LEVEL I & II AGGREGATE INSTRUCTION TEXT

TECHNICAL TRAINING AND CERTIFICATION PROGRAM 2004 – 2005

Iowa Department of Transportation

Highway Division

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AGGREGATE GLOSSARY

Abrasion – The mechanical wearing away of aggregate particles by friction and impact.

Absorption – The condition when an aggregate absorbs moisture into it's pore system.

Aggregate – Granular construction materials composed of hard mineral particles, crushed or uncrushed, which are or can be properly sized for the use intended.

Bed – A layer of material that is geologically similar.

Coarse Aggregate – All particles which are retained on #4 (4.75mm) or larger sieves.

Contamination – When a foreign material is mixed with an aggregate.

Conveyor Belt Sampling – A method of sampling aggregate by placing a template on a stopped conveyor belt and removing the aggregate.

Degradation – The breakdown of an aggregate due to mishandling, or freeze/thaw cycles of material stockpiled over a winter.

Dense Graded Aggregate – Aggregates that contain a proportion of material in each particle size present so as to minimize the void spaces between particles.

Fine Aggregate – All particles which will pass through a #4 (4.75mm) sieve, and be predominately retained on the #200 (75µm) sieve.

Fineness Modulus – A calculation based on a sieve analysis test to determine the coarseness of sand. This test is also used by other states for various purposes.

Free Moisture - The moisture on the surface of aggregate.

Gap Graded Aggregate – Aggregates that contain a disproportionate amount of particles, nearly the same size, creating voids between the particles.

Gradation – The particle size distribution of aggregates determined by using sieves with square openings and expressed in percent retained or passing.

Instructional Memorandum (I.M.) – Documents published by the Iowa DOT Material's Department to explain test procedures, materials acceptance, inspection procedures and other material's specifications.

Laboratory Qualification Program (I.M. 208) – A program for qualification or accreditation of laboratories to comply with regulations.

Ledge – A group of beds at a source that are all removed together.

Non-proportioned Aggregate – An aggregate that is produced as the finished product.

Pit – An excavation of sand and gravel

Pore – The void system of an aggregate particle.

Proportioned Aggregate – An aggregate that will be mixed with other aggregate materials to make the finished product.

Pycnometer – A one or two quart jar supplied with a gasket and conical pycnometer top used for running specific gravity and moisture tests on aggregates.

Quarry – An open excavation from which rock is removed for construction purposes.

Random Sample – A sample that is not taken because of any particular reason or notion. All material produced should have an equal chance of being tested.

Representative Sample – A sample that is representative of the total of the material being tested.

Sample Splitter – A device used to reduce a field sample for testing.

Saturated Surface Dry – The condition of an aggregate particle containing all the moisture possible but dry on the surface.

Segregation – When aggregate is improperly handled and a variation of the gradation occurs. The finer material will normally congregate in the center of the pile and the larger particles will tend to roll to the outside of the pile.

Sieve Analysis – The separation of material based on particle size.

Specific Gravity – The ratio of the density of a material to the density of water.

Specification – A rule or limit that is to be followed when performing work for the Iowa DOT. There is a book of Highway Specifications with changes published twice a year as Supplemental Specifications.

Stockpile Sampling – A method of sampling fine aggregate by use of a sand probe or shovel.

Stream Flow Sampling – A method of sampling aggregate by intercepting the aggregate streamflow with a sampling device.

Zinc Chloride ($ZNCl_2$) – A chemical solution used to separate lightweight particles in aggregate samples by floatation.

COMMONLY USED ABBREVIATIONS

AASHTO – American Association of State Highway and Transportation Officials
Al_2O_3 – Aluminum Oxide
AB – Approved Brand
Abr. – Abrasion
Abs. - Absorption
ACI – American Concrete Institute
Agg. – Aggregate
AMC – Area Materials Coordinator
AS – Approved Source
CA – Coarse Aggregate
CDM – Concrete Design Mixture
Contr. – Contractor
Corr. - Correlation
CML – Central Materials Laboratory
DME – District Materials Engineer
DOT – Department of Transportation
Dur. – Durability
FA – Fine Aggregate
FM – Fineness Modulus
Frict. – Friction
F & T – Freeze and Thaw
HMA – Hot Mix Asphalt
IA – Independent Assurance
I.M. – Instructional Memorandum
Matls. – Materials
PCC – Portland Cement Concrete
PL – Plastic Limits
QA – Quality Assurance
QC – Quality Control
QMA – Quality Management of Asphalt
QMC - Quality Management of Concrete
RAP – Recycled Asphalt Paving
RCE – Resident Construction Engineer
SpG – Specific Gravity
SSD – Saturated Surface Dry
S & T – Sampling and Testing
TTCP – Technical Training and Certification Program
Verif. – Verification
Wt. - Weight
$ZnCl_2$ - Zinc Chloride

MEASUREMENTS

Metric
g – grams
kg – kilogram = 1000grams
mm – millimeter
μm – micrometer

English
oz. - ounce
lb. - pound
T. - Ton
in. - inch
ft. – foot

^{2} - squared
^{3} - cubed

ROUNDING & DECIMALS

Rounding is uniform throughout the certification training. You would look at the place to the right of the number you are rounding to and if it is 5 or above round up or 4 and below it remains the same.

Examples:

Rounding to whole numbers-
130.5 = 131 130.4 = 130 130.46 = 130

Rounding to tenths-
130.55 = 130.6 130.54 = 130.5 130.646 = 130.6

Rounding to hundredths-
130.555 = 130.56 130.544 = 130.54 130.5545 = 130.55

Rounding to thousandths-
130.5555 = 130.556 130.5544 = 130.554 130.55546 = 130.555

The following shows examples of where to round test answers:

Specific Gravity – hundredths – 2.623 = 2.62 2.768 = 2.77

Moisture – tenths – 2.67 = 2.7 0.55 = 0.6

Fineness Modulus – hundredths – 2.849 = 2.85 3.099 = 3.10

Coal, shale, clay, chert, iron – tenths - 0.56 = 0.6 0.71 = 0.7

TECHNICAL TRAINING & CERTIFICATION PROGRAM

GENERAL

The purpose of the Technical Training and Certification Program is to ensure Quality Control (QC)/Quality Assurance (QA) and Acceptance of Aggregates, Hot Mix Asphalt (HMA), Portland Cement Concrete (PCC), Grade Inspection, Precast and Prestressed Concrete, and Pavement Profiles and to ensure proper documentation of Quality Control/Quality Assurance and Acceptance procedures and test results by industry and contracting authority personnel.

This Instructional Memorandum (IM) explains the requirements to become certified and to remain certified to perform inspection and testing in the state of Iowa. This IM also describes the duties, responsibilities and the authority of persons assigned the position of Certified Technician in any of the above areas for construction or maintenance projects. Appendix C of this IM lists what tests and procedures the technician is qualified to perform for each level of certification they obtain.

Through a cooperative program of training, study, and examination, personnel of the construction industry, State DOT, and other contracting authorities will be able to provide quality management and certified inspection. Quality Control/Quality Assurance and Acceptance testing and inspection will be performed by certified personnel and documented in accordance with the IMs.

A technician who is qualified and holds a valid certification(s) shall perform quality control/quality assurance and acceptance at a production site, proportioning plant, or project site. Responsibilities cannot be delegated to non-certified technicians. The duties of a Certified Technician may be assigned to one or more additional Certified Technicians.

The Technical Training and Certification Program will be carried out in accordance with general policy guidelines established or approved by the Highway Division Director. A Board of Certification composed of the following members will advise the Director:

Director – Office of Materials
Director – Office of Construction
Representative of District Materials Engineers**
Representative of District Construction Engineers**
Representative of Associated General Contractors (AGC of Iowa)
Representative of Iowa Concrete Paving Association (ICPA)
Representative of Asphalt Paving Association of Iowa (APAI)
Representative of Iowa Ready Mixed Concrete Association (IRMCA)
Representative of Iowa Limestone Producers Association (ILPA)
Representative of County Engineers
Coordinator of Technical Training and Certification Program**

** Appointed by Program Director

The Director of the Office of Materials will be the Program Director. Coordinators will be appointed by the Program Director to assist in administration of the program and to handle such planning, administration, and coordinating functions as may be needed.

Appeals on actions taken in this program shall be submitted to the Program Director. Unresolved appeals will be submitted to the Certification Board.

TRAINING

The Iowa DOT will provide the training necessary to become certified or an agency approved by the Program Director. Producers/Contractors are encouraged to conduct their own pretraining program. A complete listing of training opportunities is available in the Technical Training and Certification Program's Information and Registration Booklet published each fall. This book is available at any of the Iowa DOT Materials Offices. They may also be obtained from the ICPA, IRMCA, ILPA, and APAI.

CERTIFICATION REQUIREMENTS

1. A candidate must attend instruction and pass the examination(s) for all levels of certification prepared and presented by the Program Director or someone designated by the Program Director. If the new candidate fails the examination, they will have one opportunity to retake the examination. The retake must be completed within 6 months of the original exam. If they fail the retake of the examination, they will need to attend the training again before taking the examination the third time. If an individual is recertifying they will have only one opportunity to take the examination. If they fail the examination they must take the applicable training before retaking the examination.

2. All prerequisites shall be met before the applicant may attend the next level of training for the certification desired. A listing of certification levels and prerequisites is located in Appendix A.

3. Once the candidate has met all the criteria and has received certification, it is recommended the Certified Technician work under the supervision of an experienced technician until they become efficient in the inspection and testing methods they will be performing.

   An individual requesting to become certified as a Precast/Prestress Concrete Technician is required to obtain forty hours of experience assisting in quality control inspection at an approved plant before certification will be issued. The experience must be documented and shall be approved by the District Materials Engineer. This experience must be completed within two years from the date the individual attended the training.

4. Registered professional engineers, engineering graduates, and geology graduates from accredited institutions will be exempt from the training requirement in the areas they have had instruction. In order to obtain certification for any technical level, these persons must pass all applicable tests for the level of certification they wish to obtain. All certificates issued in accordance with these requirements will be subject to the same regulations concerning expiration, recertification, etc., as applies to certificates obtained via training and examinations.

Out-of-state technicians will be issued certifications when the following criteria are met:

1. The applicant must be certified in another state or shall have received equivalent training, if the state does not have a certification program, in each level of certification they are requesting.

2. The applicant must pass an examination for each level of certification desired, which will be administered by the Iowa Department of Transportation. Failure of the examination shall require the applicant to take the applicable schooling before they can retake the exam.

3. The applicant must follow the prerequisite requirements of the Technical Training and Certification Program.

Out-of-state applications should be submitted to the District Materials Office closest to the home location of the applicant. Copies of all the applicant's certifications must accompany the application.

CERTIFICATION

Upon successfully completing the requirements for certification, the Program Director will issue a certificate and a pocket certification card. This certification is not transferable. A certification shall be valid for five years.

CERTIFICATION IDENTIFICATION

The certificate will contain letters that identify the District of record, the certificate holder, certification number, the level of certification, and the expiration date of each level.

The assigned certification number may change if the certificate holder changes their residence.

RENEWAL OF CERTIFICATION

A certification shall be valid through December 31st of the fifth year. A 90-day grace period will be allowed. If the individual has not renewed their certification within the 90-day grace period, they are automatically decertified. The individual may obtain certification by taking the examination for the level of certification they are requesting. If the individual does not take the examination within one year after they are decertified in any level of certification, they must retake all applicable schooling and pass the examinations. If an applicant becomes decertified in any level of certification, and that certification is a prerequisite for other levels of certification the applicant will also be decertified in those related levels of certification.

All Certified Technicians will be required to pass an examination in each level of certification they hold before recertification will be issued. Failure of any level shall require the applicant to retake the applicable schooling and pass the test.

The certificate holder shall be responsible for applying for certification renewal and for maintaining a current address on file with the appropriate District Materials Office.

Technicians certified as Level I HMA and/or Level II PCC shall attend a minimum of two update classes each in the five-year period between certification and each recertification. The Iowa DOT or an agency or organization approved by the TTCP will hold these classes. These update classes will be listed in the Technical Training and Certification Booklet, or the Certified Technician may contact the Iowa DOT for information. If an individual does not attend the two update classes required before their certification expires, they must take the entire schooling and pass the examination for the certification required.

The Certified Technician will not receive credit for the following:

1. More than one update per training season in each level of certification.
2. An update taken during the same training season in which the individual re-certified.

PERFORMANCE REQUIREMENTS

A written notice may be issued to the Certified Technician for any inadequacies performed during their duties. Upon receipt of two such notices, the Certified Technician may be given a three-month suspension. After receiving three notices, the Certified Technician is subject to decertification. An example of this notice is shown in Appendix B.

DECERTIFICATION

The certificate will become invalid for the following reasons:

1. Failure of the certificate holder to renew the certificate prior to regular expiration as described above.

2. Use of false or fraudulent information to secure or renew the certificate.

3. Use of false or fraudulent actions or documentation by the certificate holder.

4. Not performing tests and technician duties properly and in accordance to specifications.

FUNCTIONS AND RESPONSIBILITES

A certificate holder at each production site, project site, proportioning plant, or laboratory will perform duties. The Certified Technician shall perform quality control testing in accordance with specified frequencies and submit designated reports and records.

The specification requirement for materials testing by a Certified Technician does not change the supplier's responsibilities to furnish materials compliant with the specification requirements.

The District Materials Engineer and/or Project Engineer will be responsible for monitoring the sampling, testing, production inspection activities and quality control performed by the contractor. A monitor shall have satisfactorily completed the training and be certified for the level of technician they are monitoring.

The District Materials Engineer and/or Project Engineer will have authority and responsibility to question and where necessary, require changes in operations and quality control to ensure specification requirements are met.

QUALITY CONTROL, TESTING, AND DOCUMENTATION

The QC Technician shall be present whenever construction work related to production activity, such as stockpiling or other preparatory work, requires record development and/or documentation is in progress. The QC Technician's presence is normally required on a continuing basis beginning one or more days before plant operation begins and ending after plant shut down at the completion of the project. The work shall be performed in a timely manner and at the established frequencies.

The QC Technician's presence is not normally required during temporary plant shut downs caused by conditions, such as material shortages, equipment failures, or inclement weather.

All quality control activities and records shall be available and open for observation and review by representatives of the contracting authority.

Reports, records, and diaries developed during progress of construction activities will be filed as directed by the contracting authority and will become the property of the contracting authority.

Quality control activities, testing, and records will be monitored regularly by contracting authority representatives. The Project Engineer or District Materials Engineer will assign personnel for this function.

Monitor activities will be reported and filed at prescribed intervals with the Project Engineer, District Materials Engineer, producer, contractor, and the contractor's designated producer.

At no time will the monitor inspector issue directions to the contractor, or to the QC Technician. However, the monitor inspector will have the authority and responsibility to question, and where necessary, reject any operation or completed product, which is not in compliance with contract requirements.

ACCEPTANCE

Completed work will be accepted on the basis of specification compliance documented by acceptance test records, and monitor inspection records. Specification noncompliance will require corrective action by the producer, contractor, or by the contractor's designated producer, and review of events and results associated with noncompliance by the Project Engineer.

FEDERAL CODE 1020 and IOWA CODE 714.8

I.M. 213 discusses the Unsatisfactory Notice that Certified Technicians are given when they are not performing their job duties satisfactorily. This can be given for a number of reasons including, improper sampling and/or testing, not performing their duties and reporting in the time frame required, reporting incorrect information, etc. The technician is given one written notice, the second notice is three-month certification suspension, and the third notice is decertification. According to I.M. 213 the Certified Technician can automatically be decertified for false statements without going through the Unsatisfactory Notice procedure. The Certified Technician also needs to be aware of the false statement clause that is applicable to all federal-aid projects and the fraudulent practice clause that applies to all non-federal aid projects. **Certified Technicians need to read and be aware of U.S.C. 1020 and Iowa Code 714.8 since these do apply to them.** They read as follows:

FEDERAL AID PROJECTS

IX. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, the following notice shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

NOTICE TO ALL PERSONNEL ENGAGED ON FEDERAL-AID HIGHWAY PROJECTS
18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined not more than $10,000 or imprisoned not more than 5 years or both"

NON-FEDERAL AID PROJECTS

Iowa Code 714.8, subsection 3, defines fraudulent practices. "A person who does any of the following acts is guilty of a fraudulent practice. Subsection 3, Knowingly executes or tenders a false certification under penalty of perjury, false affidavit, or false certificate, if the certification, affidavit, or certificate is required by law or given in support of a claim for compensation, indemnification, restitution, or other payment." Depending on the amount of money claimed for payment, this could be a Class C or Class D felony, with potential fines and/or prison.

The above codes refer to the individual making the false statement. **Standard Specification Article 1102.03, paragraph C. section 5 refers to the Contractor.**

Article 1102.03, paragraph C, section 5 states, "A contractor may be disqualified from bidder qualification if or when: The contractor has falsified documents or certifications, or has knowingly provided false information to the Department or the Contracting Authority."

CERTIFICATION LEVELS

CERTIFCATION LEVEL	TITLE	PRE-REQUISITES
	AGGREGATE	
Level I Aggregate	Certified Sampling Technician	None
Level II Aggregate	Certified Aggregate Technician	Level I Aggregate
	PORTLAND CEMENT CONCRETE	
Level I PCC**	PCC Testing Technician	None
Level II PCC	PCC Plant Technician	Level II Aggregate & Level I PCC
Level III PCC	PCC Mix Design Technician	Level II PCC

**American Concrete Institute (ACI) Grade I certification will be acceptable as a portion of the Level I PCC training.

CERTIFCATION LEVEL	TITLE	PRE-REQUISITES
	HOT MIX ASPHALT	
Level I HMA	HMA Technician	Level II Aggregate
Level II HMA	HMA Mix Design Technician	Level I HMA
	PROFILOGRAPH	
Profilograph	Profilograph Technician	None
	PRESTRESS	
Prestress	Prestress Technician	Level I PCC or ACI Grade I *If the technician will be performing gradations, they will need to be Aggregate Level II certified.*

UNSATISFACTORY PERFORMANCE NOTICE

Issued To: ______________________________ Date: ____________________

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This notice is to inform you that your performance as a Certified Inspector/Technician was unsatisfactory for the reason(s) listed below. After receipt of two such notices you may be given a three-month suspension. After three notices, you are subject to decertification.

This notice will be placed in your permanent file with the District Materials Office in which you reside. It will also be placed on the statewide computer file.

The goal of the Technical Training and Certification Program (TTCP) is to work with contractors, producers, cities, and counties to continually improve the quality of Iowa's construction projects. We hope you will work with us to achieve this goal.

Unsatisfactory Performance:

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District Materials Engineer

cc: Program Director – Materials Engineer Ames
TTCP Coordinator
Resident Construction Engineer

CERTIFIED TECHNICIANS QUALIFICATIONS

Tests and Procedures the Certified Technician is qualified to perform for each level of certification.

LEVEL I AGGREGATE

- IM 204 - Inspection of Construction Projects Sampling and Testing (when material is incorporated)
- IM 209 Appendix C - Aggregate Specification Limits and Sampling and Testing Guide (when material is produced)
- IM 301 - Aggregate Sampling Methods

LEVEL II AGGREGATE

- IM 216 - Guidelines for Verifying Certified Test Results
- IM 302 - Method of Test Sieve Analysis of Aggregates
- IM 306 - Method of Test to Determine the Amount of Materials Finer Than the #200 Sieve in Aggregate
- IM 307 - Method of Test Specific Gravity of Aggregates
- IM 308 - Method of Test Determination of Free Moisture and Absorption of Aggregates
- IM 336 - Methods of Reducing Aggregate Field Samples to Test Samples
- IM 344 - Method of Test for Determination of the Amount of Shale in Fine Aggregate
- IM 345 - Method of Test for Determination of the Amount of Shale in Coarse Aggregate

LEVEL I PCC

- IM 204 - Inspection of Construction Projects Sampling and Testing
- IM 208 - Materials Laboratory Qualification Program
- IM 216 - Guidelines for Verifying Certified Test Results
- IM 315 - Making and Testing Concrete Cylinders
- IM 316 - Flexural Strength of Concrete
- IM 317 - Slump of Portland Cement Concrete
- IM 318 - Air Content of Mixed Concrete by Pressure
- IM 327 - Sampling Concrete for Slump, Air, and Strength
- IM 328 - Making, Protecting, and Curing Concrete Flexural Specimens
- IM 340 - Weight Per Cubic Foot, Yield, and Air Content of Concrete
- IM 383 - Testing the Strength of PCC Using the Maturity Method
- IM 385 - Temperature of Freshly Mixed Concrete
- IM 525 - Method of Designing Flowable Mortar
- Iowa 410-B - Method of Test for Flow of Grout Mixtures
- AASHTO T 97 - Third Point Loading

AGGREGATE TECHNICIAN DUTIES

Duties of the Aggregate Technician are detailed in IM 209 and IM 300 Series and consist of, but are not limited to, the following:

A. Sampling

  1. Obtain representative samples by approved method(s).
  2. Sample at required frequencies.
  3. Identify samples with pertinent information such as:
     a. Type of material
     b. Intended use
     c. Production beds working depth
     d. Sampling method

B. Gradation testing

  1. Follow appropriate gradation testing methods.
  2. Maintain current applicable specifications.
  3. Post test results within 24 hours of sampling.

C. Other testing as required (specific gravity, moisture, deleterious material, etc.)

  1. Follow appropriate testing methods.
  2. Maintain current applicable specifications.
  3. Complete required reports.

D. Sampling and testing equipment

  1. Clean and check testing sieves for defects.
  2. Assure scale accuracy.
  3. Maintain sampling and testing equipment.

E. Communication

1. Notify Materials Department for production start-up or changes.
2. Relay test results to appropriate production or supervisory personnel.
3. Report failing test results immediately to appropriate personnel (including Materials Department) and assure remedial actions are taken.

F. General

1. Monitor stockpiling procedures to avoid contamination and excess segregation.
2. Assure proper identification of stockpiles
3. Assure specification requirements for intended use are met before shipment.
4. Assure sampling locations are safe.
5. Assure proper bedding planes or production depths are maintained.

G. Documentation

1. Report all production test results of certified aggregates on form #821278 and distribute as required.
2. Assure "plant production log" is maintained.

PORTLAND CEMENT CONCRETE (PCC) TECHNICIAN DUTIES
PAVING AND STRUCTURAL CONCRETE

The Quality Control Technician shall have no other duties while performing certified inspection duties. The District Materials Engineer may approve all Quality Control activities be performed by a single Certified Technician for low production situations.

Many of the duties of the PCC Level II Technician are detailed in IM 527 (Paving) and IM 528 (Structural) and consist of, but are not limited to, the following:

H. Stockpiles

1. Assure proper stockpiling procedures.
2. Prevent intermingling of aggregates.
3. Prevent contamination.
4. Prevent segregation.

I. Plant Facilities

1. Assure safe sampling locations.
2. Check for equipment compliance.
3. Assure proper laboratory location and facilities.

J. Calibration

1. Be present during calibration (paving).
2. Check plant calibration (structural).
3. Assure proper batch weights.

K. Cement (Fly Ash) and Aggregate Delivery

1. Check for proper sources and certification.
2. Document quantities delivered.
3. Monitor condition of shipments.

L. Plant Sampling

1. Check aggregate gradations by obtaining, splitting, and testing samples.

2. Check aggregate moistures and specific gravity.

M. Proportion Control

1. Check scale weights and operation.

2. Check admixture dispensers.

3. Check mixing time and revolutions.

4. Check cement yield. (Paving plant only unless over 10,000 cu. yds.)

N. Concrete Tests

1. Cure flexural test specimens.

2. Test flexural specimens (Contract agency will perform test in structural plant).

3. Conduct maturity testing.

O. Test Equipment

1. Clean and maintain scales, screens, pycnometers and beam molds, and laboratory facility.

P. Documentation

1. Prepare daily plant reports (paving), weekly plant reports (structures).

2. Document all checks and test results in the field book.

3. Maintain daily diary of work activity.

HOT MIX ASPHALT (HMA) TECHNCIAN INSPECTION DUTIES

The Quality Control Technician shall have no other duties while performing certified inspection duties. The District Materials Engineer may approve all Quality Control activities be performed by a single Certified Technician for low production situations.

Many of the duties of the Hot Mix Asphalt Technician are detailed in IM 508 and 511. These duties consist of, but are not limited to, the following:

A. Stockpiles

1. Assure proper stockpiling
2. Prevent intermingling of aggregates.
3. Prevent contamination.
4. Prevent segregation.
5. Document certified aggregate deliveries.

B. Plant Erection

1. Assure safe sampling locations.
2. Check specification compliance.
3. Check for proper laboratory location.

C. Calibration

1. Be in possession of appropriate mix design data.
2. Be present at the calibration.
3. Assure proper procedures being followed.
4. Obtain and/or record calibration data.
5. Check for proper gate settings.

D. Asphalt Delivery

1. Check for proper source and certification
2. Document deliveries.
3. Document quantities by tank stick, weighing, or metering.
4. Monitor Temperature

E. Plant Sampling

1. Check cold-feed gradation by obtaining, splitting, and testing samples.
2. Obtain asphalt binder samples.
3. Test aggregate moisture.

F. Mix Control

1. Monitor coating of aggregates.
2. Monitor and record mix temperature.
3. Monitor and record asphalt binder temperature.
4. Check trucks for proper loading and possible segregation.
5. Monitor mixing time.
6. Monitor recycle proportions.

G. Weights

1. Observe scale calibrations.
2. Check for specification compliance.
3. Regularly check calibrations.

H. Testing

1. Core testing*.
    a. Determine field density and percent voids of compacted mix.
    b. Calculate quality index for density and thickness when required.

2. Uncompacted mix

    a. Bulk specific gravity of laboratory-compacted specimen

    b. Maximum specific gravity

    c. Calculate voids, VMA, film thickness.

I. Documentation

1. Prepare Daily Plant Inspection Report.

2. Document all checks and test results in field book.

3. Maintain a daily diary of work activity.

4. Moving averages

5. Control Charts

*On projects where the contractor is not responsible for the Quality Control testing, then the agency is responsible for core testing functions.

PRESTRESS TECHNICIAN DUTIES

Duties of the Prestress Technician are detailed in IM 570 and consist of, but are not limited to, the following:

A. Pre-pour

1. Identify and document materials requiring outside fabrication inspection.
2. Identify potential fabrication or production problems and notify Iowa DOT inspectors.
3. Verify that all materials incorporated meet the requirements of the contract documents.
4. Review concrete placement documents for strand locations.
5. Check tension calculations.
6. Measure elongation and gauge pressure during tensioning.
7. Check hold down and insert locations.
8. Check stress distributions.
9. Check steel reinforcement and placement.
10. Check strand position.
11. Check condition of pallet.
    a. Level
    b. Holes
    c. Gaps
    d. Other deformities
12. Determine moisture of aggregates.
13. Check form condition and placement.
    a. Oil
    b. Line alignment level
    c. Tightness

B. Concrete Placement

1. Check on use of an approved mix design and batching operations (sequence).
2. Assure appropriate placement and proper vibration techniques.
3. Measure and record concrete temperature.
4. Assure test cylinders are properly made.
5. Assure appropriate finish.
6. Assure appropriate curing operations.

C. Post-pour

1. Check temperature and record during curing process.
2. Assure concrete strength has been met prior to releasing the line.
3. Assure proper detensioning procedure.
4. Check unit for defects and obtain approval for repairs.
5. Identify and store cylinders with the respective units.
6. Check beam ends for fabrication in accordance with the plans.
7. Assure exterior sides of facia beams are grouted.
8. Inspect after patching and desired surfacing.
9. Measure and record overall dimensions of beam.
10. Measure and record camber at release and compare to design camber.
11. Check and/or measure and record lateral sweep before shipping.
12. Assure proper cylinder cure.

PROFILOGRAPH TECHNCIAN DUTIES

Duties of the Profilograph Technician are detailed in IM 341 and consist of, but are not limited to, the following:

A. Test pavement for smoothness criteria

B. Evaluate and certify test results

   1. Certified person that reduces trace must sign certified test report

   2. Profilograms become part of permanent project record

C. Documentation

   1. Certified Profilograph test report must include following statement:

      This is to certify that all testing and trace reduction herein described has been performed according to applicable contract specifications and requirements.

CERTIFIED AGGREGATES APPROVED PRODUCER PROGRAM

GENERAL

This IM deals with requirements for furnishing certified aggregate and the approved producer program.

In order to furnish certified aggregates to projects, an aggregate producer shall be on the approved aggregate producer listing (Appendix B, attached). This will also apply to recycled product yards and/or processors. The specific requirements, including the details of the required quality control program are in Appendix A (attached).

Specification limits for aggregates being produced are found in Appendix C and D. For complete details on aggregate quality and gradation requirements, refer to the appropriate referenced specification.

Non-compliance to the approved Producer Quality Control Program shall constitute grounds for the source and/or producer to be placed on conditional status by the District Materials Engineer. Continued non-compliance will be considered sufficient grounds to remove the producer from the Approved Producer List.

An Aggregate Review Board will meet, as needed, for disciplinary actions and appeals involving approved producers.

The Aggregate Review Board shall consist of:

- The State Materials Engineer
- The Chief Materials Geologist

The prime contractor or a contractor-authorized representative (the producer) shall be responsible for source product Quality Control.

Aggregate source testing will be performed and documented in accordance with this Instructional Memorandum by persons qualified in accordance with the provisions of IM 213.

The tests will be called certified tests and the aggregate represented will be called certified aggregate.

Source gradation tests will be considered advisory when the aggregate acceptance is determined by sampling and testing, on the project, in accordance with IM 204. The advisory tested group will hereinafter be called proportioned aggregates. For all other aggregates, source gradation tests may be considered the basis of acceptance.

The minimum frequency of gradation tests at the source for proportioned aggregates shall be 1/1500 tons during production. For all other aggregates (non-proportioned), the minimum rate of sampling and testing at the time of production shall be 1/3000 tons.

Sampling and testing duties described in this Instructional Memorandum shall not be delegated to non-certified technicians.

SAMPLING, TESTING AND DOCUMENTATION

Gradation sampling, testing, and documentation of certified aggregates, at the source, shall be the responsibility of the aggregate producer or supplier. Quality sampling, testing, and documentation of certified aggregates shall be the responsibility of the IDOT Area Inspector.

Certified source testing shall be performed at frequencies as outlined in this IM utilizing the procedures contained in Materials IM Series 300. Additional certified gradation testing may be required at the time material is shipped to a project, for a stockpiled material carried through a winter season, or if there is evidence of segregation, contamination, or degradation. When additional certified testing of stockpiled material is required, the testing shall be at a frequency of at least one per 6000 Mg (tons). Bins or other means of securing representative samples shall be furnished for the sampling of stockpiled material.

Source quality will be determined by testing samples secured by District Materials personnel. This will not relieve the producer or supplier of their responsibility for quality of the material. It is recommended that a Producer Quality Control program include Quality Control testing to assist with ledge control and pit quality. Such tests may include: specific gravity (Materials IM 307), clay lumps and friable material (Materials IM 368), or shale in fine aggregate (Materials IM 344).

If historic data from a source indicate that quality test results approach or exceed specification limits the engineer may require specific data be provided by the aggregate producer or supplier to the IDOT (obtained by qualified persons and procedures). These data may include those tests listed above. When required, the additional Quality Control testing shall be at a minimum frequency of one sample per 12,000 ton or one sample per month whichever provides the higher frequency of testing.

The quality of the material produced shall be determined before shipment to a project.

Not less than 24 hours before start up, or as soon as possible for a production change, the appropriate District Materials Engineer shall be notified. The notification shall include the estimated daily production and total production, the intended use (project or warehouse stock), production ledge(s) if applicable, and responsible person(s). Failure to notify may result in additional quality sampling and testing, or rejection of the material.

All producer test results performed on certified aggregates, whether compliant or non-compliant, shall be promptly reported to the District Materials Engineer on Form #821278. These reports shall indicate whether the aggregate is being produced for direct project delivery, stockpiling for a specific project, or for advance warehouse stock.

Selected production limits shall be included on Form #821278.

Production limits for aggregate produced for use in HMA or PCC mix designs are generated by the contractor and supplied to the aggregate producer on Forms #955 and #955QMC respectively.

CERTIFIED AGGREGATE DELIVERY DOCUMENTATION

Documentation may be accomplished by numbered truck ticket, transfer list or shipment statement (such as Form #821278), or by a bill of lading (for rail or barge shipments). The certified documentation shall be furnished to project inspection personnel or receiving contractor before material is incorporated.

- For aggregates as bid items measured by mass (weight), the certified truck tickets shall be numbered and include signatures or initials in accordance with Article 2001.07.
- In the case of shipment by rail or barge, the documentation shall be sent to the project engineer and receiving contractor or ready mix operator no later than the same day as shipment source departure. The documentation shall include the rail car or barge number(s).
- Documentation not having an exact mass (weight) shall include an estimated quantity (i.e. transfer listings or Form #821278, etc.).
- Summary quantity documentation shall also be provided for non-proportioned aggregates. The summary documentation shall be signed, include the type of material and source, the total quantity, and the project number.

The following certification statement is required to be on the document used to certify the material being delivered (i.e. truck ticket, Form #821278, etc.): "**This is to certify the material herein described meets applicable contract specifications.**" **NOTE:** This certification statement shall be signed or initialed by an authorized representative of the aggregate supplier.

To ensure proper identification of delivered aggregates, the following additional information is required on the certification document:

Proportioned Aggregate:

PCC Aggregate: Gradation number, quantity, source name or T203A number, production beds (for quarried stones) and the delivery date. **NOTE:** For aggregate being delivered for use in a Concrete Design Mixture (CDM), the product size is required in lieu of the Iowa DOT gradation number.

HMA Aggregate: Product size, quantity, source name or T203A number, production beds (for quarried stones), the delivery date and project number. **NOTE:** The project number is preferred when practical, as in the case of shipping to a paving plant site, but not required when shipping to a plant or ready mixed concrete plant supplying material to multiple projects.

Non-proportioned Aggregate

Iowa DOT gradation number, project number, quantity, source name or T203A number and the delivery date. **NOTE:** Documentation for revetment stones shall include production beds.

MONITORING OF CERTIFIED AGGREGATES

The District Materials Office will be responsible for monitoring of sampling and testing of aggregates for gradation by the certified technician.

Monitor inspection samples are secured from aggregate being produced for a project, reserved stockpiles or stockpiles for intermittent project usage.

Monitor Sampling for Quality Testing shall be performed at the following minimum frequency:

- One per 12,000 Mg (tons)
  or
- If monthly production is greater than 12,000 Mg (tons), the minimum sampling frequency is one per month.

Monitor sampling for Gradation Testing may be independent samples or proficiency (split-bucket) samples for comparison testing in accord with IM 216. Sampling shall be performed at the following minimum frequency:

- Proportioned aggregates: one per 18,000 Mg (tons) representing the various products made.

- Non-proportioned aggregates: one per 36,000 Mg (tons) representing the various products made.

NOTE: the District Materials Engineer may adjust these sampling frequencies. Monitoring of certified gradation testing may be waived when a product quantity is less than 2000 Mg (tons).

Periodic evaluation of certified technicians will be performed by the District Materials Representative and kept on file. Correlation (split-bucket) sample results will be compared per IM 216.

At no time will the District Materials Office representative issue directions to the producer. However, the representative will have authority and responsibility to question and where necessary reject any operation, which is not in accordance with the Specifications, Special Provisions, and Instructional Memorandums.

REHANDLING OF CERTIFIED AGGREGATES

When certified aggregates are rehandled the District Materials Engineer shall be notified and afforded the opportunity to monitor the re-handling procedure.

For the purpose of this IM, re-handling is meant to include the physical unloading and reloading of aggregate at a temporary storage site before the aggregate is delivered to its final destination. Rehandled certified aggregates may be required to be re-tested, with or without re-weighing, and re-certified on a numbered shipment ticket with proper identification and certification statement.

ACCEPTANCE

In the case of proportioned aggregates, acceptance tests will be performed on samples obtained at the proportioning plant in accordance with Construction Procedures and Instructions Manual Section 3.22 and Office of Materials Instructional Memorandums 204 and 213.

Certified aggregate may be incorporated into a project on the basis of the certified truck ticket, certified bill of lading, shipment listing, certified transfer listing or Certified Gradation Test Report (Form #821278). When the material represented is non-proportioned aggregate, the project number must be on the certified document and a copy furnished for project inspection personnel. When the aggregate represented is proportioned aggregate, the project number is preferred when practical, as in the case when shipping to a paving plant site, and not required when impractical, as in the case when shipping into warehouse stock at a ready mix plant. A file of certified shipment or transfer documents for proportioned aggregate will be maintained by the contractor or ready mix operator and made available for inspection at each plant or project site during the project period. Project inspection personnel shall verify that all material incorporated in the project is properly certified and document this verification and quantity on each of the appropriate daily or periodic construction reports. No other project documentation for the incorporated aggregate is required.

Documentation procedures for asphalt and concrete paving plants that have multiple project and commercial mix responsibilities would function in the same manner as described above for ready mix plants.

Acceptance of non-proportioned aggregates will be based on proper certification and on visual examination by the contracting authority to ensure against obvious contamination or segregation.

Minor quantities of non-critical aggregates may be visually inspected by the contracting authority and recorded in the project field book. Quantities less than 200 Mg (ton) are considered minor. An example of a non-critical aggregate is a non-proportioned aggregate such as granular backfill material for bridge abutments.

GUIDELINES FOR AGGREGATE PRODUCER QUALITY CONTROL PROGRAM

GENERAL

This appendix contains the minimum requirements for the producer Quality Control Program in order to become an approved aggregate producer.

Producers must submit a written application to their District Materials Engineer (DME) for review and approval.

Quality Control Programs for recyclers will describe procedures for receiving, sorting and managing stockpiles of reclaimed materials intended to be processed into certified aggregates.

NOTE: Producers with operations in more than one District shall apply to each District Materials Engineer where certified material production exists or is anticipated. The applications are available from the DME Offices and the Iowa Limestone Producers Association (ILPA) office. (A sample application is attached.)

DEFINITIONS

The following definitions apply to the Quality Control Program guidelines:

Source - Any location aggregate is produced at or shipped from on a certified basis (e.g., quarries, pits, project sites, recycle yards, terminal locations, portable production operation, etc.).

Conditional Status - This is a written notice from the District Materials Engineer to a producer that certified aggregates will no longer be accepted from a particular source. Application of Conditional Status may vary depending upon situation or specific circumstances. The Conditional Status may apply only to a production operation and aggregate produced by that operation. In other situations, when the deficiency is more widespread, the Conditional Status may apply to an entire company or division within a company until the problem is resolved. In the case of portable production operations, Conditional Status shall apply to the specific production operation regardless of source location, and shipment of aggregate previously produced by the affected production operation may be placed on Conditional Status when warranted.

GUIDELINES FOR AGGREGATE PRODUCER QUALITY CONTROL PROGRAM

1. Aggregate Certification

   The producer has the overall responsibility of certifying that material being placed in the certified stockpile is produced under and conforms to the Aggregate Certification Program, and the producer Quality Control (QC) Program. The Iowa DOT, through its monitoring activities (sampling/testing, visual observation, etc.), will verify the continued compliance to the program.

2. Knowledge of Current Specifications

   The producer Quality Control representative(s) must maintain up-to-date knowledge of the specifications that apply to aggregate products currently being produced at the source. The producer representative shall have available, at the testing lab, a copy of the current Standard Specifications, all applicable Supplemental Specifications and all applicable Instructional Memorandums (IMs) for aggregate inspection, as well as a current geological section, if applicable. The producer will be aware of any Special Provisions, which change current aggregate specifications. This applies to both quality and gradation requirements. The producer shall be responsible for providing these up-to-date publications to their QC representative.

3. Plant Production Log

   The producer is required to maintain a plant production log when producing under the program. This production log shall detail, on a daily basis, samples taken, pass/fail results, corrective actions, plant/ledge changes, etc. The log must be kept at a designated location and be readily available to the Iowa DOT representative for review.

4. Visual Inspection

   The producer is responsible for visually inspecting the aggregate source process on a frequent basis. Visual inspection can be defined as observing the processing or production area, as well as the condition of the aggregate in the flow stream or stockpiles. This visual inspection does not take away from actual testing, but enhances the inspection to ensure quality aggregates. It is the responsibility of the producer Quality Control representative to observe the overall operation to detect segregation, degradation, and contamination that are detrimental to the quality of the product.

5. Quality Requirements

   Any certified stockpile must meet the designated quality before shipment. The producer is responsible for supplying material meeting all quality requirements. Intentional shipment of untested or out of specification material will constitute grounds for immediate rejection of material and placement of the source and/or the producer on conditional status. The producer Quality Control representative will obtain and maintain quality information on specific ledges, production methods, and certified stockpiles for each source.

6. Production Notification

   Twenty-four hours before startup or as soon as possible for production change, the appropriate Area Materials Coordinator (AMC) or District Materials Engineer (DME) shall be notified. Failure to notify may result in material rejection or resampling of the stockpile. Notification shall include the estimated intended tonnage to be produced, estimated daily production rate, intended use (e.g., project information or warehouse stock), and if applicable, production ledges, and responsible person(s).

7. Production

   A. The producer shall establish gradation production limits for each material to be certified to help ensure a product that is uniformly graded and meets specifications at the time of use.

1. Gradation production limits shall apply to individual products within each source and be maintained for each stockpile.

2. Gradation production limits are subject to review, only, by the AMC or DME.

3. Repeated non-adherence to the producer established gradation production limits require stockpile sampling and testing by the producer.

B. Testing and Reporting

1. Minimum test frequencies as per IM 209, Appendix C

2. Test results will be known before delivery when the product is being shipped to a project.

3. All test results will be available at a designated location within 24 hours of sampling when the material is being placed into a certified stockpile.

4. Report gradation test results to DME and contractor, when applicable, on Form #821278.

C. Maintaining Ongoing Quality Control Procedures

1. Proper ledge control and/or control of stockpiles of reclaimed PCC and HMA intended for recycling into certified aggregates.

2. Equipment (production and testing)

3. Stockpiling procedures

4. Proper stockpile identification (signing, stockpile maps, etc., as required).

8. Delivery

A. Stockpile identification to ensure delivery from proper stockpiles

B. Visual inspection for contamination, segregation, etc.

C. Stockpile gradation resampling may be required.

D. Proper identification and certification of delivered aggregate as per IM 209

E. Maintain ongoing QC procedures.

F. Report tonnage to the AMC when requested.

9. Quality Control Structure

In order to ensure quality as a priority, the producer Quality Control personnel will have a line of communication directly to their management, as well as their production operation.

AGGREGATE PRODUCER APPROVAL APPLICATION

Company Name ____________________
Address ____________________
(IF MORE THAN ONE; i.e., Regional Offices, etc., PLEASE ATTACH LIST AND AREA COVERED.)

1. Are copies of current applicable specifications, aggregate testing IMs and source information data such as geologic sections available at the respective sources or testing facilities? (Yes or No) If No, explain.
   ____
2. Is a plant production log maintained on a daily basis and available for inspection? (Yes or No) If No, explain. ____________________
3. Who (position) is responsible for production notification to the Area Materials Coordinator?
   ____
4. Which company representative (position) is normally responsible for daily overall Quality Control processes at the source? ____________________
5. Describe the certified stockpile identification system in place at each source (Map, signing, etc.)
   ____
6. Please attach a detailed summary of your Quality Control Program. (**<u>NOTE</u>:** Please refer to Guidelines for Required Aggregate Producer Quality Control Program.)
7. Please attach a flow chart of your current Quality Control structure (Include names, addresses, phone numbers of appropriate management personnel, chain of command, etc., for problem resolution).

Indicate the District(s) for which you are seeking approval.

1 2 3 4 5 6

AUTHORIZED SIGNATURE ____________________ DATE ____________

DME RECOMMENDATIONS ____________________
____

DME SIGNATURE ____________________ DATE ____________
APPROVAL (YES or NO) REMARKS ____________________
____

MATLS. ENGINEER SIGNATURE ____________________ DATE ____________

APPROVED AGGREGATE PRODUCERS

This appendix lists the approved aggregate producers and the Districts to which the producer has applied.

PRODUCER	APPROVED DISTRICTS
A-Line Crushing Service Waterloo, IA	DISTRICT 1, DISTRICT 2, DISTRICT 3, DISTRICT 4, DISTRICT 5, DISTRICT 6
Acme Fuel & Materials Company Muscatine, IA	DISTRICT 5
Aggregate Materials Company Dubuque, IA	DISTRICT 6
Aggregates, Inc. Cedar Rapids, IA	DISTRICT 6
Anderson Sand & Gravel Company De Witt, IA	DISTRICT 6
Arcadia Limestone Company Arcadia, IA	DISTRICT 1
Bard Concrete Dyersville, IA	DISTRICT 6
Basic Materials Corporation Waterloo, IA	DISTRICT 2
Becker Gravel Company, Inc. Stratford, IA	DISTRICT 1, DISTRICT 2, DISTRICT 3, DISTRICT 4
Bedrock Gravel Company Auburn, IA	DISTRICT 3
Bellco of Nebraska, Inc. Council Bluffs, IA	DISTRICT 4
Bellevue Sand & Gravel Company Bellevue, IA	DISTRICT 6
Blazek Corporation Lawler, IA	DISTRICT 2

PRODUCER	APPROVED DISTRICTS
Boggess Construction Company Estherville, IA	DISTRICT 3
Boyer Sand & Rock, Inc. Hawarden, IA	DISTRICT 3
Brockman Mgt., LLC, dba Brockman Sand Co. Ft. Madison, IA	DISTRICT 5
Bruening Rock Products, Inc./Skyline Const., Inc. Decorah, IA	DISTRICT 2, DISTRICT 5, DISTRICT 6
Builders Sand & Cement Company Davenport, IA	DISTRICT 6
C.J. Moyna & Sons, Inc. Elkader, IA	DISTRICT 1, DISTRICT 2, DISTRICT 3, DISTRICT 4, DISTRICT 5, DISTRICT 6
Central Stone Company #1 Hannibal, MO	DISTRICT 5
Cessford Construction Company Burlington, IA	DISTRICT 5
Cessford Construction Company Le Grand, IA	DISTRICT 1
Cohrs Construction, Inc. Spirit Lake, IA	DISTRICT 3
Concrete, Inc. Gifford, IA	DISTRICT 1
Concrete Materials Sioux Falls, SD	DISTRICT 3
Conreco, Inc. Omaha, NE	DISTRICT 4
Coots Materials Company Vinton, IA	DISTRICT 6
Corell Recycling - A Div. of Corell Contractor, Inc. Des Moines, IA	DISTRICT 1

PRODUCER	**APPROVED DISTRICTS**
Crawford Quarry Company Cedar Rapids, IA	DISTRICT 6
Croell Redi Mix Sumner, IA	DISTRICT 2
Dave's Sand & Gravel, Inc. Everly, IA	DISTRICT 3
Douds Stone, Inc. Ottumwa, IA	DISTRICT 5
Estherville Sand & Gravel Company Estherville, IA	DISTRICT 3
Falk, L. R. Construction Company St. Ansgar, IA	DISTRICT 2
Flewelling Sand & Gravel Moville, IA	DISTRICT 3
Fred Carlson Company, Inc. Decorah, IA	DISTRICT 1, DISTRICT 2
Ft. Calhoun Stone Company Blair, NE	DISTRICT 3, DISTRICT 4
Fort Dodge Asphalt Company Fort Dodge, IA	DISTRICT 1
Gehrke Quarries, Inc. Gifford, IA	DISTRICT 1
Gray Quarry, Inc. Hamilton, IL	DISTRICT 5
Greene Limestone Company Charles City, IA	DISTRICT 2
Hahn Ready Mix Muscatine, IA	DISTRICT 5
Hallett Materials Des Moines, IA	DISTRICT 1, DISTRICT 3, DISTRICT 4
"Hank" Stalp Gravel Company West Point, NE	DISTRICT 3

PRODUCER	**APPROVED DISTRICTS**
Heartland Asphalt, Inc. Mason City, IA	DISTRICT 2
Heckett MultiServ Wilton, IA	DISTRICT 5
Heckett MultiServ West Sterling, IL	DISTRICT 6
Heimes Excavating & Utilities Co. Omaha, NE	DISTRICT 3, DISTRICT 4
Higman Sand & Gravel Akron, IA	DISTRICT 3
Ideal Sand Co. aka Ideal Ready Mix Co., Inc. West Burlington, IA	DISTRICT 5
Iron Mountain Trap Rock Company Iron Mountain, MO	DISTRICT 5
J.W. Ready Mix & Construction Sac City, IA	DISTRICT 3
Kerford Limestone Company Weeping Water, NE	DISTRICT 4
Knocks' Building Supplies Parkersburg, IA	DISTRICT 2
Kruse Paving, Inc. Lakefield, MN	DISTRICT 3
Kruse Rock & Gravel Milford, IA	DISTRICT 3
Kuhlman Construction Company Colesburg, IA	DISTRICT 6, DISTRICT 2
L.G. Everist, Inc. Sioux Falls, SD	DISTRICT 3
L & M Sand & Gravel, Inc. LeMars, IA	DISTRICT 3

PRODUCER	**APPROVED DISTRICTS**
L & W Quarries Centerville, IA	DISTRICT 5
LaHARV Construction Company, Inc. Forest City, IA	DISTRICT 2, DISTRICT 3
Lessard Contracting, Inc. Sergeant Bluff, IA	DISTRICT 3
Linwood Mining & Minerals Corporation Davenport, IA	DISTRICT 5, DISTRICT 6
Lounsbury West Des Moines, IA	DISTRICT 1
Lyman-Richey Sand & Gravel Company Omaha, NE	DISTRICT 3, DISTRICT 4
Lundell Construction Co., Inc. Storm Lake, IA	DISTRICT 3
Mallard Sand & Gravel Company Valley, NE	DISTRICT 3, DISTRICT 4
Manatt's, Inc. Brooklyn, IA	DISTRICT 1, DISTRICT 2, DISTRICT 3, DISTRICT 4, DISTRICT 5, DISTRICT 6
Manatt's Sand & Gravel, Inc. Tama, IA	DISTRICT 1, DISTRICT 2, DISTRICT 6
Marengo Ready Mix, Inc. Marengo, IA	DISTRICT 6
Martin Marietta Aggregates Des Moines, IA	DISTRICT 1, DISTRICT 2, DISTRICT 3, DISTRICT 4, DISTRICT 5, DISTRICT 6
Martin Marietta Aggregates Valley, NE	DISTRICT 4, DISTRICT 5
MatX, Inc. Colorado Springs, CO	DISTRICT 6
Mielke's Quarry McGregor, IA	DISTRICT 2

PRODUCER	**APPROVED DISTRICTS**
Moberly Stone Company Moberly, MO	DISTRICT 5
Molo Sand & Gravel Dubuque, IA	DISTRICT 6
Myrl & Roy's Paving, Inc. Sioux Falls, SD	DISTRICT 3
New Ulm Quartzite Quarries, Inc. New Ulm, MN	DISTRICT 2
Norris Aggregates Company Cameron, MO	DISTRICT 4, DISTRICT 5
North Iowa Sand & Gravel, Inc. Mason City, IA	DISTRICT 2
Northwest Materials Fort Dodge, IA	DISTRICT 1
NorthWest Ready-Mix Concrete, Inc. Ocheyedan, IA	DISTRICT 3
NUAggregates Akron, IA	DISTRICT 3
Ortonville Stone Company Ortonville, MN	DISTRICT 3
Patrick M. Pinney Contractors, Inc. Sioux City, IA	DISTRICT 3
Paul Niemann Construction Company Sumner, IA	DISTRICT 2, DISTRICT 6
Pederson Brothers, Inc. Harmony, MN	DISTRICT 2
Pella Construction Company Ltd. Pella, IA	DISTRICT 1, DISTRICT 5
Persinger Sand & Gravel Smithland, IA	DISTRICT 3

PRODUCER	**APPROVED DISTRICTS**
Peterson Contractors, Inc. Reinbeck, IA	DISTRICT 1, DISTRICT 2, DISTRICT 3, DISTRICT 4, DISTRICT 5, DISTRICT 6
Pettengill Concrete & Gravel Rock Rapids, IA	DISTRICT 3
Prairie Sand & Gravel Prairie Du Chien, WI	DISTRICT 2
Preston Ready Mix Corporation Preston, IA	DISTRICT 6
Quality Concrete Company Clinton, IA	DISTRICT 6
Randall Transit Mix Company Northwood, IA	DISTRICT 2
Recycled Aggregate Products Company Sioux City, IA	DISTRICT 3
Reilly Construction Company, Inc. Ossian, IA	DISTRICT 1, DISTRICT 2, DISTRICT 3, DISTRICT 4, DISTRICT 5, DISTRICT 6
Riehm Construction Company, Inc. Waukon, IA	DISTRICT 2
River Bend Enterprises Nashua, IA	DISTRICT 2
River City Stone - Div. of Mathy Dubuque, IA	DISTRICT 6
Riverstone Group, Inc. Moline, IL	DISTRICT 6
River Products Company, Inc., The Iowa City, IA	DISTRICT 5, DISTRICT 6
Rohlin Construction Company, Inc. Estherville, IA	DISTRICT 1, DISTRICT 2, DISTRICT 3
Roverud Construction, Inc. Spring Grove, MN	DISTRICT 2

PRODUCER	APPROVED DISTRICTS
RVBT aka Rock Valley Sand & Gravel Rock Valley, IA	DISTRICT 3
S & A Construction, LTD Allendale, MO	DISTRICT 4
S & G Materials Iowa City, IA	DISTRICT 6
Schildberg Construction Company, Inc. Greenfield, IA	DISTRICT 4
Schmillen Construction, Inc. Marcus, IA	DISTRICT 3
Shipley Contracting Fort Madison, IA	DISTRICT 5
Sieh Sand and Gravel Spencer, IA	DISTRICT 3
Shell Rock Products Shell Rock, IA	DISTRICT 2
Spencer Quarries Spencer, SD	DISTRICT 3
Stensland Gravel Company Larchwood, IA	DISTRICT 3
Stoner Sand Ridgeway, MO	DISTRICT 5
Tiefenthaler Ag-Lime Inc. Breda, IA	DISTRICT 3
Ulland Brothers, Inc. Albert Lea, MN	DISTRICT 2
W. Hodgman & Sons, Inc. Fairmont, MN	DISTRICT 2, DISTRICT 3
Wayne T. Hansen Corporation Algona, IA	DISTRICT 2, DISTRICT 3

PRODUCER	APPROVED DISTRICTS
Weatherton Contracting Co., Inc. Beresford, SD	DISTRICT 3
Weber Stone Company, Inc. Anamosa, IA	DISTRICT 6
Welden Aggregates, Inc. Iowa Falls, IA	DISTRICT 1
Wendling Quarries, Inc. De Witt, IA	DISTRICT 1, DISTRICT 5, DISTRICT 6
West Des Moines Sand Des Moines, IA	DISTRICT 1
Western Engineering Company Harlan, IA	DISTRICT 4
Western Iowa Limestone Harlan, IA	DISTRICT 4
Wetherell Excavating & Trucking, Inc. Storm Lake, IA	DISTRICT 3
Wiltgen Construction Company Calmar, IA	DISTRICT 2
Winn Corporation Sand & Gravel Ollie, IA	DISTRICT 5
Wright Materials Company Belmond, IA	DISTRICT 2
Zupke Sand & Gravel Randalia, IA	DISTRICT 2

AGGREGATE SPECIFICATION LIMITS & SAMPLING AND TESTING GUIDE

(See Specifications for Complete Details.)

April 20, 2004
Supersedes April 15, 2003

Matls. IM 209
Appendix C

TEST LIMITS	Spec #	F & T A	F & T C	LA Abrasion	Absorption	Chert	Shale	Clay Lumps	Plastic Index	Mortar Strength	Al_2O_3 Limit	Pore Index	Gradation Number
Fine Aggregate for PCC													
PCC	4110.00						2			1.5			1
		Note: Maximum 40% between sieves											
		If the gradation is 80% or less passing the #16 sieve and 50% or less passing the #30 sieve, no mortar strength is required.											
		Annual test requiring mortar strength of 1.5 or greater and a fineness modulus of 2.75 or greater for continued approval.											
PCC, Class L	4111.00						2			1.3			1
		Note: Maximum 45% between sieves											
Mortar	4112.00						2			0.9			2
		Note: Shale + coal not to exceed 2%											
Coarse Aggregate for PCC													
Crushed Stone	4115.00												
		Note: Chert particles are those retained on the 3/8" sieve, except for 4115.06, which uses the #4 sieve.											
		Note: Chert refers to unsound chert on 3/8" sieve, which break into 3 or more pieces when subjected to freeze/thaw tests.											
-Structural		6		50		2	1	0.5			0.5		3-5
-Nonstructural		6		50		3	1	0.5			0.5		3-5
Gravel	4115.00												
-Structural		6		35		2	1	0.5					3-5
-Nonstructural		6		35		3	1	0.5					3-5
Deck Overlay	4115.06	4		40	2.5	0.5					0.4		6
		Note: Chert + shale + coal + iron not to exceed 1%.											
Class V Aggregate	4117.00	6		40			2 (+#16)			1.5			7
		Note: Coarse Aggregates as in 4115 (except abrasion) and Fine Aggregates as in 4110.00 and 4111.00											
Class V (Fine Limestone)	4117.03												8
		Note: Only from sources acceptable as coarse aggregate											

TEST LIMITS	Spec #	F & T A	F & T C	LA Abrasion	Absorption	Chert	Shale	Clay Lumps	Plastic Index	Mortar Strength	Al_2O_3 Limit	Pore Index	Gradation Number
Granular Surfacing													
Aggr. For Granular Shoulders	4120.02	Note: A gravel/limestone aggregate mixture may be allowed. See Specification 4120.02 for details.											Per 4120.02
Class C Gravel	4120.03		15				10	15					10
		Note: Percent of Clay Lumps + particles passing #200 sieve not to exceed 15%.											
Class A Crushed Stone	4120.04		15	45				4					11
		Note: For shoulders only; material with Al_2O_3 not exceeding 0.7 or A-freeze not exceeding 10 may have an abrasion maximum of 55.											
Class B Crushed Stone	4120.05		20	55				4					11
		Note: "C" Freeze + Abrasion not to exceed 65%											
Class D Crushed Stone	4120.06												
		Note: "C" Freeze, Abrasion, and Gradation to be specified by Contract Documents.											
Paved Shoulders Fillets	4120.07		15	45				4					16
		Note: Material with Al_2O_3 not exceeding 0.7 or A-freeze not exceeding 10 may have an abrasion maximum of 55.											
Granular Subbase													
	4121.00	25		50							1.5		12
		Note: Combinations of crushed PCC, sand, gravel, or crushed stone may be used. Specification limits are for crushed stone or gravel.											
Crushed Stone-Base													
Macadam Stone	4122.02		10	45									13(Visual) Per 4122.02C
		Note: Choke stone. See Specification 4122.02C for details.											

AGGREGATE SPECIFICATION LIMITS & SAMPLING AND TESTING GUIDE
(See Specifications for Complete Details.)

April 20, 2004
Supersedes April 15, 2003

Matls. IM 209
Appendix C

TEST LIMITS	Spec #	F & T A	F & T C	LA Abrasion	Absorption	Chert	Shale	Clay Lumps	Plastic Index	Mortar Strength	Al_2O_3 Limit	Pore Index	Gradation Number
Modified Subbase													
	4123.00		15	45							4.7(-#40)		14
		Note: Material with Al_2O_3 not exceeding 0.7 (+4) or A-freeze not exceeding 10 may have an abrasion maximum of 55.											
		Note: If gravel only, 75% of +3/8" must be crushed with a minimum of one fractured face.											
Cover Aggregate													
Cover Aggregate for Bituminous Seal Coats													
	4125.01A		10	40			5						1,19-21
		Note: Friction Type 4D or better, Shale on Sand Cover Aggregate shall not exceed 2%.											
Aggregate for Slurry Mixture													
	4125.01B		10	40			5				0.7		23
		Note: Friction Type 4 or better, sand equivalent of not less than 45.											
Aggregate for Type B HMA													
Type B													
Primary	4126.02	25	10	45	6.0						1.5		Per Form 955
Non-Primary	4126.02	45	10	45	6.0						2.5		Per Form 955
Composite Aggregate for HMA													
Type B	4126.04								4				Per Form 955
		Note: The fine portion of combined materials shall not exceed 5% shale retained on the #16 sieve.											
Coarse Aggregate for HMA													
Type A	4127.00	10		45	6.0			0.5			0.7		Per Form 955
Fine Aggregate for HMA													
Type A	4127.03							0% on 1.5"					Per Form 955
		Note: Crushed fine aggregate shall be produced from sources meeting freeze/thaw and abrasion loss requirements for coarse Aggregates for ACC.											
Combination of Materials													
Type A	4127.05	Note: The fine portion of combined materials shall not exceed 2% shale retained on the #16 sieve.											Per Form 955

AGGREGATE SPECIFICATION LIMITS & SAMPLING AND TESTING GUIDE

(See Specifications for Complete Details.)

TEST LIMITS	Spec #	F & T A	F & T C	LA Abrasion	Absorption	Chert	Shale	Clay Lumps	Plastic Index	Mortar Strength	Al_2O_3 Limit	Pore Index	Gradation Number
Revetment Stone													
Class A	4130.02	10*	5**	50	(*Primary/**Non-primary)						0.7	25	Visual
Class B	4130.03	10*	5**	50							0.7	25	Visual
Class D	4130.04		10	50									Visual
Class E	4130.04	10		50							0.7	25	Visual
		Note: See Specification 4130.01 for bedding plane/concrete slab thickness requirements.											
Erosion Stone	4130.05		15	50				5			Visual		
Porous Backfill													
	4131.00	10		45			5 (+#16)				0.7		29
		Note: Material shall be free of visible clay and objectionable clay coating.											
Special Backfill													
Crushed Stone/Concrete	4132.02												30,31
Gravel	4132.03										10		31
		Note: Carbon of no more than 1% on fraction passing the #40 sieve.											
Granular Backfill													
	4133.00							4					32
		Note: "C" Freeze and Abrasion requirements are equivalent to those of either 4120.04 or 4120.05.											
Recycled PCC		Note: Recycled PCC must meet gradation and sampling frequency of the intended product.											
Recycled Composite Pavement		Note: Recycled composite pavement must meet gradation and sampling frequency of the intended product.											

AGGREGATE GRADATION TABLE – ENGLISH

Percent Passing

Grad. No.	Section No.	Intended Use	1.5"	1.0"	3/4"	1/2"	3/8"	#4	#8	#30	#50	#100	#200	*Notes
1	4110,4111,4125	PCC FA Cover Aggr.					100	90-100	70-100	10-60			0-1.5	1
2	4112	Mortar Sand						100	95-100	40-75	10-40	0-30	0-3	
3	4115 (57, 2-8)	PCC CA	100	95-100		25-60		0-10	0-5				0-1.5	2
4	4115 (2-8)	PCC CA	100	50-100	30-100	20-75	5-55	0-10	0-5				0-1.5	
5	4115 (67, 2-8)	PCC CA		100	90-100		20-55	0-10	0-5				0-1.5	
6	4115.06 (Repair & Overlay)	PCC CA			100	97-100	40-90	0-30					0-1.5	
7	4117 (Class V)	PCC FA & CA	100					80-92	60-75	20-40				
8	4117.03 (Class V)	Fine Limestone					100	90-100					0-30	
10	4120.02, 4120.03 (C Gravel)	Granular Surface/ Shoulders			100			50-80	25-60					3,4
11	4120.04,4120.05 (A, B, Cr. St.)	Granular Surface & Shoulder		100	95-100	70-90		30-55	15-40				6-16	5
12	4121	Granular Subbase	100						10-20		0-15		0-6	6
13	4122.02 (Cr. St.)	Mac. St. Base	3" nominal maximum size – screen over 3/4" or 1.0" screen											
14	4123	Modified Subbase	100		70-90				10-40				3-10	5
16	4120.07 (Cr. St.)	Paved Shoulder Fillet	100			0-50		0-10						7
19	4125 (1/2" Cr. Gr. or Cr. St.)	Cover Aggregate			100	97-100	40-90	0-30	0-15				0-2	
20	4125 (1/2" Scr. Gr.)	Cover Aggregate			100	95-100	40-80	0-15	0-7				0-1.5	
21	4125 (3/8")	Cover Aggregate				100	90-100	10-55	0-20	0-7			0-1.5	
22	4125.02B	Fine Slurry Mixture					100	85-100	40-95	20-60	14-35	10-25	5-25	10
23	4125.01B (Cr. St.)	Coarse Slurry Mixture					100	70-90	45-70	19-34	12-25	7-18	5-15	
29	4131	Porous Backfill			100	95-100	50-100	10-50	0-8					
30	4132.02 (Cr. St.)	Special Backfill	100						15-45				0-10	5
31	4132.03 (Gravel)	Special Backfill		100	90-100	75-90			30-55				3-7	
32	4133 (Sand/Gr./Cr. St.)	Granular Backfill	100% passing the 3" screen						20-100				0-10	8, 9

Notes: Gradation Nos. 9, 15, 17, 18, 24, 26, 27, 28, 33 and 34 have been deleted.

*For numbered notes, see page 2.

1. When the fine aggregate is sieved through the following number sieves, 4, 8, 16, 30, 50, and 100, not more than 40% shall pass one sieve and be retained on the sieve with the next higher number, for Section 4110, and 45% for Section 4111.
2. When used in precast and prestressed concrete bridge beams, 100% shall pass the 1.0" sieve.
3. When compaction of material is a specification requirement, the minimum percent passing the #200 sieve is 6%.
4. See specifications for combination of gravel and limestone screenings.
5. Unwashed air-dried samples of crushed composite material shall be tested for gradation compliance except that no gradation determination will be made for the material passing the #200 sieve.
6. The gradation requirement for the #8 sieve shall be 8% to 30% when either gravel or crushed stone, without blending sand, is supplied.
7. Gradation 3 or 4 may be substituted at the Contractor's option.
8. Crushed stone shall have 100% passing the 1.0" sieve.
9. When granular backfill is used under Flowable mortar, one of the following alternative materials shall be used: natural sand compliant with Section 4110, except the % passing the #200 sieve shall not exceed 4%; gravel, crushed stone, or crushed concrete meeting the gradation requirements of Section 4121.
10. Gradation limitations for the 30, 50 and 100 (600µm, 300 µm, and 150 µm) sieves shall not apply when slurry mixture is applied by hand lutes, such as for slurry leveling.

HMA Gyratory gradation requirements are listed in IM 510, Appendix A.
Marshall gradation requirements are listed in SS-01001.
QM-C gradation requirements are listed in IM 532.

Appendix C. IM 209 - Sampling and Testing Reference Guide (see Specifications for complete details)

TEST LIMITS October, 2003	Spec #	F&T A	F&T C	LA Abrasion	Absorption	Chert	Shale	Clay Lumps	Plastic Index	Mortar Strength	Al_2O_3 Limit	Pore Index	Gradation Number	Certified Inspection
Fine Aggregate														**Gradations**
PCC	4110.00	Note: Maximum 40% between sieves					2			1.5			1	1/1500
		If the gradation is 80% or less passing the #16 sieve and 50% or less passing the #30 sieve, no mortar strength is required.												
		Annual test requiring a Mortar Strength of 1.5 or greater or a Fineness Modulus of 2.75 or greater for continued approval.												
PCC, Class L	4111.00	Note: Maximum 45% between sieves					2			1.3			1	1/1500
Mortar	4112.00	Note: Shale + Coal not to exceed 2%					2			0.9			2	1/1500
Coarse Aggregate for PCC		Note: Chert particles are those retained on the 3/8" sieve, except for 4115.06 which uses the #4 sieve.												
		Note: Chert refers to unsound chert on 3/8" sieve which break into 3 or more pieces when subjected to freeze/thaw tests												
Crushed Stone	4115.00													
-Structural		6		50		2	1	0.5			0.5		3-5	1/1500
-Nonstructural		6		50		3	1	0.5			0.5		3-5	1/1500
Gravel	4115.00													
-Structural		6		35		2	1	0.5					3-5	1/1500
-Nonstructural		6		35		3	1	0.5					3-5	1/1500
Deck Overlay	4115.06	4		40	2.5	0.5	Note: Chert+Shale+Coal+Iron not to exceed 1%				0.4		6	1/1500
Class V Aggregate	4117.00	6		40			2 (+ #16)			1.5			7	1/1500
		Note: Coarse Aggregate as in 4115.00 (except abrasion) and Fine Aggregates as in 4110.00 and 4111.00.												
Class V	4117.03												8	1/1500
(Limestone)		Note: Only from sources acceptable as coarse aggregate.											8	1/1500
Granular Surfacing														
Agg.for Granular Shoulders	4120.02	Note: A gravel/limestone aggregate mixture may be allowed. See Specification 4120.02 for details.											Per 4120.02	1/3000
Class C Gravel	4120.03		15				10	15					10	1/3000
		Note: Percent of Clay Lumps+particles passing # 200 sieve not to exceed 15%.												
Class A Crushed Stone	4120.04		15	45				4					11	1/3000
		Note:For shoulders only, material with Al_2O_3 not exceeding 0.7% or an A-Freeze not exceeding 10 may have an Abrasion maximum of 55.												
Class B Crushed Stone	4120.05		20	55				4	Note: C-Freeze+Abrasion not to exceed 65%				11	1/3000
Class D Crushed Stone	4120.06	Note: C-Freeze, Abrasion, and Gradation to be specified by Contract Documents.												1/3000
Paved Shoulders Fillets	4120.07		15	45				4					16	1/3000
		Note: Materials with Al_2O_3 not exceeding 0.7 or an A-freeze not exceeding 10 may have an abrasion maximum of 55.												
Granular Subbase	4121.00	25		50							1.5		12	1/3000
		Note: Combinations of crushed PCC, sand, gravel, or crushed stone may be used.												
		Note: Specification limits are for crushed stone or gravel.												
Crushed Stone-Base														
Macadam Stone	4122.02		10	45									13 (visual)	
		Note: Choke stone produced from Macadam has a Certified Inspection of 1/3000												
Modified Subbase	4123.00		15	45							4.7 (- #40)		14	1/3000
		Note: (+ 4) Material with Al_2O_3 not exceeding 0.7% or an A-Freeze not exceeding 10 may have an abrasion maximum of 55.												
		Note: If gravel only, 75% of + 3/8 must be crushed with a minimum of one fractured face.												
Cover Aggregate														
Cover Aggregate for Bituminous Seal Coats	4125.01A		10	40			5						1,19-21	1/1500
		Note: Friction Type 4D or better, shale on Sand Cover Aggregate shall not exceed 2%												
Aggregate for Slurry Mixture	4125.01B	10		40			5				0.7		23	1/1500
		Note: Friction Type 4 or better, sand equivalent of not less than 45.												
Coarse Aggregate for Type B HMA														
Primary	4126.02	25	10	45	6.0						1.5		Per Form 955	1/1500
Non-Primary	4126.02	45	10	45	6.0						2.5		Per Form 955	1/1500
Composite Aggregate for Type B HMA	4126.04								4				Per Form 955	Per IM 204
		Note: The fine portion of combined materials shall not exceed 5% shale retained on the #16 sieve.												
Coarse Aggregate for Type A HMA	4127.00	10		45	6.0			0.5			0.7		Per Form 955	1/1500
Fine Aggregate for Type A HMA	4127.03							0% on 1.5"					Per Form 955	1/1500
		Note: Crushed fine aggregate shall be produced from sources meeting freeze/thaw and abrasion requirements for coarse aggregates for Type A HMA.												
Combination of Type A HMA Materials	4127.05	Note: The fine portion of combined materials shall not exceed 2% shale retained on the #16 sieve.											Per Form 955	Per IM 204
Revetment Stone														
Class A	4130.02	10*	5**	50	(*Primary/**Non-Primary)						0.7	25	visual	
Class B	4130.03	10*	5**	50							0.7	25	visual	
Class D	4130.04		10	50									visual	
Class E	4130.04	10		50							0.7	25	visual	
		Note: See specification 4130.01 for bedding plane/concrete slab thickness requirements												
Erosion Stone	4130.05		15	50				5					visual	
Porous Backfill	4131.00	10		45			5 (+ #16)				0.7		29	1/1500
		Note: Material shall be free of visible clay and objectionable clay coating.												
Special Backfill														
Crushed Stone/Concrete	4132.02												30,31	1/3000
Gravel	4132.03	Note: Carbon of no more than 1% on fraction passing the #40 sieve.							10				31	1/3000
Granular Backfill	4133.00							4					32	1/3000
		Note: C-Freeze and Abrasion requirements are equivalent to those of either 4120.04 or 4120.05												
Recycled PCC		Note: Recycled PCC must meet gradation and sampling frequency of the intended product.												
Recycled Composite Pavement		Note: Recycled composite pavement must meet gradation and sampling frequency of the intended product.												

NOTES

NOTES

SECTION 1
AGGREGATES

SECTION II
SAMPLING METHODS AND EQUIPMENT

Introduction

This chapter deals with the different sampling methods and equipment. Before beginning to study, be sure to have a copy of the current I.M. Volume II prepared by the Materials Office of the Highway Division.

Importance of Proper Sampling

No other single phase of an Aggregate Inspector's duties is as important as obtaining a representative sample. At this point, all of the money and time which will be expended on the remaining activities of testing and evaluating may be lost or rendered useless by an improper sampling technique on the part of the Aggregate Inspector. In other words, if the sample you take is not representative of the total material, it is absolutely impossible to end up with a test result that means anything. At the completion of instruction you must know how to obtain a proper sample. Without this knowledge, it is useless to proceed further into the areas of test procedure.

No other single phase of an Aggregate Inspector's duties is as important as obtaining a representative sample.

Sampling Frequency

Minimum sampling and testing frequencies required at the time of aggregate production are listed in I.M. 209. The required minimum aggregate sampling and testing frequencies of aggregates at time of use (proportioned aggregate) are listed in the appendices of I.M. 204. Sampling frequencies listed are minimums and may need to be increased for reasons such as low or intermittent production and widely varying or noncomplying test results.

Size of Sample

Refer to Materials I.M. 301 in the Field Testing Manual. Appropriate minimum aggregate sample sizes for the determination of sieve analysis are listed on page 2 of this I.M. The sample sizes are based on the maximum particle size in the finished products.

Random Sampling

The sample must be representative of the total of the material being tested. This is normally accomplished by random sampling. The random sample should not be obtained because of any particular reason or notion. All material produced should have an equal chance of being tested. The inspector should not determine when or what to sample by judging if the material looks good, bad, or average, because that represents a judgement sample and not a random sample. Random samples are taken when the plant is operating at the usual rate for that plant.

It must be pointed out that not all test samples are random samples. Normally they will be the same, but there will be times when the inspector must choose the time of sampling such as new hammers placed on the secondary crusher, an area of clay in the quarry, or fine sand seams in a gravel pit. These things will directly affect gradation of the material and must be checked immediately to keep the material within proper limits. During a normal day's operation, all samples taken and tested may be random samples if all operations are running consistently. Some days will have no random samples taken, such as the first days to establish crusher settings, etc. Some days will have a combination of random and check samples. Keep in mind that during normal, steady production the samples should be taken on a random basis to represent the total of the material being produced.

Location for Sampling

To help assure that representative samples are taken, one of the following methods will be used for obtaining aggregate samples: 1) obtaining a portion of the material carried on a conveyor belt, 2) intercept the complete material streamflow from the end of a conveyor belt or from overhead bin discharge, 3) sampling from the production stockpile (only for fine aggregate or as directly by the District Materials Engineer). The preferred method of coarse aggregate sampling is the streamflow method.

Whichever sampling method is used, at least three separate increments must be taken for each field sample. Obtaining more than three increments, when possible, will better represent the material being tested by providing a wider cross-section of the product.

The field sample must also meet the minimum weight requirement as listed in I.M. 301 for the product being tested.

To obtain an off-the-belt sample, stop the belt, insert a template at three or more separate locations along the belt, remove <u>all</u> material within the template, and combine it into the field sample. In belt sampling, the ends of the template should be spaced just far enough apart to get an increment that weighs approximately one-third the minimum weight of the field sample. If the template does not yield the minimum size of field sample in three locations, additional locations will be necessary. No less than three separate locations should be used in obtaining one field sample. All material within each

Methods for Obtaining Aggregate Samples:
**Off the Belt Sampling*
**Streamflow Sampling*
**Stockpile Sampling*
(fine aggregate only)

1. Conveyor Belt Sampling

2. Streamflow Sampling

increment is removed from all three or more increments and mixed back together to make one field sample. When obtaining field sample by interception of aggregate streamflow, care must be exercised so that the sampling device passes quickly through the entire streamflow and does not overflow. At least three separate passes shall be made with the sampling device when obtaining a field sample. Each pass is an increment of the field sample.

Stockpile sampling of fine aggregate may be accomplished by either using a shovel or a sand probe. When obtaining a field sample by the stockpile method, a minimum of three increments at different locations around the pile shall be taken. Care should be used not to sample at the bottom of the stockpile. Stockpile sampling of coarse aggregate should be avoided. If it becomes absolutely necessary to obtain a sample from a stockpile, consult the District Materials Engineer to help you devise an adequate sampling plan.

Sampling Records

It is the responsibility of the aggregate sampler to get all the necessary information to fill out report headings. This includes type of material, intended use, location of producer, source, project number (if one is available), contractor who will be receiving the material, and other general information. The information on the source itself should include section of the quarry or pit and the bed numbers (quarries) or working depths (pit). If special processing equipment is used, it should be noted on the reports.

Samples are taken for either 1) field testing or 2) Central Laboratory testing. Those samples which are forwarded to the Central Laboratory of the Iowa DOT should be placed in a standard canvas sack

No less than three separate locations or passes should be used in obtaining one field sample.

3a. Stockpile Sampling: Sand Tube

3b. Stockpile Sampling: Shovel

It is not always easy to get a proper sample, but it is very important to use all the care you can. Always remember, if your sample is not representative, your test results are not worth the paper they are written on.

and securely tied to prevent loss of material during shipping. Appropriate Form 82003 should be filled out completely and placed inside the sample sack. Other identification tags should be attached to the tie for shipping information.

Review

Before you start out to take a sample, you should ask yourself these questions:

1. Are you sure that your plan for getting the sample is complete?
2. Have you checked on the approved method of taking the sample?
3. Do you know the weight of sample that is required?
4. Do you have the proper tools?
5. Do you have clean containers at hand for the sample?

After you have obtained the sample, you should ask yourself these questions:

1. Are you sure the sample really represents the material?
2. Should you divide the sample and retain part of it?
3. Is the sample completely identified?
4. Does your record show the nature of the material, its intended use, and exactly when, where, and how the sample was taken?
5. Do you know the proper action to take if the sample fails to meet specification requirements?

NOTES

MATERIALS LABORATORY QUALIFICATION PROGRAM

GENERAL

The FHWA has outlined a Laboratory Qualification Program in the Federal-Aid Policy Guide update published as 23 CFR 637 on June 29, 1995. The updated guide has requirements for laboratories performing testing on Federal-Aid highway projects on the National Highway System (NHS).

In order to avoid an appearance of a conflict of interest, any qualified non-DOT laboratory shall perform only one of the following types of testing on the same project: Verification testing, quality control testing, IA testing, or dispute resolution testing.

LABORATORIES TO BE QUALIFIED

The following laboratories are included in the qualification program for all projects on Interstate and primary routes:

Central Materials Laboratory
6 District Laboratories
District Area Laboratories
Resident Construction Laboratories
Aggregate Producer Laboratories
Ready Mix Laboratories
PCC Contractor Laboratories
HMA Contractor Laboratories
Consultant and Commercial Laboratories *
City Laboratories *

* May be qualified at the time of a project.

LABORATORY QUALIFICATION PROCESS

A two-level qualification system is required by the FHWA. Laboratories are either accredited or qualified. The accreditation process is more rigorous than the qualification process.

Accredited Laboratory Process

The Central Materials Laboratory and the six District Laboratories will be accredited as outlined in the 23 CFR 637 guide. The Central Materials Laboratory is accredited through the AASHTO Materials Reference Laboratory Program. The District Materials Laboratories will be accredited by using the Central Materials Staff and equipment to check testing and testing procedures and by using the same calibration and training documentation process. Laboratories will be accredited for a two-year period. In addition, an annual review will be made by the Central Office Staff. Appendix A contains the procedures for accrediting the District Materials Laboratories.

Qualified Laboratory Process

The remaining laboratories will be qualified as outlined below:

The District Materials Offices will qualify laboratories. Laboratories will be qualified for a two-year period. In addition, an annual review will be made by District Staff. Appendix B contains the procedures for qualifying materials laboratories.

Three laboratory types will be qualified, aggregate laboratories, PC Concrete laboratories and Hot Mix Asphalt laboratories.

Qualified laboratories will have the following:

1. Current manuals and test methods to perform the qualified testing available

2. A technician certified by the Iowa DOT to perform the qualified testing

3. Proper equipment to perform the qualified testing (calibrated or checked annually according to Appendix B)

4. Satisfactory correlation and proficiency test results

5. Documentation of equipment calibrations, equipment checks, and correlation results

ADMINISTRATION OF THE PROCESS

The Central Materials Laboratory will be responsible for implementation and operation of the Laboratory Qualification Program. The Central Materials Laboratory will accredit the District Laboratories. The District Materials Offices will qualify laboratories.

NON-COMPLIANCE/DISPUTE RESOLUTION

A laboratory that does not meet the requirements of the IM is subject to elimination from the qualification program.

Disputes concerning calibration and correlation of equipment will be resolved by the office responsible for the qualification. For disputes that cannot be resolved at the District, the Central Materials Laboratory will be the final authority.

DISTRICT LABORATORY ACCREDITATION PROGRAM

The Central Materials Laboratory (CML) will accredit the District Materials Laboratories and maintain records of the accreditation for five years. The CML Staff will check the following prior to accrediting a laboratory:

1. Check for current manuals and test procedures covering the accredited testing.
2. Check the certification and training records of the testing personnel.
3. Document that proper equipment is available to perform qualified testing.
4. Check documentation system.

Scheduling of the annual accreditation review will be discussed with the laboratories needing accreditation.

Table 1 is the list of items to be reviewed.

An oral close out on any deficiencies will be held with the testing personnel. Written notice will be sent within two months of the inspection. CML personnel will re-inspect if necessary after correction of any deficiencies.

A report showing the laboratory, the date accredited, and the expiration date will be issued by the Materials Testing Engineer.

NON-COMPLIANCE/DISPUTE RESOLUTION

A laboratory that does not meet the requirements of the IM is subject to elimination from the qualification program.

The CML and the District Materials Engineer will resolve disputes concerning calibration and correlation of equipment.

Table 1 - Laboratory Accreditation Checklist

		Minimum Calib./Verif. Interval	**Calib./Verif. Procedure**
Tester Qualifications-Proper Iowa DOT certifications			
Current Written Test Procedures			
Current Calibration Procedures & Records			
Documentation of correlation results and corrective actions taken for previous construction season			
Balances		12 months	Iowa 917-B
Ovens		4 months	Iowa 1501-A
Mechanical Shakers		12 months	Iowa 1502-A
Marshall Compactor T-245		12 months	Iowa 1504-A
Gyratory Compactor T-312		6 months	Iowa 1522-A
Marshall Molds T-245		12 months	Iowa 1523-A
Comp. Test Machine T-245		12 months	Iowa 1505-A
Sieves		6 months	Iowa 1506-A
Thermometers - Test		6 months	Iowa 1607-A
Thermometers - Ref.		12 months	Iowa 1607-A
Timers T-201, T-202		6 months	Iowa 1508-A
Sand Equivalent T-176		12 months	Iowa 1509-A
Gyratory Compactor Molds T-312		12 months	Iowa 1524-A
Vacuum Systems T-209		12 months	Iowa 1510-A
Pycnometers T-228, T209		12 months	Iowa 1618-A
Fine Aggregate Anularity T-304		12 months	Iowa 1525-A
Dynamic Shear Rheometer T-315		6 months	Iowa 1612-A
Balance Weights M-231		12 months	
Sample Splitters T-248		12 months	(visual condition)

LABORATORY QUALIFICATION PROGRAM

The District Materials Office will qualify the other laboratories and maintain records of the qualification for three years. The District Staff will check the following prior to qualifying a laboratory:

1. Establish the type of laboratory (Aggregate, Hot Mix Asphalt, PC Concrete).
2. Check for current manuals and test procedures covering the qualified testing.
3. Check the certification of the testing personnel.
4. Document that proper equipment is available to perform qualified testing.
5. Check documentation system.

Scheduling of the qualification review will be discussed with the laboratories seeking qualification. The District Materials Engineer should be contacted for laboratories that have been qualified in other states. The District Materials Office may qualify a laboratory based on an acceptable qualification report and qualification program from another state transportation agency.

Table 1 and the pages following cover the list of items to be reviewed.

An oral close out on any deficiencies will be held with the testing personnel. Written notice will be sent within two weeks of the inspection. District personnel will re-inspect after correction of any deficiencies.

A form showing the laboratory type, the date qualified, and the expiration date will be issued by the District Materials Engineer.

The list of Qualified Laboratories will be maintained on a database accessible by authorized Materials Personnel.

NON-COMPLIANCE/ DISPUTE RESOLUTION

A laboratory that does not meet the requirements of the IM is subject to elimination from the qualification program.

The office responsible for the qualification will resolve disputes concerning calibration and correlation of equipment. For disputes that cannot be resolved at the District level, the Central Materials Laboratory will be the final authority.

Table 1 - Laboratory Qualification Checklist

		Calib./Verif. Interval	**Calib./Verif. Procedure**
Tester Qualifications-Proper Iowa DOT certifications			
Current Written Test Procedures			
Current Calibration Procedures & Records			
Documentation of correlation results and corrective actions taken for previous construction season.			
Aggregate Laboratory			
Balances		12 months	Iowa 917-B
Sieves- wear, tear, size, and opening size		12 months	Iowa 1506-A
Splitter- condition		12 months	(visual)
Mechanical Shakers- condition (if used)		12 months	Iowa 1502-A
HMA Laboratory			
Balances- and water bath		12 months	Iowa 917-B
Sieves- wear, tear, size, and opening size		12 months	Iowa 1506-A
Splitter- condition		12 months	(visual)
Mechanical Shakers- condition (if used)		12 months	Iowa 1502-A
Rice equipment- vacuum and flask		12 months	IM 350
Thermometers		12 months	Iowa 1607-A
Ovens- temperatures		12 months	Iowa 1501-A
Gyratory Compactor and molds		12 months	Iowa 1524-A
Marshall Hammer and molds		12 months	Correlation Checks
PCC Laboratory			
Balances		12 months	Iowa 917-B
Sieves- wear, tear, size, and opening size		12 months	Iowa 1506-A
Splitter- condition		12 months	(visual)
Mechanical Shakers- condition (if used)		12 months	Iowa 1502-A
Air Meter		12 months	IM 318
Slump Cone and equipment-condition		12 months	
Beam Breaker		12 months	Central Lab

Iowa Department of Transportation

MATERIALS LABORATORY QUALIFICATION PROGRAM
Laboratory Inspection - per Materials Instructional Memorandum 208

Company Name: ______________________________

Laboratory name: ______________________________

Laboratory type: Aggregate HMA PCC (Circle one)

Laboratory location: ______________________________

Laboratory contact person: ______________________________

Laboratory technician:	Certification number:	Expires:
____________	____________	________
____________	____________	________
____________	____________	________

Current manuals and written test procedures available? ______________________________

Current calibration procedures and records? ______________________________

____

Documentation of correlation results and corrective actions taken for previous construction season? ________

____

____

Proper equipment available to perform qualified testing? ______________________________

____

Other remarks: ______________________________

____

Date of inspection: ______________ Qualification expiration date: ______________

Inspection performed by: ______________________________
Print name

____
Sign name

Inspection received by: ______________________________
Print name

____
Sign name

District Number ________

cc: Materials Engineer, Contractor/Producer, Ames, File

TESTING PRECISION (Difference Between Two Laboratories)

1. Asphalt Binder

   a. Penetration. The two results shall not differ from their mean by more than 8 percent of their mean.

   b. Absolute Viscosity. The two results shall not differ from their mean by more than 10 percent of their mean.

   c. Specific Gravity. The two results shall not vary by more than 0.005.

   d. DSR Stiffness. The two results shall not differ from their mean by more than 10 percent of their mean.

2. Emulsified Asphalt

   a. Percent Residue. The two results shall not differ by more than 2 percent.

3. Cut-Back Asphalt

   The two results shall not differ from their mean by more than 3 percent of their mean for material having a viscosity of less than 800 cst and 9 percent of their mean for material having viscosity between 800 to 6000 cst.

4. Hot Mix Asphalt Mixture

   a. Binder Content by Extraction. The two results shall not differ by more than 0.3 percent.

   b. Gradation of Extracted Aggregate. The two results shall meet the precision parameters prescribed in IM 216.

   c. Marshall and Gyratory Density. The two results shall not differ by more than 0.020.

   d. Maximum Specific Gravity. The two results shall not differ by more than 0.010.

5. Aggregate

   a. Gradation of Combined Aggregate. The two results shall meet the precision parameters prescribed in IM 216.

   b. Bulk Dry Specific Gravity for Mix Design. The difference between the two results shall not be more than 0.028.

   c. Absorption of Aggregate for Mix Design. The difference between the two results shall not be more than 0.37 percent.

   d. Apparent Specific Gravity for Mix Design. The difference between the two results shall not be more than 0.010.

e. Fine Aggregate Angularity. The difference between the two results shall not be more than 0.5.

Other tests such as kinematic viscosity, specific gravity of asphalt binder and penetration of emulsion residue may be correlated at the discretion of the District Materials Engineer.

GENERAL AGGREGATE SOURCE INFORMATION

GENERAL

Generally, only those sources, which have been sampled or tested within the last ten years, are listed. This listing additionally ranks sources in accordance with a frictional classification as defined herein for aggregates used in Hot Mix Asphalt (HMA) construction, and a durability class for coarse aggregates used in Portland Cement Concrete construction. Upon request, new sources or different combinations of beds within an existing source can be evaluated for classification for either type of use. These rankings do not in any way waive the normal quality requirements for the particular types of aggregates indicated in contract documents.

PORTLAND CEMENT CONCRETE AGGREGATES

Aggregates shall be produced from sources approved in accordance with the requirements of Office of Materials IM 409. The engineer may approve scalping of some portion of the coarser fraction.

All aggregates produced and inspected for intended use in contracts under Iowa Department of Transportation Specifications shall be stored in identifiable stockpiles unless they are being delivered as produced.

DURABILITY CLASSIFICATION

The coarse aggregates have been divided into three classes in accordance with their durability level as determined by performance or laboratory testing.

Class 2 durability aggregates will produce no deterioration of pavements of the non-interstate segments of the road system after 15 years and only minimal deterioration in pavements after 20 years.

Class 3 durability aggregates will produce no deterioration of pavements of non-interstate segments of the road system after 20 years of age and less than 5% deterioration of the joints after 25 years.

Class 3i durability aggregates will produce no deterioration of the interstate road system after 30 years of service and less than 5% deterioration of the joints after 35 years.

NOTE: Those sources with a "B" in their durability class designation may have 1/2 in. Bridge Deck Overlay/Repair material available.

HOT MIX ASPHALT AGGREGATES

Aggregates for HMA construction have been classified into six main functional types in accordance with their frictional characteristics. Those aggregates with the potential to develop the greatest amount of friction under traffic conditions are classified as Type 1 with the potential for friction decreasing as the type number increases. One or more friction types may be specified for use in pavement surface courses. If a type is not specified in the contract documents, Type 5 or better will be acceptable.

When aggregates of friction Type 1 through Type 4 are specified for construction, a source approval including bed limitations is required for each project. Tentative bed limitations are shown in this publication.

The frictional classification types are listed and defined in order of descending quality as follows.

Type 1: Aggregates, which are generally, a heterogeneous combination of minerals with coarse-grained microstructure of very hard particles (generally, a Mohs hardness range of 7 to 9) bonded together by a slightly softer matrix. These aggregates are typified by those developed for and used by the grinding-wheel industry such as calcinated bauxite (synthetic) and emery (natural). They are not available from Iowa sources. Due to their high cost, these aggregates would be specified only for use in extremely critical situations.

Type 2: Natural aggregates in this class are crushed quartzite and granites. The mineral grains in these materials generally have a Mohs hardness range of 5 to 7. Synthetic aggregates in this class are some air-cooled steel furnace slags and others with similar characteristics.

Type 3: Natural aggregates in this class are crushed traprocks, and/or crushed gravels. The crushed gravels shall contain 40% or more igneous and metamorphic particles. Synthetic aggregates in this class are the expanded shales with a Los Angeles abrasion loss less than 35 percent.

Type 4: Aggregates crushed from dolomitic or limestone ledges in which 80 percent of the grains are 20 microns or larger. The mineral grains in the approved ledges for this classification generally have a Mohs hardness range of 3 to 4. For natural gravels, the Type 5 carbonate (see below) particles, as a fraction of the total material, shall not exceed the non-carbonate particles by more than 20 percent.

Type 4D: A subgroup of the Type 4 category comprised of those aggregates near, but exceeding, the 20-micron minimal grain size. Type 4D aggregates are not acceptable for use in any HMA surface courses requiring the use of Type 4 or better material.

Type 5: Aggregates crushed from dolomitic or limestone ledges in which 20 percent or more of the grains are 30 microns or smaller.

SOURCE LISTINGS - Explanation

The use of Xs in the PCC or HMA columns indicates use where no classification is required or, if required, has not been made.

NOTE: - indicates additional source restrictions.

Bed numbers shown for PCC aggregate are those on the formal source approval letter. Beds shown for HMA sources are those which have been used or have potential for use and are of the designated friction type.

Frictional Classification - as indicated on page 2
Hot Mix Asphalt - Type A and B

Durability Class for Portland Cement Concrete
Coarse Aggregate Fine Aggregate
("B" indicates acceptability for Bridge Deck Overlay/Repair)

Source Code Number - Used to identify sources on test requests and for data storage.

Specific Gravity
(DWU-Determine When Used)

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	DUR PCC FA	FRICT HMA A	FRICT HMA B	BEDS	NOTE
29	**DES MOINES DIST 5**	**CRUSHED STONE**											
A29002	L&W QUARRIES INC	MEDIAPOLIS-LEONARD	SE	01	TO71	R04W	2.65	3				15	1
										4	4	15 - 18	
										5	5	20	
A29008	CESSFORD CONST CO	NELSON	NE	26	TO72	R02W	2.62	3				21 - 24	
										4	4	7 - 20	
											4	15 - 24	
										5	5	24 - 27	
A29012	CESSFORD CONST CO	GEODE	NE	01	TO69	R05W				4	4	11 - 12	
										5	5	9 - 13	
		SAND & GRAVEL											
A29502	CESSFORD CONST CO	SPRING GROVE	SW	36	TO69	R03W		3		4	4		
							2.66		X				

NOTE 1: AASHTO 57 GRADATION MAXIMUM

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	FA	FRICT HMA A	B	BEDS	NOTE
01	**ADAIR DIST 4**	**CRUSHED STONE**											
A01002	SCHILDBERG CONST CO INC	MENLO	SE	17	TO77	R31W				5	5	15 - 16	
											4	14	
A01006	SCHILDBERG CONST CO INC	HOWE	SW	01	TO76	R31W					5	25	
A01008	SCHILDBERG CONST CO INC	JEFFERSON	NE	17	TO77	R31W					5	20	
											4D	25	
02	**ADAMS DIST 4**	**CRUSHED STONE**											
A02002	SCHILDBERG CONST CO INC	MT ETNA	SW	23	TO73	R34W					4	11 - 13	
A02004	SCHILDBERG CONST CO INC	CORNING		10	TO71	R34W					4	3 - 5	
		SAND & GRAVEL											
A02502	SCHILDBERG CONST CO INC	MT ETNA	NW	23	TO73	R34W	2.67	2		4	4		
							2.67		X				
03	**ALLAMAKEE DIST 2**	**CRUSHED STONE**											
A03002	BRUENING ROCK PROD INC	WEXFORD	NE	36	TO98	R03W	2.70	3i				1C - 5	
										4	4	1 - 8	
A03008	BRUENING ROCK PROD INC	MCCABE	NE	06	TO97	R05W					4	1 - 6	
A03010	ROVERUD CONST INC	RUDE	SE	17	T100	R06W							
A03014	BRUENING ROCK PROD INC	HAMMELL-BOONIES	SW	02	TO99	R06W		X		4	4	5 - 6	
A03022	ROVERUD CONST INC	LIVINGOOD	SW	07	TO96	R06W				4	4	4 - 7	
											4	2 - 7	
A03028	ROVERUD CONST INC	WELPER-JOHNSON	SW	35	TO99	R04W							
A03034	RIEHM CONST CO INC	WILDE	SE	13	TO99	R05W		X		4	4	1 - 5	
A03038	RIEHM CONST CO INC	RIEHM	SE	07	T100	R04W	DWU	3i		4	4	1 - 4	
A03040	BRUENING ROCK PROD INC	DEE	SE	21	TO99	R04W	DWU	3iB		4	4	5A - 5D	
A03042	NIEMANN CONST CO	CHURCHTOWN	SW	29	TO99	R04W					4	1 - 3	
										4	4	3	
A03046	BRUENING ROCK PROD INC	MOHS	SW	29	TO96	R04W	DWU	2		5	5	1 - 2	
											5	1 - 4	
A03048	BRUENING ROCK PROD INC	POSTVILLE	SW	16	TO96	R06W					4	2 - 5	
A03050	BRUENING ROCK PROD INC	GREEN	NW	16	TO96	R06W	2.63	3		4	4	2 - 3A	
A03052	BRUENING ROCK PROD INC	ROSSVILLE	NE	35	TO97	R05W	DWU			4	4	1 - 5	
A03054	BRUENING ROCK PROD INC	WEST RIDGE	NE	08	TO98	R06W							
A03056	NIEMANN CONST CO	WAUKON	SW	05	TO97	R05W							
A03060	NIEMANN CONST CO	HANOVER	NE	36	TO99	R06W							
A03064	WILTGEN CONST CO	RAINBOW ACRES	SE	26	TO97	R05W							
A03066	WILTGEN CONST CO	ELSBERND	NW	29	TO97	R06W		3				2	
		SAND & GRAVEL											
A03502	CARLSON MATERIALS CO	HARPERS FERRY	SW	07	TO97	R02W	2.67	3iB		3	3		
							2.67		X				
A03506	BRUENING ROCK PROD INC	HAMMELL-BOONIES	SW	02	TO99	R06W				4	4		
A03510	CARLSON MATERIALS CO	LONNING	SE	02	TO99	R06W				4	4		
							DWU		X				
A03512	ROVERUD CONST INC	ZEZULKA	NE	11	T100	R04W				3	3		
							2.66		X				
A03516	ROVERUD CONST INC	HAMMELL	NW	15	T100	R03W							
04	**APPANOOSE DIST 5**	**CRUSHED STONE**											
A04004	L&W QUARRIES INC	MARTIN #3	E2	20	TO70	R19W	2.70	2		4D	4D	1 - 3	1
											5	6	
A04016	L&W QUARRIES INC	LEMLEY EAST #5	CT	35	TO70	R19W	2.70	2		4D	4D	1 - 3	1
											5	6	
A04018	L&W QUARRIES INC	CLARKDALE #8	SE	15	TO69	R18W					5	4	

NOTE: 1 – AASHTO 67, GRADATION #5, 40% MAXIMUM; RESTRICTION DOES NOT APPLY TO STRUCTURAL CONCRETE

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	FA	FRICT HMA A	B	BEDS	NOTE
05	**AUDUBON DIST 4**	**SAND & GRAVEL**											
A05506	HALLETT MATERIALS CO	EXIRA	SW	08	TO78	R35W	2.68	3		4	4		
							2.66		X				
06	**BENTON DIST 6**	**CRUSHED STONE**											
A06002	BASIC MATERIALS CORP	SMITH	NW	19	TO86	R12W	2.65	2		4	4	21 - 26	
A06004	WENDLING QUARRIES INC	GARRISON A	SE	28	TO85	R11W	2.67	2		4	4	6 - 16	
A06006	WENDLING QUARRIES INC	GARRISON B	NE	33	TO85	R11W	2.64	2		4	4	6 - 16	
A06008	WENDLING QUARRIES INC	BALLHEIM	NE	17	TO86	R12W					X		
A06012	COOTS MATERIALS CO INC	JABENS	SW	07	TO85	R11W	DWU	2				6 - 11	
							2.63	2		4	4	12	
										4	4	10 - 12	
A06014	WENDLING QUARRIES INC	VINTON-MILROY	S2	10	TO85	R10W					4		
A06016	COOTS MATERIALS CO INC	COOTS	SW	36	TO86	R11W					X		
A06018	WENDLING QUARRIES INC	PORK CHOP-EAST	NW	11	TO85	R09W					X		
A06020	WENDLING QUARRIES INC	PORK CHOP-WEST	NE	10	TO85	R09W							
A06022	WENDLING QUARRIES INC	LONG	SE	13	TO84	R09W					X		
		SAND & GRAVEL											
A06502	WENDLING QUARRIES INC	VINTON-MILROY	S2	10	TO85	R10W				4	4		
							2.65		X				
A06504	COOTS MATERIALS CO INC	MT AUBURN	SW	31	TO86	R10W				4	4		
							2.65		X				
A06506	WENDLING QUARRIES INC	PORK CHOP	CT	11	TO85	R09W				4	4		
							DWU		X				
07	**BLACK HAWK DIST 2**	**CRUSHED STONE**											
A07004	BASIC MATERIALS CORP	WATERLOO SOUTH	NW	18	TO87	R12W				4	4	17 - 23	
										4	4	32 - 36	
											4	1 - 16	
A07006	BASIC MATERIALS CORP	YOKUM	NE	05	TO90	R14W					5	11 - 21	
A07008	BASIC MATERIALS CORP	MORGAN	NE	15	TO89	R12W					5	1 - 3	
											5	4A - 4B	
A07014	NIEMANN CONST CO	GLORY	NE	36	TO87	R11W					4	3 - 4	
											5	1 - 4	
A07018	BASIC MATERIALS CORP	RAYMOND-PESKE	SW	01	TO88	R12W	2.66	2		4	4	1B - 5	
										4	4	6 - 10	
A07020	BASIC MATERIALS CORP	STEINBRON	SE	01	TO88	R11W	2.62	3i		X	X	1	
A07022	BASIC MATERIALS CORP	MESSERLY	NE	08	TO90	R14W							
		SAND & GRAVEL											
A07504	BASIC MATERIALS CORP	WATERLOO SAND	SW	09	TO89	R13W				4	4		
							2.65		X				
A07506	MANATT'S INC	ASPRO	NW	01	TO88	R13W				4	4		
							2.65		X				
A07508	BASIC MATERIALS CORP	GILBERTVILLE		16	TO88	R12W				4	4		
							2.65		X				
A07512	ZEIEN S&G	ZEIEN	NW	23	TO87	R12W							
A07518	NIEMANN CONST CO	JANESVILLE	NE	14	TO90	R14W				3	3		
							2.66		X				
08	**BOONE DIST 1**	**SAND & GRAVEL**											
A08504	BECKER GRAVEL CO	JENSEN	SW	36	TO85	R25W							
A08524	HALLETT MATERIALS CO	JENKINS-STURTZ	W2	36	TO84	R27W	2.69	2		3	3		
							2.66		X				

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	DUR PCC FA	FRICT HMA A	FRICT HMA B	BEDS	NOTE
09	**BREMER DIST 2**	**CRUSHED STONE**											
A09002	BASIC MATERIALS CORP	FREDERIKA	NE	12	TO93	R13W					5	2 - 8	
A09004	NIEMANN CONST CO	DENVER-FOELSKE	NE	29	TO91	R13W				4	4	4 - 9	
A09006	NIEMANN CONST CO	TRIPOLI-PLATTE	SW	36	TO93	R13W	2.65	3i		4	4	1 - 3	
										4	4	1 - 5	
A09008	NIEMANN CONST CO	DENVER #2	NE	20	TO91	R13W							
		SAND & GRAVEL											
A09504	NIEMANN CONST CO	NOLTE	SE	31	TO92	R11W				4	4		
							2.65		X				
A09508	NIEMANN CONST CO	TRIPOLI-PLATTE	SW	36	TO93	R13W							
A09510	NIEMANN CONST CO	PLAINFIELD-ADAMS	NE	32	TO93	R14W	2.66		X				
10	**BUCHANAN DIST 6**	**CRUSHED STONE**											
A10002	NIEMANN CONST CO	WESTON-LAMONT	NW	14	TO90	R07W	2.61	3iB				1 - 6	
										4	4	1 - 7	
A10004	NIEMANN CONST CO	BLOOM-JESUP	SW	32	TO89	R10W	2.63	3				2 - 5	
										4	4	1 - 7	
A10008	BRUENING ROCK PROD INC	OELWEIN	NW	02	TO90	R09W	2.65	3i		4	4	4 - 5	
										4	4	4 - 6	
A10010	NIEMANN CONST CO	HAZELTON	NW	11	TO90	R09W	2.60	3iB		4	4	4	
A10012	NIEMANN CONST CO	INDEPENDENCE	NW	14	TO88	R09W					5		
A10014	NIEMANN CONST CO	OELWEIN #1	SW	02	TO90	R09W				5	5	1 - 12	
A10016	NIEMANN CONST CO	OELWEIN #2	SE	03	TO90	R09W	DWU	3i		4	4	13 - 16	
A10018	NIEMANN CONST CO	EAST AURORA	SE	17	TO90	R07W				4	4	1 - 5	
A10022	BRUENING ROCK PROD INC	BROOKS	NW	02	TO88	R09W	2.60	3i		4	4	7	
											5	1 - 6	
A10024	NIEMANN CONST CO	RASMUSSEN #2	SE	21	TO88	R08W					5		
A10026	NIEMANN CONST CO	BRANDON	SE	27	TO87	R10W					5		
A10028	NIEMANN CONST CO	HERTZBERGER	NE	36	TO87	R10W					5		
A10030	NIEMANN CONST CO	SOUTH AURORA	NW	19	TO90	R07W	2.62	3iB			4	1 - 3	
A10032	NIEMANN CONST CO	SELLS	NW	25	TO88	R09W					5		
A10034	NIEMANN CONST CO	TROY MILLS	SE	30	TO87	R07W							
A10036	WENDLING QUARRIES INC	KILER	NW	34	TO87	R10W					4		
A10038	BASIC MATERIALS CORP	WIDGER	SW	07	TO88	R10W	2.61	3i				1B	
										4	4	1A - 1B	
A10040	ZUPKE SAND & GRAVEL	ZUPKE-OELWEIN		09	TO90	R09W							
		SAND & GRAVEL											
A10504	NIEMANN CONST CO	WARD	NE	14	TO90	R07W				4	4		
							2.65		X				
A10506	MANATT'S INC	GREENLEY	SE	29	TO89	R09W				4	4		
							2.64		X				
A10510	NIEMANN CONST CO	HUFFMAN	SE	02	TO89	R08W				4	4		
							2.65		X				
A10514	NIEMANN CONST CO	HOLLERMAN	SE	26	TO90	R07W				4	4		
A10516	NIEMANN CONST CO	MILLER	NW	14	TO88	R09W	2.65		X				
A10518	MANATT'S INC	YEAROUS	SE	19	TO89	R09W	2.65		X				
11	**BUENA VISTA DIST 3**	**SAND & GRAVEL**											
A11502	ROHLIN CONST CO INC	ROHLIN	SW	02	TO93	R38W				4	4		
A11504	MARTIN MARIETTA	RAILROAD	NE	03	TO93	R37W				3	3		
A11506	MARTIN MARIETTA	LINN GROVE	NW	25	TO93	R38W				4	4		
A11508	WETHERALL CONST CO	NEWELL	NW	01	TO90	R36W				4	4		
A11510	MARTIN MARIETTA	SIOUX RAPIDS		05	TO93	R36W				3	3		
A11512	BUENA VISTA COUNTY	MARATHON	SE	19	TO93	R35W				4	4		
A11514	LUNDELL CONST	STORM LAKE	SW	18	TO90	R36W				4	4		
A11516	ROHLIN CONST CO INC	WERNIMONT	W2	12	TO93	R37W				3	3		
A11518	BECKER GRAVEL CO	MOLGAARD	NW	03	TO93	R38W							

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	FA	FRICT HMA A	B	BEDS	NOTE
12	**BUTLER DIST 2**	**CRUSHED STONE**											
A12004	GREENE LS CO	LUBBEN	NW	25	TO93	R17W					5	1 - 21	
A12008	GREENE LS CO	FLORRY-STEERE	CT	08	TO93	R17W					5	1 - 11	
A12010	CARLSON/BRUENING	CLARKSVILLE-ENGLE	NE	16	TO92	R15W							
A12014	NIEMANN CONST CO	OLTMANN	SE	08	TO91	R16W					X		
A12016	GREENE LS CO	WIEGMANN-BRISTOW	SE	23	TO92	R18W				X	X	1 - 11	
A12018	GREENE LS CO	NEYMEYER	SW	28	TO90	R18W							
A12020	GREENE LS CO	BRUNS #2	NW	21	TO91	R18W							
		SAND & GRAVEL											
A12502	CROELL REDI-MIX	CLARKSVILLE	NW	01	TO92	R16W	2.67	2		4	4		
							2.67		X				
A12504	SHELL ROCK S&G	BROOKS	NE	02	TO91	R15W	2.66	X		4	4		
							2.67		X				
A12508	GREENE LS CO	AUSTINVILLE	NW	23	TO90	R18W	2.64		X	3	3		
A12514	GREENE LS CO	DE VRIES	SW	28	TO90	R18W				4	4		
							2.63		X				
A12516	GREENE LS CO	JENSEN	S2	18	TO93	R16W				4	4		
A12518	NIEMANN CONST CO	SHELL ROCK-ADAMS	NE	03	TO91	R15W				3	3		
							2.66		X				
13	**CALHOUN DIST 3**	**SAND & GRAVEL**											
A13502	BECKER GRAVEL CO	LAKE CITY	NW	23	TO86	R34W				4	4		
14	**CARROLL DIST 3**	**SAND & GRAVEL**											
A14506	MARTIN MARIETTA	POUND	SE	18	TO85	R33W				4	4		
A14510	TIEFENTHALER INC	LANESBORO	NW	17	TO85	R33W	2.72	2		4	4		
							2.68		X				
A14512	MARTIN MARIETTA	OPEN	SE	15	TO84	R34W				4	4		
A14514	TIEFENTHALER INC	MACKE		06	TO85	R33W	2.69	2		4	4		
							2.66		X				
A14516	BECKER GRAVEL CO	RICHLAND	NE	23	TO83	R33W				4	4		
15	**CASS DIST 4**	**CRUSHED STONE**											
A15004	SCHILDBERG CONST CO INC	LEWIS	SE	17	TO75	R37W					4	10 -11	
A15008	SCHILDBERG CONST CO INC	ATLANTIC MINE	NE	13	TO76	R37W					5	25	

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	DUR PCC FA	FRICT HMA A	FRICT HMA B	BEDS	NOTE
16	**CEDAR DIST 6**	**CRUSHED STONE**											
A16002	WENDLING QUARRIES INC	HUNT	SW	10	TO81	R04W	DWU	3iB		4	4	1	
A16004	WENDLING QUARRIES INC	LOWDEN-SCHNECKLOTH	NW	04	TO81	R01W	DWU	3i				1	
										4	4	1 - 3	
A16006	WENDLING QUARRIES INC	STONEMILL	SE	14	TO80	R03W	DWU	3iB		4	4	4	
A16010	WENDLING QUARRIES INC	PEDEN	NE	10	TO79	R03W				5	5		
A16012	WEBER STONE CO INC	ONION GROVE	SE	14	TO82	R02W	2.61	3i		4	4	1 - 7	
A16014	WENDLING QUARRIES INC	TOWNSEND	NW	02	TO79	R02W							
A16018	WENDLING QUARRIES INC	LOWDEN-MASSILLON	NW	23	TO82	R01W							
A16022	WENDLING QUARRIES INC	TRICON	N2	09	TO82	R04W	DWU	3i		4	4	1	
		SAND & GRAVEL											
A16502	WENDLING QUARRIES INC	SHARPLISS	NW	12	TO79	R03W				4	4		
							2.65		X				
A16506	WEBER STONE CO INC	ONION GROVE	SE	14	TO82	R02W	2.65		X				
A16508	WENDLING QUARRIES INC	MASSILLON	CT	11	TO82	R01W	2.65		X				
17	**CERRO GORDO DIST 2**	**CRUSHED STONE**											
A17008	MARTIN MARIETTA	PORTLAND WEST	NE	19	TO96	R19W	2.75	3iB		4	4	1 - 8	
A17012	MARTIN MARIETTA	LILLYBRIDGE-UBBEN	SW	26	TO94	R20W	2.68	2				3	
										5	5	1 - 3	
A17020	MARTIN MARIETTA	MASON CITY	NE	29	TO97	R20W	DWU	3i				7	
							2.73	3				7 - 9	
										4	4	8 - 9	
										X	X	1 - 6	
A17022	HOLCIM INC	HOLCIM	SE	19	TO97	R20W	DWU	2				1 - 4	
							DWU	2				11 - 13	
A17024	HEARTLAND ASPHALT	RIVERVIEW	NE	29	TO96	R19W				4	4	1 - 2	
		SAND & GRAVEL											
A17506	BECKER GRAVEL CO	NELSON-FORBES	SW	27	TO96	R19W				4	4		
A17512	NORTH IOWA S&G INC	WEPKING	NE	15	TO97	R21W	DWU		X				
A17514	MARTIN MARIETTA	HOLCIM SAND	NE	19	TO97	R20W	DWU	2		3	3		
							2.65		X				
18	**CHEROKEE DIST 3**	**SAND & GRAVEL**											
A18506	HALLETT MATERIALS CO	CHEROKEE SOUTH	NE	16	TO91	R40W	2.70	2		3	3		
							2.69		X				
A18512	FABER & SON CONST CO	KILLIAM	SW	20	TO93	R39W				4	4		
A18514	BEDROCK GRAVEL	MONTGOMERY	NE2	20	TO93	R39W				4	4		
A18516	MARTIN MARIETTA	WASHTA #1	NE	30	TO90	R41W				3	3		
A18518	MARTIN MARIETTA	QUIMBY	SW	15	TO90	R41W				3	3		
A18520	MARTIN MARIETTA	QUIMBY-EAST	NW	06	TO90	R40W				3	3		
A18526	HALLETT MATERIALS CO	CHEROKEE NORTH	SW	23	TO92	R40W	2.70	2		3	3		
							2.67		X				
A18528	BEDROCK GRAVEL	BEAZLEY	SW	31	TO90	R41W	DWU		X	4	4		
A18530	BEDROCK GRAVEL	PATTERSON		32	TO91	R40W	2.69	2					
							DWU		X				
A18532	HODGEMAN & SONS INC	WALKER		31	TO90	R41W							
A18534	HALLETT MATERIALS CO	NELSON	CT	23	TO92	R40W	DWU	2					
							DWU		X				
A18536	BEDROCK GRAVEL	BECK	NE	30	TO93	R39W	DWU	2					
									X				

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	DUR PCC FA	FRICT HMA A	FRICT HMA B	BEDS	NOTE
19	**CHICKASAW DIST 2**	**CRUSHED STONE**											
A19002	GREENE LS CO	TRACY	SE	29	TO94	R14W	2.55	2		4	4	9 - 10	
A19004	BRUENING ROCK PROD INC	DEERFIELD-MAHONEY	SE	33	TO97	R14W					X		
A19006	GREENE LS CO	HUNT	NE	29	TO94	R14W	2.57	2		4	4	9 - 10	
A19008	GREENE LS CO	BOICE	NE	16	TO95	R14W					5		
		SAND & GRAVEL											
A19504	GREENE LS CO	HUNT	NW	29	TO94	R14W				4	4		
A19506	BLAZEK S&G CO	BLAZEK	NW	32	TO96	R11W				4	4		
							2.66		X				
A19508	ROVERUD CONST INC	BUSTA	SE	23	TO96	R11W				4	4		
							2.65		X				
A19510	RIVER BEND ENTERPRISES	NASHUA	NE	31	TO94	R14W				X	X		
							2.66		X				
A19512	GREENE LS CO	PEARL ROCK	SE	31	TO94	R14W				4	4		
							2.65		X				
A19514	BRUENING ROCK PROD INC	NASHUA	SW	33	TO95	R14W	DWU		X				
A19516	NIEMANN CONST CO	REWOLDT	NE	25	TO94	R13W	2.64		X				
A19518	CARLSON MATERIALS CO	AGGLAND		31	TO96	R12W	2.64		X				
20	**CLARKE DIST 5**	**CRUSHED STONE**											
A20002	MARTIN MARIETTA	OSCEOLA	NW	12	TO72	R26W					5	1 - 10	
											X	1 - 4	1
21	**CLAY DIST 3**	**SAND & GRAVEL**											
A21506	DAVE'S S&G	EVERLY	SW	31	TO97	R38W	2.70	2		3	3		
							2.68		X				
A21508	MARTIN MARIETTA	SCHARNBURG	NE	11	TO96	R38W				4	4		
A21510	NORGAARD S&G	DICKENS	NW	20	TO96	R35W				3	3		
							2.70		X				
A21514	MARTIN MARIETTA	CORNELL	SW	27	TO94	R36W				4	4		
A21516	SIEH S&G	SPENCER #1	SW	24	TO96	R36W	2.69	2		3	3		
							2.66		X				
A21518	HALLETT MATERIALS CO	SPENCER #2	SW	05	TO97	R37W				4	4		
A21520	MARTIN MARIETTA	EVERLY	SE	06	TO96	R38W				4	4		
A21522	BECKER GRAVEL CO	STAINS		30	TO97	R38W				4	4		
A21526	ROHLIN CONST CO INC	CLAY COUNTY	NW	20	TO96	R35W							
A21528	ROHLIN CONST CO INC	GOEKEN	NE	05	TO96	R38W							
A21530	ROHLIN CONST CO INC	BRAUNSCHWEIG		16	TO94	R36W							
A21532	CLAY COUNTY	ELSER	CT	03	TO94	R36W							

NOTE: 1 – FRICTION TYPE TO BE DETERMINED WHEN USED ON WINTERSET BEDS 1-4

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	DUR PCC FA	FRICT HMA A	FRICT HMA B	BEDS	NOTE
22	**CLAYTON DIST 2**	**CRUSHED STONE**											
A22002	KUHLMAN CONST CO	TWIN ROCK-SCHRADER	NW	14	TO94	R05W				4	4	1 - 11	
										4	4	3 - 11	
A22004	ROVERUD CONST INC	BENTE-ELKADER-WATSON	SW	12	TO93	R05W	2.66	2				6 - 9	
										4	4	1 - 9	
A22006	BRUENING ROCK PROD INC	MARQUETTE	NW	16	TO95	R03W	DWU	3i		4	4	1 - 3	
A22008	KUHLMAN CONST CO	ANDEREGG	SE	32	TO92	R02W	DWU			4	4	2 - 8	
A22010	KUHLMAN CONST CO	OSTERDOCK	SE	02	TO91	R03W	2.67	2				3 - 5	
										4	4	1 - 8	
A22012	KUHLMAN CONST CO	SCHMIDT	NE	33	TO91	R01W	2.66	3i				4B - 6	
										4	4	2 - 6	
A22014	ROVERUD CONST INC	BLUME	NE	09	TO93	R03W	2.64	2				1 - 7	
										4	4	1 - 12	
A22016	KUHLMAN CONST CO	GISLESON	NW	06	TO95	R04W	2.66	3i		4	4	1 - 8	
										4	4	1 - 15	
A22018	ROVERUD CONST INC	ZURCHER	SE	01	TO94	R05W				4	4		
A22020	KUHLMAN CONST CO	MUELLER	NE	30	TO94	R03W	DWU	3i		4	4	1 - 8	
A22024	MIELKE'S QUARRY	SPOOK CAVE	NE	21	TO95	R04W				4	4	1 - 2	
A22026	KUHLMAN CONST CO	DOERRING-LUANA	SE	05	TO95	R05W					4		
A22030	KUHLMAN CONST CO	EBERHARDT	NW	27	TO93	R05W	2.72	3		4	4	1 - 5	
											4	1 - 8	
A22032	KUHLMAN CONST CO	WELLMAN	NW	25	TO92	R06W		X		X	4	1 - 6	
A22034	KUHLMAN CONST CO	KRUSE	NW	17	TO92	R04W	2.70	3B		4	4	5 - 11	
							2.70	2B		4	4	5 - 12	
										4	4	2 - 12	
A22038	KUHLMAN CONST CO	FASSBINDER	SW	09	TO92	R03W	2.67	3i		4	4	2B - 6	
A22040	KUHLMAN CONST CO	HARTMAN	NW	29	TO91	R06W	2.68	3i		4	4	1 - 4	
A22042	ROVERUD CONST INC	MORAREND	CT	35	TO92	R03W	2.67	X				1 - 8	
										4	4	1 - 10	
A22044	KUHLMAN CONST CO	BOGE	SW	18	TO91	R02W							
A22046	KUHLMAN CONST CO	JOY SPRINGS-BURRACK	NW	19	TO91	R06W	2.65	3i		4	4	1	
A22048	ROVERUD CONST INC	TUCKER	SW	18	TO91	R05W							
A22056	ROVERUD CONST INC	MCGREGOR	NE	34	TO95	R03W					4		
A22058	ROVERUD CONST INC	ST OLAF	SE	25	TO94	R05W							
A22060	ROVERUD CONST INC	JOHNSON	NW	26	TO93	R04W	2.64	3i		4	4	2 - 5	
										4	4	1 - 5	
A22062	ROVERUD CONST INC	SNY MAGILL	SE	22	TO94	R03W	DWU	3i		4	4	6 - 10	
A22066	ROVERUD CONST INC	PETERSON	NW	09	TO94	R06W							
A22068	RIVER CITY STONE INC	MILLVILLE	NW	10	TO91	R02W	DWU	3i				1 - 8	
A22070	ROVERUD CONST INC	BERNHARD/GIARD	NW	35	TO95	R04W				4	4	1 - 3	
A22072	PATTISON BROS	CLAYTON TERMINAL		07	TO93	R02W				4	4	1	
										4	4	3 - 4	
A22074	RIVER CITY STONE INC	STRAWBERRY POINT	NE	19	TO91	R06W	DWU	3i				1 - 2	
A22076	ROVERUD CONST INC	LARSON	NW	08	TO93	R05W							
A22078	ROVERUD CONST INC	SMITH		07	TO93	R06W							
A22080	KUHLMAN CONST CO	HILINE	NW	08	TO91	R03W							
A22082	NIEMANN CONST CO	REIERSON	NW	20	TO94	R06W							
A22084	CJ MOYNA & SONS	MOYNA		14	TO93	R05W							
		SAND & GRAVEL											
A22510	ROVERUD CONST INC	BENTE	SE	15	TO93	R05W	2.66	X		4	4		
							2.66		X				
A22512	KUHLMAN CONST CO	FAIRGROUND	NE	26	TO93	R05W				4	4		
							2.66		X				
A22514	KUHLMAN CONST CO	JOY SPRINGS	SW	19	TO91	R06W				X	X		
A22518	KUHLMAN CONST CO	THURN	CT	25	TO92	R05W				3	3		
							2.65		X				
A22520	KULHMAN CONST CO	WELTERLEN	SE	32	TO91	R05W	2.65		X				

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	FA	FRICT HMA A	B	BEDS	NOTE
23	**CLINTON DIST 6**	**CRUSHED STONE**											
A23002	WENDLING QUARRIES INC	BLOORE-ELWOOD	NW	08	TO83	R02E	DWU	3i		4	4	1 - 2	
A23004	WENDLING QUARRIES INC	BEHR	SW	02	TO81	R03E	2.61	3i		4	4	1 - 2	
A23006	WENDLING QUARRIES INC	SHAFFTON	NE	11	TO80	R05E	DWU	3i		4	4	16 - 17	
							DWU	3		4	4	3 - 14	
										4	4	3 - 15	
A23010	WENDLING QUARRIES INC	GOOSE LAKE	SW	22	TO83	R05E				4	4	1 - 10	
A23012	WENDLING QUARRIES INC	TEEDS GROVE	SW	03	TO83	R06E					4		
A23016	WENDLING QUARRIES INC	LYONS	NW	18	TO82	R07E					4		
A23026	WENDLING QUARRIES INC	MILL CREEK	NE	22	TO82	R06E					4		
A23028	WENDLING QUARRIES INC	DELMAR	SE	06	TO83	R04E							
A23030	WENDLING QUARRIES INC	EDON VALLEY		04	TO83	R01E							
A23032	ANDERSON S&G	ANDERSON		23	TO81	R03E							
		SAND & GRAVEL											
A23502	WENDLING QUARRIES INC	DOYLE	NE	30	TO83	R07E				4	4		
							2.67		X				
A23504	WENDLING QUARRIES INC	BEHR	SW	02	TO81	R03E	2.68	2		4	4		
							2.68		X				
A23506	WENDLING QUARRIES INC	SCHNECKLOTH	S2	10	TO80	R05E				4	4		
							2.67		X				
A23508	QUALITY CONCRETE CO	GATEWAY	NE	27	TO81	R06E				4	4		
							2.66		X				
A23510	WENDLING QUARRIES INC	SHAFFTON	N2	11	TO80	R05E				4	4		
							2.66		X				
A23514	ANDERSON S&G	ANDERSON	NW	23	TO81	R03E	2.68		X				
24	**CRAWFORD DIST 3**	**SAND & GRAVEL**											
A24512	HALLETT MATERIALS CO	DUNLAP	SE	27	TO82	R41W	2.70	2		3	3		
							2.66		X				
25	**DALLAS DIST 4**	**CRUSHED STONE**											
A25004	SCHILDBERG CONST CO INC	I-80	SW	33	TO78	R28W					5	25C-25E	
		SAND & GRAVEL											
A25502	HALLETT MATERIALS CO	MESSERSCHMIDT	NW	28	TO79	R27W	2.70	2		4	4		
							2.67		X				
A25510	HALLETT MATERIALS CO	PERRY	NW	01	TO81	R29W	2.70	2		4	4		
							2.67		X				
A25512	HALLETT MATERIALS CO	VAN METER	SE	16	TO78	R27W	2.68	2		3	3		
							2.66		X				
A25514	HALLETT MATERIALS CO	BOONEVILLE	S2	26	TO78	R26W	2.68	2		3	3		
							DWU		X				
26	**DAVIS DIST 5**	**CRUSHED STONE**											
A26004	DOUDS STONE INC	LEWIS	W2	02	TO69	R12W	2.60	3		4	4	1	
										5	5	3 - 7	
											5	3 - 5	
										4	4	6 - 7	
A26006	DOUDS STONE INC	BROWN	SW NW	02	TO69	R12W	2.60	3		4	4	1	
										5	5	3 - 7	
											5	3 - 5	
										4	4	6 - 7	
		SAND & GRAVEL											
A26502	DOUDS STONE INC	FRANKLIN	SW	01	TO70	R12W							

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	DUR PCC FA	FRICT HMA A	FRICT HMA B	BEDS	NOTE
27	**DECATUR DIST 5**	**CRUSHED STONE**											
A27002	MARTIN MARIETTA	GRAND RIVER	NW	22	TO70	R27W					5	12 - 14	
A27008	MARTIN MARIETTA	DECATUR	SE	32	TO69	R26W					X	7	1
											5	9 - 15	
		SAND & GRAVEL											
A27508	ROBEX INC	LORD'S SOURCE		09	TO69	R26W							
28	**DELAWARE DIST 6**	**CRUSHED STONE**											
A28002	KUHLMAN CONST CO	SEDGEWICK #2	SW	36	TO90	R06W	2.66	3iB		4	4	3	
A28006	KUHLMAN CONST CO	SEDGEWICK #1	SW	36	TO90	R06W				4	4	1 - 3	
A28008	KUHLMAN CONST CO	EDGEWOOD WEST	CT	04	TO90	R05W	2.67	3i				2 - 7	
										4	4	1 - 7	
A28010	KUHLMAN CONST CO	TIBBOTT	SW	23	TO90	R04W	2.70	3i				1 - 5	
										4	4	1 - 7	
A28012	KUHLMAN CONST CO	BAUL	SE	22	TO89	R06W	2.69	3i		4	4	1 - 4	
A28014	KUHLMAN CONST CO	LOGAN	SW	10	TO88	R05W	2.69	3				2 - 8	
										4	4	1 - 8	
A28016	KUHLMAN CONST CO	WHITE	NW	02	TO88	R04W	2.72	3i		4	4	1 - 2	
A28020	BARD CONCRETE CO	DEUTMEYER	SW	13	TO88	R03W	DWU	3i		4	4	2 - 6	
A28030	KUHLMAN CONST CO	GRIEF	NE	18	TO87	R03W					4		
A28032	RIVER CITY STONE INC	SCHNITTJER-DELHI	NE	35	TO88	R04W							
A28038	KUHLMAN CONST CO	KUHLMAN	NW	06	TO90	R04W	2.70	3i		4	4	1B - 5	
A28040	BARD CONCRETE CO	KRAPFL	SE	23	TO89	R03W	2.69	3i		4	4	4	
A28042	KUHLMAN CONST CO	WALSTON-MASONVILLE	SE	21	TO89	R06W	2.69	3i				1 - 4	
										4	4	1 - 6	
A28044	NIEMANN CONST CO	DUNDEE	NE	20	TO90	R06W					4		
A28046	KUHLMAN CONST CO	PINS	NW	27	TO88	R03W							
A28050	KUHLMAN CONST CO	BUCK CREEK	NW	20	TO87	R04W							
A28052	RIVER CITY STONE INC	MANCHESTER	SW	09	TO88	R05W	DWU	3				5 - 8	
A28054	RIVER CITY STONE INC	WINCH	NW SW	02	TO87	R04W							
A28056	RIVER CITY STONE INC	THORPE	NW	33	TO90	R05W							
A28058	RIVER CITY STONE INC	ROSSOW/MANCHESTER	NE NW	16	TO88	R05W							
		SAND & GRAVEL											
A28502	KUHLMAN CONST CO	SEDGEWICK	SW	36	TO90	R06W				4	4		
							2.65		X				
A28504	BARD CONCRETE CO	TEGLER	NE	36	TO89	R03W				4	4		
							2.65		X				
A28506	BARD CONCRETE CO	DYERSVILLE	NW	26	TO89	R03W				4	4		
							2.65		X				
A28510	KUHLMAN CONST CO	LOGAN	SW	10	TO88	R05W	2.65		X				
A28514	KUHLMAN CONST CO	FERGESEN	NE	32	TO89	R06W				4	4		
							DWU		X				
A28520	RIVER CITY STONE INC	MANCHESTER	SW	10	TO88	R05W	2.65		X				

NOTE 1: FRICTION TYPE TO BE DETERMINED WHEN USED

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	DUR PCC FA	FRICT HMA A	FRICT HMA B	BEDS	NOTE
29	**DES MOINES DIST 5**	**CRUSHED STONE**											
A29002	L&W QUARRIES INC	MEDIAPOLIS-LEONARD	SE	01	TO71	R04W	2.65	3				15	1
										4	4	15 - 18	
										5	5	20	
A29008	CESSFORD CONST CO	NELSON	NE	26	TO72	R02W	2.62	3				21 - 24	
										4	4	7 - 20	
											4	15 - 24	
										5	5	24 - 27	
A29012	CESSFORD CONST CO	GEODE	NE	01	TO69	R05W				4	4	11 - 12	
										5	5	9 - 13	
										4	4	17	
		SAND & GRAVEL											
A29502	CESSFORD CONST CO	SPRING GROVE	SW	36	TO69	R03W		3		4	4		
							2.66		X				
30	**DICKINSON DIST 3**	**SAND & GRAVEL**											
A30502	CONCRETE SAND & MATERIALS	MILFORD		12	TO98	R37W	2.70	2		3	3		
							2.66		X				
A30504	ROHLIN CONST CO INC	ROHLIN	NE	06	TO98	R36W				3	3		
A30506	HUMMEL S&G	FOSTORIA	NE	26	TO98	R37W				4	4		
A30508	ROHLIN CONST CO INC	LOST		32	TO98	R37W	2.71	3		3	3		
							2.67		X				
A30510	CEMSTONE S&G	EAST	NE	07	TO98	R36W	2.71	2		3	3		
							2.66		X				
A30512	DICKINSON CO	WESTPORT	NE	17	TO98	R38W				4	4		
A30514	ROHLIN CONST CO INC	LEITH	NE	04	TO98	R37W	DWU	2					
A30516	COHRS CONSTRUCTION INC	CROSBY	NW	21	T100	R37W							
A30518	COHRS CONSTRUCTION INC	SMITH	SE	06	T098	R36W							

NOTE 1: AASHTO 57 GRADATION MAXIMUM

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	FA	FRICT HMA A	B	BEDS	NOTE
31	**DUBUQUE DIST 6**	**CRUSHED STONE**											
A31002	RIVER CITY STONE INC	ROSE SPUR		27	TO90	R02E	2.66	3i				1 - 8	
										4	4	1 - 15	
A31006	KUHLMAN CONST CO	DYERSVILLE-SUNDHEIM	SE	32	TO89	R02W	2.66	3i				4 - 12	
										4	4	1 - 8	
A31008	RIVER CITY STONE INC	KLEIN-RICHARDSVILLE	NW	33	TO90	R01E	DWU	3i				3A - 4B	
										4	4	1 - 4	
A31010	RIVER CITY STONE INC	BROWN	NW	33	TO89	R02E	2.68	3i		4	4	3 - 9A	
										4	4	2 - 9	
A31014	BARD CONCRETE CO	KURT	N2	35	TO87	R02W	2.70	3iB		4	4	1 - 2	
A31018	RIVER CITY STONE INC	MELOY	NW	23	TO87	R01E	DWU	3i		4	4	1 - 3	
A31020	RIVER CITY STONE INC	SCHLITCHE	SE	11	TO89	R02W	DWU	3i		4	4	1 - 4	
A31024	KUHLMAN CONST CO	JOHNS CREEK	SW	36	TO88	R02W	2.69	3i				3 - 4	
										4	4	1 - 4	
A31026	WENDLING QUARRIES INC	ARNSDORF	SE	25	TO87	R02E	DWU	3i		4	4	1 - 2	
A31028	RIVER CITY STONE INC	THOLE	NW	21	TO87	R02E	DWU	3i			4	1 - 2	1
A31030	RIVER CITY STONE INC	KEMP	NE	09	TO89	R01W					4		
A31034	RIVER CITY STONE INC	HERMSEN	NE	33	TO90	R02W					4		
A31036	RIVER CITY STONE INC	BALLTOWN	SE	05	TO90	R01E							
A31038	RIVER CITY STONE INC	HARTBECKE	SW	21	TO88	R01W					4		
A31040	RIVER CITY STONE INC	KENNEDY	NW	03	TO88	R01W					4		
A31042	RIVER CITY STONE INC	GANSEN	NW	09	TO87	R02E					4		
A31046	WENDLING QUARRIES INC	DECKER	SE	24	TO87	R02E	DWU	3i		4	4	1 - 5	
A31048	RIVER CITY STONE INC	MCDERMOTT	NE	35	TO88	R01W	2.65	3i		4	4	2	
A31050	RIVER CITY STONE INC	PLOESSEL-DYERSVILLE	N2	07	TO88	R02W	2.74	3i		4	4	3 - 5	
A31052	KUHLMAN CONST CO	EPWORTH-KIDDER	SW	02	TO88	R01W							
A31054	RIVER CITY STONE INC	MERRITT	SE	05	TO89	R02E							
A31056	RIVER CITY STONE INC	RUBIE	SE	06	TO88	R03E							
A31058	RIVER CITY STONE INC	HOLY CROSS	SW	12	TO90	R02W							
A31060	BARD CONCRETE CO	EAST CASCADE	SE	22	TO87	R01W	2.71	3i		4	4	2 - 5	
A31064	RIVER CITY STONE INC	WEBER	NW	32	TO89	R02E	2.67	3i		4	4	3 - 9A	
A31066	RIVER CITY STONE INC	FILLMORE	SW	26	TO87	R01W	2.70	3i		4	4	2 - 4	
		SAND & GRAVEL											
A31502	AGGREGATE MATLS.-FLYNN	NINE MILE ISLAND	NE	24	TO88	R03E	2.66	3i		3	3		
							2.66		X				
A31504	BARD CONCRETE CO	SAUSER PROPERTY	NW	36	TO87	R02W				4	4		
							2.66		X				
A31512	MOLO S&G CO	BURKLE-MOLO	SW	19	TO89	R02W	2.66		X				
A31514	RIVER CITY STONE INC	FILLMORE	CT	26	TO87	R01W	2.66		X				

NOTE 1: TOP 17.0' ONLY OF BED 2

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	FA	FRICT HMA A	B	BEDS	NOTE
32	**EMMET DIST 3**	**SAND & GRAVEL**											
A32502	ESTHERVILLE ROCK & GRAVEL	ESTHERVILLE	N2	03	TO99	R34W	2.70	2		3	3		
							DWU		X				
A32506	EMMET COUNTY	FREY	NW	21	T100	R34W				4	4		
A32514	BOGGESS CONST	WALLINGFORD		07	TO98	R33W					4		
							DWU		X				
A32518	ROHLIN CONST CO INC	EGELAND		20	TO98	R33W				4	4		
A32520	ROHLIN CONST CO INC	YOUNG	NE	19	TO98	R32W				4	4		
A32522	ESTHERVILLE ROCK & GRAVEL	OLD ESTHERVILLE S&G		30	TO99	R33W							
A32524	EMMET COUNTY	PETERSON	SW	34	T100	R34W							
A32526	ROHLIN CONST CO INC	DAVID YOUNG	NE	29	TO98	R33W				4	4		
A32530	L C KRUSE & SONS	WHITE	SW	16	T100	R34W	DWU	2		4	4		
							DWU		X				
A32534	ROHLIN CONST CO INC	ENERSON		28	T100	R34W				4	4		
A32538	ESTHERVILLE ROCK & GRAVEL	JENSEN	NW	03	T099	R34W	DWU	2					
							DWU		X				
A32540	HODGEMAN & SONS INC	FISHER	NE	33	TO98	R32W							
33	**FAYETTE DIST 2**	**CRUSHED STONE**											
A33002	NIEMANN CONST CO	ELDORADO-JACOBSEN	SW	17	TO95	R08W	2.69	3iB		5	5	4 - 6B	
A33004	NIEMANN CONST CO	HOUG	SW	11	TO94	R08W				5	5	1 - 9	
A33006	NIEMANN CONST CO	MARYVILLE	SE	24	TO91	R07W	2.69	3i		4	4	1 - 2	
A33010	WILTGEN CONST CO	VOSHELL	NW	21	TO93	R07W				X	X	1 - 4	
A33016	NIEMANN CONST CO	MAYNARD	NE	23	TO92	R09W					X		
A33018	NIEMANN CONST CO	FAIRBANK	SW	28	TO91	R10W		X		4	4	5	
											4	1 - 5	
A33020	NIEMANN CONST CO	YEAROUS	SW	19	TO93	R08W				4	4	1 - 10	
A33022	NIEMANN CONST CO	MILLER	SW	35	TO95	R10W				4	4	1 - 8	
A33024	NIEMANN CONST CO	WAUCOMA	NW	25	TO95	R10W	2.69	3iB		5	5	2 - 4	
A33026	WILTGEN CONST CO	LYNCH	NW	05	TO95	R10W				4	4	1 - 5	
A33030	NIEMANN CONST CO	SCHWEMMAN-ST LUCAS	NE	29	TO95	R09W				X	X		
A33032	BRUENING ROCK PROD INC	LANDIS	SE	12	TO93	R08W		X		4	4	1 - 5	
A33034	NIEMANN CONST CO	MCDONOUGH	SE	36	TO94	R08W							
A33036	NIEMANN CONST CO	GRAHAM-HAWKEYE	SW	06	TO94	R09W		X		4	4	1 - 4	
A33038	NIEMANN CONST CO	PAPE	NE	28	TO95	R08W	DWU	3iB		5	5	3 - 5	
		SAND & GRAVEL											
A33506	NIEMANN CONST CO	ALPHA	NW	03	TO94	R10W	2.64	X		4	4		
							2.64		X				
A33508	CARLSON MATERIALS CO	DURSCHER	NW	03	TO94	R07W					4		
A33510	ZUPKE S&G	RANDALIA	NW	29	TO93	R09W				4	4		
							2.66		X				
A33512	NIEMANN CONST CO	WADENA	NE	25	TO93	R07W				4	4		
							2.66		X				
A33518	KUHLMAN CONST CO	BASSETT	SE	11	TO91	R07W				4	4		
							2.65		X				
A33520	BRUENING ROCK PROD INC	OELWEIN SAND	NE	09	TO91	R09W	2.65		X				
A33522	BRUENING ROCK PROD INC	PAPE	SE	08	TO95	R08W	2.65		X				
A33524	CROELL REDI-MIX	ROGERS		04	TO94	R07W	2.66		X				
A33526	WILTGEN CONST CO	ELDORADO	NE	13	TO95	R09W							

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	DUR PCC FA	FRICT HMA A	FRICT HMA B	BEDS	NOTE
34	**FLOYD DIST 2**	**CRUSHED STONE**											
A34002	GREENE LS CO	CARVILLE-BUNN	SW	23	TO95	R15W	2.63	2		4	4	1 - 4	
A34004	GREENE LS CO	MAXON	SE	07	TO94	R17W	2.68	2				4C - 19	
										5	5	1 - 17	
A34006	GREENE LS CO	JOHLAS	SW	07	TO94	R15W					X		
A34008	GREENE LS CO	WARNHOLTZ	SW	09	TO96	R16W	2.70	3i		5	5	1 - 4	
							2.68	2		4	4	17 - 18	
											X	1 - 18	
A34010	GREENE LS CO	LACOSTA	SE	25	TO97	R17W	DWU	3i		5	5	1 - 4	
										5	5	1 - 8	
										4	4	9 - 14	
A34012	GREENE LS CO	WILLIAMS	NW	29	TO96	R18W							
A34014	BRUENING ROCK PROD INC	HANNMANN	NE	20	TO94	R15W							
		SAND & GRAVEL											
A34502	GREENE LS CO	ROCKFORD	SE	15	TO95	R18W	2.68	2		3	3		
							2.65		X				
A34506	GREENE LS CO	LENT	NE	08	TO96	R16W				4	4		
A34510	GREENE LS CO	BRACKEL	NE	17	TO94	R17W				4	4		
A34514	GREENE LS CO	LITTLE CEDAR	NW	01	TO95	R15W	2.65		X				
A34516	GREENE LS CO	CEDAR ACRE RESORTS	E2	17	TO95	R15W			X				
35	**FRANKLIN DIST 2**	**CRUSHED STONE**											
A35002	MARTIN MARIETTA	DOWS	NE	30	TO91	R22W				4	4	1 - 4	
										5	5	5 - 6	
										4	4	7 - 12	
A35006	MARTIN MARIETTA	HIBNESS	SE	22	TO91	R20W	2.58	3				1 - 4A	
										4	4	1 - 12	
A35010	GREENE LS CO	MILLER	NE	13	TO91	R19W					4	1 - 5	
A35016	GREENE LS CO	AYRES		01	TO92	R19W							
		SAND & GRAVEL											
A35502	CARLSON MATERIALS CO	GENEVA	SW	07	TO91	R19W	2.68	2		3	3		
							2.66		X				
A35508	MARTIN MARIETTA	STUCK	SW	30	TO91	R22W				4	4		
A35512	MARTIN MARIETTA	ANDERSON-POPEJOY	NE	28	TO90	R22W	2.68		X	3	3		
A35514	CARLSON MATERIALS CO	KOCH	SW	08	TO91	R19W				4	4		
							2.69		X				
A35516	BECKER GRAVEL CO	PETERS	SW	04	TO92	R20W				3	3		
							2.65		X				
A35518	BECKER GRAVEL CO	REINKE	SW	22	TO91	R20W				4	4		
A35520	BECKER GRAVEL CO	BRANDT	N2	34	TO90	R19W				4	4		
							2.68		X				
A35522	MARTIN MARIETTA	RASH	SE	27	TO90	R22W			X				
36	**FREMONT DIST 4**	**CRUSHED STONE**											
A36002	SCHILDBERG CONST CO INC	THURMAN	NW	23	TO70	R43W					4		
37	**GREENE DIST 1**	**SAND & GRAVEL**											
A37502	HALLETT MATERIALS CO	BEAZOR	SW	02	TO83	R31W	2.69	2		4	4		
							2.68		X				
A37504	HALLETT MATERIALS CO	JEFFERSON	SW	04	TO83	R31W	2.66	2		4	4		
							2.64		X				
A37514	ARCADIA LIMESTONE CO	WRIGHT	NW	05	TO84	R32W				4	4		
							2.66		X				
A37518	BECKER GRAVEL CO	P&M		30	TO82	R32W	2.69		X				
A37520	GREENE CO REDI MIX	HAMILTON		27	TO83	R30W	2.59		X				

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	DUR PCC FA	FRICT HMA A	FRICT HMA B	BEDS	NOTE
38	**GRUNDY DIST 1**	**CRUSHED STONE**											
A38002	GREENE LS CO	REIKEN	NE	15	TO89	R18W				4	4	2 - 5	
		SAND & GRAVEL											
A38504	CARLSON MATERIALS CO	HERONIMOUS	SE	35	TO88	R17W	2.63		X				
39	**GUTHRIE DIST 4**	**SAND & GRAVEL**											
A39502	BECKER GRAVEL CO	HEILAND	SW	29	TO79	R30W				4	4		
A39506	BUTTLER CONST CO	BAYARD	NE	22	TO81	R32W				4	4		
40	**HAMILTON DIST 1**	**CRUSHED STONE**											
A40006	MARTIN MARIETTA	GRANDGEORGE	SE	18	TO89	R25W							
		SAND & GRAVEL											
A40508	MARTIN MARIETTA	GRANDGEORGE	SE	18	TO89	R25W					4		
A40510	BECKER GRAVEL CO	MORTVEDT	SW	24	TO86	R24W	2.67		X				
A40512	BECKER GRAVEL CO	ANDERSON		12	TO87	R26W							
41	**HANCOCK DIST 2**	**CRUSHED STONE**											
A41002	BASIC MATERIALS CORP	GARNER NORTH	SE	11	TO95	R24W	2.77	3iB		4	4	1 - 4	
							2.77	3i		4	4	6	
A41004	BASIC MATERIALS CORP	GARNER SOUTH-WIELAND	NW	13	TO95	R24W	2.77	3iB		4	4	1 - 4	
							2.77	3i		4	4	6	
		SAND & GRAVEL											
A41504	HANCOCK COUNTY	HUTCHINS	E2	27	TO96	R26W					4		
A41506	HANCOCK COUNTY	KLEMME		26	TO95	R24W					4		
A41510	NUCKOLL'S CONCRETE SERVICES INC	BRITT		34	TO96	R26W	DWU	2		3	3		
							DWU		X				
A41518	HANCOCK COUNTY	AUSTIN	NE	11	TO97	R25W							
42	**HARDIN DIST 1**	**CRUSHED STONE**											
A42002	MARTIN MARIETTA	ALDEN	NW	20	TO89	R21W	2.57	3i		4	4	0, 1, 3	
							DWU	3				0, 1	
A42004	GERHKE QUARRIES INC	GIFFORD	NW	04	TO86	R19W					5		
A42006	RIEKENA	RIEKENA	NW	03	TO88	R20W							
		SAND & GRAVEL											
A42502	WELDON BROS CONST CO	IOWA FALLS	NW	20	TO89	R20W	2.65	2		4	4		
							2.68		X				
A42510	MARTIN MARIETTA	JANSSEN	SE	34	TO89	R20W	2.65			4	4		
							2.65		X				
A42512	HARDIN AGGREGATES INC	GIFFORD	SW	31	TO87	R19W				4	4		
							2.66		X				
A42524	BECKER GRAVEL CO	GRIFFEL	SE	31	TO89	R19W				3	3		
A42528	BECKER GRAVEL CO	LLOYD		04	TO86	R19W	DWU			4	4		
A42530	BECKER GRAVEL CO	BLOME	SE	32	TO87	R21W							

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	FA	FRICT HMA A	B	BEDS	NOTE
43	**HARRISON DIST 4**	**CRUSHED STONE**											
A43002	SCHILDBERG CONST CO INC	LOGAN		19	TO79	R42W				4D	4D	25E	
										5	5	25C- 25E	
											4	26	
A43004	WESTERN IOWA LIMESTONE	LOGAN		17	TO79	R42W				4D	4D	25E	
										5	5	25C- 25E	
											4	26	
		SAND & GRAVEL											
A43506	SCHEMMER LS INC	LOGAN	SE	08	TO79	R42W				3	3		
							DWU		X				
A43512	HALLETT MATERIALS CO	WOODBINE-MCCANN	SW	29	TO81	R41W	2.68	3		3	3		
							2.64		X				
44	**HENRY DIST 5**	**CRUSHED STONE**											
A44002	COOTS MATERIALS CO INC	SMITH	SE	17	TO71	R06W							
A44006	HENRY COUNTY	LEEPER	NE	18	TO71	R06W	DWU	2				8 - 11	
A44008	DOUDS STONE INC	TWEEDY	SW	36	TO71	R06W				4	4	13 - 14	
		SAND & GRAVEL											
A44502	CESSFORD CONST CO	NORTH ROME	SW	29	TO72	R07W				4	4		
							2.66		X				
A44504	IDEAL SAND CO	ENSMINGER-ROME	NW	32	TO72	R07W	2.67		X				
45	**HOWARD DIST 2**	**CRUSHED STONE**											
A45002	ROVERUD CONST INC	ECKERMAN	NW	33	T100	R11W	2.61	2		X	X	8 - 9	
A45006	BRUENING ROCK PROD INC	NELSON	NE	33	TO99	R13W	2.54	2		4	4	1 - 3	
							2.54	2		4	4	8 - 9	
A45008	BRUENING ROCK PROD INC	DOTZLER	NE	23	TO99	R12W	2.56	3		4	4	7 - 10A	
A45010	BRUENING ROCK PROD INC	DALEY	NE	11	TO98	R11W	2.59	3		4	4	9 - 11	
A45014	FALK CONST CO	CECELIA	SE	08	TO97	R14W					5		
A45018	BRUENING ROCK PROD INC	LE ROY	NW	10	T100	R14W					X		
A45020	BRUENING ROCK PROD INC	RIECKS	NW	24	T100	R11W							
A45022	BRUENING ROCK PROD INC	MAUER	SE	13	T100	R13W							
A45024	BRUENING ROCK PROD INC	MAPLE LEAF	SE	04	TO98	R13W							
A45026	BRUENING ROCK PROD INC	BRUENING BROTHERS #1	SE	22	T100	R11W						1 - 3	
A45028	BRUENING ROCK PROD INC	ELMA	NW	06	TO97	R13W	DWU	3		4	4	2 - 3B	
A45030	BRUENING ROCK PROD INC	DIEKEN-TANK	SE	24	T100	R13W							
A45032	BILL KEIM	GANSEN		13	T100	R12W							
		SAND & GRAVEL											
A45502	BRUENING ROCK PROD INC	MAPLE LEAF-POTTER	SE	04	TO98	R13W				4	4		
A45504	ROVERUD CONST INC	ECKERMAN	NW	33	T100	R11W	DWU	3		4	4		
							2.65		X				
A45508	CARLSON MATERIALS CO	SOVEREIGN	SW	01	TO98	R12W	DWU	3		3	3		
							2.65		X				
A45514	CARLSON MATERIALS CO	EASTLAND	NE	26	T100	R14W				3	3		
A45516	CARLSON MATERIALS CO	FREIDERICH	NE	15	TO98	R14W				3	3		
							2.67		X				
A45518	BRUENING ROCK PROD INC	ELMA	NW	06	TO97	R13W	2.67		X				

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR		SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	DUR PCC FA	FRICT HMA A	FRICT HMA B	BEDS	NOTE
46	**HUMBOLDT**	**DIST 2**	**CRUSHED STONE**											
A46006	MARTIN MARIETTA		HODGES	NE	32	TO92	R28W	2.60	3i		4	4	10 - 18	
								DWU	3i		5	5	4 - 8	
A46014	MARTIN MARIETTA		PEDERSEN	SW	28	TO92	R28W	DWU	3i				4 - 13	
A46016	BECKER GRAVEL CO		ERICKSON		30	TO91	R28W							
			SAND & GRAVEL											
A46504	MARTIN MARIETTA		PETERSON	SW	27	TO92	R29W				4	4		
A46512	NORTHWEST MATERIALS		WARREN	SW	08	TO92	R30W	DWU			X	X		
A46516	BECKER GRAVEL CO		ERICKSON		30	TO91	R28W				3	3		
A46518	MARTIN MARIETTA		PEDERSEN	SW	28	TO92	R28W			X				
47	**IDA**	**DIST 3**	**SAND & GRAVEL**											
A47502	HALLETT MATERIALS CO		BATTLE CREEK		05	TO86	R41W				3	3		
A47504	BEDROCK SAND & GRAVEL		CROCKER	NW	06	TO89	R41W							
48	**IOWA**	**DIST 6**	**SAND & GRAVEL**											
A48502	MARENGO READY MIX		KIMMICH	SE	24	TO81	R11W				4	4		
								2.66		X				
A48506	WENDLING QUARRIES INC		MARENGO	NW	22	TO81	R11W	2.66		X				
A48508	MARENGO READY MIX		DISTERHOFF	SE	34	TO81	R10W	2.66		X				

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	FA	FRICT HMA A	B	BEDS	NOTE
49	**JACKSON DIST 6**	**CRUSHED STONE**											
A49002	BELLEVUE S&G CO	BELLEVUE	SW	25	TO87	R04E	2.67	3i		4	4	1 - 3	
A49004	BELLEVUE S&G CO	LAMOTT	NW	02	TO86	R03E				4	4		
A49008	WENDLING QUARRIES INC	IRON HILL	SW	16	TO85	R02E	DWU	3i		4	4	3 - 6	
										4	4	1 - 6	
A49010	WENDLING QUARRIES INC	ANDREW	NW	21	TO85	R03E	2.70	3iB		4	4	1B - 3	
										4	4	1 - 7	
A49012	WENDLING QUARRIES INC	FROST	SE	16	TO84	R03E	DWU	3iB		4	4	1A - 1D	
										4	4	1 - 2	
A49016	WENDLING QUARRIES INC	WEIS	SE	22	TO85	R04E					4		
A49018	WENDLING QUARRIES INC	PATASKA	NW	23	TO85	R05E					4		
A49020	WENDLING QUARRIES INC	PRESTON	SW	26	TO84	R05E	2.67	3i		4	4	7 - 10	
										4	4	1 - 10	
A49021	PRESTON READY MIX	PRESTON R/M	SW	26	TO84	R05E	2.67	3i		4	4	7 - 10	
										4	4	1 - 10	
A49024	WENDLING QUARRIES INC	MAQUOKETA EAST	SW	07	TO84	R03E	2.70	3i		4	4	7 - 8	
							DWU	3				1 - 8	
A49026	WENDLING QUARRIES INC	MILES	SW	20	TO84	R06E					4		
A49028	WENDLING QUARRIES INC	FULTON	SW	25	TO85	R02E	DWU	3i		4	4	2	
										4	4	1 - 2	
A49030	BELLEVUE S&G CO	SPRINGBROOK		15	TO85	R04E				4	4		
A49032	WENDLING QUARRIES INC	OTTER CREEK-GLAHN	CT	21	TO86	R02E							
A49034	WENDLING QUARRIES INC	KILBURG	NW	21	TO85	R05E							
A49040	WENDLING QUARRIES INC	JOINERVILLE-HAMANN	SE	20	TO84	R02E				4	4	1 - 3	
A49042	WENDLING QUARRIES INC	PETERSON		24	TO84	R06E				4	4	1 - 2	
A49044	WENDLING QUARRIES INC	FRANK	NW	14	TO87	R04E							
A49046	WENDLING QUARRIES INC	ROWAN	NE	25	TO86	R03E							
A49048	PRESTON READY MIX	DRURY	CT	32	TO85	R06E							
A49050	RIVER CITY STONE INC	MARSHALL	NW	01	TO84	R06E							
A49052	WENDLING QUARRIES INC	STILLMUNKES		10	TO85	R05E							
A49054	DUANE KUNDE	KUNDE	E2	33	TO84	R05E							
A49058	WENDLING QUARRIES INC	61 ROAD CUT	N2	31	TO84	R03E	2.67	3i		4	4	1	
A49060	BELLEVUE S&G CO	ST DONATUS		18	TO87	R04E							
A49062	PRESTON READY MIX	JOHNSON		31	TO84	R04E							
A49064	BELLEVUE S&G CO	VEACH		01	TO85	R02E							
		SAND & GRAVEL											
A49504	WENDLING QUARRIES INC	KNIPELMEYER	NE	36	TO87	R04E				4	4		
							2.64		X				
A49506	BELLEVUE S&G CO	BELLEVUE	E2	01	TO86	R04E	2.64	3iB		3	3		
							2.68		X				
A49510	WENDLING QUARRIES INC	MAQUOKETA	NE	13	TO84	R02E				4	4		
							2.65		X				
A49516	WENDLING QUARRIES INC	TURNER	NE	07	TO84	R07E	2.63	3iB		3	3		
							2.65		X				
A49520	WENDLING QUARRIES INC	BALDWIN	SW	28	TO84	R01E	2.66		X				
A49522	CENTURY READY MIX	EWING	NW	02	TO84	R01E	DWU		X				
A49524	BELLEVUE S&G CO	GRIEBEL	SE	25	TO87	R04E	DWU	3B		4	4		
							2.67		X				
A49526	BELLEVUE S&G CO	BELLEVUE FARM	SE	25	TO87	R04E	DWU	3i					
							DWU		X				
A49528	AGGREGATE MATERIALS CO	STEVENS	NW	02	TO84	R01E	2.65		X				
A49530	PRESTON READY MIX	PETERSEN	SW	18	TO84	R07E	DWU	3iB		4	4		
							DWU		X				
A49532	WEBER STONE CO INC	IRON HILL	NE	16	TO85	R02E	2.65		X				
A49534	PRESTON READY MIX	MARBURGER	SE	13	TO84	R07E			X				

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	FA	FRICT HMA A	B	BEDS	NOTE
50	**JASPER DIST 1**	**CRUSHED STONE**											
A50002	MARTIN MARIETTA	SULLY MINE	SE	16	TO79	R17W	2.55	3i		4	4	36 - 41	
											4	10 - 19	
		SAND & GRAVEL											
A50502	MARTIN MARIETTA	COLFAX	NE	01	TO79	R21W	2.68	2		3	3		
							2.67		X				
A50504	MARTIN MARIETTA	REASNOR	NE	10	TO78	R19W				4	4		
							2.66		X				
51	**JEFFERSON DIST 5**	**CRUSHED STONE**											
A51006	WINN CORP	JEFFERSON	NE	09	TO71	R10W							
52	**JOHNSON DIST 6**	**CRUSHED STONE**											
A52002	WENDLING QUARRIES INC	FOUR CO	NW	04	TO81	R08W					X		
A52004	RIVER PRODUCTS CO	CONKLIN	NW	33	TO80	R06W	2.66	3iB		4	4	2 - 10	
							DWU	3i		5	5	23 - 24	1
										5	5	2 - 5	
										4	4	6 - 10	
										4	4	21	
A52006	RIVER PRODUCTS CO	KLEIN	NW	02	TO79	R07W	2.66	3iB		4	4	2 - 10	
							DWU	3i		5	5	23 - 24	1
										5	5	2 - 5	
										4	4	6 - 10	
										4	4	21	
A52008	RIVER PRODUCTS CO	ERNST	SW	20	TO80	R05W					X		
		SAND & GRAVEL											
A52502	S&G MATERIALS INC	SHOWERS	NE	27	TO79	R06W				4	4		
							2.65		X				
A52506	S&G MATERIALS INC	BUTLER	SW	33	TO79	R06W	DWU		X				
A52508	S&G MATERIALS INC	WILLIAMS	NW	34	TO79	R06W	DWU		X				

NOTE 1: 1.25 INCH MAXIMUM TOP SZE

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	DUR PCC FA	FRICT HMA A	FRICT HMA B	BEDS	NOTE
53	**JONES DIST 6**	**CRUSHED STONE**											
A53002	BARD CONCRETE CO	FARMERS-BEHRENDS	NE	14	TO86	R03W	2.64	3i		4	4	1 - 5	
A53004	WENDLING QUARRIES INC	MONTICELLO	NE	24	TO86	R04W	2.66	3i		4	4	1	
A53006	WENDLING QUARRIES INC	ANAMOSA	SE	13	TO84	R04W	DWU	3i				1 - 5	
										4	4	1 - 6	
A53010	WENDLING QUARRIES INC	BALLOU-OLIN	NE	24	TO83	R03W	DWU	3iB				3	
										4	4	1 - 3	
A53012	WENDLING QUARRIES INC	WYOMING		33	TO84	R01W	2.69	3iB		4	4	1 - 2C	
A53014	WEBER STONE CO INC	JACOBS-SCOTCH GROVE	SW	07	TO85	R02W					5		
A53016	WEBER STONE CO INC	STONE CITY		5,6	TO84	R04W	2.45	3i		4	4	2B - 3	
A53018	RIVER CITY STONE INC	FINN	NE	06	TO85	R01W	DWU	3i		4	4	2 - 5	
A53020	WENDLING QUARRIES INC	CANTON	NE	24	TO85	R01W					X		
A53024	RIVER CITY STONE INC	SULLIVAN	NW	14	TO86	R03W	DWU	3i				1 - 5	
A53026	RIVER CITY STONE INC	ANAMOSA	SW	15	TO84	R04W							
		SAND & GRAVEL											
A53502	WENDLING QUARRIES INC	MONTICELLO	SE	07	TO86	R03W				4	4		
							2.66		X				
A53506	RIVER CITY STONE INC	FINN	N2	06	TO85	R01W				4	4		
							2.65		X				
A53508	WENDLING QUARRIES INC	ANAMOSA-VERNON	SW	13	TO84	R04W				4	4		
							2.66		X				
A53510	WENDLING QUARRIES INC	KNAPP	SE	27	TO84	R03W				4	4		
							2.65		X				
A53514	WENDLING QUARRIES INC	FLEMING	NE	12	TO83	R03W				4	4		
							2.66		X				
A53522	WEBER STONE CO INC	WEBER	SE SW	05	TO84	R04W	2.66		X				
A53526	BARD CONCRETE CO	STEPHENS	NW	34	TO86	R03W				4	4		
							2.66		X				
A53528	WEBER STONE CO INC	ANAMOSA	NE	14	TO84	R04W	2.65		X				
A53530	RIVER CITY STONE INC	ANAMOSA-WOOD'S	CT	15	TO84	R04W	2.66		X				
54	**KEOKUK DIST 5**	**CRUSHED STONE**											
A54002	DOUDS STONE INC	KESWICK	NW	21	TO77	R12W	2.61	2		4	4	13 - 15	1
										4	4	13 - 18	
A54004	DOUDS STONE INC	OLLIE	SW	01	TO74	R11W	2.66	3		4	4	13 - 18	
							2.60	3				27 - 29	1
										4	4	13 - 19	
										4	4	27 - 30	
											5	31 - 33	
A54008	DOUDS STONE INC	HARPER	SE	11	TO76	R11W				4	4	15 - 24	
										4	4	32 - 37	
										4	4	38 - 40	
A54010	DOUDS STONE INC	LYLE	NW	13	TO74	R13W	DWU	3		4	4	36	
							DWU	2		5	5	11	
											X	9 - 13	
										4	4	36 - 38	
		SAND & GRAVEL											
A54502	WINN S&G	WINN	SE	06	TO74	R10W	2.66		X				

NOTE 1: 1.25 INCH MAXIMUM TOP SZE

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION	BULK SSD SpGr	DUR PCC CA	FA	FRICT HMA A	B	BEDS	NOTE
55	**KOSSUTH DIST 2**	**SAND & GRAVEL**								
A55506	KOSSUTH COUNTY	WHITTEMORE	NW 16 TO95 R30W				4	4		
A55508	KOSSUTH COUNTY	IRVINGTON	NW 36 TO95 R29W				4	4		
A55510	HODGEMAN & SONS INC	SENECA	SE 08 TO98 R30W				4	4		
A55518	REDING S&G	REDING	02 TO94 R29W							
A55536	HANSEN CONST CO	BREESE	NE 15 TO98 R30W							
56	**LEE DIST 5**	**CRUSHED STONE**								
A56002	CESSFORD CONST CO	HAWKEYE	NE 10 TO68 R06W					5	1 - 21	
							4	4	22 - 27	
A56004	CESSFORD CONST CO	FRANKLIN	NE 25 TO68 R06W	2.49	2				12	1
							4	4	12 - 14	
A56006	CESSFORD CONST CO	ARGYLE	SE 18 TO66 R06W					5	4 - 12	
							4	4	13 - 17	
A56008	CESSFORD CONST CO	DONNELLSON	SE 05 TO67 R06W				4	4	10 - 15	
A56012	CESSFORD CONST CO	VINCENNES	NW 19 TO66 R06W							
		SAND & GRAVEL								
A56504	CESSFORD CONST CO	VINCENNES	SE 32 TO66 R06W				4	4		
				2.67		X				
A56506	BROCKMAN SAND CO	FORT MADISON	SW 11 TO67 R05W				4	4		
				2.67		X				
A56508	SHIPLEY CONTRACTING CORP	LEE COUNTY S&G	SE 11 TO67 R05W	DWU		X				

NOTE 1: AASHTO 57 GRADATION MAXIMUM

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	DUR PCC FA	FRICT HMA A	FRICT HMA B	BEDS	NOTE
57	**LINN DIST 6**	**CRUSHED STONE**											
A57002	WENDLING QUARRIES INC	BETENBENDER-COGGON	SW	03	TO86	R06W	DWU	3i				8 - 9	
							DWU	2				8 - 10	
A57004	WENDLING QUARRIES INC	PLOWER	SE	36	TO86	R06W	2.62	3				9 - 11	
										4	4	1 - 10	
A57006	WENDLING QUARRIES INC	ROBINS	NE	21	TO84	R07W	2.57	3i		4	4	3	1
A57008	WENDLING QUARRIES INC	BOWSER-SPRINGVILLE	SW	29	TO84	R05W	DWU	3i		4	4	6 - 7	
A57010	WENDLING QUARRIES INC	TROY MILLS	SE	09	TO86	R07W				X	X		
A57012	WENDLING QUARRIES INC	MORGAN CREEK	SE	22	TO83	R08W				X	X		
A57014	WENDLING QUARRIES INC	SWEETING	NW	18	TO85	R08W					4		
A57016	WENDLING QUARRIES INC	ALICE	NW	08	TO85	R07W					4		
A57018	MARTIN MARIETTA	CEDAR RAPIDS	NE	15	TO82	R06W	2.64	3i				2 - 9	1
										4	4	2 - 14	
A57020	WENDLING QUARRIES INC	LISBON	NW	24	TO82	R05W	DWU	3iB		4	4	1	
A57022	CRAWFORD QUARRY CO	LEE CRAWFORD	NW	23	TO83	R08W	2.55	3i		4	4	8	
A57026	NIEMANN CONST CO	COOK	NW	10	TO86	R07W							
A57028	WENDLING QUARRIES INC	BEVERLY	NW	07	TO82	R07W	DWU	3i		4	4	6	
A57030	BRUENING ROCK PROD INC	HENNESSEY	NE	01	TO82	R07W	DWU	3i		4	4	4 - 5	
		SAND & GRAVEL											
A57502	WENDLING QUARRIES INC	SWEETING	NE	18	TO85	R08W				4	4		
							2.64		X				
A57506	WENDLING QUARRIES INC	CEDAR RAPIDS	NE	27	TO84	R08W				4	4		
							2.65		X				
A57508	WENDLING QUARRIES INC	EAST MARION	NE	36	TO84	R06W				3	3		
							2.65		X				
A57516	MARTIN MARIETTA	CEDAR RAPIDS SAND	SW	35	TO83	R07W	2.65		X				
A57520	WENDLING QUARRIES INC	IVANHOE	NW	29	TO82	R05W				4	4		
							2.66		X				
A57522	WENDLING QUARRIES INC	CENTRAL CITY	NE	10	TO85	R06W				4	4		
							2.65		X				
A57524	WENDLING QUARRIES INC	COGGON	NW	11	TO86	R06W				4	4		
							2.65		X				
A57526	WENDLING QUARRIES INC	TROY MILLS	SE	09	TO86	R07W	2.65		X				
A57528	AGGREGATES INC	AGGREGATES INC	SW	26	TO84	R08W	DWU	2B		3	3		
							2.65		X				
A57530	WENDLING QUARRIES INC	HESS	SW	04	TO82	R06W	DWU		X				
A57532	CROELL READY MIX	PALO	NE	21	TO84	R08W	DWU		X				
A57534	MARTIN MARIETTA	LINN COUNTY SAND	NE	05	TO82	R06W	DWU		X				
58	**LOUISA DIST 5**	**CRUSHED STONE**											
A58002	RIVER PRODUCTS CO	COLUMBUS JUNCTION	NW	03	TO74	R05W	2.55	3				16 - 19	2
										4	4	15 - 19	
		SAND & GRAVEL											
A58504	RIVER PRODUCTS CO	FREDONIA A INLAND	SW	17	TO75	R04W				4	4		
		PUMPING					2.66		X				
		FREDONIA B RIVER	SW	17	TO75	R04W				4	4		
		PUMPING					2.66		X				

NOTE 1: 1.25 INCH MAXIMUM TOP SIZE
NOTE 2: AASHTO 57 GRADATION MAXIMUM

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	FA	FRICT HMA A	B	BEDS	NOTE
60	**LYON DIST 3**	**SAND & GRAVEL**											
A60502	PETTENGILL CONC & GRAVEL	ROCK RAPIDS #1	NW	33	T100	R45W	2.69	2		3	3		
							2.67		X				
A60504	PETTENGILL CONC & GRAVEL	ROCK RAPIDS #2	NE	09	TO99	R45W				3	3		
A60506	PETTENGILL CONC & GRAVEL	ROCK VALLEY		17	T100	R45W				4	4		
A60508	DIETER PIT	DIETER	SE	24	T100	R49W				4	4		
A60510	HODGEMAN & SONS INC	EGEBO	NW	21	T099	R48W				4	4		
A60512	JOE'S READY MIX INC	LITTLE ROCK	NW	03	T099	R43W				4	4		
							2.66		X				
A60514	MARTIN MARIETTA	DOON		21	TO98	R45W				3	3		
A60516	MARTIN MARIETTA	OPEN	SW	24	TO98	R46W				3	3		
A60518	ROCK VALLEY GRAVEL CO	OPEN	NW	17	TO99	R48W				4	4		
A60520	HOGAN	WINTER	SE	18	TO99	R43W				4	4		
A60522	HYMANS CONST CO	OPEN		17	TO98	R44W				4	4		
A60524	MARTIN MARIETTA	OPEN		29	TO98	R45W				4	4		
A60528	HYMANS CONST CO	RUDD		20	T100	R45W				4	4		
A60530	HODGEMAN & SONS INC	KOOIKER		28	TO99	R45W				4	4		
A60532	HODGEMAN & SONS INC	LEMS		24	TO98	R49W				4	4		
A60534	HODGEMAN & SONS INC	HORN		16	TO99	R48W				4	4		
A60536	ROHLIN CONST CO	VAN ENGEN	SW	35	TO98	R46W							
A60538	HODGEMAN & SONS INC	HARMSON	SE	04	TO99	R45W							
A60540	HODGEMAN & SONS INC	KANANGEITER	SE	04	TO99	R43W							
A60542	KRUSE PAVING	EBEN	NW	17	TO99	R43W							
A60544	DAKOTA ROAD BUILDERS INC	ORVE	NE	24	T100	R49W							
61	**MADISON DIST 4**	**CRUSHED STONE**											
A61002	SCHILDBERG CONST CO INC	EARLY CHAPEL-DAGGETT	SW	03	TO76	R29W				5	5	15	
											4D	12	
											4	14B	
A61006	SCHILDBERG CONST CO INC	92 QUARRY	SW	05	TO75	R29W				5	5	15	
A61010	MARTIN MARIETTA	EARLHAM	N2	09	TO77	R28W					4D	25E	
A61012	MARTIN MARIETTA	WINTERSET NORTH	SE	27	TO76	R27W					5	25	
A61013	SCHILDBERG CONST CO INC	WINTERSET WEST	SW	28	TO76	R27W					5	25E	
A61016	MARTIN MARIETTA	JONES CREEK	NE	27	TO75	R27W					5	25	
A61018	MARTIN MARIETTA	PAMMEL		08	TO75	R28W				5	5	15	
A61020	MARTIN MARIETTA	PERU	NW	10	TO74	R27W					5	25	
A61024	MARTIN MARIETTA	PENN-DIXIE	SW	32	TO76	R27W					5	25	
A61026	MARTIN MARIETTA	MASON	SW	16	TO77	R28W					4	20	
											5	25	
A61028	GRIMES ASPHALT & PAVING	GRIMES ASPHALT & PAV	SE	04	TO74	R27W					5	25	
A61030	MARTIN MARIETTA	WINTERSET SOUTH	NW	34	TO76	R27W					5	25	
A61032	MARTIN MARIETTA	THRAILKILL	NE	08	TO77	R28W							
62	**MAHASKA DIST 5**	**CRUSHED STONE**											
A62008	MARTIN MARIETTA	GIVEN #2	SE	14	TO74	R16W							
		SAND & GRAVEL											
A62502	SKYLINE CONST CO	G71	SW	15	TO74	R16W	2.67		X				

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION	BULK SSD SpGr	DUR PCC CA	DUR PCC FA	FRICT HMA A	FRICT HMA B	BEDS	NOTE
63	**MARION DIST 5**	**CRUSHED STONE**								
A63002	MARTIN MARIETTA	DURHAM MINE	NE 08 TO75 R18W	DWU	3i		4	4	101	
				2.59	2		4	4	88 - 95	1
							4	4	95 - 96	2
A63010	BRUENING ROCK PROD INC	S&S	SE 25 TO75 R20W					4		
		SAND & GRAVEL								
A63502	PELLA CONST CO LTD	BEAN PROPERTY	NE 02 TO75 R18W				4	4		
				2.67		X				
A63512	MARTIN MARIETTA	NEW HARVEY	NW 12 TO75 R18W	2.67		X				
64	**MARSHALL DIST 1**	**CRUSHED STONE**								
A64002	MARTIN MARIETTA	FERGUSON	SW 05 TO82 R17W	2.65	3i		4	4	10 - 21	
				2.64	3		4	4	10 - 17	
				DWU	2		4	4	8 - 17	
				2.66	2		4	4	8 - 21	
				DWU	2		4	4	2 - 17	
							4	4	1 - 18	
A64004	CESSFORD CONST CO	LE GRAND	SW 36 TO84 R17W	2.58	3i		5	5	1 - 7	
							4	4	8 - 27	
		SAND & GRAVEL								
A64502	MARTIN MARIETTA	MARSHALLTOWN	SW 29 TO84 R17W	2.66	2		4	4		
				2.65		X				
A64504	HALLETT MATERIALS CO	BROMLEY-CLEMONS	NE 02 TO84 R20W	2.65	2		4	4		
				2.65		X				
66	**MITCHELL DIST 2**	**CRUSHED STONE**								
A66002	FALK CONST CO	DUENOW	SE 08 TO99 R17W	2.77	3iB				5	
							4	4	1 - 5	
							4	4	7 - 13	
A66006	FALK CONST CO	WILDE	NE 07 TO98 R18W					5		
A66014	FALK CONST CO	STAFF	NE 17 TO97 R17W	DWU	3i				3	
A66016	FALK CONST CO	LESCH	SW 12 TO97 R17W	DWU	3i				6 - 7	
							5	5	1 - 8	
							4	4	9 - 14	
A66018	FALK CONST CO	DYNES	SW 30 TO99 R15W							
A66020	FALK CONST CO	ASPEL	NE 03 TO99 R15W							
A66022	FALK CONST CO	WAGNER	NW 29 TO98 R16W		X		X	X		
		SAND & GRAVEL								
A66502	FALK CONST CO	OSAGE-SCHMIDT	NW 01 TO97 R17W				4	4		
				2.63		X				
A66504	FALK CONST CO	ST ANSGAR-BLAZEK	SW 36 TO99 R18W				3	3		
A66510	FALK CONST CO	NEWBURG	NW 26 TO99 R18W				3	3		
A66512	FALK CONST CO	KLAAHSEN	SW 36 TO99 R18W	2.66		X				
A66514	FALK CONST CO	LOVIK	SE SW 12 TO97 R17W	DWU		X				

NOTE 1: TOP 6.0' ONLY OF BED 95
NOTE 2: BOTTOM 5.0' ONLY OF BED 95

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	DUR PCC FA	FRICT HMA A	FRICT HMA B	BEDS	NOTE
67	**MONONA DIST 3**	**SAND & GRAVEL**											
A67502	HALLETT MATERIALS CO	RODNEY		02	TO85	R44W	DWU	2		3	3		
							DWU		X				
A67506	HARGRAVE	HARGRAVE	NE	31	TO85	R46W				4	4		
A67508	MIDWEST PAVING CO	ONAWA	SW	09	TO82	R45W				4	4		
68	**MONROE DIST 5**	**CRUSHED STONE**											
A68004	DOUDS STONE INC	EDDYVILLE SOUTH	SW	02	TO73	R16W							
69	**MONTGOMERY DIST 4**	**CRUSHED STONE**											
A69002	SCHILDBERG CONST CO INC	STENNETT	NE	27	TO73	R38W					4	16 - 17	
		SAND & GRAVEL											
A69504	WESTERN ENGINEERING	ELLIOT		13	TO73	R38W				4	4		
70	**MUSCATINE DIST 5**	**CRUSHED STONE**											
A70002	WENDLING QUARRIES INC	MOSCOW	NW	08	TO78	R02W	2.66	3i		5	5	11 - 17	
							2.67	3iB		4	4	21A- 24	
											5	1 - 9	
A70006	HARSCO CORP/HECKETT DIV	WILTON	SE	02	TO78	R02W				2	2		
A70008	HARSCO CORP/HECKETT DIV	MONTPELIER	SE	11	TO77	R01E				2	2		
		SAND & GRAVEL											
A70504	WENDLING QUARRIES INC	ATALISSA-MCKILLIP	NW	20	TO78	R02W				4	4		
							2.66		X				
A70506	ACME FUEL AND MATERIALS	ACME	SE	22	TO76	R02W	2.65		X				
A70508	HAHN S&G	HAHN	SE	16	TO76	R02W							
A70510	NORTHERN GRAVEL CO	NORTHERN		15	TO76	R02W							
71	**O'BRIEN DIST 3**	**SAND & GRAVEL**											
A71508	MARTIN MARIETTA	SHELDON	SW	16	TO97	R42W				4	4		
A71510	MARTIN MARIETTA	OPEN	SE	29	TO97	R42W				4	4		
A71512	MARTIN MARIETTA	SANBORN	SW	04	TO96	R41W				4	4		
A71514	MARTIN MARIETTA	PAULLINA	SE	23	TO95	R41W				4	4		
A71516	MARTIN MARIETTA	OPEN	SE	01	TO94	R41W				4	4		
A71518	MARTIN MARIETTA	OPEN		17	TO95	R39W				4	4		
A71520	MARTIN MARIETTA	PRIMGHAR	NW	04	TO95	R39W				4	4		
A71522	FABER & SON CONST CO	SHELDON	SE	19	TO97	R42W				4	4		
A71524	FLOYD RIVER S&G INC	RITTER	SE	11	TO97	R42W	2.69	2		3	3		
							2.66		X				
A71526	MARTIN MARIETTA	OPEN	SE	20	TO97	R42W				4	4		
A71528	O'BRIEN COUNTY	COUNTY	NW	27	TO95	R39W				4	4		
A71530	ROHLIN CONST CO	ROHLIN		14	TO97	R42W				4	4		
A71532	BECKER GRAVEL CO	DOUMA	SE	05	TO96	R41W							
A71534	ROHLIN CONST CO	KLEINWALTERINK	CT	16	TO97	R42W							

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION	BULK SSD SpGr	DUR PCC CA	DUR PCC FA	FRICT HMA A	FRICT HMA B	BEDS	NOTE
72	**OSCEOLA DIST 3**	**SAND & GRAVEL**								
A72504	NORTHWEST R/M CONC INC	OCHEYEDAN	SE 15 SW 14 TO99 R40W	2.71	2		3	3		
				2.68		X				
A72506	HALLETT MATERIALS CO	ASHTON	SW 28 TO98 R42W	2.69	2		3	3		
				2.69		X				
A72508	MARTIN MARIETTA	THOMAS	NW 36 TO99 R40W				4	4		
A72514	MARTIN MARIETTA	OPEN	NW 31 T100 R40W				4	4		
A72518	FABER & SON CONST CO	VASS	19 T100 R42W				4	4		
A72520	NORTHWEST R/M CONC INC	OCHEYEDAN NORTH	NE 23 TO99 R40W				4	4		
A72522	MARTIN MARIETTA	KAPPES	NE 11 TO98 R42W							
A72524	BECKER GRAVEL CO	BOERHAVE	SE 21 TO98 R42W							
A72526	NORTHWEST R/M CONC INC	OCHEYEDAN SOUTH	19 TO99 R39W							
A72528	BECKER GRAVEL CO	DIRKS	SW 36 TO99 R40W							
A72530	NORTHWEST R/M CONC INC	BOYD	NW 36 TO99 R40W	2.65	2					
				2.66		X				
A72532	KRUSE PAVING	PEDLEY	NW 14 TO99 R40W							
73	**PAGE DIST 4**	**CRUSHED STONE**								
A73004	SCHILDBERG CONST CO INC	SHAMBAUGH	SW 20 TO67 R36W					4		
		SAND & GRAVEL								
A73508	HALLETT MATERIALS CO	SHENANDOAH-CONNELL II	NE 07 TO69 R39W	DWU	2					
				2.63		X				
74	**PALO ALTO DIST 3**	**SAND & GRAVEL**								
A74502	HALLETT MATERIALS CO	EMMETSBURG S&G	36 TO96 R33W	2.71	2		3	3		
				2.64		X				
A74504	MARTIN MARIETTA	DORWEILLER	SW 05 TO94 R31W				3	3		
				2.67		X				
A74506	MARTIN MARIETTA	WEST BEND	NW 08 TO94 R31W				3	3		
A74508	MARTIN MARIETTA	OPEN	NW 10 TO97 R33W				4	4		
A74509	HOFFERT S&G	EMMETSBURG	NW 22 TO96 R33W	2.69	2		4	4		
				2.66		X				
A74512	ROHLIN CONST CO INC	KAY	SW 20 TO96 R31W							
75	**PLYMOUTH DIST 3**	**SAND & GRAVEL**								
A75502	HIGMAN S&G	AKRON	NW 01 TO92 R49W	2.70	2		3	3		
				2.67		X				
A75503	EVERIST INC	AKRON	NE 01 TO92 R49W	2.69	2		3	3		
				2.67		X				
A75506	MARTIN MARIETTA	REMSEN	SE 03 TO92 R44W				4	4		
A75508	MARTIN MARIETTA	ASPEN	NE 11 TO92 R49W				3	3		
A75510	MARTIN MARIETTA	KINGSLEY	NE 35 TO90 R44W				4	4		
A75512	HYMANS CONST CO	KINGSLEY	NE 13 TO90 R44W				4	4		
A75514	WALKERS EXCAVATING CO	OYENS	05 TO92 R44W				3	3		
A75516	HALLETT MATERIALS CO	BRUNSVILLE	03 TO92 R46W				4	4		
A75518	HALLETT MATERIALS CO	HINTON	NW 16 TO90 R46W	DWU	3		3	3		
A75520	HALLETT MATERIALS CO	MERRILL	02 TO91 R46W				4	4		
A75522	ROHLIN CONST CO INC	THOMS	26 TO92 R46W							
A75524	L&M SAND & GRAVEL INC	G DIRKSEN #2	31 TO93 R44W	2.65		X				
A75526	L&M SAND & GRAVEL INC	FRITZ DIRKSEN	05 TO92 R44W	DWU		X				

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	DUR PCC FA	FRICT HMA A	FRICT HMA B	BEDS	NOTE
76	**POCAHONTAS DIST 3**	**CRUSHED STONE**											
A76002	MARTIN MARIETTA	GILMORE CITY	NE	36	TO92	R31W	2.64	3iB		5	5	1A - 3	
										4	4	1B - 3	
A76004	MARTIN MARIETTA	MOORE	SW	25	TO92	R31W	2.65	3iB		5	5	1A - 3	
										4	4	3	
										4	4	1B - 3	
										4	4	4 - 10	
										5	5	4 - 12	
		SAND & GRAVEL											
A76506	MARTIN MARIETTA	EGLE	NE	02	TO90	R31W				4	4		
A76508	MARTIN MARIETTA	OPEN	NE	07	TO91	R33W				4	4		
A76510	MARTIN MARIETTA	ZEAMAN	SE	13	TO92	R31W				4	4		
A76512	MARTIN MARIETTA	LIZARD CREEK		13	TO90	R31W				4	4		
A76514	BLACKTOP SERVICES	MILLER		12	TO93	R31W			X	4	4		
77	**POLK DIST 1**	**SAND & GRAVEL**											
A77502	MARTIN MARIETTA	JOHNSTON	NW	17	TO79	R24W	DWU	2		3	3		
							2.67		X				
A77504	HALLETT MATERIALS CO	DENNY-JOHNSTON		08	TO79	R24W	2.70	2		3	3		
							2.67		X				
A77514	WEST DES MONES SAND CO	FLINT	SE	29	TO78	R25W	2.65	2		4	4		
							2.66		X				
A77518	HALLETT MATERIALS CO	ARMY POST ROAD	SE	30	TO78	R25W	2.69	2		3	3		
							2.67		X				
A77520	MARTIN MARIETTA	ARMY POST ROAD	SW	29	TO78	R25W	2.65	2		3	3		
							2.66		X				
A77522	HALLETT MATERIALS CO	EDM #2-VANDALIA NE 07	NW	08	TO78	R23W	2.69	2		3	3		
							2.65		X				
A77524	HALLETT MATERIALS CO	UNIVERSITY PLANT	SE	33	TO79	R23W	2.69	2		3	3		
							2.65		X				
A77526	HALLETT MATERIALS CO	ARMY POST EAST	SE	29	TO78	R25W	2.66	2		3	3		
							2.65		X				
A77528	HALLETT MATERIALS	PLEASANT HILL		08	TO78	R23W	2.68	2		3	3		
							2.66		X				
A77530	HALLETT MATERIALS CO	NORTH DES MOINES	NE	16	TO79	R24W	2.67	2					
							2.66		X				
A77532	LOUNSBURY S&G	WEST DES MOINES		30	TO78	R25W							
78	**POTTAWATTAMIE DIST 4**	**CRUSHED STONE**											
A78002	SCHILDBERG CONST CO INC	CRESCENT		35	TO76	R44W				4	4	25B-25E	
											4	25A-25C	
											4D	25F	
											4	26A- 26E	
											4	27A-27B	
A78006	SCHILDBERG CONST CO INC	MACEDONIA-K&S	NE	28	TO74	R40W					4		
		SAND & GRAVEL											
A78504	WESTERN ENGRG CO INC	OAKLAND	SW	23	TO75	R40W	2.65	3		4	4		
							2.65		X				
A78506	SCHILDBERG CONST CO INC	CRESCENT	NE	34	TO76	R44W				4	4		
79	**POWESHIEK DIST 1**	**CRUSHED STONE**											
A79002	MARTIN MARIETTA	MALCOM MINE	SE	04	TO80	R15W	2.60	2		4	4	10 - 13	
80	**RINGGOLD DIST 4**	**CRUSHED STONE**											
A80002	MARTIN MARIETTA	WATTERSON	SE	19	TO67	R29W					5	7	

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	FA	FRICT HMA A	B	BEDS	NOTE
81	**SAC DIST 3**	**SAND & GRAVEL**											
A81502	HALLETT MATERIALS CO	SACTON-LAKEVIEW	S2	08	TO86	R36W	2.72	3		3	3		
							2.67		X				
A81504	HALLETT MATERIALS CO	AUBURN	NW	02	TO86	R35W	2.68	2		4	4		
							2.64		X				
A81506	HALLETT MATERIALS CO	SAC CITY	NW	36	TO88	R36W				4	4		
							DWU		X				
A81508	LAKE VIEW CONCRETE PROD	LAKEVIEW	SE	05	TO86	R36W				4	4		
A81514	TIEFENTHALER INC	CARNARVON S&G	NE	16	TO86	R36W	2.68	2		3	3		
							2.66		X				
A81520	BECKER GRAVEL CO	UREN	SE	11	TO87	R36W				3	3		
							2.67		X				
A81522	HALLETT MATERIALS CO	ULMER	SW	28	TO87	R35W				4	4		
A81524	BECKER GRAVEL CO	NO NAME	SE	04	TO87	R37W				4	4		
A81526	MARTIN MARIETTA	BETTIN		19	TO87	R36W				4	4		
A81528	HALLETT MATERIALS CO	WALL LAKE	NW	18	TO86	R36W	2.70	3					
							2.67		X				
A81530	HALETT MATERIALS CO	LEITZ NORTH	SE	29	TO87	R35W	DWU		X				
A81532	BEDROCK GRAVEL CO	EARLY-THORPE		22	TO89	R37W	DWU	2		4	4		
							2.66		X				
A81534	MARTIN MARIETTA	SAC COUNTY S&G	SE SE	22	TO89	R37W	2.68		X				
A81536	TIEFENTHALER INC	DAIKER	NE	12	TO86	R35W	DWU		X				
A81538	BEDROCK GRAVEL CO	HEIM	SE	12	TO86	R35W							
82	**SCOTT DIST 6**	**CRUSHED STONE**											
A82002	RIVERSTONE GROUP INC	MCCAUSLAND	W2	17	TO80	R04E	DWU	3i		4	4	17 - 19*	1
								3		4	4	1 - 16	1
A82004	RIVERSTONE GROUP INC	NEW LIBERTY	NE	33	TO80	R01E	DWU	3iB		4	4	1 - 2	1
A82006	RIVERSTONE GROUP INC	LECLAIRE	NW	35	TO79	R05E	2.71	3i				14 - 27	
							DWU	3i				28 - 29	
							DWU	3				2 - 13	
										4	4	1 - 28	
A82008	LINWOOD MINING & MINERALS	LINWOOD MINE	SW	13	TO77	R02E	2.67	3i		5	5	20 - 25	
							2.69	3i		5	5	27 - 30B	
							DWU	3i		4	4	33 - 41	
							DWU	3		5	5	19	
										4	4	24 - 25	
		SAND & GRAVEL											
A82502	RIVERSTONE GROUP INC	MCCAUSLAND	SW	17	TO80	R05E				4	4		
							2.66		X				
83	**SHELBY DIST 4**	**SAND & GRAVEL**											
A83506	HALLETT MATERIALS CO	HARLAN-REINIG	NW	30	TO79	R38W	2.65	3					
							2.65		X				

*TOP 32' OF BED 19

NOTE 1: 1.25-INCH MAXIMUM TOP SIZE

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME		LOCATION				BULK SSD SpGr	DUR PCC CA	FA	FRICT HMA A	B	BEDS	NOTE
84	**SIOUX DIST 3**	**SAND & GRAVEL**												
A84502	ROCK VALLEY GRAVEL CO	VANZEE		NW	20	TO97	R46W	2.69	2		3	3		
								2.67		X				
A84504	HYMANS CONST CO	VANDERESCH		SE	20	TO96	R47W	DWU	2		3	3		
A84506	JOE'S READY MIX INC	HUDSON-OSTERCAMP		SE	07	TO96	R47W				3	3		
								2.69		X				
A84508	JOE'S READY MIX INC	SIOUX CENTER		NW	33	TO95	R45W				4	4		
								DWU		X				
A84510	EVERIST INC	HAWARDEN-NORTH	S2	NW	22	TO95	R48W	2.70	2		3	3		
								2.67		X				
A84511	HYMANS CONST CO	HAWARDEN		NE	01	TO95	R48W	DWU	2		3	3		
A84514	BOYDEN	COUNTY			35	TO97	R44W				4	4		
A84516	MARTIN MARIETTA	NO NAME			25	TO97	R48W							
A84518	MARTIN MARIETTA	ALTON		SE	15	TO94	R44W				4	4		
A84520	COUNTY PIT	CHATSWORTH		SW	28	TO94	R48W				4	4		
A84522	HYMANS CONST CO	HYMAN		SW	31	TO96	R47W							
A84524	VAN ZEE	GROTH		NW	36	TO97	R48W				4	4		
A84526	BEDROCK GRAVEL	JONAS		NE	36	TO94	R44W	DWU		X	4	4		
A84528	HIGMAN S&G	HIGMAN-CHATSWORTH		W2	28	TO94	R48W	2.69	2		4	4		
								DWU		X				
A84530	ROCK VALLEY BLOCK & TILE	GROENWEG		NW	15	TO97	R46W	DWU	2		3	3		
								DWU		X				
A84532	BECKER GRAVEL CO	LASSON			32	TO94	R44W			X				
85	**STORY DIST 1**	**CRUSHED STONE**												
A85006	MARTIN MARIETTA	AMES MINE		SW	24	TO84	R24W	2.56	3i		5	5	19 - 25	
											4	4	26,28- 39	1
		SAND & GRAVEL												
A85510	HALLETT MATERIALS CO	AMES SOUTH			18	TO83	R23W	2.66	2		3	3		
								2.65		X				
86	**TAMA DIST 1**	**CRUSHED STONE**												
A86002	WENDLING QUARRIES INC	MONTOUR		NW	09	TO83	R16W	2.61	3i		5	5	1 - 7	
								2.63	3i		4	4	13 - 20	
											4	4	8 - 12	
		SAND & GRAVEL												
A86502	MANATT'S INC	FLINT		NW	03	TO82	R15W				3	3		
								2.65		X				
87	**TAYLOR DIST 4**	**CRUSHED STONE**												
A87004	SCHILDBERG CONST CO INC	102 QUARRY		NE	32	TO68	R34W					4		
88	**UNION DIST 4**	**CRUSHED STONE**												
A88002	SCHILDBERG CONST CO INC	THAYER		NE	35	TO72	R28W					5	25A-25E	
												4D	25E	

NOTE 1: THE CONTENT OF BED 26 SHALL NOT BE MORE THAN 50% IN THE OVERALL PRODUCT.

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	DUR PCC FA	FRICT HMA A	FRICT HMA B	BEDS	NOTE
89	**VAN BUREN DIST 5**	**CRUSHED STONE**											
A89002	DOUDS STONE INC	DOUDS MINE	SE	25	TO70	R11W	2.46	2		4	4	6 - 13	
A89006	CESSFORD CONST CO	FARMINGTON-COMANCHE	NE	05	TO67	R08W	2.69	3i		5	5	3	
							2.52	2		4	4	16 - 17	
											4	18 - 22	
										5	5	5 - 12	
A89008	DOUDS STONE INC	SELMA-GARDNER	NW	16	TO70	R11W	2.69	3		4	4	11	
										5	5	7 - 10	
											5	7 - 11	
										4	4	14 - 21	
										4	4	22 - 31	
90	**WAPELLO DIST 5**	**SAND & GRAVEL**											
A90504	DOUDS STONE INC	HOFFMAN	SE	10	TO72	R14W				4	4		
							2.65		X				
92	**WASHINGTON DIST 5**	**CRUSHED STONE**											
A92002	DOUDS STONE INC	WEST CHESTER	NE	19	TO76	R08W	2.64	3		4	4	5 - 7	
A92006	DOUDS STONE INC	COPPOCK	NE	30	TO74	R07W				5	5	3 - 4	
A92008	RIVER PRODUCTS CO	PEPPER-KEOTA FIELD	SW	31	TO76	R09W							
		SAND & GRAVEL											
A92502	RIVER PRODUCTS CO	RIVERSIDE	NE	10	TO77	R06W				4	4		
							2.65		X				
94	**WEBSTER DIST 1**	**CRUSHED STONE**											
A94002	MARTIN MARIETTA	FT DODGE MINE	SW	24	TO89	R29W	2.65	3iB		4	4	36 - 42	
A94006	MARTIN MARIETTA	YATES	SW	01	TO89	R29W					5		
A94008	BECKER GRAVEL CO	BUSKE	SE	36	TO90	R29W							
		SAND & GRAVEL											
A94502	NORTHWEST MATERIALS	YATES	SW	01	TO89	R29W				4	4		
							2.66		X				
A94522	AUTOMATED S&G	CROFT	NW	14	TO89	R29W	2.65		X				
A94526	BECKER GRAVEL CO	BUSKE	SE	36	TO90	R29W				3	3		
							2.67		X				
A94528	BECKER GRAVEL CO	CONDON	NW	19	TO90	R30W							

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	FA	FRICT HMA A	B	BEDS	NOTE
96	**WINNESHIEK DIST 2**	**CRUSHED STONE**											
A96002	ROVERUD CONST INC	KENDALLVILLE	NE	33	T100	R10W	2.68	3B		4	4	3 - 7	
											4	1 - 7	
A96003	WILTGEN CONST CO	BROWN	NW	08	TO99	R10W							
A96004	ROVERUD CONST INC	HOVEY	SW	28	TO98	R08W	DWU	3B		5	5	1 - 4	
										4	4	1 - 6	
A96005	BRUENING ROCK PROD INC	MCGEE	NW	19	TO99	R10W							
A96007	WILTGEN CONST CO	JACKSON	NE	31	TO96	R10W							
A96008	BRUENING ROCK PROD INC	WELKEN	SW	04	TO98	R07W	2.71	3i		4	4	4 - 8	
A96009	ROVERUD CONST INC	DRACKLEY		15	TO99	R08W							
A96010	ROVERUD CONST INC	ANDERSON	SW	22	T100	R10W	2.65	3B		5	5	1 - 4	
A96014	NIEMANN CONST CO	FESTINA	SW	26	TO96	R09W		X		5	5	1 - 3	
A96016	BRUENING ROCK PROD INC	SKYLINE A	SE	10	TO98	R08W	2.66	3B		5	5	1 - 3	
										4	4	4 - 8	
A96017	BRUENING ROCK PROD INC	SKYLINE B	CT	10	TO98	R08W	2.66	3B		5	5	1 - 3	
										4	4	4 - 11	
A96022	WILTGEN CONST CO	MADISON #2	NE	18	TO98	R08W					5		
A96025	WILTGEN CONST CO	MADISON #1	NW	17	TO98	R08W					4		
A96030	ROVERUD CONST INC	ASK	NE	27	TO98	R07W					4		
A96032	ROVERUD CONST INC	BRUVOLD	NW	20	TO98	R07W					X		
A96034	BRUENING ROCK PROD INC	THOMPSON	SE	29	TO98	R09W							
A96038	ROVERUD CONST INC	NORDNESS	SE	09	TO97	R08W					X		
A96040	ROVERUD CONST INC	LOCUST	NE	11	TO99	R08W					X		
A96046	BRUENING ROCK PROD INC	SERSLAND-SMORSTAD	SE	09	TO97	R07W				X	X		
A96048	NIEMANN CONST CO	LOVE #1	NW	30	TO96	R10W					X		
A96049	NIEMANN CONST CO	LOVE #2	SW	30	TO96	R10W					X	1 - 10	
A96050	BRUENING ROCK PROD INC	BULLERMAN-FESTINA	SE	14	TO96	R09W					4	1 - 3	
A96052	ROVERUD CONST INC	ESTREM	SW	04	TO97	R07W	2.63	3B				1 - 6	
										5	5	1 - 8	
A96054	ROVERUD CONST INC	HORSESHOE BEND	SW	20	TO97	R09W					X		
A96058	BRUENING ROCK PROD INC	BROGHAMMER	SE	26	TO99	R08W					X		
A96060	ROVERUD CONST INC	BURR OAK	SE	23	T100	R09W				4	4		
A96062	ROVERUD CONST INC	HOLT HAUS	SE	28	TO98	R08W					X		
A96064	ROVERUD CONST INC	STIKA	NW	15	TO97	R10W	DWU	3i		4	4	1 - 4A	
A96066	BRUENING ROCK PROD INC	KROSHUS	SW	13	T100	R07W					X		
A96068	BRUENING ROCK PROD INC	HOLKESVIK	SW	01	TO99	R08W							
A96070	WILTGEN CONST CO	KUHN	NW	33	TO96	R08W							
A96072	BRUENING ROCK PROD INC	MCKENNA NORTH	SW	34	T100	R09W							
A96074	WILTGEN CONST CO	OSSIAN	SW	21	TO96	R08W							
A96076	ROVERUD CONST INC	PRASKA	NE	19	TO97	R10W							
A96078	BRUENING ROCK PROD INC	BUSTA	NW	30	TO96	R10W							
A96082	WILTGEN CONST CO	CROW	SW	17	TO97	R10W							
A96084	WILTGEN CONST CO	YOUNG	SE	28	T100	R08W							
A96086	BRUENING ROCK PROD INC	BRUVOLD	NE	29	TO98	R07W							
A96090	BRUENING ROCK PROD INC	MCKENNA SOUTH	SE	28	TO99	R09W	DWU	3		5	5	1 - 5	
A96092	ROVERUD CONST INC	HANSON	SE	26	T100	R08W							
A96094	ROVERUD CONST INC	CAROLAN	SE	27	TO99	R09W							
A96100	WILTGEN CONST CO	YOUNG	NE	05	TO98	R07W							
		SAND & GRAVEL											
A96502	CARLSON MATERALS CO	DECORAH	NE	22	TO98	R08W				4	4		
							2.63		X				
A96506	ROVERUD CONST INC	FREEPORT	NE	07	TO98	R07W	2.65		X				
A96514	ROVERUD CONST INC	ELSBERND	NE	16	TO96	R09W				4	4		
							2.66		X				
A96520	CARLSON MATERIALS CO	SWEDES BOTTOM	NE	06	TO98	R08W	2.63		X	4	4		
A96522	BRUENING ROCK PROD INC	WOHLSEORS	NW	17	TO98	R10W							
A96526	ROVERUD CONST INC	STIKA	NW	15	TO98	R08W							

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	FA	FRICT HMA A	B	BEDS	NOTE
96	**WINNESHIEK DIST 2**	**SAND & GRAVEL *(CONTINUED)***											
A96528	BRUENING ROCK PROD INC	GJETLEY	NE	08	TO98	R07W				4	4		
A96530	CARLSON MATERIALS CO	CARLSON-FREEPORT	NE	13	TO98	R08W	2.63		X				
A96532	WILTGEN CONST CO	SCHMITT	NE	34	TO96	R09W	DWU		X				
97	**WOODBURY DIST 3**	**SAND & GRAVEL**											
A97502	HALLETT MATERIALS CO	CORRECTIONVILLE-BUCK	NW	13	TO89	R42W				3	3		
							DWU		X				
A97508	MARTIN MARIETTA	CORRECTIONVILLE #2	NW	35	TO89	R42W				3	3		
A97510	HALLETT MATERIALS CO	CORRECTIONVILLE-COCKBURN	SE	11	TO88	R43W				3	3		
A97514	PERSINGER S&G	SMITHLAND	NW	25	TO86	R44W				3	3		
							DWU		X				
A97516	HALLETT MATERIALS CO	ANTHON		05	TO87	R43W	2.72	3		3	3		
							2.67		X				
A97518	HALLETT MATERIALS CO	SMITHLAND		35	TO86	R44W	2.69	3		3	3		
							2.67		X				
A97520	HALLETT MATERIALS CO	CORRECTIONVILLE-BREESIE		01	TO88	R43W				4	4		
A97526	FLEWELLING S&G	FLEWELLING	NW	10	TO89	R44W	2.67		X				
A97528	HALLETT MATERIALS CO	EDWARD	SE	23	TO89	R42W							
A97530	NELSTAR	NELSTAR		14	TO88	R43W							
98	**WORTH DIST 2**	**CRUSHED STONE**											
A98002	MARTIN MARIETTA	HARRIS	SW	29	T100	R20W	DWU	3i		4	4	10	
							2.73	3B		4	4	6 - 7	
							DWU	3		4	4	6 - 11	
							DWU	2				2 - 11	
										4	4	2 - 10	
A98010	BASIC MATERIALS CORP	FERTILE	SW	36	TO98	R22W	2.73	3B				15 - 20	
										4	4	5 - 20	
A98014	FALK CONST CO	STEVENS	NW	01	TO98	R20W	2.77	3				8 - 11B	
											5	1 - 3	
										4	4	4 - 7	
A98016	ULLAND BROS CONST	EMIL OLSON-BOLTON	SW	10	TO99	R20W	DWU	2				2 - 5A	
								X		4	4	3 - 7	
											5	1 - 7	
		SAND & GRAVEL											
A98502	RANDALL TRANSIT MIX	RANDALL TRANSIT MIX	NW	31	T100	R20W				4	4		
							2.66		X				
A98504	BASIC MATERIALS CORP	FERTILE	NW	36	TO98	R22W				3	3		
							2.65		X				
A98506	MARTIN MARIETTA	KNUTSON	SW	30	T100	R20W				4	4		
A98518	FALK CONST CO	COOPER	NE	12	TO98	R20W					4		
A98522	ULLAND BROS CONST	EMIL OLSON-BOLTON	SW	10	TO99	R20W							

RECENTLY ACTIVE AGGREGATE SOURCES

CODE	OPERATOR	SOURCE NAME	LOCATION				BULK SSD SpGr	DUR PCC CA	DUR PCC FA	FRICT HMA A	FRICT HMA B	BEDS	NOTE
99	**WRIGHT DIST 2**	**CRUSHED STONE**											
A99002	BECKER GRAVEL	VOSS		36	TO90	R26W		3i				8	
		SAND & GRAVEL											
A99502	WRIGHT MATERIALS	WRIGHT	NW	12	TO93	R24W	2.70	2		3	3		
							2.66		X				
A99510	MARTIN MARIETTA	MEINEKE	NE	14	TO90	R23W				4	4		
							DWU		X				
A99514	BECKER GRAVEL CO	VOSS		36	TO90	R26W							
A99516	GIESE CONST CO	McALPINE		24	TO92	R24W							
A99518	BECKER GRAVEL CO	REICHTER	SE	06	TO92	R26W							
A99520	BECKER GRAVEL CO	DENNIS PETERSON	NE	15	TO90	R23W							

**APPROVED PRODUCERS
WITH QC PROGRAMS**

PRODUCER	STREET ADDRESS	CITY, STATE, ZIP	PHONE/FAX NUMBER
N			
NEW ULM QUARTZITE QUARRY	ROUTE 5-POB 21	NEW ULM, MN 56073	507-354-2925 507-359-7870 **(FAX)**
NORRIS AGGREGATES CO	219 3RD ST-POB 190	CAMERON, MO 64429	816-324-0310
NORTH IA SAND & GRAVEL INC	18237 KILLDEER AVENUE	MASON CITY, IA 50401	641-424-5591 641-423-1894 **(FAX)**
NORTHWEST MATERIALS	1648 LAINSON AVENUE	FORT DODGE, IA 50501	515-573-8921
NORTHWEST R/M CONCRETE INC	6340 180TH STREET	OCHEYEDAN, IA 51354	712-758-3683
NU AGGREGATES	300 NORKA DRIVE	AKRON, IA 51001	
O			
ORTONVILLE STONE CO	POB 67	ORTONVILLE, MN 56278	612-839-6131
P			
PATRICK M. PINNEY CONTRACTORS	P.O. BOX 5107, 1915 FLOYD BLVD	SIOUX CITY, IA 51102	712-252-2774
PAUL NIEMANN CONST CO	24541 150TH STREET-POB 128	SUMNER, IA 50674-0128	319-578-3261 319-578-3263 **(FAX)**
PEDERSON BROTHERS	POB 606	HARMONY, MN 55939-0606	507-498-3377
PELLA CONST CO LTD	POB 25	PELLA, IA 50219	641-628-3840
PERSINGER SAND & GRAVEL	3281 LUCAS AVENUE	SMITHLAND, IA 51056	712-889-2258
PETERSON CONTRACTORS INC	104 BLACKHAWK-POB A	REINBECK, IA 50669	319-345-2713
PETTENGILL CONC & GRAVEL INC	800 NORTH BOONE	ROCK RAPIDS, IA 51246	712-472-2571
PRAIRIE SAND & GRAVEL	POB 210	PRAIRIE DU CHIEN, WI 53821	608-326-6471
PRESTON READY MIX CORP	POB 399	PRESTON, IA 52069	319-689-3381
Q			
QUALITY CONCRETE CO	327 17TH AVENUE SOUTH	CLINTON, IA 52732	319-242-3524
R			
RANDALL TRANSIT MIX CO	1343 HWY 105-POB 153	NORTHWOOD, IA 50459-0153	641-324-1063
RECYCLED AGGREGATE PROD CO	2131 18TH STREET	SIOUX CITY, IA 51105	712-252-7732
REILLY CONSTRUCTION CO	110 MAIN STREET-POB 99	OSSIAN, IA 52161	319-532-9211 319-532-9759 **(FAX)**
RIEHM CONSTRUCTION CO INC	2340 9TH STREET SW	WAUKON, IA 52172	563-568-3314
RIVER BEND ENTERPRISES	3000 ASHERTON AVENUE	NASHUA, IA 50658	641-435-2436
RIVER CITY STONE INC	POB 1430	DUBUQUE, IA 52001-1430	608-568-3433 608-568-3472 **(FAX)**
RIVER PRODUCTS CO INC	103 E COLLEGE SUITE 220	IOWA CITY, IA 52240-4086	319-338-1184 319-338-8510 **(FAX)**
RIVERSTONE GROUP INC	1701 5TH AVENUE	MOLINE, IL 61265	309-757-8250 309-757-8257 **(FAX)**
ROHLIN CONST CO INC	POB 137	ESTHERVILLE, IA 51344	712-362-3549
ROVERUD CONST CO INC	604 HWY 44 EAST-POB 606	SPRING GROVE, MN 55974	507-498-3376 507-498-3377 800-622-7625 (T-F) 507-498-5835 **(FAX)**
RVBT-aka ROCK VALLEY S&G	1315 17TH AVENUE-POB 9	ROCK VALLEY, IA 51247	712-476-2063

APPROVED PRODUCERS
WITH QC PROGRAMS

PRODUCER	STREET ADDRESS	CITY, STATE, ZIP	PHONE/FAX NUMBER
S			
S&A CONSTRUCTION LTD	POB 20	ALLENDALE, MO 64420	660-786-2233
S&G MATERIALS	4213 SAND ROAD SE	IOWA CITY, IA 52240	319-354-1667
SCHILDBERG CONSTRUCTION CO	POB 358	GREENFIELD, IA 50849	641-743-2131
SCHMILLEN CONST INC	4772 C AVENUE	MARCUS, IA 51035-0488	712-376-2249
SHELL ROCK PRODUCTS	22281 WALNUT AVENUE	SHELL ROCK, IA 50670	319-885-4302
SHIPLEY CONTRACTING	2671 240TH STREET	FORT MADISON, IA 52625	319-372-1804
SIEH SAND & GRAVEL	101 WEST 18TH STREET-POB 1503	SPENCER, IA 51301	712-836-2244
			712-262-4580
SPENCER QUARRIES	25341 430TH AVENUE	SPENCER, SD 57374	605-246-2344
STENSLAND GRAVEL CO	1741 ASHLEY AVE	LARCHWOOD, IA 51241	712-477-2280
STONER SAND	RR 2	RIDGEWAY, MO 64481	660-824-4211
T			
TIEFENTHALER AG-LIME INC	11975 HAWTHORNE AVENUE-POB 157	BREDA, IA 51436	712-673-2686
U			
ULLAND BROTHERS INC	2400 MYERS ROAD	ALBERT LEE, MN 56007	507-373-1960
			507-433-1819
W			
W HODGEMAN & SONS INC	1100 MARCUS STREET-POB 1100	FAIRMONT, MN 56031-1100	507-235-3321
WAYNE T HANSEN CORP	13 COUNTRY ESTATES	ALGONA, IA 50511	515-295-5573
WEATHERTON CONTRACTING	307 N 16TH ST-POB151	BERESFORD, SD 57004	605-763-2078
WEBER STONE CO INC	12791 STONE CITY ROAD	ANAMOSA, IA 52205	319-462-3581
			319-462-3585 **(FAX)**
WELDEN AGGREGATES INC	POB 832	IOWA FALLS, IA 50126	641-648-5142
			641-648-5142 **(FAX)**
WENDLING QUARRIES INC	POB 230	DEWITT, IA 52742	319-659-9181
			319-659-3393 **(FAX)**
WEST DES MOINES SAND CO	10500 SW 52ND STREET	DES MOINES, IA 50265	515-287-2340
WESTERN ENGINEERING COMPANY	POB 350	HARLAN, IA 51537	712-755-5191
WESTERN IOWA LIMESTONE	POB 430	HARLAN, IA 51537	712-755-2563
			712-755-5344 **(FAX)**
WETHERELL EXCAV & TRUCKING	POB 582	STORM LAKE, IA 50588	712-732-4059
			712-732-2839
WILTGEN CONSTRUCTION CO	113 EAST MAIN STREET-POB 303	CALMAR, IA 52132	319-562-3301
			800-365-3301 (T-F)
WINN CORP SAND & GRAVEL	28825 290TH STREET	OLLIE, IA 52576	641-667-3471
WRIGHT MATERIALS CO	1127 HWY 69-POB 244	BELMOND, IA 50421	641-444-3920
Z			
ZUPKE SAND & GRAVEL	17963 150TH STREET	RANDALIA, IA 52164	319-428-4444

NOTES

INSPECTION OF CONSTRUCTION PROJECT SAMPLING & TESTING

PURPOSE

The purpose of this memorandum is to prescribe general objectives, policies, procedures, and guide schedules for sampling and testing materials and construction. Sampling and testing guides for certain types of construction are attached as appendices to this memorandum.

OBJECTIVES

The objectives of sampling and testing are:

A. To determine through process control, verification and/or acceptance sampling and testing whether the construction operations controlled by sampling and testing and materials used or proposed for use in the construction work are in reasonably close conformity with approved plans and specifications (including approved changes).

B. To provide checks or reliability of acceptance sampling and testing through independent assurance sampling and testing by personnel not normally responsible for process control or acceptance.

C. To provide opportunity for timely remedial action when results of sampling and testing indicate materials used or proposed for use and the construction work accomplished or in progress are not in reasonably close conformity with the approved plans and specifications (including approved changes).

PROCESS CONTROL, VERIFICATION, AND/OR ACCEPTANCE SAMPLING & TESTING

Process control, verification, and/or acceptance sampling and testing are required to ascertain whether the quality of materials being incorporated into the construction and the quality of construction work in progress are in reasonably close conformity with the plans and specifications. Results of these tests constitute the principal means of determining daily if materials and construction are satisfactory, or whether corrective action should be taken before work proceeds further. They serve as the principal basis for determining the acceptability of completed construction.

Materials Inspection and Acceptance

In order to provide the contractor the opportunity to construct a project with minimal sampling and testing delays, inspection is performed at the source. Source inspection may consist of inspecting process control, sampling for laboratory testing or a combination of these procedures. All source-inspected or certified materials are subject to inspection at the project site prior to being incorporated into the work. Project site inspections are for identification of materials with test reports and for any unusual alterations of the characteristics of the material due to handling or other causes. Supplemental monitor samples secured by project personnel of source-inspected, certified or project processed materials are also required for some materials in order to secure satisfactory evidence for acceptance.

Source Inspection

Materials with characteristics, which do not easily change, will normally be accepted at the time of incorporation into the work on the basis of compliant source inspection test reports or certifications. This also applies to materials in which the packaging or form of shipment ensures proper identification of the materials and the original material characteristics.

Supplemental sampling and testing of source-inspected material are required for some materials, which are subject to change during delivery. This also applies to some materials, which are difficult to identify with source inspection test reports. Except for unusual situations, the contractor may, on the contractor's responsibility and at the contractor's risk, incorporate these materials into the work before completion of the required supplemental tests. Acceptance of these materials will be based on source inspection tests and tests of the supplemental samples.

In the case of aggregate quality, production from an approved source is required. The source approval includes the quality control operation and processing procedures established, and the ledges suitable for the production of crushed stone for the various quality requirements. Random source inspection is performed to detect any significant change in characteristics of a source and any variations of the established quality control and on processing procedures. Random sampling and testing is performed to monitor the quality of aggregate being produced from each source. For certain major types of construction, supplemental construction site verification and assurance sampling and laboratory testing for quality are required in addition to the above quality control inspection and testing prior to acceptance. The contractor may, on the contractor's responsibility and at the contractor's risk, incorporate these aggregates into the work before completion of supplemental tests. Acceptance for quality will be based on source monitoring and the test results on verification, assurance and/or project samples. Source approval and monitor inspections and tests will be the basis for acceptance of other aggregates.

Certified aggregate gradation tests by a certified aggregate technician in accordance with the requirements of Materials IM 209 and 213, are required by paragraph 1106.01 of the Standard Specification.

Certified source aggregate gradation tests will be considered advisory when the aggregate acceptance is determined by sampling and testing on the project in accordance with the appended sampling and testing guides. The advisory tested group is called **proportioned aggregate**. Source gradation tests may be considered the basis of acceptance for all other aggregates. The gradation tests are called certified gradation tests and the aggregates represented are called certified aggregates.

Certification Procedures

In the case of many materials it is more economical, efficient, and practical to require certification procedures in lieu of source inspection. Certified test results are required for some materials and only a certificate of compliance is required for other materials. The acceptance of some proprietary materials is on an approved source or brand basis.

For many of the materials for which certification procedures are required, supplemental testing of samples secured by contractor process control personnel or project monitoring personnel and verification and/or assurance samples secured by District personnel are also required as part of the basis of acceptance.

When certification procedures are required, the contractor may, on the contractor's own responsibility and at the contractor's risk, incorporate these materials into the work. Acceptance will be based on satisfactory certification and compliance of the test results of any supplemental samples. When supplemental samples are not required, acceptance will be based on satisfactory certification.

An authorized representative of the company shall sign the certificate of compliance.

Small Quantities of Materials

When small quantities of construction materials are involved and the cost of sampling and testing would be excessive, or the performance of the material is not critical, visual inspection or compliance certificates may be the basis for acceptance.

Sampling & Testing Guides

The appended sampling & testing guides schedule indicates the minimum inspection, sampling and testing procedures required within the guide policy and procedures for the process control, acceptance, verification and assurance of materials and construction work. **NOTE:** There are two sets of sampling & testing guides - One in S.I. units (metric) and one in U.S. units (in./lb.).

PROJECT PLANT, FIELD LABORATORY & GRADE INSPECTION & ACCEPTANCE

The project inspectors and/or the contractor process control technicians shall identify and inspect all materials received on the project before the materials are incorporated into the work. They shall ascertain that proper inspection reports or certifications are on hand and there have been no unusual alterations in the characteristics of the materials due to handling or other causes. In the event they are unable to properly identify the materials delivered or that materials were not inspected before delivery, the District Materials Office shall be notified. Project plant, field laboratory, and grade control sampling and/or testing shall be performed by the contractor process control personnel or the contract authority personnel as outlined in the sampling and testing guides and all other applicable instructions. When the contractor provides certified plant inspection or sampling and testing, those tests shall be known as process control tests. The acceptance testing will be the responsibility of the contract authority. With documented and satisfactory correlation test results, a contractor's process control test results may be used as acceptance. Test results determined by the District or Central laboratories, which indicate specification noncompliance, will be promptly reported to the project engineer office by telephone or fax.

When certified plant inspection is required, the contractor's process control test results for aggregate gradation shall be the basis of acceptance. This acceptance will be dependent on satisfactory correlation with the contract authority's test results, in accordance with IM 216. The minimum frequency, for acceptance testing, shall be in accordance with IM 204.

Personnel that are certified by the Iowa Department of Transportation, Office of Materials, shall perform acceptance sampling and testing. When contractor process control sampling and testing are used as part of the acceptance decision, the sampling and testing shall be performed in laboratories, and by personnel, that are qualified by the Iowa DOT Office of Materials. This will be accomplished by a certified technician training program, an independent assurance (IA) program, and by a satisfactory correlation program with regional and/or Central Materials laboratories.

In order to avoid an appearance of a conflict of interest, any qualified non-DOT laboratory shall perform only one of the following types of testing on the same project: Verification testing, quality control testing, IA testing, or dispute resolution testing.

A Noncompliance Notice (Form #830245) will be immediately delivered to the acting representative of the contractor for the area of construction involved whenever project or laboratory test results indicate noncompliance with the specifications and/or plans. Appropriate action in accordance with specifications and Instructional Memorandums shall be taken.

VERIFICATION AND ASSURANCE SAMPLING & TESTING

Independent verification sampling and testing will be performed to validate the quality of a material (e.g., freeze-thaw durability, abrasion, specific gravity, etc.) or a product (e.g., AC content, voids, density, smoothness, etc.). Those verification tests will be performed on the individual materials and/or the products considered to be the most critical and are identified in the attached guides. Independent assurance inspection will be performed as a check on the reliability of a material and the process control and acceptance sampling and testing. It is the responsibility of the District Materials Engineer to provide the verification and assurance inspection as outlined herein and designated in the sampling and testing guides. Personnel assigned to either of these activities shall be certified by the Iowa Department of Transportation, Office of Materials and not have any direct responsibility for project process control or acceptance sampling and testing.

Assurance samples of materials are required in some cases for testing to secure supplemental data for acceptance of source inspected or certified materials. The majority of the assurance samples are for validating process control and acceptance sampling and testing.

Verification and assurance sampling and testing shall be performed using test equipment other than that assigned to the project. Occasionally, for expedient situations, the project test equipment may be used. When specified in the appendices or when small quantities of materials are involved, the assurance sampling and testing may be accomplished by observation of the acceptance sampling and testing performed by contract authority personnel. When similar material is being incorporated into the work and processed through the same plant for more than one project, one verification or one assurance sample may be taken to represent those projects. Test results on the sample are to be reported to all projects represented by the sample.

Assurance Sampling and Testing for Incidental Concrete, as described in IM 528, is not required.

Assurance samples of materials for which project personnel are performing acceptance sampling and testing will normally be taken at approximately the same time and location as the project acceptance samples. Verification samples will be taken at random and will not be part of a split sample.

Samples of other materials, which require laboratory testing, are to be taken in accordance with the sampling and testing guides and appropriate instructions.

A report of the assurance tests, and the companion project acceptance tests will be made by the individual performing the assurance tests. If there are any significant discrepancies between the test results, the report shall document the procedures used to evaluate and reconcile the differences and be signed by the District Materials Engineer. Generally, the Central Laboratory Testing Engineer will sign the report of the verification testing. The documentation to evaluate and reconcile any significant differences between process control and verification test results will be signed by the District Materials Engineer.

The frequency of assurance sampling should be increased when it appears that the average values of the test results are approaching either an upper or lower specification limit. If the test results on assurance samples, or verification samples, do not reflect the indicated quality of the material or if they are outside specification requirements, the District Materials Engineer should be consulted promptly concerning the cause, degree, and necessity for correction. Additional samples may be necessary to determine the cause of the deviations. Should there be any dispute over a discrepancy between contractor process control test results and verification or acceptance test results, the central office Materials Laboratory's test results will be considered as being the correct value.

The location, frequency, and responsibility for assurance and verification samples are designated in the attached sampling and testing guides.

It is not always possible to coordinate the assurance sampling from projects where small quantities of materials are incorporated in a short period of time. In such cases, the District Materials Engineer may waive assurance samples. However, assurance sampling is encouraged when possible. Quantities below which assurance samples are not required are shown in the appropriate appendixes.

The District Materials Engineer may opt to use a system basis for conducting the independent assurance responsibility. The frequency of sampling and testing will be based on quantity of production, a unit of time, or a combination of the two rather than a project basis. When a system basis is used, an annual report will be made to document the performance of the program.

SAMPLING & TESTING GUIDE SCHEDULES

The following guides prescribe the minimum frequency for sampling and testing, the indicated inspection locations and the size for each sample type. The guide frequencies are considered to be the minimum required for proper project documentation under normal construction conditions and procedures. More frequent sampling may be required by special conditions such as low or intermittent production, or widely varying test results, and must be initiated at the discretion of and by contractor process control and project inspection personnel. Test results reported via computer terminal may not be identified by a report form number.

> **NOTE:** Currently only asphaltic concrete projects follow the Quality Control/Quality Assurance (QC/QA) guidelines. The sampling and testing frequencies are described, in detail, in the specifications for these Quality Management-Asphalt (QM-A) projects and are not included in the attached guides.
>
> In order to maintain as much clarity as possible in the Guide Schedules, the changes from the last issue are not marked. The Schedules should be checked carefully for changes.

TYPE C

A Type C certification shall be prepared by the manufacturer or producer and shall certify that the materials furnished are in accordance with the specifications. The applicable specification or Materials IM shall be referred to in the certification.

Examples:
Structural plate pipe
Latex emulsion
Packaged PC premix
Clay tile

TYPE D

A Type D certification shall be in the form of a letter or statement of compliance from the approved manufacturer. The letter or statement of compliance shall state that the materials furnished comply with the applicable specifications of Iowa Department of Transportation.

Examples:
PE tubing
Cement
Fly Ash
Paint
CMP
Asphalt Cement
Aggregate
Plastic pipe (PVC, PE, ABS)

APPROVED BRAND

The material must be evaluated and approved by the Office of Materials according to the appropriate Office of Materials IM in order to be used on a project. Once a letter of approval is issued, the material is approved for use on projects. Approved source lists of materials are issued periodically for general information only. Approval for a material may be rescinded at any time if it no longer meets the requirements of the IM.

The project inspector shall document information about this material such as product name, source, date, producer, and lot number, in the project materials book.

Certification of compliance is not needed when material is accepted by approved brand.

APPROVED SHOP DRAWING & APPROVED CATALOG CUT

This information must be submitted to, and reviewed by the Iowa DOT Central Design Offices before the material can be incorporated in the project.

TEST REPORT BY AN APPROVED INSPECTION AGENCY

All treated and untreated timber products, including posts, piling, and lumber, must be tested by an approved inspection agency. A certified report will show the results of the tests. If the supplier is furnishing material from stored stock, a certification statement shall be included with each shipment stating that the material has been inspected by an approved agency.

AS PER PLAN & ENGINEER, VISUAL APPROVAL BY PROJECT ENGINEER, APPROVED BY RCE, & MANUFACTURER RECOMMENDATIONS

The inspector must document information about this material such as product name, source, producer, lot number, date produced in the project materials book. The inspector shall make sure the material meets the requirements of the plans, the engineer, or the manufacturer before the material is used. Visual approval requires construction personnel to visually inspect the material to determine if it generally complies with the specifications. Visual approval is appropriate for non-critical items such as mulch or sod stakes, where general compliance can be readily determined by visual means. If there are questions on specification compliance, samples will be taken for testing.

APPROVED SOURCE

Material furnished must be from a manufacturer or distributor evaluated and approved by the Office of Materials according to the appropriate Office of Materials IM to be used on a project. Once a letter of approval is issued, the material is approved for use on projects. Approved source lists of materials are issued periodically for general information only. Approval for a material may be rescinded at any time if it no longer meets the requirements of the IM.

The project inspector shall document pertinent information such as product name, source, date of production, distributor, etc, in the project materials book.

LOT ACCEPTANCE

Material furnished on a lot accepted basis must be from an approved brand and lot on a list maintained and provided by Central Materials. Materials on the list have been sampled, tested, and determined to comply with applicable specifications and IM's. If a product from a lot is not listed, it must be sampled and tested prior to incorporation in the project. If the sample complies with specifications, it will be added to the list of accepted lots and may be used on the project.

FABRICATION REPORT

The project inspector must have a copy of the final fabrication report prior to incorporating the component into the project. Contents of the report will vary depending on the requirements of the appropriate Materials IM for the component being fabrication. Final acceptance is by construction personnel at the project site, and is based on proper documentation and the condition of the component.

Material	IM	Spec.	Sample Size	Sampled By	Basis of Acceptance	Cert. Type	Verification/ Monitor/ Assurance/ Correlation	Other Details
Abrasives for Blast Cleaning	482.03				Approved Brand			Note brand in field book
Admixture – Air Entraining	403	4103	1 Pt/Lot	DME or RCE	Approved Brand/Lot Monitor		M-Project	Contact District Materials
Admixture – Corrosion Inhibitor	402	4103	1 Pt/Lot	DME or RCE	Approved Brand/Lot Monitor		M-Project	Contact District Materials
Admixture – Latex Emulsion		2413.02b			Certification	C		
Admixture – Retarder	403	4103	1 Pt/Lot	DME or RCE	Approved Brand/Lot Monitor		M-Project	Contact District Materials
Admixture – Water Reducer	403	4103	1 Pt/Lot	DME or RCE	Approved Brand/Lot Monitor		M-Project	Contact District Materials
Aggregates – Non-Proportioned	209	4110 to 4133			Approved Source/Certified Truck Tickets, (Form 821278)	D	M-Source	Certified Ticket for pay items by weight
Aggregates – Proportioned	209 & 204	4110 to 4133	IM 301	CONTR/ RCE/ DME	Approved Source/Certified Truck Tickets, (Form 821278)	D	M-Source V-Project C-Project	
Aluminum, Structural		4190.01			Approved Shop Drawing and Fabrication Report			
Anchor Bolts	453.08	2522.04d 4185.02a 4187.01c	1 Bolt, Nut & Washer per Size per Proj.	DME	Approved Source/Test Report/Steel Mill Certifications	A		
Anchors, Concrete	453.09				Approved Brand			
Anti-Strip Agent	491.16				Approved Brand			
Arrow Panels, Solar Assisted	486.12	2528.06			Approved Brand			
Asphalt Binder	437	4137	1 3 oz. Tin	CONTR/ DME	Approved Source/Certification/Test Report	D	M-Source V-Project	
Asphalt, Cutback	437	4138	1 Qt Tin	RCE	Approved Source/Certification/Test Report	D	M-Source	Verification for Seal Coat

Material	IM	Spec.	Sample Size	Sampled By	Basis of Acceptance	Cert. Type	Verification/ Monitor/ Assurance/ Correlation	Others Details
Asphalt, Emulsified	437	4140	1 Qt Bottle	RCE	Approved Source/Certification/Test Report	D	M-Source	Verification for Seal Coat
Asphalt, Polymer Modified	437		1 Gallon	DME	Test Report (Approved Batch)			
Backer Rod for Cold Pour Joint Seal	436.04	4136.02c			Approved Brand			
Backer Rod for Hot Pour Joint Seal	436.04	4136.02c			Approved Brand			
Barrier Rail, Precast Concrete	571	2513			Source Approval/DOT Stamp/Fabrication Report		M-Source	
Beads, Glass	484	4184	1 Qt	DME	Approved Source		M-Subcontr.	
Bearing, Bronze		4190.03	1/Project	DME	Test Report			
Bearing, Lead		4195.01			Certification	D		
Bearing, Neoprene	495.03	4195.02	1 Pad	DME	Fabrication Report/Approved Source		M-Fabricator	
Bentonite Clay					Visual Approval by RCE			
Bolts, Nuts & Washers, Structural	453.06b	4153.06	Per IM 453.06	DME	Certification/Rotational Capacity Test/ Test Report	A		
Calcium Chloride Solution	373	4194.01	4 lbs or 1 Qt	RCE	Test by RCE			
Caulking Compound		4192			Visual Approval by RCE			
Concrete, Special Sections	445	4145 4149.02b			Approved Source /Certification	D	M-Source	
Concrete, Pre-Stressed, Precast Units	570	2407			Approved Source /Iowa DOT Stamp/Fabrication Report		M-Source	
Concrete Sealer	491.12a 491.12b	4139			Approved Brand			
Conduit – See Lighting Material								

Material	IM	Spec.	Sample Size	Sampled By	Basis of Acceptance	Cert. Type	Verification/ Monitor/ Assurance/ Correlation	Others Details
Curing Materials – Burlap		4104			Visual Approval by RCE			
Curing Materials – Clear	405.07	4105.07			Approved Brand			
Curing Materials – Dark Colored	437	4105.06			Approved Source		M-Source	
Curing Materials - Plastic Film		4106.02			Visual Approval by RCE			
Curing Materials – White Pigmented	405	4105.05	1 Qt/Lot	DME	Lot Accept			
Delineators – See Signing Materials								
Dowel – See Steel Reinforcement								
Drains, Floor		2406.05			Approved Shop Drawing and Fabrication Report			
Drums, Channelizing	488.02	4188.02			Approved Brand			
Epoxy-Coated Steel – See Steel Reinforcement								
Epoxy Injection Resin	491.19 a & b				Approved Brand			
Erosion Control, Fertilizer	469.03	4169.03			Approved Source			If material suspect, DME will sample
Erosion Control, Fungicide		4169.05			Seed Manufacturing Recommendation			
Erosion Control, Inoculant		4169.04			Seed Manufacturing Recommendation			
Erosion Control, Jute Mesh		4169.10a			Visual Approval by RCE			
Erosion Control, Mulch		4169.08			Visual Approval by RCE			

Material	IM	Spec.	Sample Size	Sampled By	Basis of Acceptance	Cert. Type	Verification/ Monitor/ Assurance/ Correlation	Others Details
Erosion Control, Seed	469.02	4169.02			Certification	A		
Erosion Control, Silt Fence Fabric	496.01	4196.01			Approved Brand			
Erosion Control, Silt Fence Wire and Posts		Std Road Plan RC-16 Series			Visual Approval by RCE			
Erosion Control, Sod		4169.07			Visual Approval by RCE			
Erosion Control, Sod Stakes		4169.09			Visual Approval by RCE			
Erosion Control, Sticking Agent		4169.06			Seed Manufacturing Recommendation			
Erosion Control, Wire Staples		4169.10b			Visual Approval by RCE			
Erosion Control, Wood Excelsior Mat	469.10	4169.10c			Approved Manufacturer/Brand			
Expansion Device, Steel		4152.02			Approved Shop Drawing and Fabrication Report			
Expansion Tube		4191.01b			Visual Approval by RCE			
Fabric, Engineering	496.01	4196.01			Approved Brand			
Fasteners, Aluminum Structural	486	4190.02			Fabrication Report			
Fence, Barbed Wire		4154.04			Visual Approval by RCE			
Fence, Brace for Field Fence		4154.08			Visual Approval by RCE			
Fence, Tie and Tension Wire		4154.05			Visual Approval by RCE			
Fence, Chain Link Fabric	454.10	4154.03			Approved Source		M-Supplier	
Fence, Chain Link Fittings		4154.11			Visual Approval by RCE			

Material	IM	Spec.	Sample Size	Sampled By	Basis of Acceptance	Cert. Type	Verification/ Monitor/ Assurance/ Correlation	Others Details
Fence, Chain Link Posts, Braces, and Rails	454.10	4154.10			Approved Source/ Certification		M-Supplier	
Fence, Field Fence Fabric		4154.02			Visual Approval by RCE			
Fence, Gate		4154.12			Visual Approval by RCE			
Fence, Miscellaneous Hardware					Visual Approval by RCE			
Fence, Orange Mesh Safety	488.03	4188.03			Approved Brand			
Fence, Silt – See Erosion Control								
Fence, Staples		4154.06			Visual Approval by RCE			
Fence, Steel Line Posts		4154.09			Visual Approval by RCE			
Fence, Wood Fence Post	462	4154.07			Special Test by Approved Inspection Agency and Certification	D		
Fertilizer – See Erosion Control								
Fly Ash	491.17	4108	10 lbs.	DME	Approved Source/Certification	D	V-Project M-Source	Verification on Paving only
Galvanized Items		4100.07		DME	Test Report by District Materials			
GGBFS	491.14	41008			Approved Source/Certification	D	M-Source	
Grating (Aluminum)		4187.01a			Approved Shop Drawing and Fab. Report			
Grout, Hydraulic Cement	491.13a 491.13b				Approved Brand			
Grout, Polymer	491.11				Approved Brand			
Guardrail, Attenuators					As per Plan			
Guardrail, Box-beam Median Barrier		4155.06			Approved Shop Drawing and Fabrication Report			
Guardrail, Cable		4155.06	6 Ft	DME	Test Report by Central Lab			
Guardrail, Formed Steel Beam	455.02	4155.02			Approved Brand			

Material	IM	Spec.	Sample Size	Sampled By	Basis of Acceptance	Cert. Type	Verification/ Monitor/ Assurance/ Correlation	Others Details
Guardrail, Steel Posts		4155.05			Mill Test Report	A		
Guardrail, Wood Posts	462	4155.04			Test Report by Approved Inspection Agency and Cert	D		4'x4' or greater, must be stamped on end
Iron Castings, Utility Access Covers, etc	453.04	4153.04			Certification & Proper Identification Imprint	A		
Iron Bridge Rockers		4153.04			Approved Shop Drawing & Fabrication Report			
Joint Filler, Flexible Foam – Type CF and EF Joints	436.05a 436.05b	4136.03b 4136.03d			Approved Brand			
Joint Filler, Type E Joint	436.03	4136.03a			Approved Brand			
Joint Filler, Bituminous Type	436.03	4136.03a			Approved Brand			
Joint Sealer for Concrete Sewer Pipes	491.09	4149.08			Approved Brand			
Joint Sealer, Elastomeric (Neoprene)	436.02	4136.0			Approved Brand			
Joint Sealer, Poured	436.01	4136.02a			Approved Brand			
Keyway		4191.01a			Visual Approval by RCE			
Lighting Material, Aluminum Poles	557	4185.02e			Approved Shop Drawing/Approved Source/Certification	D		
Lighting Material, Circuit Test		2523.21		Contr	Test Report (Contractor)			
Lighting Material, Connectors		4185.11			Approved Catalog Cut			
Lighting Material, Contactors		4185.05			Approved Catalog Cut			
Lighting Material, Control Cabinet		4185.07			Approved Shop Drawing and Catalog Cut			
Lighting Matl. Conduit & Fittings Plastic		4185.10	4' – Plastic	DME	Test Report			
Lighting Matl. Conduit & Fittings Steel	485.10	4185.10			Approved Brand			

Material	IM	Spec.	Sample Size	Sampled By	Basis of Acceptance	Cert. Type	Verification/ Monitor/ Assurance/ Correlation	Others Details
Lighting Material, Ground Rods and Clamps		4185.04			Visual			
Lighting Material, Handholes	445	4185.08			Source Approval/DOT Stamp/Fabrication Report/ Certification	D	M-Source	
Lighting Material, Junction Boxes		4185.09			Approved Catalog Cut			
Lighting Material, Lighting Tower	557	2522.04			Approved Shop Drawing/Approved Source/Certification	D		
Lighting Material, Lowering Device		2522.06			Approved Shop Drawing and Fabrication Report			
Lighting Material, Luminaries		4185.03			Approved Catalog Cut			
Lighting Material, Photoelectric Control		4185.06			Approved Catalog Cut			
Lighting Material, Sealant for Traffic Loop Detectors	491.18				Approved Brand			
Lighting Material, Steel Poles	557	4185.02d			Approved Shop Drawing/Approved Source/Certification	D		
Lighting Material, Underground Warning Tape		2523.13			Visual Approval by RCE			
Lighting Material, Wire and Cable		4185.12			Approved Catalog Cut and Certification	D		DME may obtain monitor samples
Lighting Material, Wood Poles	462	4185.02f			Test Report by Approved Inspection Agency and Certification	D		4'x4' or greater, must be stamped on end
Lighting Materials, Fasteners for Poles	453.09	4185.02a	1 Each Type	DME	Test Report and Approved Shop Drawing			
Lighting Materials, Mastarms	557	4185.02b			Approved Shop Drawing/Approved Source/Certification	D		

Material	IM	Spec.	Sample Size	Sampled By	Basis of Acceptance	Cert. Type	Verification/ Monitor/ Assurance/ Correlation	Others Details
Lighting Materials, Slip Base	557	4185.02			Approved Shop Drawing/Approved Source/Certification	D		
Lighting Materials, Transformer Base	557	4185.02c			Approved Shop Drawing/Approved Source/Certification	D		
Markers (reflective) for Guard Rail and Concrete Barrier Rail	486.08	4186.08			Approved Brand			
Markers, Raised Pavement	483.07	2527.02e			Approved Brand			
Mastarms – See Lighting Materials								
Paint, Epoxy Aluminum	482.04				Approved Brand			
Paint, Traffic – VOC Complaint Solvent Borne	483.03	4183.03			Approved Brand			
Paint, Traffic – Waterborne	483.03	4183.04			Approved Source		M-Subcontr.	
Paint, Waterborne Acrylic Finish (Bridge Paint)	482.05	4182.03			Approved Brand/Certification	D		
Paint, Zinc-Rich Epoxy	482.02	4182.02			Approved Brand/Certification	D		
Paint, Zinc-silicate Solvent Borne	482.02	4182.02			Approved Brand/Certification	D		
Paint, Zinc-Silicate Waterborne	482.05	4182.02			Approved Brand/Certification	D		
Patch Material, Rapid-Set Concrete	491.20				Approved Brand			
Pedestrian Bridge, Pre-Engineered	557				Approved Fabricator/Approved Shop Drawing			

Material	IM	Spec.	Sample Size	Sampled By	Basis of Acceptance	Cert. Type	Verification/ Monitor/ Assurance/ Correlation	Others Details
Piling, Concrete	570	4166			Approved Fabricator/DOT Stamp/Fabrication Report		M-Source	
Piling, Steel	467	4167			Approved Source/Mill Certification	A	M-Project	
Pipe, ABS Sewer/PVC	443 446	4146.04 4146.05			Approved Source/Certification	D	M-Source	
Pipe, Clay Sewer		4149.02a	2 Each	DME	Test Report			
Pipe, Concrete	445	4145			Approved Fabricator/Certification	D	M-Source	
Pipe, Corrugated Aluminized	441	4141			Approved Source/Certification			
Pipe, Corrugated Polyethylene 3-10 in.	443	4146.02 4143.02			Approved Source		M-Source	
Pipe, Corrugated Polyethylene 12-36 in.	446	4146.02			Approved Source/Certification	D	M-Source	
Pipe, Corrugated Steel	441	4141			Approved Fabricator/Certification	D	M-Fabricator	
Pipe, Ductile Iron Sewer		4149.02c			Certification	A		
Pipe, Polyethylene Sewer	443 446	4146.03			Approved Source/Certification	D	M-Source	
Pipe, Rodent Guard for PE pipe	443.01a	4143.01b			Approved Brand			
Pipe, Rodent Guard for CMP pipe	443.01b	4143.01b			Approved Brand			
Pipe, Concrete Subdrain Tile	448	4148			Approved Source /Certification	C	M-Source	
Pipe, Corrugated Metal Subdrain Outlet	441	4141			Approved Fabricator/Certification	D	M-Fabricator	
Pipe, Corrugated Polyethylene Subdrain	443	4143.01b			Approved Source		M-Source	
Pipe, Welded Steel for Bridge Rail (See Railing, Bridge)								

Material	IM	Spec.	Sample Size	Sampled By	Basis of Acceptance	Cert. Type	Verification/ Monitor/ Assurance/ Correlation	Others Details
Pipe, Horizontal Subdrain	443	4143.01a			Approved Source		M-Source	
Plant Material, Fertilizer	469.03	4170.09b			Approved Source			
Plant Material, Mulch	470	4170.09d		RCE	Field Review Report			
Plant Material, Plants	470	4170.01-4170.08		Roadside Develop.	Field Review Report			Report Issued –Rdside Devel
Portland Cement Concrete Premix Pack	447				Approved Source/Certification	C	M-Source	
Portland Cement, All Types	401	4101	10 Lbs.	DME	Approved Source/Certification	D	V-Project M-Source	
Railing, Bridge		4153.05			Approved Fabricator/Approved Shop Drawing/ Fabrication Report			
Reflective Sheeting – See Signing Material								
Release Agent	491.15				Approved Brand			
Sealant, Traffic Loop – See Lighting Material								
Seed – See Erosion Control								
Signing Material, Delineator Posts		4186.10c	1 Each Supplier	DME	Test Report			
Signing Material, Delineators	486.07	4186.07			Approved Brand		M-Project	
Signing Material, Finished Sign	486	4186			Fabrication Report/Approved Source/Certification	D	M-Source	
Signing Material, Fasteners		4186.06			Fabrication Report			
Signing Material, Reflective	486.03	4186.03			Approved Manufacture/Brand		M-Source	

Material	IM	Spec.	Sample Size	Sampled By	Basis of Acceptance	Cert. Type	Verification/ Monitor/ Assurance/ Correlation	Others Details
Signing Material, Sign Panels		4186.02			Approved Shop Drawing and Fabrication Report			
Signing Material, Sign Support Structures	557	4187			Approved Fabricator/Approved Shop Drawing/Fabrication Report			
Signing Material, Steel Posts		4186.10			Approved Shop Drawing and Fabrication Report			
Signing Material, Wood Posts	462	4186.10			Test Report by Inspection Agency and Certification	D		
Signing Material, Galvanized Items		4100.07			Test Report by District Materials			
Sod – See Erosion Control								
Steel Castings		4153.03			Approved Source/Catalog Cut			
Steel Masonry Plates		4152.02			Mill Certification	A		
Steel Pile, Welded		4153.05			Approved Shop Drawing & Fabrication Report			
Steel, Pins/Rollers, Cold Finished		4153.02			Approved Source/Catalog Cut			
Steel, Pins/Rollers, Forged		4153.01			Approved Source/Catalog Cut			
Steel Reinforcement, Basket Assemblies	451.03B	4151.02			Approved Source/Certification	D		
Steel Reinforcement, Epoxy-Coated	451.03b	4151.03b	6 Ft of Largest Size in Shipment	DME	Approved Source/Mill Certifications & Epoxy Certification/Test Report	A	M-Project	Test Sample should be 3' away from end of the bar.
Steel Reinforcement, Epoxy-Coated Tie Bars	451.03b	4151.02a	1 per Proj. per Year		Approved Source/Certification	D	M-Project	
Steel Reinforcement, Epoxy-Coated Dowels	451.03b	4151.02	1 per Proj. per Year		Approved Source/Certification	D	M-Project	
Steel Reinforcement	451	4151	1 per Proj of 45T or more	DME	Approved Source/Certification	A	V-Project	6' sample or largest size

Material	IM	Spec.	Sample Size	Sampled By	Basis of Acceptance	Cert. Type	Verification/ Monitor/ Assurance/ Correlation	Others Details
Steel Reinforcement, Galvanized	451	4151.03a	3 Ft	DME	Mill Certifications & Test Report for Galvanizing	A	M-Project	
Steel Reinforcement, Uncoated	451	4151	*6 Ft. of Most Common	DME	Approved Source/Mill Certification	A	M-Project	*project Qty under 30 Tons Cert. Only, 30-100 Tons 1 sample,100+ Tons 2 samples
Steel Reinforcement, Wire Mesh	451	4151.04	2 ft. x 2 ft.	DME	Approved Supplier or Distributor/Certification	A	M-Supplier	1 sample per source per year
Steel Mechanical Splicers for Reinforcement	451				Approved Fabricator/Mill Certification/Epoxy Certification		M-Project	Need: Certification Statement, Project #, Quantity, Heat #
Steel, Structural	557,561 to 565	2408 4152			Approved Fabricator/Approved shop Drawing/Fabrication Report/Mill Certifications	A		
Step Irons for Utility Access		4149.06			Fabrication Report			
Structural Items, Other					Approved Shop Drawing and Fabrication Report			
Structural Plate (Arches)	444	4144	Visual	RCE	Approved Fabricator/Certification Statement	C		
Studs, Shear	453.10				Approved Source/Certification	A		
Surface Finish, Special	491.10	2403.21c			Approved Brand			
Tape, Pavement Marking	483.06	2527.02a			Approved Brand			
Torque Calibration Machine (skidmore)		2408.38c	Calibrate Every 6 Months	CTRL	Test Report			
Torque Wrench		2408.38c	Calibrate Every 6 Months	CTRL	Test Report			

Material	IM	Spec.	Sample Size	Sampled By	Basis of Acceptance	Cert. Type	Verification/ Monitor/ Assurance/ Correlation	Others Details
Water		4102	1 Qt per Source	DME	Test Report or City Water Supply			
Wire and Cable – See Lighting Material								
Wood, Hardware for Timber Structure	462	4153.07	1 Each Type		Test Report			
Wood, Timber Piles	462	4165			Test Report by Approved Inspection Agency and Certification	D		
Wood, Treated Posts	462	4164			Test Report by Approved Inspection Agency and Certification	D		
Wood, Treated Timber and Lumber	462	4162			Test Report by Approved Inspection Agency and Certification	D		
Wood, Untreated Timber and Lumber	462	4162			Test Report by Approved Inspection Agency and Certification	D		

GUIDE FOR THE ACCEPTANCE OF SMALL QUANTITIES OF MATERIALS

Material	Maximum Quantity	Specifications	Alternate Acceptance Method
Beads, Glass	0.5 mi. application	4184	Visual
Dowel Baskets, Epoxy-Coated	25		Visual & Field Check
Fly Ash	5 ton		Approved Source & Type
Hardware for Timber	100 lbs.	4153.07	Visual
Joint Filler, Preformed	50 ft.	4136.03	Visual & Dimension
Lighting Material - Conduit & Fittings	100 ft.	4185.10	Visual & Brand Name
Paint, Bridge	5 gal.	4182	Visual & Brand Name
Pipe, Welded Steel for Bridge Railing	100 ft.	4153.05	Letter of Compliance

...ION OF USX CORPORATION

Metallurgical Test Report

CONTRACT NO.	P.O. DATE	PURCHASE ORDER NO.	SHIPPERS NO.	MILL ORDER NO.	INVOICE NO.
	11/05/90	640350	889864 01 04 91	UM12235	187-097245

VENDOR: SOUTH WORKS
CHICAGO, ILL. 60617

VEHICLE IDENTITY: 1658 IA 60296

SOLD TO: SKYLINE STEEL CORP
17 W 705-C BUTTERFIELD RD
OAK BROOK IL 60181

SHIP TO: SKYLINE STEEL CORP
17 W 705-C BUTTERFIELD RD
OAK BROOK IL 60181

EXAMPLE: TYPE "A" CERT

BEING DULY SWORN ACCORDING TO LAW, DEPOSES AND SAYS PRODUCT DESCRIBED HEREIN WAS MFGD., SAMPLED, TESTED AND/OR INSPECTED IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECTS

PREPARED BY THE OFFICE OF:
J. J. HARRINGTON Q A MGR

BY:

DATE

SPEC. & INSP.: H-PILES CARBON ASTM A36-87

BRF-13-2 (23)--38-26
Delaware County
Contract No 32280
Guetzko Construction, Ltd

INSP 01 MILL SWORN T/R

STATE OF INDIANA
COUNTY OF LAKE
SUBSCRIBED AND SWORN TO BEFORE ME
THIS 04TH DAY OF JANUARY A. D. 19..
NOTARY PUBLIC
MY COMMISSION EXPIRES Feb 15, 199.

ITEM NO.	THICKNESS OR SECTION	WIDTH, DIA. OR FT. WT.	LENGTH	QUANTITY	WEIGHT	HEAT NO.	TEST OR PIECE IDENTITY	YIELD PT. KSI	TENSILE STR. KSI	ELONGATION % IN 8"	ELONGATION % IN 2"	% RED. OF AREA	BEN.
05	.4150	HP10X042	42'	07	12348	1R7508	294	49.7 49.3	72.0 72.5	21.0 27.0	40.0 48.0		
05	.4150	HP10X042	42'	06	10584	1R7509	252	53.5 51.5	71.5 73.0	27.0 26.0	48.0 48.0		
06	.4150	HP10X042	48'	08	16128	2R0055	384 930 L.F.	61.5 50.0	74.5 69.5	25.0 27.0	46.0 48.0		

"USS, A DIVISION OF USX, HEREBY CERTIFIES THAT ALL MANUFACTURING PROCESSES, INCLUDING MELTING, INVOLVED IN THE PRODUCTION OF USS STEEL MILL PRODUCTS OCCUR ENTIRELY IN THE UNITED STATES."
END OF DATA

OK
2/6/91
BB

HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
1R7508	HEAT	21	078	009	030	035												
1R7509	HEAT	22	075	009	031	040												
2R0055	HEAT	18	057	008	028	039												

END OF DATA

ONTECH
UCTION PRODUCTS INC

IP TO: PETIT CONSTRUCTION CO.
BOX 428
BATTLE CREEK, IA 51006

DATE: 4/19/91
PROJECT: IDA COUNTY L-90T (1)
CONTRACTOR:

CERTIFICATE OF COMPLIANCE

e material covered by this certification was manufactured to comply in full with e specifications of AASHTO M-167.

sed on mill test results, it is certified that the listed materials have been sted and that the test results conform to the requirements of this specification.

IPMENT IDENTIFICATION: ORDER NUMBER: 17-9160

SALES NUMBER: 26-0770-00

ITEM NO.	QUANTITY	MATERIAL DESCRIPTION
001	1 PIPE	GALVANIZED MULTI-PLATE ROUND PIPE: 10 ga., 102 PL, 96'0" MANUFACTURED FROM THE FOLLOWING HEAT NUMBERS: 101A91A 149P90A 475A90A 2A91A 108A91A
EXAMPLE: TYPE "C" CERT		
AVERAGE WEIGHT OF COATING: 3 OZ. MIN.		

PREPARED BY: Judy A. [illegible]
WINCHESTER PLANT

Davenport Cement Company

STRAIGHT BILL OF LADING - SHORT FORM

RECEIVED, subject to the classifications and tariffs in effect on the date of issue of the Bill of Lading

HEADQUARTERS ADDRESS:
220 EMERSON PLACE, SUITE 300, DAVENPORT, IOWA 52801 - 319/323-2751

This short form is issued in lieu of the Uniform Bill of Lading and is subject to its terms and Conditions:

CAUTION:
MAY CAUSE EYE OR SKIN INJURY
SEE NOTICE ON REVERSE SIDE

R E P R I N T Wed Apr 24 09:46:33 1991

AT: West DesMoines Terminal

BILL OF LADING NO.

CUSTOMER NO.	CONTRACT/P.O. NUMBER	TERR. NO./SALESMAN	SHIPPING DATE	FREIGHT
2075-1392			4/24/91	

SHIP TO
FRED CARLSON CO./WILLIAMS
RP-520-4(26)---16-40
JCT R-77 & 520 NEAR
WILLIAMS / HAMILTON CO. IA

SOLD TO
FRED CARLSON CO
PO Box 40
Decorah IA 52101

COUNTY

TEST/SILO # 46

CARRIER: RUAN TRANSPORT CORP.
CARRIER NO.: 255 Truck: 56255

PROJECT
110 PORTLAND TYPE I

Gross Weight 79[illegible]
Tare Weight 25620
Net Weight 52740
26.37

[illegible]

SIGNED [illegible]
TRAILER NO.

TRANS NO 41303
DRIVER: NITTAG

EXAMPLE:
TYPE "D" CERT.

[illegible]

Signed [illegible]

CONSIGNEE'S SIGNATURE

EXTRA COPY

COPY

MARTIN MARIETTA

AGGREGATES COMPANY

4626448

SOLD TO:	SOLD FROM:
MANATTS INC SN-3478(2)—51-08 BOONE COUNTY	121 AMES MINE RR2, AMES, IOWA (515)232-3363

DATE: 06/28/91 TIME: 03:08 PM TRK NO. MA63P HAULER NO. 0174 TICKET NO: 4626448

PROD NO. 0816 DESCRIPTION: 1/2 TYPE A CUST NO. 524504 P.O. NO. SCN. 507

TONS GROSS: 39.64
TONS TARE: 16.41
TONS NET: 23.23

CASH SALE		
MATERIAL	$	PER TON
TAX	$	
HAUL	$	PER TON
TOTAL	$	PAYMENT REC BY.

LOADS TODAY: 82
QUANTITY TODAY: 1755.98
QUANTITY TO DATE: 3448.96

WEIGHPERSON: SHORT D

STATE SECRETARY OF AGRICULTURE CERTIFIED. EFFECTIVE $CaCO_3$ EQUIVALENT PER TON OF AGLIME. ________ LBS

GH
DRIVER ________________

CUSTOMER ________________

CERTIFICATION BELOW VALIDONLY WITH AUTHORIZED SIGNATURE. THIS IS TO CERTIFY THAT THE MATERIAL HEREIN DESCRIBED MEETS THE APP. CONTRACT SPECIFICATIONS & REQUIREMENTS

EXAMPLE:

TYPE "D" CERT

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading

FROM CONTECH CONSTRUCTION PRODUCTS INC.

CONSTRUCTION PRODUCTS INC.

AT: DES MOINES PLANT

PAGE 1 B/L STOP 01

The property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth in the Uniform Freight Classification in effect on the date hereof, if this is a rail or a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment.
Shipper hereby certifies that he is familiar with all the terms and conditions of said bill of lading, including those on the back thereof, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

DATE 07/13/91 LSH-0778
CARRIER/ROUTE VAN WYK TRUCKING
CAR/VEHICLE NO
DEST. CODE

CONSIGNED TO: (MAIL OR STREET ADDRESS OF CONSIGNEE - FOR PURPOSES OF NOTIFICATION ONLY)

HOLLAND, CONST. CO.

EXAMPLE: TYPE "D" CERT.

001	1	H/C PIPE 2 2/3x1/2 GALV WS 16GA 24" 8.00FT ROLL ONE END	129
002	1	H/C PIPE 2 2/3x1/2 GALV WS 16GA 24" 14.00FT	226
003	2	CSP BAND 10"HUGGER GALV 16GA 24" 1PC W/BAR BOLT & STRAP.	39
004	1	H/C PIPE 2 2/3x1/2 GALV WS 16GA 18" 20.00FT	243
005	1	CSP BAND 10"HUGGER GALV 16GA 18" 1PC W/BAR BOLT & STRAP.	16
006	6	BAND ACC FASTENER STEEL BOLT 1/2"x6"	3
007	6	BAND ACC FASTENER STEEL NUT	

1. STATE CERTIFIED ...
PROJ # ...
2. STA ...
3. BRING BACK ...

The material covered by this fabricator's certification statement was manufactured in compliance with the Iowa Department of Transportation's specifications based upon mill certificates and quality control tests. It is certified that representative samples of the listed material have been tested and that the test results conform to the requirements of those specifications. Material description and project identification are as shown.

Authorized Signature

Date 7-15-91

WEIGHT 657 LBS

Item # 1-7

ON FREIGHT BILLS

SHIPPER NUMBER

72-4594 FIN

ORDER NUMBERS

PLANT: 72-00030-0

SALES 26-3876-0
BUYER:

IF CHARGES ARE TO BE PREPAID WRITE OR STAMP HERE, "PPD"

ORGN,FRGT PREPAID

TO EXPEDITE PAYMENT, MAIL A COPY OF THIS BILL OF LADING WITH FREIGHT BILL. FREIGHT BILLS RECEIVED WITHOUT THIS COPY WILL BE RETURNED. MAIL TO COMPUTREX, INC., P.O. BOX 13020, LEXINGTON, KY. 40583.

(Signature of Consignor)

* H/M This is to certify that the named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation

PER

CONTECH CONSTRUCTION PRODUCTS INC. SHIPPER

Per

Permanent post-office address of shipper:
1001 Grove St., Middletown, Ohio 45044

Agent

Per

Sampling and Testing Guide-Minimum Frequency

Matls. I.M. 204
Appendix A (U.S.) Units

ROADWAY AND BORROW EXCAVATION AND EMBANKMENTS
Section 2102 and 2107

October 3, 2000
Supersedes April 25, 2000

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Special Backfill														
Crushed Stone (4132.02)		AS 209												
Crushed Concrete (4132.02)		209												
RAP(2303.02) Gravel (4132.03)		AS 209												
Granular Backfill		AS 209												
Engineering Fabric (4196)	Quality	AB 496.01												
GRADE INSPECTION														
Special & Select Backfill Compaction Control	Moisture	309, 310	RCE	1/lift/ 1500 ft.	1 lb	RCE	Field Book							
Moisture & Density Compaction Control	Density (Proctor) Moisture	309, 310	RCE	1/soil class 1/lift/1500 ft.	25 lb 1lb	RCE	Field Book							
Compacted Materials	Density	311, 326, 334	RCE	1/lift/mile or 1/1500 cy		RCE	Field Book							Unless otherwise specified or directed

AS-Approved Source	Cert A-Type A Certification	RCE-Resident Construction Engineer/Project Engineer	ASSUR-Independent Assurance
AB-Approved Brand	Cert B-Type B Certification	DME-District Materials Engineer	VERIF-Verification
ASD-Approved Shop Drawing	Cert C-Type C Certification	CTRL-Central Materials Office	CORR-Correlation
S&T-Sampling & Testing	Cert D-Type D Certification	CONTR-Contractor	MON-Monitor

ROADWAY AND BORROW EXCAVATION AND EMBANKMENTS

Section 2102 and 2107

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➼
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Special Backfill														
Crushed Stone (4132.02)		AS 209												
Crushed Concrete (4132.02)		209												
RAP(2303.02) Gravel (4132.03)		AS 209												
Granular Backfill		AS 209												
Engineering Fabric (4196)	Quality	AB 496.01												
GRADE INSPECTION														
Special & Select Backfill Compaction Control	Moisture	309, 310	RCE	1/lift/ 450 m	0.5 kg	RCE	Field Book							
Moisture & Density Compaction Control	Density (Proctor) Moisture	309, 310	RCE	1/soil class 1/lift/450 m	12 kg 0.5 kg	RCE	Field Book							
Compacted Materials	Density	311, 326, 334	RCE	1/lift/1.5 km or 1/1150 m³ ➼		RCE	Field Book							Unless otherwise specified or directed

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert B-Type B Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Sampling and Testing Guide-Minimum Frequency

Matls. I.M. 204
Appendix C (US) Units

MODIFIED SUBBASE
Section 2115

October 3, 2000
Supersedes April 25, 2000

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➻
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Natural Aggregate	Quality Gradation	AS 209												
Recycled Products														
Composite	Gradation	*As Per Spec.												
PCC Pavement	Gradation	*As Per Spec.												
Rap		*As Per Spec.												
GRADE INSPECTION														
Compacted Subbase	Density	*As Per Spec.	RCE			RCE	Field Book							
Dimensions	Thickness Width	337	RCE	3/2 lane mi.		RCE	Field Book							
	Cross Section (Primary)	Stringline	RCE	10/mi.		RCE	Field Book							
	Cross Section (Other)	Template	RCE	3/mi.		RCE	Field Book							

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert B-Type B Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

* Use Current Specification for Modified Subbase

Sampling and Testing Guide-Minimum Frequency

Matls. I.M. 204
Appendix C (Metric) Units

MODIFIED SUBBASE
Section 2115

October 3, 2000
Supersedes April 25, 2000

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS →
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Natural Aggregate	Quality Gradation	AS 209												
Recycled Products														
Composite	Gradation	*As Per Spec.												
PCC Pavement	Gradation	*As Per Spec.												
Rap		*As Per Spec.												
GRADE INSPECTION														
Compacted Subbase	Density	*As Per Spec.	RCE			RCE	Field Book							
Dimensions	Thickness Width	337	RCE	2/2 lane km		RCE	Field Book							
	Cross Section (Primary)	Stringline	RCE	6/km		RCE	Field Book							
	Cross Section (Other)	Template	RCE	2/km		RCE	Field Book							

AS-Approved Source
AB-Approved Brand
ASD-Approved Shop Drawing
S&T-Sampling & Testing

Cert A-Type A Certification
Cert B-Type B Certification
Cert C-Type C Certification
Cert D-Type D Certification

RCE-Resident Construction Engineer/Project Engineer
DME-District Materials Engineer
CTRL-Central Materials Office
CONTR-Contractor

ASSUR-Independent Assurance
VERIF-Verification
CORR-Correlation
MON-Monitor

* Use Current Specification for Modified Subbase

Sampling and Testing Guide-Minimum Frequency

Matls. I.M. 204
Appendix D (U.S.) Units

GRANULAR SUBBASE
Section 2111

October 3, 2000
Supersedes April 25, 2000

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Natural Aggregate (4121)	Quality Gradation	AS 209												
PCC Pavement	Gradation	209												
GRADE INSPECTION														
Compacted Subbase (2111)	Density	By Specification	RCE			RCE	Field Book							
Dimensions	Thickness Width	337	RCE	3 / 2 lane mi.		RCE	Field Book							
	Cross Section (Primary)	stringline	RCE	10/ mi.		RCE	Field Book							
	Cross Section (Others)	template	RCE	3/mi		RCE	Field Book							

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert B-Type B Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Sampling and Testing Guide-Minimum Frequency

Matls. I.M. 204
Appendix D (Metric) Units

GRANULAR SUBBASE
Section 2111

October 3, 2000
Supersedes April 25, 2000

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➸
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Natural Aggregate (4121)	Quality Gradation	AS 209												
PCC Pavement	Gradation	209												
GRADE INSPECTION														
Compacted Subbase (2111)	Density	By Specification	RCE			RCE	Field Book							
Dimensions	Thickness Width	337	RCE	2/2 lane km		RCE	Field Book							
	Cross Section (Primary)	stringline	RCE	6/km		RCE	Field Book							
	Cross Section (Others)	template	RCE	2/km		RCE	Field Book							

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert B-Type B Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Form 820180ex 11-01

Lab. No.:	3	
Material:	Coarse Aggregate - PCC	Grad. No.: 3
Co. & Proj.#:		
Producer:		
Contractor:		
Sampled By:	Date:	
Sample Loc.:		

Original Dry Mass:	3759.4	Total Minus 4.75 mm (W1):	
Dry Mass Washed:		Reduced Minus 4.75mm(W2)	
Washing Loss:		Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")		23.0			
19mm (¾)		381.2			
12.5mm (½")		1476.8			
9.5mm (⅜")		1243.5			
4.75mm (4)		501.0			
2.36mm (8)	(B)	100.7 (A)			
1.18mm (16)	(B)	(A)			
600µm (30)	(B)	(A)			
300µm (50)	(B)	(A)			
150µm (100)	(B)	(A)			
75µm (200)	(B)	(A)			
Wash					
Pan	(B)	30.8 (A)			
Total					
Tolerance					

Wash Sample				
	Original Dry Mass:	2603.3		
	Dry Mass Washed:	2590.4		
	Washing Loss:			
Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 µm (200)				
Wash				
Pan	1.1			

Date Reported:	Cert No.:
Tested By:	

Comments: ____________________

Form 820180ex 11-01

Lab. No.:	3		
Material:	Coarse Aggregate - PCC	Grad. No.: 3	
Co. & Proj.#:			
Producer:			
Contractor:			
Sampled By:		Date:	
Sample Loc.:			

Original Dry Mass:	3759.4	Total Minus 4.75 mm (W1):	
Dry Mass Washed:		Reduced Minus 4.75mm(W2)	
Washing Loss:		Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")				100.0	100
25mm (1")		23.0	0.6	99.4	95-100
19mm (¾)		381.2	10.1	89.3	
12.5mm (½")		1476.8	39.3(39.4)	49.9	25-60
9.5mm (⅜")		1243.5	33.1	16.8	
4.75mm (4)		501.0	13.3	3.5	0-10
2.36mm (8)	(B)	100.7 (A)	2.7	0.8	0-5
1.18mm (16)	(B)	(A)			
600µm (30)	(B)	(A)			
300µm (50)	(B)	(A)			
150µm (100)	(B)	(A)			
75µm (200)	(B)	(A)			
Wash			0.8		
Pan	(B)	30.8 (A)			
Total		3757.0	99.9(100.0)		
Tolerance		99.9			

Wash Sample				
	Original Dry Mass:		2603.3	
	Dry Mass Washed:		2590.4	
	Washing Loss:		12.9	
Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 µm (200)			0.5	0-1.5
Wash	12.9	0.5		
Pan	1.1			

Date Reported:	Cert No.:
Tested By:	

Comments: ______________________________

Form 820180ex 11-01

Lab. No.:	4		
Material:	Coarse Aggregate - PCC	Grad. No.:	4
Co. & Proj.#:			
Producer:			
Contractor:			
Sampled By:		Date:	
Sample Loc.:			

Original Dry Mass:	5348.7	Total Minus 4.75 mm (W1):	
Dry Mass Washed:		Reduced Minus 4.75mm(W2)	
Washing Loss:		Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")		169.0			
19mm (¾)		516.7			
12.5mm (½")		1817.0			
9.5mm (⅜")		1798.3			
4.75mm (4)		713.9			
2.36mm (8)	(B)	307.1 (A)			
1.18mm (16)	(B)	(A)			
600µm (30)	(B)	(A)			
300µm (50)	(B)	(A)			
150µm (100)	(B)	(A)			
75µm (200)	(B)	(A)			
Wash					
Pan	(B)	24.6 (A)			
Total					
Tolerance					

Wash Sample		
	Original Dry Mass:	2582.8
	Dry Mass Washed:	2561.9
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 µm (200)				
Wash				
Pan	0.9			

Date Reported:		Cert No.:
Tested By:		

Comments: ______________________________

Form 820180ex 11-01

Lab. No.:	4		
Material:	Coarse Aggregate - PCC	Grad. No.: 4	
Co. & Proj.#:			
Producer:			
Contractor:			
Sampled By:		Date:	
Sample Loc.:			

Original Dry Mass:	5348.7	Total Minus 4.75 mm (W1):	
Dry Mass Washed:		Reduced Minus 4.75mm(W2)	
Washing Loss:		Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")				100.0	100
25mm (1")		169.0	3.2	96.8	
19mm (¾)		516.7	9.7	87.1	
12.5mm (½")		1817.0	34.0	53.1	
9.5mm (⅜")		1798.3	33.6	19.5	
4.75mm (4)		713.9	13.3	6.2	0-10
2.36mm (8)	(B)	307.1 (A)	5.7	0.5	0-5
1.18mm (16)	(B)	(A)			
600µm (30)	(B)	(A)			
300µm (50)	(B)	(A)			
150µm (100)	(B)	(A)			
75µm (200)	(B)	(A)			
Wash			0.5		
Pan	(B)	24.6 (A)			
Total		5346.6	100.0		
Tolerance		99.96			

Wash Sample		
	Original Dry Mass:	2582.8
	Dry Mass Washed:	2561.9
	Washing Loss:	20.9

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 µm (200)			0.8	0-1.5
Wash	20.9	0.8		
Pan	0.9			

Date Reported:		Cert No.:
Tested By:		

Comments: ______________________________

Form 820180ex 11-01

Lab. No.:	5		
Material:	1" Combined Aggregate	Grad. No.:	
Co. & Proj.#:	(Using Box and 203mm sieves)		
Producer:			
Contractor:			
Sampled By:		Date:	
Sample Loc.:			

Original Dry Mass:	3581.0	Total Minus 4.75 mm (W1):	2262.9
Dry Mass Washed:	3393.7	Reduced Minus 4.75mm(W2)	563.1
Washing Loss:		Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")		76.5			
19mm (¾)		178.4			
12.5mm (½")		202.0			
9.5mm (⅜")		296.1			
4.75mm (4)		377.8			
2.36mm (8)	103.1 (B)	(A)			
1.18mm (16)	167.6 (B)	(A)			
600μm (30)	186.3 (B)	(A)			
300μm (50)	62.1 (B)	(A)			
150μm (100)	20.3 (B)	(A)			
75μm (200)	14.8 (B)	(A)			
Wash					
Pan	6.9 (B)	(A)			
Total					
Tolerance					

Wash Sample		
	Original Dry Mass:	
	Dry Mass Washed:	
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 μm (200)				
Wash				
Pan				

Date Reported:	Cert No.:	
Tested By:		

Comments: ______________________________

Form 820180ex 11-01

Lab. No.:	5	
Material:	1" Combined Aggregate	Grad. No.:
Co. & Proj.#:	(Using Box and 203mm sieves)	
Producer:		
Contractor:		
Sampled By:	Date:	
Sample Loc.:		

Original Dry Mass:	3581.0	Total Minus 4.75 mm (W1):	2262.9
Dry Mass Washed:	3393.7	Reduced Minus 4.75mm(W2)	563.1
Washing Loss:	187.3	Conversion Factor: W1/W2	4.0186
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")				100.0	
25mm (1")		76.5	2.1	97.9	
19mm (¾)		178.4	5.0	92.9	
12.5mm (½")		202.0	5.6	87.3	
9.5mm (⅜")		296.1	8.3	79.0	
4.75mm (4)		377.8	10.6	68.4	
2.36mm (8)	103.1 (B)	414.3 (A)	11.6	56.8	
1.18mm (16)	167.6 (B)	673.5 (A)	18.8	38.0	
600μm (30)	186.3 (B)	748.7 (A)	20.9(21.0)	17.0	
300μm (50)	62.1 (B)	249.6 (A)	7.0	10.0	
150μm (100)	20.3 (B)	81.6 (A)	2.3	7.7	
75μm (200)	14.8 (B)	59.5 (A)	1.7	6.0	
Wash		187.3	6.0		
Pan	6.9 (B)	27.7 (A)			
Total	561.1	3573.0	99.9(100.0)		
Tolerance	99.6	99.8			

Wash Sample		
	Original Dry Mass:	
	Dry Mass Washed:	
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 μm (200)				
Wash				
Pan				

Date Reported:	Cert No.:
Tested By:	

Comments: ____________________

Form 820180ex 11-01

Lab. No.:	6		
Material:	3/4" Combined Aggregate	Grad. No.:	
Co. & Proj.#:	(Using Box and 203mm sieves)		
Producer:			
Contractor:			
Sampled By:		Date:	
Sample Loc.:			

Original Dry Mass:	2296.0	Total Minus 4.75 mm (W1):	1023.9
Dry Mass Washed:	2201.9	Reduced Minus 4.75mm(W2)	512.0
Washing Loss:		Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")					
19mm (¾)		15.0			
12.5mm (½")		196.0			
9.5mm (⅜")		477.3			
4.75mm (4)		489.7			
2.36mm (8)	163.2 (B)	(A)			
1.18mm (16)	101.0 (B)	(A)			
600µm (30)	97.6 (B)	(A)			
300µm (50)	80.0 (B)	(A)			
150µm (100)	41.3 (B)	(A)			
75µm (200)	26.0 (B)	(A)			
Wash					
Pan	2.4 (B)	(A)			
Total					
Tolerance					

Wash Sample		
	Original Dry Mass:	
	Dry Mass Washed:	
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 µm (200)				
Wash				
Pan				

Date Reported:		Cert No.:
Tested By:		

Comments: ______________________________

Form 820180ex 11-01

Lab. No.:	6		
Material:	3/4" Combined Aggregate	Grad. No.:	
Co. & Proj.#:	(Using Box and 203mm sieves)		
Producer:			
Contractor:			
Sampled By:		Date:	
Sample Loc.:			

Original Dry Mass:	2296.0	Total Minus 4.75 mm (W1):	1023.9
Dry Mass Washed:	2201.9	Reduced Minus 4.75mm(W2)	512.0
Washing Loss:	94.1	Conversion Factor: W1/W2	1.9998
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")				100.0	
19mm (¾)		15.0	0.7	99.3	
12.5mm (½")		196.0	8.5	90.8	
9.5mm (⅜")		477.3	20.8	70.0	
4.75mm (4)		489.7	21.3	48.7	
2.36mm (8)	163.2 (B)	326.4 (A)	14.2	34.5	
1.18mm (16)	101.0 (B)	202.0 (A)	8.8	25.7	
600μm (30)	97.6 (B)	195.2 (A)	8.5	17.2	
300μm (50)	80.0 (B)	160.0 (A)	7.0	10.2	
150μm (100)	41.3 (B)	82.6 (A)	3.6	6.6	
75μm (200)	26.0 (B)	52.0 (A)	2.3	4.3	
Wash		94.1	4.3		
Pan	2.4 (B)	4.8 (A)			
Total	511.5	2295.1	100.0		
Tolerance	99.9	100.0			

Wash Sample	Original Dry Mass:			
	Dry Mass Washed:			
	Washing Loss:			
Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 μm (200)				
Wash				
Pan				

Date Reported:	Cert No.:	
Tested By:		

Comments: ______________________________

Form 820180ex 11-01

Lab. No.:	7	
Material:	¾" Combined Aggregate	Grad. No.:
Co. & Proj.#:	(Using 305mm sieves)	
Producer:		
Contractor:		
Sampled By:	Date:	
Sample Loc.:		

Original Dry Mass:	2247.5	Total Minus 4.75 mm (W1):	
Dry Mass Washed:	2091.9	Reduced Minus 4.75mm(W2)	
Washing Loss:		Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")					
19mm (¾)		27.0			
12.5mm (½")		243.3			
9.5mm (⅜")		301.1			
4.75mm (4)		511.8			
2.36mm (8)	(B)	432.0 (A)			
1.18mm (16)	(B)	211.6 (A)			
600μm (30)	(B)	116.9 (A)			
300μm (50)	(B)	100.4 (A)			
150μm (100)	(B)	83.0 (A)			
75μm (200)	(B)	54.0 (A)			
Wash					
Pan	(B)	8.3 (A)			
Total					
Tolerance					

Wash Sample		
	Original Dry Mass:	
	Dry Mass Washed:	
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 μm (200)				
Wash				
Pan				

Date Reported:	Cert No.:	
Tested By:		

Comments: ______________________________

Form 820180ex 11-01

Lab. No.:	7	
Material:	¾" Combined Aggregate	Grad. No.:
Co. & Proj.#:	(Using 305mm sieves)	
Producer:		
Contractor:		
Sampled By:	Date:	
Sample Loc.:		

Original Dry Mass:	2247.5	Total Minus 4.75 mm (W1):	
Dry Mass Washed:	2091.9	Reduced Minus 4.75mm(W2)	
Washing Loss:	155.6	Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")				100.0	
19mm (¾)		27.0	1.2	98.8	
12.5mm (½")		243.3	10.8	88.0	
9.5mm (⅜")		301.1	13.4	74.6	
4.75mm (4)		511.8	22.8(22.9)	51.7	
2.36mm (8)	(B)	432.0 (A)	19.2	32.5	
1.18mm (16)	(B)	211.6 (A)	9.4	23.1	
600µm (30)	(B)	116.9 (A)	5.2	17.9	
300µm (50)	(B)	100.4 (A)	4.5	13.4	
150µm (100)	(B)	83.0 (A)	3.7	9.7	
75µm (200)	(B)	54.0 (A)	2.4	7.3	
Wash		155.6	7.3		
Pan	(B)	8.3 (A)			
Total		2245.0	99.9(100.0)		
Tolerance		99.9			

Wash Sample				
	Original Dry Mass:			
	Dry Mass Washed:			
	Washing Loss:			
Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 µm (200)				
Wash				
Pan				

Date Reported:		Cert No.:
Tested By:		

Comments: ______________________

Form 820180ex 11-01

Lab. No.:	8	
Material:	½ " Combined Aggregate	Grad. No.:
Co. & Proj.#:	(Using 305mm sieves)	
Producer:		
Contractor:		
Sampled By:	Date:	
Sample Loc.:		

Original Dry Mass:	1631.0	Total Minus 4.75 mm (W1):	
Dry Mass Washed:	1526.5	Reduced Minus 4.75mm(W2)	
Washing Loss:		Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")					
19mm (¾)					
12.5mm (½")		13.1			
9.5mm (⅜")		295.4			
4.75mm (4)		383.7			
2.36mm (8)	(B)	396.0 (A)			
1.18mm (16)	(B)	167.7 (A)			
600µm (30)	(B)	86.6 (A)			
300µm (50)	(B)	77.0 (A)			
150µm (100)	(B)	62.3 (A)			
75µm (200)	(B)	39.1 (A)			
Wash					
Pan	(B)	6.6 (A)			
Total					
Tolerance					

Wash Sample		
	Original Dry Mass:	
	Dry Mass Washed:	
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 µm (200)				
Wash				
Pan				

Date Reported:	Cert No.:
Tested By:	

Comments: ______________________________

Form 820180ex 11-01

Lab. No.:	8		
Material:	½ " Combined Aggregate	Grad. No.:	
Co. & Proj.#:	(Using 305mm sieves)		
Producer:			
Contractor:			
Sampled By:		Date:	
Sample Loc.:			

Original Dry Mass:	1631.0	Total Minus 4.75 mm (W1):	
Dry Mass Washed:	1526.5	Reduced Minus 4.75mm(W2)	
Washing Loss:	104.5	Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")					
19mm (¾)				100.0	
12.5mm (½")		13.1	0.8	99.2	
9.5mm (⅜")		295.4	18.1	81.1	
4.75mm (4)		383.7	23.5	57.6	
2.36mm (8)	(B)	396.0 (A)	24.3	33.3	
1.18mm (16)	(B)	167.7 (A)	10.3	23.0	
600μm (30)	(B)	86.6 (A)	5.3	17.7	
300μm (50)	(B)	77.0 (A)	4.7	13.0	
150μm (100)	(B)	62.3 (A)	3.8	9.2	
75μm (200)	(B)	39.1 (A)	2.4	6.8	
Wash		104.5	6.8		
Pan	(B)	6.6 (A)			
Total		1632.0	100.0		
Tolerance		100.1			

Wash Sample		
	Original Dry Mass:	
	Dry Mass Washed:	
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 μm (200)				
Wash				
Pan				

Date Reported:		Cert No.:
Tested By:		

Comments: ______________________________

Fineness Modulus Calculation
(Fine Aggregate for PCC)
AASHTO T27-93

Determine the cumulative percents retained for each sieve, starting with the largest sieve retaining any material, through the #100 sieve. Add the cumulative percents retained and divide that sum by 100. results are reported to the nearest 0.01 (one-hundreth).

Practice Problem

Sieves	Percent Retained	Cumulative Percent Retained
⅜"	**0.0**	
#4	**3.2**	
#8	**18.5**	
#16	**20.0**	
#30	**21.8**	
#50	**25.2**	
#100	**9.5**	

Total Cumulative Percent =

Fineness Modulus =

Fineness Modulus Calculation
(Fine Aggregate for PCC)
AASHTO T27-93

Determine the cumulative percents retained for each sieve, starting with the largest sieve retaining any material, through the #100 sieve. Add the cumulative percents retained and divide that sum by 100. results are reported to the nearest 0.01 (one-hundreth).

Practice Problem - Answer

Sieves	Percent Retained	Cumulative Percent Retained
⅜"	0.0	0.0
#4	3.2	3.2
#8	18.5	21.7
#16	20.0	41.7
#30	21.8	63.5
#50	25.2	88.7
#100	9.5	98.2

Total Cumulative Percent = $\boxed{317.0}$

Fineness Modulus = 317.0 ÷ 100 = 3.17

Fineness Modulus Calculation
(Fine Aggregate for PCC)
AASHTO T27-93

Determine the cumulative percents retained for each sieve, starting with the largest sieve retaining any material, through the #100 sieve. Add the cumulative percents retained and divide that sum by 100. results are reported to the nearest 0.01 (one-hundreth).

Sieves	Percent Retained	Cumulative Percent Retained
⅜"		
#4		
#8		
#16		
#30		
#50		
#100		

Total Cumulative Percent =

Fineness Modulus =

Form 820180ex 11-01

Lab. No.:			
Material:		Grad. No.:	
Co. & Proj.#:			
Producer:			
Contractor:			
Sampled By:		Date:	
Sample Loc.:			

Original Dry Mass:		Total Minus 4.75 mm (W1):	
Dry Mass Washed:		Reduced Minus 4.75mm(W2)	
Washing Loss:		Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")					
19mm (¾)					
12.5mm (½")					
9.5mm (⅜")					
4.75mm (4)					
2.36mm (8)	(B)	(A)			
1.18mm (16)	(B)	(A)			
600μm (30)	(B)	(A)			
300μm (50)	(B)	(A)			
150μm (100)	(B)	(A)			
75μm (200)	(B)	(A)			
Wash					
Pan	(B)	(A)			
Total					
Tolerance					

Wash Sample		
	Original Dry Mass:	
	Dry Mass Washed:	
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 μm (200)				
Wash				
Pan				

Date Reported:		Cert No.:
Tested By:		

Comments: ______________________________

Form 820180ex 11-01

Lab. No.:			
Material:		Grad. No.:	
Co. & Proj.#:			
Producer:			
Contractor:			
Sampled By:		Date:	
Sample Loc.:			

Original Dry Mass:		Total Minus 4.75 mm (W1):	
Dry Mass Washed:		Reduced Minus 4.75mm(W2)	
Washing Loss:		Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")					
19mm (¾)					
12.5mm (½")					
9.5mm (⅜")					
4.75mm (4)					
2.36mm (8)	(B)	(A)			
1.18mm (16)	(B)	(A)			
600μm (30)	(B)	(A)			
300μm (50)	(B)	(A)			
150μm (100)	(B)	(A)			
75μm (200)	(B)	(A)			
Wash					
Pan	(B)	(A)			
Total					
Tolerance					

Wash Sample		
	Original Dry Mass:	
	Dry Mass Washed:	
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 μm (200)				
Wash				
Pan				

Date Reported:		Cert No.:	
Tested By:			

Comments: ______________________________

Form 820180ex 11-01

Lab. No.:		
Material:		Grad. No.:
Co. & Proj.#:		
Producer:		
Contractor:		
Sampled By:	Date:	
Sample Loc.:		

Original Dry Mass:		Total Minus 4.75 mm (W1):	
Dry Mass Washed:		Reduced Minus 4.75mm(W2)	
Washing Loss:		Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")					
19mm (¾)					
12.5mm (½")					
9.5mm (⅜")					
4.75mm (4)					
2.36mm (8)	(B)	(A)			
1.18mm (16)	(B)	(A)			
600μm (30)	(B)	(A)			
300μm (50)	(B)	(A)			
150μm (100)	(B)	(A)			
75μm (200)	(B)	(A)			
Wash					
Pan	(B)	(A)			
Total					
Tolerance					

Wash Sample		
	Original Dry Mass:	
	Dry Mass Washed:	
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 μm (200)				
Wash				
Pan				

Date Reported:	Cert No.:	
Tested By:		

Comments: ______________________________

Form 820180ex 11-01

Lab. No.:			
Material:		Grad. No.:	
Co. & Proj.#:			
Producer:			
Contractor:			
Sampled By:		Date:	
Sample Loc.:			

Original Dry Mass:		Total Minus 4.75 mm (W1):	
Dry Mass Washed:		Reduced Minus 4.75mm(W2)	
Washing Loss:		Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")					
19mm (¾)					
12.5mm (½")					
9.5mm (⅜")					
4.75mm (4)					
2.36mm (8)	(B)	(A)			
1.18mm (16)	(B)	(A)			
600μm (30)	(B)	(A)			
300μm (50)	(B)	(A)			
150μm (100)	(B)	(A)			
75μm (200)	(B)	(A)			
Wash					
Pan	(B)	(A)			
Total					
Tolerance					

Wash Sample		
	Original Dry Mass:	
	Dry Mass Washed:	
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 μm (200)				
Wash				
Pan				

Date Reported:		Cert No.:	
Tested By:			

Comments: ______________________________

Form 820180ex 11-01

Lab. No.:			
Material:		Grad. No.:	
Co. & Proj.#:			
Producer:			
Contractor:			
Sampled By:		Date:	
Sample Loc.:			

Original Dry Mass:		Total Minus 4.75 mm (W1):	
Dry Mass Washed:		Reduced Minus 4.75mm(W2)	
Washing Loss:		Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")					
19mm (¾)					
12.5mm (½")					
9.5mm (⅜")					
4.75mm (4)					
2.36mm (8)	(B)	(A)			
1.18mm (16)	(B)	(A)			
600μm (30)	(B)	(A)			
300μm (50)	(B)	(A)			
150μm (100)	(B)	(A)			
75μm (200)	(B)	(A)			
Wash					
Pan	(B)	(A)			
Total					
Tolerance					

Wash Sample		
	Original Dry Mass:	
	Dry Mass Washed:	
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 μm (200)				
Wash				
Pan				

Date Reported:		Cert No.:
Tested By:		

Comments: ______________________________

Lab. No.:		
Material:		Grad. No.:
Co. & Proj.#:		
Producer:		
Contractor:		
Sampled By:	Date:	
Sample Loc.:		

Original Dry Mass:		Total Minus 4.75 mm (W1):	
Dry Mass Washed:		Reduced Minus 4.75mm(W2)	
Washing Loss:		Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")					
19mm (¾)					
12.5mm (½")					
9.5mm (⅜")					
4.75mm (4)					
2.36mm (8)	(B)	(A)			
1.18mm (16)	(B)	(A)			
600µm (30)	(B)	(A)			
300µm (50)	(B)	(A)			
150µm (100)	(B)	(A)			
75µm (200)	(B)	(A)			
Wash					
Pan	(B)	(A)			
Total					
Tolerance					

Wash Sample	Original Dry Mass:	
	Dry Mass Washed:	
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 µm (200)				
Wash				
Pan				

Date Reported:	Cert No.:	
Tested By:		

Comments: ______________________________

Iowa Department of Transportation
Technical Training and Certification Program

COURSE EVALUATION SHEET

In an effort to improve the Iowa DOT Technical Training and Certification Program, we ask that you fill out this evaluation form after you have taken the exam. Thank you for your cooperation.

Course: ______________________ Location: ______________________

Instructor: ____________________

1. What type of agency are you employed by?

 ____

2. Please rate the following portion of the course on a scale of 1-5. 1 = Poor, 5 = Excellent

 Facility: ________________

 Material: ________________

 Instructors: ______________

 Course Activities: _________
 (lectures, videos, demonstrations, etc.)

3. Are there any changes you would like to see made in the course?

 ____

 ____

REMARKS:

Sampling and Testing Guide-Minimum Frequency

Matls. IM 204
Appendix E (Metric) Units

PORTLAND CEMENT CONCRETE PAVEMENT, PAVEMENT WIDENING, BASE WIDENING CURB & GUTTER, AND PAVED SHOULDERS

Section 2122, 2201, 2213, 2301, and 2302

October 21, 2003
Supersedes April 15, 2003

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➛
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
PLANT INSPECTION														
Aggregates-Coarse (4115)	Grad *	302, 306 336	CONTR	3/lot	IM 301	CONTR	Refer to IM 527 for report form	ASSUR CORR V	DME CONTR DME	1/100,000 m^2 1st day + 10% 1/QM-C project	IM 301 IM 301 IM 301	DME RCE CTRL		See Notes
	Moist	308	CONTR	1/half day	1000 gm	CONTR								
	Sp. Gr.	307	CONTR	IM 527	1000 gm	CONTR								
	Quality	AS 209						V	DME	1/100,000 m^2	22 kg	CTRL		
Portland Cement (4101)	Quality	AS Cert D		Each Load				V	DME	1/100,000 m^2	7 kg	CTRL		
	Cement Yield		CONTR	1/7500 m^3		CONTR								
Fly Ash	Quality	AS Cert D		Each Load				V	DME	1/100,000 m^2	7 kg	CTRL		
GGBFS(Ground Granulated Blast Furnace Slag)	Quality	AS Cert		Each Load				V	DME	1/100,000 m^2	7 kg	CTRL		
Air Admixture	Quality	A 403	DME	1/lot	0.5 L	CTRL								
Water Reducer	Quality	AB 403	DME	1/lot	0.5 L	CTRL								
Retarding Admixture	Quality	AB 403	DME	1/lot	0.5 L	CTRL								

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

*A - System approach may be applied at the discretion of the DME.

Note 1: When Certified Plant Inspection is not provided, the Engineer is responsible for performing sampling and testing.

Note 2: When the project engineer does the acceptance gradation testing, the assurance sample is to be split with the project engineer. This split sample is for correlation purposes, and if it is not a routine lot sample, should not be used for determining specification compliance of a lot. However, any non-compliant test result is to be resolved.

Note 3: If a third aggregate is used on a QM-C project, individual verification samples of the third aggregate must be obtained by the DME at a rate of 1/QM-C project for gradation and quality testing by CTRL. Verification/Assurance samples not required when mix quantity is less than 2000 m^2.

➛ = See Remarks Column.

PORTLAND CEMENT CONCRETE PAVEMENT, PAVEMENT WIDENING, BASE WIDENING CURB & GUTTER, AND PAVED SHOULDERS
Section 2122, 2201, 2213, 2301, and 2302

October 21, 2003
Supersedes April 15, 2003

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➸
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
GRADE INSPECTION														
Chloride Solution	Concentration	373	RCE	1/day			Refer to IM 527 for report form							
Wire Mesh		AS Cert A						V	DME	1/Project/Yr	0.5 m x 0.5 m	CTRL		
Steel Reinforcement: Dowels	Quality	AS 451.03B						V ➸	DME	1/District/Yr	0.5 m	CTRL		Steel sampling
Dowel Basket Assembly	Quality	AS 451 Cert D 451.03B												
Tie Bars	Quality	AS 451						V ➸	DME	1/District/Yr	0.5 m	CTRL		Frequency
General Use	Quality	AS 451						V ➸	DME	1/District/Yr	1 m	CTRL		Minimum of one per District per year
Continuous Reinforcement	Quality	AS 451						V ➸	DME	1/District/Yr	2 - 0.5 m pcs.	CTRL		
Plastic Concrete	Air	318 327	RCE	➸ 1/750 m^3		RCE		ASSUR	DME	1/100,000 m^2		DME		1/75 m^3 for transit mixer minim 1 per day
	Grade Yield		RCE	1/750 m^3		RCE								
	Beams**	316, 327, 328	RCE	2/day		RCE								
Hardened Concrete	Thickness*➸	346, 347	CONTR	1/2000 m^2	IM 346	RCE		ASSUR	CONTR		10%	DME		Monitor Sampling
	Smoothness	341 Cert. Test Report	CONTR		100%	CONTR		CORR	DME		10%	DME		

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

*Thickness cores sent to Central Lab for additional project information testing. (Interstate and Primary only.) **None required when maturity is used
Verification/Assurance samples not required when mix quantity is less than 2000 m^2.

➸ = See Remarks Column.

Sampling and Testing Guide-Minimum Frequency

Matls. IM 204
Appendix F (U.S.) Units

HOT MIX ASPHALT (QMA)
Section 2303, 2213, and 2114

October 29, 2002
Supersedes April 30, 2002

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➼
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ. Note 1	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Aggregates-Coarse (4127)		AS 209												
Aggregates-Fine (4127)		AS 209												
Hydrated Lime (4126/4127)		AS 491.04												
Asphalt Binder		AS 437												
Emulsions & Cutbacks		AS 437												
Release Agent		AB 491.15												
PLANT INSPECTION														
Aggregates (2303)	Quality							V	DME	1/20,000 Ton	50 lb.	CTRL		
Combined Aggregate (4126, 4127)	Gradation		CONTR	3/lot	IM 301	CONTR		CORR. ASSUR	CONTR DME	1st day+10% 1/20,000 T	IM 301	DME/RCE DME	IM 216 IM 216	
	Moisture ➼		CONTR	1 / half day	1000 gm	CONTR								Dryer Drum Plants Only

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Note: Sample Frequencies based on Tons of Mix

Matls. IM 204
Appendix F (U.S.) Units

HOT MIX ASPHALT (QMA)
Section 2303, 2213, and 2114

October 29, 2002
Supersedes April 30, 2002

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➠
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ. Notes	SAMPLE SIZE	TEST BY	REPORT	
PLANT INSPECTION														
Mineral Filler			DME	1/proj.	50 gm	DME	821278							
Asphalt Binder	DSR Quality	AS Cert D	CONTR	1/80 T	3 oz. Tin	DME➠		V	DME	1/20,000 T of Mix	1 qt	CTRL		log all shipments Test 1st 3days then 1/week
Cutback	Quality Viscosity	AS 329	RCE	1/proj	1 qt	DME								log all shipments
Emulsion	Residue	AS 360	RCE	1/proj	1 qt	DME								Plastic bottle required
GRADE INSPECTION														
Uncompacted Mixture:	Lab Density	321, 325 325G	CONTR	As per 2303	60 lb	CONTR		CORR	CONTR	1/day ➠	50 lb	DME		May be adjusted by DME as per 2303
	Lab Voids	350, 501	CONTR	As per 2303	60 lb	CONTR		CORR V	CONTR DME	1/day ➠ 1/20,000 T of Mix	50 lb 40 lb	DME CTRL		May be adjusted by DME as per 2303
Compacted Mixture	Density Thickness Voids	320, 321 337 321	CONTR➠ CONTR➠ CONTR➠	lot lot lot	7/lot 7/lot 7/lot	CONTR CONTR CONTR		CORR CORR CORR	CONTR CONTR	1st day+10% 1st day+10% 1st day+10%		DME DME DME		Witness by RCE Witness by RCE Witness by RCE
	Smoothness	341	CONTR	100%	100%	CONTR		CORR	DME	10%		DME		

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Note: Verif/Assur/Corr not required under 2000 Tons of Mix.
Note: Sample Frequency based on Tons of Mix.

Sampling and Testing Guide-Minimum Frequency

Matls. IM 204
Appendix F (Metric) Units

HOT MIX ASPHALT (QMA)
Section 2303, 2213, and 2114

October 29, 2002
Supersedes April 30, 2002

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➸
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ. Note 1	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Aggregates-Coarse (4127)		AS 209												
Aggregates-Fine (4127)		AS 209												
Hydrated Lime (4126/4127)		AS 491.04												
Asphalt Binder		AS 437												
Emulsions & Cutbacks		AS 437												
Release Agent		AB 491.15												
PLANT INSPECTION														
Aggregates (2303)	Quality							V	DME	1/20,000 Mg	22 kg	CTRL		
Combined Aggregate (4126, 4127)	Gradation		CONTR	3/lot	IM 301	CONTR		CORR. ASSUR	CONTR DME	1st day+10% 1/20,000 Mg	IM 301	DME/RCE DME	IM 216 IM 216	
	Moisture ➸		CONTR	1/halfday	1000 gm	CONTR								Dryer Drum Plants Only

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Note: Sample Frequencies based on Mg of Mix

Matls. IM 204
Appendix F (Metric) Units

HOT MIX ASPHALT (QMA)
Section 2303, 2213, and 2114

October 29, 2002
Supersedes April 30, 2002

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS →
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ. Notes	SAMPLE SIZE	TEST BY	REPORT	
PLANT INSPECTION														
Mineral Filler			DME	1/proj.	50 gm	DME	821278							
Asphalt Binder	DSR Quality	AS Cert D	CONTR	1/80 Mg	85 gm Tin	DME→		V	DME	1/20,000 Mg of Mix	1 L	CTRL		log all shipments Test 1st 3days then 1/week
Cutback	Quality Viscosity	AS 329	RCE	1/proj	1 L	DME								log all shipments
Emulsion	Residue	AS 360	RCE	1/proj	1 L	DME								Plastic bottle required
GRADE INSPECTION														
Uncompacted Mixture:	Lab Density	321, 325 325G	CONTR	As per 2303	30 kg	CONTR		CORR	CONTR	1/day →	22 kg	DME		May be adjusted by DME as per 2303
	Lab Voids	350, 501	CONTR	As per 2303	30 kg	CONTR		CORR V	CONTR DME	1/day → 1/20,000 Mg of Mix	22 kg 18 kg	DME CTRL		May be adjusted by DME as per 2303
Compacted Mixture	Density Thickness Voids	320, 321 337 321	CONTR→ CONTR→ CONTR→	lot lot lot	7/lot 7/lot 7/lot	CONTR CONTR CONTR		CORR CORR CORR	CONTR CONTR	1st day+10% 1st day+10% 1st day+10%		DME DME DME		Witness by RCE Witness by RCE Witness by RCE
	Smoothness	341	CONTR	100%	100%	CONTR		CORR	DME	10%		DME		

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Note: Verif/Assur/Corr not required under 2000 Mg of Mix.
Note: Sample Frequency based on Mg of Mix.

Sampling and Testing Guide-Minimum Frequency

Matls. IM 204
Appendix G (U.S.) Units

HOT MIX ASPHALT (Non-QMA)
Section 2303, 2213, and 2114

October 29, 2002
Supersedes April 30, 2002

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➸
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ. Note 1	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Aggregates-Coarse (4127)		AS 209												
Aggregates-Fine (4127)		AS 209												
Hydrated Lime (4126/4127)		AS 491.04												
Asphalt Binder		AS 437												
Emulsions & Cutbacks		AS 437												
Release Agent		AB 491.15.												
PLANT INSPECTION *														
Aggregates (2303)	Quality							V	DME	1/20,000 Ton of Mix	50 lb.	CTRL		
Combined Aggregate (4126, 4127)	Gradation		RCE	3/lot	IM 301	RCE		ASSUR	DME	1/20,000 Ton of Mix	IM 301	DME	IM 216	
	Moisture ➸		RCE	1/ half day	1000 gm	RCE								Dryer Drum Plants Only

AS-Approved Source	Cert A-Type A Certification	RCE-Resident Construction Engineer/Project Engineer	ASSUR-Independent Assurance
AB-Approved Brand	Cert B-Type B Certification	DME-District Materials Engineer	VERIF-Verification
ASD-Approved Shop Drawing	Cert C-Type C Certification	CTRL-Central Materials Office	CORR-Correlation
S&T-Sampling & Testing	Cert D-Type D Certification	CONTR-Contractor	MON-Monitor

*For certified Plant Insp. on non-QMA projects. See QMA table for S & T guide.

Note 1: Sample frequency based on Tons of Mix.

Matls. IM 204
Appendix G (U.S.) Units

HOT MIX ASPHALT (Non-QMA)
Section 2303, 2213, and 2114

October 29, 2002
Supersedes April 30, 2002

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➼
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
PLANT INSPECTION														
Mineral Filler			DME	1/proj.	50 gm	DME	821278							
Asphalt Binder	DSR Quality	AS Cert D	RCE	1/80 T	3 oz. Tin	DME➼		V	DME	1/20,000 Tons of Mix	1 qt	CTRL		log all shipments Test 1st 3days/ then 1/week
Cutback	Quality Viscosity	AS 329	RCE➼	1/proj	1 qt	DME								log all shipments
Emulsion	Residue	AS 360	RCE	1/proj	1 qt ➼	DME								Plastic bottle required
GRADE INSPECTION														
Uncompacted Mixture	Lab Density	321, 325 325G	RCE	3/Lot ➼	60 lb	DME								Tests 1/Lot
	Lab Voids	350, 501	RCE	As per 2303	60 lb	DME		V	DME	1/20,000 Ton of Mix	40 lb	CTRL		
Compacted Mixture	Density Thickness Voids	320, 321 337 321	CONTR* CONTR* CONTR*	Lot Lot Lot	7/Lot 7/Lot 7/Lot	RCE RCE RCE		ASSUR ASSUR	CONTR CONTR	1st day+10% 1st day+10%		DME		
	Smoothness	341	CONTR	100%	100%	CONTR		CORR	DME	10%		DME		

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert B-Type B Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

*Witness by RCE

Note: Verif/Assur/Corr not required under 2000 Tons of Mix.

Sampling and Testing Guide-Minimum Frequency

Matls. IM 204
Appendix G (Metric) Units

HOT MIX ASPHALT (Non-QMA)
Section 2303, 2213, and 2114

October 29, 2002
Supersedes April 30, 2002

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➼
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ. Note 1	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Aggregates-Coarse (4127)		AS 209												
Aggregates-Fine (4127)		AS 209												
Hydrated Lime (4126/4127)		AS 491.04												
Asphalt Binder		AS 437												
Emulsions & Cutbacks		AS 437												
Release Agent		AB 491.15												
PLANT INSPECTION *														
Aggregates (2303)	Quality							V	DME	1/20,000 Mg of Mix	22 kg	CTRL		
Combined Aggregate (4126, 4127)	Gradation		RCE	3/lot	IM 301	RCE		ASSUR	DME	1/20,000 Mg of Mix	IM 301	DME	IM 216	
	Moisture ➼		RCE	1/half day	1000 gm	RCE								Dryer Drum Plants Only

AS-Approved Source	Cert A-Type A Certification	RCE-Resident Construction Engineer/Project Engineer	ASSUR-Independent Assurance
AB-Approved Brand	Cert B-Type B Certification	DME-District Materials Engineer	VERIF-Verification
ASD-Approved Shop Drawing	Cert C-Type C Certification	CTRL-Central Materials Office	CORR-Correlation
S&T-Sampling & Testing	Cert D-Type D Certification	CONTR-Contractor	MON-Monitor

*For Certified Plant Insp. on Non-QMA projects. See QMA table for S & T guide.

Note 1: Sample frequency based on Mg of Mix.

Sampling and Testing Guide-Minimum Frequency

Matls. IM 204
Appendix G (Metric) Units

HOT MIX ASPHALT (Non-QMA)
Section 2303, 2213, and 2114

October 29, 2002
Supersedes April 30, 2002

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➔
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
PLANT INSPECTION														
Mineral Filler			DME	1/proj.	50 gm	DME	821278							
Asphalt Binder	DSR Quality	AS Cert D	RCE	1/80 Mg	85 gm Tin	DME➔		V	DME	1/20,000 Mg of Mix	1 L	CTRL		Log all shipments Test 1st 3days then 1/week
Cutback	Quality Viscosity	AS 329	RCE➔	1/proj	1 L	DME								Log all shipments
Emulsion	Residue	AS 360	RCE	1/proj	1 L ➔	DME								Plastic bottle required
GRADE INSPECTION														
Uncompacted Mixture	Lab Density	321, 325 325G	RCE	3/Lot ➔	30 kg	DME								Tests 1/Lot
	Lab Voids	350, 501	RCE	As per 2303	30 kg	DME		V	DME	1/20,000 Mg of Mix	18 kg	CTRL		
Compacted Mixture	Density Thickness Voids	320, 321 337 321	CONTR* CONTR* CONTR*	Lot Lot Lot	7/Lot 7/Lot 7/Lot	RCE RCE RCE		ASSUR ASSUR	CONTR CONTR	1st day+10% 1st day+10%		 DME		
	Smoothness	341	CONTR	100%	100%	CONTR		CORR	DME	10%		DME		

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert B-Type B Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

*Witness by RCE

Note: Verif/Assur/Corr not required under 2000 Mg of Mix.

STRUCTURAL CONCRETE, REINFORCEMENT, FOUNDATIONS & SUBSTRUCTURES, CONCRETE STRUCTURES, CONCRETE FLOORS, AND CONCRETE BOX, ARCH AND CIRCULAR CULVERTS

Sections 2403, 2404, 2405, 2406, 2412, & 2415

October 19, 2004
Supercedes October 21, 2003

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➡
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Aggregate-Fine (4110)		AS 209												
Aggregate-Coarse (4115)		AS 209												
Granular Backfill (4133)		AS 209												
Portland Cement (4101)	Quality	AS 401												
Fly Ash (4108)	Quality	AS 491.17												
Mixing Water (4102)	Quality		RCE	➡ 1/project	1 L	CTRL	731							Not required for potable water from Municipal Supply
GGBFS (Ground Granulated Blast Furnace Slag)	Quality	AS 491.14												
Air Entraining Admixture	Quality	AB 403												
Retarding Admixture	Quality	AB 403												
Water reducing Admixture	Quality	AB 403												
Curing Compound (4105)	Lab Tested	AB 405 ➡	DME	1/lot	1 L	CTRL								Bridge Barrier Rails AASHTO, M148, Cert. by Manufacturer

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Verification/Assurance samples not required when mix quantity is less than 50 cu. yd.

__NOTE__: When the Project Engineer does the acceptance gradation testing, the assurance sample is to be split with the Project Engineer. This split sample is for correlation purposes and, if it is not a routine lot sample, should not be used for determining specification compliance of a lot. However, any non-compliant test result is to be resolved.

STRUCTURAL CONCRETE, REINFORCEMENT, FOUNDATIONS & SUBSTRUCTURES, CONCRETE STRUCTURES, CONCRETE FLOORS, AND CONCRETE BOX, ARCH AND CIRCULAR CULVERTS

Sections 2403, 2404, 2405, 2406, 2412, & 2415

October 19, 2004
Supercedes October 21, 2003

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➠
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Pre-formed Joint Sealer (4136)	Lab-Tested	AB 436.02 436.05												
Reinforcing Steel Bars (4151)	Quality	AS 451												
Steel Pile (4167)	Quality	467												
Concrete Pile (4166)	Quality	AS 570												
Timber Pile (4165)	Quality	➠ 462		Each Shipment										Report or Cert. by Independent Insp. Agency
Timber & (4162) Lumber (4163)		➠ 462		Each Shipment										Report or Cert. by Independent Insp. Agency
Concrete Anchors	Quality	AB 453.09												
Epoxy Grout	Quality	AB 491.11												
Concrete Sealer	Quality	AB 491.12												
Subdrain Pipe (4143)	Quality	AS 443, 448												
Neoprene Bearing Pads (4195)		AS 495.03												
Bronze Bearing Plates (4190.03)		AS D/Cert A												

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Verification/Assurance samples not required when mix quantity is less than 50 cu. yd.

NOTE: When the Project Engineer does the acceptance gradation testing, the assurance sample is to be split with the Project Engineer. This split sample is for correlation purposes and, if it is not a routine lot sample, should not be used for determining specification compliance of a lot. However, any non-compliant test result is to be resolved.

Sampling and Testing Guide-Minimum Frequency

STRUCTURAL CONCRETE, REINFORCEMENT, FOUNDATIONS & SUBSTRUCTURES, CONCRETE STRUCTURES, CONCRETE FLOORS, AND CONCRETE BOX, ARCH AND CIRCULAR CULVERTS

Sections 2403, 2404, 2405, 2406, 2412, & 2415

Matls. IM 204
Appendix H (US) Units

October 19, 2004
Supercedes October 21, 2003

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➠
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPL SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Steel Masonry Plate (4152)		AS Drawing/Cert A												
Precast Units (2407)	Quality	AS 570												
Anchor Bolts (lighting, signing, handrail) (4153)	Lab Tested	ASD												
Structural Steel (4152)	Quality	➠ Cert A												Monitor Sample According to plans or other instructions
Aluminum Bridge Rail & Anchor Assembly		ASD												
Conduit (Electrical) (4185.10)) Steel		AB												
Conduit (Plastic) (4185.10)	Lab Tested		DME	1/size	4'	CTRL								
Bentonite		AS Cert D												
Flowable Mortar	Lab Tested ➠	Approved Trial Mix 525, 375												Tested by DME

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Verification/Assurance samples not required when mix quantity is less than 50 cu. yd.

NOTE: When the Project Engineer does the acceptance gradation testing, the assurance sample is to be split with the Project Engineer. This split sample is for correlation purposes and, if it is not a routine lot sample, should not be used for determining specification compliance of a lot. However, any non-compliant test result is to be resolved.

STRUCTURAL CONCRETE, REINFORCEMENT, FOUNDATIONS & SUBSTRUCTURES, CONCRETE STRUCTURES, CONCRETE FLOORS, AND CONCRETE BOX, ARCH AND CIRCULAR CULVERTS

Sections 2403, 2404, 2405, 2406, 2412, & 2415

October 19, 2004
Supercedes October 21, 2003

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➼
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPL E SIZE	TEST BY	REPORT	
PLANT INSPECTION														
Aggregate- Fine (4110)	Gradation	302, 306 336	CONTR	3/lot	IM 301	CONTR	830211	ASSUR CORR	DME CONTR	1/1000 cy➼ 1st day +10%	IM 301 IM 301	DME RCE		System Approach Applicable
	Moisture	➼ 308, 528	CONTR	1/lot	1000 gm	CONTR	830211							See IM 528 if Moisture Probe is used
	Sp. Gr.	307	CONTR	IM 528	1000 gm	CONTR	830211							
	Quality	AS 209												
Aggregate- Coarse (4115)	Gradation	302, 306 336	CONTR	3/lot	IM 301	CONTR	830211	ASSUR CORR	DME CONTR	➼ 1/1000 CY 1st day+10%	IM 301 IM 301	DME RCE		System Approach Applicable
	Moisture	308, 528	CONTR	1/lot	2000gm	CONTR	830211							
	Sp. Gr.	307	CONTR	IM 528	2000gm	CONTR	830211							
	Quality	AS 209						V	DME	1/1000 cy	50 lb	CTRL		
Portland Cement	w/c ratio	528	CONTR	1/pour		CONTR	830211							
	Quality	AS Cert D					830211	V	DME	1/1000 cy	15 lb	CTRL		

AS-Approved Source	Cert A-Type A Certification	RCE-Resident Construction Engineer/Project Engineer	ASSUR-Independent Assurance
AB-Approved Brand	Cert C-Type C Certification	DME-District Materials Engineer	VERIF-Verification
ASD-Approved Shop Drawing	Cert D-Type D Certification	CTRL-Central Materials Office	CORR-Correlation
S&T-Sampling & Testing		CONTR-Contractor	MON-Monitor

Verification/Assurance samples not required when mix quantity is less than 50 cu. yd.

__NOTE__: When the Project Engineer does the acceptance gradation testing, the assurance sample is to be split with the Project Engineer. This split sample is for correlation purposes and, if it is not a routine lot sample, should not be used for determining specification compliance of a lot. However, any non-compliant test result is to be resolved.

Sampling and Testing Guide-Minimum Frequency

STRUCTURAL CONCRETE, REINFORCEMENT, FOUNDATIONS & SUBSTRUCTURES, CONCRETE STRUCTURES, CONCRETE FLOORS, AND CONCRETE BOX, ARCH AND CIRCULAR CULVERTS

Sections 2403, 2404, 2405, 2406, 2412, & 2415

October 19, 2004
Supercedes October 21, 2003

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➸
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
PLANT INSPECTION														
Fly Ash	Quality	AS Cert D		Each Load			830211							
GGBFS(Ground Granulated Blast Furnace Slag)	Quality	AS Cert D		Each Load			830211	V	DME	1/1000 cy	15 lb	CTRL		
Air-Entraining Admixture (4103)		AB 403	RCE	1/lot➸	0.5 L	CTRL								Sample lots not previously reported or as required by DME
Retarding Admixture		AB 403	RCE	1/lot➸	0.5 L	CTRL								
Water Reducing Admixture (4103)		AB 403	RCE	1/lot➸	0.5 L	CTRL								
GRADE INSPECTION														
Plastic Concrete	Air Content	316, 327	RCE	1/30 cy➸		RCE	830211	ASSUR	DME	1/1000 cy		DME		DME may adjust
	Slump	317, 327	RCE	1/30 cy ➸		RCE	830211	ASSUR	DME	1/1000 cy		Witness Only		DME may adjust
	Beams	316, 327, 328	RCE	2/placement ➸		RCE	830211							If required per 2403.18 and 2403.19
	Cylinders								DME	➸ 3/project		DME		Primary Projects Only (Information only)

AS-Approved Source	Cert A-Type A Certification	RCE-Resident Construction Engineer	ASSUR-Independent Assurance
AB-Approved Brand	Cert C-Type C Certification	DME-District Materials Engineer	VERIF-Verification
ASD-Approved Shop Drawing	Cert D-Type D Certification	CTRL-Central Materials Office	CORR-Correlation
S&T-Sampling & Testing		CONTR-Contractor	MON-Monitor

Verification/Assurance samples not required when mix quantity is less than 50 cu. yd.

NOTE: When the Project Engineer does the acceptance gradation testing, the assurance sample is to be split with the Project Engineer. This split sample is for correlation purposes and, if it is not a routine lot sample, should not be used for determining specification compliance of a lot. However, any non-compliant test result is to be resolved.

Sampling and Testing Guide-Minimum Frequency

Matls. IM 204
Appendix H (US) Units

STRUCTURAL CONCRETE, REINFORCEMENT, FOUNDATIONS & SUBSTRUCTURES, CCNCRETE STRUCTURES, CONCRETE FLOORS, AND CONCRETE BOX, ARCH AND CIRCULAR CULVERTS

Sections 2403, 2404, 2405, 2406, 2412, & 2415

October 19, 2004
Supercedes October 21, 2003

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➼
			SAMPLE BY	FREQ.	SAMPLE SIZE	TES BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
GRADE INSPECTION														
Reinforcing Steel (4151)	Quality	AS Cert A		Each Shipment			Field Book	V	DME	IM 451	6 ft	CTRL		
Reinforcing Steel Epoxy Coated (4151)	Quality	AS Cert A		Each Shipment			Field Book	V ➼	DME	1 of largest bar in deck	6 ft	CTRL		Will be acceptance tested for coating
Steel Pile (4167)	Quality	AS Cert A		Each Heat			Field Book		DME	IM 467		CTRL		Monitor by CTRL Materials
Timber Pile (4165)	Quality	Cert D 462						MON						Test report by Independent Lab
Anchor Bolts (lighting, signing, handrail)	Lab Tested	ASD	DME	➼ 1/project	1 bolt w/nut & washer	CTRL								Sample only if not source inspected
Steel Masonry Plates (4152)		ASD Cert A		Each Shipment			Field Book							Approved by Materials Department
Bronze Bearing Plates (4190.03)	Lab Tested		DME	➼ 1/project	1 only	CTRL								Sample only if not source inspected
Neoprene Bearing Pads (4195)		AS 495.03		Each Shipment			820905							
Alum. Bridge Rail & Anchor Assembly		ASD		Each Shipment			Field Book							Approved By Materials Dept.
Drains (Std Steel Pipe)(as per plan)	Dimensions Galvanized	ASD Visual 332	DME	1/project		DME	Test Report							

AS-Approved Source
AB-Approved Brand
ASD-Approved Shop Drawing
S&T-Sampling & Testing
Cert A-Type A Certification
Cert C-Type C Certification
Cert D-Type D Certification
RCE-Resident Construction Engineer/Project Engineer
DME-District Materials Engineer
CTRL-Central Materials Office
CONTR-Contractor
ASSUR-Independent Assurance
VERIF-Verification
CORR-Correlation
MON-Monitor

Verification/Assurance samples not required when mix quantity is less than 50 cu. yd.

NOTE: When the Project Engineer does the acceptance gradation testing, the assurance sample is to be split with the Project Engineer. This split sample is for correlation purposes and, if it is not a routine lot sample, should not be used for determining specification compliance of a lot. However, any non-compliant test result is to be resolved.

STRUCTURAL CONCRETE, REINFORCEMENT, FOUNDATIONS & SUBSTRUCTURES, CONCRETE STRUCTURES, CONCRETE FLOORS, AND CONCRETE BOX, ARCH AND CIRCULAR CULVERTS

Sections 2403, 2404, 2405, 2406, 2412, & 2415

October 19, 2004
Supercedes October 21, 2003

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➽
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
GRADE INSPECTION														
Timber (4162) & Lumber (4163)	Quality	Cert D 4162		Each Shipment										
Subdrain Pipe (4143)	Quality	AS Cert D 443, 448		Each Shipment										
Flowable Mortar (2506) ➽	Flow Test	375	RCE	As needed for Project Control		RCE	830211							Mix Design approval by DME
Bentonite	Flow Test	Visual 375				RCE								
Smoothness (2317)	Profilometer	Cert. Test Report 341	CONTR	Each Project	Each Wheelpath	CONTR	821301	CORR	DME	10%				

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert B-Type C Certification Cert C-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Verification/Assurance samples not required when mix quantity is less than 50 cu. yd.

NOTE: When the Project Engineer does the acceptance gradation testing, the assurance sample is to be split with the Project Engineer. This split sample is for correlation,purposes and, if it is not a routine lot sample, should not be used for determining specification compliance of a lot. However, any non-compliant test result is to be resolved.

STRUCTURAL CONCRETE, REINFORCEMENT, FOUNDATIONS & SUBSTRUCTURES, CONCRETE STRUCTURES, CONCRETE FLOORS, AND CONCRETE BOX, ARCH AND CIRCULAR CULVERTS

Sections 2403, 2404, 2405, 2406, 2412, & 2415

October 19, 2004
Supersedes October 21, 2003

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➠
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Aggregate-Fine (4110)		AS 209												
Aggregate-Coarse (4115)		AS 209												
Granular Backfill (4133)		AS 209												
Portland Cement (4101)	Quality	AS 401												
Fly Ash (4108)	Quality	AS 491.17												
Mixing Water (4102)	Quality		RCE	➠ 1/project	1 L	CTRL	731							Not required for potable water from Municipal Supply
GGBFS (Ground Granulated Blast Furnace Slag)	Quality	AS 491.14												
Air Entraining Admixture	Quality	AB 403												
Retarding Admixture	Quality	AB 403												
Water reducing Admixture	Quality	AB 403												
Curing Compound (4105)	Lab Tested	AB 405 ➠	DME	1/lot	1 L	CTRL								Bridge Barrier Rails AASHTO, M148, Cert. by Manufacturer

AS-Approved Source	Cert A-Type A Certification	RCE-Resident Construction Engineer/Project Engineer	ASSUR-Independent Assurance
AB-Approved Brand	Cert C-Type C Certification	DME-District Materials Engineer	VERIF-Verification
ASD-Approved Shop Drawing	Cert D-Type D Certification	CTRL-Central Materials Office	CORR-Correlation
S&T-Sampling & Testing		CONTR-Contractor	MON-Monitor

Verification/Assurance samples not required when mix quantity is less than 40 m^3.

NOTE: When the Project Engineer does the acceptance gradation testing, the assurance sample is to be split with the Project Engineer. This split sample is for correlation purposes and, if it is not a routine lot sample, should not be used for determining specification compliance of a lot. However, any non-compliant test result is to be resolved.

STRUCTURAL CONCRETE, REINFORCEMENT, FOUNDATIONS & SUBSTRUCTURES, CONCRETE STRUCTURES, CONCRETE FLOORS, AND CONCRETE BOX, ARCH AND CIRCULAR CULVERTS

Sections 2403, 2404, 2405, 2406, 2412, & 2415

Matls. IM 204
Appendix H (Metric) Units

October 19, 2004
Supersedes October 21, 2003

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➔
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Pre-formed Joint Sealer (4136)	Lab-Tested	AB 436.02 436.06												
Reinforcing Steel Bars (4151)	Quality	AS 451												
Steel Pile (4167)	Quality	467												
Concrete Pile (4166)	Quality	AS 570												
Timber Pile (4165)	Quality	➔ 462		Each Shipment										Rpt. or Cert by Independent Insp. Agency
Timber & (4162) Lumber (4163)		➔ 462		Each Shipment										Rpt. or Cert by Independent Insp. Agency
Concrete Anchors	Quality	AB 453.09												
Epoxy Grout	Quality	AB 491.11												
Concrete Sealer	Quality	AB 491.12												
Subdrain Pipe (4143)	Quality	AS 443, 448												
Neoprene Bearing Pads (4195)		AS 495.03												
Bronze Bearing Plates (4190.03)		ASD/Cert A												

AS-Approved Source	Cert A-Type A Certification	RCE-Resident Construction Engineer/Project Engineer	ASSUR-Independent Assurance
AB-Approved Brand	Cert C-Type C Certification	DME-District Materials Engineer	VERIF-Verification
ASD-Approved Shop Drawing	Cert D-Type D Certification	CTRL-Central Materials Office	CORR-Correlation
S&T-Sampling & Testing		CONTR-Contractor	MON-Monitor

Verification/Assurance samples not required when mix quantity is less than 40 m³

NOTE: When the Project Engineer does the acceptance gradation testing, the assurance sample is to be split with the Project Engineer. This split sample is for correlation purposes and, if it is not a routine lot sample, should not be used for determining specification compliance of a lot. However, any non-compliant test result is to be resolved.

STRUCTURAL CONCRETE, REINFORCEMENT, FOUNDATIONS & SUBSTRUCTURES, CONCRETE STRUCTURES, CONCRETE FLOORS, AND CONCRETE BOX, ARCH AND CIRCULAR CULVERTS

Sections 2403, 2404, 2405, 2406, 2412, & 2415

Matls. IM 204
Appendix H (Metric) Units

October 19, 2004
Supersedes October 21, 2003

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➠
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Steel Masonry Plate (4152)		AS Drawing/Cert A												
Precast Units (2407)	Quality	AS 570												
Anchor Bolts (lighting, signing, handrail) (4153)	Lab Tested	ASD												
Structural Steel (4152)	Quality	➠ Cert A												Monitor Sample According to plans or other instructions
Aluminum Bridge Rail & Anchor Assembly		ASD												
Conduit (Electrical) (4185.10) Steel)		AB												
Conduit (Plastic) (4185.10)	Lab Tested		DME	1/size	1 m with coupling	C TRL								
Bentonite		AS Cert D												
Flowable Mortar	Lab Tested ➠	Approved Trial Mix 525, 375												Tested by DME

AS-Approved Source	Cert A-Type A Certification	RCE-Resident Construction Engineer/Project Engineer	ASSUR-Independent Assurance
AB-Approved Brand	Cert C-Type C Certification	DME-District Materials Engineer	VERIF-Verification
ASD-Approved Shop Drawing	Cert D-Type D Certification	CTRL-Central Materials Office	CORR-Correlation
S&T-Sampling & Testing		CONTR-Contractor	MON-Monitor

Verification/Assurance samples not required when mix quantity is less than 40 m^3

NOTE: When the Project Engineer does the acceptance gradation testing, the assurance sample is to be split with the Project Engineer. This split sample is for correlation purposes and, if it is not a routine lot sample, should not be used for determining specification compliance of a lot. However, any non-compliant test result is to be resolved.

Sampling and Testing Guide-Minimum Frequency

STRUCTURAL CONCRETE, REINFORCEMENT, FOUNDATIONS & SUBSTRUCTURES, CONCRETE STRUCTURES, CONCRETE FLOORS, AND CONCRETE BOX, ARCH AND CIRCULAR CULVERTS

Sections 2403, 2404, 2405, 2406, 2412, & 2415

Matls. IM 204
Appendix H (Metric) Units

October 19, 2004
Supersedes October 21, 2003

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➡
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
PLANT INSPECTION														
Aggregate- Fine (4110)	Gradation	302, 306 336	CONTR	3/lot	IM 301	CONTR	830211	ASSUR CORR	DME CONTR	1/750 m^3➡ 1st day +10%	IM 301	DME RCE		System Approach Applicable
	Moisture	➡ 308, 528	CONTR	1/lot	1000 gm	CONTR	830211							See IM 528 if Moisture Probe is used
	Sp. Gr.	307	CONTR	IM 528	1000 gm	CONTR	830211							
	Quality	AS 209												
Aggregate- Coarse (4115)	Gradation	302, 306 336	CONTR	3/lot	IM 301	CONTR	830211	ASSUR CORR	DME CONTR	➡ 1/750 m^3 1st day+10%	IM 301	DME RCE		System Approach Applicable
	Moisture	308, 528	CONTR	1/lot	2000gm	CONTR	830211							
	Sp. Gr.	307	CONTR	IM 528	2000gm	CONTR	830211							
	Quality	AS 209						V	DME	1/750 m^3	22 kg	CTRL		
Portland Cement	w/c ratio	528	CONTR	1/pour		CONTR	830211							
	Quality	AS Cert D					830211	V	DME	1/750 m^3	7 kg	CTRL		

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Verification/Assurance samples not required when mix quantity is less than 40 m^3

NOTE: When the Project Engineer does the acceptance gradation testing, the assurance sample is to be split with the Project Engineer. This split sample is for correlation purposes and, if it is not a routine lot sample, should not be used for determining specification compliance of a lot. However, any non-compliant test result is to be resolved.

STRUCTURAL CONCRETE, REINFORCEMENT, FOUNDATIONS & SUBSTRUCTURES, CONCRETE STRUCTURES, CONCRETE FLOORS, AND CONCRETE BOX, ARCH AND CIRCULAR CULVERTS

Sections 2403, 2404, 2405, 2406, 2412, & 2415

Matls. IM 204
Appendix H (Metric) Units

October 19, 2004
Supersedes October 21, 2003

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➡
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
PLANT INSPECTION														
Fly Ash	Quality	AS Cert D		Ea Load			830211							
GGBFS(Ground Granulated Blast Furnace Slag)	Quality	AS Cert D		Ea Load			830211	V	DME	1/750 m^3	7 kg	CTRL		
Air Entraining Admixture (4103)		AB 403	RCE	1/lot➡	0.5 L	CTRL								Sample lots not previously reported or as required by DME
Retarding Admixture		AB 403	RCE	1/lot➡	0.5 L	CTRL								
Water Reducing Admixture (4103)		AB 403	RCE	1/lot➡	0.5 L	CTRL								
GRADE INSPECTION														
Plastic Concrete	Air Content	316, 327	RCE	1/25 m^3➡		RCE	830211	ASSUR	DME	1/750 m^3		DME		DME may adjust
	Slump	317, 327	RCE	1/25 m^3 ➡		RCE	830211	ASSUR	DME	1/750m^3		Witness Only		DME may adjust
	Beams	316, 327, 328	RCE	2/placement ➡		RCE	830211							If required per 2403.18 & 2403.19
	Cylinders								DME	➡ 3/project		DME		Primary Projects Only (Information only)

AS-Approved Source
AB-Approved Brand
ASD-Approved Shop Drawing
S&T-Sampling & Testing

Cert A-Type A Certification
Cert C-Type C Certification
Cert D-Type D Certification

RCE-Resident Construction Engineer
DME-District Materials Engineer
CTRL-Central Materials Office
CONTR-Contractor

ASSUR-Independent Assurance
VERIF-Verification
CORR-Correlation
MON-Monitor

Verification/Assurance samples not required when mix quantity is less than 40 m^3.

NOTE: When the Project Engineer does the acceptance gradation testing, the assurance sample is to be split with the Project Engineer. This split sample is for correlation purposes and, if it is not a routine lot sample, should not be used for determining specification compliance of a lot. However, any non-compliant test result is to be resolved.

Sampling and Testing Guide-Minimum Frequency

STRUCTURAL CONCRETE, REINFORCEMENT, FOUNDATIONS & SUBSTRUCTURES, CONCRETE STRUCTURES, CONCRETE FLOORS, AND CONCRETE BOX, ARCH AND CIRCULAR CULVERTS

Matls. IM 204
Appendix H (Metric) Units

Sections 2403, 2404, 2405, 2406, 2412, & 2415

October 19, 2004
Supersedes October 21, 2003

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➡
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
GRADE INSPECTION														
Reinforcing Steel (4151)	Quality	AS Cert A		Each Shipment			Field Book	V	DME	IM 451	2 m	CTRL		
Reinforcing Steel Epoxy Coated (4151)	Quality	AS Cert A		Each Shipment			Field Book	V ➡	DME	1 of largest bar in deck	2 m	CTRL		Will be acceptance tested for coating
Steel Pile (4167)	Quality	AS Cert A		Each Heat			Field Book		DME	IM 467		CTRL		Monitor by CTRL Materials
Timber Pile (4165)	Quality	Cert D 462						MON						Test report by Independent Lab
Anchor Bolts (lighting, signing, handrail)	Lab Tested	ASD	DME	➡ 1/project	1 bolt w/nut & washer	CTRL								Sample only if not source inspected
Steel Masonry Plates (4152)		ASD Cert A		Each Shipment			Field Book							Approved by Materials Department
Bronze Bearing Plates (4190.03)	Lab Tested		DME	➡ 1/project	1 only	CTRL								Sample only if not source inspected
Neoprene Bearing Pads (4195)		AS 495.03		Each Shipment			820905							
Alum. Bridge Rail & Anchor Assembly		ASD		Each Shipment			Field Book							Approved By Materials Dept.
Drains (Std Steel Pipe)(as per plan)	Dimensions Galvanized	ASD Visual 332	DME	1/project		DME	Test Report							

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Verification/Assurance samples not required when mix quantity is less than 40 m^3

NOTE: When the Project Engineer does the acceptance gradation testing, the assurance sample is to be split with the Project Engineer. This split sample is for correlation purposes and, if it is not a routine lot sample, should not be used for determining specification compliance of a lot. However, any non-compliant test result is to be resolved.

STRUCTURAL CONCRETE, REINFORCEMENT, FOUNDATIONS & SUBSTRUCTURES, CONCRETE STRUCTURES, CONCRETE FLOORS, AND CONCRETE BOX, ARCH AND CIRCULAR CULVERTS

Sections 2403, 2404, 2405, 2406, 2412, & 2415

Matls. IM 204
Appendix H (Metric) Units

October 19, 2004
Supersedes October 21, 2003

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➽
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
GRADE INSPECTION														
Timber (4162) & Lumber (4163)	Quality	Cert D 4162		Each Shipment										
Subdrain Pipe (4143)	Quality	AS Cert D 443, 448		Each Shipment										
Flowable Mortar (2506) ➽	Flow Test	375	RCE	As needed for Project Control		RCE	830211							Mix Design approval by DME
Bentonite	Flow Test	Visual 375				RCE								
Smoothness (2317)	Profilometer	Cert. Test Rpt. 341	CONTR	Each Project	Each Wheelpath	CONTR	821301	CORR	DME	10%				

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert C Type C Certification Cert D Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Verification/Assurance samples not required when mix quantity is less than 40 m^3

NOTE: When the Project Engineer does the acceptance gradation testing, the assurance sample is to be split with the Project Engineer. This split sample is for correlation purposes and, if it is not a routine lot sample, should not be used for determining specification compliance of a lot. However, any non-compliant test result is to be resolved.

Sampling and Testing Guide-Minimum Frequency

Matls. I.M. 204
Appendix I (U.S.) Units

October 3, 2000
Supersedes April 25, 2000

SOIL AGGREGATE SUBBASE
Section 2110

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➼
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Granular Surfacing Material (4120)		AS 209												
GRADE INSPECTION														
Mixed Materials (2110)	Density➼ (Proctor)	I.M. 309	RCE	2/ mile (min 2/project)	5000 gm	RCE	Field Book							Change of Soil type requires additional Proctors
Uncompacted Mixture	Pulverization Moisture	2" Sieve Visual	RCE	2/2 lane mile		RCE	Field Book							
Compacted Mixture (2110)	Density Thickness Width	311, 312, 334 337	RCE	2/2 lane mile		RCE	Field Book							
Finished Subbase	Cross Section	Stringline ➼	RCE	10/ mi		RCE	Field Book							Template for secondary park and institutional roads

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert B-Type B Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Sampling and Testing Guide-Minimum Frequency

Matls. I.M. 204
Appendix I (Metric) Units

SOIL AGGREGATE SUBBASE
Section 2110

October 3, 2000
Supersedes April 25, 2000

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➼
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Granular Surfacing Material (4120)		AS 209												
GRADE INSPECTION														
Mixed Materials (2110)	Density➼ (Proctor)	I.M. 309	RCE	2/ km (min 2/project)	5000 gm	RCE	Field Book							Change of Soil type requires additional Proctors
Uncompacted Mixture	Pulverization Moisture	50.8 mm Sieve Visual	RCE	2/2 lane km		RCE	Field Book							
Compacted Mixture (2110)	Density Thickness Width	311, 312, 334 337	RCE	2/2 lane km		RCE	Field Book							
Finished Subbase	Cross Section	Stringline ➼	RCE	6/km		RCE	Field Book							Template for secondary park and institutional roads

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert B-Type B Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

COLD-IN-PLACE ASPHALT CEMENT CONCRETE RECYCLING
Section 2318

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE & RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➻
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Emulsion (Rej. Agent) (2318.02)	Quality	AS 437												
GRADE INSPECTION														
RAP (2318.02)	Max Size		RCE	1st day + 1/week	10 lb	RCE								
Emulsion (Rej. Agent)	Quality Residue	Cert D 360	 RCE	 1/day(2)	 1 qt ➻	 DME								Must use plastic bottle
Uncompacted Mixture (2318.04)	Moisture Density	504 504	RCE RCE	1/lot 1/lot	30 lb ➻ 30 lb	DME DME								Sealed Container
Compacted Mixture (2318.04)	Moisture(1) Density	504 504	CONTR CONTR	7/day 7/day		CONTR CONTR ➻								Witnessed by RCE

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

(1) See IM 504 for Day 1 moisture correction factor.
(2) The sample from the first day and each third day shall be forwarded to the District Laboratory for testing. The other samples shall be retained for submission in the event of a failing test result.

COLD-IN-PLACE ASPHALT CEMENT CONCRETE RECYCLING
Section 2318

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE & RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➔
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Emulsion (Rej. Agent) (2318.02)	Quality	AS 437												
GRADE INSPECTION														
RAP (2318.02)	Max Size		RCE	1st day + 1/ week	5 kg	RCE								
Emulsion (Rej. Agent)	Quality Residue	Cert D 360	 RCE	 1/day(2)	 1 L ➔	 DME								Must use plastic bottle
Uncompacted Mixture (2318.04)	Moisture Density	504 504	RCE RCE	1/lot 1/lot	14 kg ➔ 14 kg	DME DME								Sealed Container
Compacted Mixture (2318.04)	Moisture(1) Density	504 504	CONTR CONTR	7/day 7/day		CONTR CONTR➔								Witnessed by RCE

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

(1) See IM 504 for Day 1 moisture correction factor.
(2) The sample from the first day and each third day shall be forwarded to the District Laboratory for testing. The other samples shall be retained for submission in the event of a failing test result.

Sampling and Testing Guide-Minimum Frequency

Matls. I.M. 204
Appendix L (U.S.) Units

October 3, 2000
Supersedes April 25, 2000

GRANULAR SURFACING/DRIVEWAY SURFACING
Section 2312 & 2315

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➛
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Class C Gravel (4120.03)	Gradation Quality	AS 209												
Class A Crushed Stone (4120.04)	Gradation Quality	AS 209												
Class B Crushed Stone (4120.05)	Gradation Quality	AS 209												
Class D Crushed Stone (4120.06)	Gradation Quality	AS 209												
Aggregate for Type B, AC or cold laid Bituminous Concrete (for driveways only)	Gradation Quality	AS 209												
Crushed Stone Base (for driveways only) (4122)	Gradation Quality	AS 209												
GRADE INSPECTION														
Dimensions	Thickness Width Cross Slope		RCE	3/ mi.			Field Book							

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert B-Type B Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Sampling and Testing Guide-Minimum Frequency

Matls. I.M. 204
Appendix L (Metric) Units

GRANULAR SURFACING/DRIVEWAY SURFACING
Section 2312 & 2315

October 3, 2000
Supersedes April 25, 2000

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➻
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Class C Gravel (4120.03)	Gradation Quality	AS 209												
Class A Crushed Stone (4120.03)	Gradation Quality	AS 209												
Class B Crushed Stone (4120.03)	Gradation Quality	AS 209												
Class D Crushed Stone (4120.03)	Gradation Quality	AS 209												
Aggregate for Type B, AC or cold laid Bituminous Concrete (for driveways only)	Gradation Quality	AS 209												
Crushed Stone Base (for driveways only) (4122)	Gradation Quality	AS 209												
GRADE INSPECTION														
Dimensions	Thickness Width Cross Slope		RCE	2/km			Field Book							

AS-Approved Source	Cert A-Type A Certification	RCE-Resident Construction Engineer/Project Engineer	ASSUR-Independent Assurance
AB-Approved Brand	Cert B-Type B Certification	DME-District Materials Engineer	VERIF-Verification
ASD-Approved Shop Drawing	Cert C-Type C Certification	CTRL-Central Materials Office	CORR-Correlation
S&T-Sampling & Testing	Cert D-Type D Certification	CONTR-Contractor	MON-Monitor

Matls. IM 204
Appendix M (U.S.) Units

CONCRETE BRIDGE FLOOR REPAIR & OVERLAY AND SURFACING

Section 2413

April 30, 2002
Supersedes April 3, 2001

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➽
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Aggregates-Fine (4110)		AS 209												
Aggregates-Coarse (4115)		AS 209												
Portland Cement (4101)	Quality	AS 401												
Mixing Water (4102)	Quality	Lab Tested	RCE	➽ 1/source	1 qt.	CTRL								Not needed for potable Municipal Water
Air Entraining Admixture (4103)	Quality	AB 403												
Water Reducing Admixture (4103)	Quality	AB 403												
Retarding Admixture (4103)		AS 403												
Curing Compound (4105)	Lab Tested	405	DME 1/lot	1/lot ➽	1 pt	CTRL								Sample lots not previously reported
PLANT INSPECTION														
Aggregate-Fine (4110)		AS CERT												
Aggregate-Coarse (4115)	Quality	AS CERT						V	DME	1/project ➽	50 lb	CTRL		DME may adjust frequency
Portland Cement (4101)	Quality	AS CERT						V	DME	1/project	15 lb	CTRL		
Air Entraining Admixture (4103)		AB 403	RCE	Each ➽ Lot	1 pt	CTRL								Sample if not previously reported
Water Reducing Admixture (4103)		AB 403	RCE	Each ➽ Lot	1 pt	CTRL								Sample if not previously reported
Retarding Admixture (4103)		AB 403	RCE	Each ➽ Lot	1 pt	CTRL								Sample if not previously reported
Latex Emulsion		Certification		Each Lot										

AS-Approved Source	Cert A-Type A Certification	RCE-Resident Construction Engineer/Project Engineer	ASSUR-Independent Assurance
AB-Approved Brand	Cert B-Type B Certification	DME-District Materials Engineer	VERIF-Verification
ASD-Approved Shop Drawing	Cert C-Type C Certification	CTRL-Central Materials Office	CORR-Correlation
S&T-Sampling & Testing	Cert D-Type D Certification	CONTR-Contractor	MON-Monitor

Matls. IM 204
Appendix M (U.S.) Units

CONCRETE BRIDGE FLOOR REPAIR & OVERLAY AND SURFACING
Section 2413

April 30, 2002
Supersedes April 3, 2001

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➔
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
GRADE INSPECTION														
Plastic Concrete (2413)	Air	318, 327	RCE	1/100 sy		RCE	830211	ASSUR	DME	1/project		DME		
	Slump	317, 327	RCE	1/100 sy		RCE	830211	ASSUR	DME	1/project		Witness Only		
	Density	358	RCE	➔ 6/bridge		RCE	1297	ASSUR	DME	1/project		Witness Only		Minimum of 1 per placement
	Thickness		RCE	3/50 sy		RCE	Field Book							
	Cylinders								DME	3/project		DME		Primary Projects only (Information Only)
Concrete Sealer (2413.09)	Quality	AB 491.12												

AS-Approved Source	Cert A-Type A Certification	RCE-Resident Construction Engineer/Project Engineer	ASSUR-Independent Assurance
AB-Approved Brand	Cert B-Type B Certification	DME-District Materials Engineer	VERIF-Verification
ASD-Approved Shop Drawing	Cert C-Type C Certification	CTRL-Central Materials Office	CORR-Correlation
S&T-Sampling & Testing	Cert D-Type D Certification	CONTR-Contractor	MON-Monitor

Matls. IM 204
Appendix M (Metric) Units

CONCRETE BRIDGE FLOOR REPAIR & OVERLAY AND SURFACING
Section 2413

April 30, 2002
Supersedes April 3, 2001

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➼
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Aggregates-Fine (4110)		AS 209												
Aggregates-Coarse (4115)		AS 209												
Portland Cement (4101)	Quality	AS 401												
Mixing Water (4102)	Quality	Lab Tested	RCE	➼ 1/source	1 L	CTRL								Not needed for potable Municipal Water
Air Entraining Admixture (4103)	Quality	AB 403												
Water Reducing Admixture (4103)	Quality	AB 403												
Retarding Admixture (4103)		AS 403												
Curing Compound (4105)	Lab Tested	405	DME 1/lot	1/lot ➼	0.5 L	CTRL								Sample lots not previously reported
PLANT INSPECTION														
Aggregate-Fine (4110)		AS CERT												
Aggregate-Coarse (4115)	Quality	AS CERT						V	DME	1/project ➼	22 kg	CTRL		DME may adjust frequency
Portland Cement (4101)	Quality	AS CERT						V	DME	1/project	7 kg	CTRL		
Air Entraining Admixture (4103)		AB 403	RCE	Each ➼ Lot	0.5 L	CTRL								Sample if not previously reported
Water Reducing Admixture (4103)		AB 403	RCE	Each ➼ Lot	0.5 L	CTRL								Sample if not previously reported
Retarding Admixture (4103)		AB 403	RCE	Each ➼ Lot	0.5 L	CTRL								Sample if not previously reported
Latex Emulsion		Certification		Each Lot										

AS-Approved Source
AB-Approved Brand
ASD-Approved Shop Drawing
S&T-Sampling & Testing

Cert A-Type A Certification
Cert B-Type B Certification
Cert C-Type C Certification
Cert D-Type D Certification

RCE-Resident Construction Engineer/Project Engineer
DME-District Materials Engineer
CTRL-Central Materials Office
CONTR-Contractor

ASSUR-Independent Assurance
VERIF-Verification
CORR-Correlation
MON-Monitor

Matls. IM 204
Appendix M (Metric) Units

CONCRETE BRIDGE FLOOR REPAIR & OVERLAY AND SURFACING
Section 2413

April 30, 2002
Supersedes April 3, 2001

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➛
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
GRADE INSPECTION														
Plastic Concrete (2413)	Air	318, 327	RCE	1/100 m²		RCE	830211	ASSUR	DME	1/project		DME		
	Slump	317, 327	RCE	1/100 m²		RCE	830211	ASSUR	DME	1/project		Witness Only		
	Density	358	RCE	➛ 6/bridge		RCE	1297	ASSUR	DME	1/project		Witness Only		Minimum of 1 per placement
	Thickness		RCE	3/50 m²		RCE	Field Book							
	Cylinders								DME	3/project		DME		Primary Projects only (Information Only)
Concrete Sealer (2413.09)	Quality	AB 491.12												

AS-Approved Source
AB-Approved Brand
ASD-Approved Shop Drawing
S&T-Sampling & Testing

Cert A-Type A Certification
Cert B-Type B Certification
Cert C-Type C Certification
Cert D-Type D Certification

RCE-Resident Construction Engineer/Project Engineer
DME-District Materials Engineer
CTRL-Central Materials Office
CONTR-Contractor

ASSUR-Independent Assurance
VERIF-Verification
CORR-Correlation
MON-Monitor

Matls. IM 204
Appendix P (US) Units

SURFACE TREATMENT (Seal Coat, Slurry, Joint Repair, Crack Filling, Fog Seal)

Section 2307, 2319, 2540, 2544, 2306, 2308

October 19, 2004
Supersedes April 20, 2004

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➸
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Aggregates (4125)	Quality Gradation	AS 209												
Emulsions/ Cutbacks	Quality	AS												
Emulsion & Aggregate	Compatibility ➸	349	DME	1/ source	1 qt & 10lb	DME/ CTRL								Seal Coat
Emulsion & Aggregate	Mix Design ➸													Slurry
GRADE INSPECTION														
Aggregate	Quality Gradation	301 Cert D						V ➸	DME	1/proj.	50 lb	CTRL		Seal Coat
Emulsion	Quality Residue ➸ Compatibility ➸	Cert D 323, 360 349	 RCE RCE	 1/20,000 gal 1st Day + 1/ week	 1 qt 1 qt & 10 lb	 DME DME	Fieldbook(2)	V (1) ➸	DME	1/proj.	1 gal.	CTRL		 Seal Coat/Slurry (1) Seal Coat
Cutback	Quality Viscosity Anti-Strip	Cert D 323, 329 AB 323, 374	 RCE	 1/20,000 gal	 1 qt	 DME	Fieldbook(2)	V	DME	1/proj	1 qt	CTRL		

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Emulsion samples in plastic bottles only.
No samples required for joint repair, crack filling, and fog seal. Acceptance based on certification only.
(1) Samples of emulsion for slurry are required for full width placement only.
(2) Log all shipments

SURFACE TREATMENT (Seal Coat, Slurry, Joint Repair, Crack Filling, Fog Seal)

Section 2307, 2319, 2540, 2544, 2306, 2308

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE & RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➸
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Aggregates (4125)	Quality Gradation	AS 209												
Emulsions/ Cutbacks	Quality	AS												
Emulsion & Aggregate	Compatibility ➸	349	DME	1/ source	1 L & 5 kg	DME/ CTRL								Seal Coat
Emulsion & Aggregate	Mix Design ➸													Slurry
GRADE INSPECTION														
Aggregate	Quality Gradation	301 Cert D						V ➸	DME	1/proj.	22 kg	CTRL		Seal Coat
Emulsion	Quality Residue ➸ Compatibility ➸	Cert D 323, 360 349	 RCE RCE	 1/75000 L 1st day + 1/ week	 1 L 1 L & 5 kg	 DME DME	Fieldbook(2)							 Seal Coat/Slurry (1) Seal Coat
Cutback	Quality Viscosity Anti-Strip	Cert D 323, 329 AB 323, 374	 RCE	 1/75000 L	 1 L	 DME	Fieldbook(2)							

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Emulsion samples in plastic bottles only.
No samples required for joint repair, crack filling, and fog seal. Acceptance based on certification only.
(1) Samples of emulsion for slurry are required for full width placement only.
(2) Log all shipments

BASE REPAIR (2212)
PAVEMENT REPAIR (Patches)
Sections 2529 and 2530

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Aggregates Fine (4110)		AS 209												
Aggregates Coarse (4115)		AS 209												
Portland Cement (4101)	Quality	AS 401												
Fly Ash (4108)	Quality	AS 491.17												
GGBFS(Ground Granulated Blast Furnace Slag)	Quality	AS 491.14												
Curing Compound (4105)	Lab Tested	405												
Air Entraining Admixture (4103)	Quality	AB 403												
Granular Backfill	Gradation Quality	AS CERT AS CERT												
Drain Tubing	Quality	AS 443												
Epoxy Grout		AB 491.11												
Joint Seal (4136.02)	Lab Tested	436.01 AB 436.02												
Backer Rod (4136.02)		AB 436.04												
Steel Reinforcing	Quality	AS 451												

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert B-Type B Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Sampling and Testing Guide-Minimum Frequency

Matls. I.M. 204
Appendix T (U.S.) Units

October 2, 2001
Supersedes April 3, 2001

BASE REPAIR (2212)
PAVEMENT REPAIR (Patches)
Sections 2529 and 2530

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➼
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
PLANT INSPECTION														
Aggregates-Coarse (4115)	Grad	302 306 336	CONTR	3/lot	I.M. 301	CONTR		CORR	CONTR	1st day +10%	IM 301	RCE		
	Moist	308	CONTR	1 / half day	1000 gm	CONTR								
	Sp. Gr.	307	CONTR	I.M. 527	1000 gm	CONTR								
	Quality	AS 209												
Aggregate- Fine (4110)	Gradation	302, 306 336	CONTR	3/lot	IM 301	CONTR	830211	CORR	CONTR	1st day+10%	IM 301 IM 301	RCE		
	Moisture	➼ 308, 528	CONTR	1/lot	1000 gm	CONTR	830211							See IM 528 if Moisture Probe is used
	Sp. Gr.	307	CONTR	IM 528	1000 gm	CONTR	830211							
	Quality	AS 209												
Portland Cement (4101)	Quality	AS CERT D		Each Load										
Fly Ash	Quality	AS CERT D		Each Load										
Air Entraining Admixture		AB 403	➼ DME	1/lot	1 pt	CTRL								Sample lots not previously reported or as directed by DME
Water Reducing Admixture		AB 403	➼ DME	1/lot	1 pt	CTRL								
Retarding Admixture		AB 403	➼ DME	1/lot	1 pt	CTRL								

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert B-Type B Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Sampling and Testing Guide-Minimum Frequency

Matls. I.M. 204
Appendix T (U.S.) Units

October 2, 2001
Supersedes April 3, 2001

BASE REPAIR (2212)
PAVEMENT REPAIR (Patches)
Sections 2529 and 2530

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➡
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
GRADE INSPECTION														
Plastic Concrete	Air Slump	318 327 318 327	RCE RCE	2/half day 2/half day		RCE RCE	830224 830224							
Reinforcing Steel Epoxy-Coated Steel	Quality Quality	AS 451 AS 451		Each Shipment										
Calcium Chloride	Concentr.	373	RCE	1/lot		RCE								
Asphalt Mixes Hardened Conc. Smoothness	➡ ➡												➡	Approval by DME See Plans/Specs for exclusions

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert B-Type B Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Sampling and Testing Guide-Minimum Frequency

Matls. I.M. 204
Appendix T (Metric) Units

October 2, 2001
Supersedes April 3, 2001

BASE REPAIR (2212)
PAVEMENT REPAIR (Patches)
Sections 2529 and 2530

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Aggregates Fine (4110)		AS 209												
Aggregates Coarse (4115)		AS 209												
Portland Cement (4101)	Quality	AS 401												
Fly Ash (4108)	Quality	AS 491.17												
GGBFS(Ground Granulated Blast Furnace Slag)	Quality	AS 491.14												
Curing Compound (4105)	Lab Tested	405												
Air Entraining Admixture (4103)	Quality	AB 403												
Granular Backfill	Gradation Quality	AS CERT AS CERT												
Drain Tubing	Quality	AS 443												
Epoxy Grout		AB 491.11												
Joint Seal (4136.02)	Lab Tested	436.01 AB 436.02												
Backer Rod (4136.02)		AB 436.04												
Steel Reinforcing	Quality	AS 451												

AS-Approved Source	Cert A-Type A Certification	RCE-Resident Construction Engineer/Project Engineer	ASSUR-Independent Assurance
AB-Approved Brand	Cert B-Type B Certification	DME-District Materials Engineer	VERIF-Verification
ASD-Approved Shop Drawing	Cert C-Type C Certification	CTRL-Central Materials Office	CORR-Correlation
S&T-Sampling & Testing	Cert D-Type D Certification	CONTR-Contractor	MON-Monitor

Sampling and Testing Guide-Minimum Frequency

Matls. I.M. 204
Appendix T (Metric) Units

October 2, 2001
Supersedes April 3, 2001

BASE REPAIR (2212)
PAVEMENT REPAIR (Patches)
Sections 2529 and 2530

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➸
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
PLANT INSPECTION														
Aggregates-Coarse (4115)	Grad	302 306 336	CONTR	3/lot	I.M. 301	CONTR		CORR	CONTR	1st day +10%	IM 301	RCE		
	Moist	308	CONTR	1 / half day	1000 gm	CONTR								
	Sp. Gr.	307	CONTR	I.M. 527	1000 gm	CONTR								
	Quality	AS 209												
Aggregate- Fine (4110)	Gradation	302, 306 336	CONTR	3/lot	IM 301	CONTR	830211	CORR	CONTR	1st day+10%	IM 301 IM 301	RCE		
	Moisture	➸ 308, 528	CONTR	1/lot	1000 gm	CONTR	830211							See IM 528 if Moisture Probe is used
	Sp. Gr.	307	CONTR	IM 528	1000 gm	CONTR	830211							
	Quality	AS 209												
Portland Cement (4101)	Quality	AS CERT D		Each Load										
Fly Ash	Quality	AS CERT D		Each Load										
Air Entraining Admixture		AB 403	➸ DME	1/lot	0.5 L	CTRL								Sample lots not previously reported or as directed by DME
Water Reducing Admixture		AB 403	➸ DME	1/lot	0.5 L	CTRL								
Retarding Admixture		AB 403	➸ DME	1/lot	0.5 L	CTRL								

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert B-Type B Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

BASE REPAIR (2212)
PAVEMENT REPAIR (Patches)
Sections 2529 and 2530

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➽
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
GRADE INSPECTION														
Plastic Concrete	Air Slump	318 327 318 327	RCE RCE	2/half day 2/half day		RCE RCE	830224 830224							
Reinforcing Steel Epoxy-Coated Steel	Quality Quality	AS 451 AS 451		Each Shipment										
Calcium Chloride	Concentr.	373	RCE	1/lot		RCE								
Asphalt Mixes Hardened Conc. Smoothness	➽ ➽												➽	Approval by DME See Plans/Specs for exclusions

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert B-Type B Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Sampling and Testing Guide-Minimum Frequency

Matls. I.M. 204
Appendix U (U.S.) Units

GRANULAR SHOULDERS
Section 2121

October 3, 2000
Supersedes April 25, 2000

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Aggregate (4120.02)	Gradation Quality	AS 209												
Aggregate (Paved Shoulder Fillets) (4120.07)	Gradation Quality	AS 209												
GRADE INSPECTION														
Dimensions	Thickness Width Cross Section	Template	RCE	3/mile 3/mile 3/mile		RCE	Field Book							
Aggregate (Paved Shoulder Fillets)	Gradation	Certification												

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert B-Type B Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Sampling and Testing Guide-Minimum Frequency

Matls. I.M. 204
Appendix U (Metric) Units

October 3, 2000
Supersedes April 25, 2000

GRANULAR SHOULDERS
Section 2121

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Aggregate (4120.02)	Gradation Quality	AS 209												
Aggregate (Paved Shoulder Fillets) (4120.07)	Gradation Quality	AS 209												
GRADE INSPECTION														
Dimensions	Thickness Width Cross Section	Template	RCE	2/km 2/km 2/km		RCE	Field Book							
Aggregate (Paved Shoulder Fillets)	Gradation	Certification												

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert B-Type B Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

SUBDRAINS
Section 2502

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Drain Tubing (4143)	Quality	AS 443												
Rodent Guard (4143.01)		AS 443.01												
Subdrain Outlet (4143)		AS												
Porous Backfill (4131)	Quality Gradation	AS 209												
Granular Backfill (4133)	Quality Gradation	AS 209												
Class A (Outlets) (4120.04)	Quality Gradation	AS 209												
GRADE INSPECTION														
Drain Tubing (4143)	Quality	AS						MON	RCE		3-5-ft pcs.	CTRL		When requested by CTRL
Engineering Fabric (4196)		AS 496.01												
Subdrain Outlet	Quality	AS Cert												
Porous Backfill (4131)	Gradation	AS Cert		Each Shipment										
Granular Backfill (4133)	Gradation	AS Cert		Each Shipment										
Class A (Outlets) (4120.04)	Gradation	AS Cert		Each Shipment										
Metal Posts (4154.09)		Visual	RCE											

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

Sampling and Testing Guide-Minimum Frequency

Matls. IM 204
Appendix V (Metric) Units

SUBDRAINS
Section 2502

April 15, 2003
Supersedes April 3, 2001

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION AND VERIFICATION S&T						REMARKS ➼
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
SOURCE INSPECTION														
Drain Tubing (4143)	Quality	AS 443												
Rodent Guard (4143.01)		AS 443.01												
Subdrain Outlet (4143)		AS												
Porous Backfill (4131)	Quality Gradation	AS 209												
Granular Backfill (4133)	Quality Gradation	AS 209												
Class A (Outlets) (4120.04)	Quality Gradation	AS 209												
GRADE INSPECTION														
Drain Tubing (4143)	Quality	AS						MON ➼	RCE		3-2m pcs.	CTRL		When requested by CTRL
Engineering Fabric (4196)		AS 496.01												
Subdrain Outlet	Quality	AS Cert												
Porous Backfill (4131)	Gradation	AS Cert		Each Shipment										
Granular Backfill (4133)	Gradation	AS Cert		Each Shipment										
Class A (Outlets) (4120.04)	Gradation	AS Cert		Each Shipment										
Metal Posts (4154.09)		Visual	RCE											

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

WATER POLLUTION CONTROL
EROSION CONTROL (New)
Section 2525, 2601

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMs	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION) AND VERIFICATION S&T						REMARKS
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
GRADE INSPECTION														
Seeds 4169.02		Cert A												
Fertilizer 4169.03		AS 469.03												
Inoculant 4169.04		Seed Manufacturer Recommendation												
Sticking Agent		Manufacturer Recommendation												
Sod 4169.07		Visual				RCE	Field Book							
Mulch 4169.07		Visual				RCE	Field Book							
Stakes for Sod		Visual				RCE	Field Book							
Jute mesh 4169.10a		Visual				RCE	Field Book							
Wire Staples 4169.10b		Visual				RCE	Field Book							
Wood Excelsior Mat 4169.10c		Visual				RCE	Field Book							
Engineering Fabrics		Cert D IM 496.01					Field Book							
Silt Fence Wire and Posts (Std. Rd. Plan RC-16)		Visual				RCE	Field Book							

AS-Approved Source	Cert A-Type A Certification	RCE-Resident Construction Engineer/Project Engineer	ASSUR-Independent Assurance
AB-Approved Brand	Cert B-Type B Certification	DME-District Materials Engineer	VERIF-Verification
ASD-Approved Shop Drawing	Cert C-Type C Certification	CTRL-Central Materials Office	CORR-Correlation
S&T-Sampling & Testing	Cert D-Type D Certification	CONTR-Contractor	MON-Monitor

Sampling and Testing Guide-Minimum Frequency

WATER POLLUTION CONTROL

EROSION CONTROL **(New)**

Section 2525, 2601

MATERIAL OR CONSTRUCTION ITEM	TESTS	METHOD OF ACCEPTANCE AND RELATED IMS	QC/ACCEPTANCE S&T					ASSURANCE, CORRELATION) AND VERIFICATION S&T						REMARKS
			SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	S&T TYPE	SAMPLE BY	FREQ.	SAMPLE SIZE	TEST BY	REPORT	
GRADE INSPECTION														
Seeds 4169.02		Cert A												
Fertilizer 4169.03		AS 469.03												
Inoculant 4169.04		Seed Manufacturer Recommendation												
Sticking Agent		Manufacturer Recommendation												
Sod 4169.07		Visual				RCE	Field Book							
Mulch 4169.07		Visual				RCE	Field Book							
Stakes for Sod		Visual				RCE	Field Book							
Jute mesh 4169.10a		Visual				RCE	Field Book							
Wire Staples 4169.10b		Visual				RCE	Field Book							
Wood Excelsior Mat 4169.10c		Visual				RCE	Field Book							
Engineering Fabrics		Cert D I.M. 496.01					Field Book							
Silt Fence Wire and Posts (Std. Rd. Plan RC-16)		Visual				RCE	Field Book							

AS-Approved Source AB-Approved Brand ASD-Approved Shop Drawing S&T-Sampling & Testing	Cert A-Type A Certification Cert B-Type B Certification Cert C-Type C Certification Cert D-Type D Certification	RCE-Resident Construction Engineer/Project Engineer DME-District Materials Engineer CTRL-Central Materials Office CONTR-Contractor	ASSUR-Independent Assurance VERIF-Verification CORR-Correlation MON-Monitor

NOTES

NOTES

AGGREGATE SAMPLING METHODS & DETERMINATION OF MINIMUM SIZE OF SAMPLES FOR SIEVE ANALYSIS

SCOPE

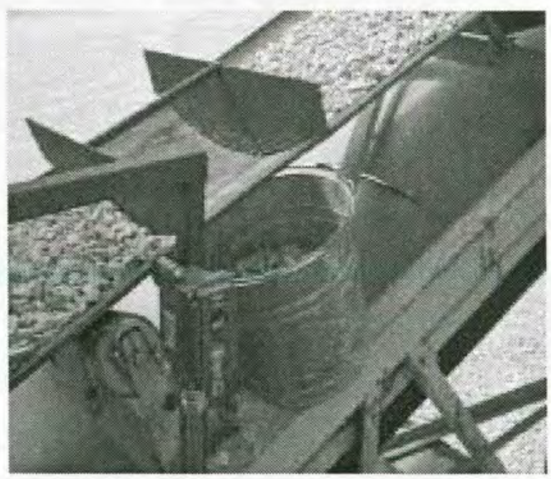
This IM sets forth approved sampling methods and the minimum amount of dry materials necessary for the determination of particle size distribution.

LOCATION FOR SAMPLING

To help ensure representative samples are taken, one of the following methods will be used for obtaining aggregate samples:

1. Conveyor Belt/Template Method

   To obtain an off-the-belt sample: stop the belt, insert a template (as illustrated in the pictures below) at three or more separate locations along the belt, remove all material within the template, and combine it into the sample. In belt sampling, the ends of the template should be spaced just far enough apart to get an increment approximately one-third the minimum mass (weight) of the sample. If the template does not yield the minimum size of sample in three locations, additional locations will be necessary. No less than three separate locations should be used in obtaining one sample.



2. Stream Flow Method

When obtaining a sample by interception of the aggregate stream flow, care must be exercised, so the sampling device (See picture below.) passes quickly through the entire stream flow and does not overflow. At least three separate passes shall be made with the sampling device when obtaining a sample. Each pass is an increment of the sample. This is normally considered to be the best method to obtain a representative sample of coarse aggregate.

3. Stockpile Method (for fine aggregate only, or as directed by the District Materials Engineer)

Stockpile sampling of fine aggregate may be accomplished by either using a shovel or a sand probe. When obtaining a field sample by the stockpile method, a minimum of three increments shall be taken at different locations around the stockpile. Avoid sampling in areas prone to segregation, such as along the bottom of cone stockpiles.

NOTE: Stockpile sampling of coarse aggregate should be avoided. If it becomes absolutely necessary to obtain a sample from a stockpile, consult the District Materials Engineer to help devise an adequate and proper sampling plan.


SHIPPING SAMPLES

Transport aggregate samples in bags or other containers constructed to preclude loss or contamination of the sample, or damage to the contents from mishandling during shipment.

Shipping containers for aggregate samples shall each have suitable identification attached and enclosed so that field reporting, laboratory logging and testing may be facilitated.

SAMPLE SIZES

Minimum sample sizes for sieve analysis of aggregates are based on the maximum size of the product and the intended use. The following table lists the required minimum field sample and test sample sizes based on the smallest sieve through which at least 95% of the sample will pass.

SIEVE SIZE	FIELD SAMPLE (lbs./kg)	TEST SAMPLE (gms/kg)
1½ in. (37.5 mm)	50/23.0	5,000/5.0(2)
1 in. (25.0 mm)	30/13.5	3,500/3.5
¾ in. (19.0 mm)	20/9.0	2,000/2.0
½ in. (12.5 mm)	20/9.0	1,500/1.5
⅜ in. (9.5 mm)	10/4.5	1,000/1.0(1)
#4 sieve (4.75mm)	10/4.5	500/0.5
#8 sieve (2.36mm)	10/4.5	200/0.2

(Products with maximum sizes over 1½ in. (37.5 mm) are normally visually inspected. Contact the appropriate District Materials Engineer.)

(1) When testing fine aggregate for PC Concrete, the minimum test sample is 500 grams.
(2) When testing 1 1/2" aggregate for Special Backfill, Granular Subbase, or Modified Subbase the minimum test sample is 2500 grams.

NOTES

<u>*SECTION III*</u>
<u>*AGGREGATE PROPERTIES AND CHARACTERISTICS*</u>

Ideally, construction aggregates should be composed of durable, abrasion-resistant particles free of any deleterious or objectionable materials <u>such as</u> clay, shale, coal, organic matter, etc. Their specific gravities and absorptions are important when they are incorporated into Portland cement or asphaltic concrete mixes.

<u>*Aggregate Production Problems*</u>

Three common problems occur during the production phase <u>and</u> also at the time of use. These are SEGREGATION, DEGRADATION, and CONTAMINATION. When any of these conditions occur, it will affect the performance of the aggregate for its intended use and may lessen the design life of the project.

Stockpile segregation

Segregation will occur anytime an aggregate is handled, and is especially predominate during construction of the stockpile. When a stacker conveyor is used, the finer (smaller) material will normally congregate in the center of the pile. The larger particles will tend to roll to the outside of the pile. As material is fed out of the stockpile, gradation variation is likely to occur.

When using a stacker conveyor, a helpful technique is using a movable stacker capable of building the stockpile in lifts. If the stacker is set too high, segregation will still occur. Some materials, such as "recycled asphalt paving" (RAP), have specifications controlling the height of individual lifts during stockpile construction.

Truck dumping is another common method of stockpile construction. With some less critical aggregates, this is usually accomplished with trucks running on the stockpile to make additional lifts. This method can result in degradation (breakdown) of the material as the trucks drive across the stockpile. Also, as the height of the stockpile increases, aggregate dumped close to the edge will segregate, with the coarser material rolling down the outside of the stockpile. Multiple lift truck stockpile construction of more critical aggregates, such as aggregate intended for use in paving, should be avoided.

Using a dozer to construct a stockpile is not recommended, especially with an aggregate prone to degradation. When a dozer is used, it normally forms ramp areas that are used over and over, tending to grind the aggregate under the tracks.

When loading material from a stockpile using an end loader, it is best to work along the entire vertical face of the pile. Done properly, this tends to equalize the coarse and fine areas of the stockpile, minimizing the segregation.

Contamination can easily happen during stockpiling. Material of one type may mistakenly be dumped into the wrong stockpile, contaminating both products. Different materials stockpiled too close to each other tends to lead to contamination where the stockpiles adjoin. Stockpiles should be constructed on sound bases to help eliminate contamination during the load-out process. Sometimes loader operators get too low when loading-out, or the bases may soften during the spring thaw or wet periods, increasing the danger of contamination from mud or dirt.

A good inspector should be alert to segregation, degradation and contamination and take steps to correct the problem before the effected material can be incorporated into the project.

Deleterious Material

It is very important that the aggregate be kept clean and free from deleterious substances. For this reason, the specifications limit the amount of deleterious substances that can be present. Shale, coal, chert, and other lightweight particles tend to float in a PC concrete mix.

Resistance to Abrasion

Abrasion is the mechanical wearing away of aggregate particles by friction and impact. Aggregates with low resistance to abrasion will readily wear away when used as surfacing materials or when exposed in pavement surfaces. They also degrade with handling. Excessive handling of aggregates with low resistance to abrasion can result in their containing relatively high percentages of fine material, often above the maximum level specified for the 75µm (#200) sieve for the particle aggregate involved.

Abrasion Test using steel balls

Los Angeles Abrasion Test

Resistance to abrasion is determined by the use of the Los Angeles Abrasion Machine, a cylindrical drum mounted on a horizontal shaft. A specified weight of coarse aggregate is placed in the machine along with a specified number of standard steel balls, the abrasive charge. After rotation at 30-33 rpm for 500 revolutions, the percentage of the aggregate sample that has been abraded to pass 1.70 mm (#12) sieve is reported as the loss due to abrasion, the percentage of wear.

Natural gravels will generally develop wear losses of 20% to 35% when tested for abrasion resistance. Crushed limestone aggregates will generally develop wear losses of 30% to 45%. Losses of 45% or more are commonly accepted to be indicative of aggregates with poor resistance to abrasion.

Durability and Soundness

These two terms are very similar in meaning and are often used interchangeably. The durability of an aggregate or other material is a measure of its ability to perform satisfactorily over an extended period of time. Soundness of an aggregate is a measure of its ability to resist the detrimental effects of exposure to natural forces.

Durability
Class 2
Class 3
Class 3i

Durability

Aggregate related deterioration can lead to the premature failure of our Portland Cement Concrete (PCC) highways. Durability is done only for **coarse aggregate** for use in PCC. The designations of Class 2, Class 3, and Class 3i durability are used. The best method to determine durability class is to observe the performance of a concrete pavement that was constructed with the coarse aggregate in question. If the pavement has performed satisfactorily for 20 years, it is a Class 3 durability. Class 3i durability aggregates must perform satisfactorily for up to 30 years in interstate class highways.

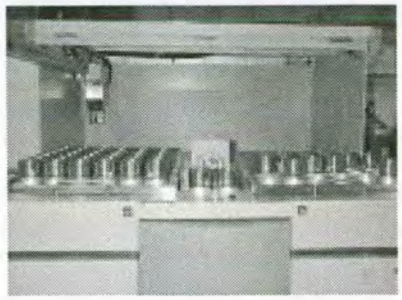
Durability Test-Sound wave machine with prepared samples (concrete cubes with brass plugs on each end). Sound wave is transmitted through each cube before subjecting the sample to 300 F&T cycles and that reading is compared to first reading. If the coarse aggregate used in the sample tends to be susceptible it will crack during the process and the second sound wave will indicate how much aggregate was affected.

When a pavement performance history is not available, we have relied on ASTM Designation C666, Method B to make laboratory determination of the durability class. This consists of a series of 300 freeze and thaw test cycles on a concrete specimen and takes approximately 6 months to complete.

Much of an aggregate's ability to perform in PCC is a function of the pore spaces between the mineral grains. These voids can be thought of as both large pores connected to a smaller, or capillary, pore system. It has been determined that aggregates with extensive capillary pore systems are subject to durability problems due to failure after repeated freeze and thaw cycles.

A unique apparatus was designed and constructed by the Iowa DOT Materials Laboratory personnel which measures the pore system of an aggregate particle in a relatively simple, quick and environmentally safe test. the test is referred to as the "Iowa Pore Index Test". This test, in conjunction with chemical analysis, has largely taken the place of the ASTM C666 test method in Iowa.

X-ray fluorescence



Chemical testing is a rapid way to evaluate the salt-susceptibility of carbonate aggregates by directly measuring aggregate properties that were being determined by indirect physical test. X-ray fluorescence (XRF), X-ray diffraction (XRD), and Thermongravimetric analysis (TGA), along with the Iowa pore index test, is used to generate an overall quality number.

•X-ray fluorescence (XRF) provides an elemental analysis used to calculate oxide percents.

•X-ray diffraction (XRD) determines mineralogy and is used primarily to determine purity of dolomite crystals.

•Thermogravimetric analysis (TGA) determines grain and crystallite size and some mineralogy.

The ASTM test takes approximately 6 months to complete. Chemical testing can normally be completed in one week, and through years of in-house research, has proven to be a more reliable method to predict the aggregate's durability.

<u>Soundness</u>

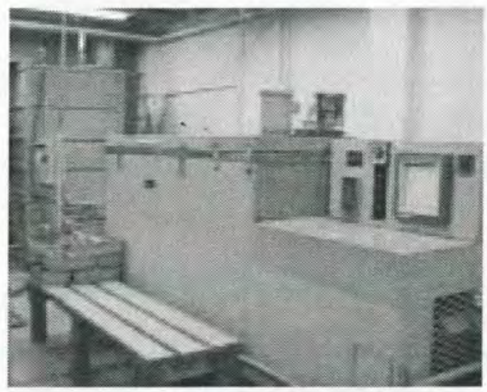
Through the chemical testing research, an alternative method of predicting a coarse, carbonate aggregate's resistance to freeze and thaw cycles has been developed. It is suspected that the principle cause of aggregate failure is due to the clay content of the stone. Because clays are aluminosilicate minerals, the amount of alumina in the aggregate will be a measure of the clay content in the stone.

We use this test as a screening method for carbonate aggregates. If an aggregate sample fails the alumina content specification (Al_2O_3), the 'A' freeze and thaw test will be performed to determine compliance. The alumina test does not indicate other characteristics such as the presence of soft oolites, which could cause 'A' F & T non-compliance.

Method of Test for Determining the Soundness of Aggregates by Freezing and Thawing

Test samples of coarse aggregate are alternately frozen and thawed for a prescribed number of cycles-16 in Method "A" for higher quality requirements, and 25 cycles in Method "C" for lower quality requirements. In both methods, the percentage passing the 2.36 mm (#8) sieve, computed to a clean dry weight basis, is reported as the soundness loss.

Freezer for Freeze-Thaw Test



Method "A": 0.5% methyl alcohol is added to water in which the sample is immersed for thawing. This test is particularly severe on limestone aggregates that contain 5% or more of insoluble material in the clay or silt-size particle range. Generally, this is also the limestone that fails to perform well when the use of sound stone is required.

Freeze-Thaw Test

Method "C": Test samples are thawed in water only. Freezing and thawing in water is not particularly severe, hence 25 cycles are required on this test while only 16 cycles are required when the water-alcohol solution is used. Any reasonably clean, coarse aggregate will perform well in this test and it is used for all materials, which do not require high quality aggregates.

Specific Gravity

Specific Gravity is a property that can be determined for all materials and is important for the aggregate inspector to understand. Simply defined, specific gravity is the relative density of a material to water, or the number of times heavier a material is than water.

The specific gravity of aggregate to be used in a Portland cement concrete (PCC) mix is determined, at time of use, by the Pycnometer Method in Iowa. This method is described in I.M. 307, included in this manual, and personnel performing this test must possess a Level II Aggregate Certification.

Specific Gravity Jars

PCC mix designs are based on volumetrics, which, for the aggregate portion of the mix, requires that the amount of each of the aggregates to be incorporated, per cubic yard of mix, be based on the "saturated surface-dry"(SSD) weight of the individual material.

SSD is defined as neither absorbing water from, nor contributing water to the concrete mix. The aggregate particles have all the moisture they can absorb with no "free" moisture on the particle surfaces.

The bulk SSD specific gravity of each aggregate must be known to determine the correct amount of each aggregate needed in the PCC mix. The specific gravity of the aggregate is normally determined from a series of tests performed on samples obtained during the production phase of each aggregate. Most aggregate sources have a uniform specific gravity as long as production practices stay consistent. Sources, which may have variable specific gravities, will usually be designated with a "DWU" (determined when used) in the T-203 source instructional memorandum.

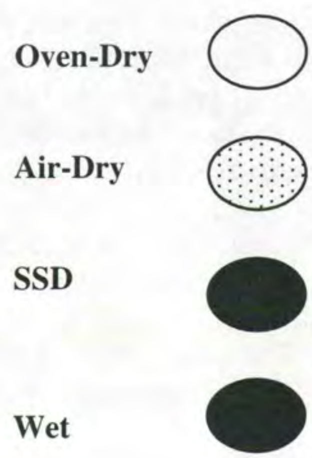
The specific gravity test performed at time of use (the plant site) is for verification purposes and to figure moisture percentages. The specific gravity to be used in determining batch weights is the one listed in the T-203. When the source indicates it is a "DWU", the plant technician is to call the appropriate District Materials office for the current specific gravity.

The test results by the plant inspector at time of use should be within 0.020 of the intended specific gravity. If the result is not within this tolerance, the plant inspector should rerun the test. If the result is still not in conformance, the plant inspector is to notify the District Materials office for investigation.

Aggregate Moisture

The amount of individual aggregates used in a Portland cement concrete mix is determined in the design process based on the **Saturated-Surface-Dry** weight of the material. Terms used to describe the moisture content of aggregate are as follows:

- **Oven-dry (or constant-dry weight)** – containing no surface or internal moisture.
- **Air-dry** – dry at the particle surface but containing some internal moisture – this is somewhat absorbent.
- **Saturated-Surface-Dry** – an ideal condition in which the aggregate can neither absorb nor contribute water. In this condition, the interior has absorbed all the moisture it can hold, but the surface is dry.
- **Damp or Wet** – containing moisture on the particle surface.

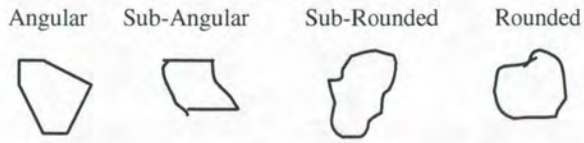


The free moisture present in aggregates must be accounted for when used in a Portland Cement Concrete mix. Aggregates containing free moisture carry that moisture into the mix during the batching process. If corrections are not made, the weight of the individual aggregates containing this moisture will result in aggregate under yielding, that is, less aggregate in the mix than is required in the mix design. This "extra" water will also affect the water/cement ratio.

An aggregate particle's internal structure is made up of solid matter and voids that may or may not contain water. Sometimes the aggregates to be used may be in an "absorbent" condition, which means that during the batching process, the aggregates will actually absorb some of the mix water, resulting in a mix drier than intended, with more aggregate by weight than designed. Iowa specifies that a stockpile of <u>coarse</u> aggregate having absorption of 0.5% or more shall be wetted and allowed to drain for at least 1 hour before use in the PCC mix. Fine aggregate, which is normally washed during the production phase, must be allowed to drain at least 24 hours before use in the mix. Also, at the time of use, aggregates must be handled in a manner that will prevent variations of more than 0.5 percent in moisture content of successive batches. The plant operator is responsible to devise remedial measures. The moisture content is normally determined in Iowa by the pycnometer method when tested at the time of use (I.M. 308, included in this manual). Personnel performing this test must have a valid Iowa Level II Aggregate certification. If water can be observed draining or dripping from any individual aggregate moisture sample, the moisture content cannot be measured successfully with the pycnometer, nor can it be uniformly controlled in the proportioning process. The moisture content must be allowed to stabilize (drain) before using the affected aggregate.

Shape and Surface Texture

Particle shape of either coarse or fine aggregate may be angular, sub-angular, sub-rounded, or rounded.



Aggregate particles should ideally be equal dimensionally and free of excessive amounts of flat and elongated pieces. Long, slender aggregate pieces should be avoided. The shape of aggregate particles many times depends on the type of crusher used in the processing operation.

Particle shape and surface texture have a definite bearing on the quality of the finished product. Base courses composed of angular particles will compact and key together to form a dense, tight base, while elongated and rounded particles will slide and roll without compacting.

On the other hand, rounded particles tend to make plastic concrete. The texture of aggregate particles is normally defined in the following sequence: lithographic, sub-lithographic, fine-grained, medium grained, and coarse grained. Lithographic and fine-grained particles are polished quite easily by normal traffic wear and in time become a maintenance problem.

Gradation

Gradation is the particle size distribution of aggregates determined by using sieves with square openings. As an aggregate is moved or handled, there is tendency for the particle sizes to separate. This separation is known as segregation. Limits are usually specified for the percentage of material passing each sieve. There are several reasons for specifying grading limits and maximum aggregate size. Deviations from the grading limits seriously affect the uniformity of finished work.

Dense Graded Aggregate:

Dense graded aggregates contain a proportion of material in each particle size present so as to minimize the void spaces between particles.

Gap Graded Aggregate:

Gap or open-graded aggregates contain too great an amount of particles of nearly the same size. This produces an open-type mixture with large void spaces. There are not enough of the smaller sizes to fill the voids between the larger sizes.

Summary-Aggregates

For the most purposes, aggregates must conform to certain requirements and should consist of clean, hard, strong, and durable particles free of chemicals, coatings of clay, or other fine materials that may affect construction.

Weak, friable, or freeze-thaw susceptible aggregate particles are undesirable for normal open highway construction. Aggregate containing natural shale or shale particles, soft and porous particles, and certain types of chert should be especially avoided since they have poor resistance to weathering. Visual inspection may often disclose weaknesses in coarse aggregates.

NOTES

Section IV
Aggregate Source Inspection

Aggregate source inspection involves monitoring the quality of material during the production process. Aggregate quality is determined by a number of factors including: clay content, freeze thaw durability, consistency in specific gravity among other properties depending on the product. Typically, preliminary testing is done by blockstoning individual beds, or obtaining samples of processed aggregate to establish the source quality potential. Some aggregate uses require the source to be approved before production for certified material can start. In any case, the producer must assure the aggregate meets minimum quality requirements before delivery to the project.

It is important for the aggregate technician to become familiar with the source. The technician should be able to recognize significant changes that may occur in a quarry ledge or gravel deposit that could affect the quality of the intended product. Changes in a source should be recognized through two equally important activities: 1) monitoring quality by looking for changes in test results, and 2) routine inspection of quarry ledges and underground mine horizons, looking for changes in the quarry beds, quarry ledge, or mine horizon.

The factors causing changes are different in quarries than in sand and gravel pits, and each will be covered separately.

Quarries

There are many reasons why an aggregate from a particular quarry can test differently with respect to quality than that previously produced. Most of these reasons fall into the following categories.

Quarry- *An open excavation from which rock is removed for construction purposes.*

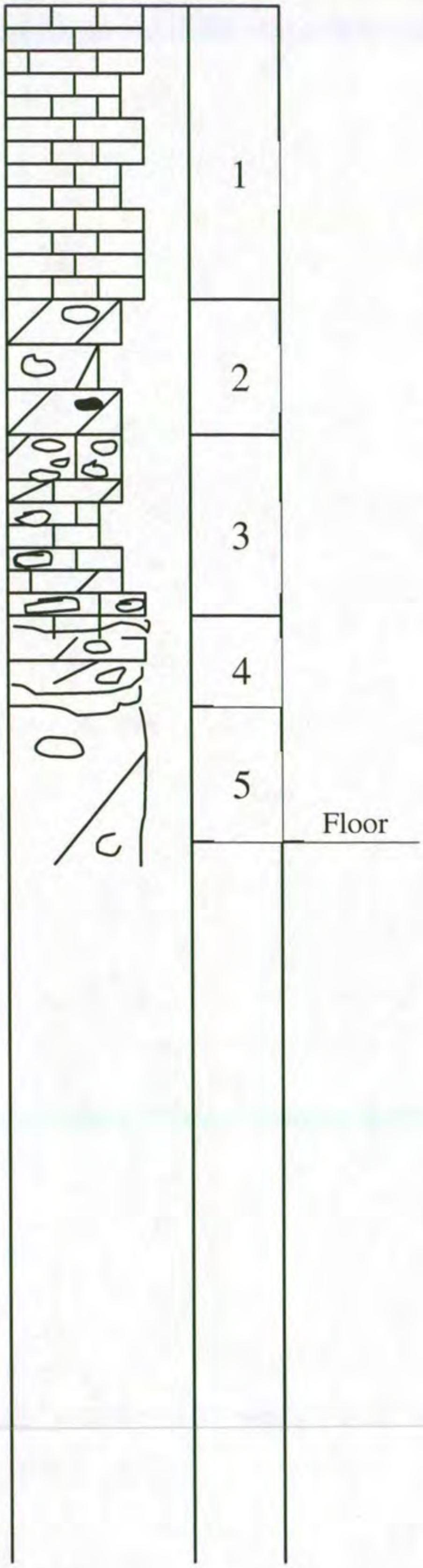
a) Ledge Control: The quarry ledge has not been maintained in the same beds.
b) Lateral Variations: One or more beds in the quarry ledge have changed laterally in quality.
c) Faulted and Dipping Beds: The beds are offset along a fault or have such an irregular surface that the quarrying operation cuts across beds to the extent that the same beds are not always being worked.
d) Deleterious Materials: The quarry ledge has become intruded with pockets or seams of clay and associated weathered material.
e) Production Changes: Production methods have changed to the extent that a similar product is not being obtained.

Ledge Control

As an aid identifying the various beds and/or quality units in quarry, geologic sections have been prepared for most (Figure 3.1). The various beds are identified be a number and a description. The geology age of the source is also noted and the relative position of the source age-wise can be found on a time chart such as Figure 3.2. Every layer or bed of rock in a quarry can be quite different in quality while often times quite similar visibly. Consequently, when material is being produced on the basis of previously established quality, we must be sure that the quarry ledge is in the same beds as before, or if it isn't, that any of the new beds in the ledge are of a quality that will assure specification compliance of the final product.

SW¼ Sec. 23 T. 95 R. 15 Co. Floyd

Peterson 5/6/75	**Carville Quarry**
	Heckman-Reynolds



00: Overburden ± 3.0’

CEDAR VALLEY FORMATION
(Coralville Member)

1. Limestone; light brown; medium crystalline; very petroliferous; carbonaceous laminations; thin to platy bedding. ±6.

2. Dolomite; light brown; coarse crystalline; a few small calcite-filled vugs- as 3 or 4 beds; very hard. 2.

3. Limestone; light, pinkish gray; medium crystalline; dolomitic; many large calcite-filled vugs in zones parallel to bedding; flaggy beds 0.3 - 0.6’ thick; upper 1.0’ is a distinctive zone of highly concentrated calcite-filled vugs. ±4.

4. Dolomite; light pinkish gray; fine crystalline; many calcite-filled vugs and “birdseye” calcite; a few small pelecypod fragments; as 3 or 4 wavy beds; reddish brown shale parting at the base; irregular reddish brown shaley bed 0.2’ thick at top; hard. ±1.

5. Dolomite; light, pinkish gray; medium crystalline; has a few small calcite-filled vugs and “birds-eye” calcite; massive but fractured; hard. ±3.

FIGURE 3.1

STRATIGRAPHIC COLUMN OF IOWA

SYSTEM	SERIES	GROUP	FORMATION	DESCRIPTION	THICK NESS (feet)	AGE In millions of years before present
Quaternary	Pleistocene		Wisconsinan	Loess, glacial till and interbedded sand and gravel	500'	2-3
			Illinoian			
			Kansan			
			Nebraskan			
Cretaceous		Manson	Niobrara		350'	130
		Colorado	Carlile Shale	Shale		
			Greenhorn Limestone	Limestone		
			Graneros Shale	Shale		
			Dakota	Sandstone & shale	200'	
			Windrow			
Jurassic			Fort Dodge	Gypsum, red & green shales--Webster Co. only	50'	185
Pennsylvanian	Virgilian	Wabaunsee	Wood Siding	Interbedded repeating cycles of Limestone, Shale and Sandstone, with occasional coal seams	210'	340
			Root			
			Stotler			
			Pillsbury			
			Zeandale			
			Willard Shale			
			Emporia			
			Auburn Shale			
			Bern			
			Scranton			
			Howard Limestone			
			Severy Shale			
		Shawnee	Topeka	Interbedded repeating cycles of Limestone, Shale and Sandstone, with occasional coal seams	180'	
			Calhoun Shale			
			Deer Creek			
			Tecumseh Shale			
			Lecompton			
			Kanwaka Shale			
			Oread			
		Douglas	Lawrence	Interbedded repeating cycles of Limestone, Shale and Sandstone, with occasional coal seams	110'	
			Stranger			
	Missourian	Lansing	Stanton	Interbedded repeating cycles of Limestone, Shale and Sandstone, with occasional coal seams	50'	
			Vilas Shale			
			Plattsburg			
		Kansas City	Lane Shale	Interbedded repeating cycles of Limestone, Shale and Sandstone, with occasional coal seams	255'	
			Wyandotte			
			Liberty Memorial Shale			
			Iola			
			Chanute Shale			
			Dewey			
			Nellie Bly Shale			
			Cherryvale			
		Bronson	Dennis	Interbedded repeating cycles of Limestone, Shale and Sandstone, with occasional coal seams		
			Galesburg Shale			
			Swope			
			Elm Branch Shale			
			Hertha			
			Pleasanton			
Pennsylvanian	Desmoinesian	Marmaton	Lost Branch	Interbedded repeating cycles of Limestone, Shale and Sandstone, with occasional coal seams	145'	340'
			Memorial Shale			
			Lenapah			
			Nowata Shale			
			Altamont			
			Bandera Shale			
			Pawnee			
			Labette			
			Stephens Forest			
			Morgan School Shale			
			Mouse Creek			
		Cherokee	Swede Hollow	Interbedded repeating	755'	
			Floris			

		Kalo	Cliffland Coal	cycles of Limestone, Shale and Sandstone, with occasional coal seams		
			Blackoak Coal			
			Kilbourn			
Pennsylvanian		Caseyville	Wyoming Hill Coal	Thin Limestone & Shales between coal seams		340
			Wildcat Den Coal			
Mississippian	Meramecian		Ste. Genevieve	Shale and limestone	140'	355
			St. Louis	Sandy limestone		
			Spergen	Limestone		
	Osagean	Augusta	Warsaw	Shale and dolomite	250'	
			Keokuk	Cherty dolomite and limestone		
			Burlington	Cherty dolomite and limestone		
	Kinderhookian	Sub-Augusta	Gilmore City	Limestone, oolitic	300'	
			Maynes Creek	Limestone and dolomite		
		North Hill	Chapin/Starrs Cave	Limestone	100'	
			Prospect Hill	Siltstone		
			McCraney	Limestone		
Devonian	Upper	Yellow Spring	Maple Mill	Siltstone & Shale	300'	410-415
			Aplington	Dolomite		
			Sheffield	Shale		
			Sweetland Creek	Dolomite and shale	225'	
			Lime Creek			
		U. Cedar Valley	Shell Rock	Limestone and dolomite		
			Lithograph City			
	Middle	L. Cedar Valley	Coralville	Limestone and dolomite	270'	
			Little Cedar			
		Wapsipinicon	Pinicon Ridge	Limestone & Dolomites, shales in middle		
			Spillville/Otis			
			Bertram	Dolomite		
Silurian	Upper		Gower	Dolomite, some chert	100'	425
			La Porte City	Chert and Limestone	0-100'	
			Scotch Grove	Dolomite	240-300'	
			Hopkinton	Dolomite, some chert	100-160'	
	Lower		Waucoma	Limestone, some chert	0-100'	
			Blanding	Cherty dolomite	20-100'	
			Tete des Morts	Sandy dolomite	5-25'	
			Mosalem	Cherty Shaley Dolomite	0-100'	
Ordovician	Upper		Maquoketa	Dolomite and shale	300'	475
		Galena	Dubuque	Dolomite, Limestone	320'	
			Wise Lake			
	Middle		Dunleith	Dolomite, Limestone and Shale		
			Decorah			
			Platteville	Dolomite, Limestone, Shale & Sandstone	70'	
		Ancell	Glenwood	Sandstone	50-230'	
			St. Peter			
	Lower	Prairie du Chien	Shakopee	Sand and cherty dolomite and sandstone	290'	
			Oneota			
Cambrian			Jordan	Sandstone	185'	570'
			St. Lawrence	Dolomite		
		Tunnel City	Lone Rock	Glauconitic sandstone, siltstone, shale	160'	
			Adel			
			Wonewoc	Sandstone	550'	
			Bonterre	Sandstone and shale, dolomite		
			Eau Claire			
			Mt. Simon	Sandstone		
Precambrian				Sandstones, igneous, and metamorphic rocks		+600'

Fig. 3.2

In quarries where bedding planes are distinct and continuous, it is a simple matter for the producer to maintain a ledge in the same beds and for the inspector to ascertain which beds they are. When there are no good bedding planes, the producer can have difficulty remaining in the same beds and difficulty in knowing exactly which beds are being worked. Satisfactory ledge control can be maintained by applying the answers to the following questions to the source being used.

> Do specifications or special provisions require ledge control? Some materials do, such as course aggregate for portland cement concrete and graded stone base.
>
> Does the production history indicate that the finished produce will be boarder line on quality or well within the requirements?
>
> What is the quality level of the beds that might be added to the ledge?
>
> Could additional beds improve a borderline product or cause it to fail?
>
> Could the additional beds be of such poor quality that they should not be incorporated into the manufacture of any product?

Often, all that is necessary is a proper identification of the ledge being worked so as to compile a dependable production history for the source. When in doubt, always consult the appropriate supervisor.

Lateral Variations

Most lateral variations in bed quality are caused by the effects of weathering. Other lateral variations are due to the factors of deposition which were present when the bed was formed. Some geologic units characteristically show very little lateral variation (like the Galena Group), others show a lot (like the St. Louis Formation). Lateral variations may or may not affect the quality of the bed. Each case has to be evaluated individually.

Lateral Variations Due to Weathering

These can be caused by actual compositional changes in a bed or by changes in a bed or by changes in thickness. A 60.7 mm (0.2 ft.) thick shale bed may increase to a very troublesome 304.8 mm (1 ft.) or more in thickness, requiring benching and removal (Figure 4.1). A limestone or dolomite bed may suddenly pinch out, becoming replaced by sandstone or some other type of rock. This happens frequently in the formations common in southeastern Iowa, but not too often elsewhere.

More common are compositional changes characteristic of those geologic formations which contain breccias, angular fragments of rock in generally shaly matrices (Figure 4.2). Breccia thickness can vary considerably within the same quarry, often affecting beds in the adjacent quarry ledges. At other times, beds will gradually change in composition, becoming more shaly, sandy, etc. Either type of change can affect the quality of the rock.

An inspector must learn and be alert to any changes that can occur that will affect the quality of the finished product.

Faulted and Dipping Beds

Frequently, the quarry beds are not flat lying. They may dip at a uniform angle (Figure 5.1), or they may roll up and down from 0.305 m to 0.607 m (1 ft. to 2 ft.) to

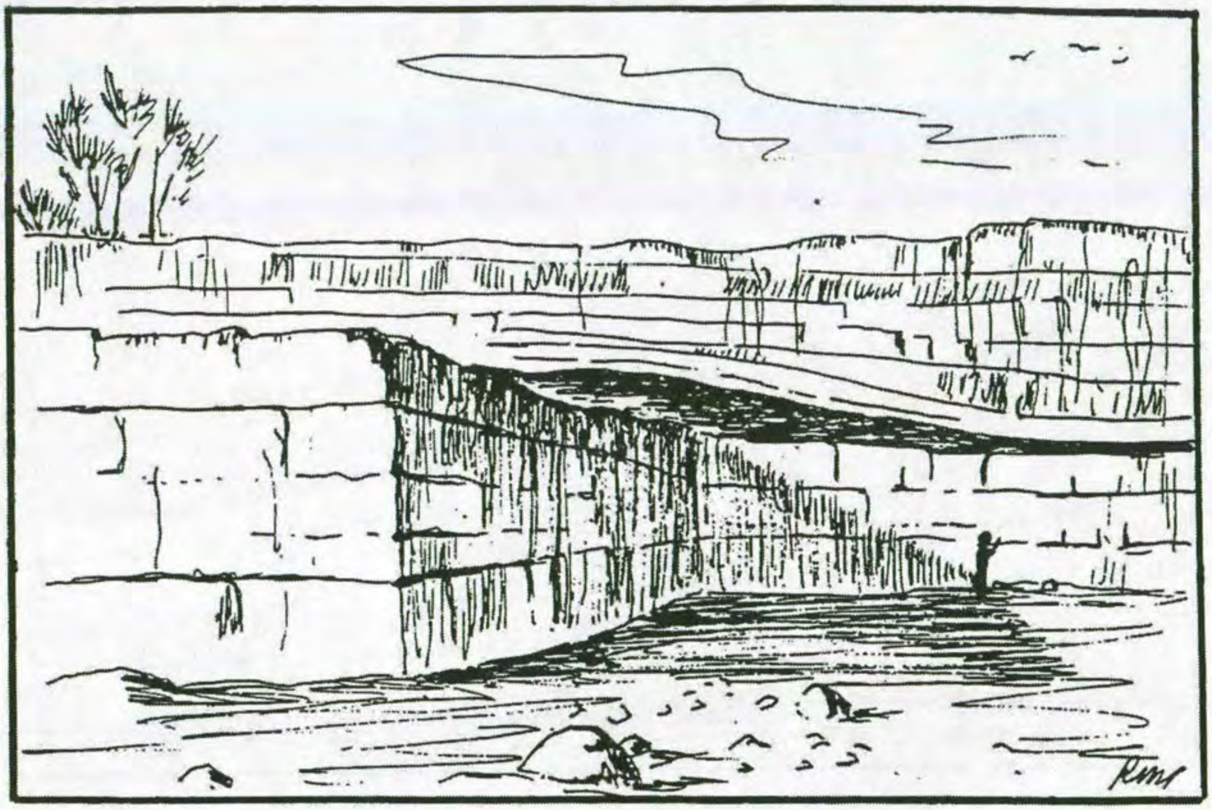


Figure 4.1

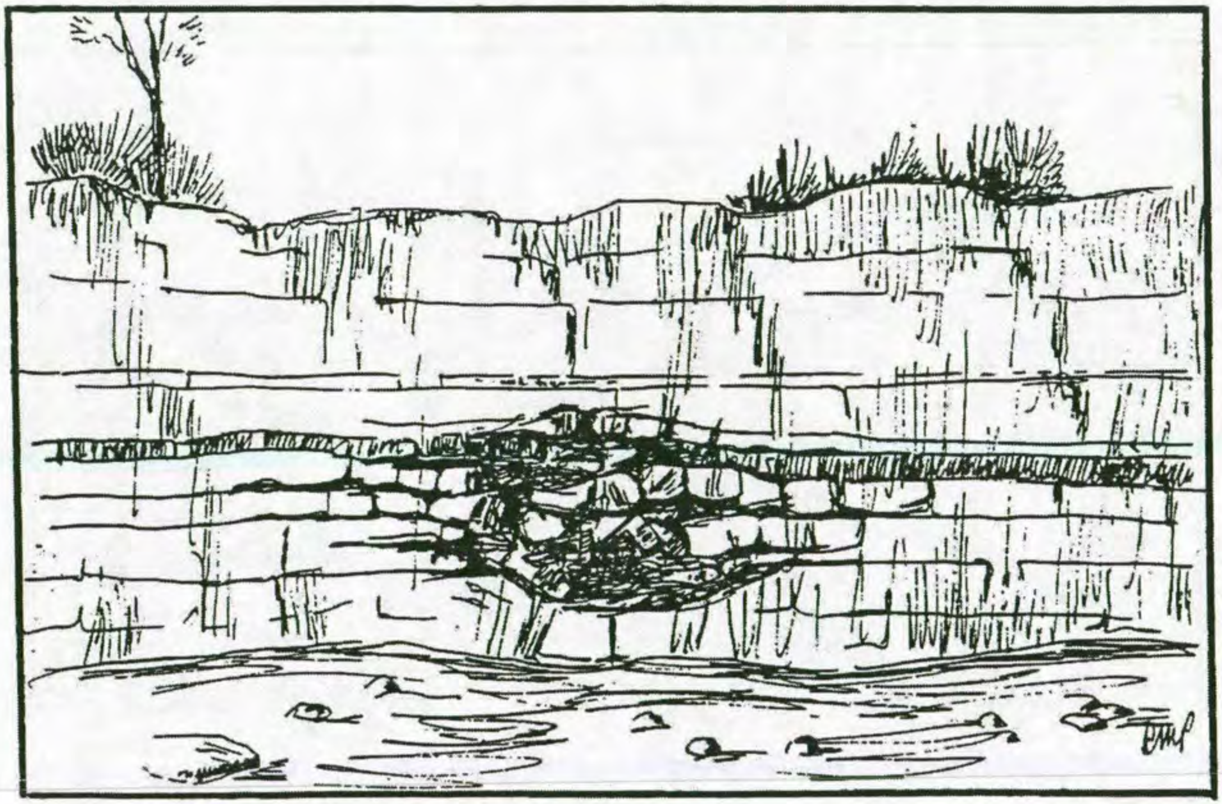


Figure 4.2

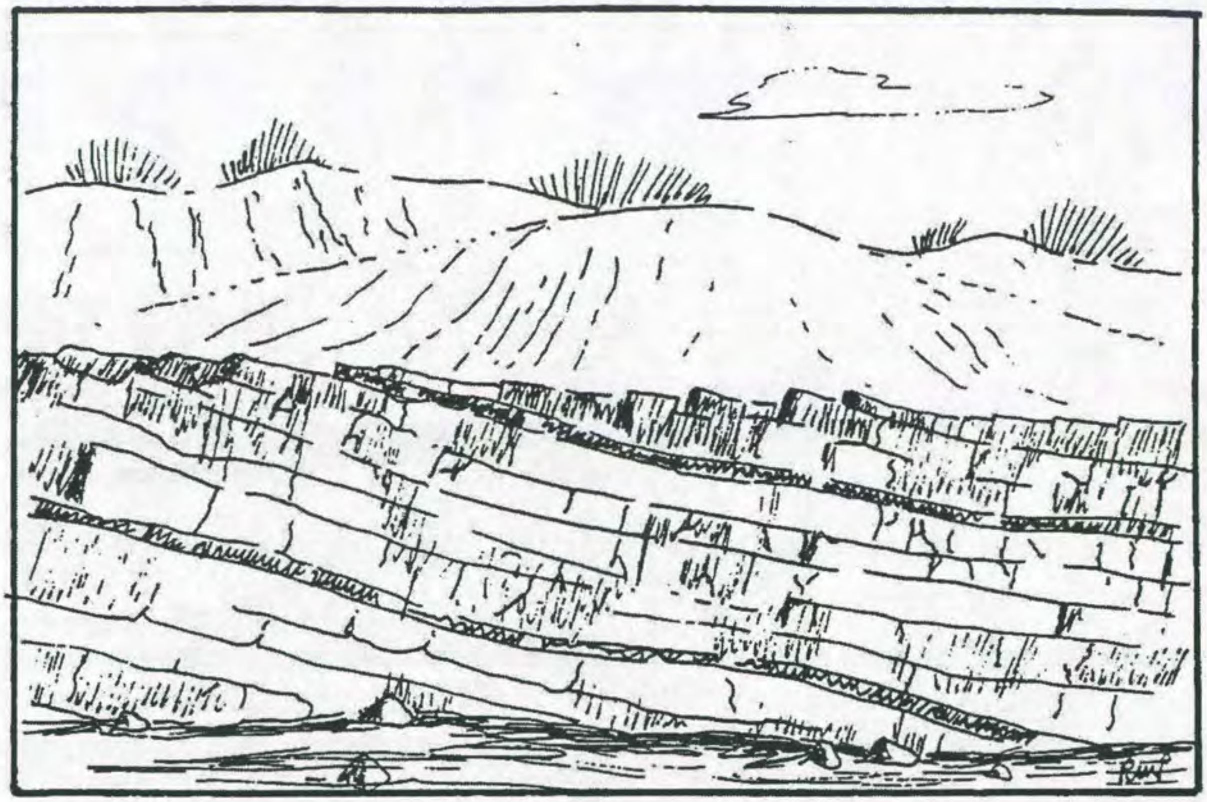


Figure 5.1

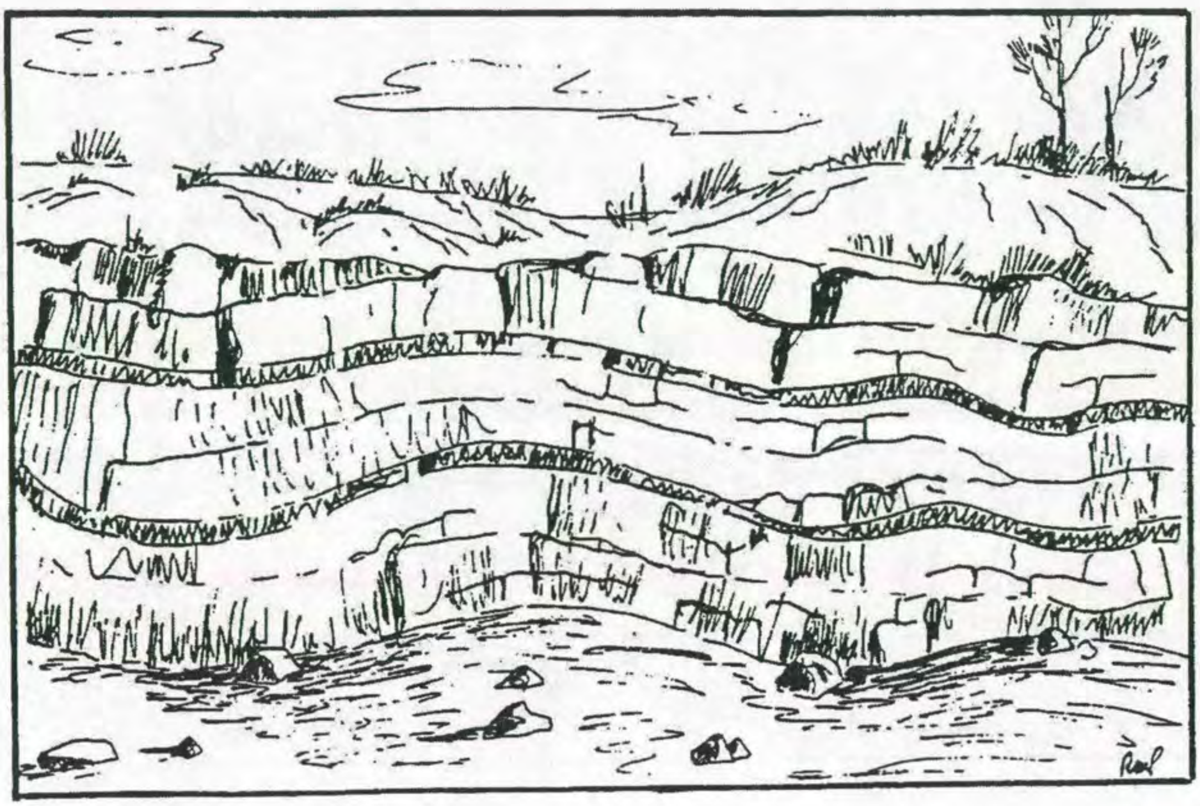


Figure 5.2

commonly as much as 2.438 m (8 ft.) over a lateral distance of 30.48 m (100 ft.) (Figure 5.2). When either situation occurs, a flat lying quarry floor will cut across beds that may not be of the quality level required for the aggregate product becoming made. Proper ledge control might require that a quarry floor be raised, lowered, or worked at an angle in order to insure the production of complying material.

True faults, fractures in bedded rock accompanied by differential movement in the fault zone, are not common, but there are a few. A quarry ledge crossing a fault will suddenly be working different beds depending on the amount of movement that occurred along the fault (Figure 5.3). This can be a problem depending on the nature of new beds incorporated into the ledge. Often, large blocks will exhibit minor slippage along the vertical joints and appear as small faults in a quarry face. These are the most common in the Galena Group and Cedar Valley Formation, both of which have massive rock units with well developed joint systems.

Deleterious Materials

Ground water moving along vertical joints and horizontal bedding planes has often left large void spaces in the rock. These are frequently filled with clay or other materials that were available to the moving ground water (Figure 6.1). Occasionally so much foreign material will be in the rock that it cannot be used for aggregate purposes. Some rock became contaminated with clay or shale during deposition. This is the case with the Silurian reefs found in eastern Iowa. Ordinarily, the rock is of high quality, but the contained clay pockets can become very troublesome (Figure 6.2). The clay content of aggregate being produced from this type of rock should be

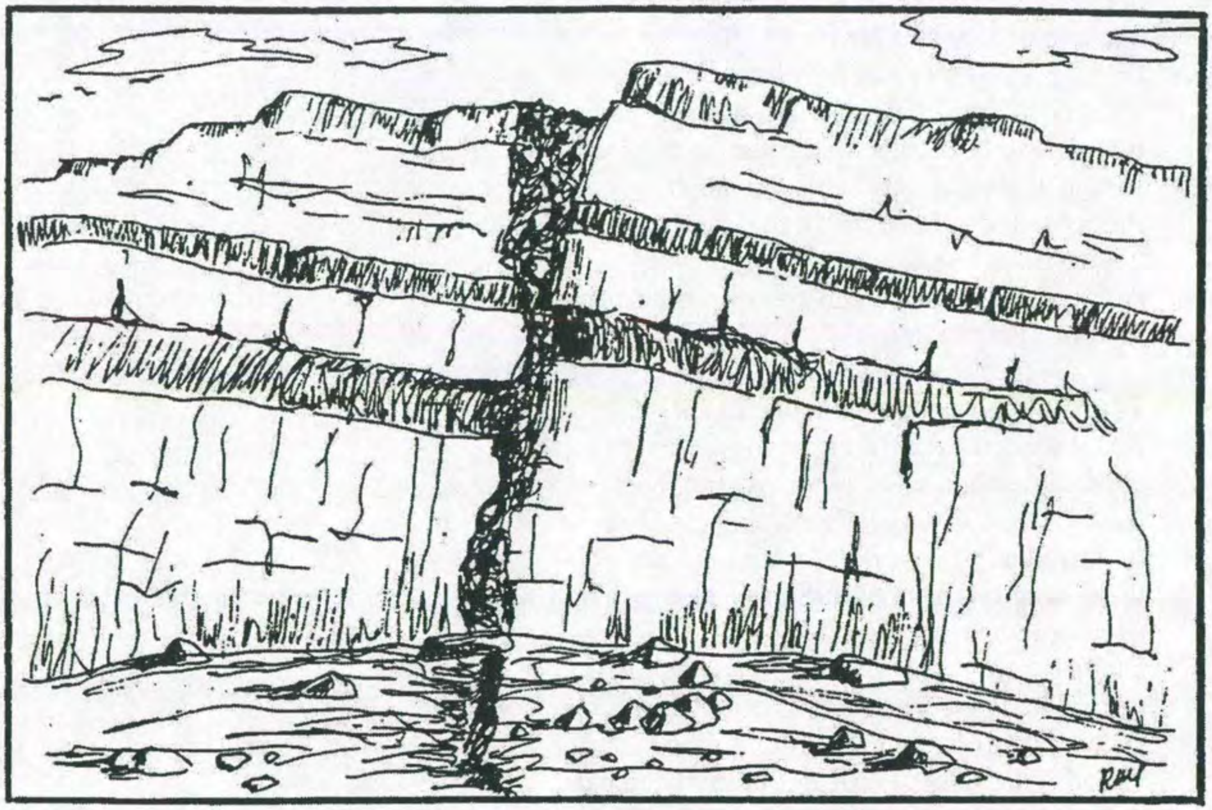


Figure 5.3

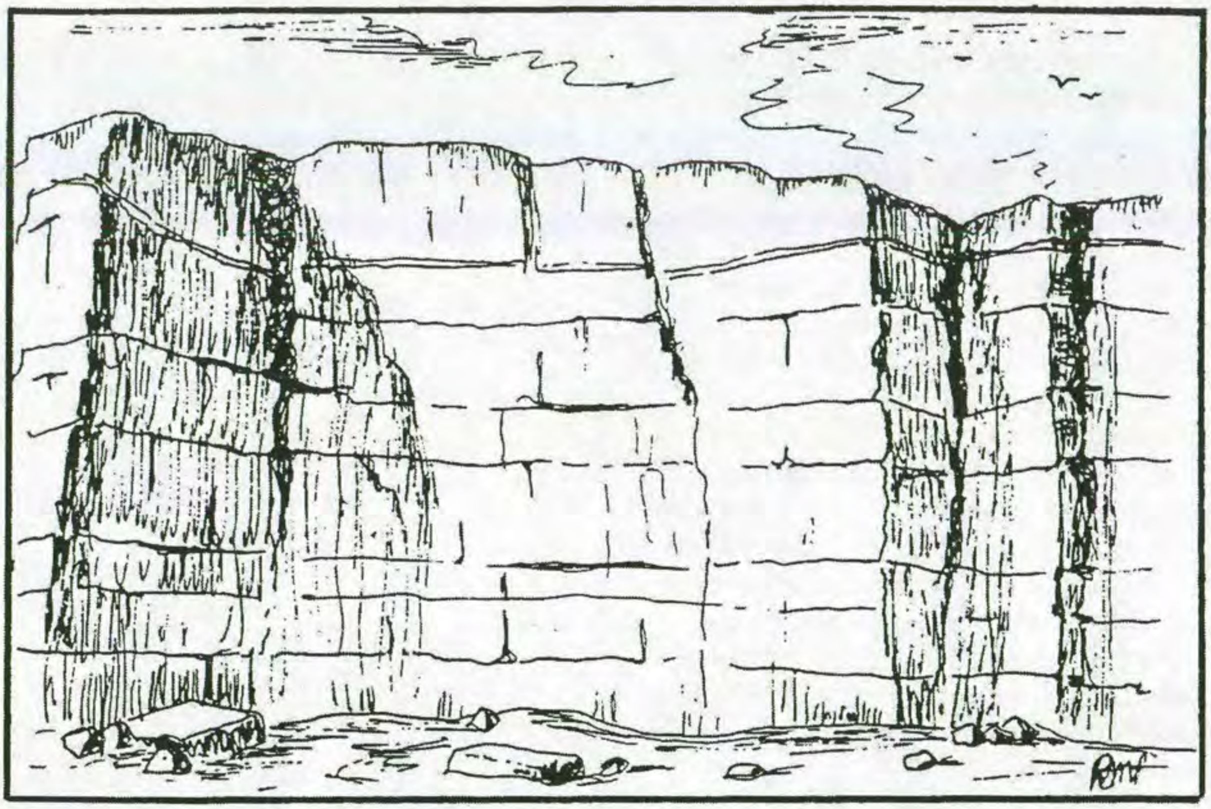


Figure 6.1

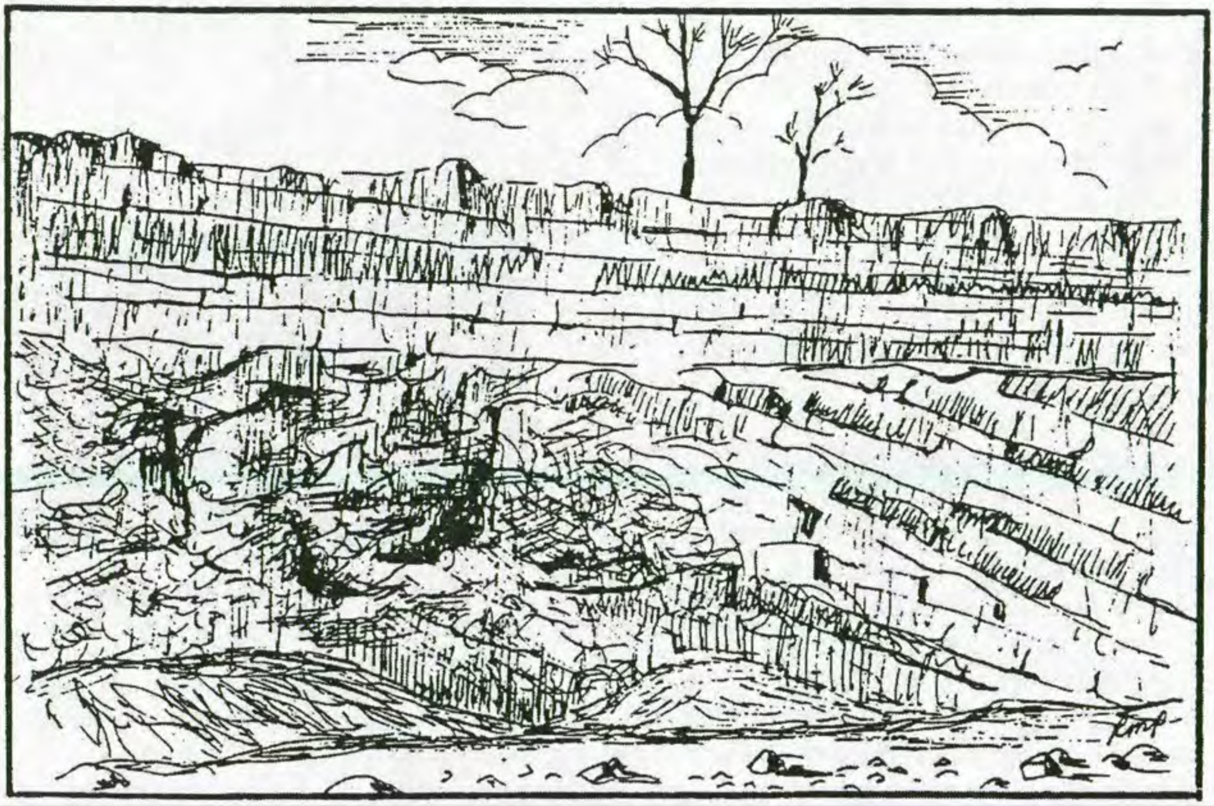


Figure 6.2

monitored closely when there are limits placed on clay lumps, clay balls, etc.

Production Changes

Some products can be made at certain quarries only by beneficiating or treating the material in order to improve its properties during the manufacturing process. For instance, when a quarry ledge consists of beds with argillaceous partings on the bedding planes, the removing or scalping of the minus 19 mm (3/4 in.) from the primary crusher may remove enough of this material to substantially improve the soundness of the final product. These situations should be documented in the source files, so that any future production employs equal or better methods of product beneficfation.

Sand and Gravel Pits

Sand- *Granular material almost entirely passing the No. 4 sieve and predominantly retained on the No. 200 sieve.*

Sand and gravel pits are granular deposits located in areas where moving water has concentrated the sand and gravel-size particles in sufficient quantity. They are generally in or adjacent to the many streams and rivers in Iowa or in glacial outwash deposits where the melting ice generated the water flow necessary to form sand and gravel deposits. There are many factors, which can cause quality changes in sand and gravel pits, but only the main points will be covered.

Flowing water deposits material only in relation to the load it carries (always changing) and its velocity and direction. Most deposits are accumulations over long time periods under a variety of conditions. Consequently, the deposit can be alternately coarse or fine, dirty or clean. Thus a greater degree of dependence is placed on the production methods and equipment to give a uniform quality product than in the case of crushed stone.

Gravel Pit Face: Note how the gravel is deposited in layers of coarse and fine with areas containing high shale, etc. Important for the producer to process this type of source properly to maintain consistent quality and gradation (i.e. using a dozer to work the entire exposed face to blend the material before it is processed at the plant.

Any change in production equipment or methods, in the area or depth of working, or in the appearance of the product should be noted since any one could signal a changed quality level in the final product. Most gravel coarse aggregate perform only moderately well in pavement because, despite containing relatively high percentages of extremely durable igneous materials, they also contain significant percentages of good to poor quality limestone, and of course, the cherts, iron spalls, shale particles, and other objectionable materials that frequently cause gravel pavements to have a poor appearance. Held within the specified limits, the objectionable materials will not affect the durability of pavement.

The quality of the limestone fraction, however, can affect the durability of pavement. Consequently, very few gravel coarse aggregates comply with the durability requirements for use in pavements on the primary highway system. When necessary, gravel coarse aggregates can be separated and tested according to rock type using a modification of the ASTM Standard Recommended Practice for Petrographic Examination of Aggregates for Concrete. This can be extremely helpful in identifying the types and amounts of poor quality materials present.

NOTES

Section V

Sieve Analysis

General Requirements

Aggregate sieve analysis procedures are governed by the Standard Specifications of the Iowa Department of Transportation and the Materials Office Instructional Memorandum Manual. The applicable test methods in the Materials Manual are included primarily in the 300 series under the subsection "Aggregate."

Sieve analysis is nothing more than the separation of a material based on particle size. For example, material that passes a 38.1 mm (1 ½ in.) sieve and is retained on a 25.4 mm (1 in.) sieve would not contain any particle larger than 38.1 mm (1 ½ in.) nor smaller than 25.4 mm (1 in.). Sieves are normally arranged in a "nest" with the largest wire opening at the top of the nest and the smallest at the bottom.

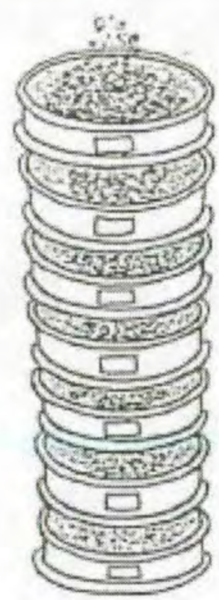
Iowa Department of Transportation Standard Specifications normally set limits on the percent passing a given sieve. The percent of the total weight retained on each sieve must be found first.

Coarse Aggregate Sieves

SI Units	US Units
37.5 mm	1 ½ inch
25.0 mm	1 inch
19.0 mm	¾ inch
12.5 mm	½ inch
9.50 mm	3/8 inch
4.75 mm	No. 4 (0.187 inch)

Fine Aggregate Sieves

SI Units	US Units
4.75 mm	No. 4 (0.187 in.)
2.36 mm	No. 8 (0.0937 in.)
1.18 mm	No. 16 (0.0469 in.)
0.600 mm	No. 30 (0.0234 in.)
0.300 mm	No. 50 (0.0117 in.)
0.150 mm	No. 100(0.0059 in.)



To calculate percent retained on any sieve, merely divide the weight retained by the original dry weight of the sample and multiply by 100. The percent passing each sieve is then determined from the percent-retained column.

Percent retained =

$$\frac{\text{Weight retained}}{\text{Original Dry Weight}} \times 100$$

NOTES

METHODS OF REDUCING AGGREGATE FIELD SAMPLES TO TEST SAMPLES

SCOPE

This method outlines the proper procedure for reducing an aggregate sample to the proper test sample size.

PROCEDURE

The sample for testing should be approximately of the mass (weight) desired, conforming to the sample size for the material as indicated by Materials IM 301. The test sample must be the end result of the sample reduction method. Do not attempt to select a sample to an exact predetermined mass (weight).

I. SPLITTING METHOD

A. Apparatus

1. Sample splitter (conforming to equipment requirements of AASHTO T248-95).
2. Three catch pans
3. Wide, flat-edged scoop

B. Sample Preparation

1. The sample shall be dry enough to allow free flow of the aggregate through the chutes.

C. Test Procedure

1. Place the field sample on a hard, clean surface, such as a counter-top, concrete floor, or in a large, flat pan.
2. Thoroughly mix the field sample until it appears homogenous.
3. Place a catch pan under the chutes on each side of the splitter.
4. Place increments of the field sample on the wide, flat-edged scoop and uniformly distribute it from edge to edge, so when it is introduced into the chutes, approximately equal amounts will flow through each chute.
5. Repeat the above step until the entire field sample has been introduced into the chutes. It may be necessary to use a brush to collect the fine material of the sample for splitting.

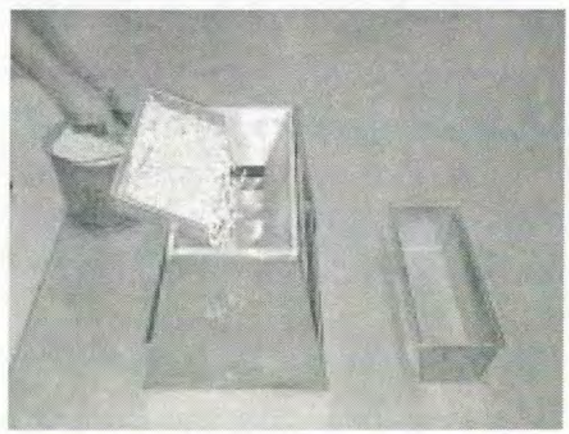
6. The rate at which the sample is introduced shall be such as to allow a free flow of material from the scoop and through the chutes into the catch pans below.

7. Use the material contained in one of the catch pans and repeat the previous steps until the sample is reduced to the desired size. Be sure to split entire increments during this procedure.

D. General Comments

1. If the catch pans are equal to, or slightly less, than the total combined width of the riffle chutes, they may be used to place the material through the splitter in lieu of using the scoop. Do not use containers longer than the combined width of the riffle chutes to avoid overloading the end chutes.

2. Use the size of sample splitter best suited for the maximum particle size of the aggregate to be tested. Generally use the splitters with 1 in. (25 mm) riffle openings for aggregates with a 3/4 in. (19 mm) maximum particle size, and the splitters with 2 in. (50 mm) openings for samples containing larger particle sizes 1 3/4 in. (45 mm). Samples of material with particles larger than 1 3/4 in. (45 mm) shall be quartered. (See IV. Below.)



II. MECHANICAL SPLITTER METHOD

A. Apparatus

1. Mechanical Sample Splitter

2. Ten Catch Pans

3. Buckets

4. Shovel

B. Sample Preparation

1. The sample shall be dry enough to allow free flow of the aggregate through the chutes.

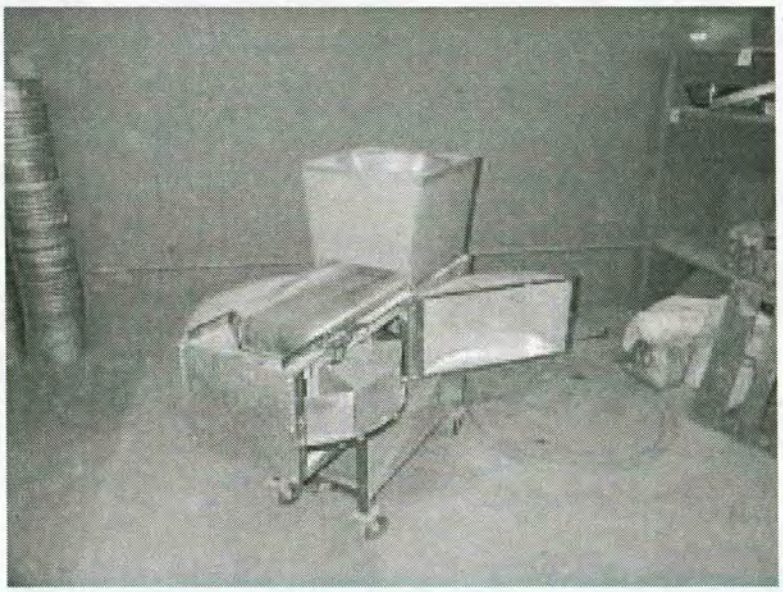
C. Test Procedure

1. Place the ten small pans of the splitter in the appropriate area of the splitter.

2. Place the entire field sample in buckets. Turn on the splitter and pour material slowly into the top of the hopper.

3. Complete the pouring of the entire field sample into the hopper (catch pans will hold one bag without overflowing). If more than one bag is used, you will have to pour each catch pan into separate, larger containers and then resume splitting. It may be necessary to use a brush to collect the fine material of the sample.

4. Use all of the material contained in one or more of the catch pans to obtain the desired size.



III. MINIATURE STOCKPILE METHOD (Fine Aggregate Only)

A. Apparatus

1. Shovel

2. Small scoop

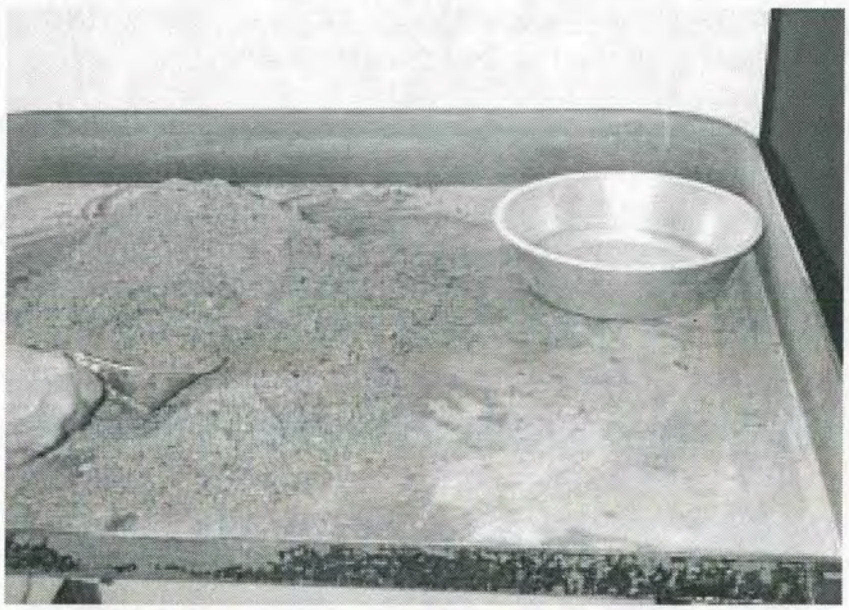
B. Sample Preparation

1. This sample reduction method is only for fine aggregate samples in moist condition. Fine aggregates, which are in a substantially surface-dry condition or drier, should be reduced with a sample splitter.

C. Test Procedure

1. Place the moist field sample on a hard, clean, level and non-absorbent surface. Thoroughly mix the sample with the shovel and form a "miniature stockpile."

2. Obtain the test sample by selecting at least five increments of material at random locations from the miniature stockpile using the scoop.



IV. QUARTERING METHOD

A. Apparatus

1. Shovel (square-nosed)

2. Brush

3. Quartering Device (optional)

B. Test Procedure

1. Place the sample on a hard, clean, smooth surface where there will be neither loss of material from the sample, nor the accidental addition of foreign material.

2. Mix the sample thoroughly by turning the entire lot over three times with a shovel. With the last turning, shovel the entire sample into a conical pile by depositing each shovelfull on top of the preceding one.

3. Carefully flatten the conical pile to a uniform thickness and diameter by pressing down the apex with the shovel, so each quarter will contain the amount of material originally in it.

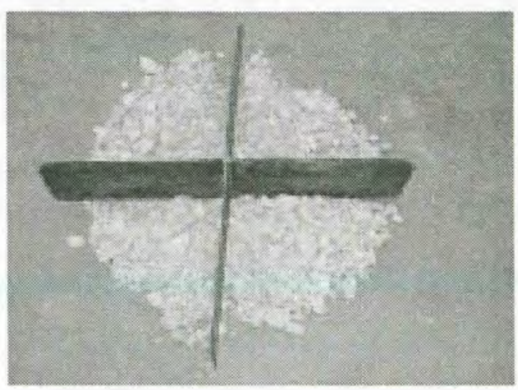
4. Mark the flattened mass (weight) into quarters (or use the quartering device) by two lines that intersect at right angles at the center of the pile.

5. Remove two diagonally opposite quarters and brush the cleared spaces clean, placing the brushed, fine aggregates into the removed quarters.

6. Sucessively mix and quarter the remaining materials as above, until the sample is reduced to the desired size, with the two remaining quarters giving the sample for the test.

C. General Comments

1. The quartering method is not recommended for sample reduction of coarse aggregate due to potential problems with segregation. This method should only be used when use of a sample splitter is not possible.



NOTES

SIEVE ANALYSIS OF AGGREGATES

SCOPE

This method of test covers the procedure for determination of the particle size distribution of aggregates.

PROCEDURE

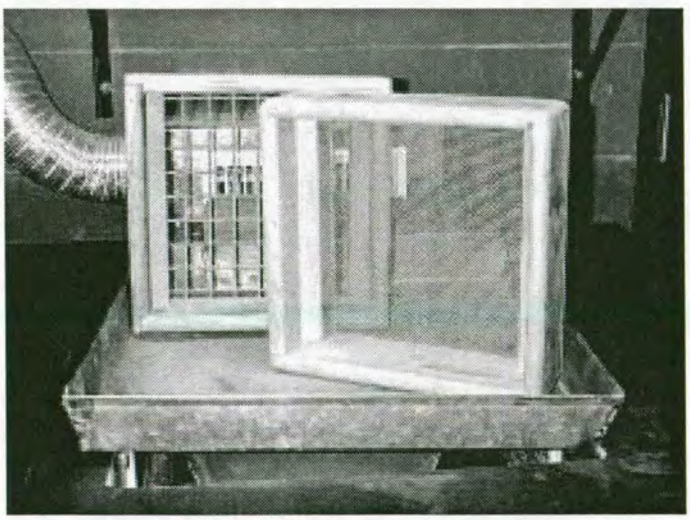
A. Apparatus

1. Balance accurate to within 0.1 percent of weight (mass) of the sample to be tested. **NOTE:** The balance shall be reset to zero before each weighing.

2. Sieves with square openings mounted on substantial frames are constructed in such a manner to prevent loss of material during sieving. Use suitable sieve sizes to furnish the information required by the specifications covering the material to be tested. The woven wire cloth shall conform to AASHTO M-92. This will normally consist of a set of each of the following:

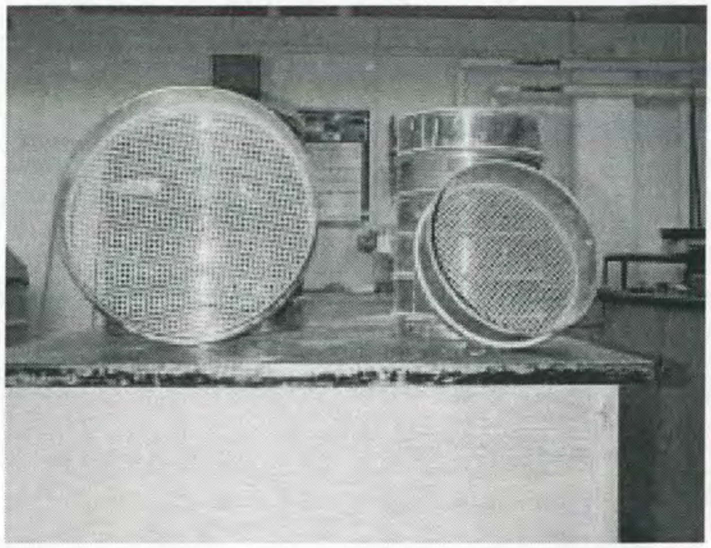
Box Sieves for testing coarse aggregates consisting of the following sizes:

37.5 mm (1 1/2-in.)	19 mm (3/4-in.)	4.75 mm (#4)
25 mm (1-in.)	12.5 mm (1/2-in.)	2.36 mm (#8)
	9.5 mm (3/8-in.)	



203 mm (8 in.) Diameter Sieves for testing fine aggregates consisting of the following sizes:

4.75 mm (#4)	1.18 mm (#16)	150 µm (#100)
2.36 mm (#8)	600 µm (#30)	75 µm (#200)
	300 µm (#50)	Pan



A set of **305 mm (12 in.) Diameter Sieves** may be used for testing fine aggregate or aggregate containing both coarse and fine material.

3. Mechanical and hand-powered sieve shakers

4. Drying oven or stove

5. Fiber bristle sieve cleaning brush (similar to stencil brush or cropped paintbrush)

B. Test Sample

1. Test samples for sieve analysis shall conform to the sample size for the applicable material as indicated by Materials IM 301.

2. Obtain the sample for sieve analysis (test sample) from the material to be tested (field sample) by the appropriate method as outlined in Materials IM 336. The test sample shall be approximately of the weight (mass) desired when dry and must be the end result of the reduction. Reduction to an exact predetermined weight (mass) shall not be permitted.

C. Preparation of Sample

1. When a determination of the amount of material passing the #200 (75 µm) sieve is required, the test sample must first be subjected to Materials IM 306, Determining the Amount of Material Finer Than the #200 (75 µm) Sieve. Coarse aggregates may have a *separate* "wash" sample of the appropriate size (per IM 306) *reduced* from the remaining portion of the field sample, per IM 336.

2. Coarse aggregates, which have changes in moisture for different particle sizes, must be dried to a constant weight (mass). When the absorbed moisture stays essentially the same for different particle sizes the sample may be sieved at a surface-dry condition (no free water present).

   NOTE: Material from crushed composite (HMA/PC) pavements shall be sieved at a surface-dry condition using no artificial heat. No gradation determination will be made for material finer than the #8 (2.36 mm) sieve. For material made from crushed PC pavement, determination of the percent passing the #200 sieve may be required. In some instances, larger particles may be coated to the extent that dry sieving will not accurately reflect the true gradation of the material. In these instances, the air-dried sample must be washed over the #8 (2.36 mm) sieve and allowed to come to a surface-dry condition by air-drying. The total percent passing this sieve is the sum of the washing loss and pan after dry sieving divided by the original (air) dry/weight (mass). Coated particles may also be a problem with some virgin aggregate material (e.g., Class D crushed stone, etc.). When this condition exists, the material shall be dried to a constant weight (mass), washed over the smallest sieve for which there is a specification requirement, and dried again. The total percentage passing this sieve is a combination of the washing loss and the amount passing the sieve obtained by dry sieving the washed sample divided by the original dry weight (mass).

D. Test Procedure

1. Weigh and record the weight (mass) of the test sample as the Original Dry Mass.

2. Sieve the sample over the required sieves. The sieving operation must be accomplished by using a lateral and vertical motion of the sieve(s), accompanied by a jarring action, which keeps the sample moving continuously over the surface of the sieve. Do not attempt to turn or manipulate the aggregate particle through the sieve openings by hand.

   When using a mechanical sieve shaker, excessive sieving times may result in degradation of the sample.

   The sieving operation may be considered complete when not more than 0.5 percent by weight (mass) of the original sample passes any sieve during an additional one minute of hand-sieving.

   a. On the #4 (4.75 mm) and larger sieves, limit the amount of material carried on the sieve to a single layer when determining sieving to completion.

b. Overloading of the 8 in. (203 mm) and 12 in. (305 mm diameter sieves, #4 (4.75 mm) and smaller, must be avoided to allow for sieving to completion. The weights retained should not exceed the following:

8 in. (203 mm) diameter sieves		12 in. (305mm) diameter sieves	
#4 (4.75 mm) and smaller	200 grams	#4 (4.75 mm)	850 grams
		#8 (2.36mm) and smaller	450 grams

If sieving to completion (as described above) is not readily accomplished, reduce the amount of material carried on the sieve.

c. When the aggregate being tested has a mixture of coarse and fine material, the portion of the sample finer than the #4 (4.75 mm) sieve may be distributed among two or more sets of sieves to prevent overloading of individual sieves. Alternately, the portion passing the #4 (4.75 mm) sieve may be reduced to a minimum of 500 grams using a mechanical splitter according to IM 336. If this procedure is followed, compute the weight (mass) of each size increment of the original sample as follows:

$$A = \frac{W1}{W2} \times B$$

Where:

A = calculated weight (mass) of the material retained on each sieve based on the total sample weight (mass).

W1 = weight (mass) of the total amount of material passing the #4 (4.75 mm) sieve.

W2 = weight (mass) of the reduced, minus #4 (4.75 mm) sieve material.

B = weight (mass) of the reduced sample material retained on each sieve.

NOTE: This method is recommended when using 8 in. (203 mm) diameter sieves to test the fine aggregate portion of a sample when overload is anticipated. If using 12 in. (305 mm) sieves and the original test sample is reasonably close to the required weight (mass), overload should not occur. When sieve overload is anticipated on the #8 (2.36 mm) sieve only, sieve the original sample through the #8 (2.36 mm) box sieve before placing the fine portion in the nest of 8 in. (203 mm) round sieves.

3. Clean the retained material from each sieve for weighing. Remove as much material as practical without damaging the wire cloth. Particles may be removed most readily from a sieve by inverting the sieve over a pan and tapping the sieve by hand and/or pushing (without force) the particles out of the mesh into the pan. Care must be taken while cleaning the sieves, so no damage occurs to the wire mesh by bending or breaking the wires. A fiber-bristle brush should be used for cleaning the #16 (1.18 mm), #30 (600 µm), and #50 (300 µm) sieves. Do not use a brush or any external force on the wire cloth to attempt cleaning the #100 (150 µm), or #200 (75 µm) sieves. If clogging of the mesh occurs on these finer sieves,. they should be sent to the District Materials Laboratory for cleaning.

4. Weight the fraction of material retained on each sieve and in the pan, to at least the nearest 0.5 gram and record. Total the weight (mass) of the material retained on the sieves and in the pan.

5. An accuracy check must be made comparing the weight (mass) of the material before sieving to the total weight (mass) after sieving. The total of the weights retained on the sieves and in the pan must be within 0.5 percent of the Original Dry Mass by washing.

   When the percent finer than the #200 (75µm) sieve is <u>not</u> determined:

$$\frac{\text{Total}}{\text{Original Dry Mass}} \times 100 = \text{Tolerance (99.5 to 100.5)}$$

   When the percent finer than the #200 (75 µm) sieve is determined by washing (IM 306):

$$\frac{\text{Total - Washing Loss}}{\text{Dry Mass Washed}} \times 100 = \text{Tolerance (99.5 to 100.5)}$$

   If the difference exceeds the 0.5 percent tolerance, check all the calculations, the sieves for retained material and the balance for proper care. If needed, weigh each increment of material retained again. If the error cannot be found, the test is void and a new sample shall be tested.

E. Calculations

1. Divide the weight (mass) of the material retained on each sieve, and in the pan, by the Original Dry Weight (mass) of the sample. When computing the percent retained of a **washed** sample the sum of the washing loss and pan weight (mass) shall be divided by the Original Dry Weight (mass). Computation shall be carried out to the nearest 0.1 percent when determining percent retained and the consequent percent passing.

2. The percent-retained column should equal 100 percent when totaled. Because the weight (mass) of material retained on the sieves may not equal the Original

Dry Weight (mass), the total of the percentages retained may not equal 100 percent. If this occurs, the percentages retained should be altered by prorating on the larger quantities, so they do equal 100 percent.

3. The percent passing is then determined by subsequent subtraction starting with the sieve which had no material retained (100 percent passing).

4. Sieve analysis results are to be reported in terms of percent passing and recorded to two significant figures, i.e., to the nearest whole percent for percentages above 10.0 and to the nearest tenth of a percent for lower results.

Form 820180ex 11-01

Lab. No.:	Example #1 Coarse Aggregate		
Material:		Grad. No.:	
Co. & Proj.#:			
Producer:			
Contractor:			
Sampled By:		Date:	
Sample Loc.:			

Original Dry Mass:	5793	Total Minus 4.75 mm (W1):	
Dry Mass Washed:		Reduced Minus 4.75mm(W2)	
Washing Loss:		Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")				100.0	
25mm (1")		577	10.0	90.0	
19mm (¾)		1068	18.4	71.6	
12.5mm (½")		1446	25.0	46.6	
9.5mm (⅜")		1383	23.9	22.7	
4.75mm (4)		1082	18.7	4.0	
2.36mm (8)	(B)	141 (A)	2.4	1.6	
1.18mm (16)	(B)	(A)			
600μm (30)	(B)	(A)			
300μm (50)	(B)	(A)			
150μm (100)	(B)	(A)			
75μm (200)	(B)	(A)		0.8	
Wash			1.6		
Pan	(B)	93 (A)			
Total		5790	100.0		
Tolerance		99.9			

Wash Sample	Original Dry Mass:	2571.0
	Dry Mass Washed:	2555.0
	Washing Loss:	16.0

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 μm (200)			0.8	
Wash	16.0	0.8		
Pan	4.0			

Date Reported:	Cert No.:
Tested By:	

Comments: ______________________________

Form 820180ex 11-01

Lab. No.:	Example #2 – Fine Aggregate	
Material:		Grad. No.: 1
Co. & Proj.#:		
Producer:		
Contractor:		
Sampled By:	Date:	
Sample Loc.:		

Original Dry Mass:	594.0	Total Minus 4.75 mm (W1):	
Dry Mass Washed:	591.5	Reduced Minus 4.75mm(W2)	
Washing Loss:	2.5	Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")					
19mm (¾)					
12.5mm (½")					
9.5mm (⅜")				100.0	
4.75mm (4)		29.0	4.9	95.1	
2.36mm (8)	(B)	64.5 (A)	10.9	84.2	
1.18mm (16)	(B)	102.0 (A)	17.2	67.0	
600µm (30)	(B)	181.5 (A)	30.6(30.7)	36.3	
300µm (50)	(B)	154.5 (A)	26.0(26.1)	10.2	
150µm (100)	(B)	51.0 (A)	8.6	1.6	
75µm (200)	(B)	6.0 (A)	1.0	0.6	
Wash		2.5	0.6		
Pan	(B)	1.0 (A)			
Total		592.0	99.8(100.0)		
Tolerance		99.7			

Wash Sample		
	Original Dry Mass:	
	Dry Mass Washed:	
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 µm (200)				
Wash				
Pan				

Date Reported:	Cert No.:
Tested By:	

Comments: ______________________

Fineness Modulus Calculation
For Concrete Sand (Grad. #1 – Spec. 4110)
AASHTO T27 – 93

Iowa DOT has specified that sand produced for use in Portland Cement Concrete should have a Fineness Modulus of 2.75 or higher. The specification also requires an annual test for Mortar Strength be performed on sand meeting the Fineness Modulus requirements. The Materials Engineer may require more samples be submitted for Mortar Strength testing if the Fineness Modulus fails to meet the 2.75 or more requirement.

The Fineness Modulus is simply a calculation based on the 'cumulative' percent **retained** from the sieve analysis sample.

Starting with the largest sieve retaining any material, add the **cumulative** percents retained on each sieve through the #100 sieve and divide this total by 100. the result is reported to the nearest 0.01%.

Note: The percent retained on the #200 sieve is not calculated in determining the Fineness Modulus.

Example

Sieve	Percent Retained	Cumulative Percent Retained
3/8"	0	0
#4	3.6	3.6
#8	16.9	20.5
#16	19.6	40.1
#30	23.4	63.5
#50	26.1	89.6
#100	9.5	99.1

Total Cumulative Percent Retained = 316.4

316.4 ÷ 100 = 3.16 Fineness Modulus

Form 820180ex 11-01

Lab. No.:	Example #3 – Combined Agg.		
Material:		Grad. No.:	
Co. & Proj.#:	(Using Box and 8" sieves)		
Producer:			
Contractor:			
Sampled By:		Date:	
Sample Loc.:			

Original Dry Mass:	2457.2	Total Minus 4.75 mm (W1):	2115.7
Dry Mass Washed:	2410.5	Reduced Minus 4.75mm(W2)	537.2
Washing Loss:	46.7	Conversion Factor: W1/W2	3.9384
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")				100.0	
19mm (¾)		14.6	0.6	99.4	
12.5mm (½")		45.9	1.9	97.5	
9.5mm (⅜")		81.0	3.3	94.2	
4.75mm (4)		154.0	6.3	87.9	
2.36mm (8)	57.6 (B)	226.9 (A)	9.2	78.7	
1.18mm (16)	93.0 (B)	366.3 (A)	14.9	63.8	
600μm (30)	176.3 (B)	694.3 (A)	28.3(28.4)	35.4	
300μm (50)	172.5 (B)	679.4 (A)	27.6	7.8	
150μm (100)	32.7 (B)	128.8 (A)	5.2	2.6	
75μm (200)	3.9 (B)	15.4 (A)	0.6	2.0	
Wash		46.7	2.0		
Pan	0.8 (B)	3.2 (A)			
Total	536.8	2456.5	99.9(100.0)		
Tolerance	99.9	100.0			

Wash Sample	Original Dry Mass:	
	Dry Mass Washed:	
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 μm (200)				
Wash				
Pan				

Date Reported:		Cert No.:
Tested By:		

Comments: ______________________________

Lab. No.:	Example #4 – Combined Agg.		
Material:		Grad. No.:	
Co. & Proj.#:	Using 12" sieves		
Producer:			
Contractor:			
Sampled By:		Date:	
Sample Loc.:			

Original Dry Mass:	2051.2	Total Minus 4.75 mm (W1):	
Dry Mass Washed:	2011.4	Reduced Minus 4.75mm(W2)	
Washing Loss:	39.8	Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")				100.0	
19mm (¾)		26.8	1.3	98.7	
12.5mm (½")		80.7	3.9	94.8	
9.5mm (⅜")		55.1	2.7	92.1	
4.75mm (4)		182.7	8.9	83.2	
2.36mm (8)	(B)	229.7 (A)	11.2	72.0	
1.18mm (16)	(B)	362.8 (A)	17.7	54.3	
600μm (30)	(B)	610.5 (A)	29.8	24.5	
300μm (50)	(B)	377.1 (A)	18.4	6.1	
150μm (100)	(B)	72.2 (A)	3.5	2.6	
75μm (200)	(B)	10.2 (A)	0.5	2.1	
Wash		39.8	2.1		
Pan	(B)	3.4 (A)			
Total		2051.0	100.0		
Tolerance		100.0			

Wash Sample	Original Dry Mass:	
	Dry Mass Washed:	
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 μm (200)				
Wash				
Pan				

Date Reported:	Cert No.:	
Tested By:		

Comments: ____________________

NOTES

DETERMINING THE AMOUNT OF MATERIAL FINER THAN THE #200 (75 µm) SIEVE IN AGGREGATE

SCOPE

This test method outlines the procedure for determining the quantity of material finer than a #200 (75 µm) sieve by washing and dry sieving.

PROCEDURE

A. Apparatus

1. A #200 (75 µm) sieve (wash sieve)
2. A wash pan large enough to prevent loss of water and material
3. Oven or drying stove
4. Balance accurate to 0.1 percent of the sample mass (weight)
5. A set of 8-in. (203-mm) or 12-in. (305-mm) sieves for dry sieving

B. Test Sample

1. Select the test sample from the material to be tested by an appropriate method as outlined in Materials IM 336.
2. When determination of specification compliance is needed on each or any of the following sieves: #16 (1.18 mm), #30 (600 µm), #50 (300 µm), or #100 (150 µm), subject the entire sample to this test procedure.
3. When determination of specification compliance is needed for only the amount of material finer than the #200 (75 µm) sieve, reduce the remaining portion of the field sample from which the original test sample was selected, by the appropriate method as outlined in IM 336. A representative sample, sufficient to yield not less than the appropriate mass of dried material, as shown in the following table shall be selected:

Sieve Analysis Sample Mass (Weight) kg (See Materials IM 301)	Appropriate Minimum Mass (Weight) kg of Sample
5.0 kg	2.5 kg
3.5 kg	2.5 kg
2.0 kg	1.0 kg
1.5 kg	*
1.0 kg	*
0.5 kg	*
0.2 kg	*

*Use entire sample.

C. Test Procedure

1. Place the sample in the oven at 230˚F (110˚C) or on the stove and dry to a constant mass (weight). Care must be taken in drying the sample to avoid overheating causing the sample to "pop" or "sputter."

2. Allow the sample to cool, weigh and record as the Original Dry Mass (Weight).

3. Place the sample in the wash pan and add a sufficient amount of water to cover it. A detergent, dispersing agent, or other wetting solution may be added to the water to ensure a thorough separation of fine material from the coarser particles.

4. Agitate the sample vigorously using a rotary motion of the pan for five to ten seconds.

5. Pour off the water through the #200 (75 µm) wash sieve. When washing samples with a high silt content, it may be necessary to vibrate or lightly tap the wash sieve in order to keep the mesh open so the water and the minus #200 (75 µm) sieve material may pass through freely. Repeat this operation until the wash water appears almost clear.

6. Rinse the material retained on the #200 (75 µm) sieve back into the sample and decant as much water as possible by carefully pouring the water through the #200 (75 µm) sieve.

7. Dry the washed sample, allow to cool, weigh and record as the Dry Mass (Weight) of the washed sample.

8. When determining only the amount passing the #200 (75 µm) sieve, screen the sample over the #8 (2.36 mm) sieve and discard the retained material. Place the portion of material passing the #8 (2.36 mm) sieve on a nest of sieves including the #50 (300 µm), #100 (150 µm), and #200 (75 µm) sieves and the pan. The sieves larger than the #200 (75 µm) sieve are included for protection of the #200 (75 µm) sieve. Place the nest of sieves in the mechanical sieve shaker and sieve to completion (normally five minutes or less). Weigh and record only the material retained in the pan.

9. When a complete sieve analysis is required, test the entire sample using the appropriate method as outlined in IM 302.

D. Calculations

$$\% \text{ Passing } 75\ \mu\text{m (\#200) sieve} = \frac{\text{Washing Loss} + \text{Pan}}{\text{Original Dry Mass (Weight)}} \times 100$$

NOTES

GUIDELINES FOR VERIFYING CERTIFIED TESTING RESULTS

GENERAL

Agency field personnel monitor certified testing by contractor and producer personnel on a regular basis. Tolerances given herein are for use as guides to flag test result variations that indicate a possible discrepancy.

TOLERANCES

The tolerances shown in the following listing apply to the difference between certified test results and monitoring test results. When the tolerances are exceeded, an immediate investigation must be made to determine possible cause so that any necessary corrections can be made.

TEST NAME	TEST METHOD	TOLERANCE
Slump of PC Concrete	IM 317	1/4 in. (6 mm)
Air Content of PC Concrete	IM 318	0.4%
Length of Concrete Cores	IM 347	0.10 in. (2 mm)
Free Moisture in Aggregate, By Pycnometer	IM 308	0.2%
Specific Gravity of Aggregate, by Pycnometer	IM 307	0.02
Moisture in Aggregate or Recycled Asphalt Paving, By Hot Plate		0.3%
Density of AC Concrete, by Displacement	IM 321	0.02
Wet Density by Nuclear Gauge, Soils & Bases	IM 334	2.0 lb./ft.^{3} (32 kg/m^3)
Pavement Profile, by 25-foot (7.6-m) Profilograph, Profile Index, in./mi. (mm/km):	IM 341	
Less than 6 in./mi. (93 mm/km)		1 in./mi. (16 mm/km)
6 to 20 in./mi. (93 to 311 mm/km)		2 in./mi. (31 mm/km)
20 to 40 in./mi. (311 to 622 mm/km)		3 in./mi. (47 mm/km)
More than 40 in./mi. (622 mm/km)		5 in./mi. (78 mm/km)

TOLERANCES FOR AGGREGATE GRADATIONS

Determining the precision of an aggregate sieve analysis presents a special problem because the result obtained with a sieve is affected by the quantity of material retained on the sieve and by results obtained on sieves coarser than the sieve in question. Tolerances are, therefore, given for different ranges of percentage of aggregate passing one sieve and retained on the next finer sieve used.

Comparisons of test results are made on each fraction of the sample, expressed in percent that occurs between consecutive sieves.

NOTE: Tolerances for aggregate gradations are only valid if the two tests were made on a split sample. Experience has shown that improper sample reduction, as well as differences in test procedures can contribute to results being out of tolerance. When a comparison exceeds the tolerance limits, a review of the test procedures and equipment will be performed. Where practical, additional comparisons will be done with similar equipment and methods.

Table 1 Tolerances for All Aggregates Except HMA-Combined Aggregate

	Size Fraction Between Consecutive Sieves, %*	Tolerance, %
Coarse Portion: #4 Sieve and larger	0.0 to 3.0	2
	3.1 to 10.0	3
	10.1 to 20.0	5
	20.1 to 30.0	6
	30.1 to 40.0	7
	40.1 to 50.0	9
Fine portion: #8 Sieve and smaller	0.0 to 3.0	1
	3.1 to 10.0	2
	10.1 to 20.0	3
	20.1 to 30.0	4
	30.1 to 40.0	4

Table 2 Tolerances for All HMA-Combined Aggregate

Size Fraction Between Consecutive Sieves, %*	Tolerances
0.0 to 3.0	2
3.1 to 10.0	3
10.1 to 20.0	5
20.1 to 30.0	6
30.1 to 40.0	7
40.1 to 50.0	9

*The monitoring analysis fraction is used to find the proper tolerance.

COMPARISON OF AGGREGATE GRADATIONS

Use of these tolerances is explained in the following examples. Computer spreadsheets to perform the analysis are available on the Iowa DOT Materials Office website. Use of the spreadsheets is preferred when possible. Appendix A contains a copy of the printouts from the spreadsheets.

Example 1 - PC Concrete Coarse Aggregate

Sieve Size	DOT Coarse Aggr Percent Passing	Prod./CPI Coarse Aggr Percent Passing	DOT Coarse Aggr Percent Retained	Prod./CPI Coarse Aggr Percent Retained	Fraction Difference	Applicable Tolerance	Complies
1.5"/37.5mm	100.0	100.0	0.0	0.0	0.0	2	Yes
1"/25.0mm	97.1	99.1	2.9	0.9	2.0	2	Yes
3/4"/19.0mm	72.2	65.1	24.9	34.0	9.1	6	No
1/2"/12.5mm	38.1	34.9	34.1	30.2	3.9	7	Yes
3/8"/9.5mm	12.0	8.8	26.1	26.1	0.0	6	Yes
#4/4.75mm	0.6	0.2	11.4	8.6	2.8	5	Yes
#8/2.36mm	0.5	0.2	0.1	0.0	0.1	1	Yes
Minus #200	0.3	0.2	0.3	0.2	0.1	1	Yes

The size fraction between consecutive sieves is found by calculating the difference between the percent passing reported for the two sieves. For example, the fraction between the 1.5 in. (37.5 mm) and 1 in. (25 mm) sieves for the above monitor test is 100.0 - 97.1 = 2.9%. Between the 1/2 in. (12.5 mm) and 3/8 in. (9.5mm) sieves it is 38.1 – 12.0 = 26.1%. Since nothing passes the pan, the size fraction between the #200 sieve and the pan is equal to the percent passing the #200.

The example shows the fraction between each pair of consecutive sieve sizes for both tests and the difference between these fractions for both tests. The difference is compared with the applicable tolerance to determine a disposition. In this example, a suspect result is found in the fraction between the 1 in. (25 mm) and 3/4 in. (19 mm) sieves. Since the suspect difference is due primarily to the percent passing results on the 3/4 in. (19 mm) sieves, it is these results that should at least be investigated first. Only further investigation can determine which 3/4 in. (19 mm) sieve, if any is faulty.

NOTE: The applicable tolerance changes between #4 and #8 size fractions.

Example 2- PC Concrete Fine Aggregate

Sieve Size	DOT Fine Aggregate Percent Passing	Prod./CPI Fine Aggregate Percent Passing	DOT Fine Aggregate Percent Retained	Prod./CPI Fine Aggregate Percent Retained	Fraction Difference	Applicable Tolerance	Complies
3/8"/9.5mm	100.0	100.0	0.0	0.0	0.0	2	Yes
#4/4.75mm	95.0	95.0	5.0	5.0	0.0	3	Yes
#8/2.36mm	87.8	86.3	7.2	8.7	1.5	2	Yes
#16/1.18mm	72.0	71.5	15.8	14.8	1.0	3	Yes
#30/600um	44.0	43.8	28.0	27.7	0.3	4	Yes
#50/300um	12.2	13.0	31.8	30.8	1.0	4	Yes
#100/150um	1.5	1.3	10.7	11.7	1.0	3	Yes
Minus #200	0.4	0.4	0.4	0.4	0.0	1	Yes

Example 3 - HMA Combined Aggregate

		Sieve Sizes										
		1"	3/4"	1/2"	3/8"	4	8	16	30	50	100	200
	Specs.											
	D.O.T.		100	99.1	87.3	68.8	54.2	41.4	28.2	15.5	9.1	6.9
	Prod./C.P.I.		100	98.8	86.1	74.9	56.1	41.9	28.7	15.1	10.9	8.6

D.O.T. FBR: ______

D.O.T. % Retained	Prod./C.P.I. % Retained	Diff.	Tol. %	Comply (Y/N)
NA	NA	0.0	2	Y
0.9	1.2	0.3	2	Y
11.8	12.7	0.9	5	Y
18.5	11.2	7.3	5	N
14.6	18.8	4.2	5	Y
12.8	14.2	1.4	5	Y
13.2	13.2	0.0	5	Y
12.7	13.6	0.9	5	Y
6.4	4.2	2.2	3	Y
2.2	2.3	0.1	2	Y
6.9	8.6	1.7	3	Y

Sieve Fraction Between Consecutive Sieves, %			Tolerance, %
0.0	To	3.0	2
3.1	To	10.0	3
10.1	To	20.0	5
20.1	To	30.0	6
30.1	To	40.0	7
40.1	To	50.0	9

NOTE: The applicable tolerance for this combined aggregate sample is from Table 2. In this example, the suspect fractions would indicate a possible problem for two pairs of consecutive sieve sizes involving the # 4 (4.75 mm) sieves. This evidence and the difference in the test values found for the # 4 (4.75 mm) sieves, strongly point to an error in one of the # 4 (4.75 mm) sieve results.

When RAP mixes are used, the comparison data is of the composite gradation results and not of the cold feed.

APPENDIX A
PC CONCRETE GRADATION COMPARISON REPORT
(Computer Spreadsheet Available on Iowa DOT Office of Materials Web Site)

Rev 05/03

Iowa Department Of Transportation

Reported Gradation & IM 216 Comparison Report

Form 200

Project No.: ____________________
Contract ID: ____________________
County: ____________________
Contractor/Producer: ____________________
Design No.: ____________________
Coarse Agg. T203 A No.: __________
Fine Agg. T203 A No.: __________
Proper Equipment: __________
Applicable Specs.: __________

Intended Use: ____________________
(Paving, Structure, Patching, Incidental

	Good	Fair	Poor
Care of Equipment:			
Sampling Procedure:			
Splitting Procedure:			
Sieving to Completion:			
Computations:			
Reporting:			

DOT Tested By: ____________________ Cert. No.: __________ Date: __________
Contr./Prod. Tested By: ____________________ Cert. No.: __________ Date: __________

Grad No.	Sample ID	Specs	Sieve Sizes - Percent Passing											
			1 1/2"	**1"**	**3/4"**	**1/2"**	**3/8"**	**#4**	**#8**	**#16**	**#30**	**#50**	**#100**	**#200**
		DOT												
		Contr./Prod.												

Grad No.	Sample ID					**Specs**								
		DOT												
		Contr./Prod.												

Sieves	DOT % Retained	Contr./Prod. % Retained	Diff.	Tol. %	Comply (Y/N)
1 1/2 - 1	NA	NA	0.0	2	Y
1 - 3/4	NA	NA	0.0	2	Y
3/4 - 1/2	0.0	0.0	0.0	2	Y
1/2 - 3/8	0.0	0.0	0.0	2	Y
3/8 - 4	0.0	0.0	0.0	2	Y
4 - 8	0.0	0.0	0.0	1	Y
8 - 200	0.0	0.0	0.0	1	Y
200	0.0	0.0	0.0	1	Y

Coarse Aggregate:

Size Fraction Between Consecutive Sieves, %			Tolerance, %
0.0	to	3.0	2
3.1	to	10.0	3
10.1	to	20.0	5
20.1	to	30.0	6
30.1	to	40.0	7
40.1	to	50.0	9

3/8 - 4	0.0	0.0	0.0	2	Y
4 - 8	0.0	0.0	0.0	1	Y
8 - 16	0.0	0.0	0.0	1	Y
16 - 30	0.0	0.0	0.0	1	Y
30 - 50	0.0	0.0	0.0	1	Y
50 - 100	0.0	0.0	0.0	1	Y
100 - 200	0.0	0.0	0.0	1	Y
200	0.0	0.0	0.0	1	Y

Fine Aggregate:

0.0	to	3.0	1
3.1	to	10.0	2
10.1	to	20.0	3
20.1	to	30.0	4
30.1	to	40.0	4

Remarks: ____

Distribution_______ Central Materials_______ Dist. Materials_______ Contr./Producer_______ Proj. Engineer_______ Technician_______

HMA GRADATION COMPARISON REPORT
(Computer Spreadsheet Available on Iowa DOT Office of Materials Web Site)

Rev 05/03

Iowa Department Of Transportation

Form 201

Reported Gradation & IM 216 Comparison Report

Project No.: ____________________

Contract ID: ____________________ Intended Use: ____________________

County: ____________________

Contractor/Producer: ____________________

Mix Design No.: ____________________

Mix Change (Y/N): ________

Date of Change: ________

Total, % Asphalt (Pb): ________

Effective % Asphalt (Pbe): ________

Proper Equipment: ________

Applicable Specs.: ________

	Good	Fair	Poor
Care of Equipment:			
Sampling Procedure:			
Splitting Procedure:			
Sieving to Completion:			
Computations:			
Reporting:			

DOT Tested By: ____________________ Cert. No.: ________ Date: ________

Contr./Prod. Tested By: ____________________ Cert. No.: ________ Date: ________

			Sieve Sizes - Percent Passing											
			1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#16	#30	#50	#100	#200
		Specs.												
Sample ID		DOT												
Sample ID		Contr./Prod.												

Sieves	DOT % Retained	Contr./Prod. % Retained	Diff.	Tol. %	Comply (Y/N)
1 1/2 - 1	NA	NA	0.0	2	Y
1 - 3/4	NA	NA	0.0	2	Y
3/4 - 1/2	NA	NA	0.0	2	Y
1/2 - 3/8	NA	NA	0.0	2	Y
3/8 - 4	NA	NA	0.0	2	Y
4 - 8	NA	NA	0.0	2	Y
8 - 16	NA	NA	0.0	2	Y
16 - 30	NA	NA	0.0	2	Y
30 - 50	NA	NA	0.0	2	Y
50 - 100	NA	NA	0.0	2	Y
100 - 200	NA	NA	0.0	2	Y
200	NA	NA	0.0	2	Y

DOT Gyratory Filler/Bitumen Ratio

0.00

Sieve Fraction Between Consecutive Sieves, %			Tolerance, %
0.0	To	3.0	2
3.1	To	10.0	3
10.1	To	20.0	5
20.1	To	30.0	6
30.1	To	40.0	7
40.1	To	50.0	9

Remarks: ____________________

Distribution______ Central Materials______ Dist Materials______ Contr./Producer______ Proj. Engineer______ Technician______

QMC GRADATION COMPARISON REPORT

(Computer Spreadsheet Available on Iowa DOT Office of Materials Web Site)

QMC Gradation Correlation I.M. 216

Project No.: ______________________

Contract ID: ____________ Date Sampled: ____________

Plant Name: ______________________ County: ____________ Gradation Date: ____________

Contractor: ______________________ Mix Design Number: ____________ Design No.: ____________

Coarse Agg. Source: ____________ Intermediate Agg. Source: ____________ Fine Agg. Source: ____________

Monitor: ____________ Cert. No.: ____________ Proper Equipment: ____________

C.P.I.: ____________ Cert. No.: ____________ Specification: ____________

Sieve Size	Aggregate Percent	Coarse Aggregate	Fraction Difference	Applicable Tolerance	Complies
1.5" / 37.5mm					
1" / 25.0mm					
3/4" / 19.0mm					
1/2" / 12.5mm					
3/8" / 9.5mm					
#4 / 4.75mm					
#8 / 2.36mm					
Minus #200					

Sieve Size	Aggregate Percent	Intermediate	Fraction Difference	Applicable Tolerance	Complies
1.5" / 37.5mm					
1" / 25.0mm					
3/4" / 19.0mm					
1/2" / 12.5mm					
3/8" / 9.5mm					
#4 / 4.75mm					
#8 / 2.36mm					
Minus #200					

Sieve Size	Aggregate Percent	Aggregate Percent	Fraction Difference	Applicable Tolerance	Complies
3/8" / 9.5mm					
#4 / 4.75mm					
#8 / 2.36mm					
#16 / 1.18mm					
#30 / 600um					
#50 / 300um					
#100 / 150um					
Minus #200					

Care of Equipment	☐ GOOD	☐ FAIR	☐ POOR
Sampling Procedure	☐ GOOD	☐ FAIR	☐ POOR
Splitting Procedure	☐ GOOD	☐ FAIR	☐ POOR
Sieving to Completion	☐ GOOD	☐ FAIR	☐ POOR
Computations	☐ GOOD	☐ FAIR	☐ POOR
Reporting	☐ GOOD	☐ FAIR	☐ POOR

Comments: ______________________

cc: ______________________

NOTES

METHOD OF TEST FOR SPECIFIC GRAVITY OF AGGREGATES (FIELD PROCEDURES FOR LABORATORY TEST METHOD 201)

SCOPE

This method describes two procedures used for determining the bulk specific gravity of aggregates proposed for use in Portland Cement Concrete.

PROCEDURE A – SPECIFIC GRAVITY OF AGGREGATES USING A PYCNOMETER

A. Apparatus

1. Balance having a capacity of at least 5,000 grams, accurate to 0.5 grams

2. Pycnometer – a fruit jar supplied with a gasket and conical pycnometer top. A two-quart pycnometer is used for coarse aggregates, and a one-quart pycnometer is used for fine aggregate. If a two-quart pycnometer cannot be obtained, a one-quart jar may be substituted(The engineer may require 2 samples be obtained and tested in separate 1-quart pycometers for some aggregates). The quantity of aggregate would be approximated 1100 grams for the one-quart pycnomter.

2. Thermometer – a thermometer with a range of at least 50°F (10°C) to 100°F (38°C)

3. Sieve – a No. 4 (4.75 mm) sieve

B. Field Sample

1. Obtain a field sample as prescribed in IM 301.

C. Preparation of Test Sample

1. Fine Aggregate

a. Obtain a test sample of approximately 1100 grams from the material to be tested by one of the following methods:

(1) Use of a sample splitter

(2) Method of quartering after being thoroughly mixed and in a damp condition

(3) By taking small scoops of material from various places over the

field sample, after it has been dampened and thoroughly mixed. In order to avoid segregation, the material must be damp enough to stand in a vertical face when cut with a trowel. This method of sample reduction is applicable to sands only.

b. If the material has been continuously wet before being received on the job, it may be assumed to be saturated. Otherwise, the sample must be saturated by immersing it in water for period of not less than 15 hours.

c. After soaking, pour off the free water, spread the wet sample on a flat, non-absorbent surface, and allow it to come to a surface-dry condition by natural evaporation of free moisture. Circulation of air by means of a fan may also be used to attain the surface-dry condition. The sample should be stirred frequently to secure uniform drying.

2. Coarse aggregate

a. Obtain the test sample as prescribed in IM 336, Methods of Reducing Aggregate Field Samples To Test Samples (See sections on Quartering or Splitting).

b. Sieve the test sample over the No. 4 (4.75 mm) sieve. The sample should be of sufficient size to produce approximately 2100 grams of material retained on the No. 4 sieve. Discard the material that passes this sieve.

c. Immerse the sample (plus No. 4 sieve size) in water for a period of not less than 15 hours.

d. After soaking, pour off the free water and allow the sample to come to a saturated-surface-dry condition by spreading the sample on a flat, non-absorbent surface. The forced circulation of air by means of a fan, if available, may hasten this process. The sample should be stirred frequently to secure uniform drying. The predominance of free moisture may be removed initially by rolling the sample back and forth in a clean, dry, absorbent cloth.

e. The sample may be considered to be saturated-surface-dry when the particles look comparatively dull as the free moisture is removed from their surfaces. For highly absorptive aggregates, the saturated-surface-dry condition is reached when there is an absence of free moisture.

D. Calibration of Pycnometers

1. Fill the pycnometer jar nearly full of water at the temperature to be used in the actual test, plus or minus 3°F (1.7°C). This may be done either before or after the actual test.

2. Screw the pycnometer top down tightly on the jar and mark the position of the top on the jar by a scratch or mark on the threaded rim and a scratch in a corresponding position on the jar, which will establish a constant volume.

3. Fill the pycnometer completely by pouring water into the hole of the pycnometer top until a bead forms above the opening. Immediately wipe the bead of water level with the pycnometer opening. Wipe all other excess moisture from the outside surfaces of the pycnometer. If a bead of water forms at the opening during the final wiping, it should remain for weighing. Weigh the pycnometer to the nearest 0.5 gram.

E. Test Procedure

1. Weigh the saturated-surface-dry sample to the nearest 0.5 gram. For ease in calculations, the fine aggregate sample may be brought to exactly 1000 grams weight, and the coarse aggregate sample may be brought to exactly 2000 grams weight.

2. Place the sample in the appropriate pycnometer containing approximately two inches of water.

3. Nearly fill the pycnometer jar with water at the same temperature plus or minus 3°F (1.7°C) as used in the calibration.

4. Screw the cap down into the proper position by lining up the mark on the pycnometer top and the jar.

5. Entirely fill the pycnometer by adding additional water through the hole in the pycnometer top.

6. Hold one finger over the hole in the top and gently roll and shake the pycnometer to remove any trapped air in the sample.

7. When further rolling and shaking brings no more air bubbles to the top, fill, dry and weigh as in step C3.

F. Calculations

1. Calculate the saturated-surface-dry (SSD) specific gravity to the nearest 0.01 by the following formula:

$$\text{Bulk Specific Gravity (SSD)} = \frac{S}{P + S - W}$$

Where:

S = Weight in grams of aggregate in a saturated-surface-dry condition.

P = Weight in grams of the pycnometer filled with water.

W = Weight in grams of the pycnometer containing the sample and sufficient water to fill the remaining space in the pycnometer.

Pycnometers for Coarse and Fine Aggregates

PROCEDURE B – SPECIFIC GRAVITY OF COARSE AGGREGATE (AASHTO T 85)

A. Apparatus

1. Balance having a capacity of at least 5,000 grams, accurate to 0.5 grams

2. Sample Container – A wire basket of No. 6 (3.35 mm) or finer mesh, or a bucket of approximately equal breadth and height, with a capacity of 4 to 7 L.. The container shall be constructed so as to prevent trapping air when the container is submerged.

3. Water Tank – A watertight tank, into which the sample and container are placed for complete immersion while suspended below the balance, equipped with an overflow outlet for maintaining a constant water level.

4. Suspended Apparatus – Wire suspending the container shall be of the smallest practical size to minimize any possible effects of a variable immersed length.

5. Sieve - A No. 4 (4.75 mm) sieve

6. Thermometer – a thermometer with a range of 50°F (10°C) to 100°F (38°C)

B. Field Sample

1. Obtain a field sample as prescribed in IM 301.

C. Preparation of Test Sample

1. Prepare the test sample identical to that described in Procedure A.

D. Test Procedure

1. Weigh the saturated-surface-dry sample to the nearest 0.5 gram. For ease in calculations, the fine aggregate sample may be brought to exactly 1000 grams weight, and the coarse aggregate sample may be brought to exactly 2000 grams weight.

2. After weighing, immediately place the saturated-surface-dry sample in the sample container, remove all entrapped air by shaking the immersed container, and determine its mass in water at 73.4°F ± 3°F (23.0°C ± 1.7°C). Make sure the water is at a depth sufficient enough to cover the container and sample.

E. Calculations

1. Calculate the saturated-surface-dry (SSD) specific gravity to the nearest 0.01 by the following formula:

$$\text{Bulk Specific Gravity (SSD)} = \frac{S}{S - W}$$

Where:

S = Weight in grams of aggregate in a saturated-surface-dry condition.
W = Weight in grams of the saturated-surface-dry sample in water

Specific Gravity Problems

Calculate the specific gravity to the nearest 0.01 saturated-surface-dry (SSD) from the following formula:

$$\text{Bulk Specific Gravity (SSD)} = \frac{S}{P + S - W}$$

Where:

S = Mass in grams of aggregate in a saturated-surface-dry condition

P = Mass in grams of the pycnometer filled with water

W= Mass in grams of the pycnometer containing the sample and sufficient water to fill the remaining space in the pycnometer

Given:

1. S = 2000 (C.A.)
   P = 2725.7
   W= 3945.2 Sp.Gr. (SSD) =

2. S = 1000 (F.A.)
   P = 1524.6
   W= 2146.6 Sp.Gr.(SSD) =

3. S = 1000
   P = 1485.9
   W= 2107.1 Sp.Gr. (SSD) =

4. S = 2000
   P = 2739.9
   W= 3976.2 Sp.Gr. (SSD) =

5. S = 2000
   P = 2637.8
   W= 3874.8 Sp.Gr. (SSD) =

NOTES

DETERMINING FREE MOISTURE & ABSORPTION OF AGGREGATES

SCOPE

This method describes several procedures for determining free moisture and absorption of aggregates.

PROCEDURE A - FREE MOISTURE IN AGGREGATES USING A PYCNOMETER

A. Apparatus

1. Balance having a capacity of at least 5,000 grams accurate to 0.5 grams

2. Pycnometer - A fruit jar supplied with a gasket and conical pycnometer top. A two-quart pycnometer is used for coarse aggregates. If a two-quart pycnomter cannot be obtained, a one-quart jar may be substituted (The engineer may require 2 samples be obtained and tested in separate 1-quart pycnometers for some aggregates). The quantity of aggregate would be approximately 1000 grams for the one-quart pycnomter. A one-quart pycnometer is used for fine aggregates.

3. Thermometer - -35°C (-30°F) to 50°C (120°F) thermometer

4. Scoop

B. Field Sample

1. Obtain a field sample as prescribed in IM 301.

C. Preparation of Test Sample

1. Obtain a test sample of about 1000 grams of fine aggregate or about 2000 grams of coarse aggregate by the following method:

   Place the field sample on a clean, hard non-absorbent surface. Mix the sample thoroughly, form a miniature stockpile and obtain small increments of materials from random locations from the stockpile until the desired sample size is obtained. **NOTE:** The moisture test should be completed as soon as possible after obtaining the field sample to avoid moisture loss due to evaporation.

2. Weigh to the nearest 0.5-gram, a 1000-gram sample of fine aggregate, or 2000-gram sample of coarse aggregate. To avoid moisture loss due to evaporation the weighing should be done immediately after obtaining the test sample. Also avoid any excessive manipulation of the aggregate, prior to weighing, which could cause a loss of moisture.

D. Calibration of Pycnometer

1. Calibrate the pycnometer by the procedure in IM 307.

E. Test Procedure

1. The test procedure is identical to IM 307 with the exception that the test sample is wet, as received, and not in a saturated surface dry condition. This procedure is intended for determining the moisture content of aggregates for Portland Cement Concrete.

F. Calculation

1. Calculate the moisture content, based on wet sample mass (weight), to the nearest 0.1 percent as follows:

$$\text{Percent Moisture as received} = \frac{(W - W_1)Gs \times 100}{(Gs - 1)s}$$

Where:

W = Mass (Weight) in grams of the pycnometer containing a saturated-surface-dry sample of the same mass (weight) as "s" and sufficient water to fill the remaining volume of the pycnometer as determined in IM 307.

W_1 = Mass (Weight) in grams of the pycnometer containing the wet sample and sufficient amount of water to fill the remaining volume of the pycnometer.

Gs = Specific gravity of material in a saturated-surface-dry condition. (This is obtained from Method IM 307.

s = Mass (Weight) in grams of wet sample

2. The percent of moisture, based on the saturated-surface-dry mass (weight), is calculated as follows:

$$\text{Percent Moisture (SSD)} = \frac{\text{\%Moisture as received}}{100 - \text{\%Moisture as received}} \times 100$$

PROCEDURE B – FREE MOISTURE IN AGGREGATE BY MASS (WEIGHT) DIFFERENCE

This procedure is an alternate to using a pycnometer and is also intended for determining the moisture content of aggregates for Portland Cement Concrete.

A. Apparatus

1. Balance having a capacity of at least 5,000 grams and accurate to 0.5 gram

B. Preparation of Sample

1. Prepare the test sample identical to that described in Procedure A.

C. Test Procedure

1. Bring the weighed wet sample to a saturated-surface-dry condition in the manner described in Materials IM 307 and weigh to the nearest 0.5 gram.

D. Calculation

1. Calculate the moisture content, based on wet mass (weight), to the nearest 0.1 percent as follows:

$$\text{Percent Moisture} = \frac{\text{Wt. as received - Wt. SSD}}{\text{Wt. as received}} \times 100$$

A negative result is due to absorption of the aggregate rather than free moisture.

2. The percent of moisture, based on saturated-surface-dry mass (weight), is calculated to the nearest 0.1 percent as follows:

$$\text{Percent Moisture SSD} = \frac{\text{\% Moisture as received}}{\text{100 - \% Moisture by wet mass (weight) as received}} \times 100$$

or

$$\text{Percent Moisture (SSD)} = \frac{\text{wet mass (weight) - saturated - surface - dry mass (weight)}}{\text{saturated - surface - dry mass (weight)}} \times 100$$

PROCEDURE C - WATER ABSORPTION IN AGGREGATE

This procedure is used for determining absorption of aggregates for use in asphaltic concrete as well as determining specification compliance for absorption.

A. Apparatus

1. Balance having the capacity of at least 5000 grams and accurate to 0.5 gram

2. Oven or hot plate

B. Preparation of Sample

1. Obtain a test sample of at least 1000 grams of fine aggregate and 2000 grams of coarse aggregate by following the appropriate procedure outlined in IM 307.

2. When the sample is not in a saturated condition it must be immersed in water at room temperature for a minimum of 15 hours before continuing with the test.

3. Allow the saturated sample to attain a surface-dry condition by following the procedure in IM 307.

C. Test Procedure

1. Weigh the saturated, surface-dry sample to the nearest 0.5 gram.

2. Dry the sample in the oven or on the hot plate or stove to a constant weight (mass).

3. Allow the sample to cool and weigh to the nearest 0.5 gram.

D. Calculation

1. The percent absorption, based on the oven dry mass (weight) is calculated to the nearest 0.01 percent as follows:

   Percent Absorption =

$$\frac{\text{Saturated - surface - dry mass (weight) - oven dry mass (weight)}}{\text{oven dry mass (weight)}} \times 100$$

******THIS IS A NEW IM. – PLEASE READ CAREFULLY.******

W-W_1 TABLE FOR PYCNOMETER MOISTURE DETERMINATION

W-W_1 In Grams	% Moisture/Absorp.		W-W_1 In Grams	% Moisture/Absorp.		W-W_1 In Grams	% Moisture/Absorp.	
	1000 gm Sample	2000 gm Sample		1000 gm Sample	2000 gm Sample		1000 gm Sample	2000 gm Sample
0	0.0	0.0	**15**	2.4	1.2	**30**	4.8	2.4
1	0.2	0.1	**16**	2.6	1.3	**31**	5.0	2.5
2	0.3	0.2	**17**	2.7	1.4	**32**	5.1	2.6
3	0.5	0.2	**18**	2.9	1.4	**33**	5.3	2.6
4	0.6	0.3	**19**	3.0	1.5	**34**	5.5	2.7
5	0.8	0.4	**20**	3.2	1.6	**35**	5.6	2.8
6	1.0	0.5	**21**	3.4	1.7	**36**	5.8	2.9
7	1.1	0.6	**22**	3.5	1.8	**37**	5.9	3.0
8	1.3	0.6	**23**	3.7	1.8	**38**	6.1	3.1
9	1.4	0.7	**24**	3.9	1.9	**39**	6.3	3.1
10	1.6	0.8	**25**	4.0	2.0	**40**	6.4	3.2
11	1.8	0.9	**26**	4.2	2.1	**41**	6.6	3.3
12	1.9	1.0	**27**	4.3	2.2	**42**	6.7	3.4
13	2.1	1.0	**28**	4.5	2.2	**43**	6.9	3.5
14	2.2	1.1	**29**	4.7	2.3			

Moisture Tests (I.M. 308)

Calculate the percent of free moisture of each of the examples below by using the following formula:

$$\text{Percent Moisture} = \frac{(W - W1)(Gs)(100)}{(Gs - 1)(s)}$$

W= Mass in grams of the pycnomemter containing a saturated-surface-dry sample of the same mass as "s" and sufficient water to fill the remaining volume of the pycnometer as determined in I.M. 307.

W1= Mass in grams of the pycnometer containing the wet sample and sufficient amount of water to fill the remaning volume of the pycnometer.

Gs = Specific Gravity of material in a saturated-surface-dry condition (this is obtained from Method I.M. 307).

s = Mass in grams of wet sample

What is the percent of free moisture in the aggregate when:

1. W = 3916.5 W1 = 3907.0 Gs = 2.61 s = 2000.0

2. W = 2096.5 W1 = 2078.5 Gs = 2.66 s = 1000.0

3. W = 3903.5 W1 = 3911.0 Gs = 2.70 s = 2000.0

4. W = 2204.5 W1 = 2184.0 Gs = 2.60 s = 1000.0

NOTES

FIELD EQUIPMENT CLEANING, CALIBRATION, & REPAIR
(General Rewrite)

GENERAL

Various items of field-testing equipment require periodic calibration to ensure reliable results. Specific items requiring calibration are balances and weights, concrete air meters, and concrete beam testing machines, etc.

The Central Materials Laboratory of the Iowa Department of Transportation will, when possible, calibrate and repair testing equipment for county and municipal governments and private organizations when certified technicians are required.

COUNTY & MUNICIPAL GOVERNMENTS

County owned equipment will be cleaned, calibrated and repaired as time permits. For any necessary repair parts, cleaning, etc., the county will be billed. If extensive repair or modification to equipment is required, the county will be billed for parts and labor. Prior to any extensive repair, the County Engineer will be notified with an estimate of the cost and his authorization to proceed must be received prior to the work.

Municipal governments that have projects involving state or federal funding may also have their equipment cleaned, calibrated, and repaired. Charges shall be the same as those imposed upon counties.

PRIVATE ORGANIZATIONS

Testing equipment owned by private organizations will be cleaned, calibrated, and repaired when the Department of Transportation requires that certified technicians be utilized. A charge will normally be made when calibrating or repairing this equipment. Extensive repairs will be billed at actual cost plus labor charges. Prior to extensive repairs the organization will be notified with an estimate of the cost and authorization to proceed must be received prior to the work.

NON-STANDARD EQUIPMENT

The Department of Transportation is not responsible for repairing equipment that is not normally used by the Department and for which replacement parts are not normally stocked by the Central Laboratory.

BILLING PROCEDURE

Upon written notification from, the Office of Materials, the Office of Accounting will bill the appropriate agency or organization.

CHARGES FOR CLEANING, CALIBRATION, AND REPAIR OF TESTING EQUIPMENT

ACTIVITY	**FEE**
Air Meters, Calibration of	$35.00
Cleaning & Checking of	$35.00 for sandblast cleaning, plus parts*
Balances, Cleaning, Repair, and Checking of	$30.00 each, plus cost of parts*
Concrete Beam (Flexural Test) Machines, Repair and Calibration of	$50.00 each, plus cost of parts* Rental is $100 per month or any part thereof. Includes use by cities & counties, contractors, and consultants.
Sieves, Cleaning and Checking of	$4.50 each or $30.00 per set (8-inch) $9.00 each or $60.00 per set (12-inch)
Skidmore, Calibration of	$50.00 each
Slump Cones, Cleaning of	$25.00 each
Torque Wrenches, Calibration of	$50.00 each

***NOTE**: The cost of parts includes an additional 7.5 percent for overhead.

NOTES

DETERMINING THE AMOUNT OF SHALE IN FINE AGGREGATE

SCOPE

This test method covers the procedure for the approximate determination of the shale content in fine aggregate. This test method is the field procedure for Laboratory Test Method 209.

PROCEDURE

A. Apparatus

1. Balance having a capacity of not less than 1000 g and sensitive to at least 0.1 g
2. A strainer with openings smaller than #16 sieve (1.18 mm)
3. Two bowls of sufficient capacity
4. A solution of zinc chloride ($ZnCl_2$) having a specific gravity between 1.950 and 1.999 at 70°F (21°C)

   NOTE: To prepare one gallon of solution, slowly add 12.5 lb. (5670 g) of technical grade zinc chloride to 4.75 pt. (2248 g) of water with constant stirring. The zinc chloride is added slowly to all the needed water to avoid generating excessive heat during the dissolving process. When all zinc chloride is in solution, cool to 70°F (21°C) and measure specific gravity with a hydrometer. If the sp. gr. is below 1.95, add zinc chloride in 0.5 lb. (227 g) increments until the sp. gr. of the solution is at least 1.95 at 70°F (21°C). It may be necessary to heat the original solution slightly in order to dissolve additional zinc chloride in a reasonable time.

   CAUTION: There is no particular hazard from the fumes of the zinc chloride solution, but protective clothing should be worn. This includes gloves, goggles, and face shield. Mix in a well-ventilated area.

5. Drying oven or hot plate
6. Mixing spoon

B. Sample Preparation

1. Select a representative sample by appropriate methods detailed in Materials IM 301 and 336. The weight of the representative sample shall be large enough to yield at least 500 grams of dry material passing the #4 (4.75mm) sieve.
2. Sieve the representative sample over the #4 (4.75mm) sieve unless the material is Fine Aggregate for use in PC Concrete. In this case, any material retained on the #4 (4.75mm) sieve is also part of the test sample.

3. Dry the test sample to a constant weight, allow to cool, weigh, and record as the Original Dry Weight of the Test Sample.

4. Sieve the test sample over the #16 (1.18mm) sieve. Discard the material passing this sieve and subject the test sample to the test procedure.

   NOTE: The test sample may be accumulated from a completed sieve analysis. This would include the material retained on the #8 (2.36mm) and #16 (1.18mm) sieves, as well as any material retained on the #4 (4.75mm) sieve if the intended use is PC Concrete.

   The Original Dry weight of the test sample would then be the difference between the Original Dry Weight of the sieve analysis sample and the total of the weights retained on and above the #4 (4.75mm sieve). (The test sample weight of Fine Aggregate for PC Concrete would be the Original Dry weight of the sieve analysis sample.)

C. Test Procedure

1. Pour the zinc chloride solution into a mixing bowl until the volume of the liquid is at least 3 times the absolute volume of aggregate.

2. Stir the fine aggregate sample into the solution until all particles are coated.

3. Pour the liquid off into a second container, passing it through the strainer. Make sure that only the floating pieces are poured off and that none of the fine aggregate is decanted onto the skimmer.

4. Return to the first container the liquid that has been collected in the second container and after further agitation of the sample by stirring, repeat the decanting process just described until the sample is free of floating pieces.

5. Thoroughly wash the removed particles in the strainer to remove the zinc chloride. Dry to a constant weight (mass) in an oven at a temperature of 230 ± 9°F (110 ± 5°C) or on a hot plate at a low heat setting. Weigh to the nearest 0.1 g.

D. Calculations

1. Calculate the percentage of shale (and other low specific gravity materials) by the following formula:

$$\%\ \text{Shale} = \frac{\text{Dry Mass (Weight) of Washed Decanted Particles (Shale)}}{\text{* Dry Mass (Weight) of Original Sieve Analysis Sample}} \text{ x } 100$$

*This mass (weight) includes the material passing the #16 sieve (1.18 mm) and represents the total sample mass (weight) of the fine aggregate. Report the result to the nearest 0.1 percent.

NOTES

DETERMINING THE AMOUNT OF SHALE IN COARSE AGGREGATE

SCOPE

This test method covers the procedure for the approximate determination of the shale content in coarse aggregate. (Field Procedure For Laboratory Test Method 210) This method separates, along with the shale, other particles of low specific gravity.

PROCEDURE

A. Apparatus

1. Balance having a capacity of at least 2500 g and sensitive to 0.1 g
2. A strainer with openings not larger than #8 sieve (2.36 mm)
3. Two bowls of sufficient capacity
4. A solution of zinc chloride ($ZnCl_2$) having a specific gravity between 1.950 and 1.999 at 70°F (21°C).

   NOTE: To prepare one gallon of solution, slowly add 12.5 lb. (5670 g) of technical grade zinc chloride to 4.75 pt. (2248 g) of water with constant stirring. The zinc chloride is added slowly to all the needed water to avoid generating excessive heat during the dissolving process. When all zinc chloride is in solution, cool to 70°F (21°C) and measure specific gravity with a hydrometer. If the sp. gr. is below 1.95, add zinc chloride in 0.5 lb. (227 g) increments until the sp. gr. of the solution is at least 1.95 at 70°F (21°C). It may be necessary to heat the original solution slightly in order to dissolve additional zinc chloride in a reasonable time.

5. Drying oven or hot plate
6. Mixing spoon

B. Test Procedure

1. A sample of approximately 2500 grams of + #4 (+ 4.75 mm) material shall be selected by quartering or splitting to insure representation.
2. Dry the sample to a constant weight (mass) in an oven at a temperature of 230 ± 9°F (110 ± 5°C) or on a hot plate at low heat setting with frequent stirring to avoid local overheating. Weigh to the nearest 0.1 g.

   CAUTION: There is no particular hazard from the fumes of zinc chloride solution, but protective clothing should be worn. This includes gloves, goggles, and face shields. Mix in a well-ventilated area.

3. Place the dried sample of aggregate in the bowl and pour the solution of zinc chloride over the aggregate until the volume of the liquid is at least 3 times the absolute volume of the aggregate.

4. Agitate the aggregate by vigorously stirring with a large mixing spoon until no additional pieces float to the surface.

5. Skim off the floating particles within one minute.

6. Thoroughly wash the removed particles in the strainer to remove the zinc chloride. Dry to a constant weight (mass) in an oven at a temperature of 230 ± 9°F (110 ± 5°C) or on a hot plate at a low heat setting. Weigh to the nearest 0.1 g.

7. Particles of low specific gravity other than shale may be handpicked and removed prior to weighing.

C. Calculation

1. Calculate the percentage of shale (or shale and other low specific gravity materials) from the following formula:

$$\%\,\text{Shale} = \frac{\text{Dry Mass (Weight) of Washed Decanted Particles}}{{}^{*}\,\text{Dry Mass (Weight) of Sample}} \times 100$$

*Mass (weight) of the + #4 (+ 4.75 mm) material

METHOD OF TEST FOR DETERMINING THE AMOUNT OF CHERT, SHALE, IRON OXIDE, AND COAL IN COARSE AGGREGATE

SCOPE

This test method is for determining the amount of chert, shale (alternate method to IM 345), iron oxide and coal in coarse aggregate. For this method, chert is identified as (1) an extremely dense sedimentary rock consisting dominantly of silica and being flint-like in appearance. It is considered sound and is referred to as brown chert. (2) Chert commonly referred to as white chert may range in color from white to dark gray. This chert is softer, less dense than the brown chert and frequently has a chalk-like appearance. This type of chert is considered to be unsound.

Shale particles are lightweight, porous, and highly absorptive. These particles are usually a light color of gray and will form suction to a wetted finger. Shale is less dense than other aggregate.

Iron oxide particles usually have a reddish color due to the presence of oxidized iron. These particles are usually more dense than carbonate and may have unusual shapes.

Coal and lignite particles are usually dark to black and are commonly lightweight and can be scratched with a knife.

PROCEDURE

A. Apparatus

1. Sieves - a 3/8 in. (9.5 mm) and No. 4 (4.75 mm) sieve having wire cloth conforming to AASHTO M-92

2. Oven or hot plate

3. Balance - A balance having a capacity of at least 5000 grams, accurate to 0.1 gram

B. Sample Size

1. Obtain a representative sample by appropriate methods as detailed in Materials IM 336 to the size that will conform to Materials IM 301 sieve analysis of applicable material. The weight of the representative sample after reduction must be large enough to yield a minimum of 2500 grams of material after sieving over the appropriate sieve size for the intended use, either the No. 4 (75mm) or 3/8 in. (9.5mm).

C. Sample Preparation

1. When the sample represents material intended for use in PC Concrete for bridge deck repairs, surfacing and overlays, the sample must be sieved on the No. 4 (4.75mm) sieve. The material passing the No. 4 (4.75mm) sieve is discarded and the amount of chert, shale, iron oxide, or coal is determined on the plus No. 4 (4.75mm) sieve size portion of the sample.

   When the sample represents material intended for other types of PC Concrete construction, the sample must be sieved on the 3/8 in. (9.5mm) sieve. The material passing the 3/8 in. (9.5mm) sieve is discarded and the amount of chert, shale, iron oxide, or coal is determined on the plus 3/8 in. (9.5mm) sieve size portion of the sample.

D. Test Procedure

1. Wash and decant the sample to remove dust from the surface of the aggregate particles.

2. Spread the sample out on a flat surface. Visually examine the aggregate particles and remove the white and brown chert, shale, iron oxide or coal.

3. Dry and cool the sample to a constant mass (weight) in an oven at a temperature of 230°F ± 9°F (110 °C ± 5°C) or on a hot plate at low heat setting.

4. Weigh the total amount of each type of chert (white and brown), shale, iron oxide, or coal to the nearest 0.1 gram.

NOTE 1: If the percent of shale exceeds the specification limit; the particles shall be floated in zinc chloride to confirm the shale determination using Test Procedure D of IM 345.

E. Calculations

1. Calculate the percent of each type of chert (white and brown), shale, iron oxide or coal based upon the total mass (weight) of the sample [plus No. 4 (4.75 mm)] after washing and drying.

PERCENT CHERT, SHALE, IRON OXIDE, OR COAL =

$$\frac{\text{Dry Mass (Wt.) of Chert (etc.)}}{\text{Dry Mass (Wt.) of Original}} \times 100$$

NOTES

METHOD OF TEST
TO DETERMINE THE AMOUNT OF CLAY LUMPS & FRIABLE PARTICLES IN COARSE AGGREGATE (METHODS A & B)

SCOPE

This method of test covers the procedure for the determination of clay lumps and friable particles in coarse aggregates. Clay lumps and friable particles are objectionable materials in the aggregate due to contamination at the time the deposit was formed, at the time of quarrying, or at the time of hauling and handling. Clay lumps and friable particles are considered any agglomerated or soft particles retained on the #4 sieve and greater, and will include such terms as mud and clay balls. Method A is used to evaluate either stream flow or stock piles samples. Method B is used to evaluate only stream flow samples. The Engineer shall determine the method most appropriate for individual sources. If a sample does not meet specification limits for either test method, the sample is considered non-compliant.

PROCEDURE

A. Apparatus

1. Balance - A balance having a capacity of at least 5000 grams, accurate to 0.5 gram.
2. Oven capable of maintaining temperature @ 110 ± 5°C (230 ± 9°F) or hot plate used at a reduced temperature, and capable of providing a uniform heat until sample has dried to a constant weight.
3. Containers - Containers of a size and shape that will permit the spreading of the sample on the bottom in a thin layer.
4. Sieves - Sieves conforming to AASHTO M92, wire cloth sieves for testing purposes.

B. Sample

1. Select a representative sample of material retained on the 4.75 mm (No. 4) sieve that will weigh at least 3000 grams.

METHOD A

C. Test Procedure

1. Separate clay lumps and friable particles from the test sample by hand picking. The sample may be wetted and decanted if this aids identification. Oven-dry the clay lumps and friable particles to a constant weight.

2. Allow the clay lumps and friable particles to cool and determine the dry weight (L).

3. Dry the test sample to a constant weight.

4. Allow to cool and determine the dry weight (W).

D. Calculation
Percent of clay lumps and friable particles (P) = 100 X L/(L+W)

Where:

P = percent of clay lumps and friable particles
L = dry weight of clay lumps and friable particles
W = dry weight of test sample

METHOD B (Field Procedure for Laboratory Test Method 214)

C. Test Procedure

1. Wash over No. 4 (75µm) sieve.

2. Oven-dry for at least 16 hours at a temperature of 230° ±9°F (110°±5° C)

3. Allow sample to cool and determine the dry weight (W).

4. Spread sample in a thin layer on the bottom of the container, cover it with water and allow it to soak for a period of 24±4 hours.

5. After soaking period any particles that can be broken with fingers into fines removable by wet sieving over the No. 8 (2.36 mm) sieve shall be classified as clay lumps or friable particles.

   Note: The breaking of clay lumps and/or friable particles shall be accomplished by squeezing and rolling them between the thumb and forefinger. The fingernails or mechanical tools shall not be used to break up the particles nor shall they be pressed against a hard surface.

6. Wet sieving is to be accomplished by passing water over the sample through the sieve while manually agitating the sieve, until all undersize has been removed.

7. The retained particles shall then be carefully removed from the sieve and dried at a temperature of 230°±9°F(110°±5°C).

8. Allow sample to cool, and weigh (R).

D. Calculation

Calculate the percent of clay lumps and friable particles of coarse aggregates as follows:

$$P = \left(\frac{W - R}{W} \right) \times 100$$

Where:

P = Percent of clay lumps and friable particles.
W = Dry weight of test sample after washing on the #4 sieve.
R = Dry weight of particles retained on the No. 8 (2.36mm)(wt. of test sample after removal of clay lumps).

NOTES

Appendix A: Forms

Aggregate Sieve Analysis

(Coarse or fine using Box and 203 mm (8 in.) Sieves; or 305 mm (12 in.) Sieves)

1. Obtain a field sample (per I.M. 301)
2. Reduce the field sample (per I.M. 336) to the proper test sample size listed in I.M. 301.
3. When required to determine the percent passing the 75 µm (#200) sieve, or when testing a Fine Aggregate sample, dry the test sample to a constant mass (weight). (Note: A second (smaller) sample of coarse aggregate may be obtained (per I.M. 336) from the field sample to test for the percent passing the 75 µm sieve. See I.M. 306 for the appropriate sample size. In this case, the larger sample of coarse aggregate needs only to be in a "surface-dry" condition when sieving down through the 2.36 mm (#8) screen).
4. Cool the sample if dried to a constant mass, weigh and record as the Original Dry Mass.
   4a. When testing for the percent passing the 75 µm sieve, wash the entire sample over a 75 µm wash sieve per I.M. 306.
   4b. Dry the washed sample to a constant mass, cool, weigh, and record as Dry Mass Washed.
   4c. Determine washing loss and record in both places on worksheet.
5. Place the sample in the appropriate sieves and sieve to completion:
   - Coarse Aggregate in box sieves, 37.5 mm through 2.36 mm (1 ½ in. through #8)
   - Fine Aggregate in 203 mm or 305 mm round sieves, 9.5 mm through 75 µm (3/8 in. through #200)
   - Combined or Fine Aggregate in 305 mm sieves, 25 mm through 75 µm (1 in. through #200)

   (Note the largest sieve size needed in any case is dependent on the maximum particle size in the sample).
6. Clean the retained material from each sieve, weigh, and record each increment to the nearest 0.5 gram saving each increment individually until the entire test procedure is completed.

7. Add the mass retained column, including the washing loss and pan if the sample was washed. Check weighing accuracy by dividing the total by the original mass x 100 (and/or the total minus the washing loss divided by the dry mass washed x 100 if the sample was washed).
8. Calculate the percent retained for each sieve by dividing the mass retained on each sieve by the Original Dry Mass x 100. Remember to combine the washing loss and pan for this calculation if sample was washed.
9. Add the percent retained column, prorating as needed, to equal 100 %.
10. Determine the percent passing each sieve by consequently subtracting the percents retained starting with the sieve that had 100 % passing (the smallest sieve used which had no material retained).

Coarse Aggregate Wash Sample
(Percent passing 75 µm sieve only)

1. Dry the sample to a constant mass, cool, weigh, and record as Original Dry Mass (at the bottom of the worksheet).
2. Wash the sample over the 75 mm sieve per I.M. 306.
3. Dry the washed sample to a constant mass, cool, weigh and record as Dry Mass Washed.
4. Determine the Washing Loss and record in appropriate places on worksheet.
5. Screen the sample over a box 2.36 mm sieve, discarding the material retained on the 2.36 mm sieve.
6. Place the minus 2.36 mm material in a nest of round sieves (300 µm, 150 µm, and 75 µm) and pan.
7. Place the nest of sieves in a mechanical shaker (or sieve by hand) until sieving to completion is achieved (usually 5 minutes in a mechanical shaker).
8. Weigh and record only the material retained in the pan.
9. Combine the Washing Loss and Pan masses and divide by the Original Dry Mass x 100.
10. Record as percent passing the 75 µm sieve.

(Now it is safe to discard your sample increments)

Combined Aggregate Sieve Analysis

(With Box and Round 203 mm (8 in.) diameter sieves)

Phase 1

1. Obtain a field sample (per I.M. 301).
2. Reduce the field sample (per I.M. 336) to the proper test sample size listed in I.M. 301.
3. Dry the test sample to a constant mass (weight), allow to cool, weigh to nearest 0.5 gram and record as Original Dry Mass.
4. Wash the sample over the 75 µm wash sieve (per I.M. 306).
5. Dry the washed sample to a constant mass, cool, weigh and record the mass as the Dry Mass of Washed Sample.
6. Determine the Washing Loss and record in both locations on worksheet.
7. Sieve the sample through the required box sieves finishing with the 4.75 mm (#4) or 2.36 mm (#8).
8. Clean the retained material from each sieve; weigh and record each increment (record in the second column of worksheet), saving each increment individually until the entire test procedure is completed.

Note: At this point technician must decide if the amount of material passing the 4.75 µm or 2.36 µm box sieve will create an overload situation on any of the 203 mm sieves (over 200 grams on a sieve).

Phase 2 (Overload not anticipated)

1. Place the minus 4.75 mm (or 2.36 mm) material in the nest of 203 mm round sieves and sieve in the mechanical shaker for a period long enough to obtain sieving to completion (usually 10 minutes).
2. Clean the retained material from each sieve; weigh and record each increment (record in the second column of worksheet), saving each increment individually until the entire test procedure is completed.
3. Add the entire mass retained column including the pan and washing loss
4. Determine the weighing accuracy (± 0.5%)

5. Calculate the percent retained on each sieve (individual mass + dry mass x 100) to nearest 0.1%. (Remember to combine the washing loss and pan for this calculation)
6. Total the percent retained column, prorating as necessary, to equal 100%.
7. Calculate the percent passing each sieve by consecutively subtracting the percent retained, starting with the sieve that had 100% passing (the smallest sieve used which had no material retained).
8. The percent passing the 75 μm (#200) sieve must equal the last result obtained in the percent retained column.

Phase 2 (overload on 203 mm sieves anticipated)

1. Weigh and record the material passing the 4.75 mm box sieve as the total minus 4.75 mm mass (W1).
2. Reduce the material passing the 4.75 mm box sieve using the 25 mm (1 in.) sample splitter (a smaller splitter may be used if available). **The minimum mass of the reduced sample is 500 grams.**
3. Weigh and record the reduced minus 4.75 mm material as the reduced minus 4.75 mm mass (W2).
4. Divide W1 by W2 and record as conversion factor (four places to the right of the decimal point).
5. Place the reduced sample into the nest of 203 mm sieves (starting with the 2.36 mm sieve) and sieve in the mechanical sieve shaker for a period long enough to obtain sieving to completion (usually 10 minutes).
6. Clean the retained material from each sieve; weigh and record each increment (record in first column on worksheet), saving each increment individually until the entire test procedure is completed.
7. Add the column including the pan (excluding the washing loss) and check weighing accuracy by dividing the column total by the W2 weight (±0.5% tolerance).
8. Multiply each mass retained (B) including the pan by the conversion factor and record the result in the second column (A) to the nearest 0.1%.
9. Add the entire second column (including the masses retained on the +4.75 mm sieves and washing loss).

10. Divide this total by the Original Dry Mass of Sample x 100. The result must be within ± 0.5%.
11. Divide each mass retained in this column (second column) by the Original Dry Mass of Sample x 100 and record in the percent retained to the nearest 0.1%.
12. Add the percent retained column, prorating as needed to equal 100%.
13. Determine percent passing each sieve by consecutively subtracting the percents retained starting with the sieve that had 100% passing.
14. The percent passing the 75 μm sieve must equal the last result obtained in the percent retained column.

(Now it is safe to discard your sample increments)

Form 821278
12/92

IOWA DEPARTMENT OF TRANSPORTATION

CERTIFIED GRADATION TEST REPORT

☐ Certified Sample

☒ Monitor Sample

☐ Verification Sample

County: Delaware
Project: WHS
Contractor:
Contract #:
Design:
Date: Oct 27, 2000 Report No.: 3

Source Name Tegler Pit T-203A No. A28504 Source Location NE Sec 36 Twp 89 Range w2 County Delaware

Material Concrete Sand Class Gradation No 1 Beds

Material Producer BARD Concrete Company Destination Stockpile Sampled At Pit 10-5, 13, 19

Date Sampled	Sample Identification	Sampled By	Tested By	Sieve Analysis 37.5mm (1 1/2in)	26.5mm (1.00in)	19mm (3/4in)	13.2mm (0.50in)	9.5mm (3/8in)	4.75mm (No.4)	2.36mm (No.8)	1.18mm (No.16)	600µm (No.30)	300µm (No.50)	150µm (No100)	Percent Passing 75µm (No200)	Other Test Results			Comp	Tons
* Production Limits			Max.					100	100	100		54			1.5					
			Min.						90	70					0					
Oct. 5	DL-192-00	DOT	Like					100	97	85	68	44	15	1.7	0.4					
Oct. 5	T18-00	Producer	S.L.					100	94	83	64	42	15	1.3	0.2					
Oct. 13	DL-197-00	DOT	Like					100	97	86	68	45	16	1.9	0.4					
Oct. 13	T21-00	Producer	L.M.					100	96	84	67	44	15	1.2	0.2					
Oct. 19	DL-202-00	DOT	Like					100	97	90	76	49	15	1.5	0.4					
Oct. 20	T23-00	Producer	S.L.					100	96	86	70	46	16	1.5	0.4					

Note to County and Resident Engineers- If County or Project Number is Incorrect, please notify inspector and Ames Office Promptly. Corrected Reports will be issued.

Comments Bard Concrete Company
Roger Boulet

File

District 6 personnel have made a comparison of gradations. No significant difference exists between these results.

*AGREED by the Contractor/producer

Distribution: Materials Engr.; Project Engr.; Certified Technician; Area Inspector

ESTIMATED QUANTITY 0 TONS

TOTAL PREVIOUSLY CERTIFIED 30,000 TONS

TOTAL CERTIFIED TO DATE 42,000 TONS

CERTIFICATION NUMBER EC222

Reported By Don Like

Representing Iowa DOT

322

Form 821278
12/92

IOWA DEPARTMENT OF TRANSPORTATION

CERTIFIED GRADATION TEST REPORT

[X] Certified Sample

[ ] Monitor Sample

[ ] Verification Sample

County: Jasper
Project: IM-80-5(184)160--13-5
Contractor: Manatt's
Contract #: .
Design:
Date: 7/24/00 Report No.: 36

Source Name #552 Colfax T-203A No. A50502 Source Location NE Sec 01 Twp 79 Range 21W County 50

Material Concrete Sant Class Gradation No 1 Beds

Material Producer Van Dusseldorp S&G Destination Sampled At Colfax Plant

Date Sampled	Sample Identification	Sampled By	Tested By		37.5mm (1 1/2in)	26.5mm (1.00in)	19mm (3/4in)	13.2mm (0.50in)	9.5mm (3/8in)	4.75mm (No.4)	2.36mm (No.8)	1.18mm (No.16)	600µm (No.30)	300µm (No.50)	150µm (No100)	75µm (No200)	Other Test Results				Comp	Tons
	* Production Limits			Max.						100	100		50			1						
				Min.					100	90	70		10		0							
7/17/00	CCC00-0258	CC	CC		Local Area				100	99	91	75	46	12	1.7	0.4						1500
7/18/00	CCC00-0267	CC	CC		" "	" "			100	99	91	75	46	12	1.2	0.3						1500

Note to County and Resident Engineers- If County or Project Number is Incorrect, please notify inspector and Ames Office Promptly. Corrected Reports will be issued.

Comments Copies: Materials Engr.
Van Dusseldorp
File Des Moines Lab
CC

ESTIMATED QUANTITY 3000 0 TONS

TOTAL PREVIOUSLY CERTIFIED 33,750 0 TONS

TOTAL CERTIFIED TO DATE 36,750 0 TONS

CERTIFICATION NUMBER CI 906

*AGREED by the Contractor/producer

Reported By Charlotte Cunningham

Distribution: Materials Engr.; Project Engr.; Certified Technician; Area Inspector

Representing Van Dusseldorp Sand & Gravel

PCC Plant Report

Date of Placement		Location From	Location To
Mix 1	10/19/01	124+00	178+50
Mix 2			
Mix 3			
Mix 4			
Mix 5			

Project No.: FM91(15)-56-91
Plant Name: Jensen -R63 & Hwy 92
Contractor: Irving F. Jensen
Weather: Sunny-cool

Contract ID: 73912
County: Warren
Temp. (°F) Min: 40
Temp. (°F) Max: 65

Report No.: 9
Date This Report: 10/19/01
Date Of Last Report: 10/18/01
Structures Des. No:

Check Mix(x)		Check One(x)		SEND
Central	X	Paving	X	(Daily)
Ready		Structure		(Weekly)
		Incidental		(Weekly)
		Patching		(Weekly)

	Mix	Batched (CY)	% Of Est. Used	Fine Aggregate Moist. (%)	Fine Aggregate T-203 Sp. G.	Fine Aggregate Wt. SSD (lbs)	Intermediate Aggregate Moist. (%)	Intermediate Aggregate T-203 Sp. G.	Intermediate Aggregate Wt. SSD (lbs)	Coarse Aggregate Moist. (%)	Coarse Aggregate T-203 Sp. G.	Coarse Aggregate Wt. SSD (lbs)	Cement	Fly Ash	GGBFS	Fine	Inter.	Coarse	Water In Agg.	Water Plant	Grade	Avg w/c Ratio	Max w/c Ratio
1	C-3WR	1,011.50	105.2	3.3	2.65	1,380				0.5	2.68	1,702	571			1,427		1,711	56	175.0		0.405	0.489
2	C-3WR	425.00	106.9	3.0	2.65	1,380				0.3	2.68	1,702	571			1,423		1,707	48	173.0		0.387	0.489
3																							
4																							
5																							

(Actual Quantities Used Per cy (in pounds): Cement through Grade)

Coarse	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#200	Comply
	100	95-100		25-60		0-10	0-5	0-1.5	Y/N

Conc. Treatment	(X)	lb / cy
Ice		
Heated Water		
Heated Materials		

Batched Check One (X)	Today	Week	Total To Date
Concrete (CY):	1,436.50		
Cement (tons):	410.12		

Intermediate	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#200	Comply
									NA
									NA
									NA

	Brand / Source	Rate	Lot Number
Air Entraining:	AEA-15/SIKA	4.5 oz./yd.	J60038M
Water Reducer:	Plastocrete 161/SIKA	3 oz./100#	J60011P
Retarder:			
Calcium Chloride:			
Superplasticizer:			

Fine	1/2"	3/8"	#4	#8	#16	#30	#50	#100	#200	Comply
		100	90-100	70-100		10-60			0-1.5	Y/N

	Type	Sp. Gr.	Source
Cement:	1	3.14	Ash Grove
Fly Ash:			
GGBFS:			

Adjusted % Passing Calculated Combined Gradation

	1.5"	1"	3/4"	1/2"	3/8"	#4	#8	#16	#30	#50	#100	#200	Within Target
Target													

	Source	T-203 A #	Grad. No.
Coarse:		A25512	3
Intermediate:			
Fine:		A77524	1

Remarks

C.P.I.: John Doe SE000
Monitor: Mike Brown SE999

Distribution: ____ Central Materials ____ DME ____ Proj. Eng. ____ Plant

900241M - 01/98

DAILY ACC PLANT REPORT

Project No.: STP-69-7(23)--2C-99
County: Wright
Class:
Report No.: 6

Contract ID: 99-0697-023
Contractor: Mathy Construction
Size: 19mm
Design Blows:

Mix Design No.: ABD7-55R4
Recycle Source:
Mix Type: A
Design Gyrations: 86

Hot Box I.D. No.:		10-1-SP	10-2-SP	10-3-SP	10-4-SP	
Date Sampled:		07/29/97	07/29/97	07/29/97	07/29/97	
Gradation ID:	Specs	CF10-1SP				
25mm Sieve	100	100				
19mm Sieve	90-100	100				
12.5mm Sieve		91				
9.5mm Sieve		77				
* 4.75mm Sieve		42				
* Moving Average		41				
* 2.36mm Sieve	23-35	24				
* Moving Average		25				
1.18mm Sieve		18				
* 600um Sieve		11				
* Moving Average		11				
300um Sieve		6.2				
150um Sieve		3.8				
* 75um Sieve	2.0-8.0	3.0				
* Moving Average		3.0				
Compliance (Y/N)		Y				
Intended Added, % AC	5.80					
Actual Added, % AC		5.81				
Intended Total, % AC	5.80					
Actual Total, % AC		5.81				
Gmb:		2.297	2.321	2.296	2.301	
Gmm:		2.413	2.398	2.402	2.414	
Pa:		4.8	3.2	4.4	4.7	
Moving Average	3.0-5.0	4.3	4.2	4.1	4.3	
Time		07:30	09:30	11:30	02:30	
Station		430+00	380+00	320+00	235+00	
Side		Rt	Rt	Rt	Rt	
Sample Mg's		252.00	857.00	1,437.00	2,203.00	
Sublot Mg's		500.00	833.33	833.33	964.95	
Mg's to Date		19,005.00	19,838.33	20,671.66	21,636.61	
Fines / Bitumen Ratio	0.6-1.20	0.65				

Gsb: 2.544 Gb: 1.0250 Effective % AC: 4.64

Mix Change Info:

Time	7:00	9:00	11:00	1:00	3:00	5:00	7:00
Air Temp. (°C)	15	19	22	24	25	25	
A.C. Temp. (°C)	151	146	149	151	153	154	
Mix Temp. (°C)	146	141	138	139	143	142	

Date Placed: 07/29/97 Date Tested: 07/30/97

Course Placed: Surface Tested By: George Seward

Density Record

Core No.:	1	2	3	4	5	6	7
Station	46+65	63+95	70+25	91+85	97+98	113+35	126+45
CL Reference	1.2m Rt	3.0m Rt	1.8m Rt	2.4m Rt	2.4m Rt	0.6m Rt	1.8m Rt
W 1 Dry	552.4	656.6	573.4	529.3	608.0	549.3	545.0
W 2 In H20	302.3	356.5	316.2	292.3	338.7	298.6	304.4
W 3 Wet	552.5	657.3	573.9	530.2	608.3	550.3	545.6
Difference	250.2	300.8	257.7	237.9	269.6	251.7	241.2
Field Density	2.208	2.183	2.225	2.225	2.255	2.182	2.260
% Density	95.833	94.748	96.571	96.571	97.873	94.705	98.090
% Voids	8.3	9.3	7.6	7.6	6.3	9.3	6.1
Thickness	38	44	38	38	38	38	35

Gmb (Lot Avg.): 2.304 Avg. Field Density: 2.220

Gmm (Lot Avg.): 2.407 Avg. % Density: 96.342

TC Labs Pa: Avg. % Field Voids: 7.0

Target % RAP: Specified % Density: 95

$$Q.I. = \frac{96.342 - 95.000}{1.353} = 0.99$$

Low Outlier: High Outlier: New Q.I. =

Film Thickness (FT): 14.4 VMA: 14.7

Remarks: **This is an example of a sharp mix using the Gyratory.**

C.P.I.: George Seward CI095 Cert. No.

QMA Tech: Michael Gullickson NE119 Cert. No.

Distribution: Central Materials TC Materials Proj. Engineer Contractor Plant

NOTES

Form 820180ex 11-01

Lab. No.:	1	
Material:	Fine Aggregate – PCC	Grad. No.: 1
Co. & Proj.#:		
Producer:		
Contractor:		
Sampled By:	Date:	
Sample Loc.:		

Original Dry Mass:	511.3	Total Minus 4.75 mm (W1):	
Dry Mass Washed:	509.0	Reduced Minus 4.75mm(W2)	
Washing Loss:		Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")					
19mm (¾)					
12.5mm (½")					
9.5mm (⅜")					
4.75mm (4)		19.1			
2.36mm (8)	(B)	98.3 (A)			
1.18mm (16)	(B)	124.0 (A)			
600µm (30)	(B)	160.9 (A)			
300µm (50)	(B)	77.2 (A)			
150µm (100)	(B)	22.6 (A)			
75µm (200)	(B)	7.3 (A)			
Wash		2.3			
Pan	(B)	0.4 (A)			
Total					
Tolerance					

Wash Sample		
	Original Dry Mass:	
	Dry Mass Washed:	
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 µm (200)				
Wash				
Pan				

Date Reported:	Cert No.:	
Tested By:		

Comments: ______________________

Form 820180ex 11-01

Lab. No.:	1	
Material:	Fine Aggregate – PCC	Grad. No.: 1
Co. & Proj.#:		
Producer:		
Contractor:		
Sampled By:		Date:
Sample Loc.:		

Original Dry Mass:	511.3	Total Minus 4.75 mm (W1):	
Dry Mass Washed:	509.0	Reduced Minus 4.75mm(W2)	
Washing Loss:	2.3	Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")					
19mm (¾)					
12.5mm (½")					
9.5mm (⅜")				100.0	100
4.75mm (4)		19.1	3.7	96.3	90-100
2.36mm (8)	(B)	98.3 (A)	19.2	77.1	70-100
1.18mm (16)	(B)	124.0 (A)	24.3	52.8	
600µm (30)	(B)	160.9 (A)	31.5(31.4)	21.4	10-60
300µm (50)	(B)	77.2 (A)	15.1	6.3	
150µm (100)	(B)	22.6 (A)	4.4	1.9	
75µm (200)	(B)	7.3 (A)	1.4	0.5	0-1.5
Wash		2.3	0.5		
Pan	(B)	0.4 (A)			
Total		512.1	100.1(100.0)		
Tolerance		100.2			

Wash Sample	Original Dry Mass:	
	Dry Mass Washed:	
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 µm (200)				
Wash				
Pan				

Date Reported:	Cert No.:
Tested By:	

Comments: ______________________________

Lab. No.:	2	
Material:	Fine Aggregate – PCC	Grad. No.: 1
Co. & Proj.#:		
Producer:		
Contractor:		
Sampled By:		Date:
Sample Loc.:		

Original Dry Mass:	542.0	Total Minus 4.75 mm (W1):	
Dry Mass Washed:	539.6	Reduced Minus 4.75mm(W2)	
Washing Loss:		Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")					
19mm (¾)					
12.5mm (½")					
9.5mm (⅜")					
4.75mm (4)					
2.36mm (8)	(B)	101.3 (A)			
1.18mm (16)	(B)	160.7 (A)			
600µm (30)	(B)	179.0 (A)			
300µm (50)	(B)	80.0 (A)			
150µm (100)	(B)	10.9 (A)			
75µm (200)	(B)	5.8 (A)			
Wash		2.4			
Pan	(B)	0.3 (A)			
Total					
Tolerance					

Wash Sample	Original Dry Mass:	
	Dry Mass Washed:	
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 µm (200)				
Wash				
Pan				

Date Reported:		Cert No.:
Tested By:		

Comments: ______________________________

Form 820180ex 11-01

Lab. No.:	2	
Material:	Fine Aggregate – PCC	Grad. No.: 1
Co. & Proj.#:		
Producer:		
Contractor:		
Sampled By:	Date:	
Sample Loc.:		

Original Dry Mass:	542.0	Total Minus 4.75 mm (W1):	
Dry Mass Washed:	539.6	Reduced Minus 4.75mm(W2)	
Washing Loss:	2.4	Conversion Factor: W1/W2	
		Calculated Weight (A)=Conversion Factor x (B)	

Sieve Size	Reduced Minus4.75mm	Total or Calc. Weight Retd.	% Retained	% Passing	Specs.
37.5mm(1½")					
25mm (1")					
19mm (¾)					
12.5mm (½")					
9.5mm (⅜")					100
4.75mm (4)				100.0	90-100
2.36mm (8)	(B)	101.3 (A)	18.7(18.8)	81.2	70-100
1.18mm (16)	(B)	160.7 (A)	29.6(29.7)	51.5	
600µm (30)	(B)	179.0 (A)	33.0(33.1)	18.4	10-60
300µm (50)	(B)	80.0 (A)	14.8	3.6	
150µm (100)	(B)	10.9 (A)	2.0	1.6	
75µm (200)	(B)	5.8 (A)	1.1	0.5	0-1.5
Wash		2.4	0.5		
Pan	(B)	0.3 (A)			
Total		540.4	99.7(100.0)		
Tolerance		99.7			

Wash Sample		
	Original Dry Mass:	
	Dry Mass Washed:	
	Washing Loss:	

Sieve Size	Mass Retd.	% Retd.	% Passing	Specs.
75 µm (200)				
Wash				
Pan				

Date Reported:	Cert No.:
Tested By:	

Comments: ______________________________