLH T 515

Project:_____ Source: _____

Sample of: _____ Lot no.: _____ Sample no.: _____

Where sampled: _____ Time sampled:_____

Sampled by: _____ Date: _____ Tested by:_____

ASPHALT CONTENT BY IGNITION:

A. Furnace chamber set point, °C _____
B. Total elapsed time, minutes _____
C. Mass of basket assembly and sample before ignition, g _____
D. Basket assembly tare mass, g _____
E. Initial sample mass, g (C - D) _____
F. Mass of basket assembly and residual aggregate, g _____
G. Mass of residual aggregate, g (F - D) _____
H. Mass loss during ignition, g (E - G) _____
I. Percent loss, % (H/E x 100) _____
J. Temperature compensation, % _____
K. Aggregate correction factor [2], % _____
L. Corrected asphalt content, % [I - (J+K)] _____
M. Final corrected % asphalt by mass of mix (L - T) _____
N. Mass of residual aggregate after washing, g _____
O. Mass lost during washing, g (G - N) _____

SIEVE ANALYSIS (AASHTO T 30)

Sieve Size	Mass [1] Retained	Mass Passing	% Passing	Target Values	Allowable Deviation
25.0 mm					
19.0 mm					
12.5 mm					
9.5 mm					
4.75 mm					
2.36 mm					
600 μm					
425 μm					
600 μm					
75 μm					
Pan					
Wash (O)					
Total [3]					

[1] All masses are in grams.
[2] Individual oven aggregate correction (calibration) factor.
[3] Total mass should be within 0.2% of the mass of residual aggregate.

MOISTURE CONTENT (MICROWAVE OVEN METHOD) FLH T-515

Q. Mass of sample initial, g _____
R. Mass of sample Dry, g _____
S. Loss, g (Q - R) _____
T. Moisture, % (S/R x 100) _____

"STAPLE FURNACE PRINTOUT TAPE HERE"

REMARKS: _____

_____

_____

Form FHWA 1639 (6-00)

U.S. Department of Transportation
Federal Highway Administration
Federal Lands Highway

WORKSHEET FOR DETERMINING IGNITION FURNACE AGGREGATE CORRECTION FACTOR

AASHTO T 308

Project: _____ Source: _____

Date: _____ Sample no.: _____

By: _____ Test temperature: _____

Asphalt Content:

		1	2
A. Target asphalt content	[%]		

Tare Masses:

B. Sample basket assembly	[g]		

Insure that the calibration bowl and spoons are buttered before mixing of the aggregates and asphalt. Failure to butter the mixing bowls will result in some of the "calculated" asphalt sticking to the bowl resulting in an incorrect asphalt content and thus an incorrect correction factor.

Material Masses:

D. Dry aggregate mass	[g]		
E. Asphalt mass*: [A ÷ (100 -A)] X D	[g]		
F. Sum of all material: D+E	[g]		
G. Mass of sample basket & mix : B+F	[g]		

* Asphalt mass by total mass of mix

Job Mix Correction Factor:

H. Asphalt content from furnace ticket or from external scale calculations	[%]		
I. Aggregate correction factor: H - A	[%]		
J. Average aggregate calibration factor [I1 + I2] ÷ 2	[%]	_____ critical value must be less than 0.50%	
K. Difference in aggregate calibration [I...Highest value minus lowest value]	[%]	_____ critical value must be less than 0.15%	

F E D E R A L H I G H W A Y A D M I N I S T R A T I O N
Federal Lands Highway Division

REPORT OF COMPRESSIVE STRENGTH OF CYLINDRICAL CONCRETE SPECIMENS

Project:

Submitted by: Date reported:

Field Number					
Laboratory Number					
Concrete Class					
Placement Location					
Slump: millimeters AASHTO T 119					
Air Content: percent AASHTO T 152 or T 196					
Water: liters					
Cement: kilograms					
Fine Aggregate: kilograms					
Coarse Aggregate: kilograms					

Date Molded					
Date Received					
Date Tested					
Age: days					

Compressive Strength AASHTO T 22					
Capping Material					
Diameter: millimeters					
Cross-Sectional Area: mm^2					
Total Load: newtons					
Compressive Strength: MPa					
Fracture Type					

Remarks:

CHAPTER 1 - INTRODUCTION
List of Exhibits[1]

Exhibit	Description
1.1	Sample of a Division Transmittal
1.2	Sample of a Division Supplement
1.3	Buy American excepted articles, material, and supplies (2)

NOTE: [1] In the list of exhibits, the parenthetical number at the end of the description identifies the number of pages in the exhibit when there is more than one page.

FEDERAL HIGHWAY ADMINISTRATION
WESTERN FEDERAL LANDS HIGHWAY DIVISION

WFLHD TRANSMITTAL No. 16 Date: 3/15/93

SUBJECT: Supplements and Interim Revisions to FLH Field Materials Manual

FROM: Emory G. Rich
Materials Engineer

By: Emory G. Rich
Signature

TO: All WFLHD Holders of FLH Field Materials Manual, the Materials Specifications and Acceptance Quality Action Team (MSA QAT), and FLHO

The attached supplements or interim revisions are applicable as of the date of this transmittal. Save all removed white pages. If the MSA QAT approves a supplement or interim revision for FLH-wide use, FLHO will issue a transmittal for removing and replacing the white pages. If the MSA QAT rejects an interim revision, WFLHD will issue a transmittal for removing the interim pages and reinserting the white pages.

Change No.	REMOVE		INSERT		REMARKS
	Page	Date	Page	Date	
1	-	-	-	3/10/93	A listing of pen & ink corrections to Section 2.22
2	-	-	2-27W	3/15/93	Add supplemental certification procedures to Section 2.44
3	3-38W-1	5/14/90	3-38W-1	2/22/93	Updating sample transmittal requirements from Alaska to WFLHD central lab
4	-	-	B-53W	2/25/93	Modified the precision statement in AASHTO T 27 by limiting applicability

Exhibit 1.1 - Sample of a Division Transmittal

Revised 3/1/94

NOTE: Insert this supplement to Section 2.44 Certification facing page 2-57 of your materials manual.

2.44 Certification. Add the following.

Grass seed certifications shall be supported by test results from a recognized laboratory substantiating that the seed has been tested within 6 months of the date of delivery to the project. The test results shall identify the name and address of the laboratory, the date of the test, the lot number, and the purity, germination, and weed seed content for each kind of seed specified in the contract.

Copies of the test results shall be attached to the certification.

October 15, 1992

25.108 Excepted articles, materials, and supplies.

(a) One or more agencies have determined that the articles, materials, and supplies listed in paragraph (d) of this section are not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality.

The list in paragraph (d) of this section is furnished for information only; an article, material or supply listed therein may be treated as domestic only when the agency concerned has made a determination that it is not mined, produced, or manufactured in the United States in sufficient and reasonably available quantities of a satisfactory quality.

(b) Agencies making determinations under 25.102(a)(4) or 25.202(a)(3) for unlisted articles, materials, and supplies shall submit a copy of these determinations to the appropriate FAR Council for possible addition of items to the list.

(c) Agencies shall provide detailed information to the appropriate FAR Council if any item on the list becomes reasonably available in sufficient commercial quantities of a satisfactory quality.

(d)(1) The excepted articles, materials, and supplies are as follows:

Agar, bulk.
Anise.
Antimony, as metal or oxide.
Asbestos, amosite, chrysotile, and crocidolite.
Bananas.
Bauxite.
Beef, corned, canned.
Beef extract.
Bephenium hydroxynapthoate.
Bismuth.
Books, trade, text, technical, or scientific; newspapers; pamphlets; magazines; periodicals; printed briefs and films; not printed in the United States and for which domestic editions are not available.
Brazil nuts, unroasted.
Cadmium, ores and flue dust.
Calcium cyanamide.
Capers.
Cashew nuts.
Castor beans and castor oil.
Chalk, English.
Chestnuts.
Chicle.
Chrome ore or chromite.
Cinchona bark.
Cobalt, in cathodes, rondelles, or other primary ore and metal forms.
Cocoa beans.
Coconut and coconut meat, unsweetened, in shredded, dessicated, or similarly prepared form.
Coffee, raw or green bean.
Colchicine alkaloid, raw.
Copra.
Cork, wood or bark and waste.
Cover glass, microscopic slide.
Crane rail (85 lb/ft)
Cryolite, natural.
Dammar gum.
Diamonds, industrial, stones and abrasives.
Emetine, bulk.
Ergot, crude.
Erythrityl tetranitrate.
Fair linen, altar.
Fibers of the following types: abaca, abace, agave, coir, flax, jute, jute burlaps, palmyra, and sisal.
Goat and kidskins.
Graphite, natural, crystalline, crucible grade.
Hand file sets (Swiss pattern)
Handsewing needles.
Hemp yarn.
Hog bristles for brushes.
Hyoscine, bulk.
Ipecac, root.
Iodine, crude.
Kaurigum.
Lac.
Leather, sheepskin, hair type.
Lavender oil.
Manganese.
Menthol, natural bulk.
Mica.
Microprocessor chips (brought onto a Government construction site as separate units for incorporation into building systems during construction or repair and alteration of real property).
Nickel, primary, in ingots, pigs, shots, cathodes, or similar forms; nickel oxide and nickel salts.
Nitroguanidine (also known as picrite).
Nux vomica, crude.
Oiticica oil.
Olive oil.
Olives (green), pitted or unpitted, or stuffed, in bulk.
Opium, crude.
Oranges, mandarin, canned.
Petroleum, crude oil, unfinished oils, and finished products (see definitions of petroleum terms in subparagraph (d)(2) of this section).
Pine needle oil.
Platinum and related group metals, refined, as sponge, powder, ingots, or cast bars.
Pyrethrum flowers.
Quartz crystals.
Quebracho.
Quinidine

Quinine.
Rabbit fur felt.
Radium salts, source and special nuclear materials.
Rosettes.
Rubber, crude and latex.
Rutile.
Santonin, crude.
Secretin.
Shellac.
Silk, raw and unmanufactured.
Spare and replacement parts for equipment of foreign manufacture, and for which domestic parts are not available.
Spices and herbs, in bulk.
Steel conduit (5” and 6”)
Sugars, raw.
Swords and scabbards.
Talc, block, steatite.
Tantalum.
Tapioca flour and cassava.
Tartar, crude; tartaric acid and cream of tartar in bulk.
Tea in bulk.
Thread, metallic (gold).
Thyme oil.
Tin in bars, blocks, and pigs.
Triprolidine hydrochloride.
Tungsten.
Vanilla beans.
Venom, cobra.
Wax, carnauba.
Woods; logs, veneer, and lumber of the following species: Alaskan yellow cedar, angelique, balsa, ekki, greenheart, lignum vitae, mahogany, and teak.
Yarn, 50 Denier rayon

(2) As used in subparagraph (d)(1) of this subsection, petroleum terms are defined as follows:

(i) "Crude oil" means crude petroleum, as it is produced at the wellhead, and liquids (under atmospheric conditions) that have been recovered from mixtures of hydrocarbons that existed in a vaporous phase in a reservoir and that are not natural gas products.

(ii) "Finished products" means any one or more of the following petroleum oils, or a mixture or combination of these oils, to be used without further processing except blending by mechanical means:

(A) "Asphalt"─ a solid or semi-solid cementitious material that (*1*) gradually liquifies when heated, (*2*) has bitumens as its predominating constituents, and (*3*) is obtained in refining crude oil.

(B) "Fuel oil"─ a liquid or liquifiable petroleum product burned for lighting or for the generation of heat or power and derived directly or indirectly from crude oil, such as kerosene, range oil, distillate fuel oils, gas oil, diesel fuel, topped crude oil, or residues.

(C) "Gasoline"─ a refined petroleum distillate that, by its composition, is suitable for use as a carburant in internal combustion engines.

(D) "Jet fuel"─ a refined petroleum distillate used to fuel jet propulsion engines.

(E) "Liquified gases"─ hydrocarbon gases recovered from natural gas or produced from petroleum refining and kept under pressure to maintain a liquid state at ambient temperatures.

(F) "Lubricating oil"─ a refined petroleum distillate or specially treated petroleum residue used to lessen friction between surfaces.

(G) "Naphtha"─ a refined petroleum distillate falling within a distillation range overlapping the higher gasoline and the lower kerosenes.

(H) "Natural gas products"─ liquids (under atmospheric conditions), including natural gasoline that--

(*1*) Are recovered by a process of absorption, adsorption, compression, refrigeration, cycling, or a combination of these processes, from mixtures of hydrocarbons that existed in a vaporous phase in a reservoir, and

(*2*) When recovered and without processing in a refinery, definitions of products contained in subdivision (B), (C), (D), and (G) of this section.

(I) "Residual fuel oil"─ a topped crude oil or viscous residuum that, as obtained in refining or after blending with other fuel oil, meets or is the equivalent of Military Specification Mil-F-859 for Navy Special Fuel Oil and any more viscous fuel oil, such as No. 5 or Bunker C.

(iii) "Unfinished oils" means one or more of the petroleum oils listed in subdivision (ii) of this section, or a mixture or combination of these oils, that are to be further processed other than by blending by mechanical means.