NEBRASKA
Good Life. Great Journey.
DEPARTMENT OF TRANSPORTATION

State of Nebraska
Department of Transportation
Materials and Research Division

LABORATORY

QUALITY SYSTEM

MANUAL

DATE: 2-3-97
REVISED: 10-23-18

NEBRASKA DEPARTMENT OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION LABORATORY
QUALITY SYSTEM MANUAL

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PREFACE

This Quality System Manual contains documents describing the Nebraska Department of Transportation (NDOT) quality system as it pertains to the testing areas of soils, aggregates, bituminous materials, hydraulic cement and portland cement concrete. Future revisions to the manual will include testing in other areas.

The Quality System Manual was developed as part of a process for the NDOT Materials and Research Division Laboratory to obtain accreditation through the American Association of State Highway and Transportation Officials (AASHTO) Accreditation Program. The AASHTO Accreditation Program (AAP) identifies specific criteria for a laboratory to become accredited. Major accreditation criteria is as follows:

1. *Quality System Criteria*—The NDOT Materials and Research Division Laboratory will conform to the requirements specified in AASHTO R 18 "Recommended Practice for Establishing and Implementing a Quality System for Construction Materials Testing Laboratories." This manual documents the organizational structure, staff responsibilities, policies, standard operating procedures and processes for the laboratory's quality system.

2. *On-Site Inspection and Quality System Evaluation Criteria*—The NDOT Materials and Research Division Laboratory will be subjected to AASHTO re:source (Formerly AMRL) AASHTO Material Reference Laboratory and Cement and Concrete Reference Laboratory (CCRL) on-site inspections and quality system evaluations at routine intervals.

3. *Proficiency Testing Criteria*—The NDOT Materials and Research Division Laboratory will participate in all required AASHTO re:source and CCRL proficiency programs.

Details of the above criteria and other accreditation criteria can be found in the "Procedures Manual for the AASHTO Accreditation Program".

All documents in this manual identify the date the document was prepared. If a document is revised the date of revision will be indicated on the document. Since frequent revisions relating to personnel changes, equipment inventory, etc. will probably occur, the manual has been developed in a loose leaf format. Manual holders should insert revised pages immediately upon receipt in order that their copy of the manual is current at all times.

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1. SCOPE OF QUALITY SYSTEM

1.1 This manual describes the organization structure, staff responsibilities, policies, standard operating procedures and processes for the implementation of a quality system for the testing of soils, aggregates, bituminous materials, hydraulic cement and portland cement concrete.

NOTE 1 – Future revisions to this manual will include testing in other areas.

1.2 The test methods covered by the scope of this manual and the laboratories conducting the test methods are identified in Table 1.1.

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Table 1.1 – Test Methods Covered by the Scope of the Quality Manual and Laboratories Conducting the Tests

TEST METHOD NUMBER	TEST METHOD TITLE	TESTING LABORATORY
Asphalt Binder Test Procedures		
AASHTO R 28	Accelerated Aging of Asphalt Binder Using a Pressurized Aging Vessel (PAV)	Bituminous
AASHTO T 49	Penetration of Bituminous Materials	Bituminous
AASHTO T 51	Ductility of Bituminous Mixtures	Bituminous
AASHTO T 78	Distillation of Cut-Back Asphaltic (Bituminous) Products	Bituminous
AASHTO T 201	Kinematic Viscosity of Asphalts (Bitumens)	Bituminous
AASHTO T 202	Viscosity of Asphalts by Vacuum Capillary Viscometer	Bituminous
AASHTO T 240	Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin-Film Oven Test)	Bituminous
AASHTO T 301	Elastic Recovery Test of Bituminous Materials by Means of a Ductilometer	Bituminous
AASHTO T 313	Determining the Flexural Creep Stiffness of Asphalt Binder Using the Bending Beam Rheometer (BBR)	Bituminous
AASHTO T 315	Determining the Rheological Properties of Asphalt Binder Using a Dynamic Shear Rheometer	Bituminous
Emulsified Asphalt Test Procedures		
AASHTO T 53	Softening Point	Bituminous
AASHTO T 59	Testing Emulsified Asphalts Residue by Evaporation Residue by Distillation Saybolt Viscosity	Bituminous
Hot-Mix Asphalt Test Procedures		
AASHTO T 30	Mechanical Analysis of Extracted Aggregate	Bituminous Aggregate
AASHTO T 166	Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens	Bituminous Aggregate
~~AASHTO T 170~~	~~Recovery of Asphalt from Solution by Abson Method~~	
AASHTO T 209	Maximum Specific Gravity of Bituminous Paving Mixtures	Bituminous Aggregate
~~AASHTO T 245~~	~~Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus~~	~~Bituminous Aggregate~~
AASHTO T 269	Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures	Bituminous Aggregate
AASHTO T 312	Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the SHRP Gyratory Compactor	Bituminous Aggregate
AASHTO T 283	Resistance of Compacted Bituminous Mixture to Moisture Induced Damage	Bituminous Aggregate
AASHTO T 308	Determining the Asphalt Content of Hot Mix Asphalt (HMA) by the Ignition Method	Bituminous Aggregate

Table 1.1 – Continued

TEST METHOD		TESTING LABORATORY
NUMBER	TITLE	
Hot-Mix Asphalt Aggregate Test Procedures		
AASHTO T 11	Materials Finer Than 75μm (No. 200) Sieve in Mineral Aggregate by Washing	Aggregates
AASHTO T 27	Sieve Analysis of Fine and Coarse Aggregate	Aggregates / Soils
AASHTO T 84	Specific Gravity and Absorption of Fine Aggregate	Aggregates
AASHTO T 85	Specific Gravity and Absorption of Coarse Aggregate	Aggregates
AASHTO T 96	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Abrasion Machine	Aggregates / Soils
AASHTO T 104	Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate	Aggregates / Soils
AASHTO T 176	Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test	Aggregates / Soils
AASHTO T 248	Reducing Field Samples of Aggregate to Testing Size	Aggregates / Soils
AASHTO T 255	Total Moisture Content of Aggregate by Drying	Aggregates
AASHTO T 304	Uncompacted Void Content of Fine Aggregate	Aggregates
ASTM D 4791	Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate	Aggregates
ASTM D 5821	Determining the Percentage of Fractured Particles in Coarse Aggregate	Aggregates
Soil Test Procedures		
AASHTO T 87	Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test	Soils
AASHTO T 88	Particle Size Analysis of Soils	Soils
AASHTO T 89	Determining the Liquid Limit of Soils	Soils
AASHTO T 90	Determining the Plastic Limit and Plasticity Index of Soils	Soils
AASHTO T 99	The Moisture-Density Relation of Soils Using a (2.5 kg) 5.5 lb Rammer and a (305 mm) 12 in. Drop	Soils
AASHTO T 100	Specific Gravity of Soils	Soils
AASHTO T 176	Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test	Aggregates / Soils
AASHTO T 180	Moisture-Density Relations of Soils Using a (4.54-kg) 10-lb Rammer and a (457-mm) 18-in Drop	Soils
AASHTO T 208	Unconfined Compressive Strength of Cohesive Soils	Soil Mechanics
AASHTO T 216	One-Dimensional Consolidation Properties of Soils	Soil Mechanics
AASHTO T 236	Direct Shear Test Under Consolidated Drained Conditions	Soil Mechanics
AASHTO T 265	Laboratory Determination of Moisture Content of Soils	Soils Soil Mechanics
AASHTO T 296	Unconsolidated, Undrained Compressive Strength of Cohesive Soils in Triaxial Compression	Soil Mechanics
AASHTO T 297	Consolidated, Undrained Triaxial Compression Tests on Cohesive Soils.	Soil Mechanics

Table 1.1 – Continued

TEST METHOD		TESTING LABORATORY
NUMBER	TITLE	
Portland Cement Concrete Test Procedures		
ASTM C 31	Making and Curing Concrete Test Specimens in the Field	Cement and Concrete
ASTM C 39	Compressive Strength of Cylindrical Concrete Specimens	Cement and Concrete
ASTM C 42	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete	Cement and Concrete
ASTM C 138	Unit Weight, Yield, and Air Content (Gravimetric) of Concrete	Cement and Concrete
ASTM C 143	Slump of Hydraulic Cement Concrete	Cement and Concrete
ASTM C 172	Sampling Freshly Mixed Concrete	Cement and Concrete
ASTM C 173	Air Content of Freshly Mixed Concrete by the Volumetric Method	Cement and Concrete
ASTM C 174	Measuring Length of Drilled Concrete Cores	Cement and Concrete
ASTM C 231	Air Content of Freshly Mixed Concrete by the Pressure Method	Cement and Concrete
ASTM C 617	Capping Cylindrical Concrete Specimens	Cement and Concrete
ASTM C 1064	Temperature of Freshly Mixed Portland Cement Concrete	Cement and Concrete
ASTM C 1231	Use of Unbonded Caps in Determination of Compressive Strength of Hardened Concrete Cylinders	Cement and Concrete
Portland Cement Concrete Aggregate Test Procedures		
AASHTO T 11	Materials Finer Than 75μm (No. 200) Sieve in Mineral Aggregate by Washing	Aggregates
AASHTO T 19	Unit Weight and Voids in Aggregate	Aggregates
AASHTO T 21	Organic Impurities in Fine Aggregates for Concrete	Aggregates
AASHTO T 27	Sieve Analysis of Fine and Coarse Aggregate	Aggregates
AASHTO T 84	Specific Gravity and Absorption of Fine Aggregate	Aggregates
AASHTO T 85	Specific Gravity and Absorption of Coarse Aggregate	Aggregates
AASHTO T 96	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Abrasion Machine	Aggregates
AASHTO T 104	Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate	Aggregates
AASHTO T 176	Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test	Aggregates / Soils
AASHTO T 248	Reducing Field Samples of Aggregate to Testing Size	Aggregates
AASHTO T 255	Total Moisture Content of Aggregate by Drying	Aggregates
Hydraulic Cement Test Procedures		
ASTM C 109	Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)	Cement and Concrete
ASTM C114	Chemical Analysis of Hydraulic Cement	Chemical
ASTM C 151	Autoclave Expansion of Portland Cement	Cement and Concrete
ASTM C 151	Supplemental Cementitious Materials – SCM Autoclave Expansion of Portland Cement	Cement and Concrete
ASTM C 185	Air Content of Hydraulic Cement Mortar	Cement and Concrete
ASTM C 187	Normal Consistency of Hydraulic Cement	Cement and Concrete

Table 1.1 – Continued

TEST METHOD		TESTING LABORATORY
NUMBER	TITLE	
Hydraulic Cement Test Procedures – Continued		
ASTM C 191	Time of Setting of Hydraulic Cement by Vicat Needle	Cement and Concrete
ASTM C 204	Fineness of Portland Cement by Air Permeability Apparatus	Cement and Concrete
ASTM C 305	Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency	Cement and Concrete
ASTM C 311	Portland Cement Concrete (Strength Activity Index)	Cement and Concrete
ASTM C 311 / C109	Supplemental Cementitious Materials – SCM (Strength Activity Index)	Cement and Concrete
ASTM C 311 / C188	Supplemental Cementitious Materials – SCM (Density)	Cement and Concrete
ASTM C 430	Fineness of Hydraulic Cement by the 45-μm (No. 325) Sieve	Cement and Concrete
ASTM C 430	Supplemental Cementitious Materials – SCM Fineness of Hydraulic Cement by the 45-μm (No. 325) Sieve	Cement and Concrete
ASTM C 451	Early Stiffening of Portland Cement (Paste Method)	Cement and Concrete
ASTM C 618	Supplemental Cementitious Materials – SCM Class C Fly Ash Physical Analysis	Cement and Concrete
ASTM C 618	Supplemental Cementitious Materials – SCM Class F Fly Ash Physical Analysis	Cement and Concrete
ASTM C 989	Supplemental Cementitious Materials – SCM Ground Granulated Blast – Furnace Slag Physical Analysis	Cement and Concrete
ASTM C 1222	Evaluation Criteria of Hydraulic Cement Testing	Cement and Concrete Chemical

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2. ORGANIZATION AND ORGANIZATIONAL POLICIES

2.1 *Name, Address and Administration.*

2.1.1 The name, address, telephone number, fax number and administration of the Nebraska Department of Transportation (NDOT) Materials and Research Division Laboratory are shown in Figure 2.1.

2.2 *Organization Charts.*

2.2.1 Figure 2.2 identifies the organizational structure of the Nebraska Department of Transportation.

2.2.2 Figure 2.3 identifies the organizational structure of the NDOT Materials and Research Division. This organization chart shows the overall structure of the Materials and Research Division including functional responsibility of the Division and positions within the Division not directly related to laboratory testing of materials and this Quality System Manual.

2.2.3 Figure 2.4 identifies the organizational structure of the NDOT Materials and Research Division Laboratory relating specifically to this Quality System Manual. This organization chart is identical in content to the organization chart shown in Figure 2.3 except that employee's names are included and the functions and positions not covered in the scope of this manual are omitted.

2.2.3.1 *Temporary Summer Employees*—The various laboratories covered by the scope of this manual may utilize summer temporary employees. Although some of these employees may perform tests covered by the scope of this manual, they are not included in the organization charts shown in Figures 2.3 and 2.4. The length of employment is normally mid-May to mid-August, but may be longer depending on the work load of the laboratory. Summer temporary employees shall be subject to all provisions of this manual if they are performing tests covered by the scope of this manual.

2.2.4 The organization charts shown in Figures 2.3 and 2.4 constitute the official organizational structure of the NDOT Materials and Research Division. Policies for maintaining and modifying the Division's organization structure are contained in Nebraska Department of Transportation Operating Instruction 21-1 (not included in this Quality System Manual).

2.3 *Functional Statement.*

2.3.1 Figure 2.5 identifies the functions assigned to the Materials and Research Division including those related to the laboratory testing of materials identified in this Quality System Manual.

2.3.2 The functional statement shown in Figure 2.5 constitutes the official delegation of management functions authorized by the Director-State Engineer of the Nebraska Department of Transportation. Policies for updating and maintaining the functional statement are contained in Department of Transportation Operating Instruction 21-4 (not included in this Quality System Manual).

2.4 *Quality System Management.*

2.4.1 The Technical Manager for the NDOR Materials and Research Division Laboratory is the Materials and Research Engineer as identified in Figure 2.4. The Technical Manager has overall responsibility for the technical operations of the laboratory.

2.4.2 The Flexible Pavement and Quality Assurance Engineer, as identified in Figure 2.4, will serve as the Technical Manager during absence of the Materials and Research Engineer.

2.4.3 The Quality Coordinator and Equipment Calibration/Verification Coordinator for the NDOT Materials and Research Division is the Highway Quality Assurance Manager for the PCC Materials Unit as identified in Figure 2.4. The Quality Coordinator has responsibility for determining if the laboratory staff is conducting quality system activities in the manner specified in this Quality System Manual. The Equipment Calibration/Verification Coordinator has responsibility for determining if calibration/verification procedures are being performed in accordance with the requirements of this Quality System Manual.

2.4.4 In the event a technical complaint is received relating to the quality of the NDOT Materials and Research Division Laboratory's work, the management team described in Section 2.4.4 shall meet within 30 days of receipt of the complaint. The purpose of this meeting will be to investigate and resolve the complaint and, if necessary, introduce changes or improvements in the quality system.

2.5 *Quality Policy Statement*

2.5.1 Figure 2.6 Identifies the intentions and commitment to the quality and objectives of our technical services.

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Figure 2.1 – Name, Address and Administration of NDOT Materials and Research Division Laboratory

Laboratory Name and Mailing Address:	Nebraska Department of Transportation Materials and Research Division P. O. Box 94759 Lincoln, NE 68509-4759
Laboratory Location:	1400 Highway 2 Lincoln, NE 68502
Phone:	(402)479-4750
FAX:	(402)479-3975
Ownership:	State of Nebraska

Nebraska Department of Transportation and
Materials and Research Division Laboratory Administration

Position	Name
Governor, State of Nebraska	Jim Pillen
Director	Vicki Kramer
Deputy Director - Engineering	Khalil Jaber
Materials and Research Engineer	Brendon Schmidt

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Figure 2.2 – Nebraska Department of Transportation Organization Chart to District/Division Level

- **Governor, State of Nebraska, Jim Pillen**
  - State Highway Commission (8 District Representatives)
  - **Director, Department of Transportation, Vicki Kramer**
    - Controller Division
    - Government Affairs Div.
    - Human Resources Div.
    - Business Technology Support Div.
    - **Deputy Director, Operations, Mostafa Jamshidi**
      - District 1 Engineer
      - District 2 Engineer
      - District 3 Engineer
      - District 4 Engineer
      - District 5 Engineer
      - District 6 Engineer
      - District 7 Engineer
      - District 8 Engineer
      - Communication Div.
      - Construction Division
      - Operations Division
      - Rail & Public Transportation Div.
    - **Deputy Director, Engineering, Khalil Jaber**
      - Bridge Division
      - Traffic Engineering Division
      - Project Scheduling & Program Management Section
      - Right of Way Division
      - Roadway Design Division
      - Planning & Project Development Division
      - **Materials and Research Division, Brendon Schmidt**

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Figure 2.3a – Materials and Research Division Organization Chart (Page 1 of 4)

- **Materials & Research Engineer, Engineer VII**
  - **Portland Cement & Concrete, Chemical Tests, Physical Tests, Engineer III**
    - PCC Pre-cast, Highway Quality Assurance Manager
      - Highway Construction Technician III
    - Highway Program Specialist
      - Professional Engineer I
      - Federal Aid Administrator II
    - Chemical Tests Laboratory, Highway Chemical Tests Manager
      - Scientist II
      - Scientist II
    - PCC Materials & Laboratory, Highway Materials and Tests Manager
      - Highway Materials and Tests Technician III
      - Highway Materials and Tests Technician III
      - Highway Materials and Tests Technician III
      - Coring, Pavement Smoothness, Highway Quality Assurance Manager
        - Highway Materials and Tests Technician III
        - Highway Materials and Tests Technician III
        - Highway Materials and Tests Technician III
  - **Flexible Pavement & Quality Assurance, Engineer III**
    - District 1 Quality Assurance, Highway Materials and Tests Technician III
    - District 2 Field Laboratory, Highway Quality Assurance Manager
      - Highway Materials and Tests Technician III
    - District 3 Field Laboratory, Highway Quality Assurance Manager
      - Highway Materials and Tests Technician III
    - District 4 Field Laboratory, Highway Quality Assurance Manager
      - Highway Materials and Tests Technician III
    - District 6 Field Laboratory, Highway Quality Assurance Manager
      - Highway Materials and Tests Technician III
      - Highway Materials and Tests Technician III
      - Highway Materials and Tests Technician III
    - Bituminous Aggregate Laboratory, Highway Quality Assurance Manager
      - Highway Materials and Tests Technician III
      - Highway Materials and Tests Technician II
    - Bituminous Laboratory, Highway Quality Assurance Manager
      - Highway Materials and Tests Technician III
  - **AASHTO Ware Project, Engineer III**
    - Physical Tests Laboratory, Highway Materials and Tests Manager
      - Highway Quality Assurance Manager
      - Highway Materials and Tests Technician III
      - Highway Materials and Tests Technician III

Figure 2.3b – Materials and Research Division Organization Chart (Page 2 of 4)

- **Geotechnical Engineer, Engineer III**
  - Bridge Foundation Engineer, Engineer II
    - Soil Laboratory Manager, Highway Quality Assurance Manager
      - Engineering Unit Supervisor
      - Highway Materials and Tests Technician III
    - Highway Materials and Tests Technician III
    - Engineer III
      - Highway Maintenance Worker Senior
      - Highway Maintenance Worker Senior
  - Aggregate Laboratory Manager, Highway Quality Assurance Manager
    - Highway Materials and Tests Technician III
    - Highway Materials and Tests Technician III

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Fig. 2.03c Materials & Research Division - Organizational Chart (Page 3 of 4)

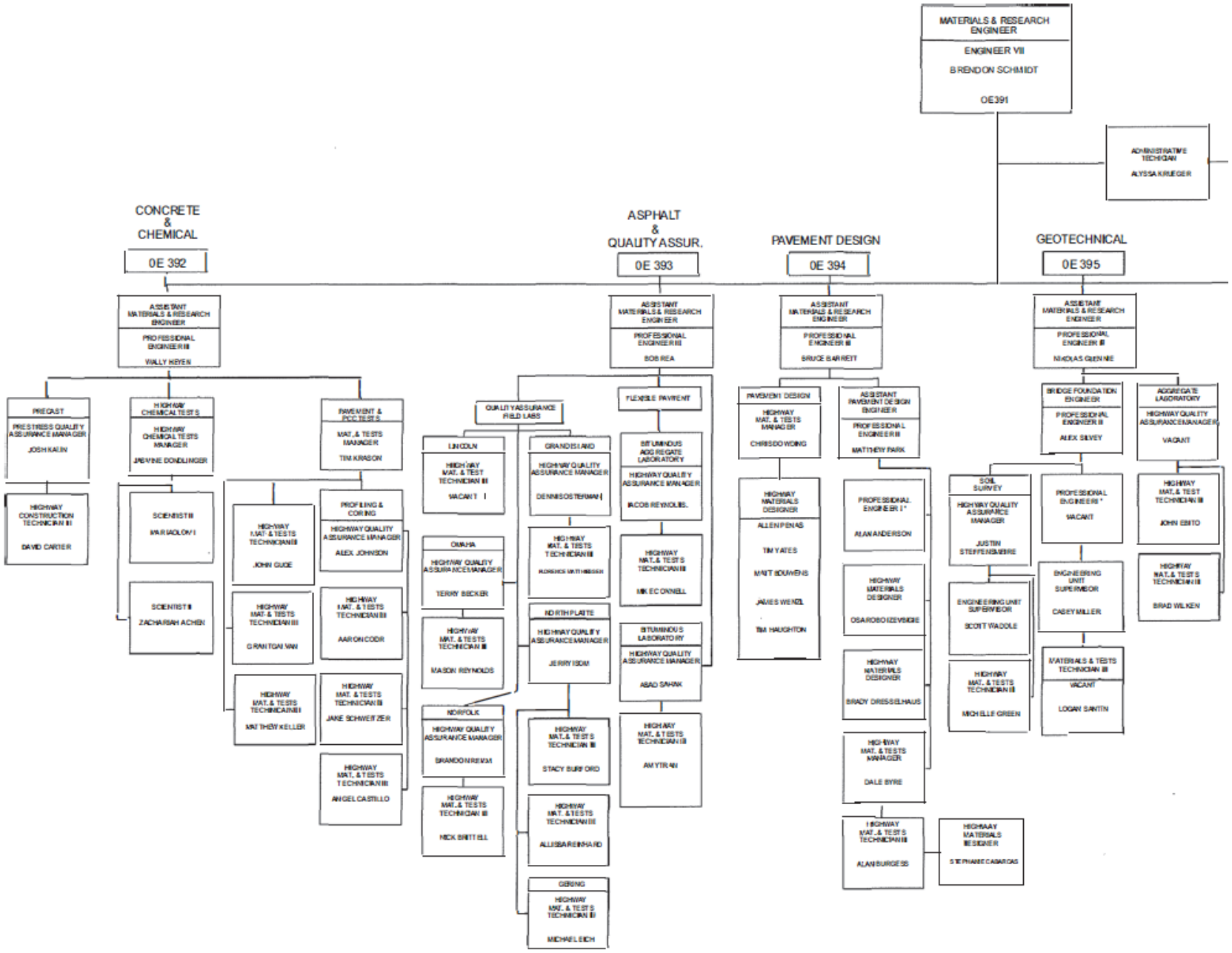

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Fig. 2.03d Materials & Research Division - Organizational Chart (Cont.) (Page 4 of 4)

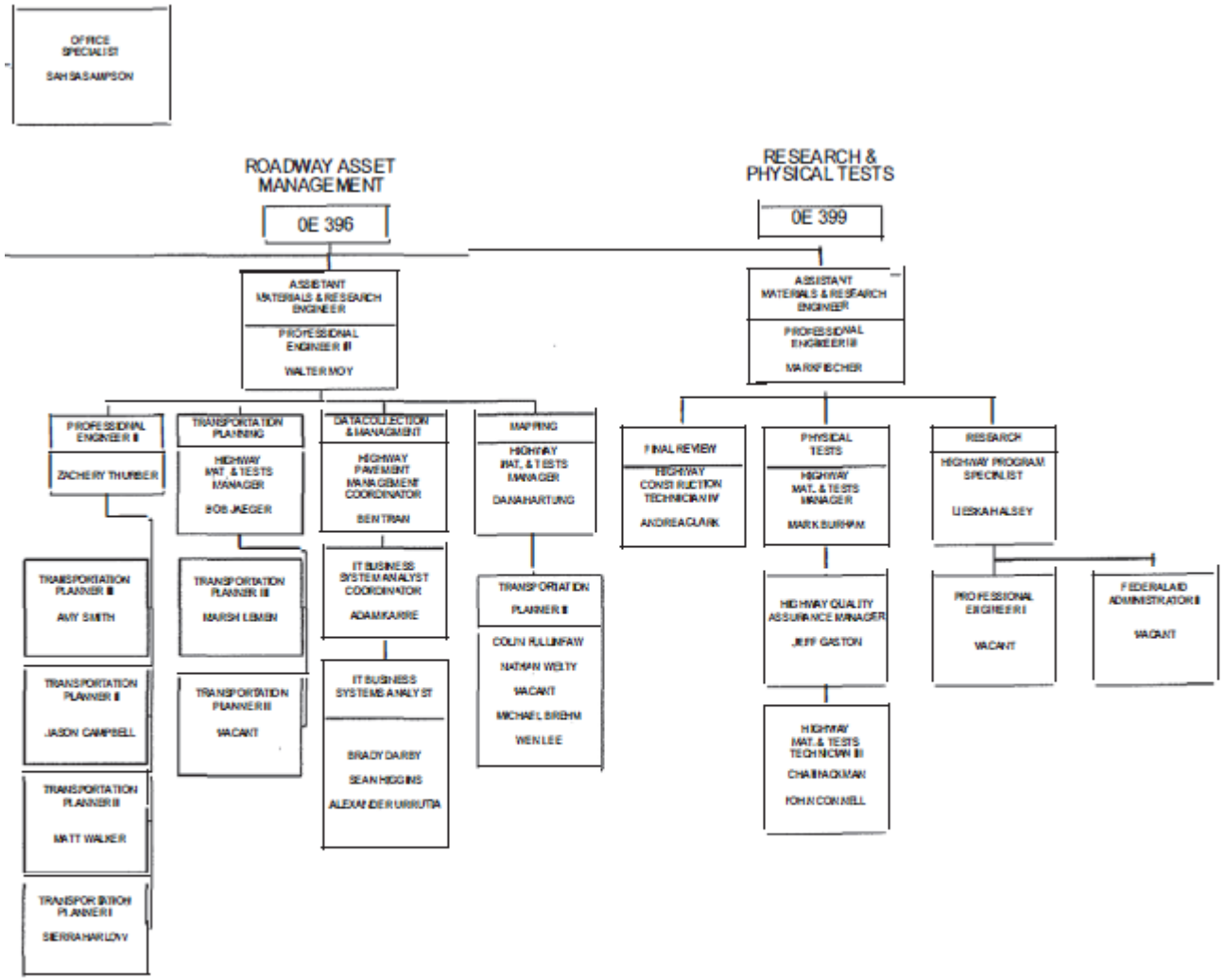

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Figure 2.4 – Materials and Research Division Laboratory Organization Chart (Names and positions relating specifically to Quality System)

- **Brandon Varilek, Materials and Research Engineer, Engineer VII**
  - **Wally Heyen, Portland Cement & Concrete, Chemical Tests, Engineer III**
    - Tim Krason, PCC Materials & Laboratory, Materials and Tests Manager (Quality System Coordinator)
      - John Gude, Highway Materials and Tests Technician III
      - Grant Galvan, Highway Materials and Tests Technician III
      - Matt Keller, Highway Materials and Tests Technician III
    - Josh Kalin, PCC Pre-stress, Highway Quality Assurance Manager (NP)
      - David Carter, Highway Construction Technician III (NP)
    - Jasmine Dondlinger, Chemical Laboratory, Highway Chemical Tests Manager
      - Maria Olomi, Scientist II
      - Zach Achen, Scientist II
    - Alex Johnson, Pavement Coring & Smoothness Testing, Highway Quality Assurance Manager (Quality System Equipment Calibration Coordinator)
      - Jake Schweitzer, Highway Materials and Tests Technician lll
      - Aaron Codr, Highway Materials and Tests Technician lll
      - Angel Castillo, Highway Materials and Tests Technician lll
  - **Bob Rea, Flexible Pavement & Quality Assurance Engineer, Engineer III**
    - Jacob Reynolds, Bituminous Aggregate Laboratory, Highway Quality Assurance Manager
      - Mike Connell, Highway Materials and Tests Technician III
      - Vacant, Highway Materials and Tests Technician II
    - Asad Sahak, Bituminous Laboratory, Highway Quality Assurance Manager
      - Amy Tran, Highway Materials and Tests Technician III
  - **Nick Glennie, Geotechnical Engineer, Engineer III**
    - Alex Silvey, Bridge Foundation Engineer, Engineer II (NP)
      - Justin Steffensmeier, Soil Laboratory, Highway Quality Assurance Manager
        - Scott Waddle, Highway Engineering Unit Supervisor
          - Shelly Green, Highway Materials and Tests Technician III
      - Justin Steffensmeier, Aggregate Laboratory, Highway Quality Assurance Manager
        - John Ebito, Highway Materials and Tests Technician lll
        - Brad Wilken, Highway Materials and Tests Technician lll
  - **Mark Fischer, AASHTO Ware Project, Physical Tests, Engineer III**
    - Mark Burham, Physical Tests Laboratory, Highway Materials and Tests Manager
      - Jeff Gaston, Highway Quality Assurance Manager
        - Chad Jackman, Highway Materials and Tests Technician III
        - John Connell, Highway Materials and Tests Technician III

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Figure 2.5 – Materials and Research Division Functional Statement

Materials and Research Division

Materials and Research Division designs, manages, researches and tests highway materials used for constructing and maintaining a quality highway transportation system within the state of Nebraska.

Site Manager & Office Services Section

The Site Manager & Office Services Section is responsible for implementing and managing the materials portion of SiteManager. SiteManager allows us to record, track, and maintain historical data on materials used in highway construction. The section provides IT support staff for 1400 building and performs all clerical tasks within the division.

The shop maintains and repairs laboratory equipment in the central and branch laboratories.

Portland Cement & Concrete, Chemical Tests, Physical Tests Section

The Concrete Section provides written specifications, sampling and testing of concrete, cement, blended cements, and other materials. The section also answers questions from other divisions and districts and investigates problems in the field.

The Chemistry Laboratory conducts chemical tests on various types of materials.

The Physical Tests Section tests and inspects numerous construction and maintenance materials, i.e., anchor bolts, concrete, metal and plastic pipe, electrical items, high tensile fasteners, bridge bearing devices, structural reinforcing, highway safety products and wood products. Develop material specifications, standards, plans and policy for NDOT. Provide technical support on material and specification related questions. Perform pavement skid resistance tests.

Flexible Pavement and Quality Assurance Section

The Flexible Pavement and Quality Assurance Section provides “Reports of Tests” on maintenance and construction materials; are conveniently available to make recommendations; and gives guidance and answers to questions on maintenance / construction materials, strategies and procedures.

Perform on-site inspections and testing. Provide technical assistance and guidance in the field. Administer technical control of the branch laboratories.

Pavement Design Section

The Pavement Design Section is responsible for making all pavement related determinations, specifications and final quantities for every new construction, rehabilitation or repair project.

Geotechnical Section

The Geotechnical Section performs exploration of existing subsurface conditions and evaluates risks posed by site and provides recommendations for the design and construction of roadway and structures for all NDOT projects as needed.

Test material properties of soils and aggregates and prepare soil and subgrade situation reports.

the roadway geometric data in Integrated Highway Inventory (IHI). We are also responsible for collecting the pavement rating and profile data for the 10,000 mile State Highway System. We report this information through the Needs Assessment, corporate measures, Pavement Optimization Program (POP), listings, and maps.

Research & Development Section

The Research & Development Section is responsible for fiscal and technical management of Nebraska's federally funded transportation research program. They also serve as the research project liaison, between academic researchers and transportation industry professionals.

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Figure 2.6 – Materials and Research Quality Policy Statement

The Nebraska Department of Transportation Materials and Research Testing Laboratories is committed to total quality to support and achieve our department's mission statement by setting testing and equipment standards for our laboratories and maintaining those standards consistently during our assessment and throughout our performance period. These standards will be maintained and reviewed annually through our testing programs for Independent Assurance, Verification and Validation testing that is conducted throughout the year.

- Each Testing Laboratory will respond to "Bad" Proficiency Sample ratings, results which are beyond 2 standard deviations from the mean, 100% of the time within one month of the Quality System Evaluation.
- The Evaluation record will be turned in an average of 5 working days from the due date.

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3. STAFF

3.1 *Position Descriptions.*

3.1.1 The class specifications for the positions in the NDOT Materials and Research Division Laboratory covered by the scope of this manual are shown in Appendix A.

3.1.1.1 The class specifications are developed and revised, as necessary, by the State of Nebraska, Department of Administrative Service, Division of State Personnel, working in conjunction with the Nebraska Department of Transportation Human Resources Division.

3.1.2 Figure 3.1 should be used to cross-reference specific employees or positions to the class specifications shown in Appendix A.

3.2 *Biographical Sketches.*

3.2.1 Brief biographical sketches for supervisory personnel in the NDOT Materials and Research Division Laboratory, covered by the scope of this manual, are shown in Appendix B.

3.2.2 Figure 3.2 lists supervisory personnel in the NDOT Materials and Research Division Laboratory with biographical sketches shown in Appendix B.

3.3 *Technician Training Program.*

3.3.1 Figure 3.3 describes the methods and procedures used to ensure that NDOT Materials and Research Division Laboratory personnel are trained to perform tests covered by the scope of this manual in accordance with standard testing procedures used by the laboratory.

3.3.2 The training specified in Figure 3.3 is applicable to new employees with little or no experience in laboratory or inspection work. Employees having experience in laboratory testing are considered as new employees for purposes of the Technician Training Program if they have not previously performed a particular test.

3.3.3 Summer temporary employees shall be trained in accordance with the requirements identified in Figure 3.3. Even though summer temporary employees may have worked in a laboratory and performed certain tests the previous summer, the employee shall be considered a new employee for purposes of the Technician Training Program. There could be a period of nine months, or more, since a summer temporary employee performed a specific test.

3.3.4 The laboratory manager having responsibility for the specific laboratory is responsible for the training program and the distribution and maintenance of training records.

3.4 *Technician Competency Evaluation Program.*

3.4.1 Figure 3.4 describes the methods and procedures used to evaluate technician competency to ensure that each test covered by the scope of this manual is performed in accordance with standard testing procedures used by the laboratory.

3.4.2 The competency evaluation specified in Figure 3.4 is applicable to all technicians in a laboratory if they perform the test being evaluated. The competency evaluation is applicable to new employees after they complete the technician training as specified in Figure 3.3.

3.4.3 Proficiency sample testing will be used as a means of evaluating technician competency. Table 3.1 shows the test methods in which proficiency sample testing will

be used. The use of proficiency sample testing will be supplemented with observation by the laboratory manager of the actual testing being performed.

3.4.4 The laboratory manager having responsibility for the specific laboratory is responsible for the competency evaluation program and the distribution and maintenance of competency evaluation records.

3.5 *Training and Competency Evaluation Records.*

3.5.1 Figure 3.5 shows the form to be used for recording technician training activities.

3.5.2 Figure 3.6 shows the form to be used for recording technician competency evaluation activities.

3.5.3 Training records and competency evaluation reviews shall be kept on file in the office of the laboratory manager.

3.6 *Retention of Records.*

3.6.1 Technician training records shall be retained for as long as the employee is employed by NDOT.

3.6.2 Technician competency evaluation records shall be retained for minimum of five years.

DATE: 10-10-08
REVISED: 02-07-24

Figure 3.1 – Cross Reference of Employees, Title or Laboratory, and Class Specifications

SUPERVISORY PERSONNEL			
NAME	TITLE	CLASS SPECIFICATION	FIGURE NO.
Brendon Schmidt	Materials and Research Engineer	Engineer VII	A.1
Nikolas Glennie	Geotechnical Engineer	Engineer III	A.2
Wally Heyen	Portland Cement and Concrete, Chemical Tests, Physical Tests Engineer	Engineer III	A.2
Bob Rea	Flexible Pavement and Quality Assurance Engineer	Engineer III	A.2
Mark Fischer	Research & Physical Tests	Engineer III	A.2
Tim A. Krason	PCC Materials & Lab Manager (Quality System Coordinator)	Hwy. Materials & Tests Manager	A.9
Jasmine Dondlinger	Chemical Tests Laboratory Manager	Highway Chemical Tests Manager	A.10
Justin Steffensmeier	Aggregates Laboratory Manager	Hwy. Quality Assurance Manager	A.13
Asad Sahak	Bituminous Laboratory Manager	Hwy. Quality Assurance Manager	A.13
Justin Steffensmeier	Soils Laboratory Supervisor	Hwy. Quality Assurance Manager	A.13
Jacob Reynolds	Bituminous Aggregate Laboratory Manager	Hwy. Quality Assurance Manager	A.13
Alex Johnson	Coring & Smoothness Manager (Equipment Calibration / Verification Coordinator)	Hwy. Quality Assurance Manager	A.13
Scott Waddle	Soils Laboratory	Engineering Unit Supervisor	A.5
Mark Burham	Physical Tests Lab Manager	Hwy. Materials & Tests Manager	A.9
Jeff Gaston	Physical Test Lab Supervisor	Hwy. Materials & Tests Manager	A.13

Figure 3.1 – Continued

LABORATORY PERSONNEL			
NAME	LABORATORY	CLASS SPECIFICATION	FIGURE NO.
Maria Olomi	Chemical Laboratory	Scientist II	A.12
Zach Achen	Chemical Laboratory	Scientist II	A.12
Shelly Green	Soils Laboratory	Hwy. Materials & Tests Tech. III	A.6
John Ebito	Aggregates Laboratory	Hwy. Materials & Tests Tech. III	A.6
Brad Wilken	Aggregates Laboratory	Hwy. Materials & Tests Tech. III	A.6
John Gude	PCC Laboratory	Hwy. Materials & Tests Tech. III	A.6
Matt Keller	PCC Laboratory	Hwy. Materials & Tests Tech. III	A.6
Jake Schweitzer	Pavement Tests	Hwy. Materials & Tests Tech. III	A.6
Aaron Codr	Pavement Tests	Hwy. Materials & Tests Tech. III	A.6
Angel Castillo	Pavement Tests	Hwy. Materials & Tests Tech. III	A.6
Grant Galvan	PCC Laboratory	Hwy. Materials & Tests Tech. III	A.6
Chad Jackman	Physical Test Laboratory	Hwy. Materials & Tests Tech. III	A.6
John Connell	Physical Test Laboratory	Hwy. Materials & Tests Tech. III	A.6
Amy Tran	Bituminous Laboratory	Hwy. Materials & Tests Tech. III	A.6
Mike Connell	Bituminous Agg. Laboratory	Hwy. Materials & Tests Tech. III	A.6

DATE: 10-20-08
REVISED: 02-07-24

Figure 3.2 – Listing of Biographical Sketches, Supervisory Personnel

NAME	POSITION	FIGURE NO.
Brendon Schmidt	Engineer VII – Materials and Research Engineer	B.1
Wally Heyen	Engineer III – Portland Cement & Concrete, Chemical Tests, Physical Tests Engineer	B.2
Nikolas Glennie	Engineer III - Geotechnical Engineer	B.3
Bob Rea	Engineer III - Flexible Pavement, Quality Assurance Engineer	B.4
Mark Fischer	Engineer III – Research & Physical Test Engineer	B.5
Tim A. Krason	Materials and Tests Manager – PCC Materials and Laboratory	B.6
Jasmine Dondlinger	Highway Chemical Tests Manager – Chemical Laboratory	B.7
Justin Steffensmeier	Highway Quality Assurance Manager – Soils & Aggregate Laboratory	B.8
Asad Sahak	Highway Quality Assurance Manager – Bituminous Laboratory	B.9
Alex Johnson	Highway Quality Assurance Manager – Coring and Pavement Smoothness	B.10
Jeff Gaston	Highway Quality Assurance Manager – Physical Test Laboratory	B.11
Jacob Reynolds	Highway Quality Assurance Manager – Bituminous Aggregate Laboratory	B.12
Mark Burham	Materials and Tests Manager – Physical Test Laboratory	B.13
Scott Waddle	Highway Engineering Unit Supervisor – Soil Laboratory	B.14

DATE: 2-3-97
REVISED: 10-23-18

Figure 3.3 – Training Program for Testing Technicians

Each laboratory manager is responsible for the training program and maintenance of all training records. (See figure 3.5 for the form to be used for recording technician training activities.)

Copies of the results of all training shall be forwarded to the Quality Coordinator for the NDOT Materials and Research Division Laboratory. Training records shall be retained in the office of the laboratory manager. All technicians shall be trained prior to performing test procedures not previously performed.

The following training procedures shall be performed for each test.

1. The trainee shall obtain a copy of the applicable test procedure and report form.

2. The trainee shall study the test procedure and test report forms to become familiar with the equipment, terminology, test procedure, calculations and test reports.

3. A qualified technician shall demonstrate the test procedure for the trainee.

4. The trainee shall repeatedly perform the test procedure under the guidance of a qualified technician until proficiency is obtained.

5. The laboratory manager shall observe the trainee demonstrating the procedure and document that the trainee has demonstrated the ability to perform the test procedure, if it is performed properly, by making an entry in the trainee's training record.

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Figure 3.4 – Method for Reviewing the Competency of Testing Technicians

Each laboratory manager is responsible for evaluating the competency of their testing technicians at least once every twelve months by requiring each technician to demonstrate the AASHTO and/or ASTM test procedures for which he/she has been trained to perform. [If a technician does not routinely perform a test, it may not be necessary to evaluate his or her competency to perform the test every twelve months. However, the technicians competency shall be evaluated prior to performing the test.] Copies of the results of all competency evaluations shall be distributed to the Quality Coordinator. Competency evaluation records shall be retained in the office of the Laboratory Manager.

A proficiency sample or stock material may be used for competency testing. AMRL/CCRL assessment may count towards the twelve month testing interval.

For each testing technician, the supervisor shall record the test demonstrated, the date of the demonstration, and the results of the evaluation (satisfactory or unsatisfactory). In addition, the supervisor shall sign each entry on the evaluation record.

If an unsatisfactory result is recorded for a specific test the supervisor shall review all observed deviations from the standard AASHTO or ASTM procedure with the testing technician, observe the technician re-demonstrate the test procedure and record the results as indicated above.

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REVISED: 10-23-18

Figure 3.5 – Technician Training Record

Date: 2-3-97
Revised: 3-29-01

Nebraska Department of Transportation
Materials and Research Division Laboratory

TECHNICIAN TRAINING RECORD

Technician: ________________________________ Laboratory: ________________________________

Date	Test Method	Evaluated By	Comments/Results

DATE: 2-3-97
REVISED: 10-23-18

Figure 3.6 – Technician Competency Evaluation Record

Date: 2-3-97
Revised: 10-23-18

Nebraska Department of Transportation
Materials and Research Division Laboratory

TECHNICIAN COMPETENCY EVALUATION RECORD

Technician: _____ Laboratory: _____

Date	Test Method	Proficiency Sample		Evaluated By	Comments/Results
		Yes	No		

DATE: 01-16-15
REVISED: 10-17-22

Table 3.1 – Test Methods for Internal Proficiency Sample Testing (Competency Evaluation Program)

TEST METHOD	
NUMBER	TITLE
Aggregates Laboratory	
AASHTO T 11	Materials Finer Than 75μm (No. 200) Sieve in Mineral Aggregate by Washing
AASHTO T 19	Unit Weight and Voids in Aggregate
AASHTO T 21	Organic Impurities in Fine Aggregates for Concrete
AASHTO T 27	Sieve Analysis of Fine and Coarse Aggregate
AASHTO T 84	Specific Gravity and Absorption of Fine Aggregate
AASHTO T 85	Specific Gravity and Absorption of Coarse Aggregate
AASHTO T 96	Resistance to Degradation on Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Abrasion Machine
AASHTO T 104	Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
AASHTO T 176	Plastic Fines in Graded Aggregates and Soils by Use of The Sand Equivalent Test
AASHTO T 248	Reducing Field Samples of Aggregate to Testing Size
AASHTO T 255	Total Moisture Content of Aggregate by Drying
AASHTO T 304	Uncompacted Void Content of Fine Aggregate
ASTM D 4791	Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregates
ASTM D 5821	Determining the percentage of Fractured Particles in Coarse Aggregate
Bituminous Laboratory	
~~AASHTO T 44~~	~~Solubility of Bituminous Materials~~
~~*AASHTO T 48*~~	~~*Flash and Fire Points by Cleveland Open Cup*~~
AASHTO T 49	Penetration of Bituminous Materials
AASHTO T 51	Ductility of Bituminous Mixtures
AASHTO T 53	Softening Point of Bitumen (Ring and Ball Apparatus)
AASHTO T 59	Testing Emulsified Asphalts: Residue by Distillation, Saybolt Viscosity 25C, Residue by Evaporation
AASHTO T 72	Saybolt Viscosity 50 C
AASHTO T 78	Distillation of Cut-Back Asphaltic (Bituminous) Products
~~AASHTO T 170~~	~~Recovery of Asphalt from Solution by Abson Method~~
AASHTO T 201	Kinematic Viscosity of Asphalts (Bitumens)
AASHTO T 202	Viscosity of Asphalts by Vacuum Capillary Viscometer
~~AASHTO T 228~~	~~Specific Gravity of Semi-Solid Bituminous Materials~~
AASHTO T 240	Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin-Film Oven Test)
AASHTO T 301	Elastic Recovery Test of Bituminous Materials
AASHTO T 313	Determining the Flexural Creep Stiffness of Asphalt Binder Using the Bending Beam Rheometer (BBR)
AASHTO T 315	Determining the Rheological Properties of Asphalt Binder Using a Dynamic Shear Rheometer
~~AASHTO T 316~~	~~Viscosity determination of Asphalt Binders by Rotational Viscometry~~
AASHTO R 28	Accelerated Aging of Asphalt Binder Using a Pressurized Aging Vessel (PAV)

Table 3.1 – Continued

TEST METHOD	
NUMBER	TITLE
Bituminous Aggregate Laboratory	
AASHTO T 30	Mechanical Analysis of Extracted Aggregate
~~AASHTO T 164~~	~~Quantitative Extraction of Bitumen from Bituminous Paving Mixtures~~
AASHTO T 166	Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens
AASHTO T 209	Maximum Specific Gravity of Bituminous Paving Mixtures
~~AASHTO T 245~~	~~Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus~~
AASHTO T 269	Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
AASHTO T 283	Resistance of Compacted Bituminous Mixture to Moisture Induced Damage
AASHTO T 308	Determining the Asphalt Content of Hot Mix Asphalt (HMA) by the Ignition Method
AASHTO T 312	Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the SHRP Gyratory Compactor
Chemical Laboratory	
ASTM C 114	Chemical Analysis of Hydraulic Cement
PCC Laboratory (Portland Cement Concrete Test Procedures)	
ASTM C 31	Making and Curing Concrete Test Specimens in the Field
ASTM C 39	Compressive Strength of Cylindrical Concrete Specimens
ASMT C 42	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C 138	Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
ASTM C 143	Slump of Hydraulic Cement Concrete
ASTM C 172	Sampling Freshly Mixed Concrete
ASTM C 173	Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C 174	Measuring Length of Drilled Concrete Cores
ASTM C 231	Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 1064	Temperature of Freshly Mixed Portland Cement Concrete
~~ASTM C 1231~~	~~Use of Unbonded Caps in Determination of Compressive Strength of Hardened Concrete Cylinders~~
PCC Laboratory (Hydraulic Cement Test Procedures)	
ASTM C 109	Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)
ASTM C 151	Autoclave Expansion of Portland Cement
ASTM C 185	Air Content of Hydraulic Cement Mortar
ASTM C 187	Normal consistency of Hydraulic Cement
ASTM C 191	Time of Setting of Hydraulic Cement by Vicat Needle
ASTM C 204	Fineness of Portland Cement by Air Permeability Apparatus
~~ASTM C 266~~	~~Time of Setting of Hydraulic Cement Paste by Gillmore Needles~~
ASTM C 305	Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency
~~ASTM C 430~~	~~Fineness of Hydraulic Cement by the 45-μm (No. 325) Sieve~~
~~ASTM C 451~~	~~Early Stiffening of Portland Cement (Paste Method)~~
ASTM C 1222	Evaluation Criteria of Hydraulic Cement Testing
ASTM C 1567	Alkali Silica Reactivity of Combinations of Cementitous Material and Aggregate

Table 3.1 – Continued

TEST METHOD	
NUMBER	TITLE
Soil Mechanics Laboratory	
AASHTO T 208	Unconfined Compressive Strength of Cohesive Soils
AASHTO T 216	One-Dimensional Consolidation Properties of Soils
AASHTO T 236	Direct Shear Test of Soils Under Consolidated Drained Conditions
AASHTO T 265	Laboratory Determination of Moisture Content of Soils
AASHTO T 296	Unconsolidated, Undrained Compressive Strength of Cohesive Soils in Triaxial Compression
AASHTO T 297	Consolidated, Undrained Triaxial Compression Tests on Cohesive Soils
Soils Laboratory	
AASHTO T 19	Unit Weight and Voids in Aggregates
AASHTO T 27	Sieve Analysis of Fine and Coarse Aggregate
AASHTO T 87	Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T 88	Particle Size Analysis of Soils
AASHTO T 89	Determining the Liquid Limit of Soils
AASHTO T 90	Determining the Plastic Limit and Plasticity Index of Soils
AASHTO T 99	The Moisture-Density Relation of Soils Using a (2.5 kg) 5.5 lb Rammer and a (305 mm) 12 in. Drop
AASHTO T 100	Specific Gravity of Soils
AASHTO T 176	Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
AASHTO T 180	Moisture-Density Relations of Soils Using a 10-lb (4.54-kg) Rammer and an 18-in (457-mm) Drop
AASHTO T 248	Reducing Field Samples of Aggregate to Testing Size
AASHTO T 265	Laboratory Determination of Moisture Content of Soils

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NEBRASKA DEPARTMENT OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION LABORATORY
QUALITY SYSTEM MANUAL

4. EQUIPMENT

4.1 *Inventory.*

4.1.1 The inventory of major sampling, testing, calibration and verification equipment contained within the scope of this manual is shown in Appendix C.

4.1.2 Where applicable, manufacturer's instructions for major sampling, testing, calibration and verification equipment used in a particular laboratory shall be kept on file in the Laboratory Manager's office. All manufacturers' instructions shall be kept in the same location within the Laboratory Manager's office and shall be clearly marked so that they are readily available in the event they are needed.

4.1.3 Major equipment is defined as equipment that is normally "tagged" with a State of Nebraska identification number in accordance with Nebraska Department of Transportation Operating Instruction 80-14 (not included in this Quality System Manual). Examples of such equipment are shakers, physical or chemical testing machines, balances, baths, ovens, microscopes, and computing equipment dedicated to testing. There may be equipment that is not "tagged" which is considered major for the purpose of the NDOT Materials and Research Division Laboratory quality system.

4.1.4 Major equipment does not include expendable items such as miscellaneous glassware, sieves, molds and viscometers. Office equipment such as desks, chairs and file cabinets are excluded from the inventory records covered by this Quality System Manual.

4.1.5 New major equipment received by a laboratory or major equipment taken out of service on a permanent basis shall be reported by the Laboratory Supervisor to the Quality Coordinator (see Section 2.4.2) in order that the inventory record (Appendix C) can be revised.

4.1.5.1 Major equipment taken out of service on a permanent basis shall be disposed of as surplus property in accordance with the Nebraska Department of Transportation Operating Instruction 80-6 (not included in the Quality System Manual).

4.2 *Equipment Calibration and Verification.*

4.2.1 Table 4.1 contains a general description, by laboratory, of equipment for performing tests covered by the scope of this manual which requires calibration or verification. Each equipment item listed includes the associated test method(s), the interval of calibration or verification, calibration and verification requirements and a reference to the calibration or verification procedure used. Table 4.1 also identifies the location of calibration and verification records.

4.2.2 Figure 4.1 describes the methods for ensuring that the calibration and verification procedures are performed for all required equipment at the specified intervals. Figure 4.1 also describes procedures for handling equipment which is new, removed from service, out of calibration or defective.

4.2.3 Table 4.2 contains a listing of all in-house equipment calibration and verification procedures which cannot be referenced in applicable standards. Appendix D contains the in-house calibration and verification procedures listed in Table 4.2.

4.2.3.1 A copy of the in-house calibration and verification procedure shall be kept in the equipment record file, if applicable (See Figure 4.1).

4.2.4 Examples of a typical certificate of calibration and certificate of verification are

shown in Figures 4.2 and 4.3 respectively.

4.2.4.1 Certificates of calibration (Figure 4.2) are those received with the purchase of Reference Standard equipment that is used to calibrate or verify other equipment in the laboratory, those received when an outside contractor calibrates testing equipment, or those received from the manufacturer when new equipment is purchased. Reference Standards needing recalibrated will be sent to a facility for recalibration in accordance with Table 4.3.

4.2.4.2 A certificate of verification (Figure 4.3) is issued by the Equipment Calibration/Verification Coordinator or a member of the In-House Inspection Team at regular intervals as identified in Table 4.1 and in accordance with calibration and verification procedures identified in Figure 4.1.

4.2.4.3 Complete calibration and verification records shall be stored on the computer in the Laboratory Supervisor's office in accordance with the procedures identified in Figure 4.1. A duplicate set of calibration and verification records shall be kept in the office of the Equipment Calibration/Verification Coordinator in accordance with the procedures identified in Figure 4.1.

4.3 *Retention of Records*

4.3.1 Calibration and verification records shall be retained in the Laboratory Supervisor's office and the Equipment Calibration/Verification Coordinator's office throughout the useful life of the equipment and for a minimum of five years after the equipment is permanently taken out of service.

4.3.2 Certificates or other documents that establish traceability of in-house equipment or reference standards used for calibration and verification shall be retained in the Equipment Calibration/Verification Coordinator's office.

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Figure 4.1 – Equipment Calibration, Maintenance and Verification Policies and Procedures

General Policies:

1. All equipment files and past records are maintained on the NDOT computer system.

2. Required equipment shall be calibrated at specified intervals following the general procedures indicated below.

3. Newly acquired equipment without manufacturer's certification shall be calibrated or verified before being placed in service. Any item of new equipment, which has been shown by verification or otherwise to be defective, shall be taken out of service and clearly identified by attaching a red ribbon or tape.

4. Equipment that has not been calibrated or verified because it has been removed from service shall be calibrated or verified and maintenance performed if necessary, before being placed back into service.

5. When any piece of equipment is overloaded, mishandled, giving results that are suspect, or is not meeting specification tolerances, the Laboratory Supervisor shall remove it from service and clearly mark it by attaching a red ribbon or tape. The equipment shall be returned to service only after appropriate repairs are made and calibration and verification shows the equipment to function satisfactorily or to meet specification tolerances.

General Procedures – Laboratory Supervisor:

1. The Supervisor in each laboratory shall monitor their labs files which are kept on the computer. Each laboratory has a file created with its name. Inside each file is a list of yearly folders. In each of the yearly folders is a list of equipment which has been checked or monthly folders (Jan. – Dec.). Any discrepancies for example, a piece of equipment not showing up in a folder, shall be reported immediately to the Calibration / Verification Coordinator.

2. During the first week of each month, the Laboratory Supervisor of each laboratory shall review the documents from the current years folder. He or she shall review the monthly folders, make a determination for calibration or verification and if there is any maintenance required and arrange for the necessary work as follows:

    a. *Calibration or Verification by Laboratory Staff* – The Laboratory Supervisor shall instruct appropriate staff to perform the necessary calibration or verification work within the next week and return the completed calibration or verification worksheets. The Laboratory Supervisor shall then forward the worksheets to the Equipment Calibration/Verification Coordinator for review and issuance of a Certificate of Verification.

Figure 4.1 – Continued

b. *Calibration or Verification by In-House Inspection Team* – The Laboratory supervisor shall make arrangements with the Equipment Calibration/Verification Coordinator for calibration or verification work to be performed by the In-House Inspection Team.

c. *Calibration or Verification by Outside Contractor* – The Laboratory Supervisor shall contact the Equipment Calibration/Verification Coordinator to determine the date and time the outside contractor will perform the calibration/verification work.

d. *Maintenance of Equipment* – Some equipment requires routine maintenance. The Laboratory Supervisor the In-House Inspection Team or an Outside Contractor will perform maintenance on the equipment that is needed. This will be done during the calibration or verification intervals of the equipment.

General Procedures – Equipment Calibration/Verification Coordinator

1. The Equipment Calibration/Verification Coordinator has overall responsibility for the In-House Inspection Team and equipment calibration or verification in the Materials and Research Division.

2. The Equipment Calibration/Verification Coordinator shall maintain the files for all calibration or verification work performed within the Materials and Research Division, whether performed by the individual laboratory staff, the In-House Inspection Team or an outside contractor. These files shall include certificates or other documents that establish traceability of in-house equipment or reference standards used for calibration and verification.

3. The Equipment Calibration/Verification Coordinator shall review all calibration or verification worksheets completed by individual laboratory personnel, In-House Inspection Team or an outside contractor and; if appropriate, issue a Certificate of Verification.

DATE: 2-3-97
REVISED: 10-24-19

Figure 4.2 – Typical Certificate of Calibration

Ever Ready Thermometer Co., Inc.
401 Park Avenue South
New York, NY 10016

Report of Calibration

Liquid in Glass Thermometer

Marked: Ertco Cat 1003-3FC S/N - 1292
Range: -1 to +51 Degrees C in 0.1 Degree Graduations

Thermometer Reading	Correction (ITS-90)**
0.00 C	0.00 C
10.00	0.00
20.00	0.00
30.00	0.00
37.00	-0.02
40.00	-0.02
50.00	0.00

** All temperatures in this report are based on the International Temperature Scale if 1990 (ITS-90) published in the Metrolgia 27, No. 1, 3/10/90.

This thermometer was calibrated against a standard calibrated at the National Institute of Standards and Technology (NIST) formerly the National Bureau of Standards (NBS).

For a discussion of accuracies attainable with such thermometers see NBS Nomograph 150.

If no sign is given on the correction, the true temperature is higher than the indicated temperature. If the sign given is negative, the true temperature is lower than the indicated temperature. To use the corrections properly, reference should be made to the notes given below.

The thermometer was tested in a large, closed-top, electrically heated, liquid bath, being "immersed" 76mm. the temperature of the room was about 25 degrees C (77 degrees F). If the temperature is used under conditions which would cause the average temperature of the emergent liquid column to differ markedly from that prevailing in the test, appreciable differences in the indications of the thermometer would result.

The tabulated corrections apply provided the ice-point reading, taken after exposure for not less the 3 days to a temperature of about 20 degrees C (70 degrees F) is 0.00 degrees C. If the ice-point reading is found to higher (or lower) than stated, all other readings will be higher (or lower) to the same extent. If the thermometer is used at a given temperature shortly after being heated to a higher temperature and error of 0.01 degrees of less, for each 10 degree difference between the two temperatures, may be introduced. The tabulate corrections apply if the thermometer is used in the upright position. If used in a horizontal position, the indications may be a few hundredths of a degree higher.

Test Number: 143110
Date: 02/19/92
Standard Serial No. 128239
NIST Identification No. 88024

_____(Signature)_____
Charles Tang-Nian
Quality Control Manager

DATE: 3-21-97
REVISED: 3-29-01

Figure 4.3 – Typical Certificate of Verification

CERTIFICATE OF VERIFICATION

Date: *March 21, 2001*

Equipment Verified: *Hydrometer*

Equipment Serial No.: *1234*

Method Used For Acceptance: *ASTM E 100*

Method Designation: *AASHTO T 88*

Equipment Checked By: *T. Krason*

Calibration Equipment Used: *Caliper #166765, Thermometer #1315, Rule #7734*

Location of Equipment: *M & R Soils Laboratory*

This certificate is issued for the aforementioned equipment and certifies that the equipment has been checked and found to comply with the requirements set forth in the Method listed above.

In order for this equipment to remain in service it must be re-certified on the following date and must comply with the latest methods listed at that time.

Next Calibration Due: *March 21, 2002*

Tim Krason (signature)
For The Materials & Research Division

copies:

Equipment Files
R. Gloe (Soils Laboratory)

DATE: 09-26-18
REVISED: 10-17-22

Table 4.1 – Equipment Calibration and Verification Information

Equipment – Requirement – Test Method	Calib./Verf. Interval (Months)	Calib./Verf. Procedure Reference
AGGREGATES LABORATORY NOTE: All calibration and verification records shall be kept in the office of the Aggregates Laboratory Supervisor.		
Balances, Scales and Weights (General Purpose) – Verify T 11, T 19, T 27, T 84, T 85, T 96, T 104, T 255	12	In-House Procedure # 8
Conical Molds and Tampers – Check Critical Dimensions T 84	24	In-House Procedure # 9
Stand, Funnel and Cylindrical Measure – Check Critical Dimensions, Calibrate Volume T 304	12	In-House Procedure # 35
Hydrometers – Check Critical Dimensions T 104	12	In-House Procedure # 24A
Los Angeles Abrasion Machine – Check RPM and Critical Dimensions T 96	24	In-House Procedure # 7
Mechanical Shakers – Check Sieving Thoroughness	12	In-House Procedure # 27
Ovens – Verify Temperature Settings T 11, T 27, T 96, T 104, T 255, T 176	12	In-House Procedure # 1
Sieves – Check Physical Condition T 11, T 27, T 85, T 104, T 176, D 4791, D 5821	12	In-House Procedure # 25
Steel Spheres – Check Individual Weight and Charge Weight T 96	12	In-House Procedure # 7
Sulfate Oven – Check Rate of Evaporation T 104	12	In-House Procedure # 24B
Sulfate Soundness Containers – Check Physical Condition T 104	12	In-House Procedure # 24
Sodium Solution Bath – Temperature Calibration T 104	12	In-House Procedure # 48
Unit Weight Measure – Calibrate T 19	12	In-House Procedure # 26
Thermometers – Calibrate	12	In-House Procedure # 47
Calipers	12	In House Procedure # 45
BITUMINOUS LABORATORY NOTE: All calibration and verification records shall be kept in the office of the Bituminous Laboratory Supervisor.		
Balances, Scales and Weights (General Purpose) – Verify	12	In-House Procedure # 8
Ductilometers – Calibrate T 51, T 301	12	In-House Procedure # 39
Ovens – Verify Temperature Settings	12	In-House Procedure # 1
Rings, Ring Holder, Balls and Assemblage T 53	12	In-House Procedure # 44

Table 4.1 – Continued

Equipment – Requirement – Test Method	Calib./Verf. Interval (Months)	Calib./Verf. Procedure Reference
BITUMINOUS LABORATORY – CONTINUED		
Penetrometers – Check Accuracy of Dial and Timer, Check Needle Condition T 49	12	In-House Procedure # 12
Vacuum Degassing Oven – Calibrate R 28	12	In-House Procedure # 41
Pressurized Aging Vessel (PAV) – Check Pressure and Temperature R 28	6	In-House Procedure # 31
Dynamic Shear Rheometer – Calibrate T 315	6	In-House Procedure # 40
Bending Beam Rheometers – Calibrate T 313	12	In-House Procedure # 42
Rolling Thin Film Oven – Check Rotation Speed of Carriage, Check Temperature T 240	12	In-House Procedure # 30
Saybolt Viscometers – Calibrate T 59	36	AASHTO T 72
Thermometers – Calibrate T 49, T 201, T 202, T 301	12	In-House Procedure # 47
Timers – Check Accuracy T 201, T 202	12	In-House Procedure # 4
Calipers	12	In House Procedure # 45
BITUMINOUS AGGREGATE LABORATORY NOTE: All calibration and verification records shall be kept in the office of the Bituminous Aggregate Laboratory Supervisor.		
Asphalt Extraction Apparatus – Check Speed of Centrifuge and Critical Dimensions T 164	12	In-House Procedure # 21
Balances, Scales and Weights (General Purpose) – Verify	12	In-House Procedure # 8
Breaking Heads – Check Critical Dimensions T 245 Removed from AASHTO Certification 11/18/16	12	In-House Procedure # 28
Compression Testing Machines –Verify Load Indications T 245 Removed from AASHTO Certification 11/18/16	12	Outside Contractor
Calipers	12	In-House Procedure # 45
Ignition Oven – Verify temperature and Calibrate Balance T 308	12	In-House Procedure # 38
Gyratory Compactor – Calibrate T 312	12	In-House Procedure # 37
Gyratory Molds and Ram Heads – Check Critical Dimensions T 312	12	In-House Procedure # 36
Marshall Molds – Check Critical Dimensions T 245 Removed from AASHTO Certification 11/18/16	12	In-House Procedure # 3
Vacuum System - Check Pressure T 209	12	In-House Procedure # 23

Table 4.1 – Continued

Equipment – Requirement – Test Method	Calib./Verf. Interval (Months)	Calib./Verf. Procedure Reference
BITUMINOUS AGGREGATE LABORATORY – CONTINUED		
Manual and Mechanical Compactors – Check Rammer Weight, Calibrate T 245 Removed from AASHTO Certification 11/18/16	12 Manual 36 Mech.	In-House Procedure # 6 In-House Procedure # 6A
Mechanical Shakers – Check Sieving Thoroughness T 30	12	In-House Procedure # 27
Ovens – Verify Temperature Setting	12	In-House Procedure # 1
Sieves – Check Physical Condition T 30	12	In-House Procedure # 25
Thermometers – Calibrate T 209	12	In-House Procedure # 47
CHEMICAL LABORATORY NOTE: All calibration and verification records shall be kept in the office of the Chemical Laboratory Supervisor.		
Balances, Scales and Weights (General Purpose) – Verify	12	In-House Procedure # 8
Muffle Furnace – Verify Temperature Setting T 105	12	In-House Procedure # 34
X-Ray Fluorescence Spectrometer – Calibrate C 114	24	Manufacturer's Procedure
PCC LABORATORY – CONCRETE TESTING NOTE: All calibration and verification records shall be kept in the office of the PCC Laboratory Supervisor.		
Air Meters – Calibrate C 231	3	ASTM C 231
Balances, Scales and Weights (General Purpose) – Verify	12	In-House Procedure # 8
Bearing Blocks – Check Planeness C 39	12	In-House Procedure # 11
Capping Material – Check Strength Not CCRL Cert.	3	ASTM C 617
Capping Plates and Alignment – Verify C 617	3	In-House Procedure # 15
Compression Test Machines – Verify Load Indications C 39	12	ASTM E 4
Moist Rooms/Storage Tanks – Verify Temperature C 39	6	ASTM C 511
Calipers	12	In-House Procedure # 45
Molds, Plastic – Check Dimensions C 39	Each Shipment	ASTM C 470
Slump Cones – Check Dimensions C 143	12	ASTM C 143
Unit Weight Measure – Calibrate C 138	12	In-House Procedure # 26

Table 4.1 – Continued

Equipment – Requirement – Test Method	Calib./Verf. Interval (Months)	Calib./Verf. Procedure Reference
PCC LABORATORY – CEMENT AND FLY ASH TESTING NOTE: All calibration and verification records shall be kept in the office of the PCC Laboratory Supervisor.		
Air Content Measure – Calibrate C 185	30	CCRL Inspection
Air Permeability Apparatus – Standardize Using NIST 114 C 204	30	ASTM C 204
Air Permeability Apparatus – Verification Using NIST 114 C 204	6	ASTM C 204
Balances and Weights (Analytical) – Verify	12	Outside Contractor
Balances, Scales and Weights (General Purpose) – Verify	12	In-House Procedure # 8
Bearing Blocks – Check Planeness C 109	12	In-House Procedure # 14
Compression Test Machines – Verify Load Indications C 109	12	ASTM E 4
Cube Molds and Tampers – Check Critical Dimensions and Mass C 109	30	CCRL Inspection
Flow Tables – Verify Flow Results C 230	30	CCRL Inspection
Gilmore Test Apparatus – Check Critical Dimensions and Mass C 266 Not CCRL Cert.	30	CCRL Inspection
Mechanical Mixing Apparatus – Check Critical Dimensions and Mass C 305	30	CCRL Inspection
Moist Room Storage Tanks – Verify Accuracy C 109, C 151, C 451, C 191, C 266	6	ASTM C 511
No. 325 Nozzle – Check Flow Rate C 430 Not CCRL Cert.	6	In-House Procedure # 16
No. 325 Sieves – Clean After 5 Determinations. Calibrate After 100 Determinations C 430 Not CCRL Cert.	—	ASTM C 430
Ovens – Verify Temperature Settings	12	In-House Procedure # 1
Standard Sand – conformance to ASTM C 778	Each New Shipment	ASTM C 778
Storage Water – Check for Lime Saturation C 109	6	ASTM C 109
Vicat Apparatus and Vicat Ring – Check Critical Dimensions and Mass C 187, C 191, C 451	30	CCRL Inspection
Thermometers – Calibrate	12	In-House Procedure # 47

Table 4.1 – Continued

Equipment – Requirement – Test Method	Calib./Verf. Interval (Months)	Calib./Verf. Procedure Reference
SOIL MECHANICS LABORATORY NOTE: All calibration and verification records shall be kept in the office of the Soil Mechanics Laboratory Supervisor.		
Balances, Scales and Weights (General Purpose) – Verify T 208, T 216, T 236, T 265, T 296	12	In-House Procedure # 8
Compression or Loading Devices – Verify Load Indications T 208, T 216, T 236, T 296	12	In-House Procedure # 43
Ovens – Verify Temperature Settings T 208, T 216, T 236, T 265	12	In-House Procedure # 1
Timer – Check Accuracy T 208	12	In-House Procedure # 4
Force, Displacement & Pressure Transducers – Calibrate T 208, T 216, T 236, T 296	12	In-House Procedure # 46
SOILS LABORATORY NOTE: All calibration and verification records shall be kept in the office of the Soils Laboratory Supervisor.		
Balances, Scales and Weights (General Purpose) – Verify	12	In-House Procedure # 8
Grooving Tools – Check Critical Dimensions T 89	12	In-House Procedure # 18
Hydrometers – Check Critical Dimensions T 88	24	In-House Procedure # 17A
Liquid Limit Devices – Check Wear and Critical Dimensions T 89	12	In-House Procedure # 18
Manual Hammers – Check Weight and Critical Dimensions T 99, T 180	12	In-House Procedure # 5
Mechanical Mixers and Cups – Check Speed of Mixer, Critical Dimensions and Physical Condition T 88	24	In-House Procedure # 17
Mechanical Shakers – Check Sieving Thoroughness	12	In-House Procedure # 27
Mechanical Soil Rammers – Calibrate T 99, T 180	12	In-House Procedure # 22
Mechanical Shakers – Check Sieving Thoroughness	12	AASHTO T 27
Molds – Check Critical Dimensions T 99. T 180	12	In-House Procedure # 2
Ovens – Verify Temperature Settings	12	In-House Procedure # 1
Sieves – Check Physical Condition	6	In-House Procedure # 25
Straightedges – Check Planeness of Edge T 99, T 180	12	In-House Procedure # 19
Weighted Foot Assembles – Check Weight T 176	12	In-House Procedure # 20
Thermometers – Calibrate	12	In-House Procedure # 47

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Table 4.2 – Listing of In-House Verification Procedures

In-House Verification Procedure Number	Equipment Description	Location of Procedure
1	Drying Ovens	Appendix D, Figure D.1
2	Compaction Molds	Appendix D, Figure D.2
3	Marshall Molds	Appendix D, Figure D.3
4	Timers	Appendix D, Figure D.4
5	Manual Hammer (T99, T180)	Appendix D, Figure D.5
6	Manual and Mechanical Compactors – Rammer Weight, Drop Height (T245)	Appendix D, Figure D.6
6A	Mech. Compactor – Calibration (T245)	Appendix D, Figure D.6A
7	L. A. Abrasion Machine & Steel Spheres	Appendix D, Figure D.7
8	Scales and Balances	Appendix D, Figure D.8
9	Conical Molds and Tampers	Appendix D, Figure D.9
~~10~~	~~Flash Cups~~	~~Appendix D, Figure D.10~~
11	Bearing Blocks & Retainers (ASTM C 39 & ASTM C 1231))	Appendix D, Figure D.11
12	Penetrometers and Water Baths	Appendix D, Figure D.12
~~13~~	~~Thin Film Ovens~~	~~Appendix D, Figure D.13~~
14	Bearing Blocks (ASTM C 109)	Appendix D, Figure D.14
15	Capping Plates and Alignment	Appendix D, Figure D.15
16	Spray Nozzles	Appendix D. Figure D.16
17	Mechanical Mixers and Cups	Appendix D, Figure D.17
17A	Hydrometer (AASHTO T 88)	Appendix D, Figure D.17A
18	Liquid Limit Device and Grooving Tool	Appendix D, Figure D.18
19	Straightedges	Appendix D, Figure D.19
20	Weighted Foot Assembly	Appendix D, Figure D.20
21	Asphalt Extraction Apparatus	Appendix D, Figure D.21
22	Mechanical Soil Rammer	Appendix D, Figure D.22
23	Vacuum System	Appendix D, Figure D.23

Table 4.2 – Continued

In-House Verification Procedure Number	Equipment Description	Location of Procedure
24	Sulfate Soundness Containers	Appendix D, Figure D.24
24A	Hydrometer (AASHTO T 104)	Appendix D, Figure D.24A
24B	Sulfate Oven	Appendix D, Figure D.24B
25	Sieves	Appendix D, Figure D.25
26	Unit Weight Measure	Appendix D, Figure D.26
27	Mechanical Sieve Shaker	Appendix D, Figure D.27
28	Breaking Head	Appendix D, Figure D.28
29	Flow Meter	Appendix D, Figure D.29
30	Rolling Thin Film Oven	Appendix D, Figure D.30
31	Pressurized Aging Vessel (PAV)	Appendix D, Figure D.31
~~32~~	~~Pycnometer~~	~~Appendix D, Figure D.32~~
33	Gas Flow Meter	Appendix D, Figure D.33
34	Muffle Furnace	Appendix D, Figure D.34
35	Funnel Stand and Cylindrical Measure	Appendix D, Figure D.35
36	Gyratory Molds and Ram Heads	Appendix D, Figure D.36
37	Gyratory Compactor	Appendix D, Figure D.37
38	Ignition Oven	Appendix D, Figure D.38
39	Ductilometer	Appendix D, Figure D.39
40	Dynamic Shear Rheometer	Appendix D, Figure D.40
41	Vacuum Degassing Oven	Appendix D, Figure D.41
42	Bending Beam Rheometer	Appendix D, Figure D.42
43	Soil Compression or Loading Devices	Appendix D, Figure D.43
44	Rings, Ringholder, Balls, and Assembly for Softening Point of Bitumen (AASHTO T 53)	Appendix D. Figure D.44
45	Calipers	Appendix D. Figure D.45
46	Force, Displacement & Pressure Transducers	Appendix D. Figure D.46
47	Thermometer & Thermocouples	Appendix D. Figure D.47
48	Sodium Solution Bath	Appendix D. Figure D.48

Table 4.3 – Listing of Reference Standards

Reference Standard	Intervals for Re-Calibration
Balance Weights	Calibrated annually by Nebraska Weights & Measures.
Caliper Gage Block	5 years
Step Gage Blocks (Rheometer)	If Gage Blocks are damaged or the accuracy is in question they will be submitted for re-calibration.
Saybolt Reference Fluid	Fluid will not be kept past its expiration date.
DSR Reference Fluid	Fluid will not be kept past its expiration date.
Thermometers	5 Years
Digital Thermometers	1 Year
Vacuum Gage	3 Years
Pressure Gauge	3 Years
Stopwatch	5 Years
Steel Ruler	1 Year

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NEBRASKA DEPARTMENT OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION LABORATORY
QUALITY SYSTEM MANUAL

5. TEST RECORDS AND REPORTS

5.1 *Procedures*—Figure 5.1 describes the procedures used to produce test records and to prepare, check and amend test reports.

5.2 *Records and Reports.*

5.2.1 The test report forms and lab worksheets used in the various test procedures covered by the scope of this manual are identified in Table 5.1. Table 5.2 shows a listing of test report forms and lab worksheets used by the various laboratories having responsibility for conducting the tests and documenting the test results.

5.2.2 Appendix E contains a copy of all test report forms and lab worksheets covered by the scope of this manual.

5.3 *Retention of Records*—All test records and reports shall be retained in the laboratory performing the tests for a minimum of five years. Records can be hardcopy paper files or electronic forms.

5.4 *Disposal of Records* - Electronic records are saved on the departments servers. They may be deleted from the server after a final project review has been performed and there is no legal litigation pending. Hardcopy files are shredded by the lab supervisor after the final project review has been performed and there is no legal litigation pending.

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Figure 5.1 – Procedures for Producing Test Records and Preparing, Checking and Amending Test Reports

Preparing Sample Log:

Each sample brought to the Materials and Research Division Laboratory shall be recorded in a log book. Each Laboratory Manager will assign responsibility for maintenance of the log book to a technician working in the laboratory. The following information is recorded for each sample:

1. Field sample identification number (when applicable).
2. Laboratory sample identification number.
3. Project number (when applicable).
4. Description of the material.
5. Supplier of the material.
6. Location from which the sample was taken.
7. Name of person(s) who sampled the material.
8. Date of sampling.
9. Date the sample was received in the materials laboratory.
10. The word "RESAMPLE" in red ink (when applicable).
11. The date testing was completed.
12. The initials of the tester.

NOTE: Additional information, unique to a specific laboratory or to a specific type of material may be included in the log book at the discretion of the Laboratory Manager.

Preparing and Checking Test Reports:

1. Test results are recorded on standard worksheets (where applicable) by the technician performing the test.

   NOTE: In some cases, test results may be recorded directly on the final test report.

2. The technician performing the test prepares the test report. The technician either signs the test report or initials the test report adjacent to the signature line in situations where the report is signed by the Laboratory Manager or other management personnel.

3. An original and two copies of the test report are prepared and forwarded to the Laboratory Manager for review.

Figure 5.1 – Continued

4. The distribution of test reports is as follows:

    a. The original test report is filed in the Materials and Research Division project files.
    b. One copy of the test report with worksheets attached is kept on file in the laboratory performing the test.
    c. One copy of the test report is sent to the Project Engineer/Manager.

    NOTE: The number of copies of a test report may vary depending on unique circumstances of the laboratory performing the test or the material being tested. Additional copies of the test report may be needed for forwarding to other Materials and Research Division laboratories, other project personnel, material suppliers, etc.

5. *Report of Failed Test* — In the event results of a test indicate the material has failed to meet specification requirements, an additional copy of the test report will be prepared and forwarded to the Laboratory Manager's immediate supervisor.

Amending Reports:

When a report must be amended a report form shall be filled out indicating the amended test results. The following procedures are used for amending a test report:

1. The words "AMENDED REPORT" shall be printed in bold capital letters in the upper right hand corner of the report form
2. The reason for the amended report shall be stated in the comments section, or other appropriate location, on the report form.
3. The amended report shall be attached to the original report and processed in the normal manner.
4. The amended report shall be filed with the original report.

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Table 5.1 – Listing of Test Report Forms and Worksheets Used for Test Procedures

TEST METHOD		LOCATION	
NUMBER	TITLE	TEST REPORT FIGURE NO.	WORKSHEET FIGURE NO.
Asphalt Binder Test Procedures			
AASHTO R 28	Accelerated Aging of Asphalt Binder Using a Pressurized Aging Vessel (PAV)	*	E1.11
AASHTO T 49	Penetration of Bituminous Materials	*	E1.1
AASHTO T 51	Ductility of Bituminous Mixtures	*	E1.12
AASHTO T 78	Distillation of Cut-Back Asphaltic (Bituminous)Products	*	E1.3
AASHTO T 201	Kinematic Viscosity of Asphalts (Bitumens)	*	E1.4
AASHTO T 202	Viscosity of Asphalts by Vacuum Capillary Viscometer	*	E1.5
AASHTO T 240	Rolling Thin Film (RTFO) Test	*	E1.6
AASHTO T 301	Elastic Recovery of Bituminous Materials by Ductilometer	*	E1.8
AASHTO T 313	Determining Flexural Creep Stiffness of Asphalt Binder Using Bending Beam Rheometer (BBR)	*	E1.9
AASHTO T 315	Determining Rheological Properties of Asphalt Binder Using a Dynamic Shear Rheometer	*	E1.10
* No specific report at this time. SiteManager is in the development for this section. 4-08.			
Emulsified Asphalt Test Procedures			
AASHTO T 53	Softening Point	*	E1.7
AASHTO T 59	Testing Emulsified Asphalts Residue by Distillation Saybolt Viscosity	*	E1.2
* No specific report at this time. SiteManager is in the development for this section. 4-08.			
Hot-Mix Asphalt Test Procedures			
AASHTO T 30	Mechanical Analysis of Extracted Aggregate	E2.1	E2.3, E2.2
AASHTO T 166	Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens	E2.1, 2.10	E2.4, E2.2
AASHTO T 170	Recovery of Asphalt from Solution by Abson Method	—	—
AASHTO T 209	Maximum Specific Gravity of Bituminous Paving Mixtures	E2.1	E2.5, E2.2
AASHTO T 245	Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus	E2.1	E2.2
AASHTO T 269	Percent Air Voids in Compacted Dense and Open Asphalt Mixtures	E2.1	E2.2
AASHTO T 283	Resistance of Compacted Hot Mix Asphalt to Moisture-Induced Damage	E2.1	E2.7, E2.11
AASHTO T 308	Determining the Asphalt Binder Content of Hot-Mix Asphalt by the Ignition Oven Method	E2.1	E2.2

TEST METHOD		LOCATION	
NUMBER	TITLE	TEST REPORT FIGURE NO.	WORKSHEET FIGURE NO.
Hot-Mix Asphalt Test Procedures - Continued			
AASHTO T 312	Density of Hot-Mix Asphalt Specimens by Means of the Superpave Gyratory Compactor	E2.1	E2.2
Hot-Mix Asphalt Aggregate Test Procedures			
ASTM D 4791	Flat and Elongated Particles	—	E3.29,E2.11
ASTM D 5821	Coarse Aggregate Angulary	—	E3.30,E2.11
AASHTO T 11	Materials Finer Than 75µm (No. 200) Sieve in Mineral Aggregate by Washing	—	E3.22, 3.23
AASHTO T 27	Sieve Analysis of Fine and Coarse Aggregate	E3.1, E3.3, E3.4, E3.5, E3.6, E3.14	E3.18, E3.22, E3.23
AASHTO T 84	Specific Gravity and Absorption of Fine Aggregate for Asphalt	E3.1, E3.3 E3.41, 3.46	E3.28, E2.11
AASHTO T 85	Specific Gravity and Absorption of Coarse Aggregate	E3.3	E3.16,E2.11
AASHTO T 96	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Abrasion Machine	E3.1, E3.3, E3.4, E3.5, E3.6, E3.14 E3.41,E3.45 E3.47,E3.48 E3.49	E3.17
AASHTO T 104	Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate	E3.1, E3.3 E3.4, E3.5 E3.6, E3.14 E3.41,E3.45 E3.46,E3.48 E3.49	E3.20,E3.21
AASHTO T 176	Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test	E3.46	E3.24,E2.11
AASHTO T 248	Reducing Field Samples of Aggregate to Testing Size	—	—
AASHTO T 255	Total Moisture Content of Aggregate by Drying	—	E3.32
AASHTO T 304	Uncompacted Void Content of Fine Aggregate	E3.46	E3.31,E2.11
Soil Test Procedures			
AASHTO T 87	Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test	—	—
AASHTO T 88	Particle Size Analysis of Soils	E4.0	E4.1, E4.5
AASHTO T 89	Determining The Liquid Limit of Soils	E3.1, E4.0	E 4.2, E4.3
AASHTO T 90	Determining the Plastic Limit and Plasticity Index of Soils	E3.1, E4.0	E4.2, E4.3
AASHTO T 99	The Moisture-Density Relation of Soils Using a (2.5 kg) 5.5 lb Rammer and a (305 mm) 12 in. Drop	—	E4.4
AASHTO T 100	Specific Gravity of Soils	E4.0	E4.1
AASHTO T 176	Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test	—	E3.24

TEST METHOD		LOCATION	
NUMBER	TITLE	TEST REPORT FIGURE NO.	WORKSHEET FIGURE NO.
Soil Test Procedures - Continued			
AASHTO T 180	Moisture-Density Relations of Soils Using a (4.54-kg) 10-lb Rammer and a (457-mm) 18-in Drop	—	E4.4
AASHTO T 208	Unconfined Compressive Strength of Cohesive Soils	*	E4.6
AASHTO T 216	One-Dimensional Consolidation Properties of Soils	*	E4.9
AASHTO T 236	Direct Shear Test of Soils Under Consolidated Drained Conditions	*	E.4.10
AASHTO T 265	Laboratory Determination of Moisture Content of Soils	—	E4.1, E4.3, E4.4
AASHTO T 296	Unconsolidated, Undrained Compressive Strength of Cohesive Soils in Triaxial Compression	*	E4.7
AASHTO T 297	Consolidated, Undrained Triaxial Compression Test on Cohesive Soils	*	E4.8
*No specific report form. Written technical report summarizing problem areas and solutions based on test data.			
Portland Cement Concrete Test Procedures			
ASTM C 39	Compressive Strength of Cylindrical Concrete Specimens	E5.1	E5.2
ASTM C 138	Unit Weight, Yield, and Air Content (Gravimetric) of Concrete	—	—
ASTM C 143	Slump of Hydraulic Cement Concrete	—	—
ASTM C 172	Sampling Freshly Mixed Concrete	—	—
ASTM C 173	Air Content of Freshly Mixed Concrete by the Volumetric Method	—	—
ASTM C 174	Measuring Length of Drilled Concrete Cores	—	—
ASTM C 231	Air Content of Freshly Mixed Concrete by the Pressure Method	—	—
ASTM C 617	Capping Cylindrical Concrete Specimens	—	—
ASTM C 1231	Use of Unbonded Caps in Determination of Compressive Strength of Hardened Concrete Cylinders	—	—
Portland Cement Concrete Aggregate Test Procedures			
AASHTO T 11	Materials Finer Than 75µm (No. 200) Sieve in Mineral Aggregate by Washing	—	E3.22
AASHTO T 19	Unit Weight and Voids in Aggregate	—	—
AASHTO T 21	Organic Impurities in Fine Aggregates for Concrete	E3.7, E3.10, E3.11,E3.42 E3.43	E3.15
AASHTO T 27	Sieve Analysis of Fine And Coarse Aggregate	E3.1, E3.7 E3.8, E3.9 E3.10,E3.11 E3.12,E3.14 E3.42,E3.43 E3.44, 3.47 E3.48, 3.50	E3.18, E3.22 E3.23

TEST METHOD		LOCATION	
NUMBER	TITLE	TEST REPORT FIGURE NO.	WORKSHEET FIGURE NO.
Portland Cement Concrete Aggregate Test Procedures - Continued			
AASHTO T 84	Specific Gravity and Absorption of Fine Aggregate	E3.1, E3.7 E3.10,E3.11 E3.42,E3.43	E3.19
AASHTO T 85	Specific Gravity and Absorption of Coarse Aggregate	E3.1, E3.8 E3.12,E3.44 E3.51	E3.16
AASHTO T 96	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Abrasion Machine	E3.1, E3.8 E3.10,E3.11 E3.12,E3.14 E3.42,E3.44 E3.47,E3.48	E3.17
AASHTO T 104	Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate	E3.1, E3.7 E3.10,E3.11 E3.14,E3.42 E3.43,E3.48	E3.20, E3.21
AASHTO T 176	Sand Equivalent Test	E3.10,E3.11 E3.42	E3.24
AASHTO T 248	Reducing Field Samples of Aggregate to Testing Size	—	—
AASHTO T 255	Total Moisture Content of Aggregate by Drying	—	E3.32
Hydraulic Cement Test Procedures			
ASTM C 109	Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)	E6.1, E6.2, E6.3	E6.11
ASTM C 114	Chemical Analysis of Hydraulic Cement	E6.12a - c	E6.13
~~ASTM C 151~~	~~Autoclave Expansion of Portland Cement~~	~~E6.1, E6.2, E6.3~~	~~E6.10~~
ASTM C 151	Supplemental Cementitious Materials – SCM Autoclave Expansion	—	E6.20
ASTM C 185	Air Content of Hydraulic Cement Mortar	E6.1, E6.2, E6.3	E6.9
ASTM C 187	Normal Consistency of Hydraulic Cement	—	E6.8
ASTM C 191	Time of Setting of Hydraulic Cement by Vicat Needle	E6.3	E6.8
ASTM C 204	Fineness of Portland Cement by Air Permeability Apparatus	E6.1, E6.2	E6.7
ASTM C 305	Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency	—	—
ASTM C 311	Portland Cement Concrete (Strength Activity Index)	—	E6.14
ASTM C 311 / C 109	Supplemental Cementitious Materials – SCM (SAI w/ Portland Cement Worksheet)	—	E6.15
ASTM C 311 / C 188	Supplemental Cementitious Materials – SCM (Density)	—	E6.19

TEST METHOD		LOCATION	
NUMBER	TITLE	TEST REPORT FIGURE NO.	WORKSHEET FIGURE NO.
Hydraulic Cement Test Procedures – Continued			
ASTM C 430	Fineness of Hydraulic Cement by the 45-µm (No. 325) Sieve	—	E6.4
ASTM C 430	Supplemental Cementitious Materials – SCM Fineness of Hydraulic Cement 45µm Sieve (No.325)	—	E6.21
ASTM C 451	Early Stiffening of Portland Cement (Paste Method)	E6.1, E6.2	E6.5
ASTM C 618	Supplemental Cementitious Materials – SCM Class C Fly Ash Physical Analysis	—	E6.16
ASTM C 618	Supplemental Cementitious Materials – SCM Class F Fly Ash Physical Analysis	—	E6.17
ASTM C 989	Supplemental Cementitious Materials – SCM Ground Granulated Blast – Furnace Slag Phy. Analysis	—	E6.18

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Table 5.2 – Listing of Test Report Forms and Worksheets Used in Laboratories

Form Description	Type of Form	Location of Form
Aggregates Laboratory		
Report of Test, Crushed Rock AASHTO T 27, T 84, T 85, T 89, T 90, T 96, T 104 NDR T 103, T 504	Test Report	App. E, Fig. E3.1
~~Report of Test, Crushed Concrete for Use in Asphaltic Concrete~~ ~~AASHTO T 27, T 85, T 96, T 104~~ ~~NDR T 103, T 504, T 584~~	~~Test Report~~	~~App. E, Fig. E3.2~~
Report of Test, Crushed Rock for Use in Asphaltic Concrete AASHTO T 27, T 85, T 96, T 104 NDR T 89, T 90, T 103, T 504, ~~T 585~~	Test Report	App. E, Fig. E3.3
Report of Test, Mineral Aggregate for Use in Asphaltic Concrete AASHTO T 27, T 96, T 104, T 89, T 90 ~~NDR T 89, T 90, T 584~~	Test Report	App. E, Fig. E3.4
Report of Test, Mineral Aggregate for Use in Armor Coat AASHTO T 27, T 96, T 104, T 248	Test Report (SiteManager)	App. E, Fig. E3.5
Report of Test, Gravel Surfacing AASHTO T 27, T 96, T 104, T 248	Test Report SM	App. E, Fig. E3.6
Report of Test, Fine Aggregate (Class A) for Use in High Density Low Slump or Silica Fume Concrete AASHTO T 21, T 27, T 84, T 104, T 248 NDR T 504	Test Report SM	App. E, Fig. E3.7
Report of Test, Coarse Aggregate (Class F) for Use in High Density Low Slump or Silica Fume Concrete AASHTO T 27, T 85, T 96, T 248 NDR T 103, T 504	Test Report SM	App. E, Fig. E3.8
~~Report of Test, Fine Aggregate (Class D) for Use in Grout Sand~~ ~~AASHTO T 27~~ ~~NDR T 504~~	~~Test Report~~	~~App. E, Fig. E3.9~~
Report of Test, Fine Aggregate (Class B) for Use in Class 47B Concrete AASHTO T 21, T 27, T 84, T 96, T 104, T 176, T 248 NDR T 504	Test Report SM	App. E, Fig. E3.10
Report of Test, Sand Gravel Aggregate (Class C) for Use in Class AX & BX Concrete AASHTO T 21, T 27, T 84, T 104, T 176, T 248 NDR T 504	Test Report SM	App. E, Fig. E3.11
Report of Test, Coarse Aggregate (Class E) for Use in Class 47B Concrete AASHTO T 27, T 85, T 96, T 248 NDR T 103, T 504	Test Report SM	App. E, Fig. E3.12
Report of Test, General AASHTO T 27, T 88, T 89, T 90, T 96, T 99, T 100, T 104 NDR T 103	Test Report	App. E, Fig. E3.14

Form Description	Type of Form	Location of Form
Aggregates Laboratory – Continued		
Organic Impurities in Fine Aggregate for Concrete AASHTO T 21	Lab Worksheet	App. E, Fig. E3.15
Coarse Aggregate Specific Gravity and Absorption AASHTO T 85	Lab Worksheet	App. E, Fig. E3.16
Aggregate - Los Angeles Abrasion Test AASHTO T 96	Lab Worksheet	App. E, Fig. E3.17
Sieve Analysis of Mixtures of Fine and Coarse Grained Materials AASHTO T 27	Lab Worksheet	App. E, Fig. E3.18
Fine Aggregate Specific Gravity and Absorption for Concrete AASHTO T 84	Lab Worksheet	App. E, Fig. E3.19
Aggregate - Sodium Sulfate Soundness Test, Record of Cycles AASHTO T 104	Lab Worksheet	App. E, Fig. E3.20
Sodium Sulfate Soundness Test AASHTO T 104	Lab Worksheet	App. E, Fig. E3.21
Coarse Aggregate for Concrete (All Classes) AASHTO T 11, T 27, T 255	Lab Worksheet	App. E, Fig. E3.22
Sieve Analysis of Aggregates AASHTO T 27	Lab Worksheet	App. E, Fig. E3.23
Sand Equivalent Test AASHTO T 176	Lab Worksheet	App. E, Fig. E3.24
Percent Clay, Shale and Soft Particles NDR T 504	Lab Worksheet	App. E, Fig. E3.25
Aggregate, Freezing and Thawing Test (16 Cycles) NDR T 103	Lab Worksheet	App. E, Fig. E3.26
Aggregate and Stone, Record of Freezing and Thawing Cycles NDR T 103	Lab Worksheet	App. E, Fig. E3.27
Aggregate for Asphaltic Concrete - Specific Gravity and Absorption AASHTO T 84	Lab Worksheet	App. E, Fig. E3.28
Flat and Elongated Particles ASTM D 4791	Lab Worksheet	App. E, Fig. E3.29
Coarse Aggregate Angulary (CAA) ASTM D 5821	Lab Worksheet	App. E, Fig. E3.30
Uncompacted Void Content of Fine Aggregate AASHTO T 304	Lab Worksheet	App. E, Fig. E3.31
Total Moisture Content of Aggregate by Drying AASHTO T 255	Lab Worksheet	App. E, Fig. E3.32
Aggregate Laboratory Sample Record	Sample Record Check-In	App. E, Fig. E3.33
Fine Aggregate Laboratory Sample Record	Sample Record Check-In	App. E, Fig. E3.34
Coarse Aggregate Laboratory Sample Record	Sample Record Check-In	App. E, Fig. E3.35
Crushed Rock Laboratory Sample Record	Sample Record Check-In	App. E, Fig. E3.36
Super Pave Combined Mineral Aggregate	Sample Record Check-In	App. E, Fig. E3.37

Form Description	Type of Form	Location of Form
Aggregates Laboratory – Continued		
Report of Test, CAA and FAA	Test Report	App. E, Fig. E3.38
Report of Test, Mineral Aggregate – Ice Control (District) AASHTO T 27, T 248	Test Report	App. E, Fig. E3.39
Report of Test, Combined Mineral Aggregate AASHTO T 27, T 248, T 304	Test Report	App. E, Fig. E3.40
Report of Test, Asphaltic Concrete Aggregate AASHTO T 27, T 84, T 96, T 104, T 248 NDR T 504	Test Report SM	App. E, Fig. E3.41
Report of Test, Fine Aggregate for Precast / Prestressed Concrete. AASHTO T 21, T 27, T 84, T 96, T 104, T 176, T 248 NDR T 504	Test Report SM	App. E, Fig. E3.42
Report of Test, C33 Fine Sand AASHTO T 21, T 27, T 84, T 104. T 248 NDR T 504	Test Report SM	App. E, Fig. E3.43
Report of Test, Coarse Aggregate for Precast / Prestressed Concrete. AASHTO T 27, T 85, T 96, T 248 NDR T 103, T 504	Test Report SM	App. E, Fig. E3.44
Report of Test, Chip Seal Aggregate AASHTO T 27, T 96, T 104, T 248	Test Report SM	App. E, Fig. E3.45
Report of Test, Microsurfacing - Mineral Aggregate AASHTO T 27, T 84, T 96, T 104, T 176,T 248, T 304	Test Report SM	App. E, Fig. E3.46
Report of Test, Crushed Rock for Surfacing AASHTO T 27, T 96, T 248 NDR T 103	Test Report SM	App. E, Fig. E3.47
Report of Test, Gravel for Surfacing, Class X AASHTO T 27, T 96, T 104, T 248	Test Report SM	App. E, Fig. E3.48
Report of Test, Granite, Dolomite Aggregates for Asphaltic Concrete. AASHTO T 27, T 96, T 104. T 176, T 248 NDR T 173, T 504	Test Report SM	App. E, Fig. E3.49
Report of Test, Granular Subdrain AASHTO T 27 NDR T 103	Test Report SM	App. E, Fig. E3.50
Report of Test, Rock Riprap, Gabion and Revet Mattress Stone AASHTO T 85, T 103	Test Report SM	App. E, Fig. E3.51
Report of Test, Mineral Aggregate for Armor Coat (District) AASHTO T 27, T 96, T 104, T 248	Test Report	App. E, Fig. E3.52
Bituminous Laboratory		
Penetration of Bituminous Materials AASHTO T 49	Lab Worksheet	App. E, Fig. E1.1
Ductility of Bituminous Mixtures AASHTO T 51	Lab Worksheet	App. E, Fig. E1.12
Emulsified Asphalt Residue by Distillation AASHTO T 59	Lab Worksheet	App. E, Fig. E1.2
Distillation of Cut –Back Asphaltic (Bituminous) Products AASHTO T 78	Lab Worksheet	App. E, Fig. E1.3

Form Description	Type of Form	Location of Form
Bituminous Laboratory – Continued		
Kinematic Viscosity of Asphalts (Viscosity at 135^{o} C) AASHTO T 201	Lab Worksheet	App.E, Fig. E1.4
Viscosity of Asphalt by Vacuum Capillary Viscometer (at 60º C) AASHTO T 202	Lab Worksheet	App. E, Fig. E1.5
Rolling Thin Film Oven (RTFO) Test AASHTO T 240	Lab Worksheet	App. E, Fig. E1.6
Softening Point AASHTO T 53	Lab Worksheet	App. E, Fig. E1.7
Elastic Recovery of Bituminous Materials by Ductilometer AASHTO T 301	Lab Worksheet	App. E, Fig. E1.8
Determining the Flexural Creep Stiffness of Asphalt Binder Using the Bending Beam Rheometer (BBR) AASHTO T 313	Lab Worksheet	App. E, Fig. E1.9
Determining Rheological Properties of Asphalt Binder Using a Dynamic Shear Rheometer AASHTO T 315	Lab Worksheet	App. E, Fig. E1.10
Accelerated Aging of Asphalt Binder Using a Pressurized Aging Vessel (PAV) AASHTO R 28	Lab Worksheet	App. E, Fig. E1.11
Bituminous Aggregate Laboratory		
Asphaltic Concrete Summary of Tests AASHTO T 30, T 166, T 209, T 245, T 269, T 283, T 304, T 308, T 312	Test Report	App. E, Fig. E2.1
Report of Test Data – Collected Data Creates Summary of Tests Report for Asphaltic Concrete Mixtures AASHTO T 30, T 166, T 209, T 245, T 269, T 283, T 304, T 308, T 312	Test Data Worksheet	App. E, Fig. E2.2
Mechanical Analysis of Extracted Aggregate AASHTO T 30	Lab Worksheet	App. E, Fig. E2.3
Bulk Specific Gravity of Compacted Bituminous Mixtures using Saturated Surface-Dry Specimens AASHTO T 166	Lab Worksheet	App. E, Fig. E2.4
Maximum Specific Gravity of Bituminous Paving Mixtures AASHTO T 209	Lab Worksheet	App. E, Fig. E2.5
Percent Air Voids in Compacted Dense and Open Asphalt Mix AASHTO T 269	Lab Worksheet	App. E, Fig. E2.6
Resistance of Compacted Hot Mix Asphalt to Moisture-Induced Damage AASHTO T 283	Lab Worksheet	App. E, Fig. E2.7
Determining the Asphalt Binder Content of Hot-Mix Asphalt by the Ignition Oven Method AASHTO T 308	Lab Worksheet	App. E, Fig. E2.8
Density of Hot-Mix Asphalt Specimens by Means of the Superpave Gyratory Compactor AASHTO T 312	Lab Worksheet	App. E, Fig. E2.9
Asphaltic Concrete Density Correlation Summary AASHTO T 166	Test Report	App. E, Fig. E2.10
Asphalt Concrete Design AASHTO T 84, T 85, T 176, T 283, T 304, ASTM D 5821	Lab Worksheet	App. E, Fig. E2.11

Form Description	Type of Form	Location of Form
Cement and Concrete Laboratory		
Summary of Compressive Strength Test Data for Portland Cement Concrete Cylinders ASTM C 39	Test Report	App. E, Fig. E5.1
Compressive Strength of Concrete Cylinders Worksheet ASTM C 39	Lab Worksheet	App. E, Fig. E5.2
Portland Cement Physical Analysis (Type I/II Cement) ASTM C 109, C 151, C 185, C 204, C 266, C 451	Test Report	App. E, Fig. E6.1
Portland Cement Physical Analysis (Type III Cement) ASTM C 109, C 151, C 185, C 266, C 451	Test Report	App. E, Fig. E6.2
Portland Cement Physical Analysis (Type IP Cement) ASTM C 109, C 151, C 185, C 191 C 204	Test Report	App. E, Fig. E6.3
Fineness of Hydraulic Cement Worksheet ASTM C 430	Lab Worksheet	App. E, Fig. E6.4
Early Stiffening of Hydraulic Cement Worksheet ASTM C 451	Lab Worksheet	App. E, Fig. E6.5
Fineness of Hydraulic Cement Worksheet ASTM C 204	Lab Worksheet	App. E, Fig. E6.7
Normal Consistency Time of Set, Vicat, Worksheet ASTM C 187, C 191	Lab Worksheet	App. E, Fig. E6.8
Air content for Hydraulic Cement Mortar Worksheet ASTM C 185	Lab Worksheet	App. E, Fig. E6.9
Autoclave Expansion Worksheet (Cementitious Materials) ASTM C 151	Lab Worksheet	App. E, Fig. E6.10
Cube Compressive Strength Worksheet (Hydraulic Cement Mortar) ASTM C 109	Lab Worksheet	App. E, Fig. E6.11
Portland Cement Concrete(Strength Activity Index) ASTM C 311	Lab Worksheet	App. E, Fig. E6.14
Supplemental Cementitious Materials – SCM (Strength Activity Index with Portland Cement Worksheet) ASTM C 311 / C 109	Lab Worksheet	App. E, Fig. E6.15
Supplemental Cementitious Materials – SCM Class C Fly Ash Physical Analysis ASTM C 618	Lab Worksheet	App. E, Fig. E6.16
Supplemental Cementitious Materials – SCM Class F Fly Ash Physical Analysis ASTM C 618	Lab Worksheet	App. E, Fig. E6.17
Supplemental Cementitious Materials – SCM Ground Granulated Blast-Furnace Slag Physical Analysis ASTM C 989	Lab Worksheet	App. E, Fig. E6.18
Supplemental Cementitious Materials – SCM (Density) ASTM C 311 / C 188	Lab Worksheet	App. E, Fig. E6.19
Supplemental Cementitious Materials – SCM Autoclave Expansion ASTM C 151	Lab Worksheet	App. E, Fig. E6.20
Supplemental Cementitious Materials – SCM Fineness of Hydraulic Cement 45µm Sieve (No.325) Sieve ASTM C 430	Lab Worksheet	App. E, Fig. E6.21

Form Description	Type of Form	Location of Form
Chemical Laboratory		
Portland Cement Chemical Analysis – Type I/II Cement ASTM C 114, C 150	Test Report	App. E, Fig. E6.12a
Portland Cement Chemical Analysis – Type III Cement ASTM C 114, C 150	Test Report	App. E, Fig. E6.12b
Portland Cement Chemical Analysis – Type IP Cement ASTM C 114, C 150	Test Report	App. E, Fig. E6.12c
ASTM C 114 Rapid Test Methods Calibration Worksheet ASTM C 114	Lab Worksheet	App. E, Fig. E6.13
Soil Mechanics Laboratory		
Triaxial Test – Unconfined Compressive Strength of Cohesive Soil AASHTO T 208	Lab Data Sheet	App. E, Fig. E4.6
Triaxial Test – Unconsolidated, Undrained Compressive Strength of Cohesive Soils in Triaxial Compression AASHTO T 296	Lab Data Sheet	App. E, Fig. E4.7
Triaxial Test – Consolidated, Undrained Triaxial Compression Test on Cohesive Soils AASHTO T 297	Lab Data Sheet	App. E, Fig. E4.8
One Dimensional Consolidation Properties of Soils AASHTO T 216	Lab Data Sheet	App. E, Fig. E4.9
Direct Shear Test of Soils Under Consolidated Drained Conditions AASHTO T 236	Lab Data Sheet	App. E, Fig. E4.10
Soils Laboratory		
Report of Test, Stabilized Mixture for Use in Foundation Course (Regular) AASHTO T 27 NDR T 99	Test Report	App. E, Fig. E3.13
Report of Test, General AASHTO T 27, T 88, T 89, T 90, T 100, T 248 NDR T 99	Test Report	App. E, Fig. E4.0
Sand Equivalent Test AASHTO T 176	Lab Worksheet	App. E, Fig. E3.24
Particle Size Analysis of Soils AASHTO T 88, T 100, T 265	Lab Worksheet	App. E, Fig. E4.1
Plasticity Index Summary Sheet AASHTO T 89, T 90	Lab Worksheet	App. E, Fig. E4.2
Liquid and Plastic Limits and Moisture Content AASHTO T 89, T 90, T 265	Lab Worksheet	App. E, Fig. E4.3
Moisture-Density Relations of Soils AASHTO T 99, T 180, T 265	Lab Worksheet	App. E, Fig. E4.4
Grain Size Accumulation Chart AASHTO T 88	Lab Worksheet	App. E, Fig. E4.5

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6. SAMPLE MANAGEMENT

6.1 Figure 6.1 describes the procedures to be used for sample identification, storage, retention and disposal of samples.

NOTE 2 – The term “storage” refers to what is done before testing. The term “retention” refers to what is done after testing.

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Figure 6.1 – Procedure for Sample Management

PROCESSING OF SAMPLES

Identification:

A AASHTOWare sample ID tag shall accompany each sample. The AASHTOWare ID tag gives that material its own unique ID number, provides a project number, contract number, project manager and the number of units. The sample identification form is kept with the sample or the sample is identified with an ID marking as long as it remains in the laboratory.

Storage:

After being logged in, samples are stored in the area of the laboratory in which testing is to be done. During storage, care is taken to avoid disturbance or contamination. Any AASHTO requirements for storage (e.g., the moist storage of Portland Cement concrete cylinders) are followed.

Retention:

Samples with acceptable test results are generally discarded when testing is completed. Those with failing results are retained until reviews of those results are completed. At that time the decision is made whether to discard, retest, or continue to retain the sample.

Disposal:

Laboratory personnel transport discarded non-hazardous materials to a holding area (loading dock area) where the materials remain until disposal occurs. Discarded hazardous materials (e.g., bituminous concrete extraction solution) are stored in proper containers in an isolated area of the laboratory. Disposal is arranged periodically by the NDOT Operations Division's Procurement Officer.

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7. DIAGNOSTIC AND CORRECTIVE ACTION

7.1 *Proficiency Samples and On-Site Inspection Programs:*

7.1.1 The NDOT Materials and Research Division Laboratory will participate, at routine intervals, in the proficiency sample and on-site inspection programs of AASHTO re:source and the Cement and Concrete Reference Laboratory (CCRL).

7.1.2 Figure 7.1 describes participation in AASHTO re:source and CCRL proficiency sample and on-site inspection programs, methods used to identify poor results, and procedures to follow when poor results or deficiencies occur.

7.2 *External Technical Complaints:*

7.2.1 Figure 7.2 outlines the procedures to be used in responding to external technical complaints.

7.2.2 Retention of Records – All reports or replies relating to an external technical complaint shall be retained for a minimum of three years in the office of the Materials and Research Engineer (Technical Manager).

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Figure 7.1 – Procedures Related to Proficiency Sample Testing and On-Site Inspections

GENERAL

When the NDOT Materials and Research Division receives reports pertaining to proficiency sample testing, on-site inspection, and quality system evaluation, they are forwarded to the Quality Coordinator for review.

It is the responsibility of the Quality Coordinator to review all reports and to bring poor results or deficiencies to the attention of the appropriate Laboratory Manager. It is the responsibility of the Laboratory Manager to ensure that corrective action is taken and documented. (In some cases, it may be necessary for the Quality Coordinator to take corrective action and prepare documentation relative to specific differences.)

The Materials and Research Division Engineer, Flexible Pavement & Quality Assurance Engineer, or Quality Coordinator shall report all actions taken to correct inspection deficiencies to the appropriate inspection agency within the specified time frame.

Reports covering the results of proficiency sample testing and on-site inspections and quality system evaluations, and memorandums summarizing investigations and any corrective action taken shall be maintained by the appropriate Laboratory Manager in the Laboratory Manager's office for a minimum of 5 years.

PROFICIENCY SAMPLE TESTING

Participation:

AMRL Soil Proficiency Sample Program
AMRL Coarse and Fine Aggregate Proficiency Sample Program
AMRL Asphalt Cement Proficiency Sample Program
AMRL Emulsified Asphalt Proficiency Sample Program
AMRL Bituminous Concrete Proficiency Sample Program
CCRL Concrete Proficiency Sample Program
CCRL Portland Cement Proficiency Sample Program (Physical and Chemical samples)
CCRL Blended Cement Proficiency Sample Program (Physical and Chemical samples)
CCRL Rebar Proficiency Sample Program

Identifying Poor Results:

A poor result is any result that is beyond two standard deviations from the average value.

Procedures to Follow when Poor Results Occur:

1. Determine if the agency conducting the proficiency sample program correctly entered the data reported.
2. Determine if the test result obtained was properly transferred to the data sheet submitted.
3. Determine if all calculations leading to the test results obtained were correct.
4. Determine if the equipment used to perform the test meets specification requirements.

Figure 7.1 – Continued

5. Determine if the procedures followed when performing the test conformed to specification requirements.
6. Take corrective action to repair or take steps to replace defective equipment or instruct the technician of the correct procedure to follow.
7. Prepare a memorandum of record summarizing the results of the investigation, identifying the cause of the poor results, if determined, and describing any corrective action taken.

ON-SITE INSPECTIONS

Participation:

AMRL Soils Inspection Program
AMRL Aggregate Inspection Program
AMRL Asphalt Cement Inspection Program
AMRL Emulsified Asphalt Inspection Program
AMRL Bituminous Concrete Inspection Program
CCRL Portland Cement Concrete Inspection Program
CCRL Hydraulic Cement Inspection Program

Procedures to Follow when Deficiencies are Reported:

(Apparatus Deficiencies)

1. Determine if the equipment meets specification requirements.
2. If the equipment is found to be defective take necessary steps to repair or replace it.
3. Prepare a memorandum of record summarizing the results of the investigation and any corrective action taken.

(Procedural Deficiencies)

1. Discuss each procedural deficiency with the testing technician and review the proper procedure.
2. Observe the technician perform the test properly.
3. Prepare a memorandum of record summarizing the action taken.

(Quality System Deficiencies)

1. The Quality Coordinator shall review each deficiency cited by the evaluator with the responsible employee.
2. Take appropriate action.
3. Prepare a memorandum of record summarizing the action taken.

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Figure 7.2 – Procedures for Handling Complaints

Upon receipt of a technical complaint, the following actions shall be taken:

1. The Materials and Research Engineer (Technical Manager) shall be notified.

2. The complaint is brought to the attention of the Laboratory Manager of the laboratory in question and the Laboratory Manager's immediate supervisor.

3. The Laboratory Manager contacts the complainant to verify all aspects of the complaint and establishes a resolution date (if necessary).

4. All reports, records and pertinent data shall be reviewed; and all calculations checked for accuracy.

5. The technician(s) performing the test is consulted by the Laboratory Manager to determine any unusual problems or circumstances involved.

6. The Laboratory Manager reports all information gathered to the Materials and Research Engineer and the Laboratory Manager's immediate supervisor.

7. The Materials and Research Engineer shall formulate an appropriate reply and issue same to the complainant.

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8. INTERNAL QUALITY SYSTEM REVIEW

8.1 *Scope and Responsibility.*

8.1.1 Figure 8.1 describes the scope of internal quality system reviews.

8.1.2 The Quality Coordinator (see Section 2.4.2) has overall responsibility for the review of the internal quality system. Equipment calibration, verification and inspection reviews are the responsibility of the Equipment Calibration/Verification Coordinator (see Section 2.4.3) who will work with the Quality Coordinator in accomplishing the overall review of the internal quality system.

8.1.2.1 Figure 8.2 shows the form to be used by the Quality Coordinator and the Equipment Calibration/Verification Coordinator in conducting the quality system review of the individual testing laboratories.

8.2 *Retention of Records*—Internal quality system review reports shall be retained in the office of the Quality Coordinator for a minimum of five years.

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Figure 8.1 – Quality System Review Procedures

1. The Quality Coordinator shall review the following records, reports and associated documents every 12 months to ensure that established quality procedures are being followed:
    a. Proficiency Sample Reports
    b. On-Site Inspection Reports
    c. External Quality System Evaluation Reports
    d. Testing Technician Training Records
    e. Testing Technician Evaluation Records
    f. Major Equipment Inventory Records

2. The Equipment Calibration/Verification Coordinator shall review equipment calibration, verification and inspection records every 12 months to ensure that established quality procedures are being followed.

3. The results of the quality system review shall be recorded (satisfactory or unsatisfactory) for each item identified above. (See Figure 8.2 for the form to be used for recording the results of the quality system review.) Deficiencies shall be recorded in the comments section of the report form or on a separate sheet attached to the report form.

4. After the 12 month review the Quality Coordinator and/or the Equipment Calibration/Verification Coordinator shall discuss any deficiencies noted with the Laboratory Manager, make sure corrective action is taken and jointly prepare a memorandum identifying deficiencies and corrective action taken. Copies of the Quality System Review Report and the attached memorandum (if required) shall be forwarded to the Laboratory Manager, the Laboratory Manager's immediate supervisor and the Materials and Research Engineer.

5. A file containing all documents relating to the internal quality system review shall be maintained in the office of the Quality Coordinator.

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Figure 8.2 – Internal Quality System Review Report

INTERNAL QUALITY SYSTEM REVIEW REPORT

Laboratory:	

Item	List Specific Record(s) Reviewed	Are records & corrective actions complete?
QMS policies and procedures, including document control		
Technician training records		
Technician competency evaluation records		
Previous internal audit findings		
Customer Complaints		
Records retention		
Equipment inventory list		
Equipment calibration, standardization, check and maintenance lists and records		
Test records and reports		
Proficiency sample reports		
On-site assessment reports		

Comments:

List specific QMS policies and procedures reviewed. Does the information accurately reflect current practices? Do they fulfill the requirements of standards we use? Is the preparation or revision date for each document correct? Include any revisions and improvements needed.

List employees interviewed during the audit:

List audit findings that require corrective action:

Audit conducted by: _____

Date: _____

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9. SUBCONTRACTING

9.1 The NDOT Materials and Research Division Laboratory performs all testing covered by the scope of this manual in-house and does not engage subcontractors for testing purposes.

9.2 The NDOT Materials and Research Division uses outside agencies for calibration of compression machines, load cells, analytical scales and balances, autoclave valves, thermometers, calibration baths, and calibration weights used for tests covered by the scope of this manual. Figure 9.1 lists the outside contractors used for this purpose.

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Figure 9.1 – Outside Calibration Contractor List

The following outside contractors provide calibration services described in Paragraph 9.2.

Compression Machines, Load Cells (Maintenance includes lubrication of breaking heads and adjustment of fluids.) Calser Calibrations, LLC PO Box 91 St. Jacob, IL 62281 (618) 644-0329 Instron 825 University Ave. Norwood MA 02062 781-575-5420	**Scales, Balances** Alfie Packers, Inc. 8901 J street Suite 10 Omaha NE 68127 800-333-7845 402-592-9102 QA Balance Service 7201 Cedar Creek Cr. Lincoln NE 68516 402-420-2774
Autoclave Valves Pioneer Industrial Corp. 36 Whse Hastings 113 S Lincoln Hastings NE 68901	**Thermometers, Calibration Baths** ThermoWorks Inc. 741 E. Utah Valley Dr. American Fork, UT 840003 801-756-7705
Calibration Weights Nebraska Department of Agriculture Division of Weights and Measures 3271 West Cumming Street Lincoln NE 68524 402-471-2087	**Vacuum & Pressure Gauge** Interstate Industrial Instrumentation, Inc. 10424 J. Street. P.O. Box 27310 Omaha, NE 68127 402-331-3535 Fax 404-339-2445
Steel Rulers Cross Precision Measurement 10327 Chandler Circle, STE 100. LaVista NE Omaha Ph: 423-498-6276 712-256-2135	

Figure A.1 – Class Specification, Engineer VII

February 28, 2007 - State of Nebraska, Department of Administrative Services

STATE OF NEBRASKA	CLASS CODE: G55327
CLASS SPECIFICATION	SALARY GRADE: 20
EST: 08/70 - REV: 11/97	OVERTIME STATUS: E

ENGINEER VII

DESCRIPTION: Performs highly responsible administrative and professional engineering work at the major division head or comparable organizational level; performs related work as required.

EXAMPLES OF WORK: (A position may not be assigned all the duties listed, nor do the listed examples include all the duties that may be assigned.)

Administers the total work of one of several major functional divisions such as roadway design, construction, maintenance, or materials and tests.

May coordinate the work of several major functional division.

Develops operational policies and procedures for a functional division.

FULL PERFORMANCE KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (These may be acquired on the job and are needed to perform the work assigned.)

ENTRY KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (Applicants will be screened for possession of these through written, oral, performance, and/or other evaluations.)

JOB PREPARATION GUIDELINES: (Entry knowledge, abilities, and/or skills may be acquired through, BUT ARE NOT LIMITED TO, the following coursework/training and/or experience.)

Post high school coursework/training in engineering AND experience in engineering related to agency function. Registration as a professional engineer in Nebraska is required.

Figure A.2 – Class Specification, Engineer III

February 28, 2007 - State of Nebraska, Department of Administrative Services

STATE OF NEBRASKA	CLASS CODE: V55315
CLASS SPECIFICATION	SALARY GRADE: 18
EST: 08/70 - REV: 07/21	OVERTIME STATUS: E

ENGINEER III

DESCRIPTION: Performs administrative and professional engineering work at the division, district or section head or comparable organizational level; performs related work as required

EXAMPLES OF WORK: (A position may not be assigned all the duties listed, nor do the listed examples include all the duties that may be assigned.)

Administers and coordinates all engineering and maintenance functions in an assigned minor geographic highway district.

Administers the total work of a functional division such as Urban and Secondary Roads, or Program and Planning.

Serves as principal assistant to the engineer in charge of highway design, construction, maintenance or materials.

Takes charge of major phases of highway planning or design, construction, maintenance or materials.

Supervises all engineering involved in watershed development, flood plain management and parks and recreation area development.

Directs major segments of a laboratory and/or field quality assurance program.

FULL PERFORMANCE KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (These may be acquired on the job and are needed to perform the work assigned.)

ENTRY KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (Applicants will be screened for possession of these through written, oral, performance, and/or other evaluations.)

JOB PREPARATON GUIDELINES: (Entry knowledge, abilities, and/or skills may be acquired through, BUT ARE NOT LIMITED TO, the following coursework/training and/or experience.)

Post high school coursework/training in engineering AND experience in engineering related to agency function. Registration as a professional engineer in Nebraska required.

Figure A.3 – Class Specification, Engineer IV

February 28, 2007 - State of Nebraska, Department of Administrative Services

STATE OF NEBRASKA	CLASS CODE: V55314
CLASS SPECIFICATION	SALARY GRADE: 17
EST: 08/70 - REV: 07/84	OVERTIME STATUS: E

ENGINEER IV

DESCRIPTION: Performs highly technical and responsible supervisory work in engineering at the section, unit head or comparable organizational level; performs related work as required.

EXAMPLES OF WORK: (A position may not be assigned all the duties listed, nor do the listed examples include all the duties that may be assigned.)

Assists a district engineer with the general supervision and coordination of district engineering and maintenance functions within an assigned geographic district.

Serves as principal assistant to engineer in charge of bridge design traffic engineering, urban and secondary planning or program and planning.

Performs supervisory work in office divisions dealing with roadway design, maintenance, program and planning, and related functions.

Serves as consultant to field personnel.

Serves as the engineer in charge of investigations related to soil and water conservation and develops resulting plans.

Supervises and directs the work of designers and draftsmen in the preparation of complete plans for roads and bridges.

Supervises the preparation of preliminary estimates, specifications, special reports and statistical data.

Conducts corridor and design public hearings.

Provides technical assistance in the development and review of federal aid urban and rural projects.

FULL PERFORMANCE KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (These may be acquired on the job and are needed to perform the work assigned.)

ENTRY KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (Applicants will be screened for possession of these through written, oral, performance and/or other evaluations.)

Figure A.3 – Continued

JOB PREPARATION GUIDELINES: (Entry knowledge, abilities, and/or skills may be acquired through, BUT ARE NOT LIMITED TO, the following coursework/training and/or experience.)

Post high school coursework/training in engineering AND experience in engineering related to agency function. Registration as a professional engineer in Nebraska required.

Figure A.4 – Class Specification, Engineer III

February 28, 2007 - State of Nebraska, Department of Administrative Services

STATE OF NEBRASKA	CLASS CODE: V55313
CLASS SPECIFICATION	SALARY GRADE: 16
EST: 01/78 - REV: 07/84	OVERTIME STATUS: E

ENGINEER III

DESCRIPTION: This is complex professional engineering work. Employees in this class perform work of a complex nature under very general supervision with a wide latitude of decision making capabilities. Design engineers in this class can be distinguished by the complexity of the project assigned and the level of responsibility accompanying the more difficult projects which require a thorough understanding of highway design procedures. Employees in this class may be considered as a team leader responsible for the completion of projects and acting as a supervisor for paraprofessional and engineers in training or may be working alone on projects requiring advanced knowledge in the engineering discipline; performs related work as required.

EXAMPLES OF WORK: (A position may not be assigned all the duties listed, nor do the listed examples include all the duties that may be assigned.)

Supervises, assists and instructs project managers within an assigned geographic area in the prosecution of preliminary surveys and all phases of construction and may assist maintenance personnel in maintenance activities.

Supervises various phases of field survey work.

Serves as a supervisor in a materials testing laboratory.

Performs responsible engineering office work.

Designs or checks plans and directs the work of subordinates in the preparation of plans and estimates for complex projects.

Supervises the engineering, special studies and research in problems of park and recreational area development, airport planning and development and highway construction materials development.

Supervises technical work in connection with road inventory, traffic, financial and other planning survey.

Supervises analysis of traffic and economic data and preparation of related reports.

Makes traffic forecasts for highway program and planning.

Develops specifications; assists in the procurement, utilization, repair and disposal of equipment.

Develops and coordinates a statewide program of bridge maintenance.

Figure A.4 – Continued

FULL PERFORMANCE KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (These may be acquired on the job and are needed to perform the work assigned.)

ENTRY KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (Applicants will be screened for possession of these through written, oral, performance, and/or other evaluations.)

Knowledge of: principles and practices of engineering; modern methods and techniques of highway construction, maintenance and materials.

Ability to: plan, assign and supervise the work of subordinates; communicate both orally and in writing.

Skill in: making complex engineering computations and in designing the most complex projects.

JOB PREPARATION GUIDELINES: (Entry knowledge, abilities, and/or skills may be acquired through, BUT ARE NOT LIMITED TO, the following coursework/training and/or experience.)

Post high school coursework/training in engineering AND experience in engineering related to agency function. Registration as a professional engineer in Nebraska is required.

Figure A.5 – Class Specification, Engineering Unit Supervisor

February 28, 2007 - State of Nebraska, Department of Administrative Services

STATE OF NEBRASKA	CLASS CODE: V55236
CLASS SPECIFICATION	SALARY GRADE: 13
EST: 07/89 - REV: 00/00	OVERTIME STATUS: N

ENGINEERING UNIT SUPERVISOR

DESCRIPTION: Under limited supervision, supervises a unit including Engineering Associate III's and/or Engineering Associate II's and performs the unit's most difficult advanced technical engineering work; responsible for the completion of assignments of a complex nature; work assignments are received with general instructions and objectives outlined by a professional engineer supervisor who reviews work for results obtained; performs related work as required.

EXAMPLES OF WORK: (A position may not be assigned all the duties listed, nor do the listed examples include all the duties that may be assigned.)

Plans, assigns, and supervises the work of subordinate Engineering Associates and other assigned classifications to achieve the unit's goals and to ensure the consistent applications of administrative and/or technical policies, procedures and standards.

Evaluates work performance of subordinates and recommends personnel actions including promotions, reassignments, status changes, disciplinary actions and the appointment of new employees.

Develops standard operating procedures to maintain consistency in application of regulations and program policies.

Instructs subordinates on the handling of operational matters when existing policies, procedures or guidelines do not cover the situations.

Performs the unit's most complex advanced para-professional engineering work (complex calculations, bridge inspection).

Functions as liaison with the public, local entities, employees, and other staff concerning unit activities.

Determines progress and priority schedules.

Assures consistency of work and coordinates deviations from procedures.

FULL PERFORMANCE KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (These may be acquired on the job and are needed to perform the work assigned.)

Figure A.5 – Continued

ENTRY KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (Applicants will be screened for possession of these through written, oral, performance, and/or other evaluations.)

Knowledge of: methods, techniques, and practices used in the appropriate specialty; extensive knowledge of the para-professional engineering principles and practices in the specialty field.

Ability to: plan, organize, coordinate, supervise and evaluate the work of subordinate staff; communicate orally and in writing; read and interpret engineering plans, specifications, reports, manuals, drawings and other documents; establish and maintain effective working relationships with other work units, contractors, consultants and the public; prepare clear and concise reports.

Skill in: using the computer and other tools for data analysis and storage.

JOB PREPARATION GUIDELINES: (Entry knowledge, abilities, and/or skills may be acquired through, BUT ARE NOT LIMITED TO, the following coursework/training and/or experience.)

Any combination of training and/or work experience that will enable the incumbent to possess the required knowledge, skills and abilities. A general qualification guideline is a high school education or equivalent plus ten years of para-professional engineering experience; graduation from a recognized two-year engineering school or other related post high school education may be substituted for work experience.

Figure A.6 – Class Specification, Highway Materials and Tests Technician III

February 28, 2007 - State of Nebraska, Department of Administrative Services

STATE OF NEBRASKA	CLASS CODE: M53633
CLASS SPECIFICATION	SALARY GRADE: 212
EST: 12/95 - REV: 01/98	OVERTIME STATUS: N

HIGHWAY MATERIALS AND TESTS TECHNICIAN III

DESCRIPTION: Under limited supervision, independently plans, coordinates, directs and performs tests and/or inspections on location statewide and/or within the central laboratory; analyzes acquired data; coordinates laboratory and/or inspection unit activities; performs related work as required.

EXAMPLES OF WORK: (A position may not be assigned all the duties listed, nor do the listed examples include all the duties that may be assigned.)

Receives or initiates work assignments; schedules, assigns, coordinates, and guides the work of a unit's technicians in accordance with established requirements to assist supervisory staff in the timely accomplishment of the assigned workload.

Reviews and reports on the work performance of co-workers to determine overall conformity to established timetables and quality standards, and to document and communicate employee production levels and training needs.

Communicates with Nebraska Department of Roads (NDOR) field personnel, contractor personnel, and materials suppliers/producers regarding the use and/or sampling of construction materials.

Directs the NDOR pavement friction program to include operation, maintenance and calibration of the computer-controlled pavement friction tester; collection of pavement friction data on location statewide; preparation of pavement friction reports; and recommendations relating to pavement friction.

Performs inspection of steel bridges and miscellaneous fabricated metal products at fabrication facilities, both in-state and out-of-state, such as inspection of welding procedures, welding materials, dimensions, camber, sweep, accuracy of punched and drilled holes, painting operations, mill certifications, etc.

Directs and/or performs sampling, testing, inspection and evaluation of concrete pipe and pre-cast concrete box culverts at concrete pipe plants statewide and directs and/or performs testing and analysis in the laboratory of steel and concrete materials used in concrete pipe and precuts concrete box culverts.

Inspects highway pavement scheduled for rehabilitation, evaluates the condition of the pavement, recommends corrective action such as joint repair, panel repair, bituminous patching and crack sealing, computes quantities and prepares specifications and estimates for pavement repair; recommends rehabilitation strategies on deteriorated pavement not scheduled for repairs.

Figure A.6 – Continued

Directs drilling operations to determine strength and consolidation characteristics of soils, determines and performs tests and analyzes test data, noting potential and unusual soil problems.

Certifies NDOR and contractor operators; certifies contractor profilographs; advises field personnel on profilograph operations and smoothness specifications.

Directs the installation of instrumentation to determine embankment settlement and stability, takes instrument readings and evaluates data noting unusual conditions.

Directs and/or performs environmental soil sampling activities to determine soil characteristics and status of soil contamination; prepares reports which advise and/or give guidance to appropriate personnel on specific subjects such as wetlands mitigation sites, leaking underground fuel storage tanks, electrical power sub-station contamination, and roadway sub-grade and drainage problems.

Directs the removal of underground storage tanks and pipes to include obtaining required permits, field testing, obtaining solid and/or water samples, preparing closure assessment reports, and coordinating activities with appropriate state and local agencies and consultants involved in ground water remediation projects.

Directs and coordinates a program for the monitoring of drinking water and wastewater treatment facilities at rest areas.

FULL PERFORMANCE KNOWLEDGE, ABILITIES AND SKILLS REQUIRED: (These may be acquired on the job and are needed to perform the work assigned.)

Knowledge of: the requirements and intent of applicable codes, standards, and specifications for materials used in the construction and maintenance of highways. The standards and specifications involved in the testing and inspection of materials used in the construction and maintenance of highways. Basic engineering principles and practices as applied to the use and production of materials used in the construction and maintenance of highways, geological surveys, in some positions.

Ability to: schedule, assign, guide, and evaluate the work of Materials and Tests Technicians; read and understand engineering blue prints; operate and evaluate various types of sampling, testing, and inspection equipment used in the materials analysis process; read, understand, and apply complex design plans, shop drawings, codes, standards, specifications, and guidelines in order to plan, direct, and enforce testing and inspection procedures; record and communicate data or observations; prepare technical recommendations.

Skill in: coordinating the work of others and maintaining an efficient work flow; communicating with a wide variety of department and non-department individuals; independently analyzing materials and conditions.

ENTRY KNOWLEDGE, ABILITIES, AND SKILLS REQUIRED: (Applicants will be screened for possession of these through written, oral, performance, and/or other evaluations.)

Figure A.6 – Continued

Knowledge of: the techniques and procedures, involved in the sampling, testing, and inspection of materials used in the construction and maintenance of highways; the occupational hazards and safety precautions applicable to the work such as the proper use of safety equipment, equipment operation, and materials handling; the use of commonly issued testing equipment, devices, scales, ovens, moisture chambers, and strain gauges; materials sampling techniques, terms, and symbols; surface geology and soil map, in some positions.

Ability to: set up and solve mathematical equations using addition, subtraction, multiplication and division; recognize test results outside of limits normally expected; perform basic scientific tests to determine the physical properties of materials used in the construction and maintenance of highways; convert standard weights and measures into units different from those given, including basic metric units; interpret road design plans, terminology and soils mapping data.

Skill in: assembling tools to perform a variety of tests, consecutively, with limited direction; the use of laboratory equipment and in performing laboratory tests. The use of sampling and testing equipment for materials testing and analysis.

JOB PREPARATION GUIDELINES: (Entry knowledge, abilities, and/or skills may be acquired through, BUT ARE NOT LIMITED TO, the following coursework/training and/or experience.)

Any combination of training and/or experience that will enable the incumbent to possess the required knowledge, abilities and skills. A general qualification guideline for positions in this class is a high school education or the equivalent and experience in highway construction inspection or materials testing or other laboratory operations.

SPECIAL NOTE

Some positions may require the ability to lift 85 pounds.

Some positions may require overnight travel.

A valid drivers license may be required.

Some positions may require obtaining a Commercial Drivers License.

Figure A.7 – Class Specification, Highway Materials and Tests Technician II

February 28, 2007 - State of Nebraska, Department of Administrative Services

STATE OF NEBRASKA	CLASS CODE: M53632
CLASS SPECIFICATION	SALARY GRADE: 210
EST: 08/95 - REV: 01/98	OVERTIME STATUS: N

HIGHWAY MATERIALS AND TESTS TECHNICIAN II

DESCRIPTION: Under general supervision, independently performs tests and/or inspections on location statewide and/or within the central laboratory; reviews and analyzes test results; identifies material properties; provides information to, and may make recommendations to, Nebraska Department of Roads (NDOR) personnel and to contractors/producers; performs related work as required.

EXAMPLES OF WORK: (A position may not be assigned all the duties listed, nor do the listed examples include all the duties that may be assigned.)

Determines the tests to be conducted, based on a review of contract provisions, and identifies acceptable standard deviations of test results.

Reviews routine test results to determine compliance with contract provisions/standard specifications; communicates nonconforming test results to appropriate contacts; distributes completed test results.

Analyzes test results and other collected data on material performance, noting inconsistencies or deficiencies; may maintain data files.

Trains Materials and Tests technicians, as directed, in specific task and job practices and procedures by demonstrating, explaining, evaluating, monitoring and reporting.

Trains contractor and NDOR field personnel in the use of equipment and proper test procedures such as nuclear gauges for density determination, asphalt concrete test procedures performed at construction site laboratories, profilograph operation, and similar training.

Calibrates and adjusts equipment to meet specification requirements.

Reviews, tests, inspects and evaluates new products and materials such as roadside delineators, barricade warning lights, epoxies, anchor bolt systems and reinforcing steel coupling devices by making comparisons to accepted NDOR standards and/or requirements established by other NDOR Divisions.

Performs quality control sampling, testing, inspection and evaluation, reviews bid proposals, and may write specifications for various manufactured products such as wire rope, log chains, aluminum sheeting and sign blanks, grader and plow blades, metal and wood posts, batteries and other similar items.

Makes recommendations to contractors to optimize rolling patterns on asphalt laydown.

Figure A.7 – Continued

Monitors, and recommends corrections, on-site, to the quarry's production testing and delivery to assure aggregates meet standards.

Calibrates, maintains repairs and/or arranges for repairs, and assigns to District personnel, all NDOR profilographs.

Directs and/or performs on-site soil surveys, to include identifying and logging of different soil horizon data, identifying and gathering all necessary soil samples, identifying water table locations and recognizing and noting any hazardous materials (information and locations); prepares soil data for inclusion into project plans.

Reviews concrete construction reports to determine if material quantities and quality comply with contract provisions and calculates routine pay deductions for deficient material.

Assures that proper proportions and mixing procedures are used in laboratory concrete mixes.

On location statewide, through the use of instrumentation and/or contacts with utilities, consultants and private individuals, identifies specific locations free of underground dangers for soil and water sampling.

Installs water monitoring wells to identify contaminated areas; gathers water samples from contaminated areas to identify changing levels and limits of contamination.

Directs bridge deck surveys statewide, including compiling inspection data and writing final reports.

Directs and/or performs concrete and asphalt pavement coring operations to include locating designated core sites and the drilling, measuring and marking of cores.

Operates a roughness surveyor to measure pavement roughness on location statewide, calculates a roughness index from raw data and maintains historical data files.

Maintains a pavement data file for the NDOR Pavement Management System by reviewing highway construction plans, editing pavement information and entering the information in computerized files.

Operates core drills and non-destructive testing equipment to investigate sub-standard non-pavement concrete placements, such as the vertical surface of an abutment backwell.

FULL PERFORMANCE KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (These may be acquired on the job and are needed to perform the work assigned.)

Knowledge of: policies for sampling, testing, and inspection of materials used in the construction and maintenance of highways; the equipment and procedures used by materials producers in the manufacture, refinement, and/or fabrication of materials; commonly used terminology and certification requirements used in materials testing; the operating of commonly issued testing equipment; sampling and testing schedules.

Figure A.7 – Continued

Ability to: Perform mathematical calculations to verify information gathered, and accurately divide and separate materials samples; operate, maintain, and calibrate equipment used in the materials sampling and analysis process; receive, record, and communicate data or observations accurately and legibly; understand and apply detailed instructions; perform moderately difficult mathematical calculations according to standard formulae; interpret road design plans and materials location maps.

Skill in: applying construction principles to materials testing; assembling technical data for reports; operating specialized equipment used to perform non-routine materials tests.

ENTRY KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (Applicants will be screened for possession of these through written, oral, performance and/or other evaluation.)

Knowledge of: the techniques and procedures, involved in the sampling, testing, and inspection of materials used in the construction and maintenance of highways; the occupational hazards and safety precautions applicable to the work such as the proper use of safety equipment , equipment operation, and materials handling; the use of commonly issued testing equipment , devices, scales, ovens, moisture chambers, and strain gauges, materials sampling techniques, terms, and symbols; surface geology and soil map, in some positions.

Ability to: set up and solve mathematical equations using addition, subtraction, multiplication and division; recognize test results outside of limits normally expected; perform basic scientific tests to determine the physical properties of materials used in the construction and maintenance of highways; convert standard weights and measures into units different from those given, including basic metric units; interpret road design plans, terminology and soils mapping data.

Skill in: assembling tools to perform a variety of tests, consecutively, with limited direction; the use of laboratory equipment and in performing laboratory tests. The use of sampling and testing equipment for materials testing and analysis.

JOB PREPARATION GUIDELINES: (Entry knowledge, abilities, and/or skills may be acquired through, BUT ARE NOT LIMITED TO, the following coursework/training and/or experience.)

Any combination of training and/or experience that will enable the incumbent to possess the required knowledge, abilities and skills. A general qualification guideline for positions in this class is a high school education or the equivalent and experience in highway construction inspection or laboratory testing.

Figure A.7 – Continued

. SPECIAL NOTE

Some positions may require the ability to lift 85 pounds.

Some positions may require overnight travel.

A valid driver's license may be required.

Some positions may require obtaining a Commercial Driver's License.

Figure A.8 – Class Specification, Highway Materials and Tests Technician I

February 28, 2007 - State of Nebraska, Department of Administrative Services

STATE OF NEBRASKA	CLASS CODE: M53631
CLASS SPECIFICATION	SALARY GRADE: 208
EST: 08/95 - REV: 10/99	OVERTIME STATUS: N

HIGHWAY MATERIALS AND TESTS TECHNICIAN I

DESCRIPTION: Under immediate to general supervision, performs routine tests on asphalt, concrete, aggregate and other construction materials following established procedures; performs related work as required.

EXAMPLES OF WORK: (A position may not be assigned all the duties listed, nor do the listed examples include all the duties that may be assigned.)

Performs AASHTO, ASTM, ANSI, IMSA and AISC tests on reinforcing steel, bolts, pre-stressed strand, electrical wire, pipe and drainage products, cast iron products, other construction materials and nondestructive testing such as coating, plating and ultrasonic thickness determinations.

Performs AASHTO and Nebraska Department of Roads (NDOR) tests on soils such as liquid limit, plastic limit, hydrometer analysis, sand equivalent, moisture density, and similar routine tests.

Performs AASHTO, ASTM and NDPR tests on cement, concrete, fly ash, concrete cores, curing materials, patching materials, and non-shrink grouts such as compression, autoclave expansion, air content, fineness, reflectivity, and similar routine tests.

Performs AASHTO and NDOR tests on aggregate such as sieve analysis, specific gravity, Los Angeles abrasion, freezing and thawing, soundness, sodium sulfate soundness, percent clay, shale and soft particles, and similar routine tests.

Performs AASHTO, NDOR and FHWA tests on oil, asphalt cement, emulsified asphalt, Performance Graded (PG) asphalt binder, diesel fuel, lube oils, hot joint sealers, gasohol, and grease, such as viscosities, penetration, distillations, evaporation, heat loss, flash point, specific gravities, and similar routine tests.

Performs AASHTO, ASTM and FHWA tests to determine the volumetric properties of asphalt concrete during design to include properties such as air voids, maximum specific gravity, voids in mineral aggregate, asphalt cement percentage, stability, flow values, "Superpave" requirements, etc.

Receives and inventories samples, prepares samples for testing, records test results, maintains lab and testing equipment, and cleans the lab.

Performs simple math (addition, subtraction, division, multiplication) functions to determine test results.

Figure A.8 – Continued

Demonstrates proper methods of performing assigned tests.

Measures final record pavement cores and records findings.

Assists with asphalt and concrete coring operations and bridge deck surveys by flagging traffic, loading/unloading equipment, measuring for coring locations, locating reinforcing steel for corrosion reading and samples, locating and identifying delaminated concrete, inventory of cores, filling holes, maintaining equipment, and similar tasks.

Installs as directed, reads and records data from field soil instruments such as inclinometers, piezometers, and settlement gauges.

Assists in on-site soil surveys including operating and maintaining soil survey equipment.

Prepares borrow pit sketches, updates soil reports and files.

Performs construction site nuclear density testing.

FULL PERFORMANCE KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (These may be acquired on the job and are needed to perform the work assigned.)

Knowledge of: the techniques and procedures involved in the sampling, testing, and inspection of materials used in the construction and maintenance of highways; the occupational hazards and safety precautions applicable to the work, such as the proper use of safety equipment, equipment operation, and materials handling; the uses of commonly issued testing equipment, devices, scales, ovens, moisture chambers, and strain gauges; materials sampling techniques, terms, and symbols; surface geology and soil maps, in some positions.

Ability to: set up and solve mathematical equations using addition, subtraction, multiplication and division; recognize test results outside of limits normally expected; perform basic scientific tests to determine the physical properties of materials used in the construction and maintenance of highways; convert standard weights and measures into units different from those given, including basic metric units; interpret road design plans.

Skill in: assembling tools to perform a variety of tests, consecutively, with limited direction; the use of laboratory equipment and in performing laboratory tests. The use of sampling and testing equipment for materials testing and analysis.

ENTRY KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (Applicants will be screened for possession of these through written, oral, performance and/or other evaluations.)

Knowledge of: highway construction materials and procedures; basic mathematics relating to the materials tests used in the Department.

Ability to: perform addition, subtraction, multiplication, and division; read and follow detailed test procedures; understand instructions and apply them to practical work situations; perform tasks repeatedly while maintaining integrity of results.

Figure A.8 – Continued

JOB PREPARATION GUIDELINES: (Entry knowledge, abilities, and/or skills may be acquired through, BUT ARE NOT LIMITED TO, the following coursework/training and/or experience.)

Any combination of training and/or experience that will enable the incumbent to possess the required knowledge, abilities and skills. A general qualification guideline for positions in this class is a high school education or the equivalent.

SPECIAL NOTE

Some positions may require the ability to lift 85 pounds.

Some positions may require overnight travel.

A valid driver's license may be required.

Some positions may require obtaining a Commercial Driver's License.

Figure A.9 – Class Specification, Highway Materials and Tests Manager

February 28, 2007 - State of Nebraska, Department of Administrative Services

STATE OF NEBRASKA	CLASS CODE: V55720
CLASS SPECIFICATION	SALARY GRADE: 16
EST: 05/96 - REV: 06/99	OVERTIME STATUS: E

HIGHWAY MATERIALS AND TESTS MANAGER

DESCRIPTION: Under limited supervision, performs complex engineering work for the Nebraska Department of Roads (NDOR) Materials and Tests Division with a wide latitude of decision-making capabilities related to highway design practice, development of specifications, resolution of construction problems, and analysis and evaluation of material used in highway construction; and providing quality assurance oversight for highway construction and branch laboratories; performs related work as required.

EXAMPLES OF WORK: (A position may not be assigned all the duties listed, nor do the listed examples include all the duties that may be assigned.)

Supervises materials design and manages the flow of projects within the Flexible Pavement Section.

Prepares project cost estimates for all base and surfacing related items prior to contract letting.

Supervises the complete design process for surface rehabilitation projects and Pavement Extension Program projects.

Performs on-site inspections of asphaltic concrete or base construction problems and recommends corrective action during construction.

Prepares preliminary project cost estimates for NDOR administration, Roadway Design, Transportation Planning, Materials and Tests Engineer and District Engineers.

Prepares preliminary project cost estimates for Roadway Design estimating staff pertaining to surface rehabilitation projects and Pavement Extension Program projects.

Monitors contractors' bids to insure accuracy of future estimates.

Writes and supervises the writing of specifications and contract special provisions.

Communicates with District Engineers, Project Managers, Roadway Design engineers and contractors and makes decisions concerning contract, design, or construction issues.

Communicates regularly with District Construction Engineers and District Maintenance Superintendents to improve future specifications.

Sets expectations for and evaluates work performance of the Flexible Pavement Section staff.

Figure A.9 – Continued

Performs field inspections and determines the surface repair or reconstruction schemes that will be required for future projects.

Supervises the distribution of material design information to Quality Assurance staff, District Engineers and Project Managers.

Establishes and/or recommends policy on material testing for the Physical Tests Laboratory.

Provides technical assistance and guidance to Materials and Tests, Bridge, Roadway Design, Construction, Traffic Engineering and Maintenance personnel on a wide variety of manufactured products; provides plan and specification review and development for these divisions.

Coordinates research activities including testing, evaluation, design and field site selection for various concrete, metal and plastic drainage products.

Identifies, investigates, develops solutions and writes reports relating to material problems encountered on highway and bridge construction projects and the maintenance of existing highway facilities.

Reviews correspondence from the Construction Division and from contractors in order to apply price deductions when deficiencies or improper materials have been incorporated into a project.

Provides analysis of failed structures, utilizing a full range of engineering applications and applied technology, such as conducting failure analysis on items such as bridge structural components, lighting and signal structures, culverts and foundations; recommendations for design, repair or retrofit, and replacement are common.

Uses engineering knowledge to design, manufacture and repair specialized equipment used for testing and research applications in the field, as well as in the laboratory.

Corresponds with other states' Departments of Transportation, engineering consultants, contractors and other testing agencies relating to the transfer of technical information, as well as testing and material selection for state, county and federal-aid projects.

Develops and provides training for field construction personnel at the project site, as well as presentations at seminars and Project Manager conferences.

Prepares an annual budget for the Physical Tests Laboratory.

Ensures that all material testing and certification requirements are met by preparing additional estimates for coordination with individual laboratories within the Materials and Tests Division.

Releases the final estimate on construction projects after receipt and verification of required material testing and certifications; determines if contractors are due interest on outstanding payments for the materials portion of the contract.

Figure A.9 – Continued

Prepares Required Documents List showing all materials required for highway construction projects for prime contractors and project managers.

Provides technical oversight of the four NDOR branch laboratories ensuring that adequate equipment is available and resolving day-to-day problems.

FULL PERFORMANCE KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (These may be acquired on the job and are needed to perform the work assigned.)

Knowledge of: construction techniques; construction specifications; materials specifications and test methods; management techniques.

Ability to: plan, organize and coordinate activities of an engineering unit; read and interpret engineering plans and specifications; communicate technical engineering and/or construction materials information orally and in writing; resolve engineering and/or construction materials related problems.

Skill in: organization; the use of engineering and/or construction materials testing equipment; using software applications related to engineering and/or construction materials work.

ENTRY KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (Applicants will be screened for possession of these through written, oral, performance and/or other evaluations.)

Knowledge of: civil engineering and/or construction materials principles and practices; engineering specifications; supervisory techniques; engineering and/or construction materials testing techniques.

Ability to: plan, organize and coordinate activities; read and interpret plans and specifications; communicate orally and in writing.

Skill in: utilizing engineering and/or construction materials testing principles; performing complex engineering and/or construction materials testing calculations; the use of computers.

JOB PREPARATION GUIDELINES: (Entry knowledge, abilities, and/or skills may be acquired through, BUT ARE NOT LIMITED TO, the following coursework/training and/or experience.)

Any combination of training and/or experience that will enable the incumbent to possess the required knowledge, abilities and skills. A general qualification guideline for positions in this class is high school education or equivalent AND education or experience in a civil engineering related field or experience in highway construction or material testing and reporting.

SPECIAL NOTE

A valid driver's license is required.

Overnight travel may be required.

Figure A.10 – Class Specification, Highway Chemical Tests Manager

February 28, 2007 - State of Nebraska, Department of Administrative Services

STATE OF NEBRASKA	CLASS CODE: V53950
CLASS SPECIFICATION	SALARY GRADE: 16
EST: 04/73 - REV: 05/86	OVERTIME STATUS: E

HIGHWAY CHEMICAL TESTS MANAGER

DESCRIPTION: Under administrative direction is responsible for managing the overall activities of the Chemical Tests Unit within the Department of Roads; performs related work as required.

EXAMPLES OF WORK: (A position may not be assigned all the duties listed, nor do the listed examples include all the duties that may be assigned.)

Directs special assignments as assigned by the Manager of the Soils, Chemical and Special Projects Section.

Coordinates the unit's research programs, special laboratory and field investigations, and cooperative test programs.

Oversees the sampling, testing, and reporting of construction and maintenance materials within the jurisdiction of the unit.

Prepares related specifications and special provisions of materials within the units.

Develops an operating budget for the unit.

Prepares manuals and guides on materials and test procedures relevant to the unit.

Monitors the composition of materials used in construction and maintenance.

FULL PERFORMANCE KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (These may be acquired on the job and are needed to perform the work assigned.)

Knowledge of: chemical composition of highway construction materials; test and research methods; lab instrumentation usage; data processing.

Ability to: direct the work of subordinate personnel.

ENTRY KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (Applicants will be screened for possession of these through written, oral, performance, and/or other evaluations.)

Knowledge of: highway construction materials; chemical testing procedures.

Ability to: exercise responsible scientific judgement in supervising quality control; communicate effectively both orally and in writing; maintain records and reports.

Figure A.10 – Continued

JOB PREPARATION GUIDELINES: (Entry knowledge, abilities, and/or skills may be acquired on the job and are needed to perform the work assigned.)

Any combination of education, training, and/or work experience that will enable the incumbent to effectively perform the required examples of work and demonstrate the necessary full performance knowledge and abilities required of the job.

~~Figure A.11 Class Specification, Chemist III~~

February 28, 2007 - State of Nebraska, Department of Administrative Services

STATE OF NEBRASKA	CLASS CODE: E53313
CLASS SPECIFICATION	SALARY GRADE: 274
EST: 09/78 - REV: 08/97	OVERTIME STATUS: E

POSITION ELIMINATED 2007

~~CHEMIST III~~

DESCRIPTION: Performs responsible supervisory and scientific work in directing the activities of a large state laboratory or laboratories. Performs related work as required.

EXAMPLES OF WORK: (A position may not be assigned all the duties listed, nor do the listed examples include all the duties that may be assigned.)

Supervises and participates in the chemical and/or physical testing and analysis of foods and/or materials such as feeds, fertilizers, agricultural chemicals, drugs, paints, petroleum products, metals, cements or concrete products.

Directs, supervises and participates in research programs.

Prepares or assists in the preparation of specifications for materials and equipment to be purchased by the state.

Develops new and improved testing procedures and apparatus.

Supervises the work of and makes work assignments for personnel of assigned laboratory or laboratories.

Directs and participates in in-service training programs.

Directs, prepares and maintains reports, records and correspondence related to assigned area.

May prepare manuals and guidelines on materials and test procedures.

May assist in preparation of the budget for assigned area.

May coordinate the work of outside agencies performing related testing for the state.

FULL PERFORMANCE KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (These may be acquired on the job and are needed to perform the work assigned.)

ENTRY KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (Applicants will be screened for possession of these through written, oral, performance, and/or other evaluations.)

JOB PREPARATION GUIDELINES: (Entry knowledge, abilities, and/or skills may be acquired through, BUT ARE NOT LIMITED TO, the following coursework/training and/or experience.)

~~Figure A.11 Continued~~

Bachelor's degree with major in chemistry plus seven to ten years experience in chemical testing and analysis including supervisory experience; or Master's degree in chemistry plus five to seven years experience in chemical test and analysis; or Doctorate in chemistry plus one to three years related experience; demonstrated excellence in supervisory and leadership capabilities.

Figure A.12 Class Specification, Scientist II

February 28, 2007 - State of Nebraska, Department of Administrative Services

STATE OF NEBRASKA	CLASS CODE: E53312
CLASS SPECIFICATION	SALARY GRADE: 672
EST: 08/70 - REV: 07/21	OVERTIME STATUS: N

SCIENTIST II

DESCRIPTION: Under limited supervision, examines and analyzes organic and inorganic materials, substances, and compounds and trains, advises, and provides work guidance to other laboratory staff on chemical analysis procedures, standards, and findings; performs related work as required.

EXAMPLES OF WORK: (A position may not be assigned all the duties listed, nor do the listed examples include all the duties that may be assigned.)

Analyzes samples and specimens in accordance with the principles of qualitative and quantitative analysis and agency protocol, to screen for, assay compare and/or identify inorganic materials and organic substances such as drugs, pesticides, antibodies, vitamins, or minerals; to assess the scope of any health or environmental chemical hazards; or to identify a common source.

Reviews and evaluates published chemical analytical procedures and methods to determine recommendations to laboratory supervisors regarding inclusion in official laboratory protocol and adaptations to current laboratory instrumentation.

Evaluates laboratory-related commercial products such as reagent test kits to determine conformance with agency product standards and to develop data for use in making purchasing decisions.

Advises laboratory staff and officials of other public and private agencies on test results and interpretation in chemical analysis specialties to explain and ensure the proper application of specific technical laboratory procedures.

Compiles and interprets chemical and/or physical data to develop conclusions on the structure, composition, and properties of materials and the significance of these characteristics.

Schedules, coordinates, distributes/balances, and guides the work assignments of other laboratory staff, in accordance with established work flow/assignment requirements, to assist in the accomplishment of the assigned workload.

Monitors, reviews, and reports the work performance of other laboratory staff to ensure effective and consistent application of chemical test and analysis procedures and standards, determine overall conformity to established timetables, and to document and communicate employee production levels and training needs.

Trains other laboratory staff engaged in conducting analyses to improve employee performance levels and to continue and improve the accuracy of analyses. Operates and/or calibrates

Figure A.12 – Continued

computerized instruments such as the gas chromatograph-mass spectrometer to perform multiple interactional analyses of samples.

Interprets read-outs, printouts, or other instrument data to determine or analyze results of chemical or physical tests and analyses.

Testifies at judicial and/or administrative hearings involving the consideration of chemical analyses to explain, interpret and provide information on the findings and conclusions of laboratory tests.

Writes and compiles laboratory reports, correspondence, or scientific papers to document significant analyses methods or findings.

Writes, constructs, and compiles laboratory notes, charts, quality control data, and graphs on test activities or analyses to summarize and document the results, conditions, and procedures of laboratory tests.

Operates, calibrates, and repairs laboratory instruments and equipment such as UV-visible and atomic absorption spectrophotometers, gas and liquid chromatographs, analytical balances, volumetric glassware, extraction apparatus, induction furnaces, reflex and flame photometers, ph-meters, technician auto-analyzers, selective ion meters, conductivity meters and/or radiochemical analysis instruments, to test, analyze, or prepare samples.

FULL PERFORMANCE KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (These may be acquired on the job and are needed to perform the work assigned.)

Knowledge of: state law and rules and agency policies, procedures, and standards governing the analysis of organic and inorganic materials; information sources and resource literature pertinent to agency chemical analysis functions; techniques of training and leading others.

Ability to: design and evaluate agency laboratory testing and analysis procedures, guidelines, and standards; compare the specifications of laboratory equipment, instruments, and materials to agency product standards; advise representatives of other organizations and local agencies on the technical practices and standards of a laboratory function; instruct other laboratory staff in the policies, procedures, and standards of a laboratory function.

ENTRY KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (Applicants will be screened for possession of these through written, oral, performance, and/or other evaluations.)

Knowledge of: the principles, practices, and methods of chemistry and biochemistry and their application in a laboratory setting; the principles and practices of scientific methodology; the procedures, equipment, instruments, and facilities of laboratory testing; the hazards and safety precautions of laboratory testing activities; research literature in chemical analysis; chemical analysis techniques.

Figure A.12 – Continued

Ability to: operate computer operated/controlled laboratory instruments including interpretation of the resulting data; communicate orally and in writing to exchange technical and scientific information and to interact with other chemists, laboratory staff, and the public; comprehend and apply oral and written supervisory and administrative instructions, equipment operation manuals, and safety rules and instructions; calculate solutions to mathematical and statistical problems; use and maintain laboratory supplies, instruments, and apparatus; apply and modify laboratory testing and analysis procedures and methods; observe and identify characteristics or patterns in substances and compounds; extract and interpret findings from laboratory tests and analyses; summarize findings and conclusions of tests and analyses into technical laboratory reports; instruct other laboratory staff in the policies, procedures, and standards of laboratory testing and analysis; set personal work priorities and manage own work time.

JOB PREPARATION GUIDELINES: (Entry knowledge, abilities, and/or skills may be acquired through, BUT ARE NOT LIMITED TO, the following coursework/training and/or experience.)

Post high school coursework/training in chemistry or biochemistry AND experience in an applied testing laboratory with responsibility for chemical analysis.

Figure A.13 Class Specification, Highway Quality Assurance Manager

February 28, 2007 - State of Nebraska, Department of Administrative Services

STATE OF NEBRASKA	CLASS CODE: V57550
CLASS SPECIFICATION	SALARY GRADE: 14
EST: 09/78 - REV: 07/84	OVERTIME STATUS: N

HIGHWAY QUALITY ASSURANCE MANAGER

DESCRIPTION: Responsible for maintaining a standard of quality for materials used in the maintenance and construction of highways. Performs related work as required.

EXAMPLES OF WORK: (A position may not be assigned all the duties listed, nor do the listed examples include all the duties that may be assigned.)

Conducts a continuous surveillance of materials used in the maintenance and construction of highways.

Reviews progress of construction work and sampling requirements for field construction personnel.

Manages and directs the activities of a Branch Laboratory or the quality Assurance Records Section of Materials and Tests Division.

Reviews test reports; determines priority of sampling and testing; maintains complete files.

Assists and advises field personnel in establishing and maintaining field laboratories and in implementing the requirements of the Materials and Tests Division.

Checks and calibrates testing equipment used by the Materials and Tests Division.

May perform the documentation of quality assurance requirements for certification to the Federal Highway Administration.

May assist in budget preparation for an assigned section.

May direct the final record coring program.

May direct research on statistical quality assurance and the development of statistical based specifications.

May direct the sampling, inspection and testing of commercial aggregates for acceptance of certain sources of production.

May prepare materials manuals and specifications.

FULL PERFORMANCE KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (These may be acquired on the job and are needed to perform the work assigned.)

Figure A.13 – Continued

ENTRY KNOWLEDGES, ABILITIES, AND SKILLS REQUIRED: (Applicants will be screened for possession of these through written, oral, performance, and/or other evaluations.)

Knowledge of: highway construction materials.

Ability to: exercise sound scientific judgement in supervising quality control and subordinates; to follow administrative direction; to communicate effectively both orally and in writing; to maintain records and reports.

JOB PREPARATION GUIDELINES: (Entry knowledge, abilities, and/or skills may acquired through, BUT ARE NOT LIMITED TO, the following coursework/training and/or experience.)

High school education plus ten years experience related to agency function; or Bachelor's degree in geology or related field plus five years experience related to agency function; or Bachelor's degree in engineering plus four years experience related to agency function. Registration as a Professional engineer in Nebraska desirable and may substitute for two years experience.

SPECIAL NOTE

Considerable driving of state vehicles.

DATE: 2-9-2024
REVISED:

Figure B.1 – Biographical Sketch
(Materials & Research Engineer (Engineer VII)

NAME:

Brendon Schmidt

FORMAL EDUCATION:

Date	Degree	Discipline	College
12/2004	Bachelor of Science	Civil Engineering	University of Nebraska—Lincoln

PROFESSIONAL RECOGNITION:

Registered Professional Engineer, State of Nebraska E-14226

EXPERIENCE:

From Date	To Date	Description of Experience
8-2023	Present	Transportation Division Engineer—Materials and Research Division
6-2017	8-2023	Transportation Division Engineer—Right of Way Division
5-2016	6-2017	Assistant Roadway Design Engineer—Districts 1 and 7, Engineer V
3-2015	5-2016	Roadway Design Expressways Section A-1, Engineer IV
12-2013	3-2015	Roadway Design Resurfacing Unit, Engineer IV
6-2012	12-2013	Roadway Design Expressways Section A-2, Engineer III
12-2011	6-2012	Roadway Design Expressways Section A-3, Engineer II
1-2007	12-2011	Roadway Design Expressways Section A-3, Highway Designer III

CERTIFICATIONS AND RATINGS:

Date	Description of Certifications and Ratings

TRAINING:

Date	Description of Training

DATE: 2-8-07
REVISED: 10-17-22

Figure B.2 – Biographical Sketch
Engineer of Portland Cement & Concrete, Chemical Tests (Engineer III)

NAME:

Wally Heyen

FORMAL EDUCATION:

Date	Degree	Discipline	College
5/89	Bachelor of Science	Civil Engineering	North Dakota State University

PROFESSIONAL RECOGNITION: (Professional licenses, etc.)

Professional Civil Engineer

EXPERIENCE:

From Date	To Date	Description of Experience
3-06	Present	Portland Cement Concrete Engineer: Manage the Chemistry, Physical Tests and PCC Materials & Testing Laboratory in the Materials & Research Division. Writes specifications, Responds to questions from the districts, contractors, suppliers, other states and peers. Monitor AASHTO & ASTM Standards. Research concrete designs and properties.
3/02	3/06	Signing and Pavement Marking Engineer: Manage Projects and delegate duties.
6/94	3/02	Roadway Design Engineer / Squad Leader: Managed and designed highway projects using highway design criteria and standards.
6/89	6/94	Project Engineer: Managed construction projects. Supervised team of employees.

CERTIFICATIONS AND RATINGS:

Date	Description of Certifications and Ratings

TRAINING:

Date	Description of Training

DATE:
REVISED: 10-17-22

Figure B.3 – Biographical Sketch
Geotechnical Engineer (Engineer III)

NAME:

Nikolas Glennie

FORMAL EDUCATION:

Date	Degree	Discipline	College
5/2011	Bachelor of Science	Civil Engineering	University of Nebraska-Lincoln

PROFESSIONAL RECOGNITION:

Professional Engineer - Nebraska

EXPERIENCE:

From Date	To Date	Description of Experience
05/11	04/14	Assistant bridge foundation engineer – Nebraska DOT
04/14	10/20	Bridge foundation engineer – Nebraska DOT
10/20	Present	Geotechnical engineer – Nebraska DOT

CERTIFICATIONS AND RATINGS:

Date	Description of Certifications and Ratings
10/15	Professional Engineer – State of Nebraska

TRAINING:

Date	Description of Training

DATE: 10-10-08
REVISED: 10-17-22

Figure B.4 – Biographical Sketch
Assistant M&R Engineer & Flexible Pavement Engineer
(Engineer III)

NAME:

Robert Charles Rea

FORMAL EDUCATION:

Date	Degree	Discipline	College
5-1991	Bachelor of Science	Civil Engineering	University of Nebraska - Lincoln

PROFESSIONAL RECOGNITION:

Registered Professional Engineer, State of Nebraska, # E-8280
Engineer In Training (EIT), 1997
University of Nebraska – Lincoln Engineering Co-op Program Graduate

EXPERIENCE:

From Date	To Date	Description of Experience
2008	Present	Flexible Pavements Engineer, M&R, Bituminous Laboratory, Bituminous Aggregate laboratory, QA Branch and Field Laboratories. NDOT
2006	2008	Chief Operations Officer for Heavy Highway Construction Company
1998	2006	Pavement Design Engineer, Research Engineer, Concrete Pavements Engineer, Management of Physical Testing laboratory, Chemical Testing Laboratory, Portland Cement Laboratory, Portland Cement Concrete Laboratory. NDOR
1996	1998	Chief Engineer for Heavy Highway Construction Company
1988	1996	Project Engineer, District Local Assistance Engineer NDOR – District One Construction Office

CERTIFICATIONS AND RATINGS:

Date	Description of Certifications and Ratings
	Minnesota DOT, Nebraska Department of Roads – Bituminous Technology IIA & IIB
	NDOR - Hot Mix Asphalt Design
	NDOR – Certified Profilograph Operator
	NDOR – Principals of Construction of Hot Mix Asphalt

TRAINING:

Date	Description of Training
	Federal Highway Administration – Traffic Network Simulation
	Iowa State University – Roadside Design Manual/Traffic Safety
	National Asphalt Pavement Association – Middle Management

DATE: 01-29-21
REVISED: 10-17-22

Figure B.5 – Biographical Sketch
(Engineer III – Final Review and Physical Test Engineer)

NAME:

Mark Fischer

FORMAL EDUCATION:

Date	Degree	Discipline	College
5/2006	Bachelors	Civil Engineering	University of Nebraska-Lincoln

PROFESSIONAL RECOGNITION:

EXPERIENCE:

From Date	To Date	Description of Experience
2006	2013	Bridge Design Engineer-designed new and in-place structures over natural and man-made obstructions. Provided design checks and training to bridge designers.
2013	2015	Roadway Design Engineer-Designed vertical, horizontal alignments as well as coordinated the design package with other divisions and turned into PS&E for letting.
2015	2018	Project Delivery Engineer-Developed schedules for DOT construction projects. Worked with other divisions to make sure scope and schedule were met.
2018	2019	Assistant Planning Engineer-Oversaw the Planning unit and Traffic Data unit
2019	Present	Assistant Materials and Research Engineer-Oversee the Research, Final Review and Physical test lab.

CERTIFICATIONS AND RATINGS:

Date	Description of Certifications and Ratings
6/2012	Certified Professional Civil Engineer (PE)
2/2014	Certified Project Management Professional (PMP)

TRAINING:

Date	Description of Training

DATE: 2-3-97
REVISED: 01-29-21

Figure B.6 – Biographical Sketch
PCC Materials & Laboratory Manager
(Materials & Tests Manager)

NAME:

Tim A. Krason

FORMAL EDUCATION:

Date	Degree	Discipline	College
1985	A.A.S.	Drafting & Design	Mid-Plains – North Platte NE
1990	Bachelor of Science	Industrial Tech. Management	Kearney State – Kearney NE

PROFESSIONAL RECOGNITION:

EXPERIENCE:

From Date	To Date	Description of Experience
2-2012	Present	M&T Manager. PCC Section Manager
2008	2-2012	Hwy. Quality Assurance Manager. PCC Materials & Laboratory Manager. Quality Assurance Manual & Equipment Verification Coordinator for Central Labs. Supervise PCC Lab and coordinate research activities and troubleshoot concrete issues.
2005	2008	Hwy. Quality Assurance Manager, PCC Materials, Materials and Research Division, Nebraska Department of Roads. Materials and Research equipment verification coordinator. Verification of accuracy and condition of branch laboratory equipment. Field concrete troubleshooting and M&R contact. Supervise concrete research conducted in laboratory and in the field.
8/98	2005	Engineering Unit Supervisor, PCC Materials, Materials and Research Division, Nebraska Department of Roads. Materials and Research equipment verification coordinator. Verification of accuracy and condition of branch laboratory equipment. Field research and concrete inspector. Supervise concrete research conducted in laboratory.
5/94	8/98	Laboratory Technician II, PCC Laboratory, Materials and Tests Division, Nebraska Department of Roads. Perform physical tests on cement and fly ash. Perform research on concrete materials.
8/91	5/94	Senior Engineering Aide, District 4, Kearney NE, Nebraska Department of Roads. Perform construction inspections, preliminary and construction surveys.

CERTIFICATIONS AND RATINGS:

Date	Description of Certifications and Ratings
	American Concrete Institute (ACI) Concrete Field Testing Technician Grade 1
	American Concrete Institute (ACI) Concrete Strength Testing Technician
	American Concrete Institute (ACI) Concrete Plant Technician Level 2
	Troxler Training & Certification

TRAINING:

Date	Description of Training

DATE: 2-27-07
REVISED: 01-29-21

Figure B.7 – Biographical Sketch
Chemical Laboratory Manager
(Highway Chemical Tests Manager)

NAME:

Jasmine Dondlinger

FORMAL EDUCATION:

Date	Degree	Discipline	College
2006	Bachelor of Science	Chemistry	University of Nebraska - Lincoln
2006	Minor	Math	University of Nebraska - Lincoln

PROFESSIONAL RECOGNITION:

EXPERIENCE:

From Date	To Date	Description of Experience
2007	Present	Highway Chemical Tests Manager, Chemical Laboratory, Materials and Research Division, Nebraska Department of Roads. Management of Chemical Laboratory.
2006	2007	Chemist II, Chemical Laboratory, Materials and Research Division, Nebraska Department of Roads. Perform chemical tests on various materials used by the Nebraska Department of Roads in highway construction.

CERTIFICATIONS AND RATINGS:

Date	Description of Certifications and Ratings

TRAINING:

Date	Description of Training
2004	X-Ray Radiation Safety Course

DATE: 4-26-23
REVISED:

Figure B.8 – Biographical Sketch
(Hwy. Quality Assurance Manager)

NAME:

Justin Steffensmeier

FORMAL EDUCATION:

Date	Degree	Discipline	College
2013	Associate's of Science	Turf Management	Northeast Community College

PROFESSIONAL RECOGNITION:

EXPERIENCE:

From Date	To Date	Description of Experience
2019	2023	Materials & Tests Tech III (Aggregate Lab) - Perform regular quality and verification tests on fine and coarse aggregate. Review/report results using SiteManager, OnBase, AASHTOWare Project.
2023	Present	Highway Quality Assurance Manager (Soils Lab), APL Coordinator – Collect and analyze soil samples. Test and report various soil tests results. Manage NDOT's Approved Products List as well as Build America, Buy America Certifications.

CERTIFICATIONS AND RATINGS:

Date	Description of Certifications and Ratings

TRAINING:

Date	Description of Training
5-20-20	DOT Hazardous Materials Training

DATE: 05-15-17
REVISED: 01-29-21

Figure B.9 – Biographical Sketch
Bituminous Laboratory Manager
(Hwy. Quality Assurance Manager)

NAME:

Asadullah Sahak

FORMAL EDUCATION:

Date	Degree	Discipline	College
06/01/1998	Certificate of Graduation	Ms. Office	Bakhtar Language & Computer Center
12/30/2001	Bachelors	Civil Engineering	Kabul University
12/30/2006	Diploma in Business Admin	Business Admin	Kardan University of Business Admin

PROFESSIONAL RECOGNITION:

N/A

EXPERIENCE:

From Date	To Date	Description of Experience
03/1996	03/2008	Language Department Supervisor at Bakhtar Language and Computer School
01/2002	03/2008	Linguist for US military in Afghanistan
01/2003	12/2004	Senior Engineering linguist / Quality Control Engineer at Camp Eggers Kabul Afghanistan
01/2005	01/2006	Monitoring and Evaluation Manager in Coordination of Humanitarian Assistance (NGO)
01/2006	03/2008	QC Engineer at Afghan Dubai (Previously Known as Afghan Korea) Construction Company
09/2008	11/2013	Taught Language to US Military through Several DoD Contractors
11/2013	05/2017	Correctional Unit Case Worker for Nebraska Department of Corrections
05/2017	03/2020	Hwy Materials & Tests Technician III NDOT
03/2020	Present	Highways Quality Assurance Manager NDOT – Bituminous Laboratory

CERTIFICATIONS AND RATINGS:

Date	Description of Certifications and Ratings
1/24/18	ACI Concrete Field-Testing Technician Grade I
2/5/18	ACI Concrete Strength Testing Technician

TRAINING:

Date	Description of Training
2005	I have participated and conducted several seminars of project management, gender, monitoring and evaluation of humanitarian projects, proposal writing and community developmental issues
12/2019	Excel Advanced Formulas and Functions
05/2020	Using a Rheometer to simplify tack testing
12/2020	NDOT Hazardous Material Training
12/2020	COE- CLSS Yellow Belt continued education

DATE: 10-17-22
REVISED:

Figure B.10 – Biographical Sketch
PCC Coring & Smoothness Testing Unit Manager
(Hwy. Quality Assurance Manager)

NAME:

Alex Johnson

FORMAL EDUCATION:

Date	Degree	Discipline	College
12/2023	Bachelors	Criminal Justice	University of Nebraska-Lincoln

PROFESSIONAL RECOGNITION:

EXPERIENCE:

From Date	To Date	Description of Experience
05/2020	08/15/2022	Construction Technician 1, 2, 3 for the Nebraska Department of Transportation. Oversee construction projects on the State Highway System, Oversee Concrete and asphalt plants during the Lincoln South Beltway.
08/15/2022	Present	Hwy. Quality Assurance Manager, PCC Coring & Smoothness Unit, Materials & Research Division, Nebraska Department of Transportation, Coordinate and test smoothness verification on the State Highway System, Supervise the Coring crew.

CERTIFICATIONS AND RATINGS:

Date	Description of Certifications and Ratings
01/18/2022	Railroad Education Training
02/02/2021	ACI Concrete Field Testing Technician – Grade 1
11/23/2020	NDOT Erosion and Sediment Control Installer certification
10/20/2020	NDOT Erosion and Sediment Control Inspector Certification

TRAINING:

Date	Description of Training
3-10-2022	Concrete Plant Class Technician Certification

DATE: 10-27-2023
REVISED:

Figure B.11 – Biographical Sketch
(Hwy Quality Assurance Manager)

NAME:

Jeff Gaston

FORMAL EDUCATION:

Date	Degree	Discipline	College
2006	Certification	Professional Truck Driver Training	Southeast Community College, Lincoln
2008	Associates of Applied Science	Nondestructive Testing Technologies	Southeast Community College, Milford

PROFESSIONAL RECOGNITION:

EXPERIENCE:

From Date	To Date	Description of Experience
2008	2018	Managed new construction projects of high-pressure storage systems (tanks, spheres, refineries.) Projects lasted 8-24 months each. Trained new employees in advanced ultrasonics and other NDT inspection techniques (VT, PT, MT, RT, UTT, UTSW, UTPA) Typical schedule was 60-80 hrs & 2,500 miles of travel per week (driving) Obtained extensive amounts of environmental compliance and job safety training. Certified in manlift operation for all seven types of forklifts. Board of Directors member
2018	2023	Materials & Tests Tech III (Physical Tests) Perform tests (Both destructive & non) of reinforcing steel, high-strength bolts, and anchor rods, culverts, high mast light towers, and cantilever signs. Analyze and review data/certifications to ensure the materials submitted meet the pertinent material standards via AASHTOWare.
2023	Present	Highway Quality Assurance Manager (Physical Tests) Lab Supervisor, manage employees, & conduct final reviews. Ultrasonic inspection of steel highway products, as well as visual, PT, & MT. Procedure and specification review for new and current products used at NDOT.

CERTIFICATIONS AND RATINGS:

Date	Description of Certifications and Ratings
2006	Class A CDL, Tanker Endorsement
2008	Level II VT, MT, PT, UT, UTT, UTSW, UTPA, RT, ET Certification
2010	Forklift Certification & ISO9001 Auditor
2014	Manlift Certification

TRAINING:

Date	Description of Training
2010	Six Sigma – Black Belt
2015	Advanced Phased Array Ultrasonics

DATE: 2/14/2024
REVISED:

Figure B.12 – Biographical Sketch
(Hwy Quality Assurance Manager~~)~~

NAME:

Jacob Reynolds

FORMAL EDUCATION:

Date	Degree	Discipline	College

PROFESSIONAL RECOGNITION:

EXPERIENCE:

From Date	To Date	Description of Experience
Nov 2023	Present	Hwy Quality Assurance Manager, Managing the Asphalt Mix Design lab.
July 2022	Nov 2023	Hwy Mat Test Tech III, Testing concrete, asphalt, and soils – D2 lab
Dec 2021	July 2022	Hwy Mat Test Tech III, Field quality assurance for D1
May 2019	Dec 2021	Hwy Mat Test Tech III, testing asphalt for D1 projects, approving asphalt mixes statewide

CERTIFICATIONS AND RATINGS:

Date	Description of Certifications and Ratings
	ACI Concrete Field Testing Technician
	ACI Concrete Strength Testing Technician
	Nebraska Asphalt Field Technician I/II
	Nebraska Laboratory Testing Technician

TRAINING:

Date	Description of Training

DATE: 10-23-18
REVISED: 01-29-21

Figure B.13 – Biographical Sketch
Physical Tests Lab Manager

NAME:

Mark Burham

FORMAL EDUCATION:

Date	Degree	Discipline	College
1980	B.S	Civil Engineering	University of Nebraska

PROFESSIONAL RECOGNITION:

EXPERIENCE:

From Date	To Date	Description of Experience
1980	Present	Physical Test Lab Manager. Oversees testing of rebar, strand, wire, resin adhesives, etc.

CERTIFICATIONS AND RATINGS:

Date	Description of Certifications and Ratings

TRAINING:

Date	Description of Training

DATE: 2-16-24
REVISED:

Figure B.14 – Biographical Sketch
(M&T Engineering Unit Supervisor)

NAME:

Scott Waddle

FORMAL EDUCATION:

Date	Degree	Discipline	College

PROFESSIONAL RECOGNITION:

EXPERIENCE:

From Date	To Date	Description of Experience
5-15-23	Present	Engineering Unit Supervisor - Soils Lab Mgr.
7-11-17	5-15-23	M&T Tech III - Soils Lab Technician. Performed all the tests in the Soils Lab
11-8-93	7-11-17	M&T Tech III – Perform all the tests in the Physical Test Lab
4-1984	11-8-93	Construction Inspector with HWS Consulting Group

CERTIFICATIONS AND RATINGS:

Date	Description of Certifications and Ratings

TRAINING:

Date	Description of Training

DATE: 03-10-06
REVISED: 01-29-21

Table C.1 – Major Equipment Inventory, Aggregates Laboratory

EQUIPMENT	DATE REC'D	DATE IN SERVICE	CONDITION (When Rec'd)	MANUFACTURER	MODEL NO.	SERIAL NO.	IDENT. NO.
Balance	1990	1990	New	Mettler	PE16		NDOR 024200 AMRL 444G
Balance	1994	1994	New	A and D	EP-12KA		NDOR 041793
Balance	1989	1989	New	Mettler	PM-11		NDOR 023499 AMRL 115E
Balance	2015	2015	New	Mettler Toledo	JS3002G		NDOR 40098
Balance	2004	2004	New	A & D	FP-12K	6503840	NDOR 048112
Balance	1950	1950	New	Toledo	31-1821D	749061	NDOR 022508
Crusher, Chipmonk	1985	1985	New	Bico		67083	NDOR 024201
Fine Aggregate Angularity Device	1997	1997	New	Humbolt	H-4940.6		A1400
Los Angeles Machine	1990	1990	New	Gilson	HM-70	CA139	NDOR 033847 AMRL 114E
Oven	1998	1998	New	Despatch			NDOR 045874
Oven	1960	1960	New	Despatch		61020	AMRL 791B
Oven	1948	1948	New	Despatch		25275	AMRL 189B
~~Oven~~ Removed 2020	~~1978~~	~~1978~~	~~New~~	~~Despatch~~			~~AMRL 190B~~
Oven	2020	2020	New	Despatch	LBB1-69-3	197544	
Shaker	1960	1960	New	Fisher Wheeler			NDOR 022532
Shaker	1960	1960	New	Fisher Wheeler			NDOR 022533
Shaker	1960	1960	New	Fisher Wheeler			NDOR 022534
Shaker	2018	2018	New	Gilson			27MR50916
Shaker	2018	2018	New	Gilson			27MR50915
~~Shaker, Mary Ann~~ Rem. 2020	~~1994~~	~~1994~~	~~New~~	~~Rainhart~~	~~637~~		~~NDOR 042020~~
~~Shaker, Mary Ann~~ Rem. 2020	~~1994~~	~~1994~~	~~New~~	~~Rainhart~~	~~637~~		~~NDOR 042021~~
Shaker, Mary Ann	1978	1978	New	Rainhart	635		NDOR 022528
Splitter, Mechanical	1970	1970	New	NDOR			NDOR 023859

Table C.1 – Continued

EQUIPMENT	DATE REC'D	DATE IN SERVICE	CONDITION (When Rec'd)	MANUFACTURER	MODEL NO.	SERIAL NO.	IDENT. NO.
Splitter (3/4")	1970	1970	New	Soiltest	CL-283A		NDOR 023855
Splitter (3/4")	1995	1995	New	Soiltest	CL 283		NDOR 042404
Splitter (1/4")	1970	1970	New	Soiltest	CL-244A		NDOR 023857
Stirring Apparatus (Mixer)	1970	1970	New	Hamilton Beach	936		NDOR 023854

DATE: 10-12-07
REVISED: 07-20-23

Table C.2 – Major Equipment Inventory, Bituminous Laboratory

EQUIPMENT	DATE REC'D	DATE IN SERVICE	CONDITION (When Rec'd)	MANUFACTURER	MODEL NO.	SERIAL NO.	IDENT. NO.
Balance Removed from service 6-8-2023	1988	1988	New	Ohaus	E 4000	1780	NDOR 024227
Balance	1994	1994	New	A and D	FA-200	5023759	NDOR 041910
Balance Removed from service 6-8-2023	1983	1983	New	American Scientific	TL4100	001047	NDOR 019995
Balance Removed from service 6-8-2023	2014		New	A and D	EJ-4100	5A2837016	
Bending Beam Rheometer Removed from service 7-1-2022	1-28-08	1-28-08	New	Cannon	TE-BBR	3459-A408	NDOR 048229
Centrifuge	1984	1984	New	Simm			NDOR 023865
Circulator	1996	1996	New	PolyScience	7305		NDOR 043574
Emulsion Distillation Appar.	8-28-96	8-28-96	New	Humboldt	H-2285		NDOR 043980
Ductility Machine	2000	2000	New	Humboldt			NDOR 047943
Dynamic Shear Rheometer Removed from service 7-31-17	1999	1999	New	TA	CSA 500	9F1482	NDOR 046099
Flash Apparatus (Still have, but discontinued use.)	1947	1947	New	Pensky-Martens	1737		NDOR 023907
Flash Apparatus	1983	1983	New	Precision Scientific		10AM/11	NDOR 023885
Oil Bath (275°F)	1972	1972	New	Cannon	H1	1070	NDOR 023891
Oven (Not in use. Loaned to UNL)	?	?	?	Blue M	SW-17TA	S4-3946	
Oven	4/15/19	4/15/19	New	Despatch	LBB1-69-2	195518	27MR50919
Oven (160°F)	3-1-05	3-11-05	New	Blue M	G013 10A	018P-504 348-OP	
Oven, Cleaning	10-10-97	12-1-97	New	Tempyrox	3-AB	9443	NDOR 044583
Oven, Rolling Thin Film Removed from Service 7/20/23	4-4-97	11-1-97	New	Despatch	Roll. Thin	158617	NDOR 044398
Oven, Thin Film (325°F)	1989	1989	New	Blue M			NDOR 0031157
Oven, Vacuum Degassing	4-26-01	5-1-01	New	Prentex	9900E1	99137	NDOR 047820
Penetrometer	1996	1996	New	Precision Scientific		BE-1	NDOR 043573
Pressurized Aging Vessel Removed from Service 7/20/23	12-95	10-97	New	Applied Test Systems	504B	N950910-28	

Freezer Removed from service 10-1-2021	2013	4-29-13	New	JRV Inc.	34-09A	S8005242	NDOR 048411
Silverson Shear Mixer	2002	5-02	New	Silverson Machines	L4R	14517	NDOR 047997

Table C.2 - Continued

EQUIPMENT	DATE REC'D	DATE IN SERVICE	CONDITION (When Rec'd)	MANUFACTURER	MODEL NO.	SERIAL NO.	IDENT. NO.
Refrigerated Water Bath Circulator	7-16-98	7-23-98	New	Fisher Scientific	1016D	198077018	NDOR 045708
Rotational Viscometer	5-13-02	Not verified.	New	Bohlin	Visco2000		NDOR 048001
Viscometer, Saybolt	8-14-96	8-14-96	New	Precision Scientific		10BD-4	NDOR 043753
Viscometer, Saybolt	10-21-03	3-1-04	New	Precision Scientific	74965		NDOR 048081
Water Bath (100°F)	1947	1947	New	NDOR			NDOR 023875
Water Bath (77°F)	1947	1947	New	NDOR			NDOR 023881
Water Bath (140°F) (Inactive)	1966	1966	New	Cannon	H1	1175	NDOR 023892
Water Bath (180°F)	1977	1977	New	Cannon	M1	2384	NDOR 023889
Water Bath (140°F) (Inactive)	1972	1972	New	Cannon	M1	2119	NDOR 023890
Water Bath (40°C)	1975	1975	New	Cannon	M1	2383	
Water Bath (100°C) (Inactive)	1975	1975	New	Cannon	M1	2118	
Viscosity Bath	5-24-07	6-1-07	New	Koehler	KV3000		NDOR 048205
Dynamic Shear Rheometer	10-11-06	11-1-06	New	TA	AR2000	6H3143	NDOR 048616
Dynamic Shear Rheometer	10-15-07	12-1-07	New	TA	AR1500	7H3490	NDOR 048221
Rotational Evaporator	2015	2015	New	BUCHI	300 Series		NDOR 049042
Pressurized Aging Vessel	2017	8-1-17	New	Applied Test Systems	PAV-3	17-16186-1	
Rolling Thin Film Oven	2017	8-1-17	New	Applied Test Systems	RTFO-Touch	17-16185-1	
Dynamic Shear Rheometer	1-2018	5-2018	New	KINEXUS		MAL1170319	27MR49530
Dynamic Shear Rheometer	1-2018	5-2018	New	KINEXUS		MAL1168233	27MR50769
Balance	2021	2-21-2021	New	Sartorious	BCE224-1S	38704011	
Freezer	2021	2021	New	Scientemp Corp	34-15A	S8009341	27MR51453
Bending Beam Rheometer	5-15-22	6-7-2022	New	Cannon	TE-BBR	3459-A408	27MR51491
Balance	2022	6-8-2023	New	OHAUS	SPX6201	24278	

DATE: 03-10-06
REVISED: 09-26-18

Table C.3 – Major Equipment Inventory, Bituminous Aggregate Laboratory

EQUIPMENT	DATE REC'D	DATE IN SERVICE	CONDITION (When Rec'd)	MANUFACTURER	MODEL NO.	SERIAL NO.	IDENT. NO.
Balance	1986	1986	New	Mettler	6000		NDOR 022901
Balance	1990	1990	New	Mettler	PJ 6000	J97752	NDOR 032516
Balance			New	Mettler	PE24Kg		NDOR 24247
Balance			New	AND	HP40K	13002542	NDOR 43752
Balance	1988	1988	New	Sartorius	E-12000 S		NDOR 024231
Compactor, Gyratory	1995	1995	New	Troxler	D-4843-01-00	05-95-140063-3	NDOR 5388
Compactor, Manual	Unknown	Unknown	Unknown				DSH 5290
Compactor, Triple Hammer	1993	1993	New	Humboldt	H-1338B		NDOR 039659
Counter, Automatic	1994	1994	New	Humboldt	H-1332		NDOR 042023
Manometer	1998?	1998?	New	Princo Instruments Inc			NDOR 042013
Manometer	1998?	1998?	New	Princo Instruments Inc			NDOR 042115
Mixer	1993	1993	New	Blakeslee	B-20T	63-61658DCB	NDOR 040026
NCAT Asphalt Content Tester	1999	1999	New	Thermolyne	F85938	1087990271761	NDOR 046035
NCAT Asphalt Content Tester	8-6-98	10-22-98	New	Barnstead/Thermolyne	F85930	1087980711910	NDOR 045873
Oven	1994	1994	New	Despatch	LAD	2-24-3	NDOR 041445
Oven	2003	2003	New	Despatch	LBB-1-69A-1	170740	NDOR 48080
Recorder, Marshall	7-03	7-03	New	Pine	AF850T	1200	NDOR 048082
Shaker, Sieve	1997	1997	New	Rainhart	TA-566A	30204	NDOR 44547
Shaker, Sieve	1997	1997	New	Rainhart	TA-566A	30204	NDOR 44548
Shaker, Sieve	1997	1997	New	Rainhart	TA-566A	30204	NDOR 44549
Splitter, Hand	1969	1969	New	Soiltest	CL-283A		NDOR 023925

Table C.3 – Continued

EQUIPMENT	DATE REC'D	DATE IN SERVICE	CONDITION (When Rec'd)	MANUFACTURER	MODEL NO.	SERIAL NO.	IDENT. NO.
Vacuum Pump	6-12-01	6-12-01	New	Welsh Thomas	2560B-01	099900000238	None
Vacuum Pump	6-12-01	6-12-01	New	Welsh Thomas	2560B-01	099900000241	None
Vacuum Pycnometer	1993	1993	New	Humboldt	H-1750		NDOR 039773
Vacuum Pycnometer	1993	1993	New	Humboldt	H-1750		NDOR 039774
Water Bath	2000	2000	New	Blue M	MW-1120A-1	13709	NDOR 4645
Water Bath	2000	2000	New	Lindberg/Blue M	WG-1120A-1	X27J-460361YJ	NDOR 47713
Water Bath (Inactive)	1972	1972	New	Blue M	MW-1130A-1	MOS-16145	NDOR 023954
Multispeed Compression Tester	2017	2018	New	Controls	1650286001	16001476	NDOR49091
Manometer			New	EXTECH	407910	H166437	
Core Lok Vacuum Bagger	2000	2000	New	Instrotek	I225	1254	
Core Dry				Instrotek		353W	NDOR48168

DATE: 3-10-06
REVISED: 01-29-21

Table C.4 – Major Equipment Inventory, Chemical Laboratory

Major Equipment Inventory, Chemistry Laboratory

Equipment	Date Received	Date in Service	Condition (When Received)	Condition (Now)	Manufacturer	Model No.	Serial No.	Ident. No.
Furnace, Muffle	1978	Sep-78	New	Fair	Lindberg	51442	787081	NDOT 23807
Furnace, Muffle	2011	Jun-11	New	Excellent	Thermo Scientific	F6020C	59858	NDOT 48928
X-Ray Fluorescence Spectrometer	2019	Jun-19	New	Excellent	Bruker	S8 Tiger	214119	NDOT 51176
Briquetting Press	1992	Nov-92	New	Fair	Angstrom, Inc.	4451A	4600-68	NDOT 38356
Vibratory Ring Pulverizer	1992	Nov-92	New	Fair	TM Engineering Ltd.	TM/STLX	None	NDOT 38356
Refrigerated Water Circulator - Chiller for X-Ray Spectrometer	2019	Jun-19	New	Excellent	Haskris Co.	INDOOR	HB36133	NDOT 51176
Analytical Balance	1993	Feb-93	New	Poor	A & D	ER-182A	4704934	NDOT 40292
Analytical Balance	2013	Jun-13	New	Excellent	Sartorius	Quintix 224-1S	29004147	NDOT 48442
Analytical Balance	2017	Apr-17	New	Excellent	Sartorius	Quintix 224-1S	34950140	NDOT 49508
Atomic Spectrometer	2014	Apr-14	New	Excellent	Perkin-Elmer	Aanalyst 200	200S14012101	NDOT 48510
Flame Photometer	2004	Jul-04	New	Excellent	Cole-Parmer	2655-10	15540	NDOT 48107
Viscometer	2019	Apr-19	New	Excellent	Brookfield	KU3ASTKB0	86004211	NDOT 51143
Retroreflectometer	1998	Apr-98	New	Fair	ART	Mirolux 30	1417	NDOT 45145
Freezer	1988	Jun-88	New	Fair	Revco	ULT 1740	OX 62226-4A	NDOT 24240
Color Spectrometer MiniScan EZ	2009	Apr-09	New	Excellent	HunterLab	45/O-LAV	MSEZ0102	NDOT 48940
Microscope	2004	Jul-04	New	Excellent	Motic	SM 168TL	560232	NDOT 48108
Freezing Point Apparatus	2008	Nov-08	New	Excellent	Koehler	K29750	R62870027	NDOT 48311
Wrist Action Shaker	2012	12-Jun	New	Excellent	Burrell Scientific	75 - 17931	183072098	NDOT 48390
Automatic Titrator	2013	Jul-13	New	Excellent	Mettler-Toledo	T50	B320339505	NDOT 48455
Colorimeter	2013	Nov-13	New	Excellent	Hach	DR 890	130490C94565	N/A
Mixer Mill	2014	Aug-14	New	Excellent	Premier Lab Supply	M400	1214180712G	NDOT 48563
Camsizer	2015	Jul-15	New	Excellent	Horiba	100.0002	E140213	NDOT 48834
Fusion	2017	Sep-17	New	Excellent	Premier Lab Supply	PM-6000-VFD/M	1558	NDOT 49531

DATE: 05-19-23
REVISED: 11-16-23

Table C.5 – Major Equipment Inventory, PCC Laboratory

EQUIPMENT	DATE REC'D	DATE IN SERVICE	CONDITION (When Rec'd)	MANUFACTURER	MODEL NO.	SERIAL NO.	IDENT. NO.	DATE CALIB.	NEXT CALIB.
CEMENT AND FLY ASH TESTING									
Air Permeability (Blaine)	1975	1975	New	Humboldt			NDOR 023710	CCRL	CCRL
Autoclave Scrapped 2-28-23	2021	2022	New	Boekel	3598	20009-16	27MR51417		
Autoclave Scrapped 2-28-23	2009	2009	New	Boekel	3L09	6545-11	27MR48938		
Balance	1999	1999	New	AND	EK-4000H	K9206205	46154	4-21-23	4-21-24
Balance	1980	1980	New	Mettler	PC 4000	B45646	NDOR 022443 CCRL R-37	4-21-23	4-21-24
Analytical Balance	2004	2004	New	AND	HR-200	12315466	12315466	6-8-22	6-2023
Flow Table	1999	1999	New	Humboldt	H3614		NDOR 047688	CCRL	CCRL
Length Comparator	1988	1988	New	Humboldt	H3250			CCRL	CCRL
Length Comparator	1988	1988	New	Humboldt	H3250			CCRL	CCRL
Mixer, Mechanical	7-16-97	7-16-97	New	Hobart	N-50	51-1113508	NDOR 044519	CCRL	CCRL
Mixer, Mechanical	6-26-01	6-26-01	New	Hobart	N-50	31-1235-778	NDOR 047946	CCRL	CCRL
Wet Sieving Apparatus	Unknown	Unknown	Unknown	Marsh	30 PSI			CCRL	CCRL
Vicat Apparatus	Unknown	Unknown	Unknown	Humboldt			CCRL B9999	CCRL	CCRL
Vicat Apparatus	Unknown	Unknown	Unknown	Forney			CCRL S4770	CCRL	CCRL
400 ml Cup	Unknown	Unknown	New	Humboldt			No.1	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Humboldt			T2376	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Humboldt			T2377	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Humboldt			T2387	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Humboldt			T2385	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Humboldt			T2388	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Humboldt			T2382	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Humboldt			T2391	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Humboldt			T2375	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Humboldt			T2380	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Humboldt			T2392	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Humboldt			T2384	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Humboldt			T2386	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Humboldt			T2379	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Humboldt			T2381	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Humboldt			T2387	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Humboldt			T2393	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Forney			B9980	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Forney			B9999	CCRL	CCRL

Table C.5 – Continued

EQUIPMENT	DATE REC'D	DATE IN SERVICE	CONDITION (When Rec'd)	MANUFACTURER	MODEL NO.	SERIAL NO.	IDENT. NO.	DATE CALIB.	NEXT CALIB.
CEMENT AND FLY ASH TESTING (Cont.)									
Cube Molds 2x2	Unknown	Unknown	New	Forney			B9994	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Forney			B9990	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Forney			B9989	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Forney			B9988	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Forney			B9992	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Forney			B9987	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Forney			B9983	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Forney			B9996	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Forney			B9982	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Forney			B9995	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Forney			B9985	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Forney			B9997	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Forney			B9984	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Forney			A708	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Forney			A707	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Forney			U3079	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Forney			U3081	CCRL	CCRL
Cube Molds 2x2	Unknown	Unknown	New	Forney			U3080	CCRL	CCRL
Digital Caliper	Unknown	Unknown	New	Fowler		13513		4-21-23	4-2024
Moist Room Recorder	Unknown	1995	New	Johnson Control Sys.	Metasys				
Dostmann Dig. Ref. Therm.	2012		New	Dostmann Electronic	650	65009010827		12-28-22	12-2023
Dostmann Dig. Ref. Therm.	2013		New	Dostmann Electronic	750	75513040151		12-28-22	12-2023
Unbonded Cap Retainers	Unknown	Unknown	New	Gilson Co.	4"	Set 1 – 1	Machine 93080	4-19-23	4-19-24
Unbonded Cap Retainers	Unknown	Unknown	New	Gilson Co.	4"	Set 1 – 2	Machine 93080	4-19-23	4-19-24
Unbonded Cap Retainers	Unknown	Unknown	New	Gilson Co.	4"	Set 2 - 1	Machine 93080	4-19-23	4-19-24
Unbonded Cap Retainers	Unknown	Unknown	New	Gilson Co.	4"	Set 2 – 2	Machine 93080	4-19-23	4-19-24
Unbonded Cap Retainers	Unknown	Unknown	New	Gilson Co.	4"	Set 3 – 1	Machine 93080	4-19-23	4-19-24
Unbonded Cap Retainers	Unknown	Unknown	New	Gilson Co.	4"	Set 3 - 2	Machine 93080	4-19-23	4-19-24

Table C.5 – Continued

EQUIPMENT	DATE REC'D	DATE IN SERVICE	CONDITION (When Rec'd)	MANUFACTURER	MODEL NO.	SERIAL NO.	IDENT. NO.	DATE CALIB.	NEXT CALIB.
CONCRETE TESTING									
Compression Test Machine	1994	1994	New	Forney	F-250C-LC1	94041	NDOR 042083	5-1-23	4-2024
Compression Test Machine (Updated w/ Forney Retropak)	1994(2021)	1994(2022)	New	Forney (Forney Retropak)	F-500C-LC1	93080	NDOR 042084	5-1-23	4-2024
Compression Test Machine		2012	New	Test Mark (Truck)	CM-2500-DB	18502H		5-1-23	4-2024
Balance (Removed 5-1-19)	Unknown	Unknown	New	AN D	HW-150K	J4800133	NDOR 042468		
Balance	Unknown	Unknown	New	AN D	FG-150K	57511	NDOR 57571	4-21-23	4-21-24
Scale	11-2019	11-2019	New	Brecknell	S100		2019S100	4-21-23	4-21-24
Concrete Mixer, Drum	1995	1995	New	Gilson	HM-224		NDOR 043854		
Concrete Mixer, Tub	1944	1944	New	Lancaster	713-7595	A-8876	NDOR 023693		
Concrete Mixer (Cures)			New	Hobart	A120	31-1235-829	047947		
Concrete Vibrator, Electric	6- -00	6- -00	New	Oztec	1.2	P28177			
Curing Compound Test Cabinet (Removed 9-2023)	5-23-00	6-1-00	New	Lunaire Ltd.	CE0932W-3	27478-08	NDOR 047930		
Curing Compound Test Cabinet	11/2/23	11/16/23	New	Lunaire. Thermal Products Solutions (TPS)	CEO-916-4-B-F4T	166049	27MR58681		
Shaker	1991	1991	New	Gilson	TS-2	11620	NDOR 036286		
Ultrasonic	2007	2007	New	Sonic Wise			048218		
End Grinder	2008	2008	New	Marui Company	MIC-196-1-30	FO7G13			
Environmental Chamber	2005	2005	New	Caron	6030	042205-6030-35	27MR48110		
Environmental Chamber	2008	2009	New	Caron	6010-1	102808-6010-1-94	27MR48282		
Environmental Chamber	10-2009	2010	New	Assoc. Enviro. Systems	ZSHD-525	8369	27MR48962		
Environmental Chamber	10-2009	2010	New	Assoc. Enviro. Systems	ZSHD-525	8370	27MR48961		
Water Chamber		1996	New	M&R Shop Fabricated	3.5' x 2.25'		None		
Water Chamber		2009	New	M&R Shop Fabricated	4.75' x 2.5'		None		
Volumetric Air Meter		1999	New	Forney	LA-0306		024238	5-4-22	5-2023
Volumetric Air Meter			New	Forney	LA-0306		047724	5-4-22	5-2023
Pressure Air Meter	1988	1988	New	Forney	LA-0306		NDOR 3213	5-19-23	8-2023
Pressure Air Meter	2009	2009	New	Humboldt	H-2786p		NDOR Y648	5-19-23	8-2023
Slump Cone			New	Forney	286		1	8-19-22	8-2023
Slump Cone			New	Forney	286		2	8-19-22	8-2023
Unit Weight Bucket			New	Humboldt	.5 CUFT		1	4-18-23	4-2024

DATE: 3-10-06
REVISED: 09-29-17

Table C.6 – Major Equipment Inventory, Soil Mechanics Laboratory

EQUIPMENT	DATE REC'D	DATE IN SERVICE	CONDITION (When Rec'd)	MANUFACTURER	MODEL NO.	SERIAL NO.	IDENT. NO.
Balance	1988	1988	New	A and D	FX-6000	5403005	NDOR 024252
Direct Shear Apparatus	4/4/05	2005	New	Geocomp	Sheartrac ll		NDOR 048654
Consolidation App.	7/17/03	2003	New	Geocomp	Loadtrac ll		NDOR 048109
Triaxial App.	7/17/03	2003	New	Geocomp	Loadtrac ll		NDOR 048074
Consolidation App.	10/1/03	2003	New	Geocomp	Loadtrac ll		NDOR 048079
Consolidation App.	12/22/04	2004	New	Geocomp	Loadtrac ll		NDOR 048660
CPT Probe	4/9/05	2005	New	Geotech	031-28-9920		NDOR 048655
Tri-Flex one cell	3/1/97	1997	New	Ele	Tri-Flex ll		NDOR 047718
~~Oven~~	~~1978~~	~~1978~~	~~New~~	~~Despatch~~	~~DO-7~~	~~62869~~	
Flow Trac II	10-7-07	2007	New	Geocomp	Triaxial Shear		NDOR 048222
Oven	7-29-16	2016	New	Despatch	LBB2-12-2	191536	

DATE: 02-03-97
REVISED: 01-29-21

Table C.7 – Major Equipment Inventory, Soils Laboratory

EQUIPMENT	DATE REC'D	DATE IN SERVICE	CONDITION (When Rec'd)	MANUFACTURER	MODEL NO.	SERIAL NO.	IDENT. NO.
Balance	1994	1994	New	A and D	EP-12KA		NDOR 041792
Balance Removed 2020	~~1987~~	~~1987~~	~~New~~	~~Denver Scientific~~	~~Z-12000~~	~~25323~~	~~NDOR 024217 AMRL 113E~~
Balance	1985	1985	New	Mettler	PE-600	D39983	NDOR 024039 AMRL 242C
Balance	1990	1990	New	A and D	EP-20KB		NDOR 034415 AMRL 111E
Balance	2017	2017	New	Ohaus	FD6	B722180769	
Barrel Machine	1970	1970	New	NDOR			NDOR 023828
Compactor, Mechanical	1970	1970	New	Soiltest	CN-4230	199	NDOR 023835
Liquid Limit Device	Unknown	Unknown	New	NDOR			
Liquid Limit Device	Unknown	Unknown	New	NDOR			
Mixer	1970	1970	New	Hobart	A-120	929519	NDOR 023836
Muller, Mechanical Rubber-Covered	1970	1970	New	Craftsman			NDOR 023827
Oven	1977			Despatch		32002	
Oven	1999		New	Despatch	LAC2-18-5	164598	NDOR 047714
Oven	1977	1977	New	Despatch	V-SP	29055	AMRL 407C
Oven	1993	1993	New	Cole/Parmer	05015-50		
Splitter, Riffle (1/2”)	1970	1970	New	Soiltest			NDOR 023824
Splitter, Riffle (1 1/2")	Unknown	Unknown	New	NDOR			
Splitter, Riffle (3/4")	1970	1970	New	Soiltest	CL-283A		NDOR 023823
Splitter, Riffle(1/2")	Unknown	Unknown	Unknown	Soiltest	CL-260A		
Splitter (1/4")	1970	1970	New	Soiltest	CL-244A		NDOR 023857
Shaker, Mechanical (SE)	1970	1970	New	Soiltest	CL-232		NDOR 023833
Shaker, Mary Ann	1978	1978	New	Rainhart	635		NDOR 022527
Shaker, Mary Ann	1978	1978	New	Rainhart	635		NDOR 022529
Shaker, Mary Ann	2009	2009	New	Rainhart	637		27MR48941
Stirring Apparatus	1993	1993	New	Hamilton Beach	936-2		NDOR 038961
Water Bath	1970	1970	New	Soiltest	CL-278E		NDOR 023830

DATE: 2-3-97
REVISED: 02-14-11

Figure D.1 – Procedure for Verifying Ovens
In-House Procedure No. 1

Equipment Checked: DRYING OVENS

Purpose:

This method provides instructions for checking drying ovens used in the laboratory.

Inspection Equipment Required:

1. A calibrated thermometer either Fahrenheit or Celsius graduated in 1.0^{o} increments having a range which includes the temperature range to be checked.
2. A thermometer well to retain heat while the oven door is open.
3. A clothes pin to hold thermometer in such a manner as to enable the operator to read the scale easily.

Tolerance:

Drying ovens shall be capable of maintaining a constant temperature range listed in the appropriate test methods.

Procedure:

1. Place the thermometer inside the well with the clothes pin attached to the thermometer. Position the thermometer on the shelf where the samples are normally dried.
2. Take the first reading at least 1 hour after closing the oven (oven should remain undisturbed).
3. Take as many readings as necessary to determine if the temperature range is within the specified tolerance (three consecutive readings, taken no less than 1/2 hr. apart, within the tolerance allowed are adequate).
4. Adjust the temperature of the oven if an observed temperature reading is outside the tolerance specified (allow at least 1/2 hr. for the temperature to stabilize between each adjustment). Return to step 3.

Verification Interval:

12 months

Report:

Send a copy of the results of each oven checked to the In-House Inspection Team for verification and issuance of a Certificate of Verification.

DATE: 2-3-97
REVISED:

Figure D.2 – Procedure for Verifying Compaction Molds
In-House Procedure No. 2

Equipment Checked: COMPACTION MOLDS (AASHTO T 99)

Purpose:

This procedure provides instructions for checking the critical dimensions of the molds used in this test.

Inspection Equipment Required:

1. Calipers capable of measuring an inside diameter of 4 in. and readable to 0.001 in.
2. Calipers capable of measuring an outside height of 6 in. and readable to 0.001 in.

Tolerance:

Molds shall meet all dimension requirements set forth in the applicable test method listed above.

Procedure:

1. Measure and record the inside diameter of the mold to nearest 0.001 in. Rotate the mold 90 degrees and repeat the procedure. Turn the mold over and repeat.
2. Measure and record the height of the mold less its collar to the nearest 0.001 in. Repeat this procedure at intervals of 90 degrees around the mold and record.

Verification Interval:

12 months

Report:

Send a copy of the results of each mold checked to the In-House Inspection Team for verification and issuance of a Certificate of Verification.

DATE: 2-3-97
REVISED: 3-26-21 Removed from AASHTO certification 11/18/16

Figure D.3 – Procedure for Verifying Marshall Molds
In-House Procedure No. 3

Equipment Checked: MARSHALL MOLDS (AASHTO T 245)

Purpose:

This procedure provides instructions for checking the critical dimensions of the molds used in this test method.

Inspection Equipment Required:

1. Calipers capable of measuring an inside diameter of 4 in. and readable to 0.001 in.

Tolerance:

The diameter of the molds checked shall meet the dimensional tolerances specified in the applicable test method listed above.

Procedure:

1. Measure and record the inside diameter of the mold to the nearest 0.001 in. Rotate the mold 90 degrees and measure and record the inside diameter again.
2. Turn the mold over and repeat Step 1.
3. Measure and record the height of the mold less its collar to the nearest 0.1 in. Repeat this procedure at intervals of 90 degrees around the mold and record.

Verification Interval:

12 months

Report

Send a copy of the results of each mold checked to the In-House Inspection Team for verification an issuance of a Certificate of Verification.

DATE: 2-3-97
REVISED: 2-13-13

Figure D.4 – Procedure for Verifying Timers
In-House Procedure No. 4

Equipment Checked: TIMERS

Purpose:

This method provides instructions for checking timers being used in the laboratory.

Inspection Equipment Required:

1. Timer readable to 0.1 sec. having an accuracy within the tolerance of the test method in which the timer is used.

Procedure:

1. Start the lab timer with one hand and simultaneously start the inspection timer.
2. Allow the timers to run for at least 15 min., then stop the timers simultaneously. Record the time indicated on both timers.
3. Record the difference between the two timers. Calculate and record the percent accuracy.
4. This procedure will be performed by the In-House Inspection Team.

Verification Interval:

12 months

Report:

The In-House Inspection Team will issue a Certificate of Verification to the laboratory in which the timer is located.

DATE: 2-3-97
REVISED: 2-28-05

Figure D.5 – Procedure for Verifying Manual Compaction Hammers
In-House Procedure No. 5

Equipment Checked: MANUAL HAMMER (AASHTO T 99) (AASHTO T 180)

Purpose:

This method provides instructions for checking the critical dimensions of the proctor hammer.

Inspection Equipment Required:

1. Calipers readable to 0.001 inch.
2. Tape measure readable to 1/16 inch.
3. Balance, capacity 5 kg, readable to 1 g.

Tolerance:

Equipment shall meet the dimensional tolerances specified in the above test method.

Procedure:

1. Measure and record the diameter of the rammer face determined by taking two readings 90 degrees apart using the calipers.
2. Pull up the handle, measure and record the drop height of the hammer. Determine this height inside the guide sleeve using the tape measure.
3. Remove the hammer from the guide sleeve. Determine and record its mass to the nearest 1 g.
4. Measure and record the diameters of the vent holes near the end of the hammer.
5. This procedure will be performed by the In-House Inspection Team.

Verification Interval:

12 months

Report:

The In-House Inspection Team will issue a Certificate of Verification to the laboratory in which the unit is located.

DATE: 3-16-05
REVISED: 3-26-21 Removed from AASHTO certification 11/18/16

Figure D.6 – Procedure for Verifying the Rammer Weight and Drop Height of Manual and Mechanical Compactors
In-House Procedure No. 6

Equipment Checked: MANUAL AND MECHANICAL COMPACTORS (AASHTO T 245)

Purpose:

This method provides instructions for checking the rammer weight and drop height of the manual and mechanical compactors.

Inspection Equipment Required:

1. Hammer and punch for removing the spring pins which hold the upper collar on the rammer guide rod.
2. Wrench for removing the upper guide rod holder.
3. Balance, capacity of 10 kg and readable to the nearest 1 g.
4. Ruler capable of measurement to the nearest 1 mm.

Tolerance:

The mass and drop height of the rammer shall meet the requirements set forth in test method AASHTO T 245.

Procedure:

1. Measure and record the rammer drop height to the nearest 1 mm.
2. Using the required tools remove the hammer from its guide rod.
3. Weigh only the rammer and record the weight to the nearest gram.
4. On multiple rammer type compactors mark each rammer with some form of identification for future inspections.
5. Record the rammer identification and its weight.
6. This procedure will be performed by the In-House Inspection Team.

Maintenance:

Clean and lubricate. Check pins and other parts for wear and replace if necessary.

Verification Interval:

12 months manual

36 months mechanical

Report:

The In-House Inspection Team will issue a Certificate of Verification to the laboratory in which the unit is located.

DATE: 5-20-97
REVISED: 3-26-21 Removed from AASHTO certification 11/18/16

Figure D.6A – Procedure for Calibration of Mechanical Compactors
In-House Procedure No. 6A

Equipment Checked: MECHANICAL COMPACTOR (AASHTO T 245)

Purpose:

This method provides instructions for checking the calibration of the mechanical compactor.

Inspection Equipment Required:

1. Scale conforming to the requirements of AASHTO M 231 and equipped with a suspension apparatus and water bath for weighing a specimen in water and air.
2. Oven or hot plate for heating the specimen prior to compacting.
3. Mixing equipment and support equipment for blending all of the components of the test mix.
4. Hand compaction hammer meeting the requirements set forth in AASHTO T 245.

Procedure:

1. Mix a 3/4" to 3/8" nominal size asphaltic concrete batch of 7400 g minimum.
2. Produce three compacted specimens following the procedure set forth in AASHTO T 245 using the mechanical compactor.
3. Produce three compacted specimens following the procedure set forth in AASHTO T 245 using the manual hammer.
4. Determine the bulk specific gravity of each compacted specimen per AASHTO T 166 and record the results.
5. Average the three specific gravity results from the manual compactor and the mechanical compactor. Record the two averages.
6. Determine if the average bulk specific gravity from the mechanical compacted specimens is within ± 5% of the average bulk specific gravity obtained from the manual compacted specimens.

Verification Interval:

36 months

Report:

The In-House Inspection Team will issue a Certificate of Verification to the laboratory in which the unit is located.

DATE: 10-14-08
REVISED: 1-27-12

Figure D.7 – Procedure for Verifying L. A. Abrasion Machine
In-House Procedure No. 7

Equipment Checked: L. A. ABRASION MACHINE (AASHTO T 96)

Purpose:

This method provides instructions for checking the critical dimensions and general operating condition of the L. A. Abrasion Machine and the mass of the spheres used as the test charge

Inspection Equipment Required:

1. Steel rule readable to 1/16 inch.
2. Stopwatch readable to 0.1 sec.
3. Balance with a minimum capacity of 6 kg, readable to 1 g.
4. Tape measure readable to 1/16 in.

Tolerance:

The L. A. machine shall meet the dimensional tolerances specified in the applicable test method listed above and shall be in good operating condition. The steel spheres used to charge the L. A. machine shall meet the mass tolerances specified in the applicable test method listed above.

Procedure:

(L. A. Machine)

1. Measure and record the inside diameter of the drum at the left and right edges to the nearest 1/16 in.
2. Measure and record the width and height of the opening to the nearest 1/16 in.
3. Measure and record the wall thickness at the left and right edge to the nearest 1/16 in.
4. Determine if the cylinder is horizontal using a steel ball to check left to right roll.
5. Measure and record the shelf width and length inside the drum to the nearest 1/16 in.
6. Measure and record the distance from the shelf to the opening in the direction of rotation.
7. Using the stopwatch, determine the RPM to the nearest whole number over a 5-minute period. Record the RPM.
8. Check that the number of revolutions is 500 by looking at the counter on the machine.

(Steel Spheres)

1. Determine and record the mass of each individual sphere to the nearest 1 g.
2. Determine and record the mass of the collective charge to the nearest 1 g.

Maintenance:

L. A. Machine - Grease fittings. Visually & physically check for worn or loose parts.

Verification Interval:

L. A. Machine - 24 months

Steel spheres - 12 months

Report:

Send inspection results to the In-House Inspection Team for issuance of a Certificate of Verification.

DATE: 2-3-97
REVISED:

Figure D.8 – Procedure for Verifying Scales and Balances
In-House Procedure No. 8

Equipment Checked: SCALES AND BALANCES (AASHTO M 231)

Purpose:

This method provides instructions for checking the accuracy sensitivity of Scales and Balances used in all labs.

Inspection Equipment Required:

1. S-1 and Class 4 masses
2. Powder free gloves designed for handling these weights.

Tolerance:

All tests requiring the use of scales and or balances have in their procedures a list of the requirements for the weighing devices. It will be up to the inspector to check these requirements when checking and verifying this equipment.

Procedure:

All scales and balances will be checked and verified by the In-House Inspection Team. The team will adhere strictly to the guidelines set forth in AASHTO M 231. Upon completing the verification and acceptance of a scale or balance the inspection team shall mark the scale or balance with a tag containing the inspectors name and date of the inspection. A Certificate of Verification will be sent to the supervisor of the lab in which the scale or balance is located for their records.

Analytical Balances:

Analytical Balances in Classes "A" and "B" in Table 1 of the AASHTO Designation M 231 will be verified by an outside contractor. The In-House Inspection Team shall be responsible for seeing that this is accomplished at the proper times. A Certificate of Verification will be sent to the supervisor of the lab in which the balance is located for their records.

Inspection Interval:

12 months

DATE: 2-3-97
REVISED:

Figure D.9 – Procedure for Verifying Conical Molds and Tampers
In-House Procedure No. 9

Equipment Checked: CONICAL MOLDS AND TAMPERS (AASHTO T 84)

Purpose:

This method provides instructions for checking the critical dimensions of the conical mold and mass of the tamper used in this test procedure.

Inspection Equipment Required:

1. A scale or balance capable of weighing to 500 grams and readable to the nearest gram.
2. A caliper for measuring the inside diameter of the top and bottom of the cone and measuring the outside diameter of the tamper face. The caliper should be able to read to the nearest 0.1 mm.
3. A ruler for measuring the height of the cone and readable to the nearest 1.0 mm.

Procedure:

Using the requirements set forth in the AASHTO test method, check each of the dimensions of the cone and the mass of the tamper. The In-House Inspection Team shall perform this task at the appointed time and will issue a Certificate of Verification to the Laboratory Supervisor.

Verification Interval:

24 months

DATE: 2-3-97
REVISED: 2-25-05

~~Figure D.10 – Procedure for Verifying Flash Cups~~
~~In-House Procedure No. 10~~

Equipment Checked: FLASH CUPS (AASHTO T 48)

Purpose:

This method provides instructions for checking and reporting the critical dimensions of the flash cups used in this test method.

Inspection Equipment Required:

1. Calipers and micrometers capable of measuring up to 4 inches and readable to the nearest 0.01" (0.1 mm).
2. Certified flash point reference material.
3. Testing apparatus as illustrated in Figures 1, 2 & 3 of the AASHTO test method.

Tolerance:

All dimensions are found in the AASHTO test method and should be adhered to.

AASHTO test method repeatability of certified reference material is the certified flash point +/- 8 Degrees C.

Procedure:

Measure and record all of the dimensions listed in the AASHTO manual for this test.

Perform the flash point test as per the AASHTO T48 procedure, using a certified flash point reference material.

Record the known reference flash point and the flash point obtained.

Submit a Certificate of Verification to the Laboratory Supervisor.

Note: The In-House Inspection Team shall perform this inspection at the required time intervals.

Verification Interval:

12 months

DATE: 07-28-17
REVISED: 09-26-18

Figure D.11 – Procedure for Verifying Bearing Blocks and Retainers
In-House Procedure No. 11

Equipment Checked: BEARING BLOCKS (ASTM C 39) RETAINERS (ASTM C 1231)

Purpose:

This method provides instructions for checking the planeness of the bearing blocks of the compression testing machine as described in ASTM C 39 & C 1231.

Inspection Equipment Required:

1. Steel Rule
2. Feeler Gauges. .001" and .002"

Tolerance:

The critical dimensions shall meet the requirements set forth in ASTM C 39 & C 1231.

Procedure:

The units shall be checked by in house personnel and the results shall be reported to the Laboratory Supervisor. Any deviation from the requirements shall be repaired prior to placing the unit back in service.

Verification Interval:

12 months

DATE: 4-10-07
REVISED: 2-13-12

Figure D.12 – Procedure for Verifying Penetrometers and Water Baths
In-House Procedure No. 12

Equipment Checked: PENETROMETER AND WATER BATH (AASHTO T 49)

Purpose:

This method provides instructions for checking the accuracy of the dial and timer, and the needle verification. It also covers the checking of the water bath dimensions and temperature.

Inspection Equipment Required:

1. Support block, 10. mm metal block, and 25.4 mm metal block
2. Engineering thickness gauge
3. Certified stop watch
4. Certified thermometer
5. Certified balance (0.01 resolution)
6. Certified Micrometer
7. Optical magnification device, 10x
8. Ruler, 1mm increments

Tolerance:

The accuracy of the dial, timer, and the water bath shall meet the requirements set forth in AASHTO Test Method T 49.

Procedure:

1. Remove the needle from the penetrometer.
2. Place the support block on the lower surface of the penetrometer device and rest the needle chuck against the support block. Take an initial reading of the dial and record.
3. Using the thickness gauges and metal blocks, take the required readings and record each.
4. Verify the weight of the spindle, and the 50g and 100g weights.
5. Check the timer by comparing readings against the stop watch and record the results.
6. Check the condition of the needles (at least three) visually to verify if straight.
7. Weigh the needles (at least three) on a balance and record weights.
8. Verify and record needle diameter, ferrule diameter, and ferrule length of at least three needles with a micrometer.
9. Using optics of 10x, inspect needles (at least three) for burrs and verify that the ferrule base is flat.
10. Verify water bath operating temperature with certified thermometer.
11. Using ruler, measure the perforated support shelf depth from bottom, and from surface, and the depth the thermometer is immersed.

Verification Interval:

12 months

Report:

The In-House Inspection Team will issue a Certificate of Verification to the laboratory in which the equipment is located.

DATE: 2-3-97
REVISED: **VOID – DO NOT USE**

Figure D.13 – Procedure for Verifying Thin Film Ovens
In-House Procedure No. 13

Equipment Checked: THIN FILM OVEN (AASHTO T 179)

Purpose:

This method provides instructions for checking the oven use in this test method.

Inspection Equipment Required:

1. Certified stop watch.
2. An ASTM 13^{o} C thermometer.

Tolerance:

The operating temperature and rotating shelf speed shall meet the requirements set forth in AASHTO T 179.

Procedure:

1. Using the stop watch check the rpm of the rotating shelf and record the result.
2. After allowing sufficient time for the temperature of the oven to stabilize note the temperature and record.
3. After recording the operating temperature place two sample pans into the oven. Note the time required to recover to 162 degrees C, and record.
4. This procedure will be performed by the In-House Inspection Team.

Verification Interval:

12 months

Report:

The In-House Inspection Team will issue a Certificate of Verification to the laboratory in which the equipment is located.

DATE: 2-3-97
REVISED:

Figure D.14 – Procedure for Verifying Bearing Blocks
In-House Procedure No. 14

Equipment Checked: BEARING BLOCKS (ASTM C 109)

Purpose:

This method provides instructions for checking the planeness of the bearing blocks of the compression testing machine as described in ASTM C 109.

Tolerance:

The critical dimensions shall meet the requirements set forth in ASTM C 109.

Procedure:

The units shall be checked by the Maintenance Shop and the results shall be reported to the Laboratory Supervisor. Any deviation from the requirements shall be repaired prior to placing the unit back in service

Verification Interval:

12 months

Report:

The In-House Inspection Team will issue a Certificate of Verification to the laboratory in which the equipment is located.

DATE: 2-3-97
REVISED:

Figure D.15 – Procedure for Verifying Capping Plates and Alignment
In-House Procedure No. 15

Equipment Checked: CAPPING PLATES AND ALIGNMENT (ASTM C 617)

Purpose:

This method provides instructions for checking the capping plates and alignment devices as described in ASTM C 617.

Tolerance:

The critical dimensions shall meet the requirements set forth in ASTM C 617.

Procedure:

The units shall be checked by the Maintenance Shop and the results shall be reported to the Laboratory Supervisor. Any deviation from the requirements shall be repaired prior to placing the unit back in service

Verification Interval:

3 months

Report:

The In-House Inspection Team will issue a Certificate of Verification to the laboratory in which the equipment is located.

DATE: 2-3-97
REVISED:

Figure D.16 – Procedure for Verifying Spray Nozzles
In-House Procedure No. 16

Equipment Checked: SPRAY NOZZLE (ASTM C 430)

Purpose:

This method provides instructions for checking the spray nozzle flow rate as described in ASTM C 430.

Tolerance:

The flow rate shall be between 1500 and 3000 g/min at 10 ± 0.4 psi.

Procedure:

Use a water tight container with a volume of 3500 cc minimum. Tare the container prior to using. Turn on the spray nozzle and adjust the pressure to 10 psi. Place the container under the flow from the nozzle for 1 minute. At the end of 1 minute weigh the container with the water, subtract the weight of the container and report the weight of the water to the nearest gram.

Verification Interval:

6 months

Report:

Send a copy of the results to the In-House Inspection Team for a Certificate of Verification.

DATE: 2-3-97
REVISED:

Figure D.17 – Procedure for Verifying Mechanical Mixers and Cups
In-House Procedure No. 17

Equipment Checked: MECHANICAL MIXER AND CUP (AASHTO T 88)

Purpose:

This method provides instructions for checking the mixer and cup used for particle size analysis of soils.

Inspection Equipment Required:

1. A hand held tachometer for checking the mixer speed.
2. A steel machinist rule for measuring the cup.

Procedure:

1. To check the speed of the mixer it is necessary to use the tachometer with the blue drive wheel. Set the tachometer on the 1000 to 4000 rpm range.
2. Turn on the mixer and place the edge of the blue drive wheel against the shaft of the mixer and note the reading on the tachometer.
3. Take the tachometer reading and multiply this by 5 to get the speed of the mixer.
4. Measure the cup using the steel ruler. Note that all of the measurements are approximate and should not be taken as exact.
5. Check the baffle rods to make sure that they are not loose. If any of the rods are loose the cup must be repaired.
6. This procedure shall be performed by the In-House Inspection Team.

Verification Interval:

24 months

Report:

The In-House Inspection Team will issue a Certificate of Verification to the laboratory in which the equipment is located.

DATE: 3-7-97
REVISED: 02-14-11

Figure D.17A – Procedure for Verifying Hydrometers (AASHTO T 88)
In-House Procedure No. 17A

Equipment Checked: HYDROMETER (AASHTO T 88)

Purpose:

This method provides instruction for checking the hydrometer used in performing AASHTO T 88.

Tolerance:

The hydrometer shall conform to the requirements set forth in ASTM E 100.

Procedure:

1. All measurements for dimension shall be made using a rule capable of being read to the nearest 0.1 cm.
2. It will be necessary to measure the body of the hydrometer using a caliper and or a "go-no-go" gage made of some rigid material.
3. Using a beaker containing distilled water maintained at 20^{o} C, place the hydrometer in the water and allow it to float free and note the reading.

Verification Interval:

24 months

Report:

A Certificate of Verification will be issued to the lab from the In-House Inspection Team.

DATE: 2-3-97
REVISED: 3-12-01

Figure D.18 – Procedure for Verifying Liquid Limit Devices and Grooving Tools
In-House Procedure No. 18

Equipment Checked: LIQUID LIMIT DEVICE AND GROOVING TOOL (AASHTO T 89)

Purpose:

This method provides instructions for checking the liquid limit device and grooving tool used in this test.

Inspection Equipment Required:

1. Caliper capable of reading to nearest 0.01 mm.
2. Dial micrometer.

Tolerance:

The critical dimensions shall meet the requirements set forth in AASHTO T 89.

Procedure:

1. Check all the critical dimensions for the liquid limit device's brass cup and the grooving tool. A picture of the apparatus and the necessary points to measure with the tolerances are printed in the AASHTO test procedure T89.
2. Where the cup comes in contact with the base, a small indention will be made. Measure the depth of this indention using the vertical dial micrometer to the nearest 0.01 in.
3. Check the rim of the cup for excessive wear, which will cause it to become sharp rather than a milled flat surface. Rejection is at the inspector's judgment.
4. Turn the crank slowly and note if the cup wobbles on the rise. Also check that the cup is fastened to the cam follower with mechanical rather than a welded connector.
5. Check the inside of the cup for excessive wear, which will create a groove in the cup. Rejection is based on the judgment of the inspector.
6. This inspection will be performed by the In-House Inspection Team.

Verification Interval:

12 months

Report:

The In-House Inspection Team will issue a Certificate of Verification to the laboratory in which the equipment is located.

DATE: 4-12-07
REVISED: 10-17-08

Figure D.19 – Procedure for Verifying Straightedges
In-House Procedure No. 19

Equipment Checked: STRAIGHTEDGE (AASHTO T 99, T 180)

Purpose:

This method provides instructions for checking the steel straightedge used in AASHTO Test Methods T 99 and T 180.

Inspection Equipment Required:

1. Ruler.
2. Feeler gauge.

Tolerance:

The critical dimensions shall meet the requirements set forth in AASHTO T 99 and T 180.

Procedure:

1. Measure the length with a ruler and record.
2. Place the straightedge so that the beveled edge is down on a flat surface and using a 0.01 in. thickness gage, try to pass the gage between the edge of the unit and the flat surface. If the gage can be slipped between the unit and the flat surface the straightedge shall have to be repaired
3. This verification may be performed by either the Maintenance Shop or the In-House Inspection Team.

Verification Interval:

12 months

Report:

The In-House Inspection Team will issue a Certificate of Verification to the laboratory in which the equipment is located.

DATE: 2-3-97
REVISED: 4-12-07

Figure D.20 – Procedure for Verifying Weighted Foot Assemblies
In-House Procedure No. 20

Equipment Checked: WEIGHTED FOOT ASSEMBLY (AASHTO T 176)

Purpose:

This method provides instructions for checking the mass and dimensions of the weighted foot assembly as described in AASHTO Test Method T 176

Inspection equipment Required:

1. Balance

Tolerance:

The mass and dimensions of this assembly shall meet the requirements set forth in AASHTO T 176.

Procedure:

Weigh the entire assembly as follows: Place the unit on a scale with the weight down and the rod standing upright. Carefully hold the guide sleeve so that its weight is not included in the total weight.

Measure the physical dimensions of the unit as described in AASHTO Test Method T 176.

Report the weight and dimensions to the In-House Inspection Team.

Verification Interval:

12 months

Report:

The In-House Inspection Team will issue a Certificate of Verification to the laboratory in which this equipment is located.

DATE: 2-3-97
REVISED: 3-26-21 Removed from AASHTO certification

Figure D.21 – Procedure for Verifying An Asphalt Extraction Apparatus
In-House Procedure No. 21

Equipment Checked: ASPHALT EXTRACTION APPARATUS (AASHTO T 164)

Purpose:

This method provides instructions for checking the centrifuge and bowls used for the extraction of bitumen from bituminous paving mixtures.

Inspection Equipment Required:

1. A handheld tachometer for checking the speed of the centrifuge.
2. A steel rule for measuring the bowl and lid dimensions.
3. A caliper for measuring the thickness of the bowl lid.

Procedure:

1. To check the speed of the centrifuge, place the pointed drive end on the tachometer and press this against the center of the centrifuge shaft. Turn the centrifuge on to maximum speed and record the rpm.
2. Measure the bowl's inside and outside diameters using the steel rule. Record the dimensions.
3. Measure the thickness of the lid with a caliper and record this dimension.
4. The In-House Inspection Team will perform this procedure.

Verification Interval:

12 months

Report:

The In-House Inspection Team will issue a Certificate of Verification to the laboratory in which this equipment is located.

DATE: 3-1-05
REVISED: 8-27-09

Figure D.22 – Procedure for Verifying Mechanical Soil Rammers
In-House Procedure No. 22

Equipment Checked: MECHANICAL SOIL RAMMER (AASHTO T 99) (AASHTO T 180)

Purpose:

This method provides instructions for checking the critical dimensions and masses required in the test method for this piece of equipment.

Inspection Equipment Required:

1. Outside caliper with a 2 in. capacity readable to 0.001 in.
2. A hand rammer meeting the requirements of the AASHTO Test Method being checked (T 99 or T180).
3. A scale meeting AASHTO M 231 for Class G-2 and Class G-20.
4. A drying oven capable of maintaining a temperature not to exceed 140^{o} F.

Tolerance:

The dimensions and masses shall meet the requirements set forth in the AASHTO Test Method being checked (T 99 or T 180).

Procedure:

1. Use the caliper to measure the diameter of the rammer face at two locations 90 degrees apart and record.
2. Using the edge of the ruler check to see if the face of the rammer is flat and record.
3. Calibrate the mechanical rammer by using the procedure set forth in ASTM D 2168.

Maintenance:

Clean and lubricate all moving parts. Inspect chain links, pins, rollers, drop rammers, etc. for wear.

Verification Interval:

12 months

Report:

The In-House Inspection Team shall issue a Certificate of Verification to the laboratory in which this equipment is located.

DATE: 2-3-97
REVISED: 5-20-97

Figure D.23 – Procedure for Verifying Vacuum System Pressure
In-House Procedure No. 23

Equipment Checked: VACUUM SYSTEM

Purpose:

This method provides instructions for checking the pressure developed by vacuum pumps.

Procedure:

1. Connect the vacuum pump to the vacuum chamber.
2. Place a manometer in series between the pump and the vacuum chamber being sure all connections are tight.
3. Start the pump and allow it to run for at least 5 minutes to allow the system to stabilize.
4. Record the vacuum attained and the serial numbers of pump and manometer being used.

Verification Interval:

12 months

Report:

It will be necessary for the lab supervisor to send the results to the In-House Inspection Team for issuance of a Certificate of Verification.

DATE: 3-7-97
REVISED:

Figure D.24 – Procedure for Verifying Sulfate Soundness Containers
In-House Procedure No. 24

Equipment Checked: SULFATE SOUNDNESS SAMPLE CONTAINERS (AASHTO T 104)

Purpose:

This method provides instructions for checking the containers used to hold the samples during the test.

Procedure:

It will be necessary for the inspector to visually note the physical condition of the containers. Check to be sure that there are no holes in the screens or broken joints which might allow any portion of the sample to escape.

Verification Interval:

12 months

Report:

It will be necessary for the lab supervisor to send the results to the In-House Inspection Team for issuance of a Certificate of Verification.

DATE: 3-7-97
REVISED:

Figure D.24A – Procedure for Verifying Hydrometers (AASHTO T 104)
In-House Procedure No. 24A

Equipment Checked: HYDROMETER (AASHTO T 104)

Purpose:

This method provides instruction for checking the hydrometer used in performing AASHTO T 104.

Tolerance:

The hydrometer shall conform to the requirements set forth in ASTM E 100.

Procedure:

1. All measurements for dimension shall be made using a rule capable of being read to the nearest 0.5 mm.
2. It will be necessary to measure the body of the hydrometer using a caliper and or a "go-no-go" gage made of some rigid material.
3. Using a beaker containing distilled water maintained at 60^{o} F, place the hydrometer in the water and allow it to float free and note the reading which should be 0.

Verification Interval:

12 months

Report:

A Certificate of Verification will be issued to the lab from the In-House Inspection Team.

DATE: 4-12-07
REVISED: 6-30-08

Figure D.24B – Procedure for Verifying Sulfate Ovens
In-House Procedure No. 24B

Equipment Checked: SULFATE OVEN (AASHTO T 104)

Purpose:

This method provides instruction for checking the rate of evaporation for the oven used in this test procedure.

Inspection Equipment Required:

1. Balance readable to 0.1 g.
2. Thermometer.

Tolerance:

The oven shall conform to the requirements set forth in AASHTO T 104, Section 3.6.

Procedure:

1. Oven temperature must be maintained continuously at $230^{o} \pm 9^{o}$ F or $110^{o} \pm 5^{o}$ C.
2. Using 1-liter Griffin low-form beakers, each initially containing 500 g of water at a temperature of $70^{o} \pm 3^{o}$ F or $21^{o} \pm 2^{o}$ C, place one beaker at each corner and one in the center of the oven. Leave the beakers in the preheated oven for 4 hours. The loss of water through evaporation should be at least 25 g/h. Record the loss for each beaker.

Verification Interval:

12 months

Report:

A Certificate of Verification will be issued by the In-House Inspection Team.

DATE: 3-7-97
REVISED: 2-13-12

Figure D.25 – Procedure for Verifying Sieves
In-House Procedure No. 25

Equipment Checked: SIEVES

Purpose:

This method provides instruction for checking sieves used in the laboratory.

Inspection Equipment Required:

1. A caliper capable of reading to the nearest 0.01 mm.
2. A method for providing a lighted background when viewing the sieve screen.
3. A magnifier for close examination of the sieve screen.

Tolerance:

The sieves examined shall meet the requirements set forth in AASHTO M 92.

Procedure:

1. Check each sieve tag for the proper designation and standard opening size. This designation shall be in metric dimensions and in the case of older sieves the English and metric dimensions shall both be on the tag.
2. Check the frame for excessive wear along the rim and for looseness between the top and bottom halves.
3. Check the screen for loose wires, bowed screens, torn screens, creases in the screen, broken screen wires, and deformation of the screen openings. These items are normally visible with the naked eye when viewed against a lighted background. The use of a magnifier will aid when viewing the finer screens.
4. A detailed inspection will be made by measuring the screen with a caliper. When doing this type of inspection, measure both the X and Y direction of the wires. On the screens having larger openings, it may be necessary to measure all of the full size openings. It will be necessary to record all of the opening dimensions when doing this type of check, and comparing these readings with Table 1 in AASHTO M 92.

Verification Interval:

12 months

Report:

All inspection results shall be sent to the In-House Inspection Team for verification and issuance of a Certificate of Verification.

DATE: 3-7-97
REVISED:

Figure D.26 – Procedure for Determining the volume of Unit Weight Measures
In-House Procedure No. 26

Equipment Checked: UNIT WEIGHT MEASURE

Purpose:

This directive gives guidance for the calibration of unit weight measures used in Aggregate and Portland Cement Concrete Labs

Inspection Equipment Required:

1. A thermometer capable of being read to the nearest 1.0 degree F.
2. A piece of glass large enough to cover the entire top of the measure being calibrated.
3. A scale capable of weighing the yield measure, glass, and the water within to the nearest 0.01 lbs.

Procedure:

Follow the procedure set forth in ASTM C 29, Section 8.

Verification Interval:

12 months

Report:

A Certificate of Verification will be issued by the In-House Inspection Team to the lab in which the measure is used.

DATE: 3-7-97
REVISED: 8-24-09

Figure D.27 – Procedure for Verifying Mechanical Sieve Shakers
In-House Procedure No. 27

Equipment Checked: MECHANICAL SIEVE SHAKER (AASHTO T 27)

Purpose:

This method provides instructions for checking the sieving efficiency of mechanical sieve shakers.

Inspection Equipment Required:

1. A scale capable of weighing to the nearest 0.1 gm.
2. An oven for drying the sample to a constant weight.
3. Sieves of sufficient diameter and screen openings so as not to cause overloading of any one screen.
4. Sample splitter.

Procedure:

1. Dry the sample to a constant weight.
2. Split the dried sample so as to provide at least 500 gm of fine aggregate or 2500 gm of coarse aggregate
3. Place the prepared and weighed sample in the sieve nest and place on the shaker.
4. Shake the sample for 5 minutes and remove.
5. Hand shake each sieve over a pan for one minute and weigh the material passing and record the weight.
6. Total the weight of the material passing for all of sieves in the nest and record. The total passing from hand shaking shall not exceed one-half of one percent of the total weight of the sample used.
7. If the weight exceeds the requirement in #6, increase the time on the shaker and repeat the test until the requirement is met.
8. When checking shakers which have adjustable shaking speeds it may be necessary to adjust the speed as well as the time in order to meet the requirements.

Maintenance:

Visually inspect hammers and the hose supporting the nest for wear. Replace parts as needed.

Verification Interval:

12 months

Report:

The In-House Inspection Team will issue a Certificate of Verification to the laboratory in which the equipment is located.

DATE: 4-7-97
REVISED: 3-26-21 Removed from AASHTO certification 11/18/16

Figure D.28 – Procedure for Verifying Breaking Heads
In-House Procedure No. 28

Equipment Checked: BREAKING HEAD (AASHTO T 245)

Purpose:

This procedure provides instructions for checking the critical dimensions of the breaking head used in this test method.

Inspection Equipment Required:

1. Steel rule capable of measuring to the nearest 1/16".
2. A steel straightedge at least 6" in length.
3. A round disk with a diameter of 4.0"

Procedure:

1. Place the steel straightedge across the flats of the breaking head and use the steel rule to measure the height of the bevel and the overall height of each half of the breaking head. All other dimensions can be accomplished with the rule with exception of the radius of the head.
2. To check the radius of the breaking head place the round disk on edge in the lower half of the head and place the top half on the disk. Note the fit of the two halves to the disk and also measure the gap between the two halves.
3. Record all dimensions on the worksheet as well as the condition of the unit.

Verification Interval:

12 months

Report:

A Certificate of Verification will be issued by the In-House Inspection Team.

DATE: 5-20-97
REVISED:

Figure D.29 – Procedure for Calibration of Flow Meters
In-House Procedure No. 29

Equipment Checked: FLOW METER (AASHTO T 170)

Purpose:

This procedure provides instructions for gas flow calibration of the flow meter used in this test method.

Inspection Equipment Required:

1. One liter calibrated cylinder.
2. Laboratory stand and ring clamp.
3. Stop watch.

Procedure:

1. Fill laboratory sink 3/4 full of water.
2. Mount ring clamp on stand approximately 18" above top of lab table.
3. Fill calibrated cylinder full of water.
4. Place hand over end of cylinder and turn upside down through ring clamp and release under level of water in sink.
5. Place hose connected to flow meter under cylinder and collect CO_2 bubbles for one minute at 100 ml/min. and 900 ml/min. flow rate settings on flow meter.
6. Read initial and final meniscus readings before and after one minute flow period. Record readings on worksheet and calculate flow volume.
7. Note flow meter settings, make adjustments and repeat tests as necessary to determine correlation between flow meter settings and observed flow volume.

Verification Interval:

12 months

Report:

A Certificate of Verification will be issued by the In-House Inspection Team.

DATE: 5-10-99
REVISED:

Figure D.30 – Procedure for Verifying Rolling Thin Film Ovens
In-House Procedure No. 30

Equipment Checked: ROLLING THIN FILM OVEN (AASHTO T 240)

Purpose:

This method provides instructions for checking the components of a rolling thin film oven.

Inspection Equipment Required:

1. Certified stop watch.
2. ASTM certified thermometer.
3. Ruler, readable to 1/8 in.

Tolerance:

The equipment shall meet the tolerances specified in AASHTO Test Method T 240

Procedure:

1. Measure and record the distance from the thermometer to the right side of the oven. Measure and record the distance from the thermometer bulb to the horizontal axis running through the center of the carriage.
2. Perform the test according to T 240. After placing the test samples in the oven, record the time needed for the oven to recover to test temperature.
3. Record the number of carriage rotations in one minute.
4. Record the oven temperature at half-hour intervals until the test is complete.
5. This procedure shall be performed by the In-House Inspection Team.

Verification Interval:

12 months

Report:

The In-House Inspection Team will issue a Certificate of Verification to the laboratory in which the equipment is located.

DATE: 08-01-17
REVISED: 09-26-18

Figure D.31 – Procedure for Verifying Pressurized Aging Vessels (PAV)
In-House Procedure No. 31

Equipment Checked: PRESSURIZED AGING VESSELS (AASHTO R 28)

Purpose:

This method provides instructions for checking the components of the pressurized aging vessel.

Inspection Equipment Required:

1. ASTM certified thermometer.
2. Circulating water bath.
3. Certified pressure-measuring device.

Tolerance:

The equipment shall meet the tolerances specified in AASHTO Test Method R 28.

Procedure:

1. Attach the calibrated thermometer to the thermistor with a rubber band or O-ring in the PAV.
2. Allow the temperature of the PAV to stabilize.
3. After verifying the accuracy of the thermistor and its meter, hook up the pressure gauge to the PAV. (Pressure gauge shall be calibrated once every 3 years by a commercial vendor).
4. Load the vessel with the pan rack and empty pans and secure the top. Run the PAV through a complete cycle and record the pressure and temperature readings.

Verification Interval:

6 months

Report:

Send a copy of the results to the In-House Inspection Team for verification and issuance of a Certificate of Verification.

DATE: 5-10-99
REVISED:

~~Figure D.32 – Procedure for Verifying Pycnometers and Stoppers~~
~~In-House Procedure No. 32~~

Equipment Checked: PYCNOMETERS AND STOPPERS (AASHTO T 228)

Purpose:

This method provides instructions for checking the critical dimensions of the pycnometers and stoppers used in this test procedure.

Inspection Equipment Required:

1. Caliper readable to the nearest 0.1 mm.
2. Balance capable of reading to the nearest 1 mg.

Tolerance:

The equipment shall meet the tolerances specified in AASHTO Test Method T 228.

Procedure:

1. Check all critical dimension of the pycnometer and stopper set forth in the AASHTO test method.
2. Determine the capacity of the stoppered pycnometer and overall weight of the pycnometer following the procedure set forth in the AASHTO test method.
3. Visually inspect the condition of the pycnometer and stopper.

Verification Interval:

12 months

Report:

Send a copy of the results to the In-House Inspection Team for verification and issuance of a Certificate of Verification.

DATE: 3-12-01
REVISED: 7-8-04

Figure D.33 – Procedure for Calibration of Flow Meters
In-House Procedure No. 33

Equipment Checked: GAS FLOW METER (AASHTO T 240)

Purpose:

This procedure provides instructions for gas flow calibration of the flow meter used in this test method.

Inspection Equipment Required:

1. One liter calibrated cylinder.
2. Laboratory stand and ring clamp.
3. Stop watch.

Procedure:

1. Fill laboratory sink 3/4 full of water.
2. Mount ring clamp on stand approximately 18" above top of lab table.
3. Fill calibrated cylinder full of water.
4. Place hand over end of cylinder and turn upside down through ring clamp and release under level of water in sink.
5. Place hose connected to flow meter under cylinder and collect compressed air bubbles for 15 seconds at 4000 ml/min. flow rate setting on flow meter.
6. Read initial and final meniscus readings before and after 15 seconds flow period. Record readings on worksheet and calculate flow volume.
7. Note flow meter settings, make adjustments and repeat tests as necessary to determine correlation between flow meter settings and observed flow volume.

Verification Interval:

12 months

Report:

A Certificate of Verification will be issued by the In-House Inspection Team.

DATE: 5-28-08
REVISED: 10-22-08

Figure D.34 – Procedure for Verifying Muffle Furnaces
In-House Procedure No. 34

Equipment Checked: MUFFLE FURNACE (AASHTO T 105)

Purpose:

This procedure provides instruction for checking the temperature accuracy of the furnace in the laboratory.

Inspection Equipment required

1. Orton Self-Supporting Pyrometric Cones: 06,07,08,09
2. Measuring Template for Standard Pyrometric Cones.

Tolerance:

The equipment shall meet the tolerances specified in test method AASHTO T 105.

Procedure:

1. Place one cone each of cones numbered 06, 07, 08, 09 on a slab made of asbestos or ceramic
2. Heat the muffle furnace to 950º C and hold at that temperature for one hour.
3. Once the furnace is cooled, take the cone that is only curved slightly to measure the angle against a measuring template.
4. Use the cone calculation computer program to input the heating rate, cone being measured, and the hold time at temperature. This program will give the equivalent temperature of the muffle furnace.

Verification Interval:

12 months

Report:

A Certificate of Verification will be issued by the In-House Inspection Team.

DATE: 3-15-01
REVISED: 3-27-03

Figure D.35 – Procedure for Verifying Funnel Stand Apparatus and 100 ml Cylindrical Measure In-House Procedure No. 35

Equipment Checked: FUNNEL STAND APPARATUS AND 100 ml CYLINDRICAL MEASURE (AASHTO T 304)

Purpose:

This procedure provides instructions for checking the volume of the cylindrical measure and the critical dimensions of the funnel stand apparatus used in this test method.

Inspection Equipment required

1. Caliper
2. Balance
3. Thermometer
4. Glass plate and grease

Tolerance:

The equipment shall meet the tolerances specified in test method AASHTO T 304-96.

Procedure:

The first step is to calibrate the cylindrical measure. Apply a light coat of grease to the top edge of the dry empty cylinder measure. Weight the measure, grease, and glass plate. Fill the measure with deionized water at the temperature of 18 to 24 C (64.4 to 75.2 F). Record the temperature of the water. Place the glass plate on the measure, being sure no air bubbles remain. Dry the outside of the measure and weigh the measure with the water and glass plate on top. Calculate the volume of the measure on the worksheet.

After calibrating the measure, place the measure on the funnel stand apparatus and check the critical dimensions. Check the dimensions with the tolerances specified in AASHTO T 304 test procedure.

Verification Interval:

12 months

Report:

Send a copy of the results to the In-House Inspection Team for verification and issuance of a Certificate of Verification.

DATE: 2-3-03
REVISED: 3-26-21

Figure D.36 – Procedure for Verifying Gyratory Molds and Ram Heads
In-House Procedure No. 36

Equipment Checked: GYRATORY MOLDS AND RAM HEADS (AASHTO T312)

Purpose:

This procedure provides instructions for checking the critical dimensions of the molds and heads used in this test method.

Inspection Equipment Required:

1. Calipers or steel rule capable of measuring to hundredths of millimeters.
2. Surface Comparator.
3. Rockwell Hardness Tester.
4. S-22 Microfinish Comparator Surface Finish Scale.
5. Mitutoyo 12” Digital Caliper #1031225 Calibrated.
6. MTI Digimatic Holtest Model HTD-6” R Digital 3 Point Bore Gauge
7. Calibrated Master Ring Issue #11G14017

Procedure:

1. Procedure for measuring the molds use Annex A of AASHTO T312.
2. Check the smoothness of the molds and bottom plate surfaces that are in contact with the specimen. Use a surface comparator. (Follow owners manual).
3. Check the Rockwell Hardness of the molds and bottom plates with a Rockwell Hardness tester. (Follow owners manual)
   Note: Only new molds need the hardness tested.

Verification Interval:

12 months

Report:

Send a copy of the results to the In-House Inspection Team for verification and issuance of a Certificate of Verification.

DATE: 8-26-09
REVISED: 3-26-21

Figure D.37 – Procedure for Verifying Gyratory Compactors
In-House Procedure No. 37

Equipment Checked: GYRATORY COMPACTOR (AASHTO T 312)

Purpose:

This procedure provides instructions for calibrating the gyratory ram pressure, angle of gyration, gyration frequency, and LVDT.

Inspection Equipment Required:

1. Calibration kit, including equipment to verify and calibrate the pressure and angle.
2. Dynamic Angle Validation Kit (DAVII-HMS)

Tolerance:

The equipment checked shall meet the tolerances specified in the equipment owners manual.

Procedure:

1. The procedure for calibrating the gyratory compactor is located in the Manual of Operation and Maintenance for Model 4140 Gyratory Compactor. Follow the manual's procedures for calibration.
2. Manual procedure for DAVII-HMS

Maintenance:

Follow manufacturers recommended schedule of maintenance. (Includes vacuuming, degreasing, lubricating and inspecting for loose or worn parts)

Verification Interval:

12 months

Report:

Send a copy of the print out results to the In-House Inspection Team for verification and issuance of a Certificate of Verification.

DATE: 3-13-01
REVISED: 5-16-01

Figure D.38 – Procedure for Verifying Ignition Ovens
In-House Procedure No. 38

Equipment Checked: IGNITION OVEN (AASHTO T 308)

Purpose:

This procedure provides instructions for calibrating the ignition oven balance.

Inspection Equipment Required:

1. 8000 g calibration mass.

Tolerance:

The equipment checked shall meet the tolerances specified in the test method listed above.

Procedure:

1. For calibrating the ignition oven balance, follow the Preventive Maintenance and Servicing Manual procedure.

Verification Interval:

12 months

Report:

Send a copy of the results to the In-House Inspection Team for verification and issuance of a Certificate of Verification.

DATE: 4-10-07
REVISED: 02-14-11

Figure D.39 – Procedure for Verifying Ductilometers
In-House Procedure No. 39

Equipment Checked: Ductilometer (AASHTO T 51 and T 301)

Purpose:

This procedure provides instructions for calibrating a Ductilometer, which is used for testing ductility.

Inspection Equipment Required:

1. Stopwatch.
2. Calipers.
3. ASTM calibrated thermometer, No. 63.
4. Measuring tape or Ruler (in centimeters).

Tolerance:

The equipment checked shall meet the tolerances specified in the test method listed above.

Procedure:

1. Measure dimensions of molds in accordance with AASHTO T 51 and T 301, Figure 1.
2. Check temperature of bath with thermometer in 3 different locations in the bath.
3. Determine speed by measuring mm/min.
4. Verify that bath ruler is flat, and verify markings with reference tape or ruler.

Maintenance:

Check oil level.

Verification Interval:

12 months

Report:

The In-House Inspection Team will issue a Certificate of Verification.

DATE: 3-14-01
REVISED: 3-26-21

Figure D.40 – Procedure for Verifying Dynamic Shear Rheometers
In-House Procedure No. 40

Equipment Checked: DYNAMIC SHEAR RHEOMETER (AASHTO T 315)

Purpose:

This procedure provides instructions for calibrating a Dynamic Shear Rheometer.

Inspection Equipment Required:

1. Voltmeter
2. Calibration standard.
3. Temperature Thermistor (Wafer).
4. Micrometer

Tolerance:

The equipment checked shall meet the tolerances specified in the test method listed above.

Procedure:

1. Calibrate temperature transducer of DSR using the voltmeter and thermistor by following procedures of the DSR software.
2. Following DSR software procedures, load calibration standard and allow 2 to 4 minutes for sample to heat to purge air bubbles..
3. Following DSR software procedures, verify torque transducer.
4. Use micrometer to verify 25 mm and 8 mm plate diameters. Enter smaller diameter of both sets into DSR software.

Verification Interval:

6 months.

Report:

The In-House Inspection Team will issue a Certificate of Verification.

DATE: 2-3-03
REVISED:

Figure D.41 – Procedure for Verifying Vacuum Degassing Oven
In-House Procedure No. 41

Equipment Checked: VACUUM DEGASSING OVEN

Purpose:

This procedure provides instructions for calibrating a Vacuum Degassing Oven

Inspection Equipment Required:

1. Calibrated temperature device
2. Calibrated vacuum pressure gauge
3. Stop watch

Tolerance:

The equipment checked shall meet the tolerances specified in the test method listed above.

Procedure:

Temperature

1. Pre-heat the Vacuum Degassing Oven.
2. After it has reached the degassing temperature, attach the calibrated temperature device in the oven.
3. Take readings at 5 minutes, 15 minutes and 30 minutes of the temperature device and the display on the oven, and record.
4. Determine offset by averaging the 3 differences and adjust the temperature of the oven to reflect the determined offset.

Vacuum

1. Attach a calibrated vacuum pressure gauge.
2. Pre-heat the Vacuum Degassing Oven.
3. Once the oven has been preheated, apply the vacuum. After the vacuum has stabilized, take an initial reading. Take readings after the initial reading at 15 minutes of the 30-minute cycle of the oven.
4. Compare the readings when they are taken to the gauge on the oven and record. Determine the offset by averaging the 2 differences and apply necessary adjustments to the metering valve.

Verification Interval:

12 months for the Vacuum Degassing Oven
36 months for the calibrated vacuum pressure gauge

Report:

The In-House Inspection Team will issue a Certificate of Verification.

DATE: 4-12-07
REVISED: 5-22-08

Figure D.42 – Procedure for Verifying Bending Beam Rheometer
In-House Procedure No. 42

Equipment Checked: Bending Beam Rheometer (AASHTO T 313)

Purpose:

This procedure provides instructions for verifying masses and beam dimensions for a Bending Beam Rheometer.

Inspection Equipment Required:

1. Outside measurement calipers or micrometer capable of measuring up to 130 mm to the nearest 0.01 mm.
2. Standardized weights and certified Balance capable of weighing 100 grams to the nearest 0.1 gram.

Tolerance:

The equipment checked shall meet the tolerances specified in the test method listed above.

Procedure:

1. Use calipers or micrometer to measure the thickness, width and length of the non-compliance beam.
2. Use calipers or micrometer to measure the thickness, width and length of the confidence beam.
3. Verify that the measurements are within the specified tolerances.
4. Enter dimensions of confidence beam into the instrument software.
5. In-House Inspection team will verify all masses with standardized weights.

Verification Interval:

12 months

Report:

The In-House Inspection Team will issue a Certificate of Verification.

DATE: 3-2-05
REVISED: 2-15-08

Figure D.43 – Procedure for Verifying Soil Compression or Loading Devices
In-House Procedure No. 43

Equipment Checked: LOAD TRAC II AUTOMATED SOIL COMPRESSION AND LOADING UNITS (AASHTO T 208, T 216, T 236, T 296 and T 297)

Purpose:

This procedure provides instructions for calibration of the Load Trac II Automated soil compression strength and soil consolidation testing units.

Inspection Equipment Required:

1. Calibration weights for incremental loading of testing units.
2. Verified scale (AASHTO M 231) for determining accurate weight of calibration weights.
3. Displacement gauge test blocks with thicknesses of 0.80mm, 1.60mm, and 3.20mm.
4. Incompressible dummy test specimens.

Tolerance:

The equipment shall meet the tolerances specified in the test methods listed above.

Force Transducer Calibration Procedure:

1. Obtain and record weight of calibration weights on scale (State ID 046037, Model HP-30K, manufacturer AND).
2. Load the Load Trac II software for test application and follow manufacturer's force transducer calibration procedure.

Displacement Transducer Calibration Procedure

1. Obtain displacement gauge blocks with thicknesses of 0.80 mm, 1.60 mm, and 3.20 mm.
2. Load the Load Trac II software for test application and follow manufacturer's displacement transducer calibration procedure.

Machine Compressibility Calibration Procedure

1. The machine compressibility calibration is run like a standard consolidation test except an incompressible dummy replaces the soil specimen.
2. Load the Load Trac II software for test application and follow manufacturer's machine compressibility calibration procedure.

Verification Interval:

12 months

Report:

Send a copy of the results to the In-House Inspection Team for verification and issuance of a Certificate of Verification.

DATE: 3-27-07
REVISED:

Figure D.44 – Procedure for Verifying Softening Point of Bitumen Ring and Ball Apparatus
In-House Procedure No. 44

Equipment Checked: RINGS, RINGHOLDER, BALLS, AND ASSEMBLAGE (AASHTO T 53)

Purpose:

This method provides instructions for verifying the rings, balls, and ring holder assembly used in the determination of Softening Point.

Inspection Equipment Required:

1. Micrometer
2. Balance (0.01g resolution)

Tolerance:

The equipment checked shall meet the tolerances specified in the test method listed above.

Procedure:

1. Using a micrometer, measure and record the dimensions of the shouldered rings to 0.1mm.
2. Using a balance, record the weights of the steel balls to 0.01g.
3. Using a micrometer, measure and record the diameter of the steel balls to 0.1mm.
4. Using a micrometer, verify that the dimensions of the Ball Centering Guides resemble Figure 1 in the procedure.
5. Using a micrometer, verify that the dimensions of the Ring Holder resemble Figure 1 in the procedure, and that it is adjusted in the assembly correctly.

Verification Interval:

12 months

Report:

The In-House Inspection Team will issue a Certificate of Verification to the laboratory in which the equipment is located.

DATE: 7-7-09
REVISED:

Figure D.45 – Procedure for Verifying Calipers
In-House Procedure No. 45

Equipment Checked: CALIPERS

Purpose:

This method provides instructions for verifying the accuracy of calipers.

Tolerance:

The accuracy shall meet the manufacturer's technical specifications.

Inspection Equipment Required:

1. Caliper Gage Block

Procedure:

1. Wipe clean all the measuring faces and caliper bar.
2. Check to see if all the buttons, switches and LCD display respond well.
3. Verify the outside jaws in 1" increments the full range of the caliper up to 6".
4. Verify the inside jaws in 1" increments starting at .5". Check the full range up to 4.5".

Outside Calipers tend to wear more on the outer edge where they get more use. If you can see daylight through the jaws when completely closed this does not mean the calipers are necessarily unusable. The outer edge may be out of spec. but the inner jaw is still within tolerance and could be used. Any deviation from the requirements shall be reported to the lab supervisor prior to use.

Verification Interval:

12 months

Report:

The In-House Inspection Team will keep the original records on file and give a copy to the laboratory in which the equipment is located.

DATE: 8-13-09
REVISED:

Figure D.46 – Procedure for Calibration of Force, Displacement, & Pressure Transducers for Load Trac and Shear Trac II Units
In-House Procedure No. 46

Equipment Checked: LOAD TRAC II TEST EQUIPMENT, (AASHTO T 208, T 216, T 236, T 265, T 296)

Purpose:

This method provides instructions for calibration of the load cells and displacement sensors used in the laboratory equipment (Load Trac II and Shear Trac II) for testing AASHTO T208, T216, T236, T265, and T296.

Inspection Equipment Required:

1. Independently calibrated Proving Ring or Load Cell
2. Gauge Blocks
3. Independently calibrated pressure transducer or pressure gage.

Tolerance:

The accuracy shall meet the manufacturer's technical specifications.

Procedure (General):

The Calibration Summary Table from the Geocomp, Inc. testing software contains calibration factors and offsets for the conversion of displacement, force, and pressure transducer readings from counts to engineering units using the following equation:

Sensor Reading in Engineering Unit =

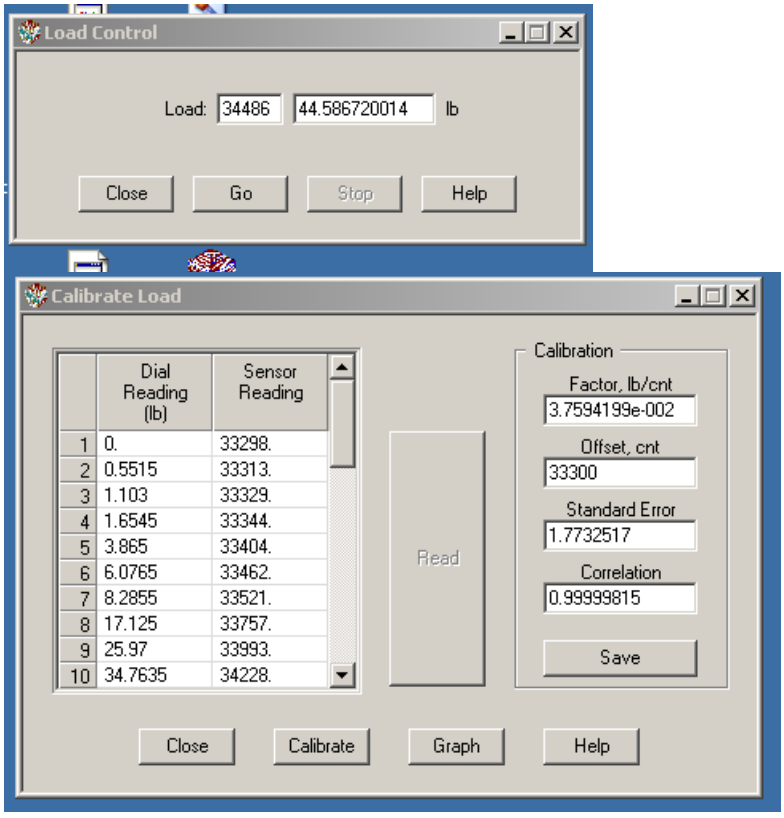
Calibration Factor x (Sensor Reading in Analog Units – Offset Value)

The control software performs the conversion by first subtracting the offset (in counts) from the transducer reading (in counts) and then multiplying the result by the conversion factor. This displacement offset is the displacement is the displacement transducer reading at the beginning of the test. The force offset corresponds to the load cell reading under zero load condition. The pressure offset corresponds to the pressure transducer reading at atmospheric pressure.

The calibration factor will depend on the unit system being used. The factor will automatically adjust if a new unit system is selected.

Procedure (Force Transducer):

1. Using the keypad on the Load Trac II or Shear Trac II, move the platen all the way to the bottom position.
2. Place the independently calibrated load cell or proving ring onto the platen and center it under the extension rod of the load cell on the load frame.
3. Open up the Geocomp Software template used for the appropriate Test. Pull down the Control menu and click Load. This opens the Load Control Window. Position the Load Control window on the side of the computer screen.
4. Pull down the Calibrate menu and click the Load option. This will open the Calibrate Load window. Position this window so both the Load Control and Calibrate Load windows can be seen on the screen.

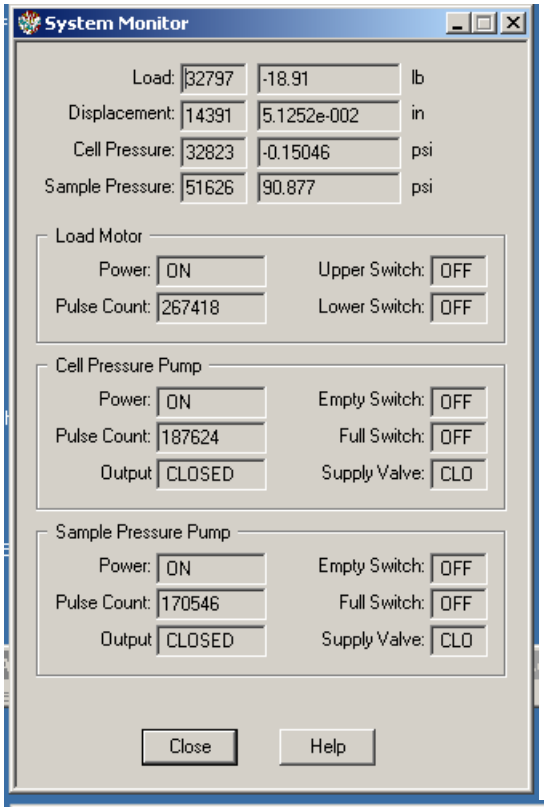


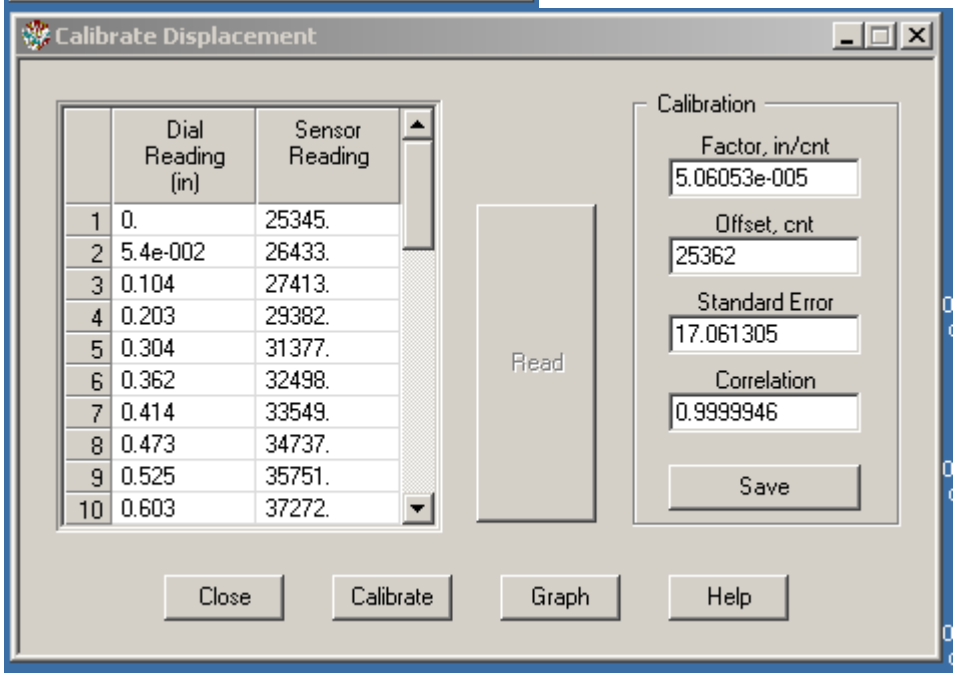
5. On the Load Control window, enter a load value. The value is entered as a value in the units you have chosen.
6. Click the Go button. The platen will move up until the reading from the system load cell matches (as per the previous calibration) the force value entered. When the platen stops, read the forced produced on the calibrated load cell or proving ring and enter it in the Dial Reading column of the Calibrate Load Window.
7. On the Calibrate Load window click the Read button. A value will appear in the sensor reading column.
8. Repeat this procedure for a series of load values that covers the range of the system load cell.
9. When all the data needed for the calibration has been collected, click the Calibrate button on the Calibrate Load window. The factor (calibration factor or slope of units per count) and offset of a best-fit line will be displayed in the upper right of the screen together with the correlation coefficient.
10. If the Correlation Coefficient is less than 0.999 there is a bad reading and the calibration process needs to be repeated.
11. Once a calibration is greater than 0.999, write down the calibration factor and offset. Open the Calibration Summary menu and compare the factor and offset to those shown. If they are more than 5% different, there is an error somewhere or the equipment has changed significantly since the last calibration.
12. To save the calibration results, click the Save button. If you close the window, the calibration results will not be saved, but they won't be removed from the window. If you close the window before saving just reopen the window and save the results. Saving the calibration results will replace the values shown on the Calibration Summary Window.
13. Save the file template using the clicking File, Save As. Name as appropriate for the new calibration year.

Procedure (Displacement Transducer):

1. Locate the stem of the displacement transducer which presses against the under side of the load platen (Load Trac II) or to the right of the Shear Mold (Shear Trac II).
2. For a stack of gauge blocks of thicknesses of 0.025, .050, and 0.125 inches to form a stack of 0.2 inches.
3. Gently push the stem down and place the stack between the displacement transducer stem and the platen (or shear mold).
4. Release the stem so that it holds the gauge blocks against the under side of the platen (or shear mold). The stem should now be 0.2 inches lower than when you started.
5. Open up the Geocomp Software template used for the appropriate Test. Pull down the View menu and click System. This opens the System Monitor Window. Position the System Monitor window on the side of the computer screen.
6. Pull down the Calibrate menu and click the Displacement option. This will open the Calibrate Displacement window. Position this window so both the System Monitor and Calibrate Displacement windows can be seen on the screen.

7. You will observe a count reading for displacement on the System Monitor window in the left box of the row labeled Displacement. Use the keypad on the front panel of the Load Trac II or Shear Trac II to move the platen or shear mold, respectively. Move the platen or shear mold until the displayed count number for displacement is about 40,000.

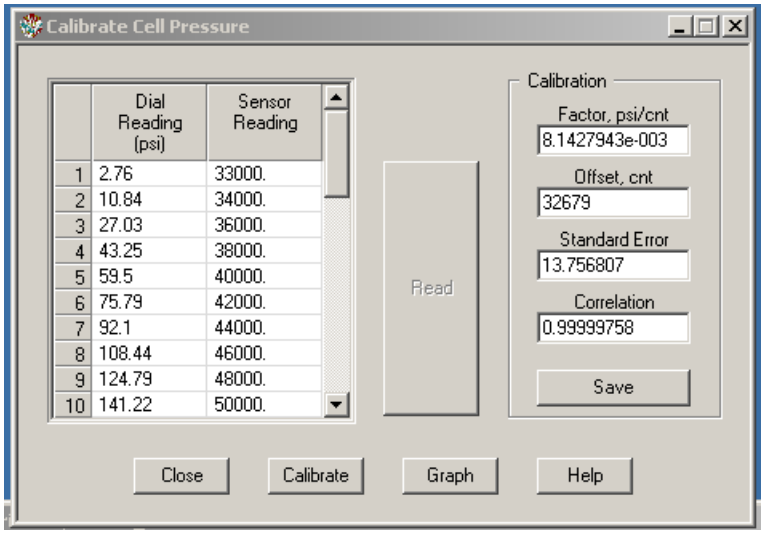




8. The column headed Dial Reading in the Calibrate Displacement window is for the thickness values established by the gauge block stack. Because the count reading from the transducer increases as the shaft moves up, it is best to start this column with 0 and have the thickness value increase. Then the entry for each row corresponds to the thickness change rather than the actual thickness.
9. On the Calibrate Displacement window, enter a displacement value of 0 in the first column of row 1. Then click the Read button. A value will appear in the Sensor Reading column.
10. Move the cursor down one row and enter 0.025 in the Dial Reading column. Remove the smallest gauge block, reducing the thickness by 0.025 inches and moves the transducer up 0.025 inches. Click the Read button and move the cursor down one row.
11. Enter 0.050, remove the 0.50 inch block and replace the 0.025 inch block to move the shaft up 0.050 inches. Click the Read button.
12. Continue entering numbers in increments of 0.025, appropriately adjusting the gauge block stack and clicking the Read button until you have reached 0.20 inches.
13. When finished click the Calibrate button on the Calibrate Displacement window. The factor (calibration factor or slope of units per count) and offset of a best-fit line will be displayed in the upper right of the screen together with the correlation coefficient.
14. If the Correlation Coefficient is less than 0.999 there is a bad reading and the calibration process needs to be repeated.
15. Once a calibration is greater than 0.999, write down the calibration factor and offset. Open the Calibration Summary menu and compare the factor and offset to those shown. If they are more than 5% different, there is an error somewhere or the equipment has changed significantly since the last calibration.
16. To save the calibration results, click the Save button. If you close the window, the calibration results will not be saved, but they won't be removed from the window. If you close the window before saving just reopen the window and save the results. Saving the calibration results will replace the values shown on the Calibration Summary Window.
17. Save the file template using the clicking File, Save As. Name as appropriate for the new calibration year.

<u>Procedure (Pressure Transducer):</u>

1. Use tubing and a "T" fitting to connect the independently calibrated pressure measuring device with the Pressure Transducer, and an external source of pressure to apply pressure increments.
2. Open up the Geocomp Software template used for the appropriate Test. Pull down the Calibrate menu and click the Cell Pressure option. This will open the Calibrate Cell Pressure window.



3. Apply a pressure using the external pressure source and let it stabilize.
4. Read the pressure produced on the calibrated pressure-measuring device and enter it in the Dial Reading column of the Calibrate Pressure window.
5. Click the Read Button on the Calibrate Pressure window. A value will appear in the Sensor Reading column
6. Repeat this procedure for a series of pressure values that covers the range of the sample pressure transducer.
7. When all the data is collected for the calibration, click the Calibrate button on the Calibrate Pressure window. The factor (calibration factor or slope in psi per count) and offset of a best-fit line will be displayed in the upper right of the screen together with the correlation coefficient. If the calibration coefficient is less than 0.999 there is a bad reading and the calibration process will need to be repeated.
8. Once a calibration is greater than 0.999, write down the calibration factor and offset. Open the Calibration Summary menu and compare the factor and offset to those shown. If they are more than 5% different, there is an error somewhere or the equipment has changed significantly since the last calibration.
9. To save the calibration results, click the Save button. If you close the window, the calibration results will not be saved, but they won't be removed from the window. If you close the window before saving just reopen the window and save the results. Saving the calibration results will replace the values shown on the Calibration Summary Window.
10. Save the file template using the clicking File, Save As. Name as appropriate for the new calibration year.

Note:

- Once calibrations are finished for all transducers/ sensors, save the appropriate calibration factors and offsets on a new test software template for each individual machine.

- If a machine (load trac II) runs more than one type of test, the calibration factors and offsets values can be copied into each different software and saved.

- After calibration, be sure to manually enter the calibration factor and offset for each machine unit by pressing 4 setup, 5 calibration, channel 1, 2, or 3 for force, displacement, and pressure, respectively. After entering the factors and offsets, turn off the load trac II or shear trac II for 1 minute and turn back on. The settings are now saved.

Verification Interval:

12 months

Report:

An Outside Contractor will perform the calibrations and issue a Certificate of Verification to the laboratory in which the equipment is located.

DATE: 11-28-11
REVISED: 2-13-12

Figure D.47 – Procedure for Verifying Thermometers & Thermocouples
In-House Procedure No. 47

Equipment Checked: Thermometers & Thermocouples (ASTM E77 & E220)

Purpose:

This method provides instructions for checking the accuracy of Thermometers and Thermocouples used in all labs.

Inspection Equipment :

1. Liquid Bath, Dry Well - Calibrator
2. Calibrated Reference Thermometer, Calibrated Reference Thermocouple

Tolerance:

Tolerance for mercury filled thermometers is ± one scale division. Tolerance for spirit filled thermometers is ± 1 % of the total range for that thermometer. Tolerance for dial thermometers is ± one scale division. Digital thermometers such as Oaktrons & Taylors that are used most commonly in water baths and in ovens shall meet the manufacturer's tolerance specs. Digital thermometers and thermocouples used for laboratory testing shall meet the same requirements as those of mercury thermometers used for that test method.

Procedure:

All temperature measuring devices will be checked and verified by the In-House Inspection Team. Check each device at a minimum of two points. A laboratory may specify at which points to check the device, based on its use or test method it is used for. A liquid bath or dry well calibrator or combination of both may be used to verify the devices at determined points. The laboratory device being verified is done so against a calibrated reference thermometer or thermocouple. Readings are taken once the temperature has stabilized for approximately 5 minutes. The use of binder clips or paper clips may be needed to hold the devices being checked in place in the bath or dry well.

Inspection Interval:

12 months

Report:

Upon completing the verification, a worksheet and Certificate of Verification will be saved electronically in the laboratory folder.

DATE: 05-16-17
REVISED:

Figure D.48 - Procedure for Equipment Calibration, Check and Maintenance Records for Sodium Bath. In House Procedure No. 48

Equipment Checked: Sodium Solution Bath (AASHTO T 104)

Purpose:

This method provides instructions for checking the accuracy of the built in temperature thermostat, check and maintenance records.

Inspection Equipment :

1. Sodium Sulfate Bath
2. Calibrated Reference Thermometer
3. OM-CP Data Logger

Tolerance:

Temperature tolerance for sodium sulfate bath is 21 +/- 1 degree C (70 +/- 2 F). Sp. Gravity range 1.151 to 1.174.

Procedure:

1. Sodium sulfate bath temperature will be checked and verified by the In-House Inspection Team using calibrated thermometers and referenced against the Omega Engineering OM-CP Data Logger.
2. Temperatures will be checked three times on a 30 minute interval and crossed referenced with the Omega Data Logger temperature log to insure accurate temperature readings.

Inspection Interval:

12 months

Report:

Upon completing the verification, a worksheet and Certificate of Verification will be saved electronically in the laboratory folder.

DATE: 2-14-97
REVISED: 3-28-08

Figure E1.1 – Lab Worksheet
Penetration of Bituminous Materials

Laboratory: Bituminous
Test Methods: AASHTO T 49

STATE OF NEBRASKA
DEPARTMENT OF ROADS

Penetration of Bituminous Materials
AASHTO Designation: T 49

Sample #	Type of Material	Penetration 1/10 mm Division			Average	Specification Range	Technician
		70					

DATE: 2-14-97
REVISED: 3-28-08

Figure E1.2 – Lab Worksheet
Emulsified Asphalt Residue by Distillation

Laboratory: Bituminous

Test Methods: AASHTO T 59

Nebraska Department of Roads
Materials and Tests Division
Lab Worksheet

Emulsified Asphalt Residue by Distillation

Test Method: AASHTO Designation: T 59

Date ⟶						
Technician						
Sample #						
Weight of still						
+ 200 grams of sample						
TOTAL						
Weight of still & residue						
+ 1.5 grams*						
TOTAL						
Weight of still & 200 gram sample						
- Weight of still residue & 1.5 grams						
= Weight of water						
200 grams of sample						
- Weight of water						
+ Total residue						
Divided by 2 = % residue						
Oil distillate						

*Heat Correction

DR Form 408b, Aug 07

DATE: 2-14-97
REVISED: 3-28-08

Figure E1.3 – Lab Worksheet
Distillation of Cut-Back Asphaltic (Bituminous) Products

Laboratory: Bituminous

Test Methods: AASHTO T 78

E1.3

STATE OF NEBRASKA
DEPARTMENT OF ROADS

Distillation of Cut-Back Asphaltic
(Bituminous) Products

AASHTO Designation: T 78

Date						
Technician						
Lab I.D. AO						
Refiner						
Specific Gravity 60/60 F						
Weight of 200 ml						
Weight of Flask						
Total Weight						
I B. P.						
Temp. F Std. Local	Volume ml	% of Total Dist. to 680 F	Volume ml	% of Total Dist to 680 F	Volume ml	% of Total Dist to 680 F
374 371						
437 434						
500 497						
600 597						
680 676						
Residue From Dist., % by Vol.	ml / 2 =		ml / 2 =		ml / 2 =	

DATE: 2-14-97
REVISED: 3-28-08

Figure E1.4 – Lab Worksheet
Kinematic Viscosity of Asphalts (Viscosity at 135^{o} C)

Laboratory: Bituminous
Test Method: AASHTO T 201

STATE OF NEBRASKA
DEPARTMENT OF ROADS

Kinematic Viscosity of Asphalts (Bitumens)
AASHTO Designation: T 201

Sample #	Grade	Tube #	Tube Factor	Time	Viscosity (135 ° C)	Date	Technician

DATE: 2-14-97
REVISED: 3-28-08

Figure E1.5 – Lab Worksheet
Viscosity of Asphalt by Vacuum Capillary Viscometer
(Viscosity at 60° C)

Laboratory: Bituminous
Test Method: AASHTO T 202

STATE OF NEBRASKA
DEPARTMENT OF ROADS

Viscosity of Asphalts by Vacuum Capillary Viscometer
AASHTO Designation: T 202

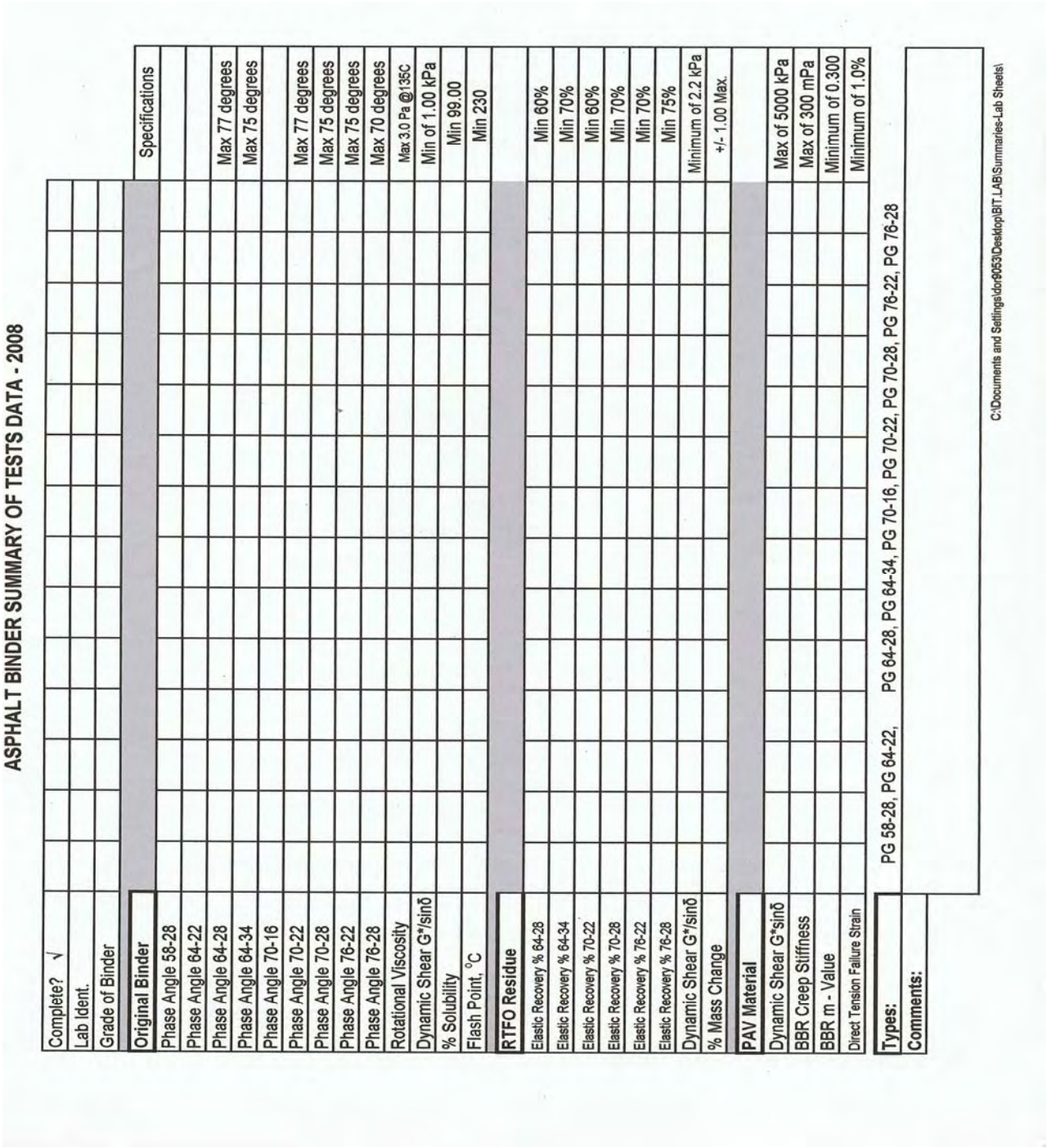
Sample #	Grade	Tube #	Tube Factor	Time	Viscosity (60° C)	Date	Technician

DATE: 2-14-97
REVISED: 3-31-08

Figure E1.6 – Lab Worksheet
Rolling Thin Film Oven (RTFO) Test

Laboratory: Bituminous

Test Method: AASHTO T 240



DATE: 2-14-97
REVISED: 3-31-08

Figure E1.7 – Lab Worksheet
Softening Point

Laboratory: Bituminous
Test Method: AASHTO T 53

Emulsified Asphalt Test Data - 2008

Lab Ident. EA-							
Type							
Viscosity, S.F.S. @ 77F or 50C							
% Residue by Distillation or Evap.							
Penetration, 77F							
Residue Viscosity, S.F.S., Cannon Manning @ 140F HFE-500 & 1000							
Residue Viscosity, S.F.S., Kinematic Conversion, 180F CMS-1 & 1W							
Kinematic Viscosity @ 140F, all MC							
Elastic Recovery, 77F (25C) CRS2P							
Ductility, 77F (25C)							
Softening Point, R&B CSS-1H Micro							
Notes							
Date Tested							

Lab Ident. EA-							
Type							
Viscosity, S.F.S. @ 77F or 50C							
% Residue by Distillation or Evap.							
Penetration, 77F							
Residue Viscosity, S.F.S., Cannon Manning @ 140F HFE-500 & 1000							
Residue Viscosity, S.F.S., Kinematic Conversion, 180F CMS-1 & 1W							
Kinematic Viscosity @ 140F, all MC							
Elastic Recovery, 77F (25C) CRS2P							
Ductility, 77F (25C)							
Softening Point, R&B CSS-1H Micro							
Notes							
Date Tested							

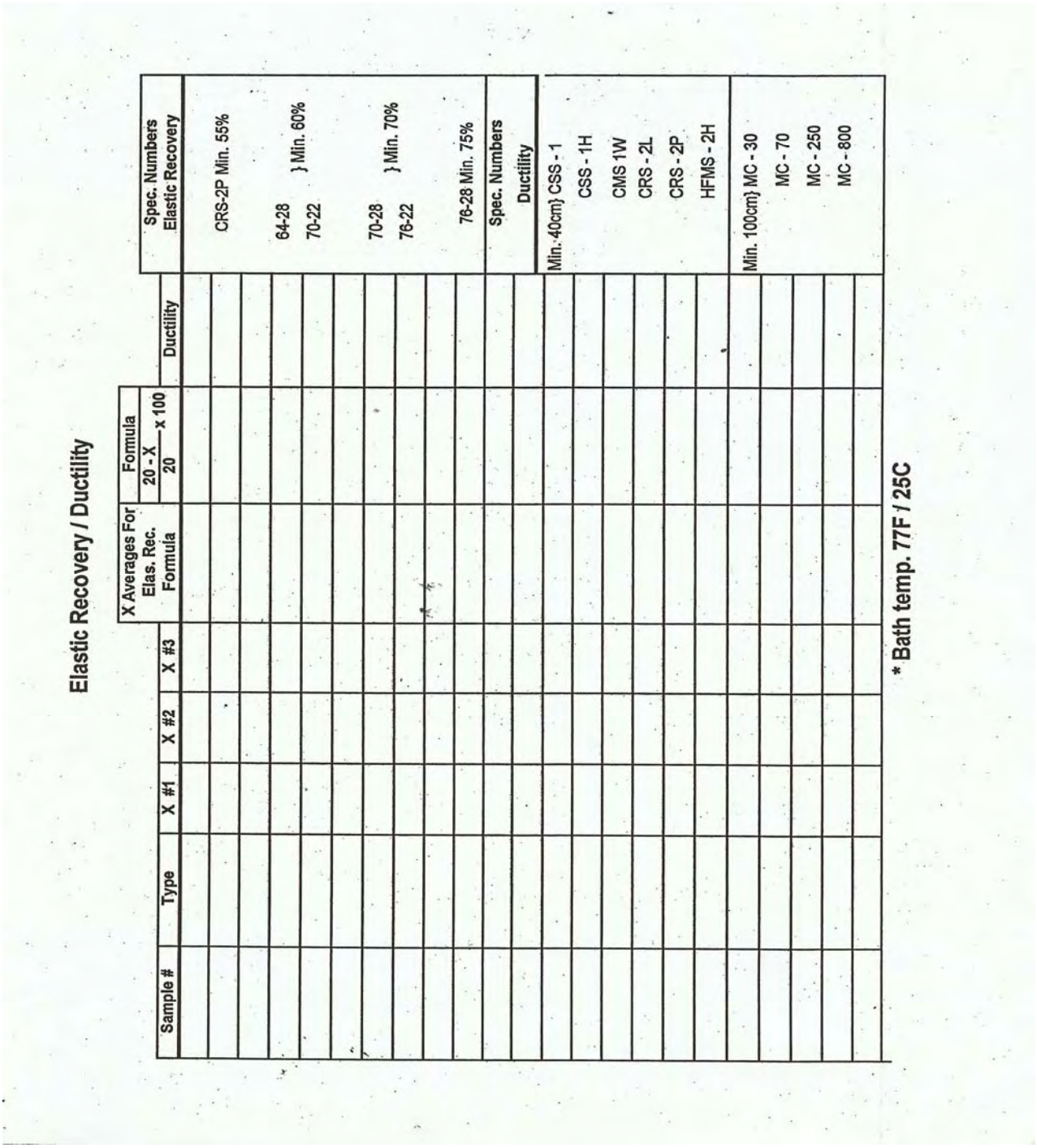
Lab Ident. EA-							
Type							
Viscosity, S.F.S. @ 77F or 50C							
% Residue by Distillation or Evap.							
Penetration, 77F							
Residue Viscosity, S.F.S., Cannon Manning @ 140F HFE-500 & 1000							
Residue Viscosity, S.F.S., Kinematic Conversion, 180F CMS-1 & 1W							
Kinematic Viscosity @ 140F, all MC							
Elastic Recovery, 77F (25C) CRS2P							
Ductility, 77F (25C)							
Softening Point, R&B CSS-1H Micro							
Notes							
Date Tested							

DATE: 8-29-97
REVISED: 3-31-08

Figure E1.8 – Lab Worksheet
Elastic Recovery of Bituminous Materials by Ductilometer

Laboratory: Bituminous

Test Method: AASHTO T 301



DATE:
REVISED: 3-31-08

Figure E1.9 - Lab Worksheet
Determining the Flexural Creep Stiffness of Asphalt Binder
Using the Bending Beam Rheometer (BBR)

Laboratory: Bituminous
Test Method: AASHTO T 313

ASPHALT BINDER SUMMARY OF TESTS DATA - 2008

Complete? √														
Lab Ident.														
Grade of Binder														
Original Binder														Specifications
Phase Angle 58-28														
Phase Angle 64-22														
Phase Angle 64-28														Max 77 degrees
Phase Angle 64-34														Max 75 degrees
Phase Angle 70-16														
Phase Angle 70-22														Max 77 degrees
Phase Angle 70-28														Max 75 degrees
Phase Angle 76-22														Max 75 degrees
Phase Angle 76-28														Max 70 degrees
Rotational Viscosity														Max 3.0 Pa @135C
Dynamic Shear G*/sinδ														Min of 1.00 kPa
% Solubility														Min 99.00
Flash Point, °C														Min 230
RTFO Residue														
Elastic Recovery % 64-28														Min 60%
Elastic Recovery % 64-34														Min 70%
Elastic Recovery % 70-22														Min 60%
Elastic Recovery % 70-28														Min 70%
Elastic Recovery % 76-22														Min 70%
Elastic Recovery % 76-28														Min 75%
Dynamic Shear G*/sinδ														Minimum of 2.2 kPa
% Mass Change														+/- 1.00 Max.
PAV Material														
Dynamic Shear G*/sinδ														Max of 5000 kPa
BBR Creep Stiffness														Max of 300 mPa
BBR m - Value														Minimum of 0.300
Direct Tension Failure Strain														Minimum of 1.0%

Types: PG 58-28, PG 64-22, PG 64-28, PG 64-34, PG 70-16, PG 70-22, PG 70-28, PG 76-22, PG 76-28

Comments:

C:\Documents and Settings\dor9053\Desktop\BIT LAB\Summaries-Lab Sheets\

DATE:
REVISED: 3-31-08

Figure E1.10 - Lab Worksheet
Determining Rheological Properties of Asphalt Binder Using a Dynamic Shear Rheometer

Laboratory: Bituminous
Test Method: AASHTO T 315

ASPHALT BINDER SUMMARY OF TESTS DATA - 2008

Complete? √															
Lab Ident.															
Grade of Binder															
Original Binder															Specifications
Phase Angle 58-28															
Phase Angle 64-22															
Phase Angle 64-28															Max 77 degrees
Phase Angle 64-34															Max 75 degrees
Phase Angle 70-16															
Phase Angle 70-22															Max 77 degrees
Phase Angle 70-28															Max 75 degrees
Phase Angle 76-22															Max 75 degrees
Phase Angle 76-28															Max 70 degrees
Rotational Viscosity															Max 3.0 Pa @135C
Dynamic Shear G*/sinδ															Min of 1.00 kPa
% Solubility															Min 99.00
Flash Point, °C															Min 230
RTFO Residue															
Elastic Recovery % 64-28															Min 60%
Elastic Recovery % 64-34															Min 70%
Elastic Recovery % 70-22															Min 60%
Elastic Recovery % 70-28															Min 70%
Elastic Recovery % 76-22															Min 70%
Elastic Recovery % 76-28															Min 75%
Dynamic Shear G*/sinδ															Minimum of 2.2 kPa
% Mass Change															+/- 1.00 Max.
PAV Material															
Dynamic Shear G*sinδ															Max of 5000 kPa
BBR Creep Stiffness															Max of 300 mPa
BBR m - Value															Minimum of 0.300
Direct Tension Failure Strain															Minimum of 1.0%

Types: PG 58-28, PG 64-22, PG 64-28, PG 64-34, PG 70-16, PG 70-22, PG 70-28, PG 76-22, PG 76-28

Comments:

C:\Documents and Settings\dor9053\Desktop\BIT.LAB\Summaries-Lab Sheets\

DATE:
REVISED: 3-31-08

Figure E1.11 - Lab Worksheet
Accelerated Aging of Asphalt Binder Using a Pressurized Aging Vessel (PAV)

Laboratory: Bituminous
Test Method: AASHTO R 28

ASPHALT BINDER SUMMARY OF TESTS DATA - 2008

Complete? √															
Lab Ident.															
Grade of Binder															
Original Binder															Specifications
Phase Angle 58-28															
Phase Angle 64-22															
Phase Angle 64-28															Max 77 degrees
Phase Angle 64-34															Max 75 degrees
Phase Angle 70-16															
Phase Angle 70-22															Max 77 degrees
Phase Angle 70-28															Max 75 degrees
Phase Angle 76-22															Max 75 degrees
Phase Angle 76-28															Max 70 degrees
Rotational Viscosity															Max 3.0 Pa @135C
Dynamic Shear G*/sinδ															Min of 1.00 kPa
% Solubility															Min 99.00
Flash Point, °C															Min 230
RTFO Residue															
Elastic Recovery % 64-28															Min 60%
Elastic Recovery % 64-34															Min 70%
Elastic Recovery % 70-22															Min 60%
Elastic Recovery % 70-28															Min 70%
Elastic Recovery % 76-22															Min 70%
Elastic Recovery % 76-28															Min 75%
Dynamic Shear G*/sinδ															Minimum of 2.2 kPa
% Mass Change															+/- 1.00 Max.
PAV Material															
Dynamic Shear G*/sinδ															Max of 5000 kPa
BBR Creep Stiffness															Max of 300 mPa
BBR m - Value															Minimum of 0.300
Direct Tension Failure Strain															Minimum of 1.0%

Types: PG 58-28, PG 64-22, PG 64-28, PG 64-34, PG 70-16, PG 70-22, PG 70-28, PG 76-22, PG 76-28

Comments:

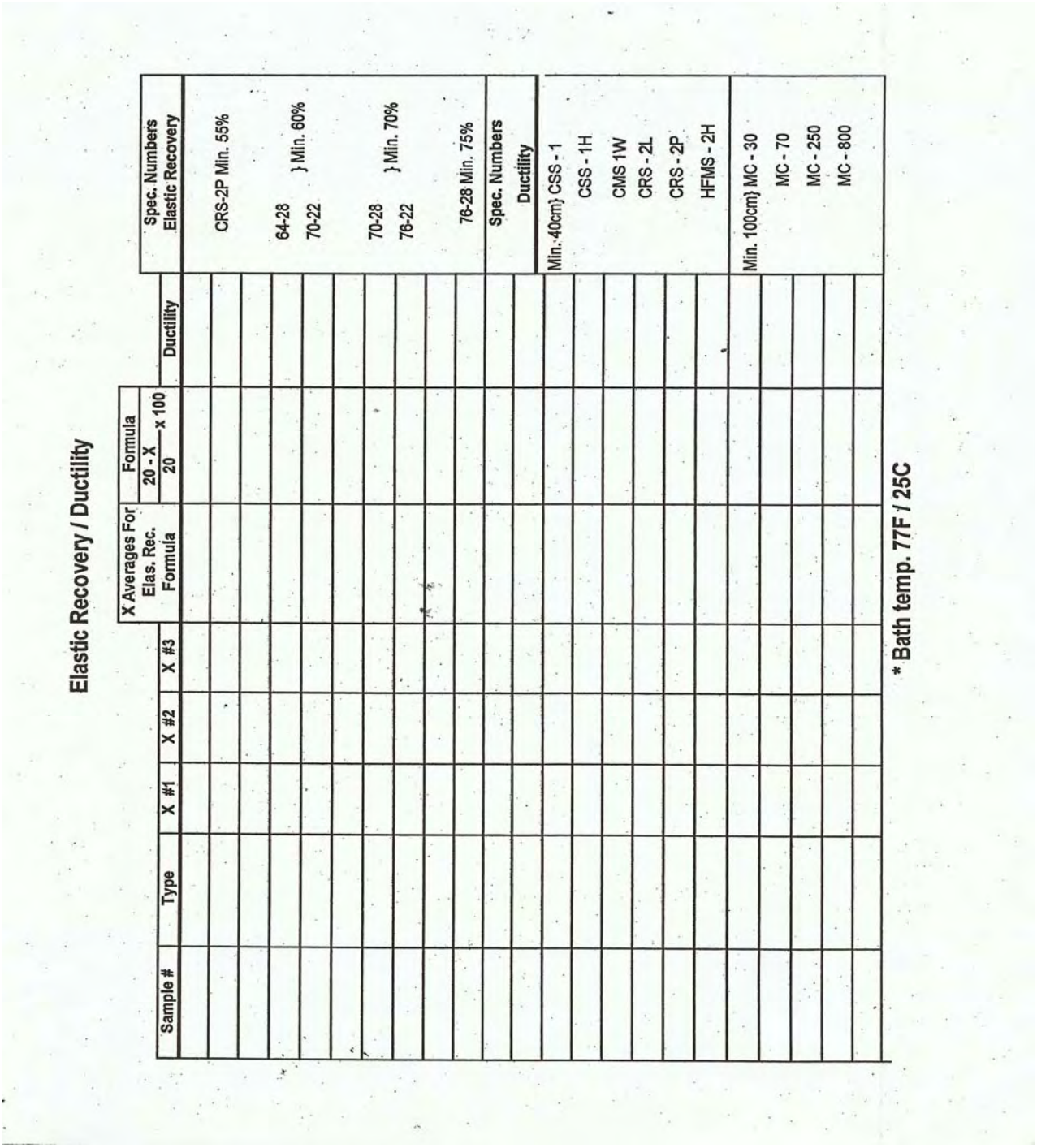
C:\Documents and Settings\dor9053\Desktop\BIT LAB\Summaries-Lab Sheets\

DATE: 3-31-08
REVISED:

Figure E1.12 – Lab Worksheet
Ductility of Bituminous Mixtures

Laboratory: Bituminous

Test Method: AASHTO T 51



Elastic Recovery / Ductility

Sample #	Type	X #1	X #2	X #3	X Averages For Elas. Rec. Formula	Formula 20 - X / 20 x 100	Ductility	Spec. Numbers Elastic Recovery
								CRS-2P Min. 55%
								64-28 } Min. 60%
								70-22
								70-28 } Min. 70%
								76-22
								76-28 Min. 75%
								Spec. Numbers Ductility
								Min. 40cm} CSS - 1
								CSS - 1H
								CMS 1W
								CRS - 2L
								CRS - 2P
								HFMS - 2H
								Min. 100cm} MC - 30
								MC - 70
								MC - 250
								MC - 800

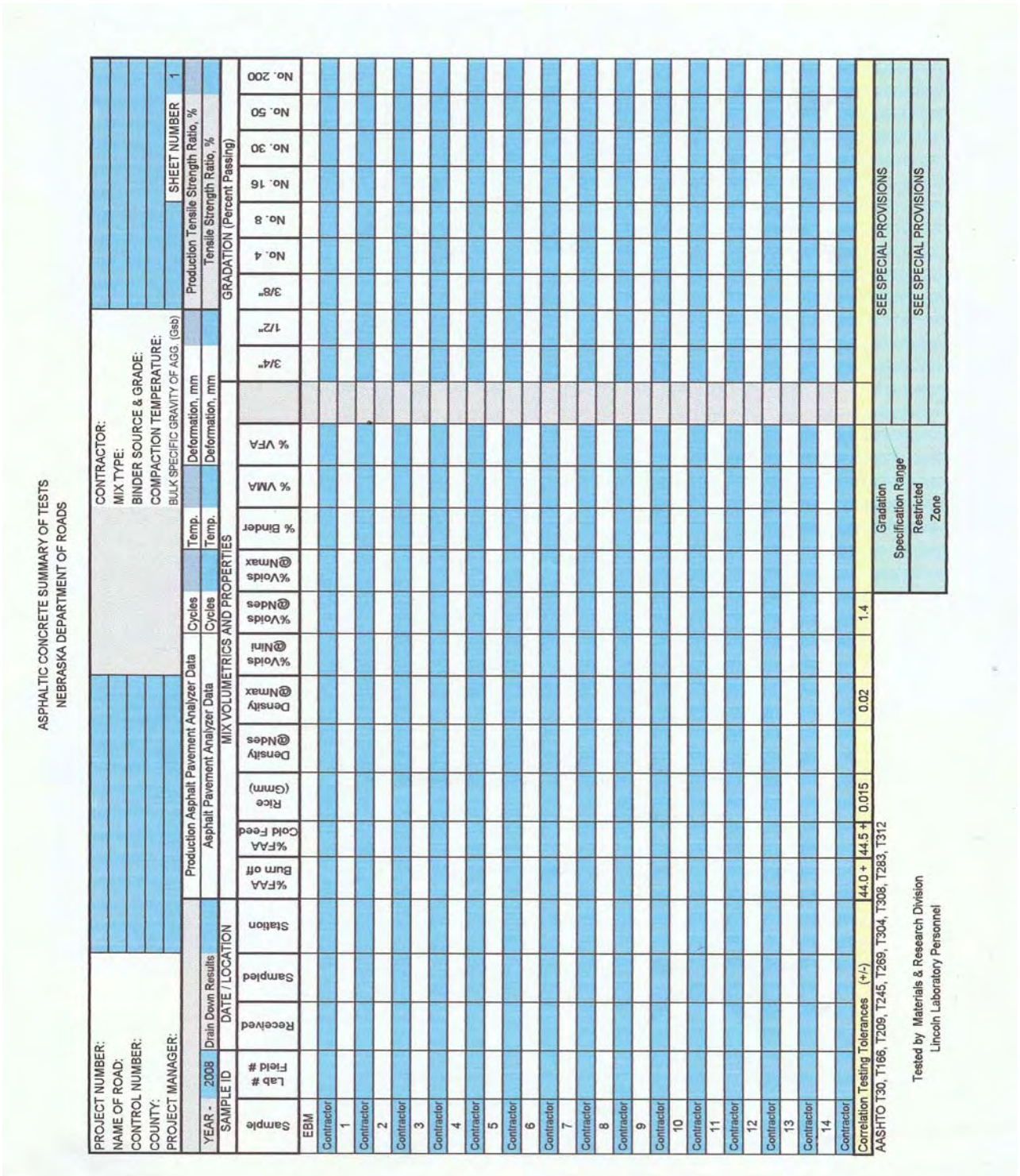
*** Bath temp. 77F / 25C**

DATE: 2-6-03
REVISED: 4-11-08

Figure E2.1 – Test Report
Asphaltic Concrete Summary of Tests

Laboratory: Bituminous Aggregate

Test Methods: AASHTO T 30, T 166, T 209, T 245, T 269, T 283. T 304, T 308, T 312

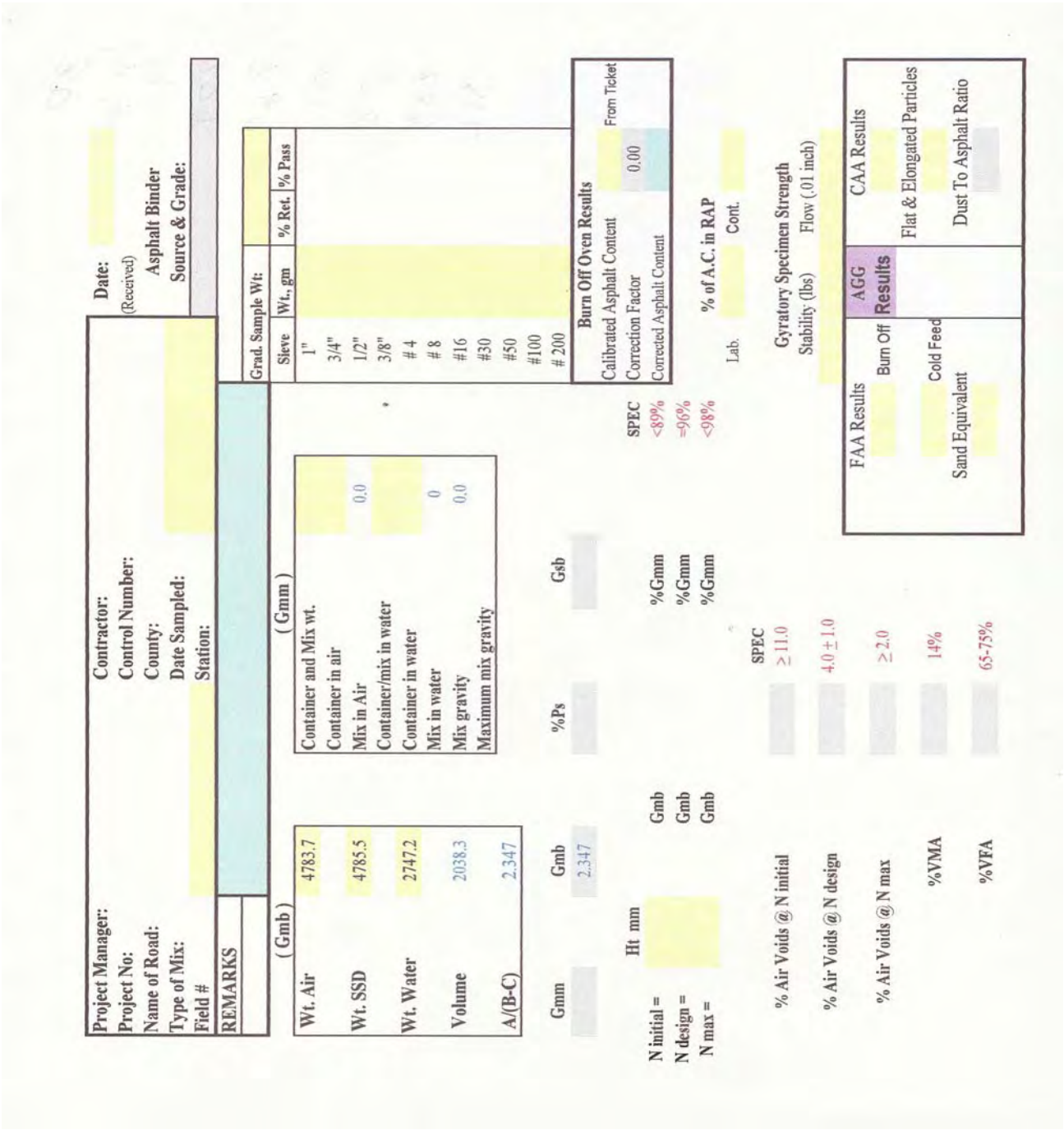


DATE: 8-29-97
REVISED: 4-11-08

Figure E2.2– Lab Worksheet
Report of Test Data – Collected Data Creates the Summary of Test Report for Asphaltic Concrete Mixtures

Laboratory: Bituminous Aggregate

Test Method: AASHTO T 30, T 166, T 209, T 245, T 269, T 283, T 304, T 308, T 312



DATE: 2-3-97
REVISED: 2-6-03

Figure E2.3 – Lab Worksheet
Superpave Mechanical Analysis of Extracted Aggregates

Laboratory: Bituminous Aggregate
Test Methods: AASHTO T 30

Nebraska Department of Roads
Materials and Tests Division
Lab Worksheet

Laboratory Identification
BA
EBM
Sample Wt.

Superpave Mechanical Analysis of Extracted Aggregate
Test Method: AASHTO T 30

Sample Wt. After Wash/Dry =

Sieve Size	Total Passing (Water Wash)		
	Weight, gm	* Percent Retained	** Percent Passing
1 Inch			
3/4 Inch			
1/2 Inch			
3/8 Inch			
No. 4			
No. 8			
No. 16			
No. 30			
No. 50			
No. 100			
No. 200			
Passing No. 200			

*** Weight, gm/Sample Weight X 100 = Percent Retained**

**** 100 - % Retained = Percent Passing**

Tested by:	Date Tested:

DATE: 8-29-97
REVISED: 4-11-08

Figure E2.4 – Lab Worksheet
Bulk Specific Gravity of Compacted Bituminous Mixtures
Using Saturated Surface-Dry Specimens

Laboratory: Bituminous Aggregate
Test Method: AASHTO T 166

Nebraska Department of Roads
Materials and Research Division
Lab Worksheet

Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface - Dry Specimens

Test Method: AASHTO T 166

Sample No.	Dry Weight in Air *gm*	S.S.D. Weight in Air *gm*	Saturated Weight in Water *gm*	Volume *cc*	Density *gm/cc*	Average	Correction Factor	Date	Technician

DR Form 72b, Aug 97

printed on recycled paper

DATE: 8-29-97
REVISED: 4-11-08

Figure E2.5 – Lab Worksheet
Maximum Specific Gravity of Bituminous Paving Mixtures

Laboratory: Bituminous Aggregate
Test Method: AASHTO T 209

Nebraska Department of Roads
Materials and Tests Division
Lab Worksheet

Maximum Specific Gravity of Bituminous Paving Mixtures

Test Method: AASHTO T 209

Sample No.	Jar No.	Weight of Jar & Material		Weight of Material *gm*	Volume of Material *cc*	Density	Date	Technician
		In Air *gm*	In Water *gm*					

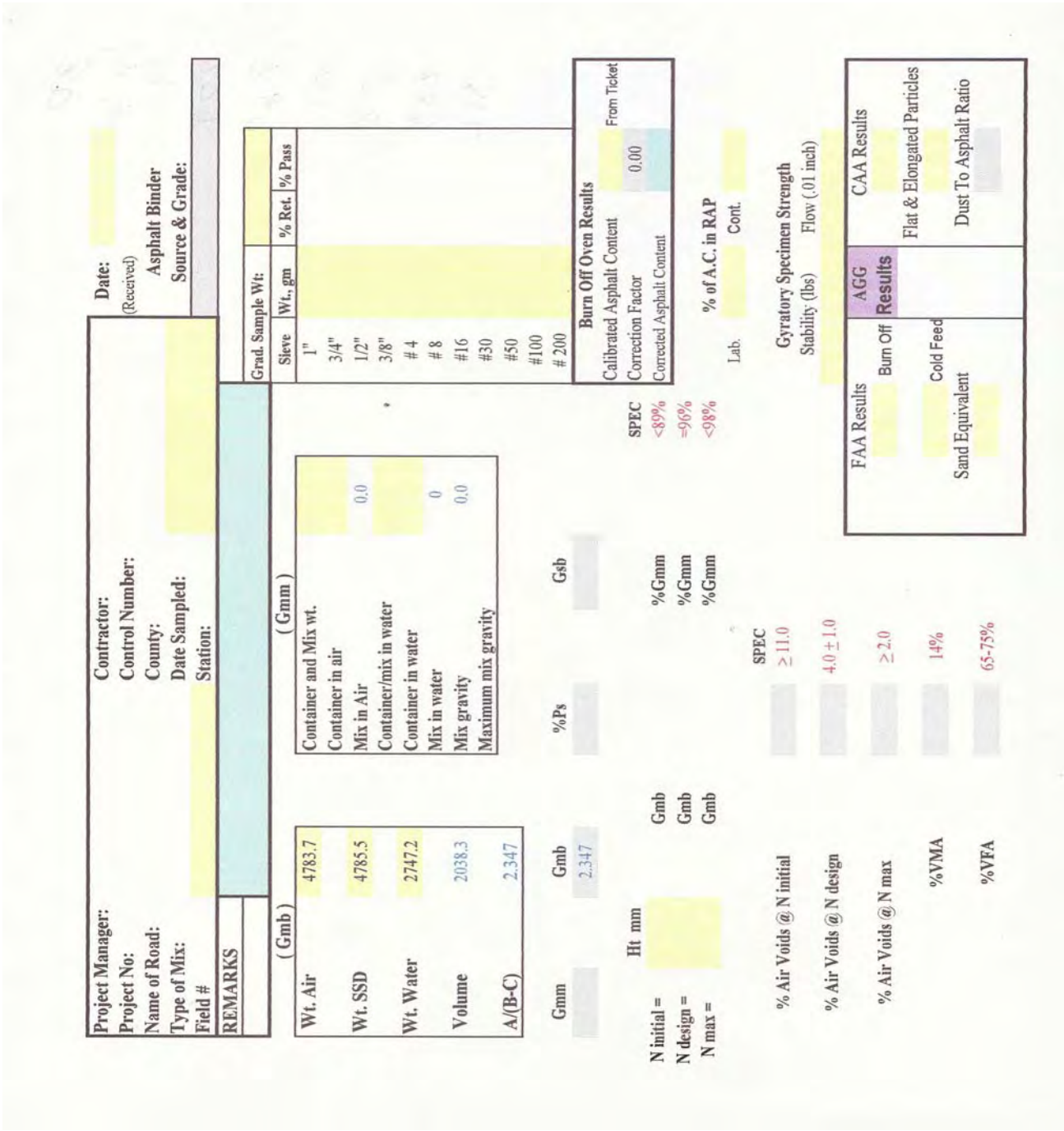
DR Form 72a, Aug 97

printed on recycled paper

DATE: 8-29-07
REVISED: 4-11-08

Figure E2.6 – Lab Worksheet
Percent Air Voids in Compacted Dense and Open Asphalt Mix

Laboratory: Bituminous Aggregate
Test Method: AASHTO T 269



DATE: 4-11-08
REVISED:

Figure E2.7– Lab Worksheet
Resistance of Compacted Hot Mix Asphalt to Moisture-Induced Damage

Laboratory: Bituminous Aggregate
Test Method: AASHTO T 269

State of Nebraska
Department of Roads

Tensile Strength Ratios
AASHTO T-283-03

Version 3-24-04

Date:
Project No.
Mix Type:
PG Grade:
Asphalt Content:
Comments:

	Conditioned			Unconditioned		
Sample	1	2	3	4	5	6
Diameter (mm)	150.0	150.0	150.0	150.0	150.0	150.0
Thickness (mm)	95	95	95	95	95	95
Dry Mass in Air (gm)						
Mass in Water (gm)						
SSD Mass (gm)						
Volume (ml)						
Bulk Specific Gravity (Gmb)						
Maximum Specific Gravity (Gmm)						
% Air Voids						
Volume of Air Voids (ml)						

Group Air Void Values	Conditioned Average:	Control Average:

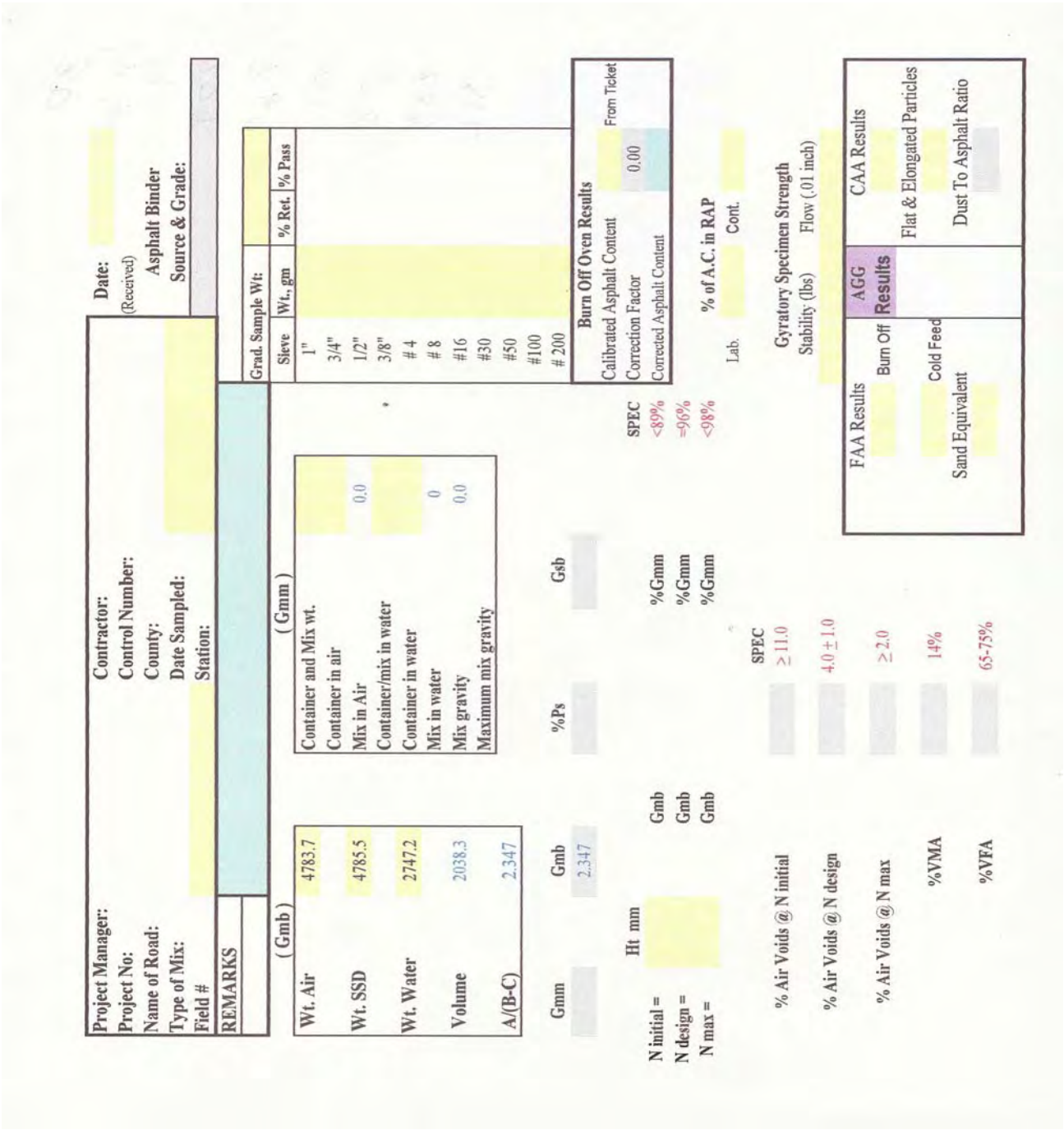
SSD Mass @ 70% Saturation		(Saturation Ranges)	
SSD Mass @ 80% Saturation			
Weight after saturation (SSD Mass (gm))			
Volume of Absorbed Water (ml)			
Actual % Saturation			
Thickness after conditioning (mm)	95	95	95
Stability (lbs)			
Tensile Strength (psi)			

	(Time)	(Date)	
Freeze Cycle - Time/Date In			(Minimum 16 hrs.)
			(Date)
140 Degree Water Bath - Time In		(24 +/- 1 hrs.)	
77 Degree Water Bath - Time In		(2 hrs. +/- 10 min.)	
Visual Moisture Damage		(0 to 5, with 5 being most stripped)	
Tensile Strength Ratio		(Minimum 80%)	

DATE: 4-11-08
REVISED:

Figure E2.8 - Lab Worksheet
Determining the Asphalt Binder Content of Hot-Mix Asphalt by the Ignition Oven Method

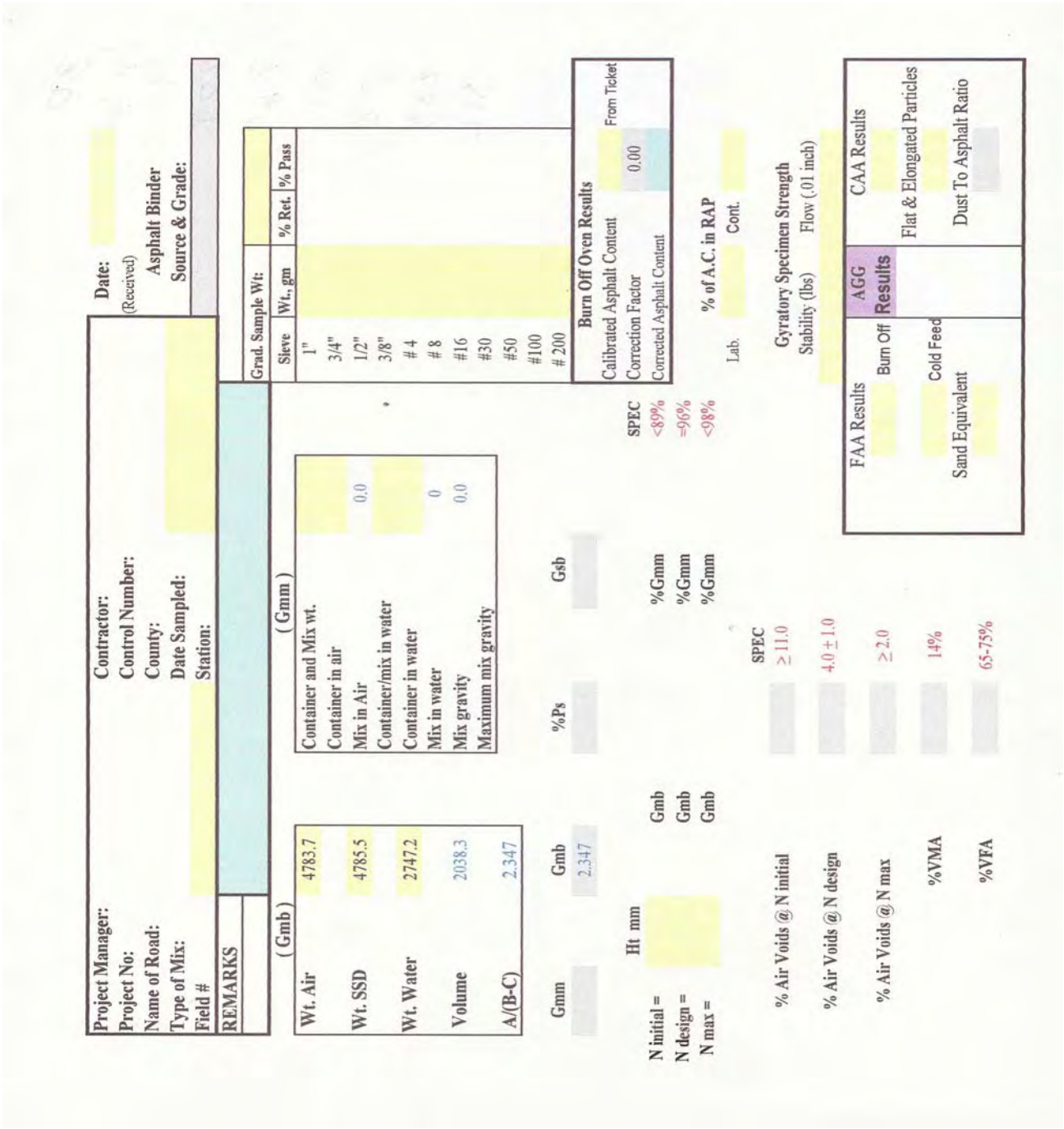
Laboratory: Bituminous Aggregate
Test Method: AASHTO T 308



DATE: 4-11-08
REVISED:

Figure E2.9 - Lab Worksheet
Density of Hot-Mix Asphalt Specimens by Means of the Superpave Gyratory Compactor

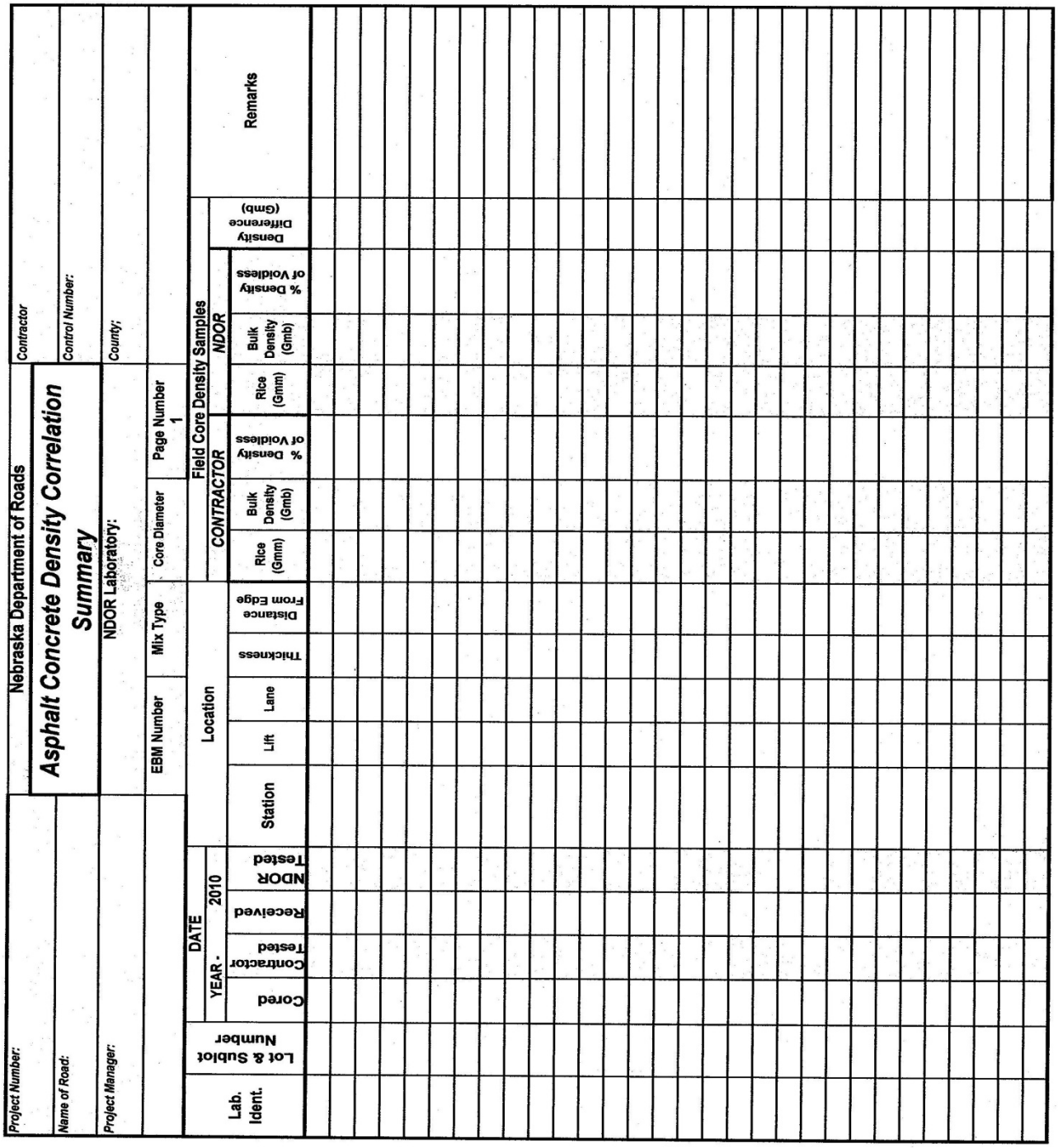
Laboratory: Bituminous Aggregate
Test Method: AASHTO T 312



DATE: 11-29-11
REVISED:

Figure E2.10 – Test Report
Asphalt Concrete Density Correlation Summary

Laboratory: Bituminous Aggregate
Test Method: AASHTO T 166



DATE: 11-29-11
REVISED:

Figure E2.11 – Lab Worksheet
Asphalt Concrete Design

Laboratory: Bituminous Aggregate
Test Method: AASHTO T 84, T 85, T 176, T 283, T 304, ASTM D 5821, D 4791

State of Nebraska

Department of Roads
Asphalt Concrete Design

Project Manager: **Date:**
Project No:
Name of Road:
Type of Asphalt Concrete: **ASPHALT CEMENT**
Design No: **Source:**
Grade:

GRADATION OF MATERIALS PROPOSED						SIEVE ANALYSIS (WASH)								
MATERIAL	PIT LOCATION					19.0	12.5	9.50	4.75	2.36	1.18	600	300	75
	%	1/4	SEC	T	R	3/4"	1/2"	3/8"	#4	#8	#16	#30	#50	#200
		COMBINED GRADATION				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		SPECIFICATION RANGE												

LABORATORY MIXES			
Mix	1	2	3
EBM #			
% TOTAL			
% BURN			

CONSENSUS PROPERTIES		FAA SP. GR.
FAA Results		
CAA Results		
Sand Equivalent		
F & E Particles		
Moisture Sensitivity		
Dust to Asphalt Ratio		
Design Gsb		

Plasticity index of material passing the #200 sieve: NR
Combined mineral aggregate samples for plasticity index are not required.
*Note: One percent Hydrated Lime, by weight of virgin aggregate, will be added during construction of this design.

APA Results		
Strokes		Rut Depth
Time(Min.)		

The Target asphalt content is 5.30% (By weight of mix)

This constitutes verification of the job-mix gradation and superpave criteria values proposed by the contractor. If it is necessary to change the job mix either before or after the job starts, including the asphalt binder %, the contractor shall notify the P.E. / P.M.

Remarks:

cc:

A.Dearmont
L.Koves
R.Rea
File

Validated by Robert C. Rea & Materials and Research Div.
Fax (402) 479 - 3882

DATE: 2-14-97
REVISED: 4-3-01

Figure E3.1 – Test Report
Report of Test – Crushed Rock

Laboratory: Aggregates, Soils

Test Methods: AASHTO T 27, T 84, T 85, T 89, T 90, T 96, T 104
NDR T103, T 504

Nebraska Department of Roads
Materials and Research Division
1400 Highway 2
PO Box 94759
Lincoln NE 68509-4759

Report of Test

Project Manager: *(Name & Address)*

Name of Road:

Project No.:

Name of Material: ***Crushed Rock***

Control No.:

For Use In:

County:

Source:

Contractor: *(Number, Name & Address)*

Producer:

Laboratory:

Report No.:

LAB IDENT. CR	FIELD IDENT.	CONST.	ITEM	DATE SAMPLED	DATE RECEIVED	DATE REPORTED	SIEVE ANALYSIS (Spacer Sieves Were Used) Total Percent Passing 1½ 37.5 mm	1 25.0 mm	¾ 19.0 mm	½ 12.5 mm	⅜ 9.50 mm	4 4.75 mm	10 2.00 mm	20 850 µm	50 300 µm	200 75 µm	BULK SPECIFIC GRAVITY	% ABSORPTION	L.A. ABRASION GRADING & % LOSS	% CLAY LUMPS & % SHALE & COAL	% SOFT PARTICLES	TOTAL CLAY, SHALE & SOFT PARTICLES, %	SOUNDNESS LOSS FREEZE & THAW	SOUNDNESS LOSS SODIUM SULFATE	LIQUID LIMIT	PLASTICITY INDEX	WT./CU. FT. lbs.
Q = Quarry Sample			Specifications																								

Test Results Based On: AASHTO T 27, T 84, T 85, T 89, T 90, T 96, T 104
NDR T 103, T 504

(1) _____ (2) _____

DR Form 211a, Sep 00

For Materials and Research Division

~~DATE: 2-14-97~~
~~REVISED:~~ VOID – DO NOT USE

~~Figure E3.2 – Test Report~~
~~Report of Test – Crushed Rock for Use in Asphaltic Concrete~~

~~Laboratory:~~ ~~Aggregates~~

~~Test Methods:~~ ~~AASHTO T 27, T 85, T 96, T 104~~
~~NDR T103, T 504, T 584~~

DATE: 2-14-97
REVISED: 4-3-01

Figure E3.3 – Test Report
Report of Test – Crushed Rock for Use in Asphaltic Concrete

Laboratory: Aggregates

Test Methods: AASHTO T 27, T 96, T 104, T 89, T 90, T 85
NDR T 103, T 504

Nebraska Department of Roads
Materials and Research Division
1400 Highway 2
PO Box 94759
Lincoln NE 68509-4759

Report of Test

Project Manager: *(Name & Address)*	Name of Road:	Project No.:
		Name of Material: *Crushed Rock* — Control No.:
County:		For Use In: *Asphaltic Concrete*
Contractor: *(Number, Name & Address)*		Source:
		Producer:
		Laboratory: *Lincoln, NE* — Report No.:

LAB IDENT.	FIELD IDENT.	CONST.	CONTRACTOR	ITEM	DATE			SIEVE ANALYSIS *(Spacer Sieves Were Used)* *Total Percent Passing*											BULK SPECIFIC GRAVITY	% ABSORPTION	L.A. ABRASION GRADING & % LOSS	% CLAY LUMPS & % SHALE & COAL	% SOFT PARTICLES	TOTAL CLAY, SHALE & SOFT PARTICLES, %	PERCENT SOUNDNESS LOSS	
					SAMPLED	RECEIVED	REPORTED	1	¾	½	⅜	4	8	10	16	30	50	200							FREEZE & THAW	SODIUM SULFATE
CR								25.0 mm	19.0 mm	12.5 mm	9.50 mm	4.75 mm	2.36 mm	2.00 mm	1.18 mm	600 µm	300 µm	75 µm								
				Specifications																						

Q = Quarry Sample

Test Results Based On: AASHTO T 27, T 96, T 104, T 89, T 90, T 85
NDR T 103, T 504

DR Form 226a, Mar 01

For Materials and Research Division

DATE: 2-14-97
REVISED: 4-3-01

Figure E3.4 – Test Report
Report of Test – Mineral Aggregate for Use in Asphaltic Concrete

Laboratory: Aggregates
Test Methods: AASHTO T 27, T 96, T 104, T 248, T 304, T 89, T 90, T 84

Nebraska Department of Roads
Materials and Research Division
1400 Highway 2
PO Box 94759
Lincoln NE 68509-4759

Report of Test

Project Manager: *(Name & Address)*	Name of Road:	Project No.:
		Name of Material: ***Mineral Aggregate*** — Control No.:
		For Use In: ***Asphaltic Concrete***
County:		Source:
Contractor: *(Number, Name & Address)*		Producer:
		Laboratory: ***Lincoln, NE*** — Report No.:

LAB IDENT. MA	FIELD IDENT.	Sample Class: CONST.	Sample Class: PRS	Sample Class: CONTRACTOR	ITEM	DATE: SAMPLED	DATE: RECEIVED	DATE: REPORTED	SIEVE ANALYSIS (Spacer Sieves Were Used) Total Percent Passing: 1 (25 mm)	¾ (19.0 mm)	½ (12.5 mm)	⅜ (9.50 mm)	4 (4.75 mm)	8 (2.36 mm)	10 (2.00 mm)	16 (1.18 mm)	30 (600 µm)	40 (425 µm)	50 (300 µm)	200 (75 µm)	BULK SPECIFIC GRAVITY	ABSORPTION	MINUS 75 µm SIEVE LIQUID LIMIT	MINUS 75 µm SIEVE PLASTICITY INDEX	SODIUM SULFATE SOUNDNESS	L.A. ABRASION GRADING & % WEAR
						Specifications																			Max. 12	Max. 40

Test Results Based On: AASHTO T 27, T 96, T 104, T 248, T 304, T 89, T 90, T 84

(1) ______________________ (2) ______________________

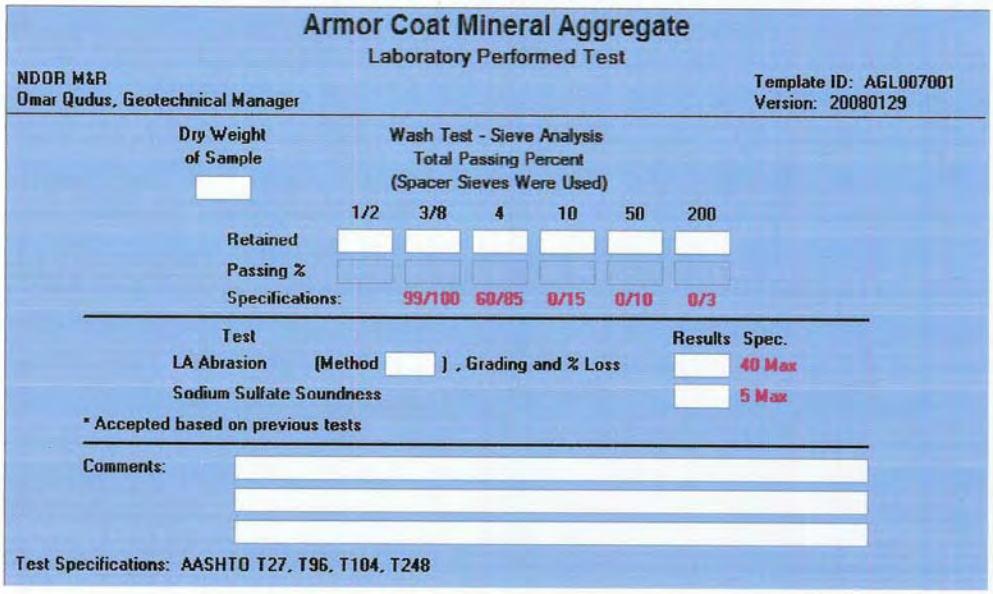
DR Form 230a, Mar 01

For Materials and Research Division

DATE: 2-14-97
REVISED: 02-29-08

Figure E3.5 – Test Report
Report of Test – Mineral Aggregate for Use in Armor Coat

Laboratory: Aggregates
Test Methods: AASHTO T 27, T 96, T 104, T 248



Armor Coat Mineral Aggregate
Laboratory Performed Test

NDOR M&R
Omar Qudus, Geotechnical Manager

Template ID: AGL007001
Version: 20080129

Dry Weight of Sample

Wash Test - Sieve Analysis
Total Passing Percent
(Spacer Sieves Were Used)

	1/2	3/8	4	10	50	200
Retained						
Passing %						
Specifications:		99/100	60/85	0/15	0/10	0/3

Test		Results	Spec.
LA Abrasion	(Method) , Grading and % Loss		40 Max
Sodium Sulfate Soundness			5 Max

* Accepted based on previous tests

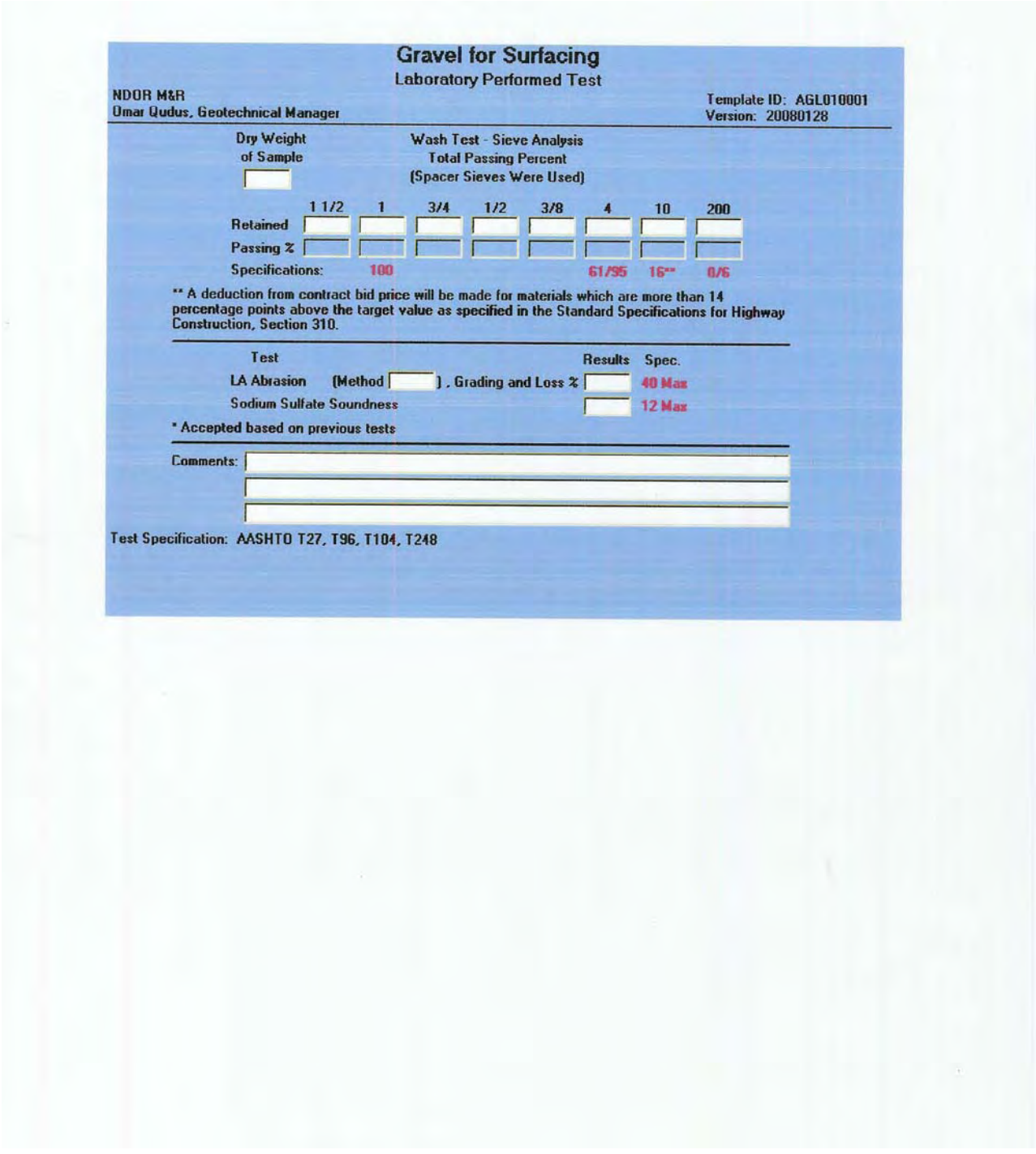
Comments:

Test Specifications: AASHTO T27, T96, T104, T248

DATE: 2-14-97
REVISED: 02-29-08

Figure E3.6 – Test Report
Report of Test – Gravel Surfacing

Laboratory: Aggregates
Test Methods: AASHTO T 27, T 96, T 104, T 248



Gravel for Surfacing

Laboratory Performed Test

NDOR M&R
Omar Qudus, Geotechnical Manager

Template ID: AGL010001
Version: 20080128

Dry Weight of Sample

Wash Test - Sieve Analysis
Total Passing Percent
(Spacer Sieves Were Used)

	1 1/2	1	3/4	1/2	3/8	4	10	200
Retained								
Passing %								
Specifications:		100				61/95	16**	0/6

** A deduction from contract bid price will be made for materials which are more than 14 percentage points above the target value as specified in the Standard Specifications for Highway Construction, Section 310.

Test		Results	Spec.
LA Abrasion	(Method [ ]), Grading and Loss %		40 Max
Sodium Sulfate Soundness			12 Max

* Accepted based on previous tests

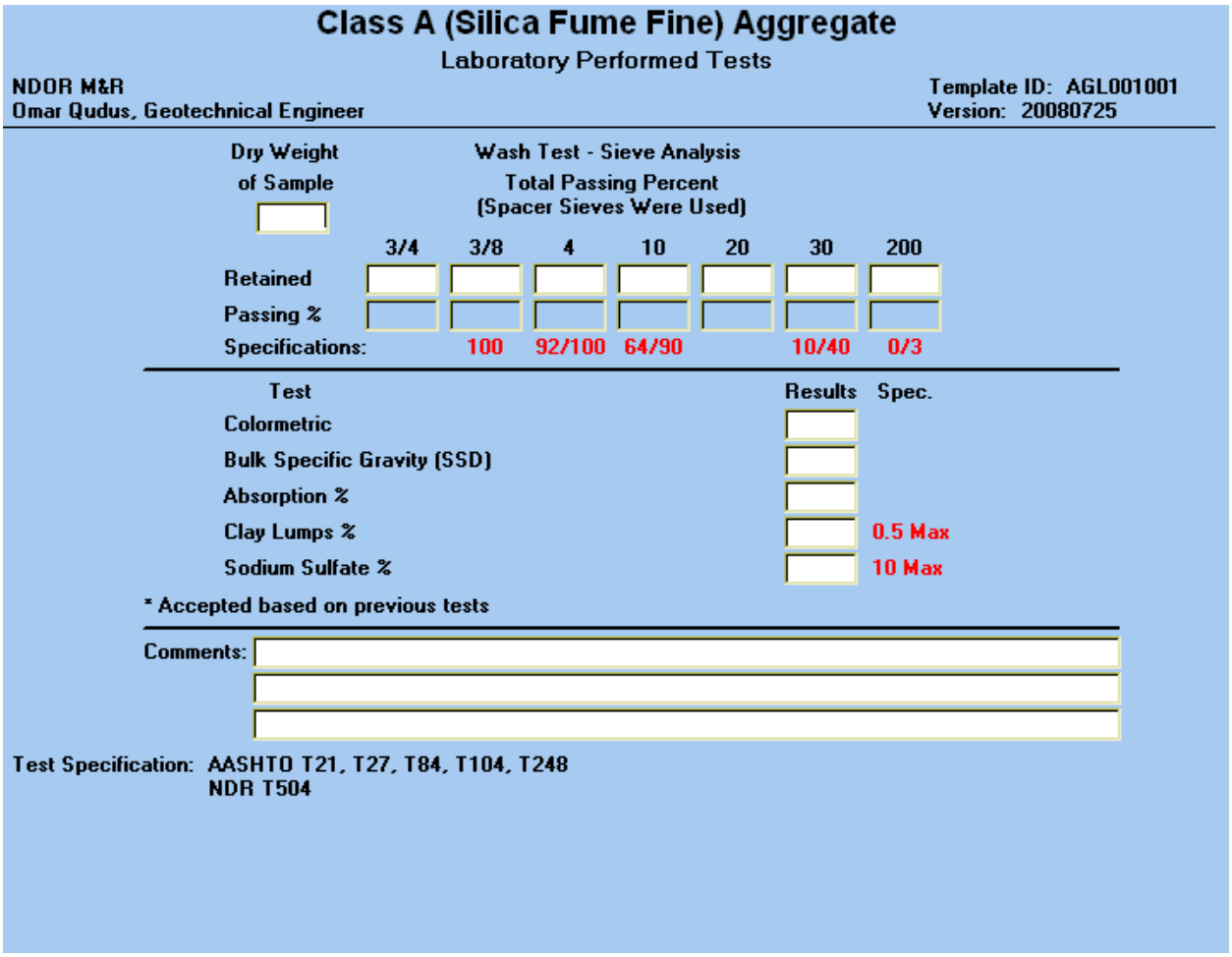
Comments:

Test Specification: AASHTO T27, T96, T104, T248

DATE: 2-14-97
REVISED: 02-29-08

Figure E3.7 – Test Report
Report of Test – Fine Aggregate (Class A) for Use in High-Density Low-Slump or Silica Fume Concrete

Laboratory: Aggregates
Test Methods: AASHTO T 21, T 27, T 84, T 104, T 248
NDR T 504



Class A (Silica Fume Fine) Aggregate

Laboratory Performed Tests

NDOR M&R
Omar Qudus, Geotechnical Engineer

Template ID: AGL001001
Version: 20080725

Dry Weight of Sample

Wash Test - Sieve Analysis
Total Passing Percent
(Spacer Sieves Were Used)

	3/4	3/8	4	10	20	30	200
Retained							
Passing %							
Specifications:		100	92/100	64/90		10/40	0/3

Test	Results	Spec.
Colormetric		
Bulk Specific Gravity (SSD)		
Absorption %		
Clay Lumps %		0.5 Max
Sodium Sulfate %		10 Max

* Accepted based on previous tests

Comments:

Test Specification: AASHTO T21, T27, T84, T104, T248
NDR T504

DATE: 2-14-97
REVISED: 02-29-08

Figure E3.8 – Test Report
Report of Test – Coarse Aggregate (Class F) for Use in High-Density Low-Slump or Silica Fume Concrete

Laboratory: Aggregates

Test Methods: AASHTO T 27, T 85, T 96, T 248
NDR T 103, T 504

Class F (Silica Fume Coarse) Aggregate

Laboratory Performed Tests

NDOR M&R
Omar Qudus, Geotechnical Engineer

Template ID: AGL006001
Version: 20080725

Dry Weight of Sample

Wash Test - Sieve Analysis
Total Percent Passing
(Spacer Sieves Were Used)

	1	3/4	1/2	3/8	4	10	200
Retained							
% Passing							
Specifications:		100	96/100	40/90	4/30	0/8	0/3

** may be increased to 0/6 provided no more than 1.5% is passing the 200 sieve when washed

Test	Results	Spec.
Bulk Specific Gravity (SSD)		
Absorption %		
LA Abrasion (Method) , Grading and Loss %		40 Max
Clay Lumps %		0.5 Max
Shale and Coal %		1 Max
Soft Particles %		3.5 Max
Total Clay, Shale, Coal, and Soft Particles %		3.5 Max
Freeze Thaw %		8 Max

* Accepted based on previous tests

Comments:

Test Specifications: AASHTO T27, T85, T96, T248
NDR T103, T504

DATE: 2-14-97
REVISED: 4-3-01

Figure E3.9 – Test Report
Report of Test – Fine Aggregate (Class D) for Use in Grout Sand

Laboratory: Aggregates

Test Methods: AASHTO T 27
NDR T 504

Nebraska Department of Roads
Materials and Research Division
1400 Highway 2
PO Box 94759
Lincoln NE 68509-4759

Report of Test

Project Manager: *(Name & Address)*	Name of Road:	Project No.:
		Name of Material: *Fine Aggregate - Class D* / Control No.:
County:		For Use In: *Grout Sand*
Contractor: *(Number, Name & Address)*		Source:
		Producer:
		Laboratory: *Lincoln, NE* / Report No.:

LAB IDENT.	FIELD IDENT.	CONST.	FHWA	ITEM	DATE SAMPLED	DATE RECEIVED	DATE REPORTED	SIEVE ANALYSIS (Spacer Sieves Were Used) Total Percent Passing 1½ / 37.5 mm	1 / 25.0 mm	¾ / 19.0 mm	⅜ / 9.50 mm	4 / 4.75 mm	10 / 2.00 mm	20 / 850 µm	30 / 600 µm	200 / 75 µm	COLORIMETRIC	BULK SPECIFIC GRAVITY (SSD)	% ABSORPTION	LA ABRASION GRADING & % LOSS	% CLAY LUMPS	% SHALE & COAL	% SOFT PARTICLES	TOTAL CLAY, SHALE & SOFT PARTICLES, %	PERCENT SOUNDNESS LOSS: FREEZE & THAW	PERCENT SOUNDNESS LOSS: SODIUM SULFATE
FA																										
Ready Mix Plant Location				Specifications								100	95 ±5		57 ±18	3 ±3										

Test Results Based On: AASHTO T 27, NDR T 504

(1) _____ (2) _____

DR Form 191d, Aug 00

For Materials and Research Division

DATE: 2-14-97
REVISED: 02-29-08

Figure E3.10 – Test Report
Report of Test – Fine Aggregate (Class B) for Use in Class 47B Concrete

Laboratory: Aggregates

Test Methods: AASHTO T 21, T 27, T 84, T 96, T 104, T 176, T 248
NDR T 504

Class B (47B Fine) Aggregate

Laboratory Performed Tests

NDOR M&R
Omar Qudus, Geotechnical Engineer

Template ID: AGL002001
Version: 20080725

Dry Weight of Sample

WASH TEST - SIEVE ANALYSIS
Total Passing Percent

	1 1/2	1	3/4	1/2	3/8	4	10	20	30	200
Retained										
Passing %										
Specifications:		100				77/97	50/70		16/40	0/3

Test	Results	Spec.
Colormetric		
Bulk Specific Gravity (SSD)		
Absorption %		
Clay Lumps %		0.5 Max
LA Abrasion (Method)		
Sodium Sulfate %		10 Max
Sand Equivalent		

* Accepted based on previous tests

Fineness Modulus	3/4	3/8	4	8	16	30	50	100
Retained								
Retained %								

Fineness Modulus Total Retained %

Comments:

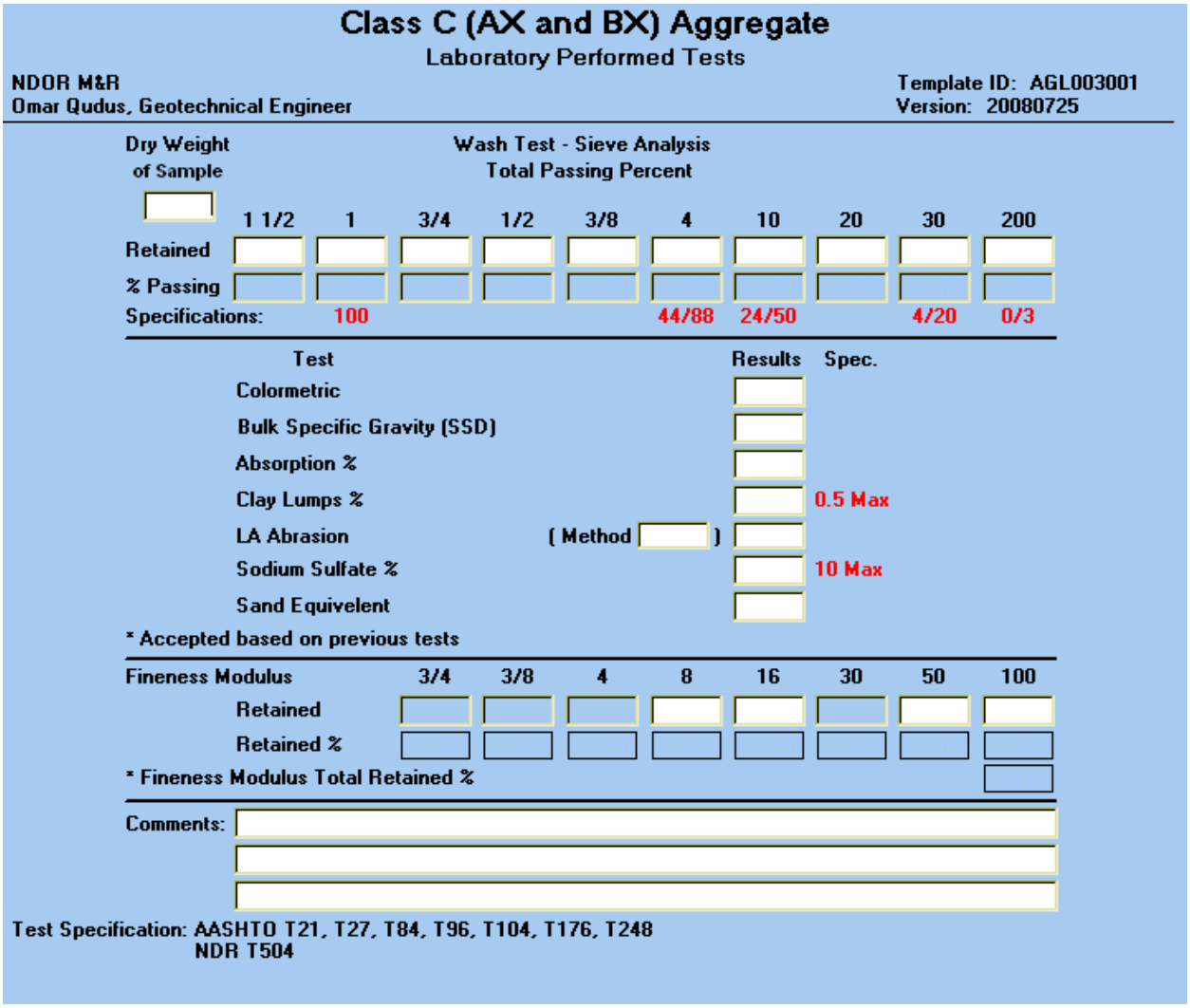
Test Specification: AASHTO T21, T27, T84, T96, T104, T176, T248
NDR T504

DATE: 2-14-97
REVISED: 02-29-08

Figure E3.11 – Test Report
Report of Test – Sand-Gravel Aggregate (Class C) for Use in Class AX & BX Concrete

Laboratory: Aggregates

Test Methods: AASHTO T 21, T 27, T 84, T 96, T 104, T 176, T 248
NDR T 504



Class C (AX and BX) Aggregate

Laboratory Performed Tests

NDOR M&R
Omar Qudus, Geotechnical Engineer

Template ID: AGL003001
Version: 20080725

Dry Weight of Sample

Wash Test - Sieve Analysis
Total Passing Percent

	1 1/2	1	3/4	1/2	3/8	4	10	20	30	200
Retained										
% Passing										
Specifications:		100				44/88	24/50		4/20	0/3

Test		Results	Spec.
Colormetric			
Bulk Specific Gravity (SSD)			
Absorption %			
Clay Lumps %			0.5 Max
LA Abrasion	(Method)		
Sodium Sulfate %			10 Max
Sand Equivelent			

* Accepted based on previous tests

Fineness Modulus	3/4	3/8	4	8	16	30	50	100
Retained								
Retained %								
* Fineness Modulus Total Retained %								

Comments:

Test Specification: AASHTO T21, T27, T84, T96, T104, T176, T248
NDR T504

DATE: 2-14-97
REVISED: 02-29-08

Figure E3.12 – Test Report
Report of Test – Coarse Aggregate (Class E) for Use in Class 47B Concrete

Laboratory: Aggregates

Test Methods: AASHTO T 27, T 85, T 96, T 248
NDR T 103, T 504

Class E (47B Coarse) Aggregate

Laboratory Performed Tests

NDOR M&R
Omar Qudus, Geotechnical Engineer

Template ID: AGL005001
Version: 20080725

Dry Weight of Sample: ____

Wash Test - Sieve Analysis
Total Passing Percent
(Spacer Sieves Were Used)

	2	1 1/2	1	3/4	1/2	3/8	4	20	200
Retained									
Passing %									
Specifications:		100	92/100	66/90		15/45	0/12	**0/4	0/3

** May be increased to 0/6 provided no more than 1.5% is passing the 200 sieve when washed

Test	Results	Spec
Bulk Specific Gravity (SSD)		
Absorption %		
LA Abrasion (Method ____), Grading and Loss %		40 Max
Clay Lumps %		0.5 Max
Shale and Coal %		1 Max
Soft Particles %		3.5 Max
Total Clay, Shale, Coal, and Soft Particles %		3.5 Max
Freeze Thaw %		8 Max
Calcium Carbonate		80 Min

* Accepted based on previous tests

Comments: ____

Test Specification: AASHTO T27, T85, T96, T248
NDR T103, T504

DATE: 2-14-97
REVISED: 03-03-08

Figure E3.13 – Test Report
Report of Test – Stabilized Mixture for Use in Foundation Course (Regular)

Laboratory: Soils

Test Methods: AASHTO T 27, T 248
NDR T 99

Nebraska Department of Roads
Materials and Research Division
1400 Highway 2
PO Box 94759
Lincoln NE 68509-4759

Report of Test

Project Manager: *(Name & Address)*

Name of Road:

Project No.:

Name of Material: ***Stabilized Mixture***

Control No.:

For Use In: ***Foundation Course (req)***

County:

Source:

Contractor: *(Number, Name & Address)*

Producer:

Laboratory: ***Lincoln, NE***

Report No.:

LAB IDENT. SM	FIELD IDENT.	Sample Class. CONST.	PRS	CONTRACTOR	DATE SAMPLED	RECEIVED	REPORTED	SIEVE ANALYSIS (Spacer Sieves Were Used) Total Percent Passing 1 25 mm	¾ 19.0 mm	½ 12.5 mm	⅜ 9.50 mm	4 4.75 mm	10 2.00 mm	30 600 µm	40 425 µm	50 300 µm	200 75 µm	MOISTURE DENSITY TEST MAXIMUM DENSITY gm/cc	OPTIMUM MOISTURE %	METHOD	MOISTURE DENSITY CURVE NO.			
(P) Producer					Specifications			100 None					62±12		34±8		9±3							

Test Results Based On: AASHTO T 27, T 248
NDR T 99

DR Form 435d, Feb 01

For Materials and Research Division

DATE: 2-14-97
REVISED: 4-3-01

Figure E3.14 – Test Report
Report of Test – (General)

Laboratory: Aggregates

Test Methods: AASHTO T 27, T 88, T 89, T 90, T 96, T 100, T 104, T 248
NDR T 99, T 103

Nebraska Department of Roads
Materials and Research Division
1400 Highway 2
PO Box 94759
Lincoln NE 68509-4759

Report of Test

Project Manager: *(Name & Address)*	Name of Road:	Project No.:
		Name of Material: / Control No.:
County:		For Use In:
Contractor: *(Number, Name & Address)*		Source:
		Producer:
		Laboratory: **Lincoln, NE** / Report No.:

LAB IDENT.	FIELD IDENT.	Sample Class. CONST.	Sample Class. PRS	ITEM	DATE SAMPLED	DATE RECEIVED	DATE REPORTED	SIEVE ANALYSIS (Spacer Sieves Were Used) Total Percent Passing 1 (25.0 mm)	¾ (19.0 mm)	½ (12.5 mm)	⅜ (9.50 mm)	4 (4.75 mm)	10 (2.00 mm)	30 (600 µm)	40 (425 µm)	50 (300 µm)	100 (150 µm)	200 (75 µm)	HYDROMETER % SILT	HYDROMETER % CLAY	SPECIFIC GRAVITY	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE DENSITY TEST MAXIMUM DENSITY g/m3	MOISTURE DENSITY TEST OPTIMUM MOISTURE %	MOISTURE DENSITY TEST METHOD	MOISTURE DENSITY CURVE NO.	SODIUM SULFATE SOUNDNESS	LOS ANGELES ABRASION
				Specifications																									

Test Results Based On: AASHTO T 27, T 88, T 89, T 90, T 96, T 100, T 104, T 248
NDR T 99, T 103

DR Form 435a, Feb 01

For Materials and Research Division

DATE: 2-14-97
REVISED: 03-03-08

Figure E3.15 – Lab Worksheet
Organic Impurities in Fine Aggregate for Concrete

Laboratory: Aggregates
Test Method: AASHTO T 21

Nebraska Department of Roads
Materials and Research Division
Lab Worksheet

Organic Impurities in Fine Aggregate for Concrete
Test Method: AASHTO T 21

LAB. IDENT. FA	BOTTLE NO.	START		FINISH		RESULT	TESTED BY	DATE REPORTED
		DATE	TIME	DATE	TIME			

DR Form 445, Feb 06

DATE: 2-14-97
REVISED: 03-03-08

Figure E3.16 – Lab Worksheet
Coarse Aggregate Specific Gravity and Absorption

Laboratory: Aggregates
Test Method: AASHTO T 85

Nebraska Department of Roads
Materials and Research Division
Lab Worksheet

Coarse Aggregate Specific Gravity and Absorption
Test Method: AASHTO T 85

Lab Ident.	Dry Weight (A)	Wet Weight: In Air (B)	Wet Weight: In H_2O (C)	Bulk Sp. Grav. $\frac{A}{B-C}$	Bulk Sp. Grav. SS-D Basis $\frac{B}{B-C}$	App. Sp. Grav/ $\frac{A}{A-C}$	Absorp. $\frac{B-A}{A} \times 100$	Tested By	Date Reported

DR Form 446, Feb 06

DATE: 2-14-97
REVISED: 03-03-08

Figure E3.17 – Lab Worksheet
Aggregate – Los Angeles Abrasion Test

Laboratory: Aggregates
Test Method: AASHTO T 96

Nebraska Department of Roads
Materials and Research Division
Lab Worksheet

Aggregate
Los Angeles Abrasion Test
Test Method: AASHTO T 96

Gradings of Test Samples

SIEVE SIZE		WEIGHT AND GRADING OF TEST SAMPLE, gm			
PASSING	RETAINED	A	B	C	D
1 1/2 INCH	1 INCH	1250			
1 INCH	3/4 INCH	1250			
3/4 INCH	1/2 INCH	1250	2500		
1/2 INCH	3/8 INCH	1250	2500		
3/8 INCH	1/4 INCH			2500	
1/4 INCH	NO. 4			2500	
NO. 4	NO. 8				5000

Test Results

LAB IDENT.	TESTED BY	GRADATION	A INITIAL WT., gm	B FINAL WT., gm Retained on +12 Sieve	C PASSING NO. 12 SIEVE, gm A-B	PERCENT LOSS $\frac{C}{A} \times 100$	DATE REPORTED
			5000				
			5000				
			5000				
			5000				
			5000				
			5000				
			5000				
			5000				
			5000				
			5000				
			5000				
			5000				
			5000				
			5000				
			5000				
			5000				
			5000				
			5000				
			5000				
			5000				
			5000				

DR Form 492, Feb 08

DATE: 2-14-97
REVISED: 03-03-08

Figure E3.18 – Lab Worksheet
Sieve Analysis of Mixtures of Fine and Coarse Grained Materials

Laboratory: Aggregates
Test Method: AASHTO T 27

Nebraska Department of Roads
Materials and Research Division
Lab Worksheet

Sieve Analysis of Mixtures of Fine and Coarse Grained Materials

Test Method: AASHTO T 27

Lab Ident.

TOTAL UNWASHED OVEN-DRY WEIGHT			C	D
A	B	Plus No. 4	% of Sample Passing No. 4 (B/A)	Weight of Minus No. 4 Material Tested, gm
Total Sample	Minus No. 4			

SIEVE SIZE	PLUS NO. 4 MATERIAL			MINUS NO. 4 MATERIAL			
	E	F	G	H	I	J	K
	WEIGHT RETAINED, gm		% Retained Cumulative $\frac{F}{A}$ x 100	Weight Retained Cumulative, gm	% Retained Cumulative $\frac{H}{D}$ x 100	% Adjusted to Total Sample I x C	Cumulative % Retained Total Sample G + J
	Each Size	Cumulative					
3 Inch							
2 Inch							
1½ Inch							
1 Inch							
3/4 Inch							
1/2 Inch							
3/8 Inch							
No. 4							
No. 8							
No. 10							
No. 16							
No. 20							
No. 30							
No. 40							
No. 50							
No. 100							
No. 200							
Pass No. 200							

Tested by: .....

Date Completed: ..... Date Reported: .....

Form MT9, Jan 03/

DATE: 2-14-97
REVISED: 03-03-08

Figure E3.19 – Lab Worksheet
Fine Aggregate Specific Gravity and Absorption

Laboratory: Aggregates
Test Method: AASHTO T 84

Nebraska Department of Roads
Materials and Research Division
Lab Worksheet

Fine Aggregate Specific Gravity and Absorption

Test Method: AASHTO T 84

* Where 500 = Weight of S.S.D. Aggregate

Lab. Ident.	Flask No.	A Total Weight Flask + 500 gm + 500 ml Water	B Total Weight Flask + 500 gm + Water to Mark	C Volume of Displacement of S.S.D. Aggregate A – B	D Oven Dry Weight	E Bulk Specific Gravity S.S.D. 500* / C	F Absorption Percent (500-D / D) x 100	Tested By	Date Reported

DR Form 448, Feb 06

DATE: 2-14-97
REVISED: 03-05-08

Figure E3.20 – Lab Worksheet
Aggregate – Sodium Sulfate Soundness Test, Record of Cycles

Laboratory: Aggregates
Test Method: AASHTO T 104

Date: 2-3-97
Revised:
Nebraska Department of Roads
Materials and Tests Division
Lab Worksheet

AGGREGATE
SODIUM SULFATE SOUNDNESS TEST
RECORD OF CYCLES

TEST METHOD: AASHTO T 104

Lab Identification _____

CYCLE NO.	Test No.					Tank No.					
	IN Na_2SO_4 SOLUTION				OUT Na_2SO_4 SOLUTION				OUT OF OVEN		
	SPECIFIC GRAVITY	TEMP. OF SOLUTION	DATE	TIME	SPECIFIC GRAVITY	TEMP. OF SOLUTION	DATE	TIME	TEMP.	DATE	TIME
1											
2											
3											
4											
5											

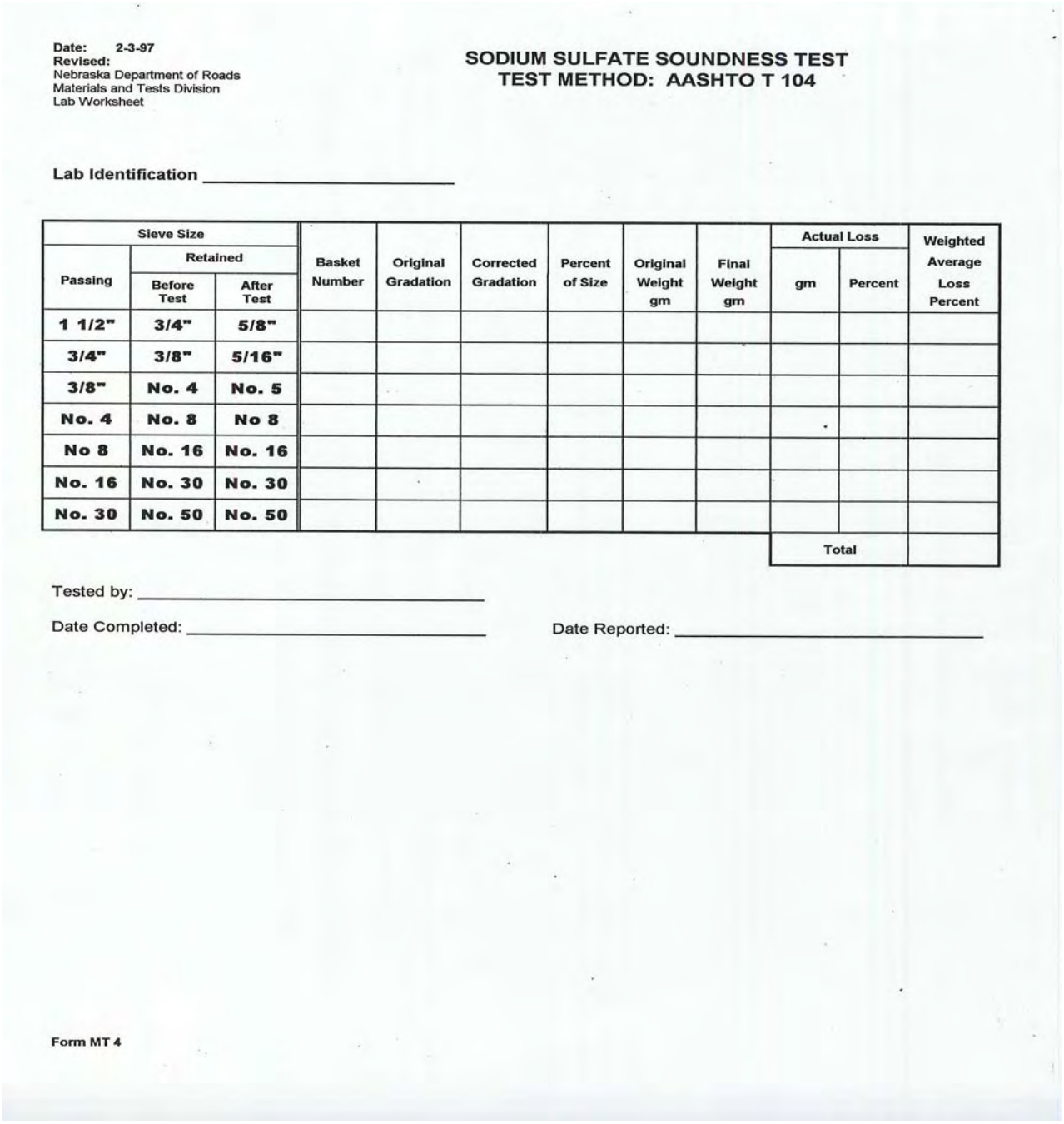
Tested by: _____

Form MT 5

DATE: 2-14-97
REVISED: 03-05-08

Figure E3.21 – Lab Worksheet
Sodium Sulfate Soundness Test

Laboratory: Aggregates
Test Method: AASHTO T 104



Date: 2-3-97
Revised:
Nebraska Department of Roads
Materials and Tests Division
Lab Worksheet

SODIUM SULFATE SOUNDNESS TEST
TEST METHOD: AASHTO T 104

Lab Identification _____

Sieve Size			Basket Number	Original Gradation	Corrected Gradation	Percent of Size	Original Weight gm	Final Weight gm	Actual Loss		Weighted Average Loss Percent
Passing	Retained								gm	Percent	
	Before Test	After Test									
1 1/2"	3/4"	5/8"									
3/4"	3/8"	5/16"									
3/8"	No. 4	No. 5									
No. 4	No. 8	No 8									
No 8	No. 16	No. 16									
No. 16	No. 30	No. 30									
No. 30	No. 50	No. 50									
									Total		

Tested by: _____

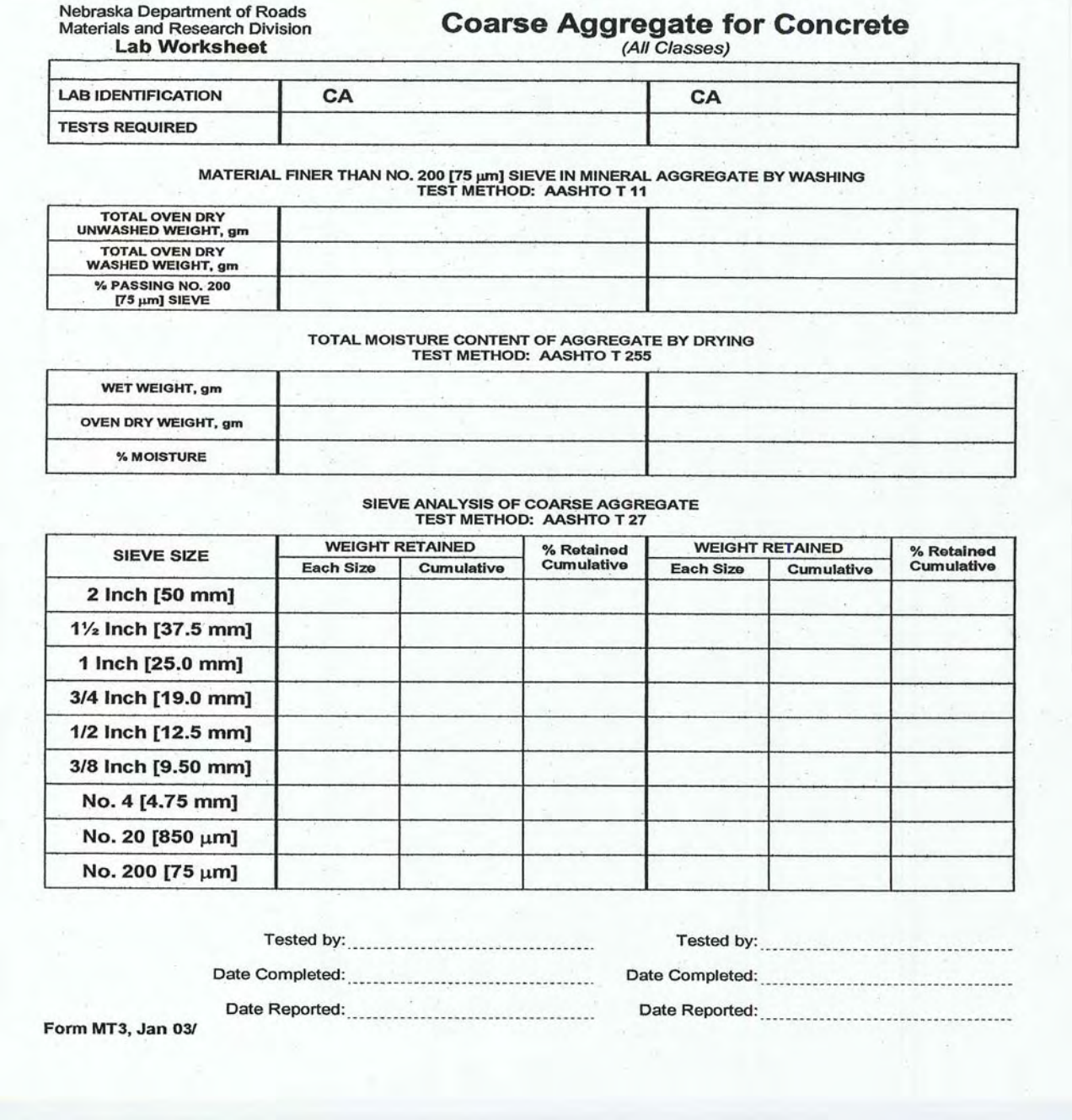
Date Completed: _____ Date Reported: _____

Form MT 4

DATE: 2-14-97
REVISED: 03-05-08

Figure E3.22 – Lab Worksheet
Coarse Aggregate for Concrete (All Classes)

Laboratory: Aggregates
Test Methods: AASHTO T 11, T 27, T 255



Nebraska Department of Roads
Materials and Research Division
Lab Worksheet

Coarse Aggregate for Concrete
(All Classes)

LAB IDENTIFICATION	CA	CA
TESTS REQUIRED		

MATERIAL FINER THAN NO. 200 [75 µm] SIEVE IN MINERAL AGGREGATE BY WASHING
TEST METHOD: AASHTO T 11

TOTAL OVEN DRY UNWASHED WEIGHT, gm		
TOTAL OVEN DRY WASHED WEIGHT, gm		
% PASSING NO. 200 [75 µm] SIEVE		

TOTAL MOISTURE CONTENT OF AGGREGATE BY DRYING
TEST METHOD: AASHTO T 255

WET WEIGHT, gm		
OVEN DRY WEIGHT, gm		
% MOISTURE		

SIEVE ANALYSIS OF COARSE AGGREGATE
TEST METHOD: AASHTO T 27

SIEVE SIZE	WEIGHT RETAINED		% Retained Cumulative	WEIGHT RETAINED		% Retained Cumulative
	Each Size	Cumulative		Each Size	Cumulative	
2 Inch [50 mm]						
1½ Inch [37.5 mm]						
1 Inch [25.0 mm]						
3/4 Inch [19.0 mm]						
1/2 Inch [12.5 mm]						
3/8 Inch [9.50 mm]						
No. 4 [4.75 mm]						
No. 20 [850 µm]						
No. 200 [75 µm]						

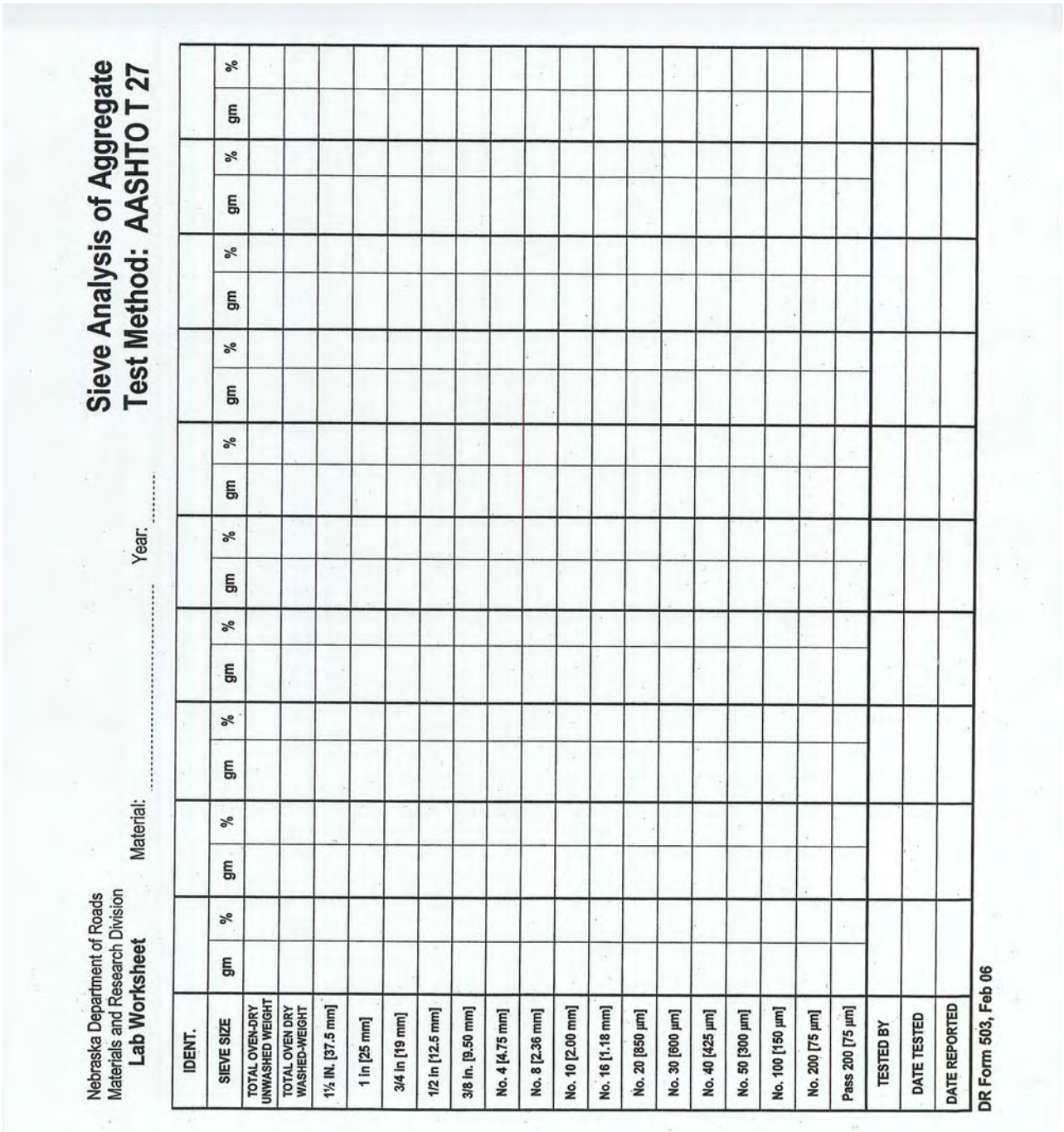
Tested by: ..... Tested by: .....
Date Completed: ..... Date Completed: .....
Date Reported: ..... Date Reported: .....

Form MT3, Jan 03/

DATE: 2-14-97
REVISED: 03-05-08

Figure E3.23 – Lab Worksheet
Sieve Analysis of Aggregate

Laboratory: Aggregates
Test Method: AASHTO T 27, T 11



Nebraska Department of Roads
Materials and Research Division
Lab Worksheet

Sieve Analysis of Aggregate
Test Method: AASHTO T 27

Material: ..... Year: .....

IDENT.																																	
SIEVE SIZE	gm	%	gm	%	gm	%	gm	%	gm	%	gm	%	gm	%	gm	%	gm	%	gm	%	gm	%	gm	%	gm	%	gm	%	gm	%	gm	%	gm	%
TOTAL OVEN-DRY UNWASHED WEIGHT																																	
TOTAL OVEN DRY WASHED-WEIGHT																																	
1½ IN. [37.5 mm]																																	
1 in [25 mm]																																	
3/4 in [19 mm]																																	
1/2 in [12.5 mm]																																	
3/8 in. [9.50 mm]																																	
No. 4 [4.75 mm]																																	
No. 8 [2.36 mm]																																	
No. 10 [2.00 mm]																																	
No. 16 [1.18 mm]																																	
No. 20 [850 µm]																																	
No. 30 [600 µm]																																	
No. 40 [425 µm]																																	
No. 50 [300 µm]																																	
No. 100 [150 µm]																																	
No. 200 [75 µm]																																	
Pass 200 [75 µm]																																	
TESTED BY																																	
DATE TESTED																																	
DATE REPORTED																																	

DR Form 503, Feb 06

DATE: 2-14-97
REVISED: 03-10-08

Figure E3.24 – Lab Worksheet
Sand Equivalent Test

Laboratory: Aggregates, Soils
Test Method: AASHTO T 176

Nebraska Department of Roads
Materials and Research Division
Lab Worksheet

Sand Equivalent Test
AASHTO Designation: T 176

Lab. Ident.	Date Tested	Method of Test	Operator	Soaking Period Start	Soaking Period End	Sedimentation Period Start	Sedimentation Period End	Clay Reading	Sand Reading	Sand Equivalent	Average	Date Reported

DR Form 440, Apr 06

Sand Eq. = *(Sand Reading / Clay Reading)* x 100

DATE: 2-14-97
REVISED: 03-10-08

Figure E3.25 – Lab Worksheet
Percent Clay, Shale and Soft Particles

Laboratory: Aggregates
Test Method: NDR T 504

Nebraska Department of Roads
Materials and Tests Division
Lab Worksheet

Aggregate Percent Clay, Shale & Soft Particles
Test Method: NDR T 504

Lab. Ident.	Tested By	Date Tested	Total Weight Oven Dry	Clay		Shale		Soft Particles		Date Reported
				Weight	%	Weight	%	Weight	%	

DR Form 444, Feb 06

DATE: 2-14-97
REVISED: 03-10-08

Figure E3.26 – Lab Worksheet
Aggregate, Freezing and Thawing Test (16 Cycles)

Laboratory: Aggregates
Test Method: NDR T 103

Nebraska Department of Roads
Materials and Research Division
Lab Worksheet

Aggregate Freezing and Thawing Test
(16 cycles)

Test Method: NDR T 103

Lab Ident.	Pan No.	Tested By	Initial Weight on No. 4 Sieve Before Test, gm		Final Wt. on No. 8 Sieve After Test, gm	Loss, gm	Percent Loss	Date Reported
			Wet	Oven-Dry				

DR Form 425, Feb 06

DATE: 2-14-97
REVISED: 03-10-08

Figure E3.27 – Lab Worksheet
Aggregate and Stone, Record of Freezing and Thawing Cycles

Laboratory: Aggregates
Test Method: NDR T 103

Date: 2-3-97
Revised:
Nebraska Department of Roads
Materials and Tests Division
Lab Worksheet

AGGREGATE AND STONE
RECORD OF FREEZING AND THAWING CYCLES
TEST METHOD: NDR T 103

Lab Identification _____

CYCLE NO.	FREEZING			THAWING			TESTED BY	REMARKS
	DATE	TIME STARTED	(A) TEMP. T. WATER	DATE	TIME STARTED	(B) TEMP. FREEZER		
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								

(A) Temperature of thawing water when samples are transferred to freezer.
(B) Air temperature of freezer when samples are transferred to thawing water.

Date Reported: _____

Form MT 6

DATE: 2-14-97
REVISED: 03-10-08

Figure E3.28 – Lab Worksheet
Aggregate for Asphaltic Concrete – Specific Gravity and Absorption

Laboratory: Aggregates
Test Method: AASHTO T 84

Nebraska Department of Roads
Materials and Research Division
Lab Worksheet

Aggregate for Asphaltic Concrete Specific Gravity and Absorption

Test Method: AASHTO T 84

* Where 500 = Weight of S.S.D. Aggregate

Lab. Ident.	Date Tested	Tested By	Flask No.	A Total Weight Flask + 500 gm + 500 m Water	B Total Weight Flask + 500 gm + Water to Mark	C Volume of Displacement of S.S.D. Aggregate A – B	D Oven Dry Weight	Bulk Specific Gravity D / C	Absorption Percent * (500-D) / D x 100	Date Reported

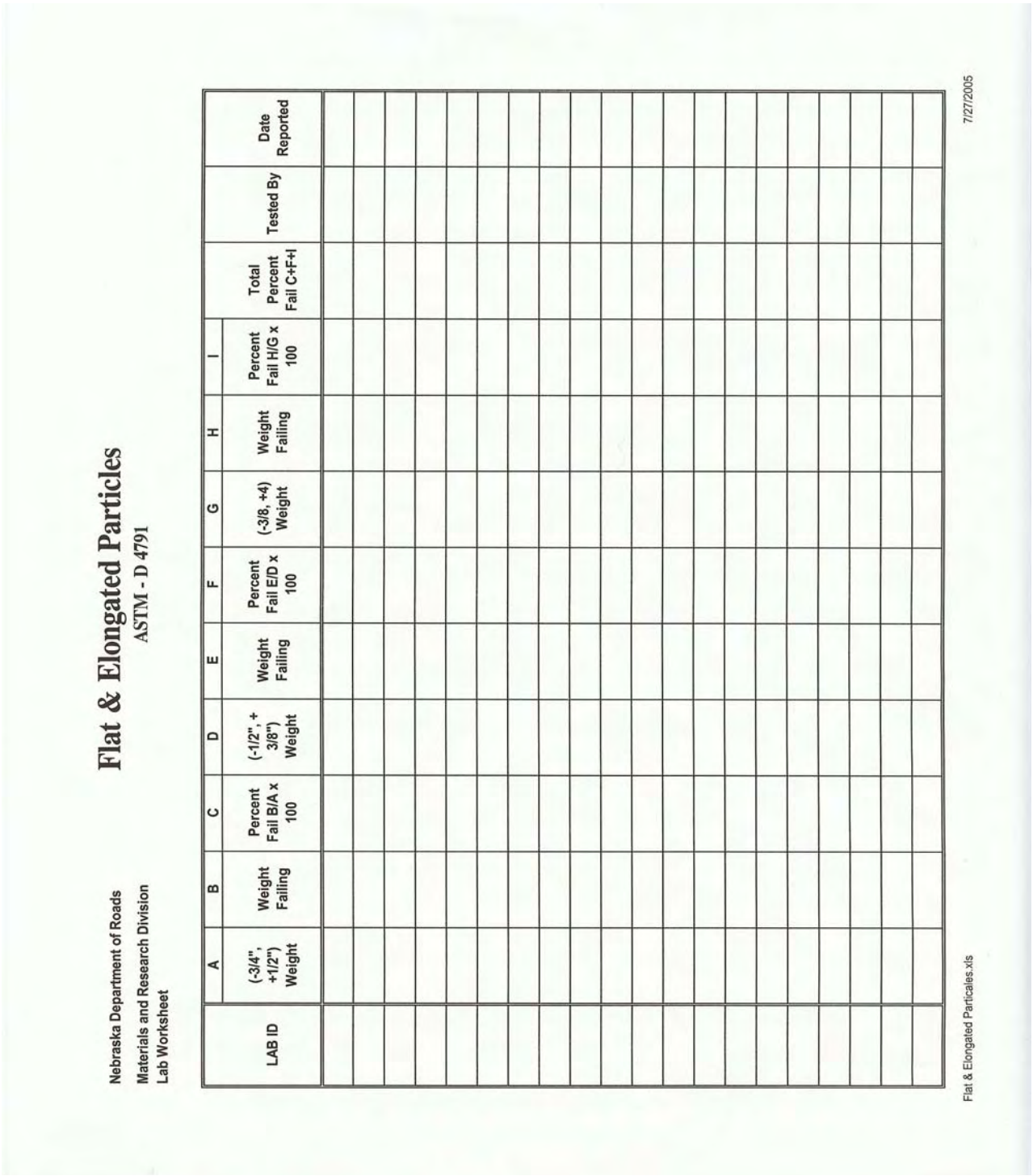
DR Form 429, Feb 06

DATE: 2-28-03
REVISED: 03-10-08

Figure E3.29 – Lab Worksheet
Flat & Elongated Particles

Laboratory: Aggregates

Test Method: ASTM – D 4791



Nebraska Department of Roads
Materials and Research Division
Lab Worksheet

Flat & Elongated Particles
ASTM - D 4791

LAB ID	A	B	C	D	E	F	G	H	I	Total Percent Fail C+F+I	Tested By	Date Reported
	(-3/4", +1/2") Weight	Weight Failing	Percent Fail B/A x 100	(-1/2", + 3/8") Weight	Weight Failing	Percent Fail E/D x 100	(-3/8, +4) Weight	Weight Failing	Percent Fail H/G x 100			

Flat & Elongated Particales.xls

7/27/2005

DATE: 2-28-03
REVISED: 10-03-11

Figure E3.30 – Lab Worksheet
Coarse Aggregate Angularity (CAA)

Laboratory: Aggregates
Test Method: ASTM – D 5821

Nebraska Department of Roads
Materials and Research Division
Lab Worksheet

Coarse Aggregate Angularity (CAA)

ASTM - D 5821

LAB IDENT.	Type of Asphalt Mix	A Total Weight +4	B 1+ Fractured Faces	C Percent B/A x 100	D 2+ Fractured Faces	E Percent D/A x 100	Total Percent C+E	Tested By	Date Reported

DR Form 472, April 2011

DATE: 03-10-08
REVISED:

Figure E3.31 – Lab Worksheet
Uncompacted Void Content of Fine Aggregate

Laboratory: Aggregates
Test Method: AASHTO T 304

Nebraska Department of Roads
Materials and Research Division
Lab Worksheet

Uncompacted Void Content of Fine Aggregate

AASHTO Designation: T-304
Method A

Lab. Ident.	Aggregate Weight (A)	Volume of Cylinder (B)	Bulk Dry Sp. Gravity (C)	Agg. Wt. / Gravity A/C (D)	Uncomp. Voids (%) (B-D)/B x 100	% Uncomp. Voids (Average)	Tested By and Date

DR Form 473, Feb 06

DATE: 03-10-08
REVISED:

Figure E3.32 – Lab Worksheet
Total Moisture Content of Aggregate by Drying

Laboratory: Aggregates
Test Method: AASHTO T 255

Nebraska Department of Roads
Materials and Research Division
Lab Worksheet

Total Moisture Content of Aggregate by Drying

Test Method AASHTO T 255

Lab ID	Wet Weight A	Dry Weight B	% Moisture (A-B) / B × 100	Tested By	Date Reported

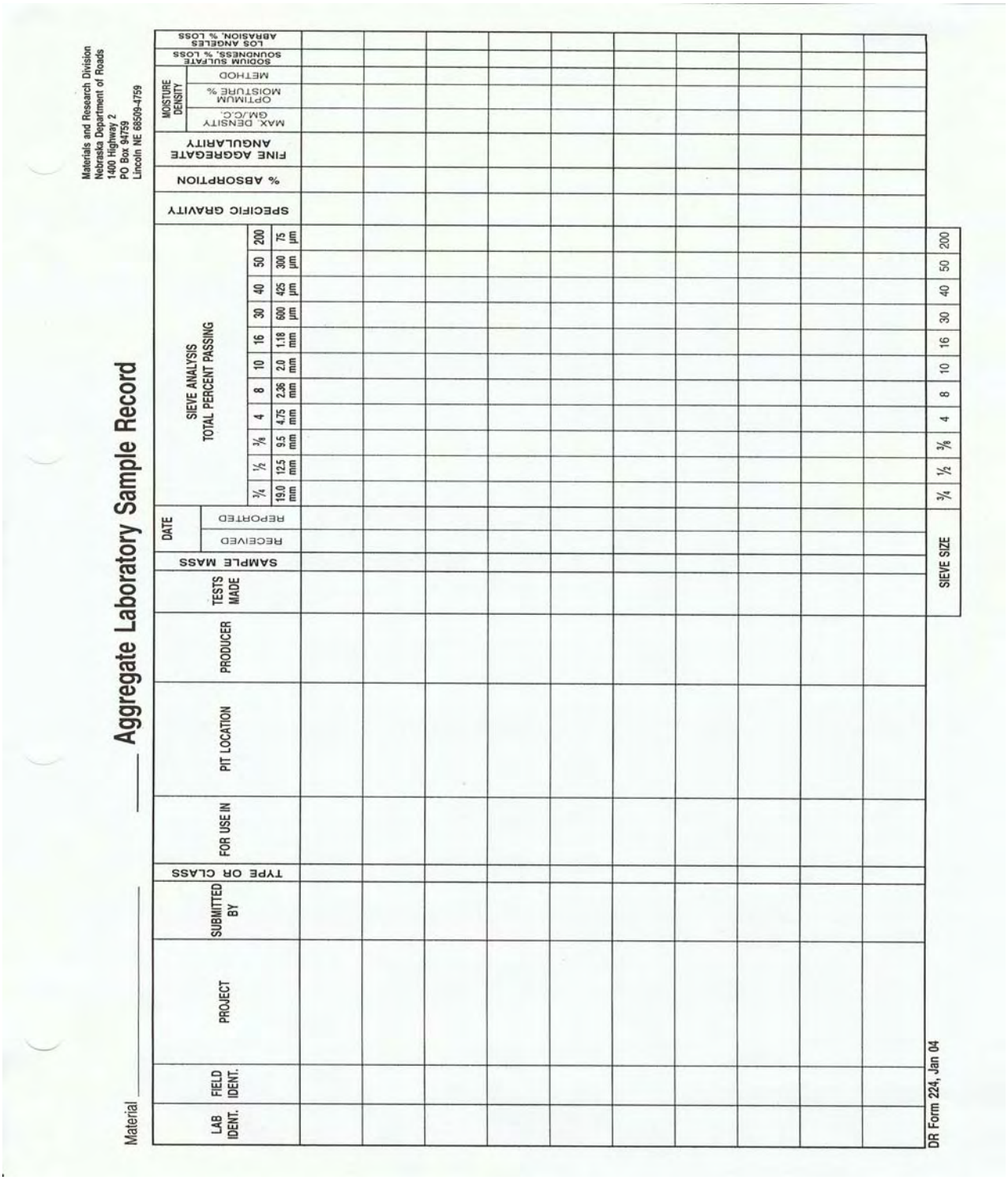
DR Form 419, Feb 07

DATE: 03-10-08
REVISED:

Figure E3.33 – Sample Check-In
Aggregate Laboratory Sample Record

Laboratory: Aggregates

Test Method:

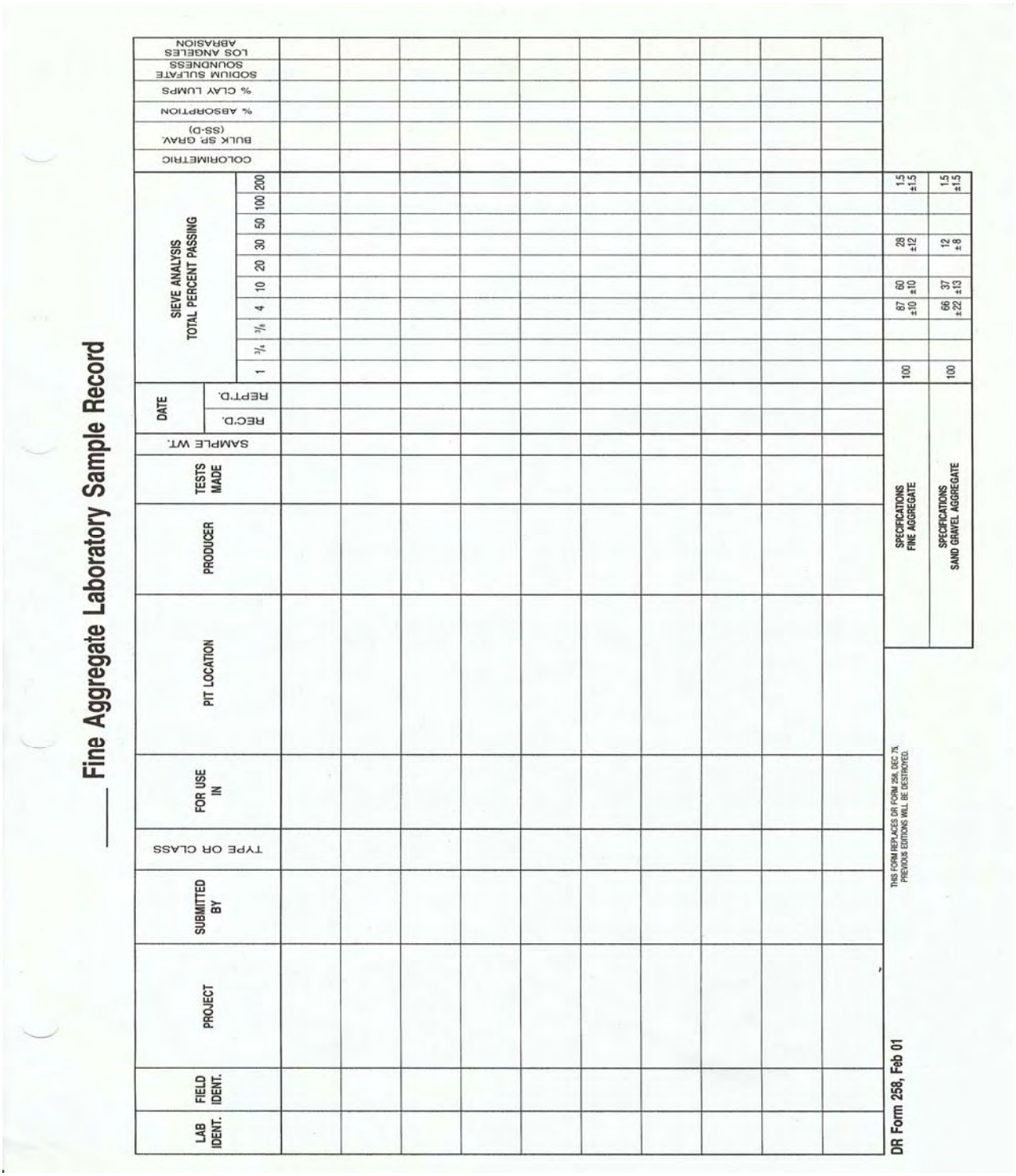


DATE: 03-10-08
REVISED:

Figure E3.34 – Sample Check-In
Fine Aggregate Laboratory Sample Record

Laboratory: Aggregates

Test Method:

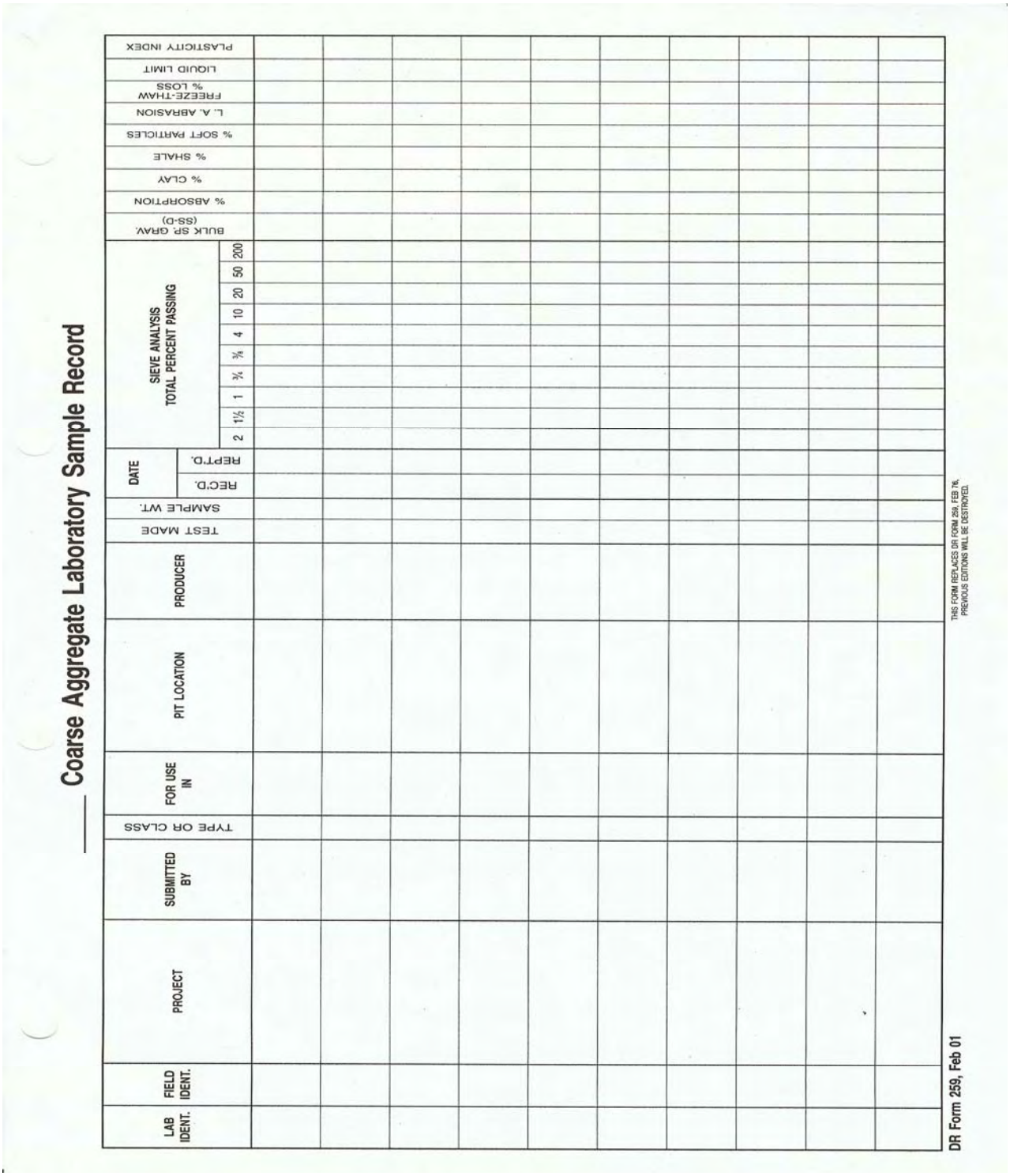


DATE: 03-10-08
REVISED:

Figure E3.35 – Sample Check-In
Coarse Aggregate Laboratory Sample Record

Laboratory: Aggregates

Test Method:

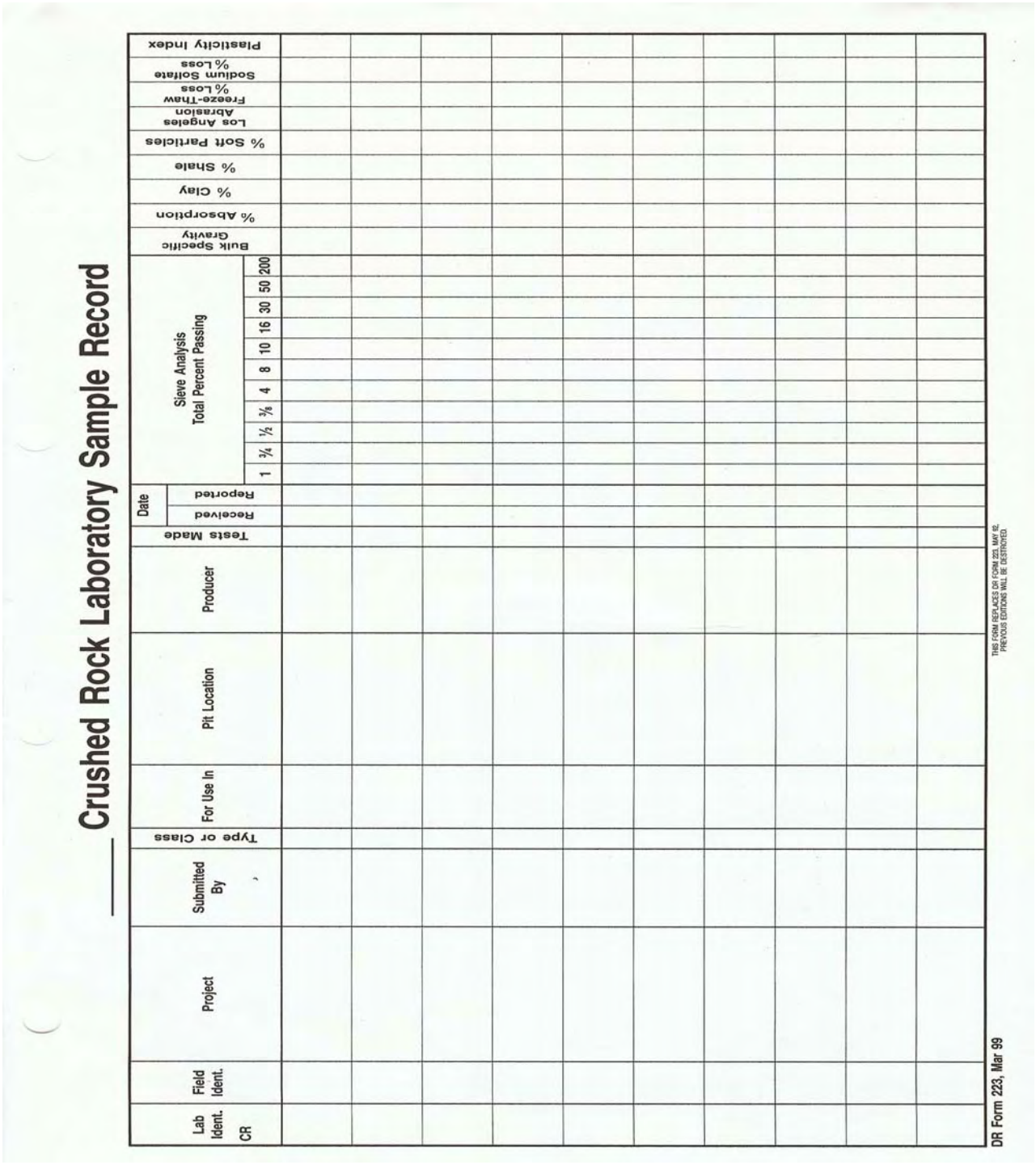


DATE: 03-10-08
REVISED:

Figure E3.36 – Sample Check-In
Crushed Rock Laboratory Sample Record

Laboratory: Aggregates

Test Method:

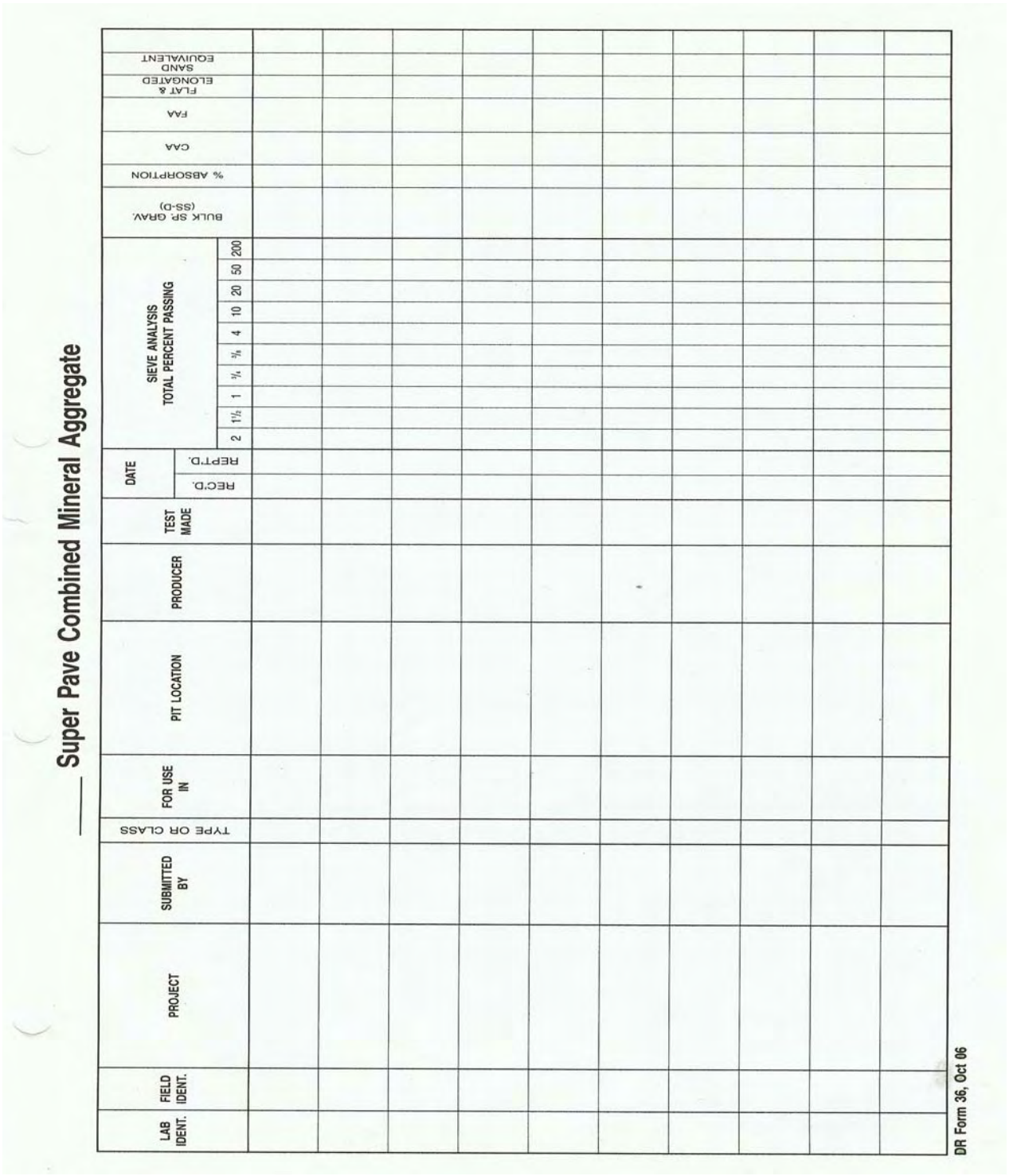


DATE: 03-10-08
REVISED:

Figure E3.37 – Sample Check-In
Super Pave Combined Mineral Aggregate

Laboratory: Aggregates

Test Method:



DATE: 03-10-08
REVISED:

Figure E3.38– Test Report
Report of Test - CAA and FAA

Laboratory: Aggregates
Test Method:

Nebraska Department of Roads
Materials and Research Division

Report of Tests for CAA and FAA

Project No.: ..... Burn Off ☐
Type of Asphalt: ..... Cold Feed ☐
Contractor: ..... FAA Sp. Gr. .....

Lab ID	CAA	FAA	Date Reported

DR Form 482, Feb 06

DATE: 03-17-08
REVISED:

Figure E3.39– Test Report
Report of Test for Mineral Aggregate (District)

Laboratory: Aggregates
Test Method: AASHTO T 27, T 248

Nebraska Department of Roads
Materials and Research Division
1400 Highway 2
PO Box 94759
Lincoln NE 68509-4759

Report of Test

Project Manager: *(Name & Address)*	Name of Road:	Project No.: *District -*	
		Name of Material: *Mineral Aggregate*	Control No.:
		For Use In: *Ice Control*	
County:		Source:	
Contractor: *(Number, Name & Address)*		Producer:	
		Laboratory: *Lincoln, NE*	Report No.:

LAB IDENT.	FIELD IDENT.	Sample Class. CONST.	PRS	CONTRACTOR	PO NUMBER OR AREA	DATE SAMPLED	RECEIVED	REPORTED	SIEVE ANALYSIS (Spacer Sieves Were Used) Total Percent Passing 1 25 mm	¾ 19.0 mm	½ 12.5 mm	⅜ 9.50 mm	4 4.75 mm	10 2.00 mm	20 850 µm	40 425 µm	50 300 µm	200 75 µm					SODIUM SULFATE SOUNDNESS	L.A. ABRASION GRADING & % WEAR	
MA																									
						Specifications						100	80/100	15/55	6/30			0/6					---	---	

Test Results Based On: AASHTO T 27, T 248

For Materials and Research Division

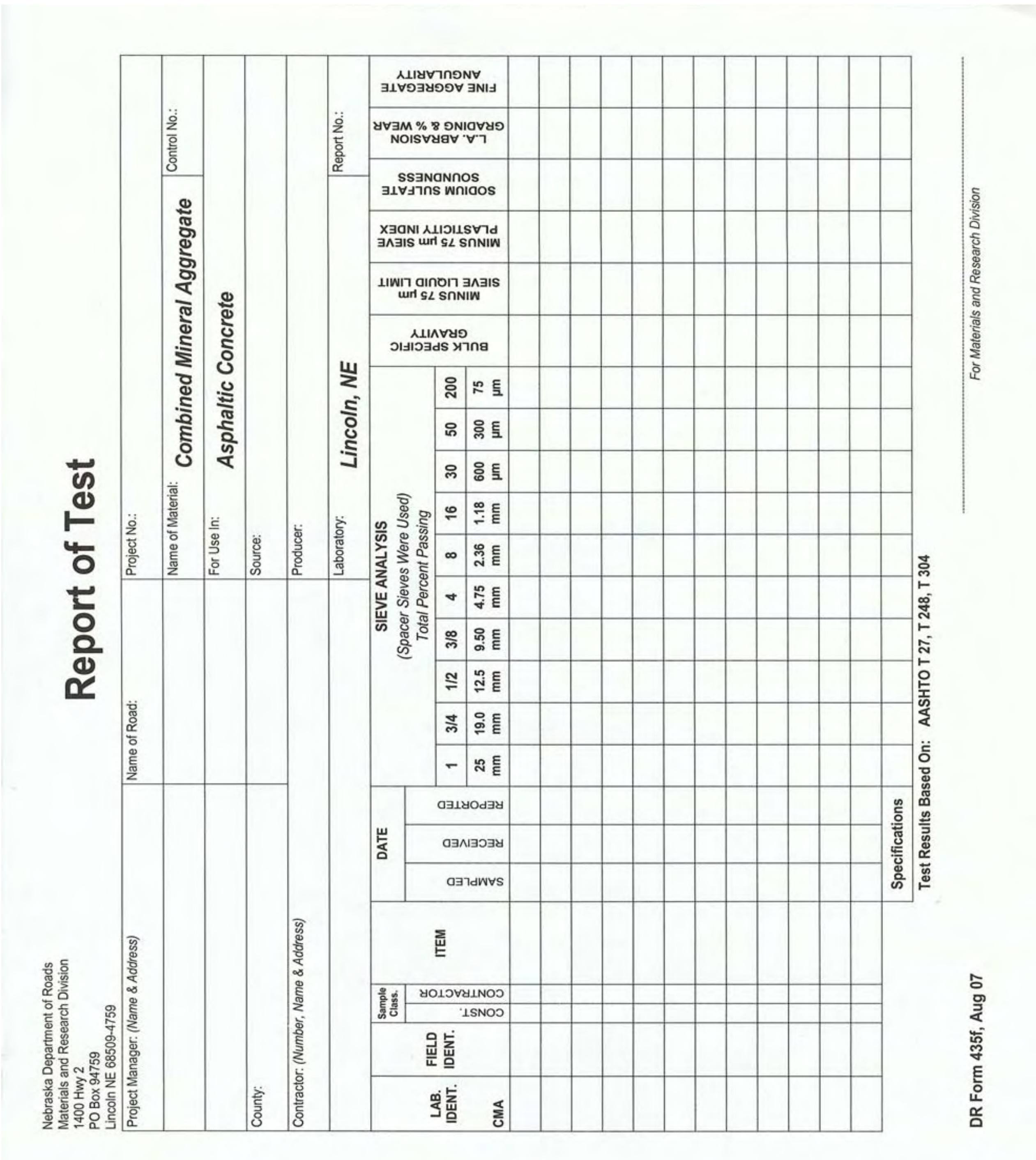
DR Form 435c, Feb 01

DATE: 03-17-08
REVISED:

Figure E3.40 Test Report
Report of Test for Combined Mineral Aggregate

Laboratory: Aggregates

Test Method: AASHTO T 27, T 248, T 304



Report of Test

Nebraska Department of Roads
Materials and Research Division
1400 Hwy 2
PO Box 94759
Lincoln NE 68509-4759

Project Manager: *(Name & Address)*	Name of Road:	Project No.:
		Name of Material: ***Combined Mineral Aggregate*** / Control No.:
		For Use In: ***Asphaltic Concrete***
County:		Source:
Contractor: *(Number, Name & Address)*		Producer:
		Laboratory: ***Lincoln, NE*** / Report No.:

LAB. IDENT.	FIELD IDENT.	Sample Class. CONST.	Sample Class. CONTRACTOR	ITEM	DATE SAMPLED	DATE RECEIVED	DATE REPORTED	SIEVE ANALYSIS (Spacer Sieves Were Used) Total Percent Passing 1 (25 mm)	3/4 (19.0 mm)	1/2 (12.5 mm)	3/8 (9.50 mm)	4 (4.75 mm)	8 (2.36 mm)	16 (1.18 mm)	30 (600 µm)	50 (300 µm)	200 (75 µm)	BULK SPECIFIC GRAVITY	MINUS 75 µm SIEVE LIQUID LIMIT	MINUS 75 µm SIEVE PLASTICITY INDEX	SODIUM SULFATE SOUNDNESS	L.A. ABRASION GRADING & % WEAR	FINE AGGREGATE ANGULARITY
CMA																							
Specifications																							

Test Results Based On: AASHTO T 27, T 248, T 304

For Materials and Research Division

DR Form 435f, Aug 07

DATE: 3-17-08
REVISED:

Figure E3.41 – Test Report
Report of Test – Asphaltic Concrete Aggregate

Laboratory: Aggregates

Test Methods: AASHTO T 27, T 96, T 104, T 248
NDR T 504

Asphaltic Concrete Aggregate

Laboratory Performed Tests

NDOR M&R
Omar Qudus, Geotechnical Engineer

Template ID: AGL020001
Version: 20080728

Dry Weight of Sample

Wash Test - Sieve Analysis
Total Passing Percent

	1	3/4	1/2	3/8	4	8	16	30	50	200
Retained										
Passing %										

Test	Results	Spec
LA Abrasion (Method), Grading and Loss %		40 Max
Sodium Sulfate %		12 Max
Shale and Clay %		1.5 Max
Soft Particles %		3.5 Max
Total Shale, Clay, and Soft Particles %		3.5 Max
Freeze Thaw %		8 Max
Sand Equivalent		

* Accepted based on previous tests

Comments:

Test Specification: AASHTO T27, T96, T104, T176, T248
NDR T173, T504

DATE: 3-17-08
REVISED:

Figure E3.42– Test Report
Report of Test – Fine Aggregate for Precast / Prestressed Concrete

Laboratory: Aggregates

Test Methods: AASHTO T 21, T 27, T 84, T 96, T 104, T 176, T 248
NDR T 504

Fine Aggregate for Precast / Prestressed Concrete

Laboratory Performed Tests

NDOR M&R
Omar Qudus, Geotechnical Engineer

Template ID: AGL013001
Version: 20080725

Dry Weight of Sample

Wash Test - Sieve Analysis
Total Passing Percent

	1 1/2	1	3/4	1/2	3/8	4	10	20	30	200
Retained										
Passing %										
Specifications:		100				77/97	50/70		16/40	0/3

Test		Results	Spec.
Colormetric			
Bulk Specific Gravity (SSD)			
Absorption %			
Clay Lumps %			0.5 Max
LA Abrasion	(Method)		
Sodium Sulfate %			10 Max
Sand Equivelent			

Fineness Modulus	3/4	3/8	4	8	16	30	50	100
Retained								
Retained %								

Fineness Modulus Total Retained %

Comments:

Test Specifications: AASHTO T21, T27, T84, T96, T104, T176, T248
NDR T504

DATE: 3-17-08
REVISED:

Figure E3.43– Test Report
Report of Test – C33 Fine Sand

Laboratory: Aggregates

Test Methods: AASHTO T 21, T 27, T 84, T 104, T 248
NDR T 504

C33 Fine Sand

Laboratory Performed Tests

NDOR M&R
Omar Qudus, Geotechnical Engineer

Template ID: AGL019001
Version: 20080728

Dry Weight of Sample

Wash Test - Sieve Analysis
Total Passing Percent

	1/2	3/8	4	8	16	30	50	100
Retained								
Passing %								
Specifications:		100	95/100	80/100	50/85	25/60	5/30	0/10

Test	Results	Spec.
Colormetric		
Bulk Specific Gravity (SSDD)		
Absorption %		
Clay Lumps %		0.5 Max
Sodium Sulfate %		5 Max

* Accepted based on previous tests

Comments:

Test Specification: AASHTO T21, T27, T84, T104, T248
NDR T504

DATE: 3-17-08
REVISED:

Figure E3.44– Test Report
Report of Test – Coarse Aggregate for Precast / Prestressed Concrete

Laboratory: Aggregates

Test Methods: AASHTO T 27, T 85, T 96, T 248
NDR T 103, T 504

Coarse Aggregate for Precast / Prestressed Concrete

Laboratory Performed Tests

NDOR M&R
Omar Qudus, Geotechnical Engineer

Template ID: AGL016001
Version: 20080725

Dry Weight of Sample

Wash Test - Sieve Analysis
Total Passing Percent
(Spacer Sieves Were Used)

	2	1 1/2	1	3/4	1/2	3/8	4	20	200
Retained									
Passing %									

Test	Results	Spec.
Bulk Specific Gravity (SSD)		
Absorption %		
LA Abrasion (Method), Grading and Loss %		40 Max
Clay Lumps %		0.5 Max
Shale and Coal %		1 Max
Soft Particles %		3.5 Max
Total Clay, Shale, Coal, and Soft Particles %		3.5 Max
Freeze Thaw %		8 Max

* Accepted based on previous tests

Comments:

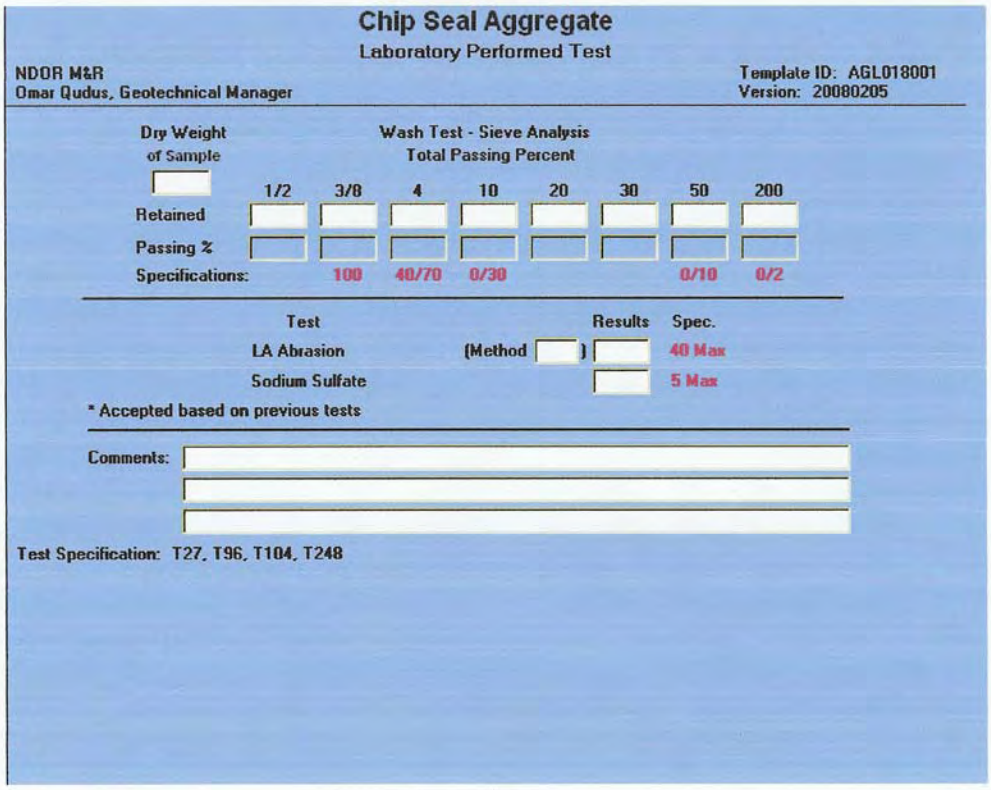
Test Specifications: AASHTO TESTS: T27, T85, T96, T248
NDR TESTS: T103, T504

DATE: 3-17-08
REVISED:

Figure E3.45 – Test Report
Report of Test – Chip Seal Aggregate

Laboratory: Aggregates

Test Methods: AASHTO T 27, T 96, T 104, T 248



Chip Seal Aggregate

Laboratory Performed Test

NDOR M&R
Omar Qudus, Geotechnical Manager

Template ID: AGL018001
Version: 20080205

Dry Weight of Sample

Wash Test - Sieve Analysis
Total Passing Percent

	1/2	3/8	4	10	20	30	50	200
Retained								
Passing %								
Specifications:		100	40/70	0/30			0/10	0/2

Test		Results	Spec.
LA Abrasion	(Method)		40 Max
Sodium Sulfate			5 Max

* Accepted based on previous tests

Comments:

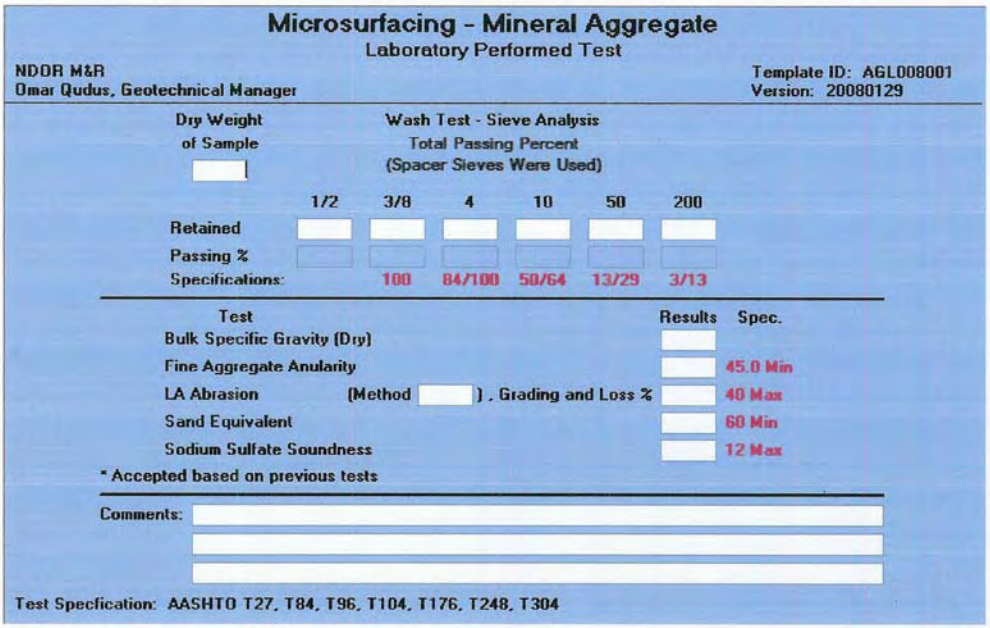
Test Specification: T27, T96, T104, T248

DATE: 3-18-08
REVISED:

Figure E3.46 – Test Report
Report of Test – Microsurfacing - Mineral Aggregate

Laboratory: Aggregates

Test Methods: AASHTO T 27, T 84, T 96, T 104, T 176, T 248, T 304



Microsurfacing - Mineral Aggregate

Laboratory Performed Test

NDOR M&R
Omar Qudus, Geotechnical Manager

Template ID: AGL008001
Version: 20080129

Dry Weight of Sample

Wash Test - Sieve Analysis
Total Passing Percent
(Spacer Sieves Were Used)

	1/2	3/8	4	10	50	200
Retained						
Passing %						
Specifications:		100	84/100	50/64	13/29	3/13

Test	Results	Spec.
Bulk Specific Gravity (Dry)		
Fine Aggregate Anularity		45.0 Min
LA Abrasion (Method) , Grading and Loss %		40 Max
Sand Equivalent		60 Min
Sodium Sulfate Soundness		12 Max

* Accepted based on previous tests

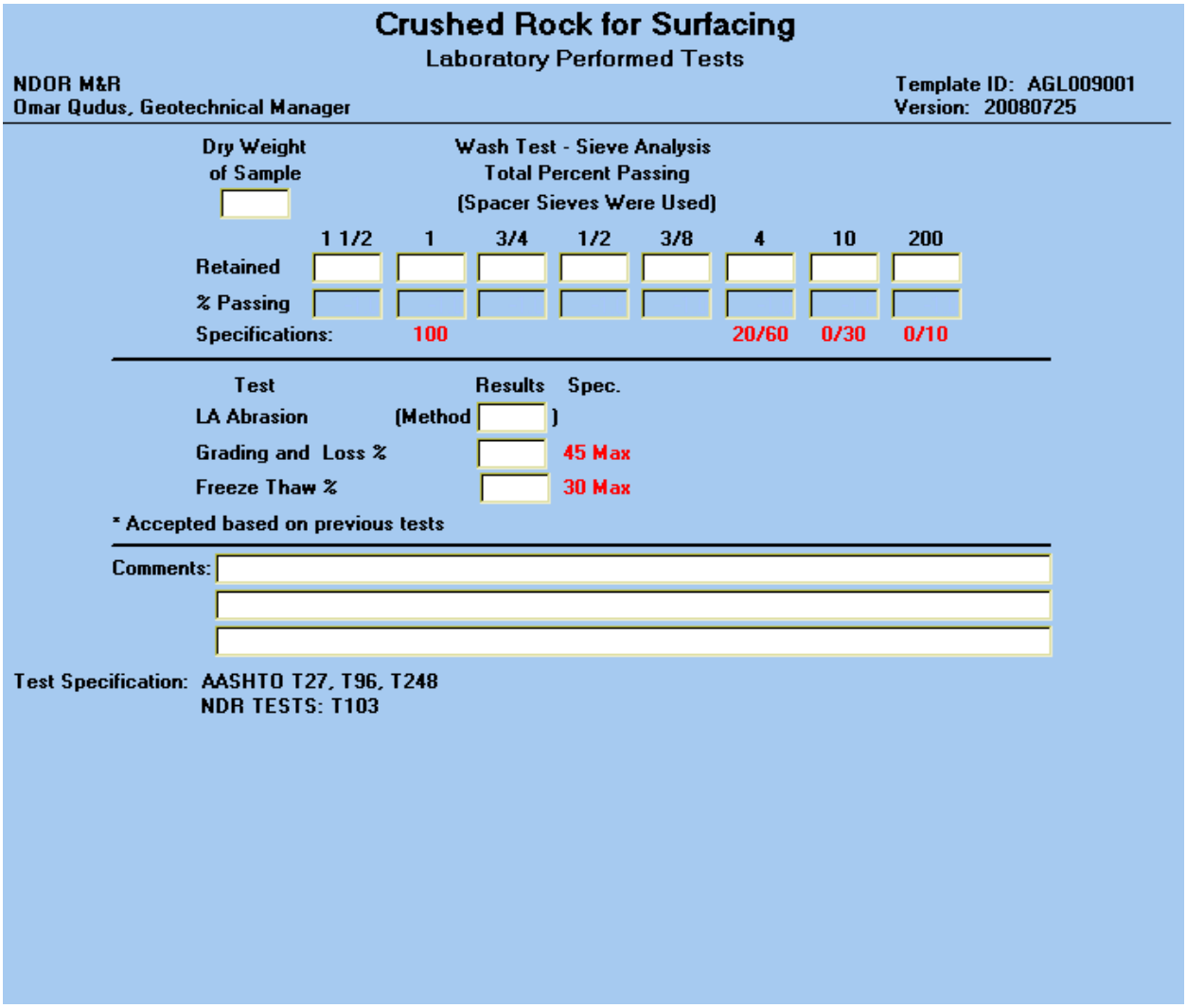
Comments:

Test Specification: AASHTO T27, T84, T96, T104, T176, T248, T304

DATE: 3-18-08
REVISED:

Figure E3.47 – Test Report
Report of Test – Crushed Rock for Surfacing

Laboratory: Aggregates
Test Methods: AASHTO T 27, T 96, T 248
NDR T 103



Crushed Rock for Surfacing

Laboratory Performed Tests

NDOR M&R
Omar Qudus, Geotechnical Manager

Template ID: AGL009001
Version: 20080725

Dry Weight of Sample

Wash Test - Sieve Analysis
Total Percent Passing
(Spacer Sieves Were Used)

	1 1/2	1	3/4	1/2	3/8	4	10	200
Retained								
% Passing								
Specifications:		100				20/60	0/30	0/10

Test	Results	Spec.
LA Abrasion (Method)		
Grading and Loss %		45 Max
Freeze Thaw %		30 Max

* Accepted based on previous tests

Comments:

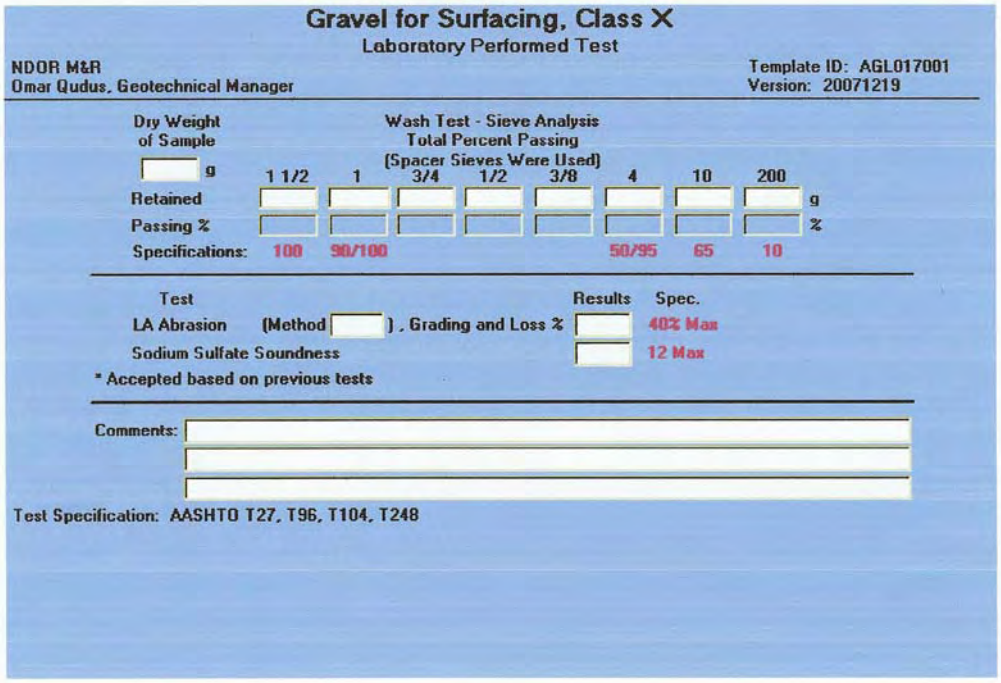
Test Specification: AASHTO T27, T96, T248
NDR TESTS: T103

DATE: 3-18-08
REVISED:

Figure E3.48 – Test Report
Report of Test – Gravel for Surfacing, Class X

Laboratory: Aggregates

Test Methods: AASHTO T 27, T 96, T 104, T 248



Gravel for Surfacing, Class X

Laboratory Performed Test

NDOR M&R
Omar Qudus, Geotechnical Manager

Template ID: AGL017001
Version: 20071219

Dry Weight of Sample ____ g

Wash Test - Sieve Analysis
Total Percent Passing
(Spacer Sieves Were Used)

	1 1/2	1	3/4	1/2	3/8	4	10	200	
Retained									g
Passing %									%
Specifications:	100	90/100				50/95	65	10	

Test		Results	Spec.
LA Abrasion	(Method ____), Grading and Loss %		40% Max
Sodium Sulfate Soundness			12 Max

* Accepted based on previous tests

Comments:

Test Specification: AASHTO T27, T96, T104, T248

DATE: 3-18-08
REVISED: 7-31-08

Figure E3.49 – Test Report
Report of Test – Asphaltic Concrete Aggregate

Laboratory: Aggregates
Test Methods: AASHTO T 27, T 96, T 104, T 176, T 248
NDR T 173, T 504

Asphaltic Concrete Aggregate

Laboratory Performed Tests

NDOR M&R
Omar Qudus, Geotechnical Engineer

Template ID: AGL020001
Version: 20080728

Dry Weight of Sample: ____

Wash Test - Sieve Analysis
Total Passing Percent

	1	3/4	1/2	3/8	4	8	16	30	50	200
Retained										
Passing %										

Test		Results	Spec
LA Abrasion	(Method ____), Grading and Loss %		40 Max
Sodium Sulfate %			12 Max
Shale and Clay %			1.5 Max
Soft Particles %			3.5 Max
Total Shale, Clay, and Soft Particles %			3.5 Max
Freeze Thaw %			8 Max
Sand Equivalent			

* Accepted based on previous tests

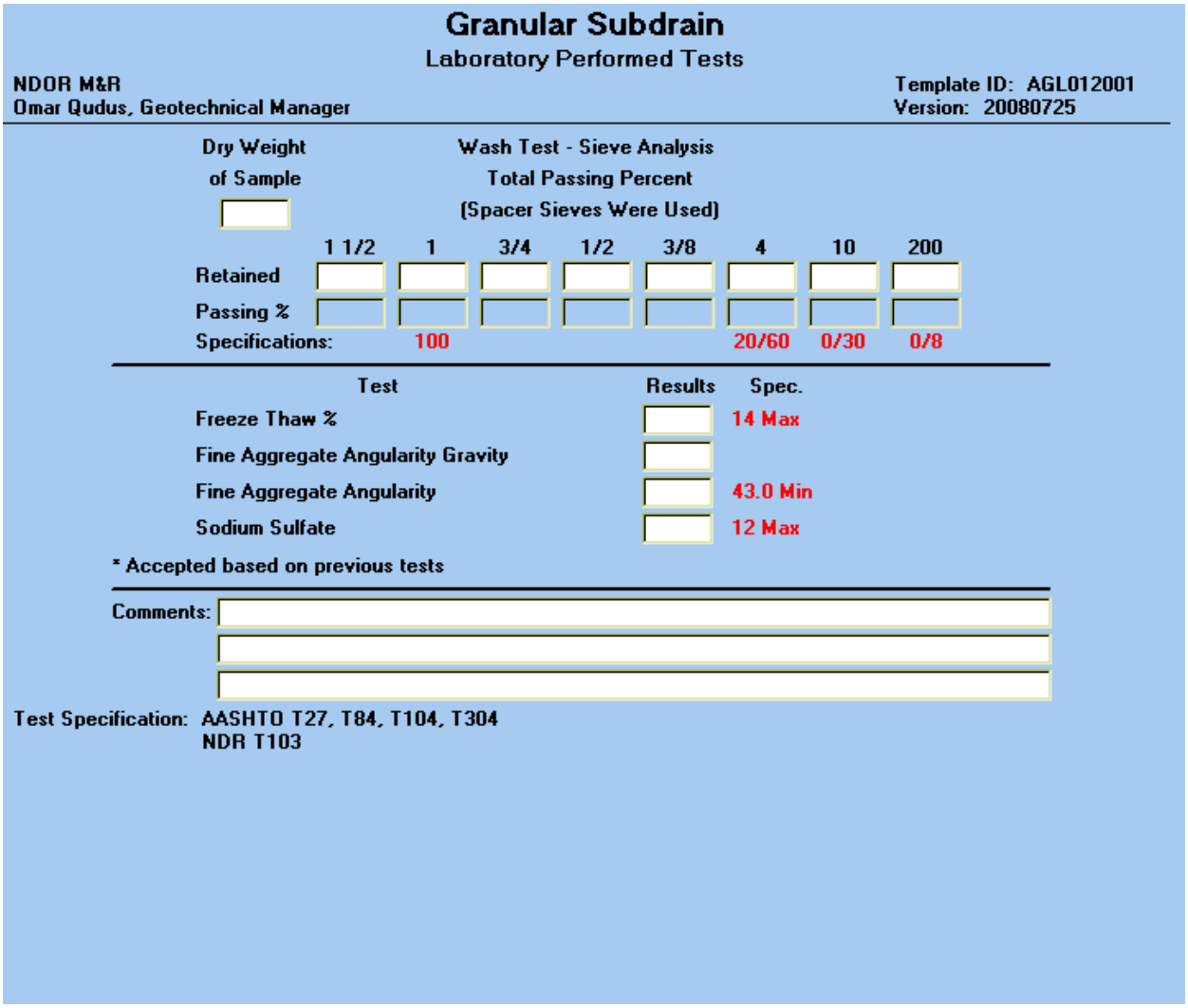
Comments:

Test Specification: AASHTO T27, T96, T104, T176, T248
NDR T173, T504

DATE: 3-18-08
REVISED:

Figure E3.50 – Test Report
Report of Test – Granular Subdrain

Laboratory: Aggregates
Test Methods: AASHTO T 27
NDR T 103



Granular Subdrain

Laboratory Performed Tests

NDOR M&R
Omar Qudus, Geotechnical Manager

Template ID: AGL012001
Version: 20080725

Dry Weight of Sample: [ ]

Wash Test - Sieve Analysis
Total Passing Percent
(Spacer Sieves Were Used)

	1 1/2	1	3/4	1/2	3/8	4	10	200
Retained	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Passing %	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Specifications:		100				20/60	0/30	0/8

Test	Results	Spec.
Freeze Thaw %	[ ]	14 Max
Fine Aggregate Angularity Gravity	[ ]	
Fine Aggregate Angularity	[ ]	43.0 Min
Sodium Sulfate	[ ]	12 Max

* Accepted based on previous tests

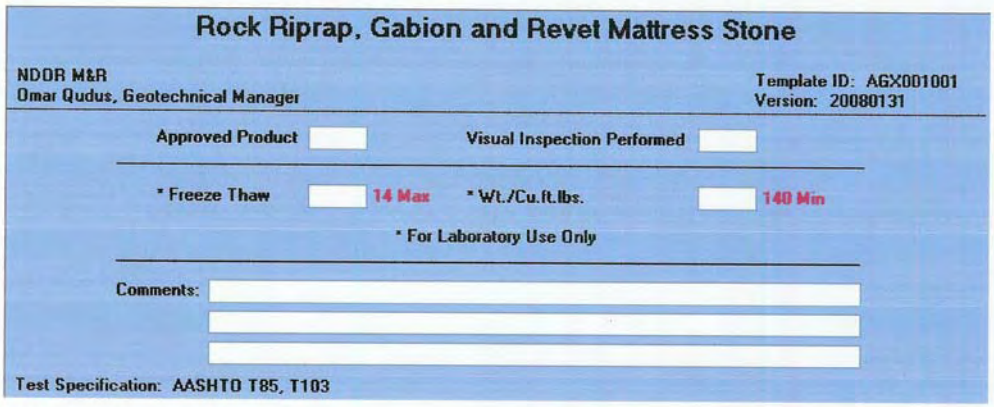
Comments: [ ]

Test Specification: AASHTO T27, T84, T104, T304
NDR T103

DATE: 3-18-08
REVISED:

Figure E3.51 – Test Report
Report of Test – Rock Riprap, Gabion and Revet Mattress Stone

Laboratory: Aggregates
Test Methods: AASHTO T 85, T 103



Rock Riprap, Gabion and Revet Mattress Stone

NDOR M&R
Omar Qudus, Geotechnical Manager

Template ID: AGX001001
Version: 20080131

Approved Product ☐ Visual Inspection Performed ☐

* Freeze Thaw ☐ 14 Max * Wt./Cu.ft.lbs. ☐ 140 Min

* For Laboratory Use Only

Comments:

Test Specification: AASHTO T85, T103

DATE: 04-16-08
REVISED:

Figure E3.52– Test Report
Report of Test for Mineral Aggregate for Armor Coat (District)

Laboratory: Aggregates
Test Method: AASHTO T 27, T 96, T 104, T 248

Nebraska Department of Roads
Materials and Research Division
1400 Hwy 2
PO Box 94759
Lincoln NE 68509-4759

Report of Test

Project Manager: *(Name & Address)*	Name of Road:	Project No.: District –
		Name of Material: ***Mineral Aggregate*** / Control No.:
County:		For Use In: ***Armor Coat***
Contractor: *(Number, Name & Address)*		Source:
		Producer:
		Laboratory: ***Lincoln NE*** / Report No.:

LAB. IDENT.	FIELD IDENT.	CONST.	CONTRACTOR	PO NUMBER OR AREA	DATE			SIEVE ANALYSIS (*Spacer Sieves Were Used*) *Total Percent Passing*											SODIUM SULPHATE SOUNDNESS	L.A. ABRASION % LOSS
					SAMPLED	RECEIVED	REPORTED	1	3/4	1/2	3/8	4	10	30	50	200				
MA								25 mm	19.0 mm	12.5 mm	9.50 mm	4.75 mm	2.00 mm	600 µm	300 µm	75 µm				
					Specifications						99/ 100	60/ 85	0/ 15		0/ 10	0/ 3			Max. 5	Max. 40

Test Results Based On: AASHTO T 27, T 96, T104, T 248

For Materials and Research Division

DR Form 294. Jul 07

DATE: 06-11-08
REVISED:

Figure E3.53– Test Report
Report of Test - Crushed Concrete for Foundation Course

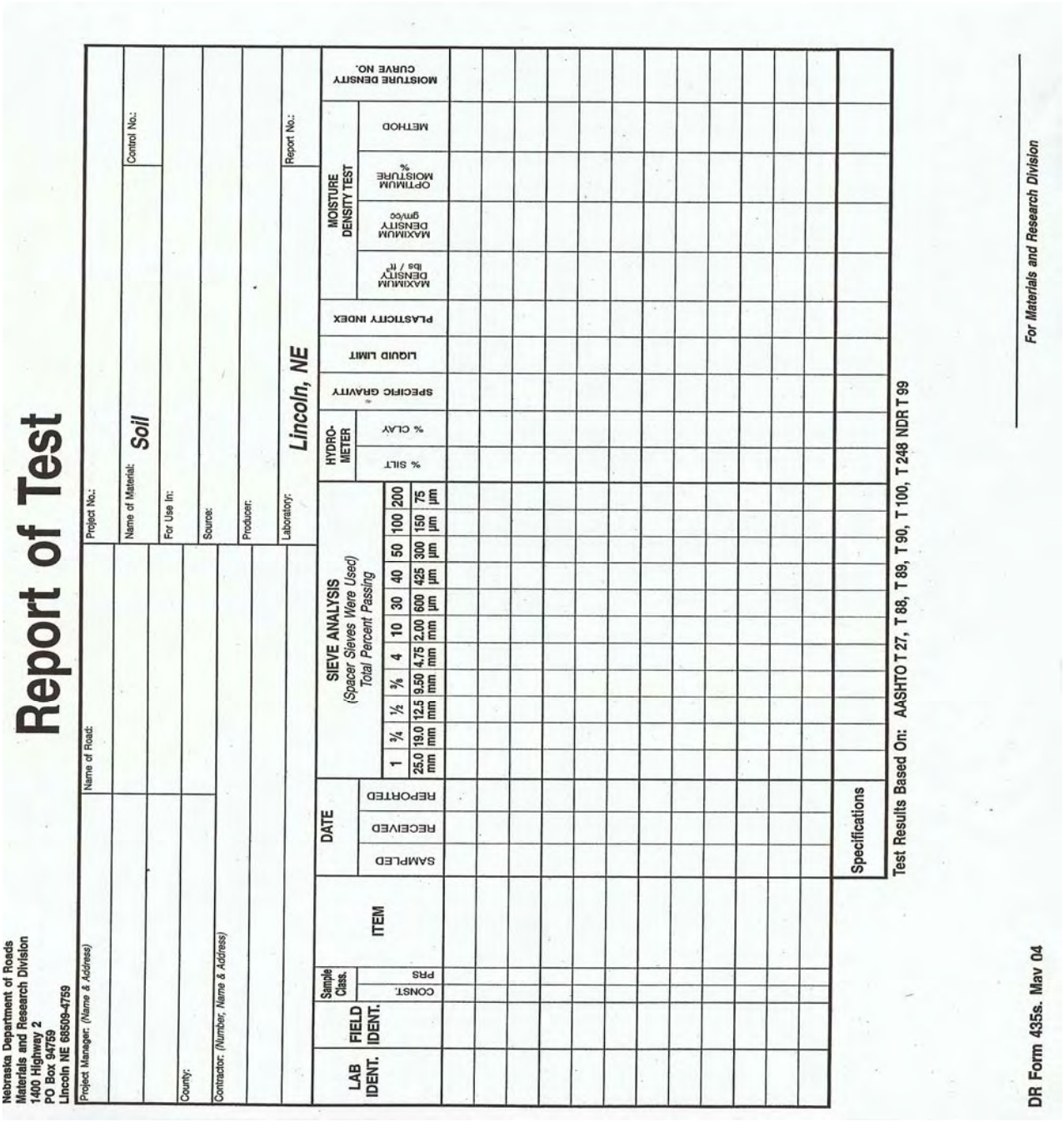
Laboratory: Aggregates
Test Method: NDR T 27

DATE: 4-1-08
REVISED:

Figure E4.0 –Test Report
Report of Test - General

Laboratory: Soils

Test Methods: AASHTO T 27, T 88, T 89, T 90, T 100, T 248
NDR T 99

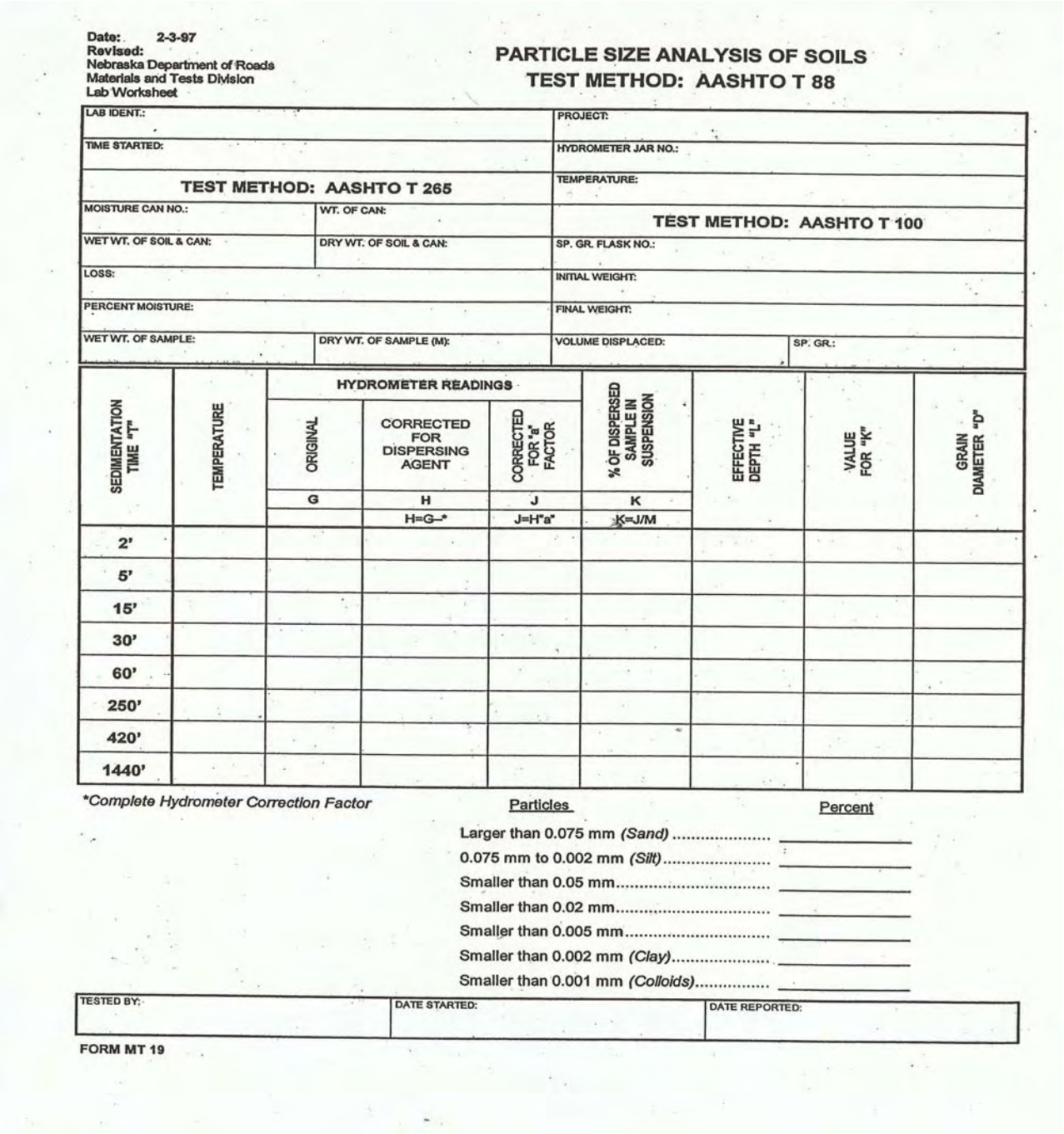


DATE: 2-14-97
REVISED: 4-1-08

Figure E4.1 – Lab Worksheet
Particle Size Analysis of Soils

Laboratory: Soils

Test Methods: AASHTO T 88, T 100, T 265



Date: 2-3-97
Revised:
Nebraska Department of Roads
Materials and Tests Division
Lab Worksheet

PARTICLE SIZE ANALYSIS OF SOILS
TEST METHOD: AASHTO T 88

LAB IDENT.:	PROJECT:
TIME STARTED:	HYDROMETER JAR NO.:
TEST METHOD: AASHTO T 265	TEMPERATURE:
MOISTURE CAN NO.: / WT. OF CAN:	**TEST METHOD: AASHTO T 100**
WET WT. OF SOIL & CAN: / DRY WT. OF SOIL & CAN:	SP. GR. FLASK NO.:
LOSS:	INITIAL WEIGHT:
PERCENT MOISTURE:	FINAL WEIGHT:
WET WT. OF SAMPLE: / DRY WT. OF SAMPLE (M):	VOLUME DISPLACED: / SP. GR.:

SEDIMENTATION TIME "T"	TEMPERATURE	HYDROMETER READINGS: ORIGINAL	CORRECTED FOR DISPERSING AGENT	CORRECTED FOR "a" FACTOR	% OF DISPERSED SAMPLE IN SUSPENSION	EFFECTIVE DEPTH "L"	VALUE FOR "K"	GRAIN DIAMETER "D"
		G	H	J	K			
			H=G–*	J=H"a"	K=J/M			
2'								
5'								
15'								
30'								
60'								
250'								
420'								
1440'								

*Complete Hydrometer Correction Factor

Particles	Percent
Larger than 0.075 mm *(Sand)*	
0.075 mm to 0.002 mm *(Silt)*	
Smaller than 0.05 mm	
Smaller than 0.02 mm	
Smaller than 0.005 mm	
Smaller than 0.002 mm *(Clay)*	
Smaller than 0.001 mm *(Colloids)*	

TESTED BY:	DATE STARTED:	DATE REPORTED:

FORM MT 19

DATE: 2-14-97
REVISED: 4-1-08

Figure E4.2 – Lab Worksheet
Plasticity Index Summary Sheet

Laboratory: Soils
Test Methods: AASHTO T 89, T 90

Date: 2-3-97
Revised:
Nebraska Department of Roads
Materials and Tests Division
Lab Worksheet

PLASTICITY INDEX SUMMARY SHEET
TEST METHOD: AASHTO T 89 & T 90

LAB IDENT.	LIQUID LIMIT (AASHTO T 89)	PLASTIC LIMIT (AASHTO T 90)	PLASTICITY INDEX (AASHTO T 90)	DATE TESTED	DATE REPORTED

LAB IDENT.	LIQUID LIMIT (AASHTO T 89)	PLASTIC LIMIT (AASHTO T 90)	PLASTICITY INDEX (AASHTO T 90)	DATE TESTED	DATE REPORTED

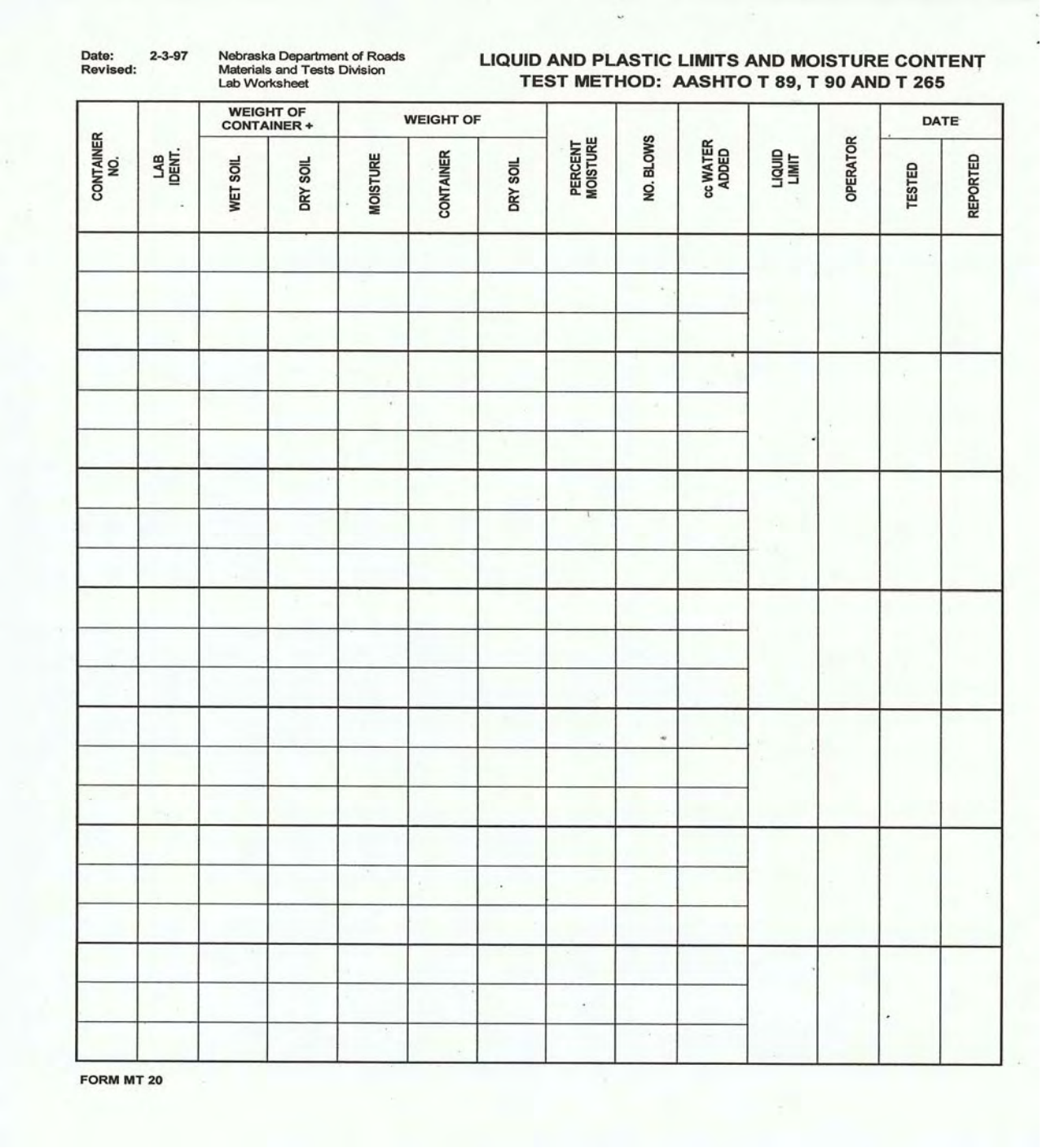
FORM MT 18

DATE: 2-14-97
REVISED: 4-1-08

Figure E4.3 – Lab Worksheet
Liquid and Plastic Limits and Moisture Content

Laboratory: Soils

Test Methods: AASHTO T 89, T 90, T 265



Date: 2-3-97
Revised:

Nebraska Department of Roads
Materials and Tests Division
Lab Worksheet

LIQUID AND PLASTIC LIMITS AND MOISTURE CONTENT
TEST METHOD: AASHTO T 89, T 90 AND T 265

CONTAINER NO.	LAB IDENT.	WEIGHT OF CONTAINER +		WEIGHT OF			PERCENT MOISTURE	NO. BLOWS	cc WATER ADDED	LIQUID LIMIT	OPERATOR	DATE	
		WET SOIL	DRY SOIL	MOISTURE	CONTAINER	DRY SOIL						TESTED	REPORTED

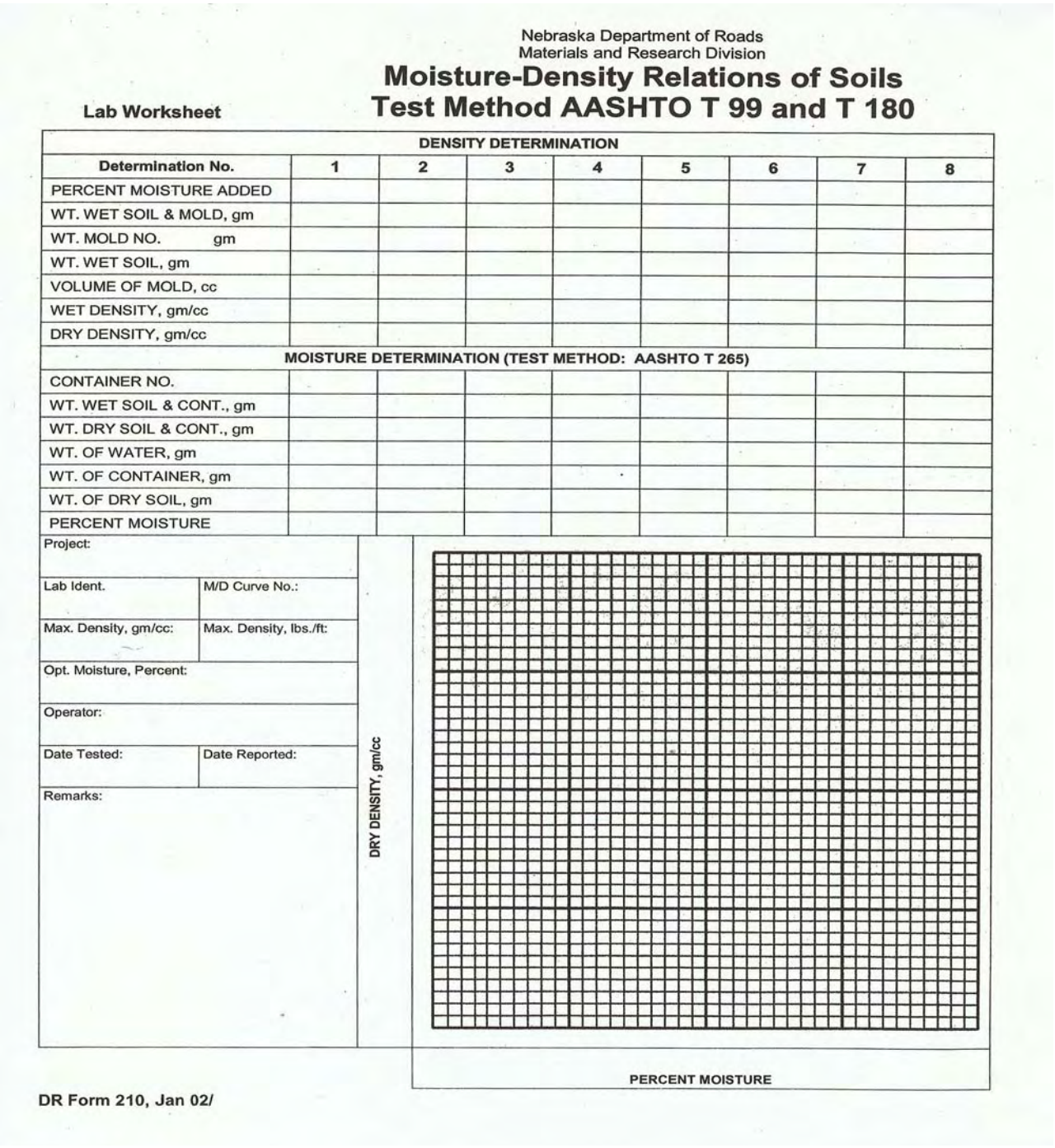
FORM MT 20

DATE: 2-14-97
REVISED: 4-1-08

Figure E4.4 – Lab Worksheet
Moisture-Density Relation of Soils

Laboratory: Soils

Test Methods: AASHTO T 99, T 180, T 265



Nebraska Department of Roads
Materials and Research Division

Moisture-Density Relations of Soils
Test Method AASHTO T 99 and T 180

Lab Worksheet

DENSITY DETERMINATION								
Determination No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
PERCENT MOISTURE ADDED								
WT. WET SOIL & MOLD, gm								
WT. MOLD NO. gm								
WT. WET SOIL, gm								
VOLUME OF MOLD, cc								
WET DENSITY, gm/cc								
DRY DENSITY, gm/cc								
MOISTURE DETERMINATION (TEST METHOD: AASHTO T 265)								
CONTAINER NO.								
WT. WET SOIL & CONT., gm								
WT. DRY SOIL & CONT., gm								
WT. OF WATER, gm								
WT. OF CONTAINER, gm								
WT. OF DRY SOIL, gm								
PERCENT MOISTURE								

Project:

Lab Ident. | M/D Curve No.:

Max. Density, gm/cc: | Max. Density, lbs./ft:

Opt. Moisture, Percent:

Operator:

Date Tested: | Date Reported:

Remarks:

DRY DENSITY, gm/cc

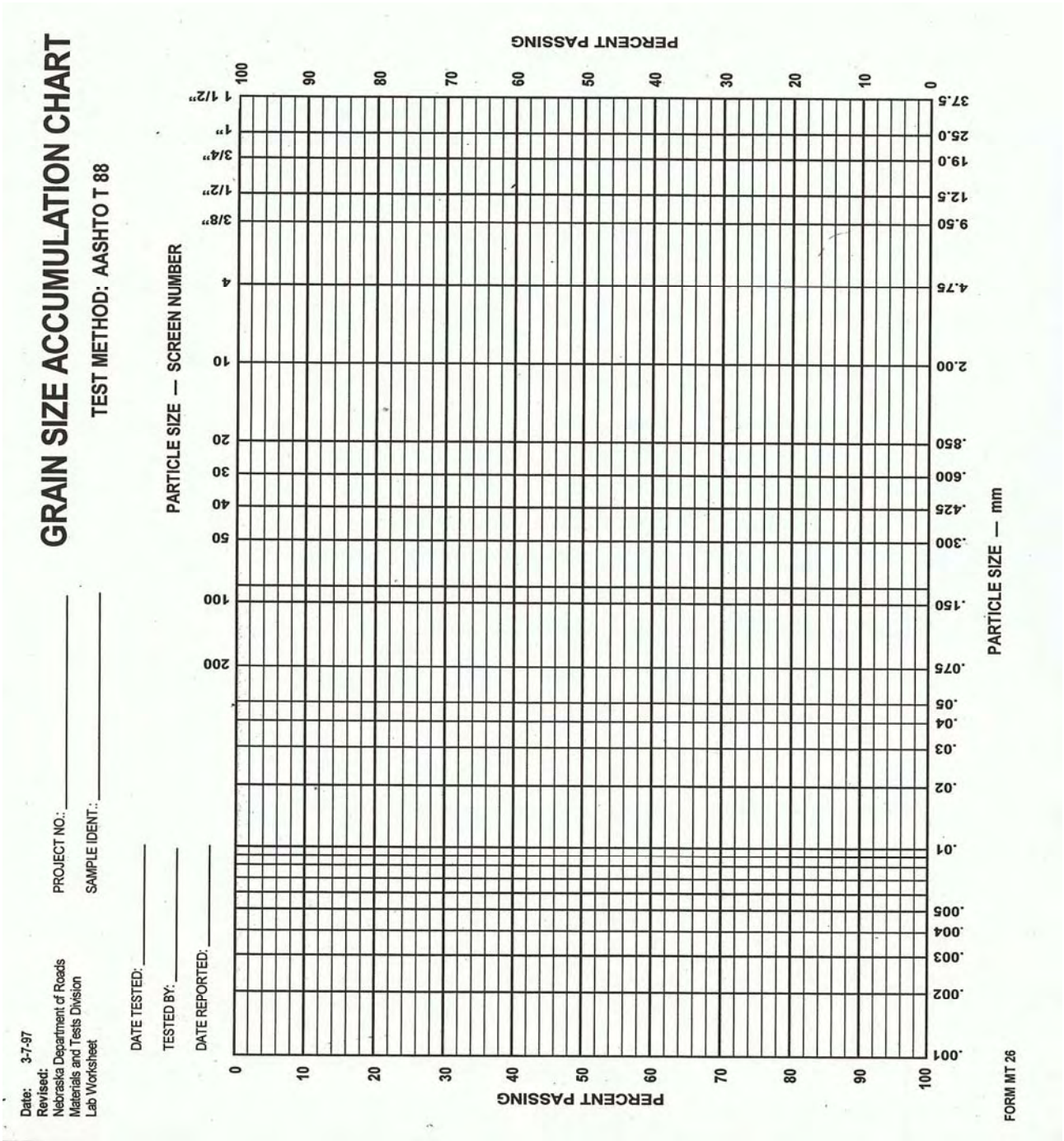
PERCENT MOISTURE

DR Form 210, Jan 02/

DATE: 2-14-97
REVISED: 4-1-08

Figure E4.5 – Lab Worksheet
Grain Size Accumulation Chart

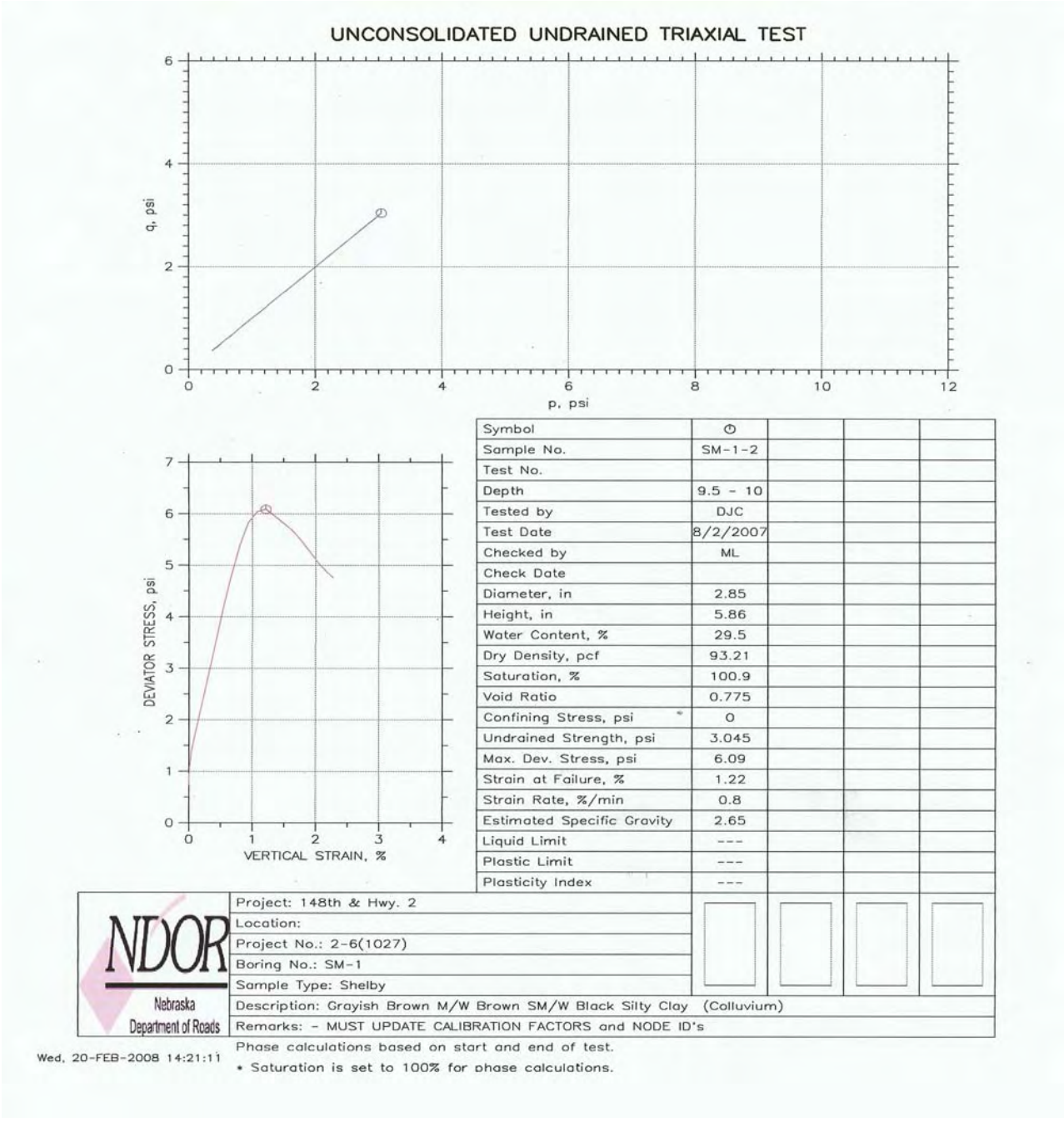
Laboratory: Soils
Test Method: AASHTO T 88



DATE: 2-14-97
REVISED: 3-31-08

Figure E4.6 – Lab Data Sheet
Triaxial Test – Unconfined Compressive Strength of Cohesive Soil

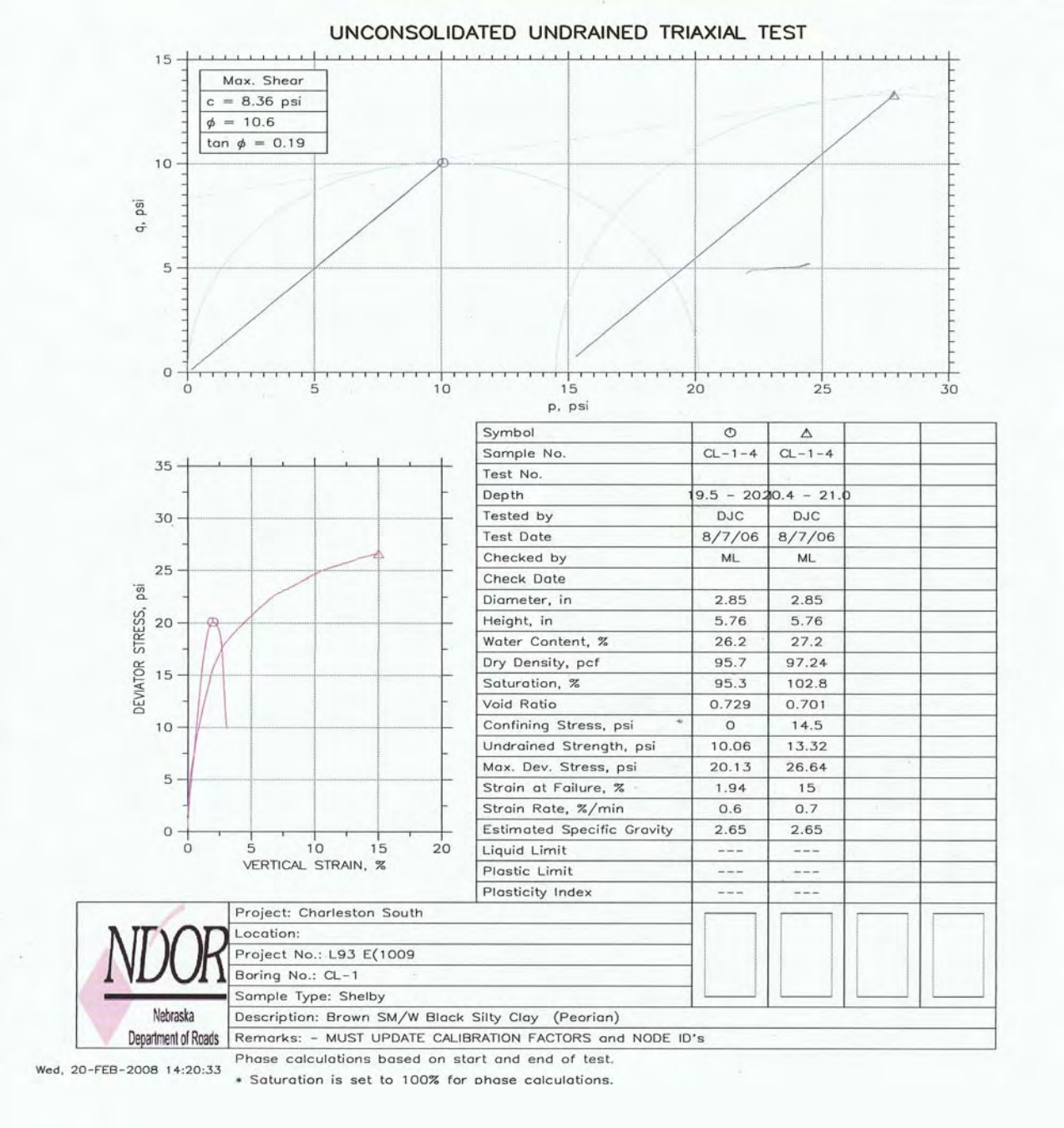
Laboratory: Soil Mechanics
Test Methods: AASHTO T 208



DATE: 2-14-97
REVISED: 3-31-08

Figure E4.7 – Lab Data Sheet
Triaxial Test – Unconsolidated, Undrained Compressive Strength of Cohesive Soils in Triaxial Compression

Laboratory: Soil Mechanics
Test Methods: AASHTO T 296



Symbol	⏲	△		
Sample No.	CL-1-4	CL-1-4		
Test No.				
Depth	19.5 - 20	20.4 - 21.0		
Tested by	DJC	DJC		
Test Date	8/7/06	8/7/06		
Checked by	ML	ML		
Check Date				
Diameter, in	2.85	2.85		
Height, in	5.76	5.76		
Water Content, %	26.2	27.2		
Dry Density, pcf	95.7	97.24		
Saturation, %	95.3	102.8		
Void Ratio	0.729	0.701		
Confining Stress, psi	0	14.5		
Undrained Strength, psi	10.06	13.32		
Max. Dev. Stress, psi	20.13	26.64		
Strain at Failure, %	1.94	15		
Strain Rate, %/min	0.6	0.7		
Estimated Specific Gravity	2.65	2.65		
Liquid Limit	---	---		
Plastic Limit	---	---		
Plasticity Index	---	---		

NDOR Nebraska Department of Roads

Project: Charleston South
Location:
Project No.: L93 E(1009
Boring No.: CL-1
Sample Type: Shelby
Description: Brown SM/W Black Silty Clay (Peorian)
Remarks: - MUST UPDATE CALIBRATION FACTORS and NODE ID's

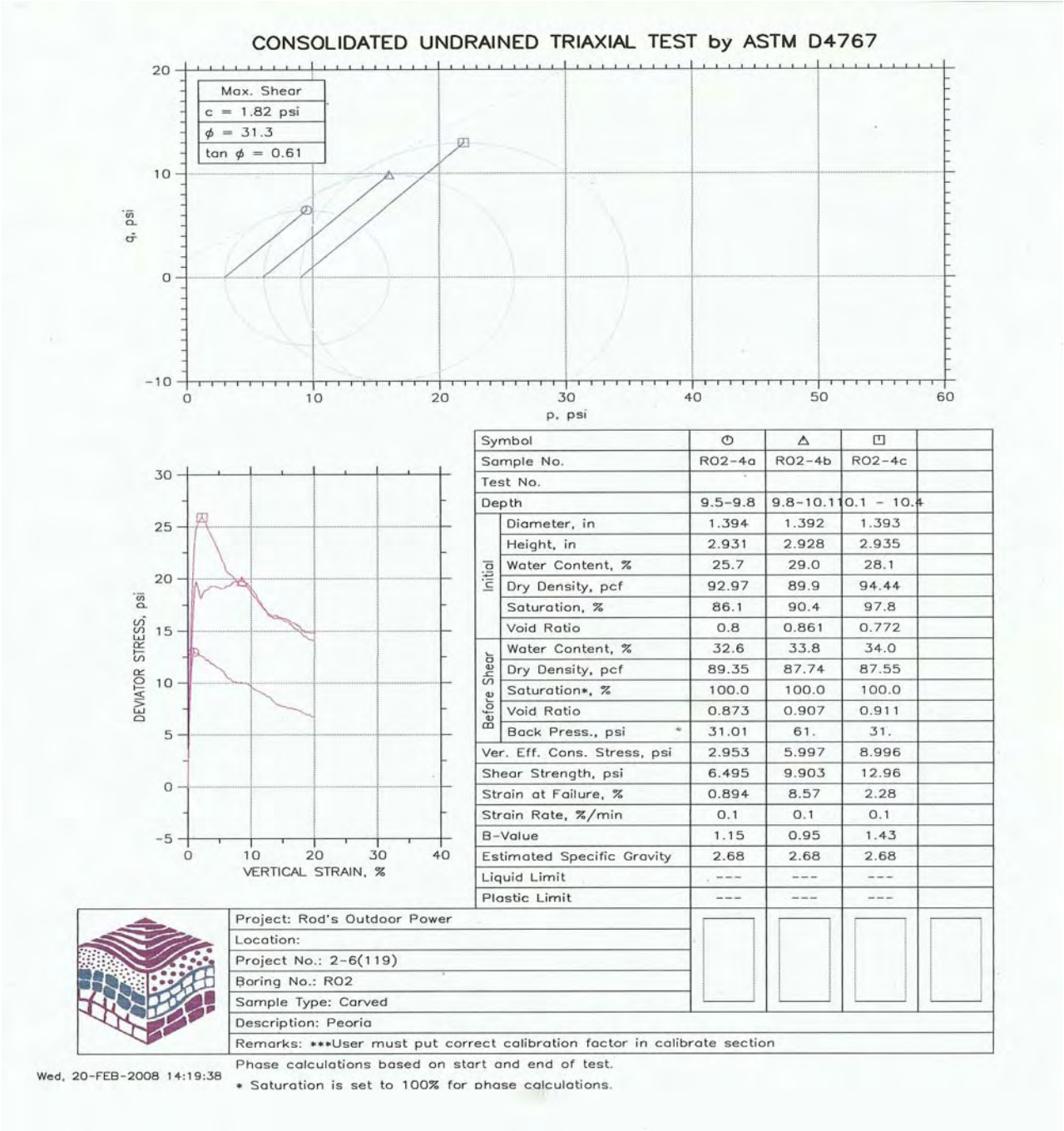
Wed, 20-FEB-2008 14:20:33

Phase calculations based on start and end of test.
* Saturation is set to 100% for phase calculations.

DATE: 3-31-08
REVISED:

Figure E4.8 – Lab Data Sheet
Triaxial Test – Consolidated, Undrained Triaxial Compression Test on Cohesive Soils

Laboratory: Soil Mechanics
Test Methods: AASHTO T 297



Symbol		⏀	△	⏍	
Sample No.		RO2-4a	RO2-4b	RO2-4c	
Test No.					
Depth		9.5-9.8	9.8-10.1	10.1 - 10.4	
Initial	Diameter, in	1.394	1.392	1.393	
	Height, in	2.931	2.928	2.935	
	Water Content, %	25.7	29.0	28.1	
	Dry Density, pcf	92.97	89.9	94.44	
	Saturation, %	86.1	90.4	97.8	
	Void Ratio	0.8	0.861	0.772	
Before Shear	Water Content, %	32.6	33.8	34.0	
	Dry Density, pcf	89.35	87.74	87.55	
	Saturation*, %	100.0	100.0	100.0	
	Void Ratio	0.873	0.907	0.911	
	Back Press., psi	31.01	61.	31.	
Ver. Eff. Cons. Stress, psi		2.953	5.997	8.996	
Shear Strength, psi		6.495	9.903	12.96	
Strain at Failure, %		0.894	8.57	2.28	
Strain Rate, %/min		0.1	0.1	0.1	
B-Value		1.15	0.95	1.43	
Estimated Specific Gravity		2.68	2.68	2.68	
Liquid Limit		---	---	---	
Plastic Limit		---	---	---	

Project: Rod's Outdoor Power
Location:
Project No.: 2-6(119)
Boring No.: RO2
Sample Type: Carved
Description: Peoria
Remarks: ***User must put correct calibration factor in calibrate section

Wed, 20-FEB-2008 14:19:38

Phase calculations based on start and end of test.
* Saturation is set to 100% for phase calculations.

DATE: 3-31-08
REVISED:

Figure E4.9 – Lab Data Sheet
One Dimensional Consolidation Properties of Soils

Laboratory: Soil Mechanics
Test Methods: AASHTO T 216

				Before Test	After Test
Overburden Pressure: 0 psi			Water Content, %	27.87	25.59
Preconsolidation Pressure: 0 psi			Dry Unit Weight, pcf	89.62	101.4
Compression Index: 0			Saturation, %	87.31	107.47
Diameter: 2.485 in		Height: 1 in	Void Ratio	0.85	0.63
LL: ---	PL: ---	PI: --- GS: 2.65			

NDOR Nebraska Department of Roads

Project: Rod's Outdoor Power	Location: Lincoln	Project No.: 2-6(119)
Boring No.: RO-1	Tested By: DJC	Checked By: ML
Sample No.: RO-1-3	Test Date: 9/27/2007	Depth: 8.1 - 8.4
Test No.:	Sample Type: Shelby	Elevation:
Description: Gray M/W Yellowish Brown Silty Clay (Peorian)		
Remarks: ASTM D2435, LOAD TRAC-II ID 103		

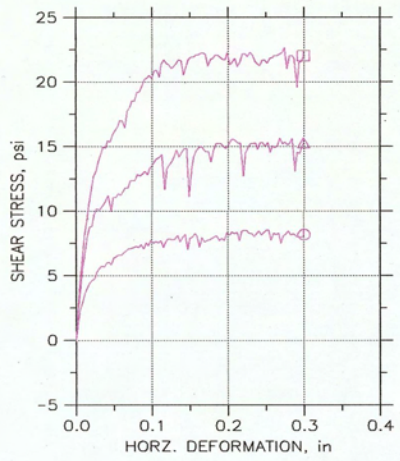
Wed, 20-FEB-2008 14:21:51

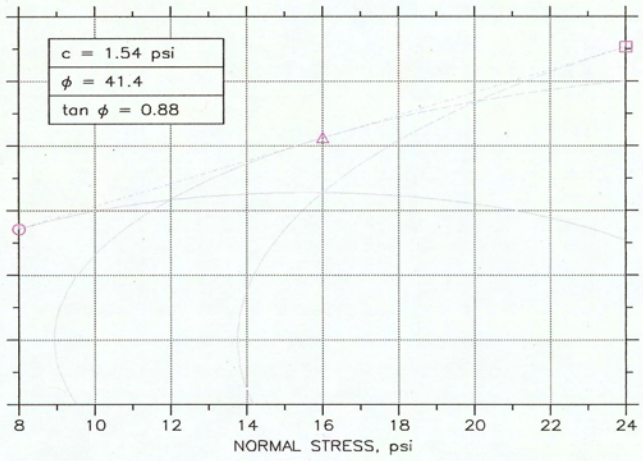
DATE: 3-31-08
REVISED:

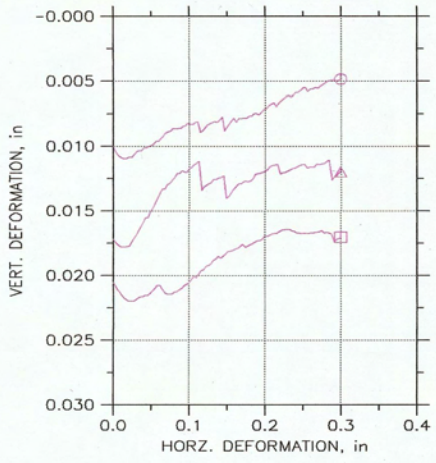
Figure E4.10 – Lab Data Sheet
Direct Shear Test of Soils Under Consolidated Drained Conditions

Laboratory: Soil Mechanics
Test Methods: AASHTO T 236

DIRECT SHEAR TEST REPORT







Symbol		○	△	□	
Test No.		1	2	3	
Sample No.		S08-1	S08-1	S08-1	
Shape		Square	Square	Square	
Initial	Dimension, in	4	4	4	
	Area, in^2	16	16	16	
	Height, in	1.14	1.14	1.14	
	Water Content, %	9.63	9.63	9.63	
	Dry Density, pcf	113.87	113.87	113.87	
	Saturation, %	55.44	55.44	55.44	
	Void Ratio	0.4638	0.4638	0.4638	
Consol. Height, in		1.1311	1.1233	1.1201	
Consol. Void Ratio		0.45233	0.4423	0.43826	
Final	Water Content, %	11.08	11.08	11.08	
	Dry Density, pcf	114.35	115.08	115.6	
	Saturation, %	64.64	65.96	66.93	
	Void Ratio	0.4576	0.44845	0.44192	
Normal Stress, psi		8.0015	16.001	24	
Max. Shear Stress, psi		8.5743	15.657	22.657	
Ult. Shear Stress, psi		8.1917	15.301	22.047	
Time to Failure, min		79.003	84.003	86.002	
Disp. Rate, in/min		0.008	0.008	0.008	
Estimated Specific Gravity		2.67	2.67	2.67	
Liquid Limit		NP	NP	NP	
Plastic Limit		NP	NP	NP	
Plasticity Index		NP	NP	NP	

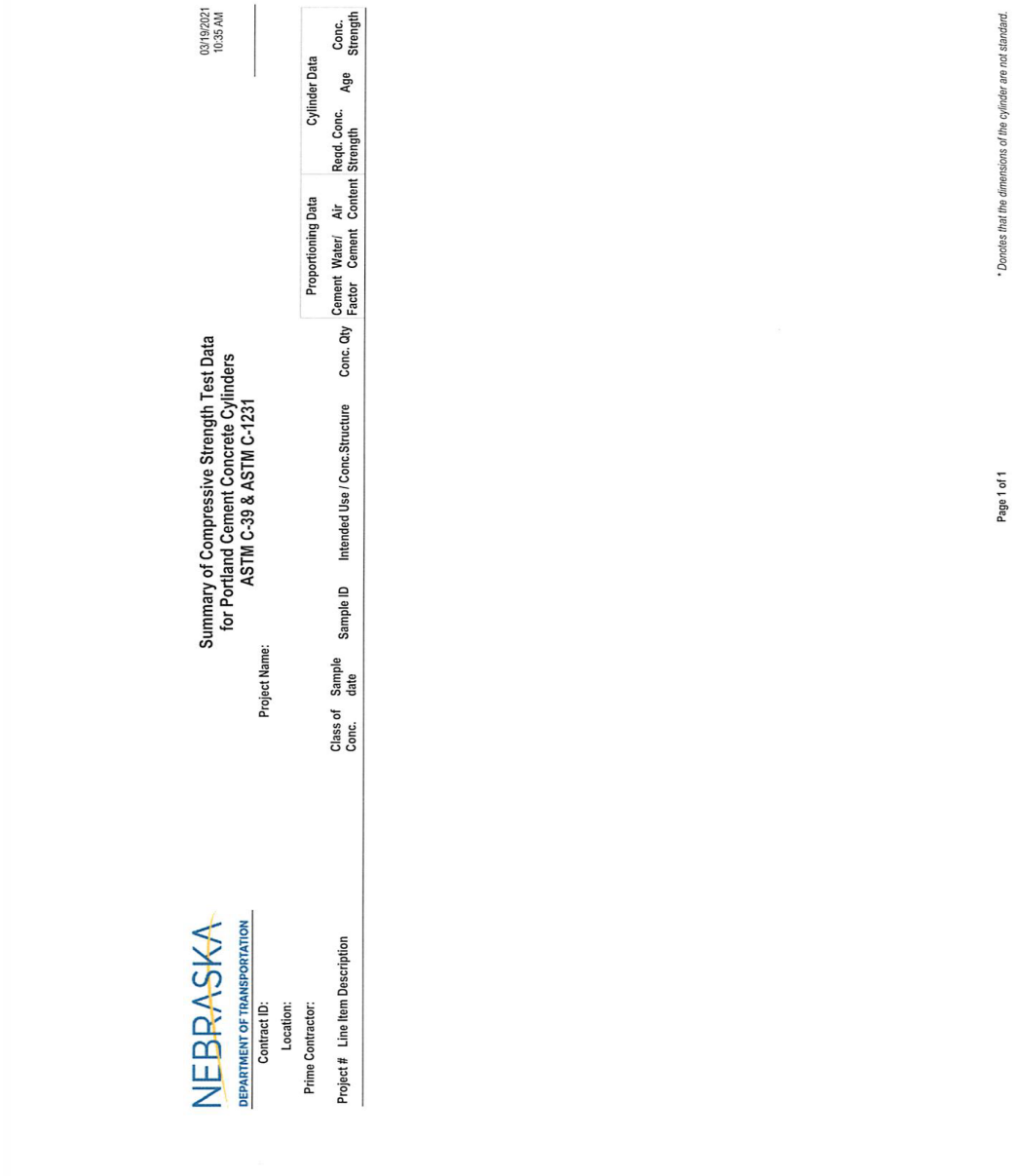
Project: 176th Street over I-80
Location:
Project No.: 80-9(837)
Boring No.:
Sample Type: Compacted
Description: 47B Sand @ 100%
Remarks: Direct Shear (Square Mold)

Wed, 20-FEB-2008 13:18:47

DATE: 2-26-08
REVISED: 3-26-21

Figure E5.1 – Test Report (NDOT Reporting Portal)
Summary of Compressive Strength Test Data for Portland Cement Concrete Cylinders

Laboratory: Cement and Concrete
Test Method: ASTM C 39



NEBRASKA
DEPARTMENT OF TRANSPORTATION

Summary of Compressive Strength Test Data
for Portland Cement Concrete Cylinders
ASTM C-39 & ASTM C-1231

03/19/2021
10:35 AM

Contract ID:
Location:
Project Name:
Prime Contractor:

Project #	Line Item Description	Class of Conc.	Sample date	Sample ID	Intended Use / Conc.Structure	Conc. Qty	Proportioning Data			Cylinder Data		
							Cement Factor	Water/ Cement	Air Content	Reqd. Conc. Strength	Age	Conc. Strength

Page 1 of 1

* Denotes that the dimensions of the cylinder are not standard.

DATE: 2-26-08
REVISED: 3-26-21

Figure E5.2 – Lab Worksheet (NDOT Reporting Portal)
Compressive Strength of Concrete Cylinders Worksheet

Laboratory: Cement and Concrete
Test Method: ASTM C 39

NEBRASKA
DEPARTMENT OF TRANSPORTATION

Portland Cement Concrete Cylinder Break Count
PCC
ASTM C-39 & ASTM C-1231

03/19/2021
12:06 PM

Date	Break #	Sample ID	Age	Length	Diameter	Surface Area	Peak Load	PSI	Technician	
3/19/2021	3818	213145110016-2	7.00 d	8.00 in	4.00 in	12.5660 sqin	40760	3243 psi	John.Gude	
	3817	213145110016-1	7.00 d	8.00 in	4.00 in	12.5660 sqin	40460	3220 psi	John.Gude	
3/18/2021	3816	213145210016-2	7.00 d	8.00 in	4.00 in	12.5660 sqin	46220	3678 psi	John.Gude	
	3815	213145210016-1	7.00 d	8.00 in	4.00 in	12.5660 sqin	46840	3727 psi	John.Gude	
3/17/2021	3814	213133810005-4	7.00 d	8.00 in	4.00 in	12.5660 sqin	50820	4044 psi	John.Gude	
	3813	213133810005-3	7.00 d	8.00 in	4.00 in	12.5660 sqin	50860	4047 psi	John.Gude	
3/16/2021	3812	213145210015-2	7.00 d	8.00 in	4.00 in	12.5660 sqin	48200	3835 psi	John.Gude	
	3811	213145210015-1	7.00 d	8.00 in	4.00 in	12.5660 sqin	48660	3873 psi	John.Gude	
3/12/2021	3810	213145110012-4	7.00 d	8.00 in	4.00 in	12.5660 sqin	46200	3676 psi	KIM.JIRKOVSKY	
	3809	213145110012-3	7.00 d	8.00 in	4.00 in	12.5660 sqin	46500	3701 psi	KIM.JIRKOVSKY	
	3808	212038410028-2	7.00 d	8.00 in	4.00 in	12.5660 sqin	49740	3959 psi	KIM.JIRKOVSKY	
	3807	212038410028-1	7.00 d	8.00 in	4.00 in	12.5660 sqin	51340	4086 psi	KIM.JIRKOVSKY	
	3806	213145110013-4	7.00 d	8.00 in	4.00 in	12.5660 sqin	42120	3352 psi	KIM.JIRKOVSKY	
	3805	213145110013-3	7.00 d	8.00 in	4.00 in	12.5660 sqin	40540	3226 psi	KIM.JIRKOVSKY	
	3804	213145210013-2	7.00 d	8.00 in	4.00 in	12.5660 sqin	45860	3649 psi	KIM.JIRKOVSKY	
	3803	213145210013-1	7.00 d	8.00 in	4.00 in	12.5660 sqin	47320	3765 psi	KIM.JIRKOVSKY	
	3802	213145110014-4	7.00 d	8.00 in	4.00 in	12.5660 sqin	45140	3591 psi	KIM.JIRKOVSKY	
	3801	213145110014-3	7.00 d	8.00 in	4.00 in	12.5660 sqin	43860	3490 psi	KIM.JIRKOVSKY	
3/11/2021	3800	213133810005-2	2.00 d	8.00 in	4.00 in	12.5660 sqin	25500	2030 psi	John.Gude	Replace or Flip Pad
	3799	213133810005-1	2.00 d	8.00 in	4.00 in	12.5660 sqin	25340	2017 psi	John.Gude	
	3798	212038910009-4	7.00 d	8.00 in	4.00 in	12.5660 sqin	47340	3768 psi	John.Gude	
	3797	212038910009-3	7.00 d	8.00 in	4.00 in	12.5660 sqin	46880	3731 psi	John.Gude	
	3796	212000710015-4	7.00 d	8.00 in	4.00 in	12.5660 sqin	49480	3937 psi	John.Gude	
	3795	212000710015-3	7.00 d	8.00 in	4.00 in	12.5660 sqin	49160	3912 psi	John.Gude	
	3794	212000710016-4	7.00 d	8.00 in	4.00 in	12.5660 sqin	51980	4136 psi	John.Gude	
	3793	212000710016-3	7.00 d	8.00 in	4.00 in	12.5660 sqin	50300	4003 psi	John.Gude	
	3792	213145110011-4	7.00 d	8.00 in	4.00 in	12.5660 sqin	44480	3540 psi	John.Gude	
	3791	213145110011-3	7.00 d	8.00 in	4.00 in	12.5660 sqin	45240	3601 psi	John.Gude	
	3790	213145110010-2	7.00 d	8.00 in	4.00 in	12.5660 sqin	44040	3504 psi	John.Gude	
	3789	213145110010-1	7.00 d	8.00 in	4.00 in	12.5660 sqin	44020	3502 psi	tim.krason	
3/10/2021	3788	212000710014-2	7.00 d	8.00 in	4.00 in	12.5660 sqin	45240	3601 psi	John.Gude	
	3787	212000710014-1	7.00 d	8.00 in	4.00 in	12.5660 sqin	46760	3720 psi	John.Gude	
3/9/2021	3786	213256010178-2	7.00 d	8.00 in	4.00 in	12.5660 sqin	42720	3399 psi	KIM.JIRKOVSKY	
	3785	213256010178-1	7.00 d	8.00 in	4.00 in	12.5660 sqin	41060	3268 psi	KIM.JIRKOVSKY	
	3784	213145210012-2	7.00 d	8.00 in	4.00 in	12.5660 sqin	51860	4128 psi	KIM.JIRKOVSKY	

Page 1 of 110

DATE: 4-3-97
REVISED: 03-26-21

Figure E6.1 – Test Report
Portland Cement Physical Analysis (Type I/II Cement)

Laboratory: Cement and Concrete
Test Methods: ASTM C 109, C 151, C 185, C 191, C 204, C 451

State of Nebraska
Department of Transportation
Materials and Research Division

Wallace Heyen
Concrete Engineer

Portland Cement
ASTM C150 Type I/II
Standard Physical Requirements

Manufacturer _____ **Mill Location** _____ **Type I/II**

Laboratory ID C _____

Physical Test		Result	Limit	Inspector's Initials	Date
Compressive Strength, min PSI	ASTM C-109				
3-day			1450		
7-day			2470		
Time of Setting (Vicat Test), minutes	ASTM C-191				
Initial – not less than…			45		
Final – not more than…			375		
Autoclave Expansion max %	ASTM C-151		0.80		
Air Content of Mortar, Volume % max	ASTM C-185		12.0		
Fineness, Specific Surface Air Permeability Test, min	ASTM C-204		260		

Checked By: _____

NDOT Form 141c, February 2021

DATE: 4-3-97
REVISED: 03-26-21

Figure E6.2 – Test Report
Portland Cement Physical Analysis (Type III Cement)

Laboratory: Cement and Concrete
Test Methods: ASTM C 109, C 151, C 185, C 451, C 191

State of Nebraska
Department of Transportation
Materials and Research Division

Wallace Heyen
Concrete Engineer

Portland Cement
ASTM C150 Type III
Standard Physical Requirements

Manufacturer _____ **Mill Location** _____ **Type III**

Laboratory ID C _____

Physical Test		Result	Limit	Inspector's Initials	Date
Compressive Strength, min PSI	ASTM C-109				
1-day			1740		
3-day			3480		
Time of Setting (Vicat Test), minutes	ASTM C-191				
Initial – not less than…			45		
Final – not more than…			375		
Autoclave Expansion max %	ASTM C-151		0.80		
Air Content of Mortar, Volume % max	ASTM C-185		12.0		
False Set, final penetration, min %	ASTM C-451		50		

Checked By: _____

NDOT Form 141b, February 2021

DATE: 4-3-97
REVISED: 03-26-21

Figure E6.3 – Test Report
Portland Cement Physical Analysis (Type IP Cement)

Laboratory: Cement and Concrete
Test Methods: ASTM C 109, C 151, C 185, C 191

State of Nebraska
Department of Transportation
Materials and Research Division

Wallace Heyen
Concrete Engineer

Portland Cement
ASTM C595
Blended Hydraulic Cements
Standard Physical Requirements

Manufacturer _____ **Mill Location** _____ **Type** _____

Laboratory ID C _____

Physical Test		Result	Limit	Inspector's Initials	Date
Compressive Strength, min PSI	ASTM C-109				
3-day			1890		
7-day			2900		
28-day			3620		
Time of Setting (Vicat Test), minutes	ASTM C-191				
Initial – not less than…			45		
Final – not more than…			420		
Autoclave Expansion Test, max %	ASTM C-151		0.80		
Autoclave Contraction Test, max %	ASTM C-151		0.20		
Air Content of Mortar, Volume % max	ASTM C-185		12		

Checked By: _____

NDOT Form 141a, February 2021

DATE: 02-29-08
REVISED: 3-26-21 Do not perform this test for CCRL certification.

Figure E6.4 – Lab Worksheet
Fineness of Hydraulic Cement Worksheet

Laboratory: Cement and Concrete
Test Method: ASTM C 430

State of Nebraska
Department of Transportation
Materials and Research Division

Portland Cement Concrete – ASTM C-430
Fineness of Hydraulic Cement Worksheet
45-µm Sieve (No. 325) Sieve

Inspector _____ Year _____

Lab Identification	Brand	Type	Sieve Id.	Sieve Correction Factor (C)	Mass Retained (R)	% Retained R_p R(C+100)	Date

NDOT Form 141g, October 2017

DATE: 02-29-08
REVISED: 3-26-21 Do not perform this test for CCRL certification

Figure E6.5 – Lab Worksheet
Early Stiffening of Hydraulic Cement Worksheet

Laboratory: Cement and Concrete
Test Method: ASTM C 451

State of Nebraska
Department of Transportation
Materials and Research Division

Early Stiffening of Hydraulic Cement Worksheet

False Set
ASTM C-451

Inspector: _____ Date: _____

Lab ID	Water Required	Initial Penetration	Final Penetration	Percent Final Penetration F/I x 100	Comments

NDOT 141V, October 2017

DATE: 2-14-97
REVISED: 02-26-08

~~Figure E6.6 – Lab Worksheet~~
~~Normal Consistency Time of Set (Gillmore) Worksheet~~

Laboratory: Cement and Concrete

Test Methods: ASTM C 187, C 266

DATE: 2-14-97
REVISED: 02-29-08

Figure E6.7 – Lab Worksheet
Fineness of Hydraulic Cement Worksheet (Air Permeability)

Laboratory: Cement and Concrete
Test Method: ASTM C 204

State of Nebraska
Department of Roads
Materials and Research Division

Portland Cement Concrete - ASTM C-204
Fineness of Hydraulic Cement Worksheet
Air Permeability

Cell No. _____

Lab Identification	Type	Mill Code	Time	Room Temp.	√Time	Specific Surface	Inspector	Date

DR Form 141h, Oct 05

DATE: 2-14-97
REVISED: 02-29-08

Figure E6.8 – Lab Worksheet
Normal Consistency Time of Set (Vicat) Worksheet

Laboratory: Cement and Concrete
Test Methods: ASTM C 187, C 189

State of Nebraska
Department of Roads
Materials and Research Division

Portland Cement Concrete
ASTM C-187 Normal Consistency
ASTM C-191 Vicat Time of Setting

Inspector _____ Year _____

Lab Identification	Type of Cement	Water Req.	Actual Drop	Time	Penetration		Set Time		Comments
					Initial	Final	Initial	Final	

DR Form 141j, Oct 05

DATE: 2-14-97
REVISED: 02-29-08

Figure E6.9 – Lab Worksheet
Air Content for Hydraulic Cement Mortar Worksheet

Laboratory: Cement and Concrete
Test Method: ASTM C 185

State of Nebraska
Department of Roads
Materials and Research Division

Portland Cement Concrete - ASTM C-185
Air Content for Hydraulic Cement
Mortar Worksheet

Inspector _____ Year _____

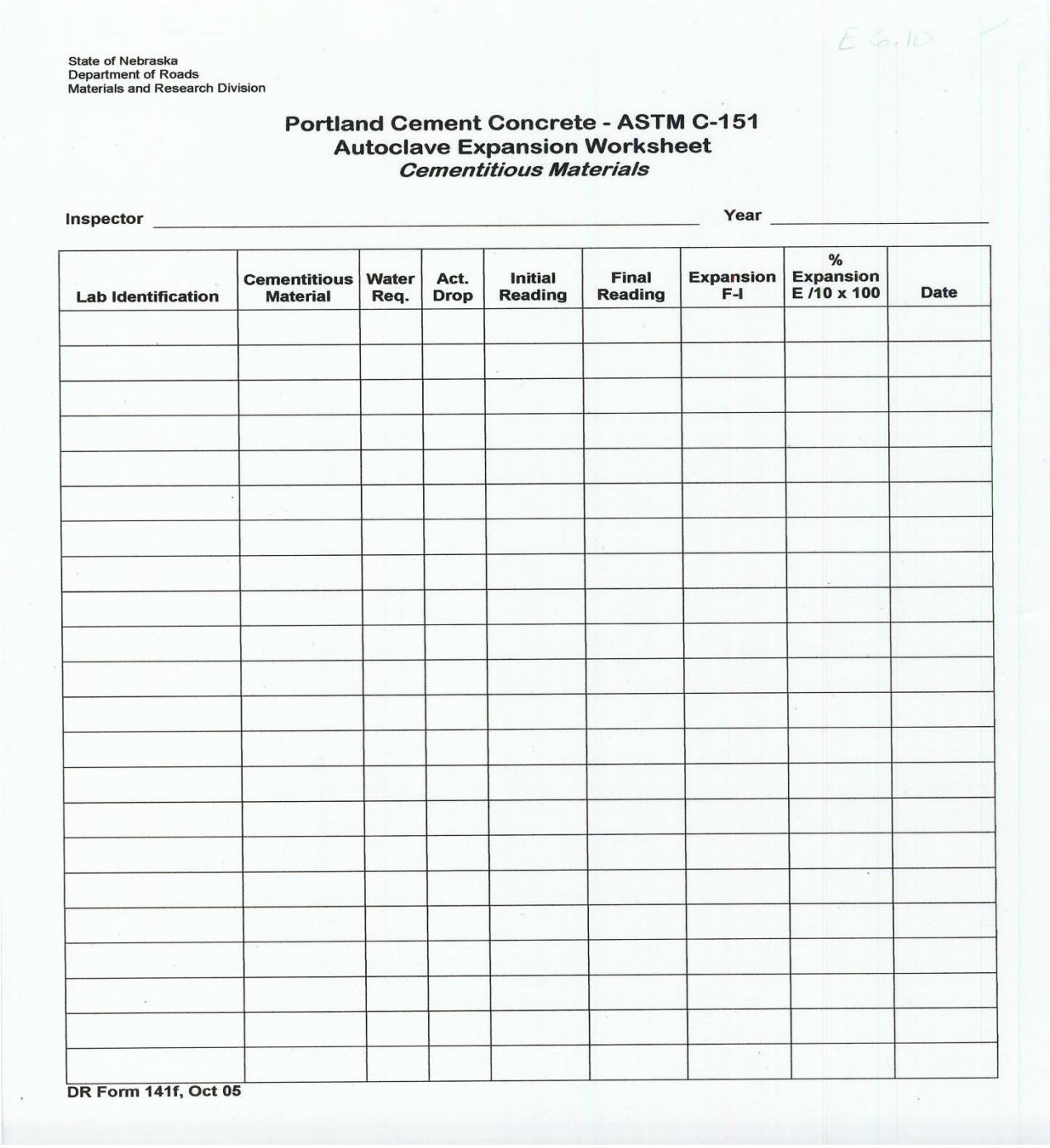
Lab Identification	Brand	Type	Water Added cc	D_1	D_2	D_3	D_4	Flow $D_1+D_2+D_3+D_4$	Mass of Mortar	Air Content	Date

DR Form 141d, Oct 05

DATE: 2-14-97
REVISED: 02-20-24 Test Method Eliminated from Standards

~~Figure E6.10 – Lab Worksheet~~
~~Autoclave Expansion Worksheet (Cementitious Materials)~~

Laboratory: Cement and Concrete
Test Method: ASTM C 151



E 6.10

State of Nebraska
Department of Roads
Materials and Research Division

Portland Cement Concrete - ASTM C-151
Autoclave Expansion Worksheet
Cementitious Materials

Inspector _____ **Year** _____

Lab Identification	Cementitious Material	Water Req.	Act. Drop	Initial Reading	Final Reading	Expansion F-I	% Expansion E /10 x 100	Date

DR Form 141f, Oct 05

DATE: 2-14-97
REVISED: 02-29-08

Figure E6.11 – Lab Worksheet
Cube Compressive Strength Worksheet (Hydraulic Cement Mortar)

Laboratory: Cement and Concrete
Test Method: ASTM C 109

State of Nebraska
Department of Roads
Materials and Research Division

Portland Cement Concrete - ASTM C-109
Cube Compressive Strength Worksheet
Hydraulic Cement Mortar

Inspector _____ **Age** _____ **Date Made** _____ **/Date Broke** _____

Lab Identification	Cube 1 Load	Cube 2 Load	Cube 3 Load	Average $(C_1+C_2+C_3)/3$	Strength * A/4

DR Form 141e, Oct 05

DATE: 4-1-08
REVISED: 3-26-21

Figure E6.12a – Test Report
Portland Cement Chemical Analysis – Type I/II Cement

Laboratory: Chemical
Test Method: ASTM C 114, C 150

NEBRASKA
DEPARTMENT OF TRANSPORTATION

Portland Cement Concrete Chemical Test Results

March 19, 2021

Sample ID: 2134246A0053
Producer Supplier: Continental Cement Co.-Davenport, IA
Product: II
XRF Test Method: CHL052001

Min	Max	Test #	1
		Pass/Fail	Pass
	6.0	MgO %	1.896
	3.0	SO_3 %	3.209
	3.0	LOI %	1.93
		CaO %	63.085
		SiO_2 %	19.516
		K_2O %	0.666
		Na_2O %	0.118
	6.0	Al_2O_3 %	4.629
	6.0	Fe_2O_3 %	2.992
		TiO_2 %	0.247
		P_2O_5 %	0.161
		Cr_2O_3 %	0.009
		Mn_2O_3 %	0.535
		ZnO %	0.040
	0.60	Equiv. Alkali %	0.556

General Remarks

Test #	Remarks	
1	X-Ray Fluorescence	*SO3 of the sample exceeds the limit. However, certified results of ASTM C1038 bar expansion demonstrate the sample complies with ASTM C150 requirements. JLD*

DATE: 4-1-08
REVISED: 3-26-21

Figure E6.12b – Test Report
Portland Cement Chemical Analysis – Type III Cement

Laboratory: Chemical
Test Method: ASTM C 114, C 150

NEBRASKA
DEPARTMENT OF TRANSPORTATION

Portland Cement Concrete
Chemical Test Results

March 19, 2021

Sample ID: 2134246A0048
Producer Supplier: Central Plains Cement Co-Sugar Creek, MO
Product: III
XRF Test Method: CHL052001

Min	Max	Test #	1
		Pass/Fail	Pass
	6.0	MgO %	1.134
	3.5	SO_3 %	4.096
	3.0	LOI %	1.19
		CaO %	63.170
		SiO_2 %	20.441
		K_2O %	0.516
		Na_2O %	0.193
		Al_2O_3 %	4.837
		Fe_2O_3 %	3.116
		TiO_2 %	0.336
		P_2O_5 %	0.085
		Cr_2O_3 %	0.009
		Mn_2O_3 %	0.084
		ZnO %	0.007
	0.60	Equiv. Alkali %	0.533
	1.5	IR %	0.240

General Remarks

Test #	Remarks	
1	X-Ray Fluorescence	*SO3 of the sample exceeds the limit. However, certified results of ASTM C1038 bar expansion demonstrate the sample complies with ASTM C150 requirements. JLD*

DATE: 4-1-08
REVISED: 3-26-21

Figure E6.12c – Test Report
Portland Cement Chemical Analysis – Type I/B Cement

Laboratory: Chemical
Test Method: ASTM C 114, C 595

NEBRASKA
DEPARTMENT OF TRANSPORTATION

Portland Cement Concrete
Chemical Test Results

March 19, 2021

Sample ID: 213528250013
Producer Supplier: Ash Grove Cement-Louisville, NE
Product: AshGrove IP(25) Duracem-IP
XRF Test Method: CHL052001

Min	Max	Test #	1
		Pass/Fail	
		MgO %	1.356
		SO_3 %	2.296
	5.0	LOI %	2.87
		CaO %	50.318
		SiO_2 %	27.507
		K_2O %	0.969
		Na_2O %	0.388
		Al_2O_3 %	7.159
		Fe_2O_3 %	4.832
		TiO_2 %	0.391
		P_2O_5 %	0.142
		Cr_2O_3 %	0.017
		Mn_2O_3 %	0.058
		ZnO %	0.029
		CaO/SiO_2	1.829
		Max Ratio	1
		Equiv. Alkali %	1.026
		C3A %	10.796

General Remarks

Test # **Remarks**

DATE: 4-3-97
REVISED: 4-1-08

Figure E6.13 – Lab Worksheet
ASTM C 114 Rapid Test Methods Worksheet

Laboratory: Chemical
Test Method: ASTM C 114

ASTM C 114 Rapid Test Methods Worksheet

Date Test Started_____ _____ Operator___ ____

Component Tested_____ _____

SRM#	1880a	1881a	1884a	1885a	1886a	1887a	1888a	1889a	634a
Value									

Two Non-Consecutive Daily Rounds of Tests.

SRM#	1880a	1881a	1884a	1885a	1886a	1887a	1888a	1889a	634a
DAY 1									
DAY 2									
AVG.									
1 - 2*									

*** Difference between runs of Day 1 & Day 2.**

Difference between runs acceptable? Yes

SRM#	1880a	1881a	1884a	1885a	1886a	1887a	1888a	1889a	634a
Two day Average									
SRM Value									
Average - SRM									

Is the maximum difference between the Sample average and the SRM Certificate value acceptable? Yes
See Table1, ASTM C 114 Section 3.11 for specific tolerances.

DATE: 02-26-08
REVISED:

Figure E6.14 – Lab Worksheet
Portland Cement Concrete (Strength Activity Index)

Laboratory: Cement and Concrete
Test Method: ASTM C 311

State of Nebraska
Department of Roads
Materials and Research Division

Portland Cement Concrete - ASTM C-311
Strength Activity Index Worksheet

Inspector _____ **Age** _____ **Date Made** _____ **/Date Broke** _____

Lab Identification	Type	mL of Water	Flow	Cube 1 Load	Cube 2 Load	Cube 3 Load	Average (C1+ C2+ C3) /3	Strength A/4	% of Control	Water Required

DR Form 141i, Oct 05

DATE: 02-26-08
REVISED: 3-26-21 Do not perform this test for CCRL certification

Figure E6.15 – Lab Worksheet
Supplemental Cementitious Materials (SCM)
Strength Activity Index with Portland Cement Worksheet

Laboratory: Cement and Concrete
Test Method: ASTM C 311 / C 109

State of Nebraska
Department of Transportation
Materials and Research Division

Supplemental Cementitious Materials
SCM
ASTM C-311/C-109
Strength Activity Index with Portland Cement Worksheet

Inspector _____ Age _____ Date Made _____ /Date Broke _____

Lab Identification	Type	mL of Water	Flow	Cube 1 Load	Cube 2 Load	Cube 3 Load	Average (C1+C2+C3)/3	Strength A/4	% of Control	Water Required

NDOT Form 143b, October 2017

DATE: 02-26-08
REVISED: 3-26-21 Do not perform this test for CCRL certification

Figure E6.16 – Lab Worksheet
Supplemental Cementitious Materials (SCM)
Class C Fly Ash Physical Analysis

Laboratory: Cement and Concrete
Test Method: ASTM C 618

State of Nebraska
Department of Transportation
Materials and Research Division

Wallace Heyen
Concrete Engineer

Supplemental Cementitious Materials
SCM
ASTM C618
Class C Fly Ash Physical Analysis

Brand _____ **Plant** _____

Laboratory ID FA _____

Physical Test		Result	Limit	Inspector's Initials	Date
Fineness: Amount Retained when wet-sieved on 45-µm sieve, max. % max. variation from average 5%	ASTM C-311/C-430	_____	34	_____	_____
Strength Activity Index min. % at 7-day or 28-day	ASTM C-311	_____	75	_____	_____
Water Requirement	ASTM C-311	_____	105	_____	_____
Autoclave Expansion or Contraction, max. %	ASTM C-311/C-151	_____	0.8	_____	_____
Density max. variation from average 5%	ASTM C-311/C-188	_____		_____	_____

Checked By: _____

NDOT Form 143c, October 2017

DATE: 02-26-08
REVISED: 3-26-21 Do not perform this test for CCRL certification

Figure E6.17 – Lab Worksheet
Supplemental Cementitious Materials (SCM)
Class F Fly Ash Physical Analysis

Laboratory: Cement and Concrete
Test Method: ASTM C 618

State of Nebraska
Department of Transportation
Materials and Research Division

Wallace Heyen
Concrete Engineer

Supplemental Cementitious Materials
SCM
ASTM C-618
Class F Fly Ash Physical Analysis

Brand _____ **Plant** _____

Laboratory ID FA _____

Physical Test		Result	Limit	Inspector's Initials	Date
Fineness: Amount Retained when wet-sieved on 45-µm sieve, max. % max. variation from average 5%	ASTM C-311/C-430	_____	34	_____	_____
Strength Activity Index min. % at 7-day or 28-day	ASTM C-311	_____	75	_____	_____
Water Requirement	ASTM C-311	_____	105	_____	_____
Autoclave Expansion or Contraction, max. %	ASTM C-311/C-151	_____	0.8	_____	_____
Density max. variation from average 5%	ASTM C-311/C-188	_____		_____	_____

Checked By: _____

NDOT Form 143e, October 2017

DATE: 02-26-08
REVISED: 3-26-21 Do not perform this test for CCRL certification

Figure E6.18 – Lab Worksheet
Supplemental Cementitious Materials (SCM)
Ground Granulated Blast-Furnace Slag Physical Analysis

Laboratory: Cement and Concrete
Test Method: ASTM C 989

State of Nebraska
Department of Transportation
Materials and Research Division

Cementitious Supplementary Materials
SCM
ASTM C989
Ground Granulated Blast-Furnace Slag for Use in Concrete
Physical Analysis

Manufacturer _____ **Mill** _____ **Grade** _____

Laboratory ID FA _____ **Date** _____

Physical Test		Result	Limit	Inspector's Initials
Fineness:	ASTM C-311/C-595			
Amount Retained when wet-sieved on 45-µm sieve, max. %	Table 3			
max. variation from average 5%		_____	20	_____
Strength Activity Index Individual Sample	ASTM C-311/C-989			
at 7 days	Table 1	_____		_____
at 28 days		_____		_____
Water Requirement	ASTM C-311	_____	105	_____
Air Content of Slag Mortar, Max. %	ASTM C-185	_____	12	_____
Density max. variation from average 5%	ASTM C-311/C-188	_____		_____

Table 1	Average of Last Five Consecutive Samples	Result	Any Individual Sample	Inspector's Initials
Slag Activity Index, min. %				
7-Day Index				
Grade 80	--	_____	--	_____
Grade 100	75	_____	70	_____
Grade 120	95	_____	90	_____
28-Day Index				
Grade 80	75	_____	70	_____
Grade 100	95	_____	90	_____
Grade 120	115	_____	110	_____

Checked By _____ *Date* _____

NDOT Form 143g, October 2017

DATE: 02-26-08
REVISED: 3-26-21 Do not perform this test for CCRL certification

Figure E6.19 – Lab Worksheet
Supplemental Cementitious Materials (SCM)
Density

Laboratory: Cement and Concrete
Test Method: ASTM C 311 / C 188

State of Nebraska
Department of Transportation
Materials and Research Division

Supplemental Cementitious Materials
SCM
ASTM C-311/C-188
Density Worksheet

Inspector _____ Month _____ /Year _____

Lab Identification	Material Type	Flask # 50±0.05g	Mass of Fly Ash	Initial Reading	Final Reading	Diff. F-1	Density M/D	Date

NDOT Form 143f, October 2017

DATE: 02-26-08
REVISED: 3-26-21 Do not perform this test for CCRL certification

Figure E6.20 – Lab Worksheet
Supplemental Cementitious Materials (SCM)
Autoclave Expansion

Laboratory: Cement and Concrete
Test Method: ASTM C 151

State of Nebraska
Department of Transportation
Materials and Research Division

Supplemental Cementitious Materials
SCM
ASTM C-151
Autoclave Expansion Worksheet
Cementitious Materials

Inspector _____ **Year** _____

Lab Identification	Cementitious Material	Water Req.	Act. Drop	Initial Reading	Final Reading	Expansion F-I	% Expansion E /10 x 100	Date

NDOT Form 143d October 2017

DATE: 02-26-08
REVISED: 3-26-21 Do not perform this test for CCRL certification

Figure E6.21 – Lab Worksheet
Supplemental Cementitious Materials (SCM)
Fineness of Hydraulic Cement 45-µm sieve (No. 325) Sieve

Laboratory: Cement and Concrete
Test Method: ASTM C 430

State of Nebraska
Department of Transportation
Materials and Research Division

Supplemental Cementitious Materials
SCM
ASTM C-430
Fineness of Hydraulic Cement Worksheet
45-µm Sieve (No. 325) Sieve

Inspector _____ Year _____

Lab Identification	Brand	Type	Sieve Id.	Sieve Correction Factor (C)	Mass Retained (R)	% Retained R_o R(C+100)	Date

NDOT Form 143a, October 2017