

DOCUMENTATION GUIDE

**(Minimum Documentation Requirements for
Pay Item Approvals and Material Acceptance)**

2013 EDITION

VERSION 2.0

June 1, 2013



**CONSTRUCTION FIELD SERVICES
DIVISION**

For copies of this manual contact the MDOT Publications Office
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The 2012 Minimum Acceptance Requirements for Material Approvals and Documentation Guide has been edited by the team of:

Mohammad Azam, Construction Field Services Division
Mike Cornacchia, Metro Region
Yvonne Guerra, University Region
Steve Hawker, University Region
Channing Page, University Region
Robert Smrek, Southwest Region
Matthew Thomas, Bay Region

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DOCUMENTATION REQUIREMENTS FOR PROJECTS

This document is intended for use as a **GUIDE** to assist in project documentation of construction operations. It is a working document and will be updated as required. It is the responsibility of the managing office preparing the project record files to verify that the requirements are current.

FINAL ESTIMATE REVIEWS

The purpose of the Final Estimate Review is to determine whether the documentation is in substantial compliance with the plans, specifications and properly authorized contract modifications. Refer to [BOH IM11-04](#), or as superseded, for additional information.

When the Construction/Project Engineer has determined the final quantities of all pay items and has received all material documentation, the Region Construction Engineer should be notified that the project is ready for a final estimate review. A review team will meet with the Construction/Project Engineer to review the project documentation. The Construction/Project Engineer is to provide the review team with work space, read only access to the FieldManager files, all of the project files and access to personnel familiar with the project and file documentation. All of the files shall be provided at one physical location.

The review team will evaluate the following questions:

- Was the pay item measured according to specifications?
- Were the source documents (pay items and testing) validated by signatures and dates?
- Were the prescribed forms used?
- Were the testing frequencies correct?
- Were the materials listed on the signed Material Source List?
- Were the materials approved per MDOT specifications?
- Were the pay items and materials used and approved in FieldManager?

Particular attention will be focused on the proper use of FieldManager, FieldBook, and ProjectWise in the cross-referencing of pay items and source documents (IDRs, certifications, test reports, project file for numbers/descriptions/forms, etc.). The correct use of FieldManager provides reviewers with good cross-references for finding the documentation in the files.

NOTES PAGE:**INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS**

- Aggregate: A minimum of one satisfactory test per tester/per season (NHS Routes ONLY)
- Concrete: A minimum of one satisfactory test, per tester/per season (NHS Routes ONLY)
- Density: A minimum of one satisfactory test per tester/per type/per season (NHS Routes ONLY)
- HMA: A minimum of one satisfactory test, per tester/ per type / per season (NHS Routes ONLY)

NHS PROJECTS ONLY:

Aggregate, Concrete, Density, and HMA acceptance testing or the independent assurance testing program must be conducted by qualified personnel.

MDOT PROJECTS ONLY:

Aggregate, Concrete, Density, and HMA testing must be performed by CERTIFIED personnel on all state and federally funded projects, regardless of NHS status.

AGGREGATES:

One scale test per year if plant is stationary (if material is paid by the ton). Written verification from scale owner to region material staff that the scale system has been inspected or copy of current scale inspection must be on file.

MATERIAL SOURCE GUIDE:

Verify current sample requirements from latest edition of Material Source Guide.

MATERIAL SOURCE LIST (FORM 501):

The source and approximate quantity for all materials incorporated into the project must be listed and submitted on the Material Source List form. The Material Source List form along with the appropriate signatures is required in the project files.

BUY AMERICA:

Check for the "BUY AMERICA" statement on all steel and iron certifications which is required on Federal Aid Projects. It should be noted that this is different than the "BUY AMERICAN" statement which may also be listed. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA".

TICKETS:

Immediate possession of tickets is required for items paid by ton (weight).

QUALIFIED PRODUCTS LIST:

Notation on an IDR that includes the material manufacturer and product name as well as a statement that the material/product label was checked and verified.

OR

Placement of label, tag, etc. in the project files. A direct copy of this identification is also acceptable.

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BACKFILL, SWAMP

Pay Unit: Cubic Yard

MATERIALS: Granular Material Class III**ACCEPTANCE TESTING REQUIREMENTS****Granular Materials****Prequalified Sources:**

1. One ticket REQUIRED per load containing the following data.
 - a. MDOT aggregate source number (Pit Number)
 - b. Date of shipment
 - c. Time of shipment (if applicable)
 - d. MDOT control section and job number
 - e. Michigan series number and class letter of aggregate
 - f. Weight or volume shipped
 - g. Suppliers name, telephone number and location
 - h. Truck identifier number (if applicable)
2. Documentation verifying passing QA test results in project files. Refer to [CA 2012-08](#), or as superseded, for additional information.
3. See Material Quality Assurance Procedures Manual section C-6, Part 7 f for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.
4. In addition, the following statement shall be printed or stamped on each ticket: "I attest that aggregate as delivered from this pre-qualified source meets specification requirements for the listed Michigan series and class for quantity stated. Date _____ Signature _____."
This statement must be signed by an authorized company representative. This statement does not signify acceptance by MDOT of the aggregate.

Non-Prequalified Sources:

1. One ticket REQUIRED per load containing the following data **if applicable**.
 - a. MDOT aggregate source number
 - b. Date and time of shipment
 - c. MDOT control section and job number
 - d. Michigan series number and class letter of aggregate
 - e. Weight or volume shipped
 - f. Suppliers name, telephone number and location
 - g. Truck identifier number
2. Test reports must be in project files.
 - a. One test per 10,000 cubic yards.

2050001**BACKFILL, SWAMP**

Pg 2 of 2

Job Site/On Site Sources:

1. Test reports must be in project files.
 - a. One test per 10,000 cubic yards.

Visual Inspection: Maximum 500 cubic yards per project

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will measure volume in original position.
 - b. If it is not practical to calculate the volume in its original position, the engineer will calculate the volume within the limits of the plans, or from soil borings and increase the volume by 15%.
3. Density Reports
 - a. Review reports to see that all test and retests meet MDOT requirements (see form 0582B) and the minimum frequency of one test per 1000 cubic yards have been achieved.
 - b. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

NOTE: Refer to notes on sheet 7 of 7 of Standard Plan R-103-C concerning the backfill of a dry trench.

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EMBANKMENT, CIP

Pay Unit: Cubic Yard

MATERIALS: Granular Material Class II or Granular Material Class III, Sound Earth**ACCEPTANCE TESTING REQUIREMENTS****Granular Materials****Prequalified Sources:**

1. One ticket REQUIRED per load containing the following data.
 - a. MDOT aggregate source number (Pit Number)
 - b. Date of shipment
 - c. Time of shipment (if applicable)
 - d. MDOT control section and job number
 - e. Michigan series number and class letter of aggregate
 - f. Weight or volume shipped
 - g. Suppliers name, telephone number and location
 - h. Truck identifier number (if applicable)
2. Documentation verifying passing QA test results in project files. Refer to [CA 2012-08](#), or as superseded, for additional information.
3. See Material Quality Assurance Procedures Manual section C-6, Part 7 f for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.
4. In addition, the following statement shall be printed or stamped on each ticket: "I attest that aggregate as delivered from this pre-qualified source meets specification requirements for the listed Michigan series and class for quantity stated.
Date _____ Signature _____.
This statement must be signed by an authorized company representative. This statement does not signify acceptance by MDOT of the aggregate.

Non-Prequalified Sources:

1. One ticket REQUIRED per load containing the following data **if applicable**.
 - a. MDOT aggregate source number
 - b. Date and time of shipment
 - c. MDOT control section and job number
 - d. Michigan series number and class letter of aggregate
 - e. Weight or volume shipped
 - f. Suppliers name, telephone number and location
 - g. Truck identifier number
2. Test reports must be in project files.
 - a. Class II – One test per 3,000 cubic yards.
 - b. Class III - One test per 10,000 cubic yards.

2050010**EMBANKMENT, CIP**

Pg 2 of 2

Job Site/On Site Sources:

1. Test reports must be in project files.
 - a. Class II – One test per 3,000 cubic yards.
 - b. Class III - One test per 10,000 cubic yards.

Visual Inspection: Maximum 500 cubic yards per material class per project.

Sound Earth

Visual Inspection: All material placed.

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Grade checks once every 50 feet across the section. Tolerance +/- 1 inch if subbase is required and +/- $\frac{3}{4}$ inch if subbase is not required.
2. Measurement and payment.
 - a. Engineer will determine if payment will be based on plan quantity.
 - b. Engineer will measure volume based on the grade and cross section shown on the plans if not by plan quantity.
3. Density Reports.
 - a. Controlled Density Method (subsection 205.03.H.4.a). Review reports to see that all test and retests meet MDOT requirements (see form 0582B) and the minimum frequency of one test per 1000 cubic yards have been achieved. Sound Earth if used must be compacted to 95 percent of maximum unit weight.
 - b. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

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EMBANKMENT, LM

Pay Unit: Cubic Yard

MATERIALS: Granular Material Class II or Granular Material Class III, Sound Earth**ACCEPTANCE TESTING REQUIREMENTS****Granular Materials****Prequalified Sources:**

1. One ticket REQUIRED per load containing the following data.
 - a. MDOT aggregate source number (Pit Number)
 - b. Date of shipment
 - c. Time of shipment (if applicable)
 - d. MDOT control section and job number
 - e. Michigan series number and class letter of aggregate
 - f. Weight or volume shipped
 - g. Suppliers name, telephone number and location
 - h. Truck identifier number (if applicable)
2. Documentation verifying passing QA test results in project files. Refer to [CA 2012-08](#), or as superseded, for additional information.
3. See Material Quality Assurance Procedures Manual section C-6, Part 7 f for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.
4. In addition, the following statement shall be printed or stamped on each ticket: "I attest that aggregate as delivered from this pre-qualified source meets specification requirements for the listed Michigan series and class for quantity stated.
Date _____ Signature _____.
This statement must be signed by an authorized company representative. This statement does not signify acceptance by MDOT of the aggregate.

Non-Prequalified Sources:

1. One ticket REQUIRED per load containing the following data **if applicable**.
 - a. MDOT aggregate source number
 - b. Date and time of shipment
 - c. MDOT control section and job number
 - d. Michigan series number and class letter of aggregate
 - e. Weight or volume shipped
 - f. Suppliers name, telephone number and location
 - g. Truck identifier number
2. Test reports must be in project files.
 - a. Class II – One test per 3,000 cubic yards.
 - b. Class III - One test per 10,000 cubic yards.

2050011**EMBANKMENT, LM**

Pg 2 of 2

Job Site/On Site Sources:

1. Test reports must be in project files.
 - a. Class II – One test per 3,000 cubic yards.
 - b. Class III - One test per 10,000 cubic yards.

Visual Inspection: Maximum 500 cubic yards per material class per project.

Sound Earth

Visual Inspection: All material placed.

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Grade checks once every 50 feet across the section. Tolerance +/- 1 inch if subbase is required and +/- 3/4 inch if subbase is not required.
2. Measurement and payment.
 - a. Engineer will measure by volume, LM.
3. Density Reports.
 - a. Controlled Density Method (subsection 205.03.H.4.a). Review reports to see that all test and retests meet MDOT requirements (see form 0582B) and the minimum frequency of one test per 1000 cubic yards have been achieved. Sound Earth if used must be compacted to 95 percent of maximum unit weight.
 - b. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

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EMBANKMENT, STRUCTURE, CIP

Pay Unit: Cubic Yard

MATERIALS: Granular Material Class III, Sound Earth (if allowed)**ACCEPTANCE TESTING REQUIREMENTS****Granular Materials****Prequalified Sources:**

1. One ticket REQUIRED per load containing the following data.
 - a. MDOT aggregate source number (Pit Number)
 - b. Date of shipment
 - c. Time of shipment (if applicable)
 - d. MDOT control section and job number
 - e. Michigan series number and class letter of aggregate
 - f. Weight or volume shipped
 - g. Suppliers name, telephone number and location
 - h. Truck identifier number (if applicable)
2. Documentation verifying passing QA test results in project files. Refer to [CA 2012-08](#), or as superseded, for additional information.
3. See Material Quality Assurance Procedures Manual section C-6, Part 7 f for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.
4. In addition, the following statement shall be printed or stamped on each ticket: "I attest that aggregate as delivered from this pre-qualified source meets specification requirements for the listed Michigan series and class for quantity stated.
Date _____ Signature _____.
This statement must be signed by an authorized company representative. This statement does not signify acceptance by MDOT of the aggregate.

Non-Prequalified Sources:

1. One ticket REQUIRED per load containing the following data **if applicable**.
 - a. MDOT aggregate source number
 - b. Date and time of shipment
 - c. MDOT control section and job number
 - d. Michigan series number and class letter of aggregate
 - e. Weight or volume shipped
 - f. Suppliers name, telephone number and location
 - g. Truck identifier number
2. Test reports must be in project files.
 - a. Class III - One test per 10,000 cubic yards.

2050012**EMBANKMENT, STRUCTURE, CIP**

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Job Site/On Site Sources:

1. Test reports must be in project files.
 - a. Class III - One test per 10,000 cubic yards.

Visual Inspection: Maximum 500 cubic yards per material class per project.

Sound Earth

1. For use under structure footing supported by piling if allowed by Engineer.

Visual Inspection: All material placed.

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment.
 - a. Engineer will measure based on the grade and cross section shown in the plans.
3. Density Reports.
 - a. Controlled Density Method (subsection 205.03.H.4.a). Review reports to see that all test and retests meet MDOT requirements (see form 0582B) and the minimum frequency of one test per 1000 cubic yards have been achieved.
 - b. Original ground must be compacted to 95 percent of maximum unit weight.
 - c. Backfill material must be compacted to 100 percent of maximum unit weight under structure footing for which piling is not specified.
 - d. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

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EXCAVATION, EARTH

Pay Unit: Cubic Yard

MATERIALS: Existing Material at Cut Depth**ACCEPTANCE TESTING REQUIREMENTS****Existing Material**

1. Compact the subgrade to at least 95 percent of its maximum unit weight to a depth of at least 10 inches.

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Grade checks once every 50 feet across the section. Tolerance +/- 1 inch if subbase is required and +/- 3/4 inch if subbase is not required.
2. Measurement and payment.
 - a. Engineer will determine if payment will be based on plan quantity.
 - b. Engineer will measure volume based on the grade and cross section shown on the plans if not by plan quantity.
3. Density Reports.
 - a. Review reports to see that all test and retests meet MDOT requirements (see form 0582B) and the minimum frequency of 1 test per 500 feet per width of 24 feet or less.
 - b. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

2050040

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SUBGRADE UNDERCUTTING, TYPE I

Pay Unit: Cubic Yard

MATERIALS: Selected Clay or other Engineer Approved Material**ACCEPTANCE TESTING REQUIREMENTS****Clay****Visual Inspection:** All material placed.**Engineer Approved Material**

1. Test for acceptance per latest Material Quality Assurance Procedures Manual.

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Grade checks once every 50 feet across the section. Tolerance +/- 1 inch if subbase is required and +/- 3/4 inch if subbase is not required.
2. Measurement and payment.
 - a. Engineer will measure in its original position.
3. Density Reports.
 - a. Controlled Density Method (subsection 205.03.H.4.a). Review reports to see that all test and retests meet MDOT requirements (see form 0582B) and the minimum frequency of one test per 500 feet per width of 24 feet or less. Material must be compacted to 95 percent of maximum unit weight.
4. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

NOTE: Refer to notes on sheet 7 of 7 of Standard Plan R-103-C concerning the backfill of a dry trench.

2050041

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SUBGRADE UNDERCUTTING, TYPE II

Pay Unit: Cubic Yard

MATERIALS: Granular Material Class II**ACCEPTANCE TESTING REQUIREMENTS****Granular Materials****Prequalified Sources:**

1. One ticket REQUIRED per load containing the following data.
 - a. MDOT aggregate source number (Pit Number)
 - b. Date of shipment
 - c. Time of shipment (if applicable)
 - d. MDOT control section and job number
 - e. Michigan series number and class letter of aggregate
 - f. Weight or volume shipped
 - g. Suppliers name, telephone number and location
 - h. Truck identifier number (if applicable)
2. Documentation verifying passing QA test results in project files. Refer to [CA 2012-08](#), or as superseded, for additional information.
3. See Material Quality Assurance Procedures Manual section C-6, Part 7 f for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.
4. In addition, the following statement shall be printed or stamped on each ticket: "I attest that aggregate as delivered from this pre-qualified source meets specification requirements for the listed Michigan series and class for quantity stated.
Date _____ Signature _____.
This statement must be signed by an authorized company representative. This statement does not signify acceptance by MDOT of the aggregate.

Non-Prequalified Sources:

1. One ticket REQUIRED per load containing the following data **if applicable**
 - a. MDOT aggregate source number
 - b. Date and time of shipment
 - c. MDOT control section and job number
 - d. Michigan series number and class letter of aggregate
 - e. Weight or volume shipped
 - f. Suppliers name, telephone number and location
 - g. Truck identifier number
2. Test reports must be in project files
 - a. Class II - One test per 3,000 cubic yards.

2050041**SUBGRADE UNDERCUTTING, TYPE II**

Pg 2 of 2

Job Site/On Site Sources:

1. Test reports must be in project files.
 - a. Class II - One test per 3,000 cubic yards.

Visual Inspection: Maximum 500 cubic yards per project.

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page at the beginning of this document for IAT requirements.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Grade checks once every 50 feet across the section. Tolerance +/- 1 inch if subbase is required and +/- 3/4 inch if subbase is not required.
2. Measurement and payment.
 - a. Engineer will measure in its original position.
3. Density Reports.
 - a. Controlled Density Method (subsection 205.03.H.4.a). Review reports to see that all test and retests meet MDOT requirements (see form 0582B) and the minimum frequency of one test per 150 feet per width of 24 feet or less. Material must be compacted to 95 percent of maximum unit weight.
 - b. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

NOTE: Refer to notes on sheet 7 of 7 of Standard Plan R-103-C concerning the backfill of a dry trench.

2050042

Pg 1 of 1

SUBGRADE UNDERCUTTING, TYPE III

Pay Unit: Cubic Yard

MATERIALS: Excavated Material effectively mixed or Engineer Approved Material**ACCEPTANCE TESTING REQUIREMENTS****Excavated Material****Visual Inspection:** All material placed.**Engineer Approved Material**

1. If approved material is used in lieu of excavated material, the acceptance testing requirements for the approved material in section G of the Materials Quality Assurance Procedures Manual must be followed.

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Grade checks once every 50 feet across the section. Tolerance +/- 1 inch if subbase is required and +/- $\frac{3}{4}$ inch if subbase is not required.
2. Measurement and payment.
 - a. Engineer will measure in its original position.
3. Density Reports.
 - a. Controlled Density Method (subsection 205.03.H.4.a). Review reports to see that all test and retests meet MDOT requirements (see form 0582B) and the minimum frequency of one test per 500 per width of 24 feet or less. Material must be compacted to 95 percent of maximum unit weight.
 - b. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

NOTE: Refer to notes on sheet 7 of 7 of Standard Plan R-103-C concerning the backfill of a dry trench.

2060002

Pg 1 of 2

BACKFILL, STRUCTURE, CIP

Pay Unit: Cubic Yard

MATERIALS: Granular Material Class II**ACCEPTANCE TESTING REQUIREMENTS****Granular Materials****Prequalified Sources:**

1. One ticket REQUIRED per load containing the following data.
 - a. MDOT aggregate source number (Pit Number)
 - b. Date of shipment
 - c. Time of shipment (if applicable)
 - d. MDOT control section and job number
 - e. Michigan series number and class letter of aggregate
 - f. Weight or volume shipped
 - g. Suppliers name, telephone number and location
 - h. Truck identifier number (if applicable)
2. Documentation verifying passing QA test results in project files. Refer to [CA 2012-08](#), or as superseded, for additional information.
3. See Material Quality Assurance Procedures Manual section C-6, Part 7 f or reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.
4. In addition, the following statement shall be printed or stamped on each ticket: "I attest that aggregate as delivered from this pre-qualified source meets specification requirements for the listed Michigan series and class for quantity stated.
Date _____ Signature _____.
This statement must be signed by an authorized company representative. This statement does not signify acceptance by MDOT of the aggregate.

Non-Prequalified Sources:

1. One ticket REQUIRED per load containing the following data **if applicable**.
 - a. MDOT aggregate source number
 - b. Date and time of shipment
 - c. MDOT control section and job number
 - d. Michigan series number and class letter of aggregate
 - e. Weight or volume shipped
 - f. Suppliers name, telephone number and location
 - g. Truck identifier number
2. Test reports must be in project files.
 - a. Class II - One test per 3,000 cubic yards.

2060002**BACKFILL, STRUCTURE, CIP**

Pg 2 of 2

Job Site/On Site Sources:

1. Test reports must be in project files.
 - a. Class II - One test per 3,000 cubic yards.

Visual Inspection: Maximum 500 cubic yards per project.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment.
 - a. Engineer will base payment on plan quantity
3. Density Reports.
 - a. Controlled Density Method (subsection 205.03.H.4.a). Review reports to see that all test and retests meet MDOT requirements (see form 0582B) and the minimum frequency of one test per 300 cubic yards with 6 inch layers.
 - b. Backfill material must be compacted to 95 percent of maximum unit weight.
 - c. Backfill material must be compacted to 100 percent of maximum unit weight in the load bearing area.
 - d. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

2080025

Pg 1 of 1

EROSION CONTROL, SILT FENCE

Pay Unit: Foot

MATERIALS: Geosynthetics, Stakes and Lath (Silt Fence)

ACCEPTANCE TESTING REQUIREMENTS

Geosynthetics

1. Qualified Products List (910.04) – Document Product name and quantity used on IDR.

Silt Fence

1. A General Certification from an approved Manufacturer of the silt fence system. Fabric manufacturer and brand/product name must be included on certification.

Or

2. If not from an approved manufacturer then test prior to incorporation. Sample size: One piece 8 foot long by the width of the roll (including 2 stakes and lath). One sample per the first 3,000 foot or fraction of. One sample for per additional 10,000 foot or fraction of.

Visual Inspection: Maximum 500 feet per project.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment.
 - a. Engineer will measure in place excluding overlap.

3010002**3010003**

Pg 1 of 2

SUBBASE, CIP**SUBBASE, LM**

Pay Unit: Cubic Yard

MATERIALS: Granular Material Class II**ACCEPTANCE TESTING REQUIREMENTS****Granular Materials****Prequalified Sources:**

1. One ticket REQUIRED per load containing the following data.
 - a. MDOT aggregate source number (Pit Number)
 - b. Date of shipment
 - c. Time of shipment (if applicable)
 - d. MDOT control section and job number
 - e. Michigan series number and class letter of aggregate
 - f. Weight or volume shipped
 - g. Suppliers name, telephone number and location
 - h. Truck identifier number (if applicable)
2. Documentation verifying passing QA test results in project files. Refer to [CA 2012-08](#), or as superseded, for additional information.
3. See Material Quality Assurance Procedures Manual section C-6, Part 7 f or reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.
4. In addition, the following statement shall be printed or stamped on each ticket: "I attest that aggregate as delivered from this pre-qualified source meets specification requirements for the listed Michigan series and class for quantity stated.
Date _____ Signature _____.
This statement must be signed by an authorized company representative. This statement does not signify acceptance by MDOT of the aggregate.

Non-Prequalified Sources:

1. One ticket REQUIRED per load containing the following data **if applicable**
 - a. MDOT aggregate source number
 - b. Date and time of shipment
 - c. MDOT control section and job number
 - d. Michigan series number and class letter of aggregate
 - e. Weight or volume shipped
 - f. Suppliers name, telephone number and location
 - g. Truck identifier number
2. Test reports must be in project files
 - a. Class II - One test per 3,000 cubic yards.

3010002**SUBBASE, CIP****3010003****SUBBASE, LM**

Pg 2 of 2

Job Site/On Site Sources:

1. Test reports must be in project files.
 - a. Class II - One test per 3,000 cubic yards.

Visual Inspection: Maximum 500 cubic yards per project.

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENT

1. See Notes page for IAT requirements.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Grade checks once every 50 feet across the section. Tolerance + 1 inch.
2. Measurement and payment.
 - a. Engineer will measure CIP based on cross sections. LM will be based on hauling unit dimensions and load counts.
3. Density Reports.
 - a. Refer to section 301 Subbase. Review reports to see that all test and retests meet MDOT requirements (see form 0582B) and the minimum frequency of one test per 500 feet per width of 24 feet or less. Material must be compacted to 95 percent of maximum unit weight.
 - b. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

3020001	AGGREGATE BASE
3020002	AGGREGATE BASE, LM
3020008 – 3020030	AGGREGATE BASE, __ INCH
Pg 1 of 3	Pay Unit: Cubic Yard, Square Yard, Ton

MATERIALS: Dense Graded Aggregate - 21AA, 21A, 22A
O.G.D.C. by special provision

ACCEPTANCE TESTING REQUIREMENTS

Aggregates

Prequalified Sources:

1. One ticket REQUIRED per load containing the following data
 - a. MDOT aggregate source number (Pit Number)
 - b. Date of shipment
 - c. Time of shipment (if applicable)
 - d. MDOT control section and job number
 - e. Michigan series number and class letter of aggregate
 - f. Weight or volume shipped
 - g. Suppliers name, telephone number and location
 - h. Truck identifier number (if applicable)
2. If paid by square yard or cubic yard, truck number and time are not required on tickets/documentation.

Documentation verifying passing QA test results in project files. Refer to [CA 2012-08](#), or as superseded, for additional information.

3.
 4. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.
 5. In addition, the following statement shall be printed or stamped on each ticket: "I attest that aggregate as delivered from this pre-qualified source meets specification requirements for the listed Michigan series and class for quantity stated.
Date _____ Signature _____.
This statement must be signed by an authorized company representative. This statement does not signify acceptance by MDOT of the aggregate.

Non-Prequalified Sources:

1. One ticket REQUIRED per load containing the following data **if applicable**
 - a. MDOT aggregate source number
 - b. Date and time of shipment
 - c. MDOT control section and job number
 - d. Michigan series number and class letter of aggregate
 - e. Weight or volume shipped
 - f. Suppliers name, telephone number and location
 - g. Truck identifier number

3020001 **AGGREGATE BASE**
3020002 **AGGREGATE BASE, LM**
3020008 – 3020030 **AGGREGATE BASE, ___ INCH**

Pg 2 of 3

2. Test reports must be in project files
 - a. One test per 1,000 tons

Job site/On site Sources:

1. Test reports must be in project files
 - a. One test per 1,000 Tons
 - b. Weigh Tickets required if paid by ton

Visual Inspection: Maximum VI 500 cubic yards per material class per project

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Immediate possession of tickets is required if paying by ton (weight).
 - e. Moisture check required on ton pay items by inspector and note on the IDR.
 - f. Depth checks required. One test per 400 lft per traffic lane width. One test per 1,200 syds for intersections, crossovers, ramps, widening strips, and acceleration lanes. Note depth checks on IDR for SYD pay item specified depth.
 - g. Grade checks required once every 50 feet across the section.
Tolerance +/- 1/2 inch.
2. Measurement and payment
 - a. Tons: Engineer will measure scale weight of the material, including ad mixtures and moisture content no greater than 6%.
 - b. LM: Engineer will measure based on hauling unit dimensions and load count before placement and compaction.
 - c. SYD: Engineer will measure based on the width and length for the specified depth as shown on the plans.

3020001
3020002
3020008 – 3020030

AGGREGATE BASE
AGGREGATE BASE, LM
AGGREGATE BASE, ___ INCH

Pg 3 of 3

3. Density Reports
 - a. Refer to subsection 302.03A, Placing and Compacting. Review reports to see that all test and retests meet MDOT requirements (see form 0582B) and the minimum frequency of one test per 500 feet per width of 24 feet or less.
 - b. Backfill material must be compacted to 95 percent of maximum unit weight under concrete
 - c. Backfill material must be compacted to 98 percent of maximum unit weight under HMA pavement.
 - d. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

3030004 – 3030006**OPEN-GRADED DR CSE, ___ INCH**

Pg 1 of 2

Pay Unit: Square Yard

MATERIALS: Open Graded Aggregate 4G, See special provisions in the proposal**ACCEPTANCE TESTING REQUIREMENTS****Aggregates****Prequalified Sources:**

1. One ticket REQUIRED per load containing the following data
 - a. MDOT aggregate source number (Pit Number)
 - b. Date of shipment
 - c. Time of shipment (if applicable)
 - d. MDOT control section and job number
 - e. Michigan series number and class letter of aggregate
 - f. Weight or volume shipped
 - g. Suppliers name, telephone number and location
 - h. Truck identifier number (if applicable)

Documentation verifying passing QA test results in project files. Refer to [CA 2012-08](#), or as superseded, for additional information.

- 2.
3. See Material Quality Assurance Procedures Manual section C-6, Part 7 f for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

4. In addition, the following statement shall be printed or stamped on each ticket: "I attest that aggregate as delivered from this pre-qualified source meets specification requirements for the listed Michigan series and class for quantity stated.

Date _____ Signature _____.

This statement must be signed by an authorized company representative. This statement does not signify acceptance by MDOT of the aggregate.

Non-Prequalified Sources:

1. One ticket REQUIRED per load containing the following data **if applicable**
 - a. MDOT aggregate source number
 - b. Date and time of shipment
 - c. MDOT control section and job number
 - d. Michigan series number and class letter of aggregate
 - e. Weight or volume shipped
 - f. Suppliers name, telephone number and location
 - g. Truck identifier number
2. Test reports must be in project files
 - a. One test per 1,000 Tons

3030004 – 3030006 OPEN-GRADED DR CSE, __ INCH

Pg 2 of 2

Job site/On site Sources:

1. Test reports must be in project files
 - a. One test per 1,000 Tons

Visual Inspection: Maximum 100 Ton per material class

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. Depth checks required. One test per 400 lft per traffic lane width. One test per 1,200 syds for intersections, crossovers, ramps, widening strips, and acceleration lanes. Note depth checks on IDR.
 - d. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will measure and the department will pay for OGDC according to the contract.
3. Density Reports
 - a. Refer to contract documents. Review reports to see that all test and retests meet MDOT requirements (see form 0582B) and the minimum frequency requirement per the contract.
 - b. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

3050002

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HMA BASE CRUSHING AND SHAPING

Pay unit: Square Yard

MATERIALS: If required 21A, 21AA, 22A, (to be paid separately as aggregate base)**ACCEPTANCE TESTING REQUIREMENTS****Job site/On site Sources:****Visual Inspection:** All material placed. Check specification for gradation requirements on crushed material.**INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENT**

1. See Notes page for IAT requirements.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Grade checks once every 50 feet across the section. Tolerance +/- 1/2 inch when tested with a 10 foot straightedge.
2. Measurement and payment
 - a. Engineer will measure based on plan quantity in accordance with standard specifications 109.01A regardless of any variations in depth.
3. Density Reports
 - a. Refer to subsection 305.03C, Compacting and Shaping in the standard specifications. Review reports to see that all test and retests meet MDOT requirements (see form 0582B) and the minimum frequency of one test per 500 feet per width of 24 feet or less. Material must be compacted to 98 percent of maximum unit weight.
 - b. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

3060005 – 3060006
3060010 – 3060016
 Pg 1 of 2

AGGREGATE SURFACE CSE
AGGREGATE SURFACE CSE, __ INCH
 Pay Units: Ton, Cubic Yard, Square Yard

MATERIALS: Dense Graded Aggregate 21A, 21AA, 22A, or 23A

ACCEPTANCE TESTING REQUIREMENTS

Aggregates

Prequalified Sources:

1. One ticket REQUIRED per load containing the following data
 - a. MDOT aggregate source number (Pit Number)
 - b. Date of shipment
 - c. Time of shipment (if applicable)
 - d. MDOT control section and job number
 - e. Michigan series number and class letter of aggregate
 - f. Weight or volume shipped
 - g. Suppliers name, telephone number and location
 - h. Truck identifier number (if applicable)
2. If paid by square yard or cubic yard, truck number and time are not required on tickets/documentation.

Documentation verifying passing QA test results in project files. Refer to [CA 2012-08](#), or as superseded, for additional information.

3.
 4. See Material Quality Assurance Procedures Manual section C-6, Part 7 f or reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.
 5. In addition, the following statement shall be printed or stamped on each ticket: "I attest that aggregate as delivered from this pre-qualified source meets specification requirements for the listed Michigan series and class for quantity stated.
 Date _____ Signature _____.
 This statement must be signed by an authorized company representative. This statement does not signify acceptance by MDOT of the aggregate.

Non-Prequalified Sources:

1. One ticket REQUIRED per load containing the following data if applicable
 - a. MDOT aggregate source number
 - b. Date and time of shipment
 - c. MDOT control section and job number
 - d. Michigan series number and class letter of aggregate
 - e. Weight or volume shipped
 - f. Suppliers name, telephone number and location
 - g. Truck identifier number
2. Test reports must be in project files
 - a. One test per 1,000 Tons.

3060005 – 3060006**AGGREGATE SURFACE CSE****3060010 – 3060016****AGGREGATE SURFACE CSE, __ INCH**

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Job site/On site Sources:

1. Test reports must be in project files
 - a. One test per 1,000 Tons

Visual Inspection: Maximum VI is 500 Tons per material class per project

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS (IAT)

1. See Notes page for IAT requirements

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Immediate possession of tickets is required if paying by ton (weight).
 - e. Moisture check required on ton pay items by inspector and note on the IDR.
 - f. Depth check required. One test per 400 lft per traffic lane width. One test per 1,200 syds for intersections, crossovers, ramps, widening strips, and acceleration lanes. Note depth checks on IDR for SYD pay item specified depth.
 - g. Grade checks required once every 50 feet across the section. Tolerance +/- 1/2 inch.
2. Measurement and payment
 - a. Tons: Engineer will measure scale weight of the material, including ad mixtures and moisture content no greater than 6%.
 - b. SYD: Engineer will measure based on the width and length for the specified depth as shown on the plans.
 - c. CYD: Engineer will measure based on haul ling unit/load count for LM or computations for CIP.
3. Density Reports
 - a. Controlled Density Method (subsection 306.03b). Review reports to see that all test and retests meet MDOT requirements (see form 0582B) and the minimum frequency of one test per 500 feet per width of 24 feet or less. Material must be compacted to 95 percent of maximum unit weight.
 - b. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

3070001 – 3070051
3070101 – 3070162
 Pg 1 of 2

APPROACH, CL I; CL II AND CL III
SHOULDER, CL I; CL II; CL III AND CL IV
 Pay Units: Ton, Cubic Yard, Square Yard

MATERIALS: Dense Graded Aggregate 21A, 21AA, 22A, 23A or Salvaged Material

ACCEPTANCE TESTING REQUIREMENTS

Aggregates

Prequalified Sources:

1. One ticket REQUIRED per load containing the following data.
 - a. MDOT aggregate source number (Pit Number)
 - b. Date of shipment
 - c. Time of shipment (if applicable)
 - d. MDOT control section and job number
 - e. Michigan series number and class letter of aggregate
 - f. Weight or volume shipped
 - g. Suppliers name, telephone number and location
 - h. Truck identifier number (if applicable)
2. Documentation verifying passing QA test results in project files. Refer to [CA 2012-08](#), or as superseded, for additional information.
3. See Material Quality Assurance Procedures Manual section C-6, Part 7 f or reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.
4. In addition, the following statement shall be printed or stamped on each ticket: "I attest that aggregate as delivered from this pre-qualified source meets specification requirements for the listed Michigan series and class for quantity stated.
 Date _____ Signature _____.
 This statement must be signed by an authorized company representative. This statement does not signify acceptance by MDOT of the aggregate.

Non-Prequalified Sources:

1. One ticket REQUIRED per load containing the following data **if applicable**.
 - a. MDOT aggregate source number
 - b. Date and time of shipment
 - c. MDOT control section and job number
 - d. Michigan series number and class letter of aggregate
 - e. Weight or volume shipped
 - f. Suppliers name, telephone number and location
 - g. Truck identifier number
2. Test reports must be in project files.
 - a. One test per 1,000 Tons

3070001 – 3070051
3070101 – 3070162

APPROACH, CL I; CL II AND CL III
SHOULDER, CL I; CL II; CL III AND CL IV

Pg 2 of 2

Job site/On site Sources:

1. Test reports must be in project files.
 - a. One test per 1,000 Tons

Visual Inspection: Maximum 500 Tons per material class per project.

Salvaged Material

Visual Inspection: All material for 2 in maximum particle size, document on IDR.

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Immediate possession of tickets is required if paying by ton (weight).
 - e. Moisture check required on ton pay items by inspector and note on the IDR.
 - f. Depth check required: One test per 400 lft per traffic lane width. One test per 1,200 syds for intersections, crossovers, ramps, widening strips, and acceleration lanes. Note depth checks on IDR for SYD items.
2. Measurement and payment.
 - a. Tons: Engineer will measure scale weight of the material, including ad mixtures and moisture content no greater than 6%.
 - b. LM: Engineer will measure based on hauling unit dimensions and load count before placement and compaction.
 - c. SYD: Engineer will measure based on the width and length for the specified depth as shown on the plans.
3. Density Reports.
 - a. Refer to subsection 307.03C, Placing and Compacting. Review reports to see that all test and retests meet MDOT requirements (see form 0582B) and the minimum frequency of one test per 500 feet per width of 24 feet or less.
 - b. Class I must be compacted to 98 percent of maximum unit weight, Class II, Class III and Class IV must be compacted to 95 percent of maximum unit weight.
 - c. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

4010012 – 4010108

Pg 1 of 1

CULVERT END SECTIONS

Pay Unit: Each

MATERIALS: Concrete End Section, Metal End Section**ACCEPTANCE TESTING REQUIREMENTS****End Section**

1. Concrete End Section.
 - a. Certification from approved manufacturer.
- Or**
- b. Test per lot prior to incorporation. Test 1 percent of pieces per Section G of the Materials Quality Assurance Manual.

Visual Inspection: Maximum 10 pieces

2. Metal End Section.
 - a. A General Certification.

Visual Inspection: Maximum 4 pieces**NOTE:**

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment.
 - a. Engineer will base payment for each end section used.

4010131 – 4010698

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CULVERTS

Pay Unit: Foot

MATERIALS: Aggregate 6A, 17A, 34R, Granular Material Class II, III, IIIA, Geosynthetic, Joint Sealers, Pipe Gaskets, Reinforced/Nonreinforced Concrete pipe, or Corrugated & Spiral Ribbed Al-Alloy/Steel pipe, Smooth-Lined Corrugated Plastic Pipe(CPE), Water Tight Joint

ACCEPTANCE TESTING REQUIREMENTS**Aggregates & Granular Materials****Prequalified Sources:**

1. One ticket REQUIRED per load containing the following data.
 - a. MDOT aggregate source number (Pit Number)
 - b. Date of shipment
 - c. Time of shipment (if applicable)
 - d. MDOT control section and job number
 - e. Michigan series number and class letter of aggregate
 - f. Weight or volume shipped
 - g. Suppliers name, telephone number and location
 - h. Truck identifier number (if applicable)
2. Documentation verifying passing QA test results in project files. Refer to [CA 2012-08](#), or as superseded, for additional information.
3. See Material Quality Assurance Procedures Manual section C-6, Part 7 f or reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.
4. In addition, the following statement shall be printed or stamped on each ticket: "I attest that aggregate as delivered from this pre-qualified source meets specification requirements for the listed Michigan series and class for quantity stated.
Date _____ Signature _____.
This statement must be signed by an authorized company representative. This statement does not signify acceptance by MDOT of the aggregate.

Non-Prequalified Sources:

1. One ticket REQUIRED per load containing the following data **if applicable**.
 - a. MDOT aggregate source number
 - b. Date and time of shipment
 - c. MDOT control section and job number
 - d. Michigan series number and class letter of aggregate
 - e. Weight or volume shipped
 - f. Suppliers name, telephone number and location
 - g. Truck identifier number

4010131 – 4010698 CULVERTS

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2. Test reports must be in project files.
 - a. Class II – One test per 3,000 cubic yards
 - b. Class III – One test per 10,000 cubic yards
 - c. Class IIIA – One test per 1,000 cubic yards
 - d. Aggregates 6A, 17A and 34R – One test per 1,000 tons

Job site/On site Sources:

1. Test reports must be in project files.
 - a. Class II – One test per 3,000 cubic yards
 - b. Class III – One test per 10,000 cubic yards
 - c. Class IIIA – One test per 1,000 cubic yards

Visual Inspection:

Class II – Maximum 500 cubic yards per project..

Class III – Maximum 500 cubic yards per project.

Class IIIA – Maximum 100 cubic yards per project.

Aggregates 6A, 17A and 34R – Maximum 100 tons per material class per project.

Geosynthetics

1. Geotextile blanket - Test data Certification. One test for the first 1200 square yards, one additional test for each additional 7500 square yards.

Visual Inspection: Maximum 360 Syd**Joint Sealers**

1. Cold applied joint sealers (Mastic).
 - a. Test prior to incorporation. One test per shipment from a single container.

Visual Inspection: Maximum 10 gallons**Pipe**

1. Concrete and Steel Pipe.
 - a. A Certification from approved manufacturer.
- Or**
 - b. Test prior to incorporation. Test per Section G of the Materials Quality Assurance Procedures Manual.

Visual Inspection: Maximum 10 pieces Conc. Non Reinforced, 5 pieces 42 inch or less Conc Reinforced, 125 ft steel 12 inch or less, 50 ft steel 15 inch to 54 inch, 25 ft 60 inches or greater.

2. Polyethylene Pipe.
 - a. Shipment of Tested Stock Report, Form 1922, from approved source.
Note: Class B polyethylene pipe CPE must be from QPL (909.06A).

Or

4010131 – 4010698 CULVERTS

Pg 3 of 3

- b. Test prior to incorporation. One per 1,000 feet for 12 inch diameter and over.
Note: All Class B polyethylene pipe CPE must be from QPL (909.06A).

Visual Inspection: Maximum 100 ft 12 inch and greater, 250 ft less than 12 inch

3. Aluminum Alloy Pipe.
 - a. A General Certification

And

- b. Test prior to incorporation. One test per 1000 feet of pipe.

Visual Inspection: Maximum 200 ft

NOTE: Mandrel testing required only for CPE pipe. For additional information Refer to [CA-2011-08](#), or as superseded, for additional information. Video inspection required per subsections 401.03.C.1 and 401.03.M.

Water Tight Joint System

1. Water Tight Joint/Gaskets.
 - a. Must be on Qualified Product List for Compression or External Rubber Type. VI as part of the Watertight Joint System and note on IDR.

NOTE:

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

INDEPENDENT ASSURANCE TEST (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment.
 - a. Engineer will measure culverts of the diameter, class or material required, by length, excluding the length of the end sections as shown on the plans.
3. Density Reports.
 - a. Review reports to see that all test and retests meet MDOT requirements (see form 0582B).
 - b. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

4020001 – 4021133**SEWER, CL __, __ INCH, TR DET __**

Pg 1 of 4

Pay Unit: Foot

MATERIALS: Aggregate 6A,17A, 34R , Granular Materials Class II, II I, IIIA, Geosynthetics, Joint Sealers, Reinforced/Non-reinforced Concrete Pipe, or Corrugated & Spiral Ribbed Al-Alloy/Steel Pipe, Smooth-Lined Corrugated Plastic Pipe(CPE), Corrugated Polyvinyl Chloride Pipe(CPV, CPVC and PVC), Steel Pipe Jacked-in-Place, Water Tight Joint System

ACCEPTANCE TESTING REQUIREMENTS

Aggregate/Granular Material

Prequalified Sources:

1. One ticket REQUIRED per load containing the following data.
 - a. MDOT aggregate source number (Pit Number)
 - b. Date of shipment
 - c. Time of shipment (if applicable)
 - d. MDOT control section and job number
 - e. Michigan series number and class letter of aggregate
 - f. Weight or volume shipped
 - g. Suppliers name, telephone number and location
 - h. Truck identifier number (if applicable)
2. Documentation verifying passing QA test results in project files. Refer to [CA 2012-08](#), or as superseded, for additional information.
3. See Material Quality Assurance Procedures Manual section C-6, Part 7 f or reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.
4. In addition, the following statement shall be printed or stamped on each ticket: "I attest that aggregate as delivered from this pre-qualified source meets specification requirements for the listed Michigan series and class for quantity stated.
 Date _____ Signature _____.
 This statement must be signed by an authorized company representative. This statement does not signify acceptance by MDOT of the aggregate.

Non-Prequalified Sources:

1. One ticket REQUIRED per load containing the following data **if applicable**.
 - a. MDOT aggregate source number
 - b. Date and time of shipment
 - c. MDOT control section and job number
 - d. Michigan series number and class letter of aggregate
 - e. Weight or volume shipped
 - f. Suppliers name, telephone number and location
 - g. Truck identifier number

4020001 – 4021133 SEWER, CL __, __ INCH, TR DET __
Pg 2 of 4

2. Test reports must be in project files.
 - a. Class II – One test per 3,000 cubic yards
 - b. Class III – One test per 10,000 cubic yards
 - c. Class IIIA – One test per 1,000 cubic yards
 - d. Aggregates 6A,17A and 34R – One test per 1000 tons

Job site/On site Sources

1. Test reports must be in project files.
 - a. Class II – One test per 3,000 cubic yards
 - b. Class III – One test per 10,000 cubic yards
 - c. Class IIIA – One test per 1,000 cubic yards

Visual Inspection

Class II – Maximum 500 cubic yards per project
Class III – Maximum 500 cubic yards per project
Class IIIA – Maximum 100 cubic yards per project
Aggregates 6A,17A and 34R – Maximum 100 tons per material class per project

Geosynthetic

1. Geotextile Blanket - Test Data Certification. Test per Section G of the Materials Quality Assurance Procedures Manual.

Visual Inspection: Maximum 360 Syd

Joint Sealers:

1. Cold applied joint sealers (Mastic).
 - a. Test prior to incorporation. One test per shipment from a single container.

Visual Inspection: Maximum 10 gallons

Pipe

1. Corrugated Polyvinyl Chloride Pipe (CPV, CPVC and PVC).
 - a. Test prior to incorporation. One test per 1000 feet of 12 inch or greater diameter straight lengths of pipe.

NOTE: All Class B Polyethylene Pipe CPV, CPVC and PVC must be from QPL

Visual Inspection: Maximum 100 ft. 12 inches or greater.

2. Concrete/Steel Pipe.
 - a. A Certification from approved manufacturer.

Or

- b. Test prior to incorporation. Test 1 percent of number of pieces of each size. Test per Section G of the Materials Quality Assurance Procedures Manual.

4020001 – 4021133 SEWER, CL __, __ INCH, TR DET __
Pg 3 of 4

Visual Inspection: Maximum 10 pieces Conc. Non Reinforced, 5 pieces 42 inch or less Conc Reinforced., 125 ft steel 12 inch or less, 50 ft steel 15 inch to 54 inch, 25 ft 60 inches or greater.

3. Corrugate Polyethylene Pipe (CPE).
 - a. Shipment of Tested Stock Report, Form 1922, from approved source.

Or

- b. Test prior to incorporation. One test per 1000 feet of 12 inch or greater diameter straight lengths of pipe. Test per Section G of the Materials Quality Assurance Procedures Manual.

NOTE: All Class B polyethylene pipe CPE must be from QPL (909.06A).

Visual Inspection: Maximum 100 feet 12 inch or greater.

4. Aluminum Alloy Pipe
 - a. A General Certification

AND

- b. Test prior to incorporation. One test per 1000 feet of pipe.

Visual Inspection: Maximum 250 ft

5. Steel Pipe, Jacked-in-Place
 - a. A General Certification

Water Tight Joint/Gaskets

1. Must be on Qualified Product List for Compression or External Rubber Type. VI as part of the Watertight Joint System and note on IDR.

NOTE:

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

INDEPENDENCE ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements.

4020001 – 4021133 SEWER, CL __, __ INCH, TR DET __
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CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment.
 - a. Engineer will measure sewer and sewer, Reinf conc, Ellip of the size, class, and trench detail required, in-place from center to center of manhole, catch basin, or inlet.
 - b. Engineer will measure sewer, jack in place, of the size and class required, by multiplying the number of units jack by the commercial laying length.
3. Density Reports.
 - a. Review reports to see that all test and retests meet MDOT requirements (see form 0582B).
 - b. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

4030010 – 4030090

DR STRUCTURE COVER , Type _ XX

Pg 1 of 1

Pay Units: Ea

MATERIALS: Castings, malleable iron and steel

ACCEPTANCE TESTING REQUIREMENTS

Malleable iron and steel

Visual Inspection: All material placed

NOTE:

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will measure drainage structure covers based on placed quantity.

4030200 – 4030271

Pg 1 of 5

DR STRUCTURE, ___ INCH DIA**DR STRUCTURE, ADD DEPTH, ___ INCH DIA, 8 TO 15 FT****DR STRUCTURE, ADD DEPTH, ___ INCH DIA, OVER 15 FT**

Pay Unit: Each, Ft

MATERIALS: Mortar Standard, Granular Material Class II, III, Steel Reinforcement, Concrete Brick or Block, Pre-cast Reinforced Concrete Units, Manhole Bases & Sumps, Concrete Grade S3

ACCEPTANCE TESTING REQUIREMENTS

Mortar

1. Standard, VI and document on IDR

GRANULAR MATERIALS

Prequalified Sources:

1. One ticket REQUIRED per load containing the following data.
 - a. MDOT aggregate source number (Pit Number)
 - b. Date of shipment
 - c. Time of shipment (if applicable)
 - d. MDOT control section and job number
 - e. Michigan series number and class letter of aggregate
 - f. Weight or volume shipped
 - g. Suppliers name, telephone number and location
 - h. Truck identifier number (if applicable)
2. Documentation verifying passing QA test results in project files. Refer to [CA 2012-08](#), or as superseded, for additional information.
3. See Material Quality Assurance Procedures Manual section C-6, Part 7 f or reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.
4. In addition, the following statement shall be printed or stamped on each ticket: "I attest that aggregate as delivered from this pre-qualified source meets specification requirements for the listed Michigan series and class for quantity stated.
 Date _____ Signature _____.
 This statement must be signed by an authorized company representative. This statement does not signify acceptance by MDOT of the aggregate.

Non-Prequalified Sources:

1. One ticket REQUIRED per load containing the following data **if applicable**.
 - a. MDOT aggregate source number
 - b. Date and time of shipment
 - c. MDOT control section and job number
 - d. Michigan series number and class letter of aggregate

4030200 – 4030271

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DR STRUCTURE, ___ INCH DIA**DR STRUCTURE, ADD DEPTH, ___ INCH DIA, 8 TO 15 FT****DR STRUCTURE, ADD DEPTH, ___ INCH DIA, OVER 15 FT**

- e. Weight or volume shipped
 - f. Suppliers name, telephone number and location
 - g. Truck identifier number
2. Test reports must be in project files.
 - a. Class II – One test per 3,000 cubic yards
 - b. Class III – One test per 10,000 cubic yards

Job site/On site Sources:

1. Test reports must be in project files.
 - a. Class II – One test per 3,000 cubic yards
 - b. Class III – One test per 10,000 cubic yards

Visual Inspection:

- Class II – Maximum 500 cubic yards per project
- Class III – Maximum 500 cubic yards per project

Concrete Brick and Block

1. A Certification from approved manufacturer.

Or

2. Test prior to incorporation. One test for first 10,000 pieces or fraction thereof. Two tests for lots of 10,000 to 100,000 pieces.

Visual Inspection: Maximum 1,000 pieces each.**Pre-cast Reinforced Concrete Units**

1. A Certification from approved manufacturer.

Or

2. Test prior to incorporation. Test 1 percent per each size. Test per Section G of the Materials Quality Assurance Procedures Manual.

Visual Inspection: Maximum 10 pieces.**Pre-cast Concrete Bases**

1. A Certification from approved manufacturer

Or

2. Test prior to incorporation. Test 5 percent of total

Visual Inspection: Maximum 10 pieces

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DR STRUCTURE, ___ INCH DIA**DR STRUCTURE, ADD DEPTH, ___ INCH DIA, 8 TO 15 FT****DR STRUCTURE, ADD DEPTH, ___ INCH DIA, OVER 15 FT****Concrete Grade S3****NRMCA Plants**

1. Plant
 - a. Current NRMCA certification
2. Scales Check
 - a. Inspection certification every 6 months
3. Dispenser Check
 - a. Inspection certification every 90 days
4. MDOT Mix Design
 - a. Copy in project files

For Portable Batch Plants

1. Plant
 - a. Documentation of Inspection after each move per 601.03.A.1.a.

For non NRMCA Plants

All of the following documentation is required including FORM 1174 CONCRETE PLANT PROPORTIONING (a minimum of one report per mix).

1. Scales Check
 - a. Inspection certification every 6 months
2. Dispenser Check
 - a. Inspection certification every 90 days
3. MDOT Mix Design
 - a. Copy in project files

For all Plants

1. Cement
 - a. Approved Manufacturer.
- Or**
- b. Test prior to incorporation
 - c. Test per Section G of the Materials Quality Assurance Procedures Manual.

Visual Inspection: Maximum VI 45 tons

4030200 – 4030271

Pg 4 of 5

DR STRUCTURE, ___ INCH DIA**DR STRUCTURE, ADD DEPTH, ___ INCH DIA, 8 TO 15 FT****DR STRUCTURE, ADD DEPTH, ___ INCH DIA, OVER 15 FT****2. Coarse Aggregates**

- a. Test prior to incorporation. One test per 1,000 tons. Maximum VI 100 tons for total grade used on job. L.A. Abrasion, freeze-thaw durability may be request from MDOT CFS.

Visual Inspection: Maximum 100 tons for total grade used on job

- b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

3. Fine Aggregate

- a. Test prior to incorporation. One test per 1,000 tons.

Visual Inspection: Maximum 100 tons for total FA used on job

- b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.
- c. GGBFS: Approved Manufacturer

Or

- d. Test prior to incorporation. Submit cement with sample.

4. Concrete Admixtures

- a. Qualified Products List (903.01, and 903.02)
- b. Document Admixtures: Manufacturer on IDR

5. Fly Ash

- a. Approved Manufacturer

Or

- b. Test prior to incorporation. Submit cement with sample.

6. GGBFS

- a. A Test Data Certification from approved manufacturer.

Or

- b. Test prior to incorporation. Submit cement with sample.
- c. Compressive Test reports for 28 day strength (work sheet not summary). Average Strength Test of 2 cylinder breaks for each test. Tester's signature required.

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS

- 1. See Notes page for IAT requirements.

4030200 – 4030271

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DR STRUCTURE, ___ INCH DIA**DR STRUCTURE, ADD DEPTH, ___ INCH DIA, 8 TO 15 FT****DR STRUCTURE, ADD DEPTH, ___ INCH DIA, OVER 15 FT****CONSTRUCTION**

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will base payment for DR STRUCTURE, INCH DIA. from 0 to 8 feet as each.
3. Additional payment is required for
 - a. DR STRUCTURE, ADD DEPTH, ___ INCH DIA, 8 FT TO 15 FT will be paid by the foot
 - b. DR STRUCTURE, ADD DEPTH, ___ INCH DIA, OVER 15 FT will be paid by the foot.
4. Density Reports
 - a. Review reports to see that all test and retests meet MDOT requirements (see form 0582B).
 - b. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

**4040001 – 4040089 UNDERDRAIN (Subgrade, Bank, Fdn., Subbase,
Pipe, PDS and Edge of Pavt.)**

4040091 – 4040099 UNDERDRAIN OUTLETS

Pg 1 of 3

Pay Unit: Foot

MATERIALS: OGDC Aggregate (34R), Granular Material Class IIAA, Geosynthetics, Prefabricated Drainage System (PDS), Corrugated Plastic Tubing, Acrylonitrile-Butadiene-Styrene Pipe (ABS), Smooth Plastic Pipe and Corrugated Steel Pipe.

ACCEPTANCE TESTING REQUIREMENTS

Aggregate/Granular Materials

Prequalified Sources:

1. One ticket per load containing
 - a. MDOT aggregate source number
 - b. Date and time of shipment
 - c. MDOT Control section and job number
 - d. Michigan series number and class letter of aggregate
 - e. Weight or volume shipped
 - f. Suppliers name, telephone number and location
 - g. Truck identifier number
2. Documentation verifying passing QA test results in project files. Refer to [CA 2012-08](#), or as superseded, for additional information.
3. See Material Quality Assurance Procedures Manual section C-6, Part 7 f or reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.
4. In addition, the following statement shall be printed or stamped on each ticket: "I attest that aggregate as delivered from this pre-qualified source meets specification requirements for the listed Michigan series and class for quantity stated.
Date _____ Signature _____.
This statement must be signed by an authorized company representative. This statement does not signify acceptance by MDOT of the aggregate.

Non-Prequalified Sources:

1. One ticket per load containing
 - a. MDOT aggregate source number
 - b. Date and time of shipment
 - c. MDOT Control section and job number
 - d. Michigan series number and class letter of aggregate
 - e. Weight or volume shipped
 - f. Suppliers name, telephone number and location
 - g. Truck identifier number
 - h. If paid by square yard or cubic yard, truck number and time are not required on tickets/documentation

**4040001 – 4040089 UNDERDRAIN (Subgrade, Bank, Fdn., Subbase,
Pipe, PDS and Edge of Pavt.)**

4040091 – 4040099 UNDERDRAIN OUTLETS

Pg 2 of 3

2. Test reports must be in project files
 - a. Class IIAA – One test per 3,000 cubic yards
 - b. Aggregates 34R – One test per 1,000 tons

Job site/On site Sources:

1. Test reports must be in project files
 - a. Class IIAA – One test per 3,000 cubic yards

Visual Inspection:

Class IIAA – Maximum 500 cubic yards per project
34R – Maximum 100 Tons

Geosynthetics

1. Geotextile Blanket
 - a. Test data certification and Sample test verification

Visual Inspection: Maximum 360 feet.

Underdrain

1. Corrugated Steel Pipe
 - a. A Test Data Certification from approved manufacturer.

Or

- b. Test prior to incorporation. Test per Section G of the Materials Quality Assurance Procedures Manual.

Visual Inspection: Maximum 125 feet 12 inch or less, 50 ft, 15 inch to 54 inch

2. Smooth Plastic Pipe
 - a. Test prior to incorporation. One test per 2,500 feet or fraction thereof

Visual Inspection: Maximum 250 feet

3. Corrugated Plastic Tubing (PE or PVC) (wrapped and unwrapped)
 - a. A General Certification from approved manufacturer.

Or

- b. Test prior to incorporation. One test per 5,000 feet with sample from coil.

Visual Inspection: Maximum 250 feet.

**4040001 – 4040089 UNDERDRAIN (Subgrade, Bank, Fdn., Subbase,
Pipe, PDS and Edge of Pavt.)****4040091 – 4040099 UNDERDRAIN OUTLETS**

Pg 3 of 3

4. Prefabricated Drainage System
 - a. A Test Data Certification from approved manufacturer
- Or**
- b. Test prior to incorporation. One test per 10,000 feet or less.
5. Acrylonitrile-Butadiene-Styrene Pipe (ABS)
 - a. Test prior to incorporation. One test per 6,000 feet or less.

Visual Inspection: Maximum 600 feet

NOTE:

BUY AMERICA statement required on steel and iron certification. “BUY AMERICAN” is not an acceptable alternate to “BUY AMERICA”. Refer to [BOH IM13-01](#), or as superseded, for additional information.

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will measure underdrains in place.
3. Density Reports
 - a. Review reports to see that all test and retests meet MDOT requirements (see form 0582B).
 - b. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

4040111 – 4040115

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UNDERDRAIN, OUTLET ENDING, __ INCH

Pay Unit: Each

MATERIALS: Concrete or Steel End Section with Rodent Screen**ACCEPTANCE TESTING REQUIREMENTS****Outlet Ending**

1. Steel

Visual Inspection: All material placed of complete unit and note on IDR.

2. Concrete

Visual Inspection: All material placed and note on IDR.

3. Rodent Screen

Visual Inspection: All material placed and note on IDR.**NOTE:**

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will measure each outlet ending in place.

5010025 – 5010806

Pg 1 of 2

HMA, ___; HMA Approach

Pay Unit: Ton, Square Yard

MATERIALS: Asphalt Binder, Emulsified Asphalt (Bond Coat), and HMA Mixture**Note: Refer to SP 501 U SUPERPAVE HOT MIX ASPHALT PERCENT WITHIN LIMITS (PWL)****ACCEPTANCE TESTING REQUIREMENTS****Asphalt Binder**

1. A General Certification from approved manufacturer.
- Or**
2. Test prior to incorporation. One test per day per contractor's tank of asphalt binder.

Visual Inspection: Maximum 5 tons per day or 27 tons total asphalt binder for project.**NOTE:****Daily Asphalt Binder Sample:** Contractor shall submit one sample per grade, per project, per day of production for certification verification (see form 1923B).**Witness Sample:** The Engineer may request to witness the sampling of the asphalt binder upon any visit to the HMA plant. The engineer will complete the 1923B form for the witness sample. The witness sample will become the daily asphalt binder sample of record. Any other binder sample taken that same day will be discarded.

The inspector is to witness at least one daily asphalt binder sample per binder grade, per project, and document on an IDR.

Failing binder notification letters must be in the project files.

Emulsified Asphalt (Bond Coat)

1. A General Certification from approved manufacturer.

Visual Inspection: Maximum 1000 gal**INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS**

1. See Notes page for IAT requirements.
2. HMA Mixtures
 - a. Contact Traveling Mix Inspector (TMI) to schedule IAT as soon as possible. One satisfactory test/per sampler and t ester/per season. A qualified bituminous technician is required for testing on all state and federally funded projects.

HMA Mixtures**HMA Plant:**

1. Plant certification will be verified by RMI on Form 1911. JMF (Job Mix Formula) Form 1911 must be in project file.

5010025 – 5010806 HMA, ___; HMA Approach
Pg 2 of 2**HMA mixture**

1. Test for acceptance. A written statement from the supplier certifying all materials used in mix are of the same source submitted for JMF. This requirement must be met by separate letter in file from producer.

Visual Inspection: Maximum 500 tons per project per mix.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Delivery tickets required per load which includes control section/job number, mix type, date, time, truck number, tare weight, tonnage delivered and accumulated tonnage.
 - e. Immediate possession of tickets is required if paying by ton (weight).

NOTE: An annual certification is required for staff performing HMA sampling.

2. Measurement and payment
 - a. Engineer will measure and pay for HMA of the mix specified based on weight placed as supported by weigh tickets.
3. Additional Documentation Requirements in project file
 - a. Form 1903B Verification/Acceptance Report (minimum frequency, one report per lot placed)
 - b. Form 1903C Report of Contractor's Quality Control Tests
 - c. Form 1907 Core Density(4 cores per subplot)
 - d. MDOT QA Plan
 - e. Contractor QC Plan
 - f. Random number sheets signed by MDOT and Contractor
 - g. Pre-production meeting minutes
 - h. PWL Calculation spreadsheet (if required)
4. Local Agency Projects
 - a. Form 1903 Daily report of bit plant inspection for each day of production. Check special provision for additional requirements.
5. Density Reports
 - a. Refer to section 501 HMA Construction Practices. One test per 1000 feet, width of 24 feet (minimum) or as defined per special provision if any in the proposal.
 - b. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.

6020002 – 6020010	CONC BASE CSE, REINF, __ INCH
6020015 – 6020023	CONC BASE CSE, NONREINF, __ INCH
6020030 – 6020031	CONC, GRADE __
6020050 – 6020062	CONC PAVT, MISC, NONREINF, __ INCH
6020070 – 6020082	CONC PAVT, MISC, REINF, __ INCH
6020100 – 6020115	CONC PAVT, NONREINF, __ INCH
6020120 – 6020135	CONC PAVT, REINF, __ INCH
6020500 – 6020523	CONC PAVT, HIGH PERFORMANCE
Pg 1 of 5	Pay Unit: Square Yard, Cubic Yard

MATERIALS: Adhesive System, Bituminized Fiber Joint Filler, Concrete Grade P1, P1-M and P2, Curing Compound-White, Hot Poured Rubber, Lane Tie bars, Wire Fabric

Note: Refer to SP 604 B for concrete QC/QA requirement

ACCEPTANCE TESTING REQUIREMENTS

Adhesive System

1. QPL and pull out test required per section 602.03.F.2

Bituminized Fiber Joint Filler

1. A General Certification from approved manufacturer.

Or

2. Test prior to incorporation. One test per 1,000 square feet or fraction thereof. 1/4 inch material may be VI - note on IDR.

Visual Inspection: Maximum 150 square feet for all other sizes.

Concrete Grade P1, P1-M, P2

NRMCA Plants

1. Plant
 - a. Current NRMCA certification.
2. Scales Check
 - a. Inspection certification every 6 months.
3. Dispenser Check
 - a. Inspection certification every 90 days.

For Portable Batch Plants

1. Plant
 - a. Documentation of Inspection after each move per 601.03.A.1.b. With Waiver certification per 601.03.C from the Engineer

6020002 – 6020010	CONC BASE CSE, REINF, __ INCH
6020015 – 6020023	CONC BASE CSE, NONREINF, __ INCH
6020030 – 6020031	CONC, GRADE __
6020050 – 6020062	CONC PAVT, MISC, NONREINF, __ INCH
6020070 – 6020082	CONC PAVT, MISC, REINF, __ INCH
6020100 – 6020115	CONC PAVT, NONREINF, __ INCH
6020120 – 6020135	CONC PAVT, REINF, __ INCH
6020500 – 6020523	CONC PAVT, HIGH PERFORMANCE

Pg 2 of 5

For non NRMCA Plants

All of the following documentation is required including FORM 1174 CONCRETE PLANT PROPORTIONING (a minimum of one report per mix).

1. Scales Check
 - a. Inspection certification every 6 months
2. Dispenser Check
 - a. Inspection certification every 90 days

Materials

1. Cement
 - a. Approved Manufacturer.
- Or**
- b. Test prior to incorporation. Test per Section G of the Materials Quality Assurance Procedures Manual.

Visual Inspection: Maximum 45 tons

2. Coarse/Intermediate Aggregates
 - a. Test prior to incorporation. One test per 1,000 tons. Maximum VI 100 tons for total grade used on job. L.A. Abrasion, freeze-thaw durability may be request from MDOT CFS.
 - b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

Visual Inspection: Maximum 100 tons for total grade used on job

3. Fine Aggregate
 - a. Test prior to incorporation. One test per 1,000 tons.
 - b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

Visual Inspection: Maximum 100 tons for total FA used on job

6020002 – 6020010	CONC BASE CSE, REINF, __ INCH
6020015 – 6020023	CONC BASE CSE, NONREINF, __ INCH
6020030 – 6020031	CONC, GRADE __
6020050 – 6020062	CONC PAVT, MISC, NONREINF, __ INCH
6020070 – 6020082	CONC PAVT, MISC, REINF, __ INCH
6020100 – 6020115	CONC PAVT, NONREINF, __ INCH
6020120 – 6020135	CONC PAVT, REINF, __ INCH
6020500 – 6020523	CONC PAVT, HIGH PERFORMANCE

Pg 3 of 5

4. Liquid Concrete Admixtures
 - a. Qualified Products List (903.01, 903.02 & 903.03).
5. GGBFS
 - a. Approved Manufacturer

Or

 - b. Test prior to incorporation. Submit cement with sample.
6. Fly Ash
 - a. Approved Manufacturer

Or

 - b. Test prior to incorporation. Submit cement with sample.

Curing Compound

1. A Test Data Certification. One test per lot or batch.

NOTE: Must be used within one year of manufacturer date.

Visual Inspection: Maximum 200 gallons for total material used on project.

Hot Poured rubber

1. Tested stock

Or

2. Test prior to incorporation.

Visual Inspection: Maximum 100 lb

Lane Tie Bars

1. A Test Data Certification from approved manufacturer.

Or

2. Test prior to incorporation. One test per project per manufacturer. Pullout test required - documentation on field inspection report.

Visual Inspection: Maximum 500 pounds

NOTE: Epoxy coating must come from the Qualified Products List (905.03C1).

6020002 – 6020010	CONC BASE CSE, REINF, __ INCH
6020015 – 6020023	CONC BASE CSE, NONREINF, __ INCH
6020030 – 6020031	CONC, GRADE __
6020050 – 6020062	CONC PAVT, MISC, NONREINF, __ INCH
6020070 – 6020082	CONC PAVT, MISC, REINF, __ INCH
6020100 – 6020115	CONC PAVT, NONREINF, __ INCH
6020120 – 6020135	CONC PAVT, REINF, __ INCH
6020500 – 6020523	CONC PAVT, HIGH PERFORMANCE

Pg 4 of 5

Welded Wire Fabric

1. Approved Manufacturer

Or

2. Test prior to incorporation. One test per project per manufacturer.

Visual Inspection: Maximum 500 square yards.**NOTE:**

BUY AMERICA statement required on steel and iron certification. “BUY AMERICAN” is not an acceptable alternate to “BUY AMERICA”. Refer to [BOH IM13-01](#), or as superseded, for additional information.

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements

CONSTRUCTION

1. Inspector’s Daily Report
 - a. IDR shall show the inspector’s computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Signed certification statement and batch weights required on each concrete delivery tickets from supplier for each load. Water additions must be noted and signed. Inspector should sign all delivery tickets. Refer to [CA 2009-15](#), or as superseded, for additional information.
 - e. Form 1174R - Inspector’s Report of Concrete Placed - roadway. One report per day of placement completely filled out and signature of inspector is required. Document all underruns.
 - f. Contractors QC documentation
2. Measurement and payment
 - a. Engineer will measure and determine quantity.

6020002 – 6020010	CONC BASE CSE, REINF, __ INCH
6020015 – 6020023	CONC BASE CSE, NONREINF, __ INCH
6020030 – 6020031	CONC, GRADE __
6020050 – 6020062	CONC PAVT, MISC, NONREINF, __ INCH
6020070 – 6020082	CONC PAVT, MISC, REINF, __ INCH
6020100 – 6020115	CONC PAVT, NONREINF, __ INCH
6020120 – 6020135	CONC PAVT, REINF, __ INCH
6020500 – 6020523	CONC PAVT, HIGH PERFORMANCE

Pg 5 of 5

3. Additional Documentation Requirements in project file
 - a. Form 1155
 - b. Weekly summary of concrete shipped (for Regions who use numbered concrete plants). Fax copy to Regional CFS office.
 - c. Contractor's QC Plan
 - d. QA Plan (if required)
 - e. Approved mix designs (JMF, form 1976)
 - f. QA – Compressive Test reports for 28 day strength (work sheet not summary) per Department's latest QA testing requirements. Testers' signature required.
 - g. Attach pavement core thickness forms and document on IDR whether a penalty was required.
 - h. QC – Work progress specimen (strength results).
 - i. Pull out test for lane ties required per section 602.03.F.2
 - j. Optimized aggregate acceptance test reports.
 - k. Alkali – Silica Reactivity (ASR) test report per special provision.

4. Local Agency Projects

Refer to [12SP604A](#) (or as superseded) QUALITY CONTROL AND ACCEPTANCE OF PORTLAND CEMENT CONCRETE (FOR LOCAL AGENCY PROJECTS ONLY).

6020200 - 6020211

Pg 1 of 2

JOINT, CONTRACTION, (TYPE____)**JOINT, EXPANSION, (TYPE____)****JOINT, PLANE -OF- WEAKNESS, (TYPE____)**

Pay Unit: Foot

MATERIALS: Backer Rod, Expansion Caps, Hot Poured Rubber Sealant, Joint Filler Fiber, Load Transfer Assemblies

ACCEPTANCE TESTING REQUIREMENTS**Backer Rod**

1. VI and document on IDR

Dowel Bars

1. Certification from approved manufacturer.
2. Coating company from approved manufacturer
3. Coating must be QPL

Or

4. Test prior to incorporation. One test per project per manufacturer.

Visual Inspection: Maximum 240 Bars**Expansion Caps****Visual Inspection:** All material placed must conform to Standard Plan R-40 series.**Hot Poured Joint Sealant**

1. Shipment of Tested Stock Report, Form 1922, from approved source.

Or

2. Test prior to incorporation. One test per batch/lot

Visual Inspection: Maximum 100 pounds.**Joint Filler Fiber**

1. A General Certification from approved manufacturer

Or

2. Test prior to incorporation. One test per 1,000 square feet or fraction thereof. 1/4 inch material may be VI - note on IDR.

Visual Inspection: Maximum VI 150 square feet for all other sizes.

6020200 - 6020211

Pg 2 of 2

JOINT, CONTRACTION, (TYPE____)**JOINT, EXPANSION, (TYPE____)****JOINT, PLANE -OF- WEAKNESS, (TYPE____)****Load Transfer Assemblies**

1. Certification from an approved manufacturer
2. Coating company from approved manufacturer
3. Coating must be from QPL product
4. Bond release agent QPL product

OR

5. Test prior to incorporation. One test per 3000 assemblies or fraction there of

Visual Inspection: Maximum 20 assemblies**NOTE:**

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will pay based on measurement

6030035

Pg 1 of 1

NON CHLORIDE ACCELERATOR

Pay Unit: Gal

MATERIALS: Non-Chloride accelerator

ACCEPTANCE TESTING REQUIREMENTS

1. Non Chloride Accelerator
 - a. Qualified Products List (903.04)

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will measure and pay based on the quantity printed on the automated batch ticket.

6030040 – 6030053
6030060 – 6030072
Pg 1 of 4

PAVT REPAIR, NONREINF CONC, __ INCH
PAVT REPR, REINF CONC, __ INCH
Pay Unit: Square Yard

MATERIALS: Adhesive System, Concrete Grade P1, P1-M, P-MS and P-NC, Curing Compound-White, Hot Poured Rubber, Insulation Blankets, Lane Tie Bars
Wire Fabric

Note: Refer to SP 604 B for concrete QC/QA requirement

ACCEPTANCE TESTING REQUIREMENTS

Adhesive system

1. Qualified Products List (712.03J).

Concrete Grade P1, P1-M, P-MS and P-NC

NRMCA Plants

1. Plant
 - a. Current NRMCA certification.
2. Scales Check
 - a. Inspection certification every 6 months.
3. Dispenser Check
 - a. Inspection certification every 90 days.

For non NRMCA Plants

All of the following documentation is required including FORM 1174 CONCRETE PLANT PROPORTIONING (a minimum of one report per mix).

1. Scales Check
 - a. Inspection certification every 6 months
2. Dispenser Check
 - a. Inspection certification every 90 days

Materials

1. Cement
 - a. Approved Manufacturer.

Or

- b. Test prior to incorporation. Test per Section G of the Materials Quality Assurance Procedures Manual.

Visual Inspection: Maximum 45 tons

6030040 – 6030053**PAVT REPAIR, NONREINF CONC, __ INCH****6030060 – 6030072****PAVT REPR, REINF CONC, __ INCH**

Pg 2 of 4

2. Coarse Aggregates

- a. Test prior to incorporation. One test per 1,000 tons L.A. Abrasion, freeze-thaw durability may be request from MDOT CFS.

Visual Inspection: Maximum 100 tons for total grade used on job

- b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

3. Fine Aggregate

- a. Test prior to incorporation. One test per 1,000 tons.

Visual Inspection: Maximum 100 tons for total FA used on job.

- b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

4. GGBFS

- a. Approved Manufacturer

Or

- b. Test prior to incorporation. Submit cement with sample.

5. Fly Ash

- a. Approved Manufacturer

Or

- b. Test prior to incorporation. Submit cement with sample

6. Liquid Concrete Admixtures

- a. Qualified Products List (903.01, 903.02 & 903.03).

Curing Compound

1. A Test Data Certification. One test per lot or batch.

NOTE: Must be used within one year of manufacturer date.**Visual Inspection:** Maximum 200 gallons.

6030040 – 6030053**PAVT REPAIR, NONREINF CONC, __ INCH****6030060 – 6030072****PAVT REPR, REINF CONC, __ INCH**

Pg 3 of 4

Hot Poured Joint Sealant

1. Shipment of Tested Stock Report, Form 1922, from approved source.

Or

2. Test prior to incorporation. One test per batch/lot

Visual Inspection: Maximum 100 pounds.**Insulation Blankets**

1. A Test Data Certification

Visual Inspection: Maximum 10 sheets.**Lane Tie Bars**

1. A Test Data Certification from approved manufacturer.

Or

2. Test prior to incorporation. One test per project per manufacturer. Pullout test required required per section 602.03.F.2 - documentation on field inspection report.

Visual Inspection: Maximum 500 pounds.**NOTE:** Epoxy coating must come from the Qualified Products List (905.03C1).**Welded Wire Fabric**

1. Approved Manufacturer

Or

2. Test prior to incorporation. One test per project per manufacturer.

Visual Inspection: Maximum 500 square yards.**NOTE:**

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

INDEPENDENCE ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements

6030040 – 6030053**PAVT REPAIR, NONREINF CONC, __ INCH****6030060 – 6030072****PAVT REPR, REINF CONC, __ INCH**

Pg 4 of 4

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Signed certification statement and batch weights required on each concrete delivery tickets from supplier for each load. Water additions must be noted and signed. Inspector should sign all delivery tickets. Refer to [CA 2009-15](#), or as superseded, for additional information.
 - e. Form 1174R - Inspector's Report of Concrete Placed - roadway. One report per day of placement completely filled out and signature of inspector is required. Document all underruns.
 - f. Contractors QC documentation
2. Measurement and payment
 - a. Engineer will measure based on pavement surface
3. Additional Documentation Requirements in project file
 - a. Form 1155
 - b. Weekly summary of concrete shipped (for Regions who use numbered concrete plants). Fax copy to Regional CFS office.
 - c. Contractor's QC Plan
 - d. Approved mix designs (JMF, form 1976)
 - e. Work progress specimen (Modulus of Rupture)
 - f. Pull out test for lane ties required per section 602.03.F.2
 - g. Alkali – Silica Reactivity (ASR) test report per special provision.

6030095-6030096
6030100-6030101
Pg 1 of 1

**SAWING AND SEALING PAVT JOINTS
RESEALING JOINTS W/HOT Poured RUBBER**
Pay Unit: Foot

MATERIALS: Backer Rod, Hot Poured Joint Sealant

ACCEPTANCE TESTING REQUIREMENTS

Backer Rod

Visual Inspection: All material placed.

Hot Poured Joint Sealant

1. Shipment of Tested Stock Report, Form 1922, from approved source.

Or

2. Test prior to incorporation. One test per batch from a single container.

Visual Inspection: Maximum 100 pounds

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will measure length of the joint.

7040001

Pg 1 of 1

STEEL SHEET PILING, PERMANENT

Pay Unit: Square Foot

MATERIALS: Steel Sheet Piling**ACCEPTANCE TESTING REQUIREMENTS****Steel Sheet Piling**

1. General Certification

NOTE:

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will calculate quantity based on the lines and lengths below cut off , shown on the plans.

7040002

7040003

Pg 1 of 1

STEEL SHEET PILING, TEMP**STEEL SHEET PILING, TEMP, LEFT IN PLACE**

Pay Unit: Square Foot

MATERIALS: Steel Sheet Piling**ACCEPTANCE TESTING REQUIREMENTS****Steel Sheet Piling**

1. Temporary Piling
 - a. General Certification.

2. Temporary Piling Left in Place
 - a. General Certification along with Buy America Certification

NOTE:

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.

2. Measurement and payment
 - a. Engineer will calculate quantity based on the area of earth retention.

7050020 **PILE, CIP CONC, FURN AND DRIVEN, 12 INCH**
7050021 **TEST PILE, CIP CONC, 12 INCH**
7050025 **PILE POINTS, CIP CONC**
 Pg 1 of 3 Pay Unit: Foot, Each

MATERIALS: Concrete Grade S1, Pile Points, Pile Shells

Note: Refer to SP 604 B for concrete QC/QA requirement

ACCEPTANCE TESTING REQUIREMENTS

Concrete Grade S1

NRMCA Plants

1. Plant
 - a. Current NRMCA certification.
2. Scales Check
 - a. Inspection certification every 6 months.
3. Dispenser Check
 - a. Inspection certification every 90 days.

For non NRMCA Plants

All of the following documentation is required including FORM 1174 CONCRETE PLANT PROPORTIONING (a minimum of one report per mix).

1. Scales Check
 - a. Inspection certification every 6 months
2. Dispenser Check
 - a. Inspection certification every 90 days

Materials

1. Cement
 - a. Approved Manufacturer.
- Or**
- b. Test prior to incorporation. Test per Section G of the Materials Quality Assurance Procedures Manual.

Visual Inspection: Maximum 45 tons

2. Coarse Aggregates
 - a. Test prior to incorporation. One test per 1,000 tons L.A. Abrasion, freeze-thaw durability may be request from MDOT CFS.

Visual Inspection: Maximum 100 tons for total grade used on job

7050020 PILE, CIP CONC, FURN AND DRIVEN, 12 INCH
7050021 TEST PILE, CIP CONC, 12 INCH
7050025 PILE POINTS, CIP CONC

Pg 2 of 3

- b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

3. Fine Aggregate

- a. Test prior to incorporation. One test per 1,000 tons.

Visual Inspection: Maximum 100 tons for total FA used on job.

- b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

4. GGBFS

- a. Approved Manufacturer

Or

- b. Test prior to incorporation. Submit cement with sample.

5. Fly Ash

- a. Approved Manufacturer

Or

- b. Test prior to incorporation. Submit cement with sample

6. Liquid Concrete Admixtures

- a. Qualified Products List (903.01, 903.02 & 903.03).

Foundation Piles and Points

1. A Test Data Certification

NOTE:

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements

7050020**7050021****7050025**

Pg 3 of 3

PILE, CIP CONC, FURN AND DRIVEN, 12 INCH**TEST PILE, CIP CONC, 12 INCH****PILE POINTS, CIP CONC****CONSTRUCTION**

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Signed certification statement and batch weights required on each concrete delivery tickets from supplier for each load. Water additions must be noted and signed. Inspector should sign all delivery tickets. Refer to [CA 2009-15](#), or as superseded, for additional information.
 - e. Form 1174S - Inspector's Report of Concrete Placed - structure. One report per day of placement completely filled out and signature of inspector is required. Document all underruns.
 - f. Contractors QC documentation
 - g. Need forms 1161 and 1157.
2. Measurement and payment
 - a. Test Piles - Department will pay for test piles in addition to the contract unit prices for furnished and driven pile pay items.
 - b. Production Piles - Engineer will measure by the length of piling left in place below cut off.
 - c. Pile Points – Engineer will base payment for each pile point used
3. Additional Documentation Requirements in project files
 - a. Form 1155
 - b. Weekly summary of concrete shipped (for Regions who use numbered concrete plants). Fax copy to Regional CFS office.
 - c. Contractor's QC Plan
 - d. Approved mix designs (JMF, form 1976)
 - e. Need form 1157A and 1956
 - f. QA – Compressive Test reports for 28 day strength (work sheet not summary) per Department's latest QA testing requirements. Testers' signature required.
 - g. Alkali – Silica Reactivity (ASR) test report per special provision.

7050030 & 7050034
7050031 & 7050035
7050039

PILES, STEEL FURN AND DRIVEN, __ INCH
TEST PILES, STEEL ____ INCH
PILE POINT, STEEL ____

Pg 1 of 1

Pay Unit: Ea, Foot,

MATERIALS: Steel Piles, Pile Points

ACCEPTANCE TESTING REQUIREMENTS

Steel Piles and Points

1. A Test Data Certification. Field check certification and note on IDR's or include copy of certification.

NOTE:

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Need form 1161 and 1157.
2. Measurement and payment
 - a. Test Piles - Department will pay for test piles in addition to the contract unit prices for furnished and driven pile pay items.
 - b. Production Piles - Engineer will measure by the length of piling left in place below cut off.
3. Additional Documentation Requirements in project file
 - a. Need form 1157A and 1956

7060090

Pg 1 of 1

REINFORCEMENT, STEEL

Pay Unit: Pound

MATERIALS: Steel Reinforcement**ACCEPTANCE TESTING REQUIREMENTS****Steel Reinforcement**

1. A Test Data Certification from approved manufacturer.

Or

2. Test prior to incorporation. One test per project per manufacturer. Per heat.

Visual Inspection: Maximum 500 pounds**NOTE:**

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Form 1138 and 1125 needs to be turned in with the IDR. Refer to [BOH IM07-02](#), or as superseded, for additional information.
2. Measurement and payment
 - a. Engineer will calculate the weight of the bar from the theoretical bar weight per table 706-2 of Standard Specifications.

7060092

Pg 1 of 1

REINFORCEMENT, STEEL, EPOXY COATED

Pay Unit: Pound

MATERIALS: Steel Reinforcement Epoxy Coated**ACCEPTANCE TESTING REQUIREMENTS****Steel Reinforcement Epoxy Coated**

1. A Test Data Certification from approved manufacturer.

Or

2. Test prior to incorporation. One test per project per manufacturer. Per heat.

Visual Inspection: Maximum 500 pounds

3. Epoxy Coating Company

- a. A Test Data Certification from approved manufacturer.

Or

- b. Test prior to incorporation. One test per project per manufacturer. Per heat.

4. Epoxy coating Material

- a. Qualified Products List (905.03C1).

NOTE:

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

CONSTRUCTION

1. Inspector's Daily Report

- a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
- b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
- c. When item is completed FFM (Final Field Measurement) should be noted.
- d. Form 1138 and 1125 needs to be turned in with the IDR. Refer to [BOH IM07-02](#), or as superseded, for additional information.

2. Measurement and payment

- a. Engineer will calculate the weight of the bar from the theoretical bar weight per table 706-2 of Standard Specifications.

7060010 – 7060013	CONC, GRADE, ___
7060100	SUBSTRUCTURE CONC
7060110	SUPERSTRUCTURE CONC
7060113	SUPERSTRUCTURE CONC, NIGHT CASTING
Pg 1 of 3	Pay Unit: Cubic Yard

NOTES: For Substructure and Superstructure Concrete refer to [BOH IM07-02](#), or as superseded. Refer to [12SP604B](#), or as superseded, for concrete QC/QA requirement

MATERIALS: Bituminized Fiber Joint Filler, Concrete Grade S2, T and D , Curing Compound, Hot Poured Rubber

ACCEPTANCE TESTING REQUIREMENTS

Bituminized Fiber Joint Filler

1. A General Certification from approved manufacturer.

Or

2. Test prior to incorporation. One test per 1,000 square feet or fraction thereof.

Visual Inspection: Maximum 150 square feet

Concrete Grade S2, T and D

NRMCA Plants

1. Plant
 - a. Current NRMCA certification.
2. Scales Check
 - a. Inspection certification every 6 months.
3. Dispenser Check
 - a. Inspection certification every 90 days.

For Portable Batch Plants

1. Plant
 - a. Documentation of Inspection after each move per 601.03.A.1.b. With Waiver certification per 601.03.C from the Engineer

For non NRMCA Plants

All of the following documentation is required including FORM 1174 CONCRETE PLANT PROPORTIONING (a minimum of one report per mix).

1. Scales Check
 - a. Inspection certification every 6 months
2. Dispenser Check
 - a. Inspection certification every 90 days

7060010 – 7060013 **CONC, GRADE, ___**
7060100 **SUBSTRUCTURE CONC**
7060110 **SUPERSTRUCTURE CONC**
7060113 **SUPERSTRUCTURE CONC, NIGHT CASTING**
Pg 2 of 3

Materials

1. Cement
 - a. Approved Manufacturer.
- Or**
- b. Test prior to incorporation. Test per Section G of the Materials Quality Assurance Procedures Manual.

Visual Inspection: Maximum 45 tons

2. Coarse/Intermediate Aggregates
 - a. Test prior to incorporation. One test per 1,000 tons. Maximum VI 100 tons for total grade used on job. L.A. Abrasion, freeze-thaw durability may be request from MDOT CFS.
 - b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

Visual Inspection: Maximum 100 tons for total grade used on job

3. Fine Aggregate
 - a. Test prior to incorporation. One test per 1,000 tons.
 - b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

Visual Inspection: Maximum 100 tons for total FA used on job

4. Liquid Concrete Admixtures
 - a. Qualified Products List (903.01, 903.02 & 903.03).
 5. GGBFS
 - a. Approved Manufacturer
- Or**
- b. Test prior to incorporation. Submit cement with sample.
6. Fly Ash
 - a. Approved Manufacturer
- Or**
- b. Test prior to incorporation. Submit cement with sample.

7060010 – 7060013	CONC, GRADE, ___
7060100	SUBSTRUCTURE CONC
7060110	SUPERSTRUCTURE CONC
7060113	SUPERSTRUCTURE CONC, NIGHT CASTING

Pg 3 of 3

Hot Poured rubber

1. Tested stock

Or

2. Test prior to incorporation.

Visual Inspection: Maximum 100 lb**INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS**

1. See Notes page for IAT requirements

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Signed certification statement and batch weights required on each concrete delivery tickets from supplier for each load. Water additions must be noted and signed. Inspector should sign all delivery tickets. Refer to [CA 2009-15](#), or as superseded, for additional information.
 - e. Form 1174S - Inspector's Report of Concrete Placed - structure. One report per day of placement completely filled out and signature of inspector is required. Document all underruns.
 - f. Contractors QC documentation
2. Measurement and payment
 - a. Concrete Grade S2, T and D – The Engineer will calculate and pay quantities for pay items based on the lines and dimensions shown on the plans.
 - b. Superstructure – The Engineer will measure superstructure concrete for decks based on batch plant tickets with deductions made for material wasted or rejected.
3. Additional Documentation Requirements in project file
 - a. Form 1155
 - b. Weekly summary of concrete shipped (for Regions who use numbered concrete plants). Fax copy to Regional CFS office.
 - c. Contractor's QC Plan
 - d. QA Plan (if required)
 - e. Approved mix designs (JMF, form 1976)
 - f. QA – Compressive Test reports for 28 day strength (work sheet not summary) per Department's latest QA testing requirements. Testers' signature required.
 - g. QC – Work progress specimen (strength results).
 - h. Optimized aggregate acceptance test reports.
 - i. Alkali – Silica Reactivity (ASR) test report per special provision.

7060140

Pg 1 of 1

WATER REPELLENT TREATMENT, PENETRATING

Pay Unit: Square Yard

MATERIALS: Penetrating Water Repellents

ACCEPTANCE TESTING REQUIREMENTS

Penetrating Water Repellents

1. Qualified Products List (706.03S).

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. The Engineer will calculate and pay quantities for pay items based on the lines and dimensions shown on the plans.

7070050 - 7070071

Pg 1 of 1

Structural Steel, Mixed, Erect
Structural Steel, Mixed, Furn and Fab
Structural Steel, Plate, Erect
Structural Steel, Plate, Furn and Fab
Structural Steel, Rolled Shape, Erect
Structural Steel, Rolled Shape, Furn and Fab
Pay Unit: Pound

MATERIALS: High Strength Bolts, Nuts and Washers, Structural Steel___,

ACCEPTANCE TESTING REQUIREMENTS

High Strength Bolts, Nuts and Washers

1. Need to be tested by Construction Field Services

NOTE:

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

Structural Steel Fabrication

1. Shop inspection of structural steel reports (Form 538). According to QA manual section D10.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Ensure bolts are tightened and document on IDR per section 707.03.D.7.c
 - e. When item is completed FFM (Final Field Measurement) will be based on approved pay weights.
2. Measurement and payment
 - a. The Engineer will measure structural steel by the calculated weight of metal in the finished structure excluding filler material in welding (Approved Pay Weights).

Additional Requirements

1. Need approved shop drawings
2. Welder's Qualification Report for field welding

7070010 – 7070024

Pg 1 of 1

BEARING, ELASTOMERIC, __ INCH

Pay Unit: Square Inch

MATERIALS: Elastomeric Bearing Pads**ACCEPTANCE TESTING REQUIREMENTS****Elastomeric Bearing Pads**

1. A Test Data Certification. Show test result for Shear Modulus, ASTM D 4014.

NOTE:

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will measure, with no deduction for holes.

7070040

Pg 1 of 1

SHEAR DEVELOPERS

Pay Unit: Lump Sum

MATERIALS: Shear Developers**ACCEPTANCE TESTING REQUIREMENTS****Shear Developers**

1. Qualified Products List (906.08).

Or

2. A Test Data Certification which certifies that they meet the requirements of the current AWS D1.5, Section 7.

NOTE:

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will measure as a unit for each structure.
3. Additional Documentation Requirements in project file.

TESTING STUDS

1. Studs are tested by *ringing* with a hammer. To test the studs, the inspector should allow studs to cool before testing. The first two studs welded will be bent to a 30 degree angle without breaking the weld. If the weld breaks, repairs will be made and the next set of studs tested along with the studs that were repaired. The rest of the studs on that beam can then be checked for proper welding. Sufficient tests should be made to insure proper procedures are being followed (bend over additional studs). If a weld defect is found, the stud may be bent to an angle of 15 degrees away from the defect. If no weld break occurs, the stud is acceptable. No welding will be done when the temperature of the base material is below 32 degrees F (0 degrees C) or when the surface is wet or exposed to rain or snow.

7080001 - 7080010

Pg 1 of 3

PREST CONC DECK, ___ INCH

Pay Unit: Square Foot

MATERIALS: Concrete, Precast Panels**ACCEPTANCE TESTING REQUIREMENTS****Concrete****NRMCA Plants**

1. Plant
 - a. Current NRMCA certification.
2. Scales Check
 - a. Inspection certification every 6 months.
3. Dispenser Check
 - a. Inspection certification every 90 days.

For non NRMCA Plants: *All of the following documentation is required including FORM 1174 CONCRETE PLANT PROPORTIONING (a minimum of one report per mix).*

1. Scales Check
 - a. Inspection certification every 6 months
2. Dispenser Check
 - a. Inspection certification every 90 days

Materials

1. Cement
 - a. Approved Manufacturer.

Or

- b. Test prior to incorporation. Test per Section G of the Materials Quality Assurance Procedures Manual.

Visual Inspection: Maximum 45 tons

2. Coarse Aggregates
 - a. Test prior to incorporation. One test per 1,000 tons L.A. Abrasion, freeze-thaw durability may be request from MDOT CFS.

Visual Inspection: Maximum 100 tons for total grade used on job

- b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

7080001 - 7080010 PREST CONC DECK, __ INCH

Pg 2 of 3

3. Fine Aggregate
 - a. Test prior to incorporation. One test per 1,000 tons.

Visual Inspection: Maximum 100 tons for total FA used on job.

- b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

4. GGBFS
 - a. Approved Manufacturer

Or

 - b. Test prior to incorporation. Submit cement with sample.

5. Fly Ash
 - a. Approved Manufacturer

Or

 - b. Test prior to incorporation. Submit cement with sample

6. Liquid Concrete Admixtures
 - a. Qualified Products List (903.01, 903.02 & 903.03).

Precast Panels

1. Must be inspected during fabrication, according to section D8 of the Materials Quality Assurance Procedures Manual and section 708 of the standard specifications. Beams will be stamped or tagged "Approved for Use" by the inspector. Report will follow issued by CFS Fabrication Engineer or Local Government Agency. Local Government Agencies are responsible for all testing requirements.

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements

7080001 - 7080010**PREST CONC DECK, __ INCH**

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CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Signed certification statement and batch weights required on each concrete delivery tickets from supplier for each load. Water additions must be noted and signed. Inspector should sign all delivery tickets. Refer to [CA 2009-15](#), or as superseded, for additional information.
 - e. Form 1174S - Inspector's Report of Concrete Placed - structure. One report per day of placement completely filled out and signature of inspector is required. Document all underruns.
 - f. Contractors QC documentation
2. Measurement and payment
 - a. Engineer will measure based on the nominal overall length of the units, multiplied by the overall plan width.
3. Additional Documentation Requirements in project file
 - a. Form 1155
 - b. Weekly summary of concrete shipped (for Regions who use numbered concrete plants). Fax copy to Regional CFS office.
 - c. Contractor's QC Plan
 - d. Approved mix designs (JMF, form 1976)
 - e. Work progress specimen.
 - f. Alkali – Silica Reactivity (ASR) test report per special provision.

7080015

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POST TENSIONING, (STRUCTURE NO.)

Pay Unit: Lump Sum

MATERIALS: Grout R-2, Post Tensioning Strands (Tendons)**ACCEPTANCE TESTING REQUIREMENTS****Grout R-2**

Visual Inspection: All material placed. Verify mix proportioning per Standard Specifications table 702.1A and 702.1B.

Post Tensioning Strands (Tendons)

1. Strands
 - a. A Test Data Certification or test for acceptance.

NOTE: Sampling and testing may be waived if strand from same reel is tested for beam fabrication.

NOTE:

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Test for slump and air when required.
2. Measurement and payment
 - a. Engineer will pay as Lump Sum per structure number

7080021 – 7080041 **PREST CONC I BEAMS, __, __ INCH**
7080051 – 7080096 **PREST CONC BOX BEAM, __, __ INCH**
7080101 – 7080102 **PREST CONC 1800 BEAM, __**
Pg 1 of 2 Pay Unit: Foot

MATERIALS: Grout E-1 and H-1, Hot Pour Rubber, and Prest Concrete Beams

ACCEPTANCE TESTING REQUIREMENTS

Grout E-1

1. Test Data Certification
2. Mix Proportion per section 702.02.C
3. Must meet 28 day compressive strength (3000 psi)

Grout H-1

1. Qualified Products List (702.02.B).

Hot Poured Rubber

1. Tested stock

Or

2. Test prior to incorporation.

Visual Inspection: Maximum 100 lb

Prest Concrete Beams

1. Fabrication inspection and testing will be performed by consultant retained by CFS Structural Fabrication Engineer (Call CFS at 517-322-5709) or consultant retained by local government.
2. Letter from CFS approving beams or a letter from consultant retained by local government agency approving the beams must be in the project file.
3. For MDOT oversight inspection projects -VI of beam at project site check for stamp or tag "Approved for Use" by the inspector. The beams are not released from the plant without inspector's approval.
4. For Independent Agency oversight projects agreement as to the markings used on approved beams should be confirmed at the preconstruction meeting and VI for those markings should be done when beams arrive at the job site.

NOTE: Local Government Agency is required to hire independent agency to perform all required testing. Reports must be signed by inspector performing the testing and/or inspection. For testing requirements contact Lansing CFS, Structural Fabrication Engineer.

7080021 – 7080041 PREST CONC I BEAMS, __, __ INCH
7080051 – 7080096 PREST CONC BOX BEAM, __, __ INCH
7080101 – 7080102 PREST CONC 1800 BEAM, __

Pg 2 of 2

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Notation on IDR confirming the fabrication acceptance stamp on beams.

2. Measurement and payment
 - a. Engineer will measure based on the nominal length of the unit.

7100001

Pg 1 of 1

JOINT WATERPROOFING

Pay Unit: Square Foot

MATERIALS: Shotcrete, Waterproofing Membrane - Preformed

ACCEPTANCE TESTING REQUIREMENTS

Shotcrete

Visual Inspection: All material placed. Verify test panels prior to accepting Shortcrete use per Standard Specifications 710.03.D.1.

Waterproofing Membrane - Preformed

1. Qualified Products List (914.11).

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will measured based on width of 18 inch and the plan length of the joint.

7110005

Pg 1 of 3

BRIDGE RAILING, AESTHETIC PARAPET TUBE

Pay Unit: Foot

MATERIALS: Anchor Studs, Concrete - Grade D, Curing Compound
High Strength Bolts, Tubing, Steel Railing

ACCEPTANCE TESTING REQUIREMENTS**Anchor Studs**

1. Test. One test per heat per diameter per project.

Concrete - Grade D**NRMCA Plants**

1. Plant
 - a. Current NRMCA certification.
2. Scales Check
 - a. Inspection certification every 6 months.
3. Dispenser Check
 - a. Inspection certification every 90 days.

For non NRMCA Plants: *All of the following documentation is required including FORM 1174 CONCRETE PLANT PROPORTIONING (a minimum of one report per mix).*

1. Scales Check
 - a. Inspection certification every 6 months
2. Dispenser Check
 - a. Inspection certification every 90 days

Materials

1. Cement
 - a. Approved Manufacturer.

Or

- b. Test prior to incorporation. Test per Section G of the Materials Quality Assurance Procedures Manual.

Visual Inspection: Maximum 45 tons

2. Coarse Aggregates
 - a. Test prior to incorporation. One test per 1,000 tons L.A. Abrasion, freeze-thaw durability may be request from MDOT CFS.

Visual Inspection: Maximum 100 tons for total grade used on job

- b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

7110005**BRIDGE RAILING, AESTHETIC PARAPET TUBE**

Pg 2 of 3

3. Fine Aggregate
 - a. Test prior to incorporation. One test per 1,000 tons.

Visual Inspection: Maximum 100 tons for total FA used on job.

- b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

4. GGBFS
 - a. Approved Manufacturer

Or

- b. Test prior to incorporation. Submit cement with sample.

5. Fly Ash
 - a. Approved Manufacturer

Or

- b. Test prior to incorporation. Submit cement with sample

6. Liquid Concrete Admixtures
 - a. Qualified Products List (903.01, 903.02 & 903.03).

Curing Compound

1. A Test Data Certification. One test per lot or batch.

Visual Inspection: Maximum 200 gallons.

NOTE: Must be used within one year of manufacturer date.

High Strength Bolts

1. Test. One test per heat per diameter per project

NOTE: Standard Plan B-25-Series.

Tubing, Steel Railing

1. Test or tested stock

And

2. Test Data Certification must be attached to the sample ID. Test Report to Engineer.

NOTE:

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

7110005**BRIDGE RAILING, AESTHETIC PARAPET TUBE**

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CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Signed certification statement and batch weights required on each concrete delivery tickets from supplier for each load. Water additions must be noted and signed. Inspector should sign all delivery tickets. Refer to [CA 2009-15](#), or as superseded, for additional information.
 - e. Form 1174S - Inspector's Report of Concrete Placed - structure. One report per day of placement completely filled out and signature of inspector is required. Document all underruns.
 - f. Contractors QC documentation
2. Measurement and payment
 - a. Engineer will measure based on Plan Quantity
3. Additional Documentation Requirements in project file
 - a. Form 1155
 - b. Weekly summary of concrete shipped (for Regions who use numbered concrete plants). Fax copy to Regional CFS office.
 - c. Contractor's QC Plan
 - d. Approved mix designs (JMF, form 1976)
 - e. Work progress specimen (Modulus of Rupture)
 - f. Alkali – Silica Reactivity (ASR) test report per special provision.

7120010**7120015 - 7120016****7120110 - 7120115**

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PATCH, FULL DEPTH**PATCHING MORTAR OR CONC****PATCHING CONC, C; C-HE; C-L; C-L-HE; F-L; M**

Pay Units: Cubic Foot, Cubic Yard

MATERIALS: Concrete – Grade C, C-HE, M, Curing Compound,
and Structure Patching Mixture (Conc C; C-HE; C-L; C-L-HE; F-L; M)

ACCEPTANCE TESTING REQUIREMENTS**Concrete - Grade C; C-HE; M****NRMCA Plants**

1. Plant
 - a. Current NRMCA certification.
2. Scales Check
 - a. Inspection certification every 6 months.
3. Dispenser Check
 - a. Inspection certification every 90 days.

For non NRMCA Plants: *All of the following documentation is required including FORM 1174 CONCRETE PLANT PROPORTIONING (a minimum of one report per mix).*

1. Scales Check
 - a. Inspection certification every 6 months
2. Dispenser Check
 - a. Inspection certification every 90 days

Materials

1. Cement
 - a. Approved Manufacturer.
- Or**
- b. Test prior to incorporation. Test per Section G of the Materials Quality Assurance Procedures Manual.

Visual Inspection: Maximum 45 tons

2. Coarse Aggregates
 - a. Test prior to incorporation. One test per 1,000 tons L.A. Abrasion, freeze-thaw durability may be request from MDOT CFS.

Visual Inspection: Maximum 100 tons for total grade used on job

- b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

7120010
7120015 - 7120016
7120110 - 7120115
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PATCH, FULL DEPTH
PATCHING MORTAR OR CONC
PATCHING CONCRETE, C; C-HE; C-L; C-L-HE; F-L; M

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Form 1174S - Inspector's Report of Concrete Placed - structure. One report per day of placement completely filled out and signature of inspector is required. Document all underruns.
2. Measurement and payment
 - a. Engineer will measure based on volume in-place.
3. Additional Documentation Requirements in project file
 - a. Work progress specimen if necessary
 - b. Alkali – Silica Reactivity (ASR) test report per special provision.

7120028 – 7120038
7120040 – 7120044
Pg 1 of 1

ADHESIVE ANCHORING OF __ BAR, __ INCH
BOLT, ADHESIVE ANCHORED, __ INCH
Pay Unit: Each

MATERIALS: Adhesive System, Bolts

ACCEPTANCE TESTING REQUIREMENTS

Adhesive System

1. Qualified Products List (712.03J).

Bolts

1. Test One bolt per diameter/heat/per project. A Test Data Certification must be submitted with sample for testing.

NOTE:

BUY AMERICA statement required on steel and iron certification. “BUY AMERICAN” is not an acceptable alternate to “BUY AMERICA”. Refer to [BOH IM13-01](#), or as superseded, for additional information.

Pull-Out Testing

1. Field Inspection Report (see form 0566). See subsection 712.03.J.

CONSTRUCTION

1. Inspector’s Daily Report
 - a. IDR shall show the inspector’s computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will measure based on each item placed.

7120084

Pg 1 of 1

REINFORCEMENT, MECHANICAL SPLICE

Pay Unit: Each

MATERIALS: Reinforcement Mechanical Splice**ACCEPTANCE TESTING REQUIREMENTS****Reinforcement Mechanical Splice**

1. Qualified Products List (712.03L).
 - a. Test – The contractor must make test splices, witnessed by the Engineer, on the largest bar size being spliced.
 - b. Mechanical and other splices: Make two test splices on the largest bar size being spliced. Test splice consists of 2 pieces of reinforcing bar joined by the coupler with a minimum of 12 inches of bar exposed on each end of the coupler.

Or

2. Non-Qualified Products List and Swag Splices
 - a. Swaged Splices: Make five test splices on the largest bar size being spliced. Test splice consists of 2 pieces of reinforcing bar joined with a coupler with a minimum of 12 inches of bar exposed on each end of the coupler.

NOTE: Use these tests to establish a splicing procedure. Demonstrate that splices have a tensile strength of 125 percent of the bar's yield strength. For all required tests, supply sample bars with 12 inches of exposed bar on each end. If the existing reinforcing steel being spliced has an inferior or badly corroded exterior deformation pattern, the Engineer may require additional qualification testing on these bars. The Department will test all test splices.

NOTE:

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will measure based on each item placed.

7150045

Pg 1 of 1

STEEL STRUCTURES CLEANING, TYPE 4

Pay Unit: Lump Sum

MATERIALS: Low Dusting Abrasive

Note: Refer to BOH IM 2005-13 and SP in proposal

ACCEPTANCE TESTING REQUIREMENTS

Low Dusting Abrasive

1. Qualified Products List (715.02).

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment.
 - a. Engineer will measure as a unit for each structure.
3. Additional Documentation Requirements in project file.
 - a. Form 1941

7150046

Pg 1 of 1

STEEL STRUCTURE, COATING, TYPE 4

Pay Unit: Lump Sum

MATERIALS: Coating System

Note: Refer to BOH IM05-13 and SP in proposal

ACCEPTANCE TESTING REQUIREMENTS

Coating System

1. Qualified Products List (915).

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment.
 - a. Engineer will measure as a unit for each structure.

8010001 – 8010004**8010005 – 8010008**

Pg 1 of 4

DRIVEWAY, REINF CONC, __ INCH**DRIVEWAY, NONREINF CONC, __ INCH**

Pay Unit: Square Yard

MATERIALS: Bituminous Fiber Filler, Concrete Grade P1, P-NC and S2,
Curing Compound-White, Wire Fabric

Note: Refer to SP 604 B for concrete QC/QA requirement

ACCEPTANCE TESTING REQUIREMENTS

Bituminized Fiber Joint Filler

1. A General Certification from approved manufacturer.

Or

2. Test prior to incorporation. One test per 1,000 square feet or fraction thereof. 1/4 inch material may be VI - note on IDR.

Visual Inspection: Maximum 150 square feet for all other sizes.

Concrete Grade P1, P-NC, S2

NRMCA Plants

1. Plant
 - a. Current NRMCA certification.
2. Scales Check
 - a. Inspection certification every 6 months.
3. Dispenser Check
 - a. Inspection certification every 90 days.

For Portable Batch Plants

1. Plant
 - a. Documentation of Inspection after each move per 601.03.A.1.b. With Waiver certification per 601.03.C from the Engineer

For non NRMCA Plants: All of the following documentation is required including FORM 1174 CONCRETE PLANT PROPORTIONING (a minimum of one report per mix).

1. Scales Check
 - a. Inspection certification every 6 months
2. Dispenser Check
 - a. Inspection certification every 90 days

8010001 – 8010004**DRIVEWAY, REINF CONC, __ INCH****8010005 – 8010008****DRIVEWAY, NONREINF CONC, __ INCH**

Pg 2 of 4

Materials

1. Cement

- a. Approved Manufacturer.

Or

- b. Test prior to incorporation. Test per Section G of the Materials Quality Assurance Procedures Manual.

Visual Inspection: Maximum 45 tons

2. Coarse/Intermediate Aggregates

- a. Test prior to incorporation. One test per 1,000 tons. Max. VI 100 tons for total grade used on job. L.A. Abrasion, freeze-thaw durability may be request from MDOT CFS.
- b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

Visual Inspection: Maximum 100 tons for total grade used on job

3. Fine Aggregate

- a. Test prior to incorporation. One test per 1,000 tons.
- b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

Visual Inspection: Maximum 100 tons for total FA used on job

4. Liquid Concrete Admixtures

- a. Qualified Products List (903.01, 903.02 & 903.03).
- b. GGBFS
- c. Approved Manufacturer

Or

- d. Test prior to incorporation. Submit cement with sample.

5. Fly Ash

- a. Approved Manufacturer

Or

- b. Test prior to incorporation. Submit cement with sample.

8010001 – 8010004**DRIVEWAY, REINF CONC, __ INCH****8010005 – 8010008****DRIVEWAY, NONREINF CONC, __ INCH**

Pg 3 of 4

Curing Compound

1. A Test Data Certification. One test per lot or batch.

Visual Inspection: Maximum 200 gallons**NOTE:** Must be used within one year of manufacturer date.**Wire Fabric**

1. Approved Manufacturer

Or

2. Test prior to incorporation. One test per project per manufacturer.

Visual Inspection: Maximum 500 square yards.**NOTE:**

BUY AMERICA statement required on steel and iron certification. “BUY AMERICAN” is not an acceptable alternate to “BUY AMERICA”. Refer to [BOH IM13-01](#), or as superseded, for additional information.

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements

CONSTRUCTION

1. Inspector’s Daily Report
 - a. IDR shall show the inspector’s computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Signed certification statement and batch weights required on each concrete delivery tickets from supplier for each load. Water additions must be noted and signed. Inspector should sign all delivery tickets. Refer to [CA 2009-15](#), or as superseded, for additional information.
 - e. Form 1174R - Inspector’s Report of Concrete Placed - roadway. One report per day of placement completely filled out and signature of inspector is required. Document all underruns.
 - f. Contractors QC documentation.
2. Measurement and payment
 - a. Engineer will measure and determine quantity.

8010001 – 8010004**DRIVEWAY, REINF CONC, __ INCH****8010005 – 8010008****DRIVEWAY, NONREINF CONC, __ INCH**

Pg 4 of 4

3. Additional Documentation Requirements in project file
 - a. Form 1155
 - b. Weekly summary of concrete shipped (for Regions who use numbered concrete plants). Fax copy to Regional CFS office.
 - c. Contractor's QC Plan.
 - d. QA Plan (if required).
 - e. Approved mix designs (JMF, form 1976).
 - f. QA – Compressive Test reports for 28 day strength (work sheet not summary) per Department's latest QA testing requirements. Testers' signature required.
 - g. Attach pavement core thickness forms and document on IDR whether a penalty was required.
 - h. QC – Work progress specimen (strength results).
 - i. Optimized aggregate acceptance test reports.
 - j. Alkali – Silica Reactivity (ASR) test report per special provision.
4. Local Agency Projects
 - a. Refer to [12SP604A](#) (or as superseded) QUALITY CONTROL AND ACCEPTANCE OF PORTLAND CEMENT CONCRETE (FOR LOCAL AGENCY PROJECTS ONLY).

8020001 – 8020006
 8020010
 8020015 – 8020040
 Pg 1 of 4

Curb, Conc, Det ___
Curb and Gutter, Bridge Approach
Curb and Gutter, Conc, Det ___
 Pay Unit: Foot

MATERIALS: Bituminous Fiber Filler, Concrete Grade P1 and S2,
 Curing Compound-White, Lane Ties Bars,
 Mortar-Type R-2, Steel Reinforcement-Epoxy Coated

ACCEPTANCE TESTING REQUIREMENTS

Bituminized Fiber Joint Filler

1. A General Certification from approved manufacturer.

Or

2. Test prior to incorporation. One test per 1,000 square feet or fraction thereof. 1/4 inch material may be VI - note on IDR.

Visual Inspection: Maximum 150 square feet.

Concrete Grade P1, S2

NRMCA Plants

1. Plant
 - a. Current NRMCA certification.
2. Scales Check
 - a. Inspection certification every 6 months.
3. Dispenser Check
 - a. Inspection certification every 90 days.

For Portable Batch Plants

1. Plant
 - a. Documentation of Inspection after each move per 601.03.A.1.b. With Waiver certification per 601.03.C from the Engineer

For non NRMCA Plants: All of the following documentation is required including FORM 1174 CONCRETE PLANT PROPORTIONING (a minimum of one report per mix).

1. Scales Check
 - a. Inspection certification every 6 months
2. Dispenser Check
 - a. Inspection certification every 90 days

8020001 – 8020006
8020010
8020015 – 8020040
Pg 2 of 4

Curb, Conc, Det __
Curb and Gutter, Bridge Approach
Curb and Gutter, Conc, Det __

Materials

1. Cement
 - a. Approved Manufacturer.

Or

- b. Test prior to incorporation. Test per Section G of the Materials Quality Assurance Procedures Manual.

Visual Inspection: Maximum 45 tons

2. Coarse/Intermediate Aggregates
 - a. Test prior to incorporation. One test per 1,000 tons. Max. VI 100 tons for total grade used on job. L.A. Abrasion, freeze-thaw durability may be request from MDOT CFS.
 - b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

Visual Inspection: Maximum 100 tons

3. Fine Aggregate
 - a. Test prior to incorporation. One test per 1,000 tons.
 - b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

Visual Inspection: Maximum 100 tons

4. Liquid Concrete Admixtures
 - a. Qualified Products List (903.01, 903.02 & 903.03).
 5. GGBFS
 - a. Approved Manufacturer
- Or**
- b. Test prior to incorporation. Submit cement with sample.
6. Fly Ash
 - a. Approved Manufacturer
- Or**
- b. Test prior to incorporation. Submit cement with sample.

8020001 – 8020006 **Curb, Conc, Det** ___
 8020010 **Curb and Gutter, Bridge Approach**
 8020015 – 8020040 **Curb and Gutter, Conc, Det** ___
 Pg 3 of 4

Curing Compound

1. A Test Data Certification. One test per lot or batch.

Visual Inspection: Maximum 200 gallons

NOTE: Must be used within one year of manufacturer date.

Lane Tie Bars

1. A Test Data Certification from approved manufacturer.

Or

2. Test prior to incorporation. One test per project per manufacturer. Pullout test required - documentation on field inspection report.

Visual Inspection: Maximum 500 pounds

NOTE: Epoxy coating must come from the Qualified Products List (905.03C1).

Mortar Type R-2

1. Document supplier and quantity used on IDR.

Steel Reinforcement Epoxy Coated

1. A Test Data Certification from approved manufacturer.

Or

2. Test prior to incorporation. One test per project per manufacturer. Per heat.

Visual Inspection: Maximum 500 pounds

3. Epoxy Coating Company
 - a. A Test Data Certification from approved manufacturer.

Or

- b. Test prior to incorporation. One test per project per manufacturer. Per heat.

4. Epoxy coating Material
 - a. Must be from the Qualified Products List (905.03C1).

NOTE:

BUY AMERICA statement required on steel and iron certification. “BUY AMERICAN” is not an acceptable alternate to “BUY AMERICA”. Refer to [BOH IM13-01](#), or as superseded, for additional information.

8020001 – 8020006 **Curb, Conc, Det ___**
8020010 **Curb and Gutter, Bridge Approach**
8020015 – 8020040 **Curb and Gutter, Conc, Det ___**

Pg 4 of 4

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Signed certification statement and batch weights required on each concrete delivery tickets from supplier for each load. Water additions must be noted and signed. Inspector should sign all delivery tickets. Refer to [CA 2009-15](#), or as superseded, for additional information.
 - e. Form 1174R - Inspector's Report of Concrete Placed - roadway. One report per day of placement completely filled out and signature of inspector is required. Document all underruns.
 - f. Contractors QC documentation.
2. Measurement and payment
 - a. Engineer will measure in place along the joint of the curbing with the pavement.
3. Additional Documentation Requirements in project file
 - a. Form 1155
 - b. Weekly summary of concrete shipped (for Regions who use numbered concrete plants). Fax copy to Regional CFS office.
 - c. Contractor's QC Plan
 - d. QA Plan (if required)
 - e. Approved mix designs (JMF, form 1976)
 - f. QA – Compressive Test reports for 28 day strength (work sheet not summary) per Department's latest QA testing requirements. Testers' signature required.
 - g. Attach pavement core thickness forms and document on IDR whether a penalty was required.
 - h. QC – Work progress specimen (strength results).
 - i. Pull out test for lane ties required per section 602.03.F.2
 - j. Optimized aggregate acceptance test reports.
 - k. Alkali – Silica Reactivity (ASR) test report per special provision.
4. Local Agency Projects

Refer to [12SP604A](#) (or as superseded) QUALITY CONTROL AND ACCEPTANCE OF PORTLAND CEMENT CONCRETE (FOR LOCAL AGENCY PROJECTS ONLY).

8030033 - 8030037
8030043 – 8030047
Pg 1 of 3

SIDEWALK RAMP
SIDEWALK, CONC, ___ INCH
Pay Unit: Square Foot

MATERIALS Bituminous Fiber Filler, Concrete Grade P1, P2, S2 and S3,
Curing Compound-White, Granular Material CI II

Note: Refer to SP 604 B for concrete QC/QA requirement

ACCEPTANCE TESTING REQUIREMENTS

Bituminized Fiber Joint Filler

1. A General Certification from approved manufacturer.

Or

2. Test prior to incorporation. One test per 1,000 square feet or fraction thereof. 1/4 inch material may be VI - note on IDR.

Visual Inspection: Maximum 150 square feet for all other sizes.

Concrete Grade P1, P2, S2, S3

NRMCA Plants

1. Plant
 - a. Current NRMCA certification.
2. Scales Check
 - a. Inspection certification every 6 months.
3. Dispenser Check
 - a. Inspection certification every 90 days.

For Portable Batch Plants

1. Plant
 - a. Documentation of Inspection after each move per 601.03.A.1.b. With Waiver certification per 601.03.C from the Engineer

For non NRMCA Plants: All of the following documentation is required including FORM 1174 CONCRETE PLANT PROPORTIONING (a minimum of one report per mix).

1. Scales Check
 - a. Inspection certification every 6 months.
2. Dispenser Check
 - a. Inspection certification every 90 days.

8030033 - 8030037
8030043 – 8030047

SIDEWALK RAMP
SIDEWALK, CONC, ___ INCH

Pg 2 of 3

Materials

1. Cement

- a. Approved Manufacturer.

Or

- b. Test prior to incorporation. Test per Section G of the Materials Quality Assurance Procedures Manual.

Visual Inspection: Maximum 45 tons

2. Coarse/Intermediate Aggregates

- a. Test prior to incorporation. One test per 1,000 tons. Max. VI 100 tons for total grade used on job. L.A. Abrasion, freeze-thaw durability may be request from MDOT CFS.
- b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

Visual Inspection: Maximum 100 tons

3. Fine Aggregate

- a. Test prior to incorporation. One test per 1,000 tons.
- b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

Visual Inspection: Maximum 100 tons

4. Liquid Concrete Admixtures

- a. Qualified Products List (903.01, 903.02 & 903.03).

5. GGBFS

- a. Approved Manufacturer

Or

- b. Test prior to incorporation. Submit cement with sample.

6. Fly Ash

- a. Approved Manufacturer

Or

- b. Test prior to incorporation. Submit cement with sample.

Curing Compound

1. A Test Data Certification. One test per lot or batch.

Visual Inspection: Maximum 200 gallons

NOTE: Must be used within one year of manufacturer date.

8030033 - 8030037**SIDEWALK RAMP****8030043 – 8030047****SIDEWALK, CONC, ___ INCH**

Pg 3 of 3

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Signed certification statement and batch weights required on each concrete delivery tickets from supplier for each load. Water additions must be noted and signed. Inspector should sign all delivery tickets. Refer to [CA 2009-15](#), or as superseded, for additional information.
 - e. Form 1174R - Inspector's Report of Concrete Placed - roadway. One report per day of placement completely filled out and signature of inspector is required. Document all underruns.
 - f. Contractors QC documentation.
2. Measurement and payment
 - a. Engineer will measure in place area.
3. Additional Documentation Requirements in project file
 - a. Form 1155
 - b. Weekly summary of concrete shipped (for Regions who use numbered concrete plants). Fax copy to Regional CFS office.
 - c. Contractor's QC Plan
 - d. QA Plan (if required)
 - e. Approved mix designs (JMF, form 1976)
 - f. QA – Compressive Test reports for 28 day strength (work sheet not summary) per Department's latest QA testing requirements. Testers' signature required.
 - g. Attach pavement core thickness forms and document on IDR whether a penalty was required.
 - h. QC – Work progress specimen (strength results).
 - i. Optimized aggregate acceptance test reports.
 - j. Alkali – Silica Reactivity (ASR) test report per special provision.
4. Local Agency Projects
 - a. Refer to [12SP604A](#) (or as superseded) QUALITY CONTROL AND ACCEPTANCE OF PORTLAND CEMENT CONCRETE (FOR LOCAL AGENCY PROJECTS ONLY).
5. Density Reports
 - a. Density testing as per subsection 302.03 of the standard specifications.

NOTE:

All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum. Field staff must perform moisture checks on weight pay items and note the value on the IDRs.

8070000 – 8070008
8070010 – 8070011
 Page 1 of 2

GUARDRAIL, TYPE ___
GUARDRAIL, CURVED, TYPE ___
 Pay Unit: Foot

MATERIALS: Blocks (Plastic or Wood), Guardrail Beam Elements and Hardware (includes all components from same manufacturer), Wood Post

ACCEPTANCE TESTING REQUIREMENTS

Blocks (Plastic or Wood)

1. Plastic - Qualified Products List (912.09Q).
 2. Wood –
 - a. Approved Manufacturer.
- Or**
- b. Shipment of Tested Stock Report, Form 1922, from approved source
- Or**
- c. Test prior to incorporation. One test per charge.

Guardrail Beam Element and Hardware

1. Approved Manufacturer.
- Or**
2. Test prior to incorporation. Beam element - One test per project per manufacturer.
 3. Steel Post – One test per 1000 post or fraction thereof

Visual Inspection: Maximum VI for beam elements 125 feet
 Maximum VI for steel post 25 Each.

Wood Post

1. Shipment of Tested Stock Report, Form 1922, from approved source.
- Or**
2. Approved Manufacturer.
- Or**
3. Test prior to incorporation. One test per charge.

NOTE: All posts must be treated except Northern White Cedar. General Certification document required for Northern White Cedar in lieu of approved manufacturer.

NOTE:

BUY AMERICA statement required on steel and iron certification. “BUY AMERICAN” is not an acceptable alternate to “BUY AMERICA”. Refer to [BOH IM13-01](#), or as superseded, for additional information.

8070000 – 8070008

GUARDRAIL, TYPE __

8070010 – 8070011

GUARDRAIL, CURVED, TYPE __

Page 2 of 2

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.

2. Measurement and payment
 - a. Engineer will measure along the face of the rail.

8070020 – 8070033

Pg 1 of 2

GUARDRAIL ANCHORAGE, BRIDGE, DETAIL ___

Pay Unit: Each

MATERIALS: Blocks (Plastic or Wood), Guardrail Beam Elements and Hardware (includes all components from same manufacturer), Wood Post

ACCEPTANCE TESTING REQUIREMENTS**Blocks (Plastic or Wood)**

1. Plastic - Qualified Products List (912.09Q).
 2. Wood
 - a. Approved Manufacturer
- Or**
- b. Shipment of Tested Stock Report, Form 1922, from approved source.
- Or**
- c. Test prior to incorporation. One test per charge.

Guardrail Beam Element and Hardware

1. Approved Manufacturer.
- Or**
2. Test prior to incorporation. Beam element - One test per project per manufacturer.
 3. Steel Post – One test per 1000 post or fraction thereof

Visual Inspection: Max VI for beam elements 125 feet
Max VI for steel post 25 Each.

Wood Post

1. Shipment of Tested Stock Report, Form 1922, from approved source.
- Or**
2. Approved Manufacturer.
- Or**
3. Test prior to incorporation. One test per charge.

NOTE: All posts must be treated except Northern White Cedar. General Certification document required for Northern White Cedar in lieu of approved manufacturer.

NOTE:

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

8070020 – 8070033 GUARDRAIL ANCHORAGE, BRIDGE, DETAIL ___

Pg 2 of 2

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.

2. Measurement and payment
 - a. Engineer will measure each item in-place.

8070080

Pg 1 of 1

GUARDRAIL REFLECTOR

Pay Unit: Each

MATERIALS: ReflectORIZED Washer

ACCEPTANCE TESTING REQUIREMENTS

ReflectORIZED Washer

1. VI. Document supplier and quantity used on IDR. Inspect galvanizing, dimensions and type of sheeting.

NOTE:

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will measure each item in-place.

8070095

Pg 1 of 1

POST, MAILBOX

Pay Unit: Each

MATERIALS: Wood Post

ACCEPTANCE TESTING REQUIREMENTS

Wood Post

1. Approved Manufacturer.

Or

2. Test prior to incorporation. One test per each charge.

Visual Inspection: Maximum 25 post

NOTE: All posts must be treated except Northern White Cedar. General Certification document required for Northern White Cedar in lieu of approved manufacturer.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will measure each item in-place

8080001
8080002
Pg 1 of 3

FENCE, WOVEN WIRE WITH WOOD POST
FENCE, WOVEN WIRE WITH STEEL POSTS
Pay Unit: Foot

MATERIALS: Barbed Wire, Concrete Grade P2, Steel Post, Wood Posts,
Woven Wire Fabric and Hardware

ACCEPTANCE TESTING REQUIREMENTS

Barbed Wire

1. VI along with BUY AMERICA statement required. Document source on IDR.

Concrete Grade P2

NRMCA Plants

1. Plant
 - a. Current NRMCA certification.
2. Scales Check
 - a. Inspection certification every 6 months.
3. Dispenser Check
 - a. Inspection certification every 90 days.

For Portable Batch Plants

1. Plant
 - a. Documentation of Inspection after each move per 601.03.A.1.b. With Waiver certification per 601.03.C from the Engineer

For non NRMCA Plants: *All of the following documentation is required including FORM 1174 CONCRETE PLANT PROPORTIONING (a minimum of one report per mix).*

1. Scales Check
 - a. Inspection certification every 6 months
2. Dispenser Check
 - a. Inspection certification every 90 days

Materials

1. Cement
 - a. Approved Manufacturer.

Or

- b. Test prior to incorporation. Test per Section G of the Materials Quality Assurance Procedures Manual.

Visual Inspection: Maximum 45 tons

8080001
8080002
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FENCE, WOVEN WIRE WITH WOOD POST
FENCE, WOVEN WIRE WITH STEEL POSTS

2. Coarse/Intermediate Aggregates
 - a. Test prior to incorporation. One test per 1,000 tons. Max. VI 100 tons for total grade used on job. L.A. Abrasion, freeze-thaw durability may be request from MDOT CFS.
 - b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

Visual Inspection: Maximum 100 tons

3. Fine Aggregate
 - a. Test prior to incorporation. One test per 1,000 tons.
 - b. See Material Quality Assurance Procedures Manual section C-6, Part 7 for reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.

Visual Inspection: Maximum 100 tons

4. Liquid Concrete Admixtures
 - a. Qualified Products List (903.01, 903.02 & 903.03). .
5. GGBFS
 - a. Approved Manufacturer

Or

 - b. Test prior to incorporation. Submit cement with sample.
6. Fly Ash
 - a. Approved Manufacturer

Or

 - b. Test prior to incorporation. Submit cement with sample.

Steel Post

1. VI - Document source on IDR.

NOTE:

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

Woven Wire Fabric and Hardware

1. VI - Document source on IDR.

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Pg 3 of 3

FENCE, WOVEN WIRE WITH WOOD POST
FENCE, WOVEN WIRE WITH STEEL POSTS

Wood Post

1. Approved Manufacturer. Document supplier and quantity used on IDR.

Or

2. Shipment of Tested Stock Report, Form 1922, from approved source.

Or

3. Test prior to incorporation. One test per charge.

Visual Inspection: Maximum 25 posts.

NOTE: All post must be treated except Northern White Cedar. General Certification document required for Northern White Cedar in lieu of approved manufacturer.

CONSTRUCTION

1. Inspector's Daily Report

- a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
- b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
- c. When item is completed FFM (Final Field Measurement) should be noted.
- d. Signed certification statement and batch weights required on each concrete delivery tickets from supplier for each load. Water additions must be noted and signed. Inspector should sign all delivery tickets. Refer to [CA 2009-15](#), or as superseded, for additional information.
- e. Form 1174R - Inspector's Report of Concrete Placed - roadway. One report per day of placement completely filled out and signature of inspector is required. Document all underruns.
- f. Contractors QC documentation

2. Measurement and payment

- a. Engineer will measure fence in place and will not include gate openings and the measurement.

3. Additional Documentation Requirements in project file

- a. Form 1155
- b. Weekly summary of concrete shipped (for Regions who use numbered concrete plants). Fax copy to Regional CFS office.
- c. Contractor's QC Plan
- d. QA Plan (if required)
- e. Approved mix designs (JMF, form 1976)
- f. QA – Compressive Test reports for 28 day strength (work sheet not summary) per Department's latest QA testing requirements. Testers' signature required.
- g. Attach pavement core thickness forms and document on IDR whether a penalty was required.
- h. QC – Work progress specimen (strength results).
- i. Alkali – Silica Reactivity (ASR) test report per special provision.

8100370 - 8100371

POST, STEEL, __ LB

Pg 1 of 1

Pay Unit: Foot

MATERIALS: Steel post

ACCEPTANCE TESTING REQUIREMENTS

Steel Post

1. A Test Data Certification.

Visual Inspection: Maximum 20 posts

NOTE:

BUY AMERICA statement required on steel and iron certification. "BUY AMERICAN" is not an acceptable alternate to "BUY AMERICA". Refer to [BOH IM13-01](#), or as superseded, for additional information.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will measure Sign Supports to the nearest commercial length required.

8100392 – 8100413

Pg 1 of 1

SIGN, TYPE ___

Pay Unit: Square Foot

MATERIALS: Reflective Sheeting, Sign-Type I, III, IV, Sign-Type II.

NOTE: Refer to *CIM 1997-B* and *CIM 1997-C*.

ACCEPTANCE TESTING REQUIREMENTS

Reflective Sheeting

1. Qualified Products List (919.02B1).

Sign, Type I, III, IV

1. General Certification must be attached and inspected at project site.
- AND
2. Shipment of Tested Stock Report, Form 1922, per CIM 1997-B.

Visual Inspection: Maximum 100 square feet (Type III and IV)

Sign, Type II

1. General Certification must be attached and inspected at project site.
- AND
2. Grade mark on materials serves as certification

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will measure Sign Supports to the nearest commercial length required.

8110022 – 8110258

PAVEMENT MARKINGS

Pg 1 of 1

Pay Unit: Foot & Each

MATERIALS: Cold Plastic, Glass Beads, Polyurea, Regular Dry, Sprayable, Thermoplastic, Thermoplastic, Waterborne,

ACCEPTANCE TESTING REQUIREMENTS

Cold Plastic

1. Qualified Products List (811.03D5)

Glass Beads

1. A General Certification.

Visual Inspection: Maximum 500 pounds.

Polyurea

1. Qualified Products List (811.0D3).

Regular Dry

1. Qualified Products List (811.0D2).

Sprayable Thermoplastic

1. Qualified Products List (811.03D6).

Thermoplastic

1. Qualified Products List (811.03D4).

Waterborne

1. Qualified Products List (811.0D1).

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will verify the measured Pavement Markings.

8120080 – 8120083

Pg 1 of 1

CONC BARRIER, TEMP, ___

Pay Unit: Foot

MATERIALS Concrete Barrier**ACCEPTANCE TESTING REQUIREMENTS****Concrete Barrier**

1. Non JJ Hooks Type Barrier Wall
 - a. Requires the contractor to provide a Test Data Certification for the number of barrier segments placed on the job. The contractor is responsible for all dimensional verification and a ny pull testing required per MTM 716. When pull testing is conducted the test results must be attached. The project staff is required to visually inspect the barriers placed and to measure the snug tight distance between barriers. If any loops look suspicious contact region materials staff to pull the loops. Refer to [CA 2007-01](#), or as superseded, for additional information. VI. Document inspection and quantity used on IDR. Note receipt of a Test Data Certification.
2. JJ Hooks
 - a. A General Certification from contractor.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
 - d. Check for fully engaged connection between sections.
2. Measurement and payment
 - a. Engineer will measure in-place at initial location with barrier reflector marker attached.

8120100

Pg 1 of 1

DUST PALLATIVE, APPLIED

Pay Unit: Ton

MATERIALS Calcium Chloride Solids, Calcium Chloride Solutions

ACCEPTANCE TESTING REQUIREMENTS

Calcium Chloride Solutions

1. VI and Test Data Certification. One test per project. Load ticket or bag count required if paying by Ton.

Visual Inspection: Maximum 1000 gallons.

Calcium Chloride Solids

1. VI and Test Data Certification. One test per project. Load ticket or bag count required if paying by Ton.

Visual Inspection: Maximum 5,000 pounds.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Immediate possession of delivery tickets or shipping document is required.
3. Measurement and payment
 - a. Engineer will pay based on weight of calcium chloride.

8120220 – 8120241

Pg 1 of 1

PAVT MRK, TYPE R AND PAVT MRK, TYPE NR

Pay Unit: Foot

MATERIALS: Glass Beads, Temp Pavement Marking Tape,
Temp Pavement Marking Paint,

ACCEPTANCE TESTING REQUIREMENTS**Glass Beads**

1. A General Certification.

Visual Inspection: Maximum 500 pounds.

Temp Pavement Marking Paint

1. Qualified Products List (811.03).

Temp Pavement Marking Tape

1. Qualified Products List (922.06A).

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Type R – Engineer will pay based on each unit placed and includes the cost of providing, installing, maintaining, removing and disposing of raised pavement markers.
 - b. Type NR Tape and Paint - Engineer will pay based on each unit placed and includes the cost of providing and placing temporary pavement markings.

8120280 – 8120301
Pg 1 of 1

**RAISED PAVT MRK, TEMP, TYPE __,
(COLOR), (DIRECTION)**
Pay Unit: Each

MATERIALS: Temp Raised Pavement Marker

ACCEPTANCE TESTING REQUIREMENTS

Temp Raised Pavement Marker

1. Qualified Products List (922.06B).

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will pay based on each unit placed and includes the cost of providing, installing, maintaining, removing and disposing of raised pavement markers.

8130005 – 8130012

Pg 1 of 1

RIPRAP, _____

Pay Unit: Square Yard, Cubic Yard or Ton

MATERIALS: Geotextile Liner, Riprap**ACCEPTANCE TESTING REQUIREMENTS****Geotextile Liner**

1. Test Data Certification

AND

2. Test as follows:
 - a. Plain Riprap: 1 test from 360 to 1200 Syd, additional tests every 5,000 Syd.
 - b. Heavy Riprap: 1 test from 360 to 1200 Syd, additional tests every 4,000 Syd.

Visual Inspection: Maximum 360 square yards.**Riprap**

1. VI - Check special provision. Load tickets are required if paying by Ton. Document quantity used on IDR.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Riprap (Cyd) – Engineer will pay based on measured in-place volume.
 - b. Riprap (Syd) – Engineer will pay based on measured in-place quantity.
 - c. Riprap (Ton) - Engineer will pay based on weight.

8160020 – 8160022

FERTILIZER, CHEMICAL NUTRIENT, CL ___

Pg 1 of 1

Pay Unit: Pound

MATERIALS: Chemical Fertilizer

ACCEPTANCE TESTING REQUIREMENTS

Chemical Fertilizer

Visual Inspection: Provide the bag label, showing the guaranteed analysis.

NOTE: The requirements are for pounds of nutrient (must be calculated) - not total pounds of fertilizer. See subsection 816.04.C or per special provision.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will pay based on measurements and calculations.

8160026

Pg 1 of 1

MULCH ANCHORING

Pay Unit: Square Yard/Each

MATERIALS: Mulch Anchoring - (Tackifier)

ACCEPTANCE TESTING REQUIREMENTS

Mulch Anchoring - (Tackifier)

1. Qualified Products List (917.15C5).

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will pay based on measurements and calculations.

8160027 - 8160028

Pg 1 of 1

MULCH BLANKET_____

Pay Unit: Square Yard

MATERIALS: High Velocity Mulch Blankets, Mulch Blanket

ACCEPTANCE TESTING REQUIREMENTS

High Velocity Mulch Blankets

1. Qualified Products List (917.15B1).

Mulch Blankets

1. Qualified Products List (917.15B2).

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will pay based on measurements and calculations and includes providing, placing and anchoring.

8160035 – 8160045

Pg 1 of 1

SEEDING, MIXTURE ___

Pay Unit: Pound

MATERIALS: Seed Mixture**ACCEPTANCE TESTING REQUIREMENTS****Seed Mixture**

1. Seed varieties must be selected from the Qualified Product List (917.12). Document supplier and quantity used on IDR.
2. Approved Manufacturer.

Or

3. Test prior to incorporation. One per lot per shipment. Allow 30+ days for testing after receipt of sample.

Visual Inspection: Maximum 100 pounds.**CONSTRUCTION**

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.

NOTE: Computations must be shown on IDR using rates of application as shown in the spec book or proposal.

2. Measurement and payment
 - a. Engineer will pay based on pounds of seed applied.

8160100 - 8160103

Pg 1 of 2

SLOPE RESTORATION, _____

Pay Unit: Square Yard

MATERIALS: Fertilizer, Herbicides, High Velocity Mulch Blanket, Mulch, Mulch Anchoring, Mulch Blanket, Permanent Turf Reinforcement Mat (TRM), Seed Mixture, Sod, Top soil

ACCEPTANCE TESTING REQUIREMENTS**Fertilizer**

Visual Inspection: Provide the bag label, showing the guaranteed analysis.

Herbicides

1. A Test Data Certification.

High Velocity Mulch Blankets

1. Qualified Products List (917.15B1).

Mulch

1. Verify application rate

Mulch Anchoring Material

1. Qualified Products List (917.15C5).

Mulch Blankets

1. Qualified Products List (917.15B2).

Permanent Turf Reinforcement Mat (TRM)

1. Test Data Certification to meet Special Provision

Seed Mixture

1. Seed varieties must be selected from the Qualified Product List (917.12). Document supplier and quantity used on IDR.
2. Approved Manufacturer.

Or

3. Test prior to incorporation. One per lot per shipment. Allow 30+ days for testing after receipt of sample.

Visual Inspection: Maximum 100 pounds.

Sod

Visual Inspection: All material placed. Document supplier and quantity placed on IDR.

8160100 - 8160103**SLOPE RESTORATION, _____**

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Top Soil

Visual Inspection: All material placed. Per section 917.07 of the Standard Specification for Construction.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.

NOTE: Computations must be shown on IDR using rates of application as shown in the spec book or proposal.

1. Measurement and payment
 - a. Engineer will pay based on measured Syd in place.

8160055

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SODDING

Pay Unit: Square Yard

MATERIALS: Sod

ACCEPTANCE TESTING CRITERIA

Sod

Visual Inspection: All material placed. Document supplier and quantity placed on IDR.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will pay based on measured Syd in place.

8190330 – 8190346

LUMINAIRE

Pg 1 of 1

Pay Unit: Each

MATERIALS: Luminaire

ACCEPTANCE TESTING REQUIREMENTS

Luminaire

1. A General Certification.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will pay based on each placed.

8230150 – 8230181**WATER MAIN**

Pg 1 of 2

Pay Unit: Foot

MATERIALS: Ductile Iron Pipe, Granular CI III and Granular CI IIIA**ACCEPTANCE TESTING REQUIREMENTS****Ductile Iron Pipe**

1. A General Certification.

Visual Inspection: Maximum 250 feet.**Granular Materials****Prequalified Sources**

1. One ticket REQUIRED per load containing the following data.
 - a. MDOT aggregate source number (Pit Number)
 - b. Date of shipment
 - c. Time of shipment (if applicable)
 - d. MDOT control section and job number
 - e. Michigan series number and class letter of aggregate
 - f. Weight or volume shipped
 - g. Suppliers name, telephone number and location
 - h. Truck identifier number (if applicable)
2. Documentation verifying passing QA test results in project files. Refer to [CA 2012-08](#), or as superseded, for additional information.
3. See Material Quality Assurance Procedures Manual section C-6, Part 7 f or reduced acceptance testing requirements if material is from a pre-qualified supplier. Refer to [CA 2011-09](#), or as superseded, for additional information.
4. In addition, the following statement shall be printed or stamped on each ticket: "I attest that aggregate as delivered from this pre-qualified source meets specification requirements for the listed Michigan series and class for quantity stated.
Date _____ Signature _____."
This statement must be signed by an authorized company representative. This statement does not signify acceptance by MDOT of the aggregate.

Non-Prequalified Sources

1. One ticket REQUIRED per load containing the following data **if applicable**.
 - a. MDOT aggregate source number
 - b. Date and time of shipment
 - c. MDOT control section and job number
 - d. Michigan series number and class letter of aggregate
 - e. Weight or volume shipped
 - f. Suppliers name, telephone number and location
 - g. Truck identifier number
2. Test reports must be in project files.
 - a. One test per 10,000 cubic yards.

8230150 – 8230181 WATER MAIN

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Job Site/On Site Sources:

1. Test reports must be in project files.
 - a. One test per 10,000 cubic yards.

Visual Inspection:

- Class III – Maximum 500 cubic yards per project.
- Class III A – Maximum 100 cubic yards per project

NOTE:

BUY AMERICA statement required on steel and iron certification. “BUY AMERICAN” is not an acceptable alternate to “BUY AMERICA”. Refer to [BOH IM13-01](#), or as superseded, for additional information.

INDEPENDENT ASSURANCE TESTING (I.A.T.) REQUIREMENTS

1. See Notes page for IAT requirements.

CONSTRUCTION

1. Inspector's Daily Report
 - a. IDR shall show the inspector's computations, measurements and supporting documentation verifying quantity submitted for pay.
 - b. All materials used must be VI and accepted by the inspector with notation on the IDR that includes the material manufacturer, product name, and quantity used.
 - c. When item is completed FFM (Final Field Measurement) should be noted.
2. Measurement and payment
 - a. Engineer will pay based on measurements along the centerline of the pipe with no deductions for fittings.
3. Density Reports
 - a. Review reports to see that all test and retests meet MDOT requirements (see form 0582B).
 - b. All density reports are to be sent to the Area Density Supervisor (ADS) and Radiation Safety Officer (RSO) on a weekly basis as a minimum.



OFFICE MEMORANDUM

DATE: April 20, 2007

TO: Region Engineers
Region Delivery Engineers
TSC Managers
Resident/Project Engineers
Region Construction Engineers
Region Materials Engineers

FROM: Larry E. Tibbits
Chief Operations Officer

John C. Friend
Engineer of Delivery

SUBJECT: Bureau of Highway Instructional Memorandum 2007-02
Bridge Construction and Bridge Deck Construction Inspection

This document clarifies the procedures for bridge construction and bridge deck construction inspection. It also provides requirements for sampling and testing of bridge concrete, documenting bridge steel reinforcement, wet and dry bridge decks concrete depth measurements, and documentation for bridge construction inspection. This document must be coordinated with the *2003 Standard Specifications for Construction*, Divisions 6 and 7 of the *Construction Manual*, and the *Materials Quality Assurance Procedures Manual*.

Documentation for Bridge Construction and Bridge Deck Construction Inspection

The resident/project/delivery engineer (hereinafter referred to as "engineer") is responsible for performing all testing, inspection, and recording on the forms listed below. See Section 706 of the *2003 Standard Specifications for Construction* and the contract documents for the contractor's responsibilities.

- Form 1138, Bridge Reinforcing Computations

The engineer must complete Form 1138, Bridge Reinforcing Computations, for all structural concrete pours prior to the commencement of the pour. The engineer shall verify and record bar type, size, number, length, calculate total length, weight per foot, calculate total weight and add any remarks (top mat, bottom mat, transverse, longitudinal, vertical, barrier, etc.).

- Form 1131, Bridge Decks Concrete Depth Measurements (required for bridge decks)

The engineer must complete Form 1131, Bridge Decks Concrete Depth Measurements, for all bridge deck pours. See Division 706 of the *Construction Manual* for a sample form and instructions. The engineer shall verify and record dry run and wet run depth

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checks. Note the locations of dry run measurements and measure wet run at or near the same locations.

- Form 1125, Permit to Place

The engineer must complete Form 1125, Permit to Place, for all substructure and superstructure concrete pours including bridge barrier railings. Note the form has been revised to include substructure and superstructure concrete. Issue permit to place only after approval of forms, bracing, reinforcing steel, and preparations for casting concrete. This includes removing debris from the forms, cleaning forms and steel reinforcement. The contractor must also provide a minimum 12-hour burlap soak for wet cure for bridge decks, have appropriate weather equipment to determine relative humidity and wind speed for the evaporation rate for bridge deck pours, vibrators with rubber coated heads, and a ten foot straightedge for checking bridge deck trueness.

- Form 1174A, Inspector's Report of Concrete Placed

The engineer must complete Form 1174A, Inspector's Report of Concrete Placed, for all structural concrete pours. See Division 6 of the *Construction Manual* for instructions. Note the form has been revised to include "Aggregate Correction Factor" and "Evaporation Rate" under "Structure Items Placed." Use contractor-supplied weather equipment to determine and record the evaporation rate for bridge deck pours is less than 0.20 psf per hour per Figure 706-1 of the *2003 Standard Specifications for Construction*. Verify and record all concrete test results, cylinders tags, aggregate correction factor supplied from the concrete supplier, quantity of curing compound used, and structural concrete quantities on the form.

- Form 1122B, Inspector's Daily Report (IDR)

The engineer must complete Form 1122B, Inspector's Daily Report, for all bridge work. See the *Construction Manual* for instructions. The engineer shall record and verify permanent metal deck form information. The engineer must record, verify reinforcement storage, and verify repair to epoxy-coated reinforcement. The engineer must also verify the contractor has provided weather equipment to determine the evaporation rate.

- MDOT Bridge Deck Construction Inspection Checklist (attached)

This checklist is an aid for documentation and inspection of bridge deck construction. The checklist identifies important documentation items for testing and inspection, and items to observe during the bridge pour operations. The engineer shall complete the MDOT Bridge Deck Construction Inspection Checklist for all bridge decks.

Random Number

Following is the required procedure to be used to ensure the random sampling process is uniform, properly documented, and reproducible. See the *Materials Quality Assurance Procedures Manual* for more information.

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1. Prior to the pre-pour meeting, generate random numbers using a computer spreadsheet program or a calculator. The random numbers will be used for the cubic yardage to determine samples based on the size of the pour. Generate an excess amount of random numbers to take into account overruns or any situation where another random number is required.
2. At the pre-pour meeting, present each page that lists random numbers (cover the numbers with a separate sheet of paper) for signature of the contractor and delivery engineer.
3. Place the original list in the project file; copies go to MDOT's field personnel.
4. Provide the list of random numbers to the contractor when the project is completed.

Bridge Construction and Bridge Deck Construction Inspection

Permanent Metal Deck Forms

The engineer shall record and verify the source of the permanent metal deck forms. The engineer shall verify the contractor is installing the forms as shown in the approved shop plan drawings. The engineer shall also verify the contractor has field drilled $\frac{1}{4}$ inch diameter weep holes in the forms at 12 inch maximum spacing along the transverse and longitudinal construction joints. See Section 707 of the *2003 Standard Specifications of Construction* regarding field welding and welder certifications. If using Styrofoam in corrugations, ensure it is secure so the concrete will not displace it.

Shear Developers

See Division 707 of the *Construction Manual* and Section 707 of *2003 Standard Specifications for Construction* for installing and testing procedures for shear developers.

Epoxy Coated Steel Reinforcement

The engineer shall ensure the contractor is storing the epoxy coated steel reinforcement per the *2003 Standard Specifications for Construction*, and covering the reinforcement to protect it from the sun's ultraviolet rays. The engineer shall also verify the contractor's repair of epoxy coating using a patching/repair material selected from Section 905.03.C, Bar Reinforcement (Epoxy Coating) of the qualified products list. Note the repair product on Form 1122B, Inspector's Daily Report. Complete Form 1138, Bridge Reinforcing Computations. Ensure reinforcement is placed as shown on the plans and provide clear cover according to the plans and specifications. Verify the contractor is placing bar chairs as required in the *2003 Standard Specifications for Construction*.

Bridge Deck Pour Sequence

The engineer shall verify the contractor is following the pour sequence as shown on the plans. Any changes to the sequence must be approved in writing by MDOT Bridge Design and noted in the project files. See Section 706.03.P. of the *2003 Standard Specifications for Construction* for instructions to remove vertical forms, including bulkheads at construction joints. Removal should not be done until at least 15 hours after the pour is completed.

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Changing Night Casting of Bridge Decks

There are circumstances when proposed night casting of a bridge deck may be changed to day pours. Such circumstances occur primarily when the maximum daytime temperature does not exceed 60 degrees (F) and/or the nighttime temperatures are below 40 degrees (F). Consult the Bridge Construction staff in the Construction and Technology Division's Bridge Operations Section prior to revising night casting. The engineer must document the change in the project records. The following requirements must be followed:

1. The concrete mix design should not incorporate a retarding admixture.
2. Cold weather precautions are applied, as appropriate.
3. MDOT is credited for all cost savings from the appropriate pay items associated with the deletion for any portion of the night casting:
 - An adjustment to the cubic yard price for the item of "Superstructure Concrete, Night Casting" which was cast during the day (usually a reduction of two dollars per cubic yard).
 - Adjust the quantity for cubic yard for the item, "Bridge Lighting, Operate and Maintain," to that which was actually night cast.
 - Delete the item, "Bridge Lighting, Furnish and Remove" (delete only if all pours were cast during the day).
 - No adjustment for "Superstructure Concrete, Form, Finish, Cure, Night Casting" is required.

Concrete Quality Assurance and Quality Control

The engineer shall generate random numbers for quality assurance testing. The engineer shall also ensure the contractor is performing concrete yield tests as part of contractor's concrete quality control. Subtract the aggregate correction factor from the field air content test results. Perform sampling of the concrete according to Michigan Test Method 207 at the pump discharge unless it is correlated to the concrete delivery truck. Note the correlation on the IDR.

Placing Bridge Deck Concrete

Verify the concrete is falling less than 6 inches from the discharge chute to the uppermost steel reinforcement for bridge deck pours.

Finishing Bridge Deck Concrete

The engineer shall ensure the contractor verifies the bridge deck trueness with a 10 foot straightedge while the concrete is still plastic. The engineer will check the finished deck with a 10 foot straightedge and mark the defective areas prior to acceptance.

Texturing and Curing Bridge Decks

The engineer shall ensure the contractor textures the deck as soon as the concrete has set sufficiently to maintain the texture per the *2003 Standard Specifications for Construction*. The engineer shall also ensure the contractor applies a curing compound from the qualified product list at a rate not less than one gallon per 150 square feet of surface immediately after the sheen of bleed water has left the textured concrete surface. The engineer shall ensure the contractor wet

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cures the bridge deck per the *2003 Standard Specifications for Construction*. The engineer shall ensure the contractor has soaked the burlap a minimum of 12 hours prior to beginning the deck pour, that the burlap is placed (excess water removed) as soon as the curing compound has dried sufficiently to prevent adhesion, and that the concrete will support it without deformation, but not more than two hours after the deck was cast. Do not use Burlene directly on the bridge deck concrete. The engineer shall ensure the contractor provides a network of soaker hoses and a system to apply cure water uniformly and continuously for at least 7 days, and that the entire deck surface is covered with a minimum 4 mil polyethylene film.

Concrete Delivery Tickets

The engineer shall verify and record discharge time on the tickets and sign all of the concrete delivery tickets.

Notification

Notify Eric Burns (517-322-6331) or Scott Hobner (517-322-5120) of the Construction and Technology Division's Bridge Operations Section one week prior to the commencement of the bridge deck pours.

 Chief Operations Officer

 Engineer of Delivery

BOHD:C/T:EMB:kab

Index: Structures

cc:	C & T Division Staff	G. Moore
	J. Polasek	K. Reincke
	M. DeLong	T. Fudaly, FHWA
	M. Van Port Fleet	ACEC
	J. Reincke	APAM
	J. Culp	CRAM
	B. O'Brien	MAA
	P. Collins	MCA
	C. Rademacher	MCPA
	P. Sebenick	MITA

MDOT BRIDGE DECK CONSTRUCTION INSPECTION CHECKLIST
(pg 2)

C. <u>During the Pour</u>	<u>Initials</u>
• Record Aggregate Correction Factor on <i>Form 1174A, Inspector's Report of Concrete Placed</i>	_____
• Ensure contractor is performing QC and QA testing, including yield tests	_____
• Complete <i>Form 1174A, Inspector's Report of Concrete Placed</i>	_____
• Verify concrete delivery tickets match the concrete mix design	_____
• Perform concrete QA verification testing	_____
• Ensure engineer tags the quality assurance cylinders	_____
• Test concrete at the pump discharge and correlate to testing at the concrete Truck, according to MTM 207	_____
• Record elapsed time interval on every delivery ticket between charging the mixer and the placement of the concrete. Sign the concrete delivery tickets	_____
• Vibrator with rubber coated heads being used within 15 minutes of placement	_____
• Ensure contractor does not over vibrate or over finish the concrete	_____
• Ensure concrete does not freefall more than 6 inches to the deck resteel	_____
• Perform wet run and record measurements on <i>Form 1131, Bridge Decks Concrete Depth Measurement</i> near locations of the dry run	_____
• Ensure contractor checks deck tolerance with a 10 foot straightedge both longitudinally and transversely	_____
• Do not allow the contractor to apply water to the deck surface to aid in finishing. If necessary, allow only with an approved fog sprayer and only when approved by the engineer	_____
• Inspect texturing per subsection 706.03.M.	_____
• Verify the white curing compound was applied at the appropriate time and at the correct application rate	_____
• Verify the wet cure (burlap, soaker hoses, polyethylene) was applied at the appropriate time	_____
• Verify the low temperature protection was applied as necessary per 706.03.J2.b.	_____
D. <u>After the Deck Pour</u>	
• Verify the wet cure is maintained for seven days. Check deck to verify soaker hoses are working	_____
• Ensure that the contractor waits a minimum of 15 hours to strip bulkheads after completion of the pour	_____
• Do not allow casting of sidewalks or railings until the deck concrete has met 7 day minimum flexural or compressive strength and after the 7 day wet cure	_____
• Saw cut deck construction joints within 4 hours after removing wet cure	_____
• Inspect deck tolerance 1/8 inch in 10 foot with 10 foot straightedge prior to acceptance	_____



DATE: August 16, 2011

TO: Region Engineers
Region Delivery Engineers
TSC Managers
Resident/Project Engineers
Region Construction Engineers

FROM: Gregory C. Johnson, P.E.
Chief Operations Officer

Randy R. Van Portfliet, P.E.
Bureau Director of Statewide Field Services

SUBJECT: Bureau of Highway Instructional Memorandum 2011-04
Final Estimate Review Procedure

The Final Estimate Review Procedure applies to MDOT let projects that utilize a non-certified delivery/project engineer. This includes all projects where full consultant construction engineering is used. A non-certified delivery/project engineer is a delivery/project engineer that has not achieved a passing score under MDOT's project record Certification Review Program, or is not eligible to obtain certification under this program. The non-certified delivery/project engineer is required to adhere to these procedures on every project until they successfully graduate into the department's Project Record Certification Program. This Final Estimate Review Procedure supersedes the procedures set forth in Section 109 of the MDOT Construction Manual.

Purpose of the Review

The purpose of the review is to verify that final contract quantities are supported by proper documentation and have been paid in accordance with contract documents and MDOT's Standard Specifications for Construction. The review provides assurance that the project records are in substantial conformance with the plans and specifications, as well as the department's policies and procedures. Substantial conformance is defined as having attained a passing evaluation on 80 percent of the contract items sampled and listed on the Final Estimate Review Summary (Form #1147), and in the section of this document titled Individual Pay Item Review.

When actions depart from specifications and established MDOT policies/procedures, the basis for acceptance must be documented by the delivery/project engineer in accordance with BOH IM 2005-09, or as superseded.

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Review Teams

Each Final Estimate Review Team will have a leader, as well as members with knowledge and experience in MDOT construction and materials documentation. The team leader will be responsible for scheduling the review, ensuring that the review is completed in a timely and thorough manner, management of review documentation, and completing final deliverables of the closeout review by compiling the final estimate review report, and signing the Final Estimate Review Summary at the completion of the review. Upon request, consultation or assistance on project related review issues is available with the Construction Contracts Unit, Construction & Technology Division.

MDOT Projects: The region construction engineer will appoint team members. Members may consist of MDOT engineering and/or technical staff from other TSCs, the region, or prequalified consultants. However, staff from the overseeing TSC office shall not be part of the review team.

Local Agency Projects: The region construction engineer will appoint team members. Members may consist of MDOT engineering and/or technical staff from TSC offices not involved in oversight of the project, the region office, or prequalified consultants. Consultants and TSC staff who had involvement in the design or construction of the project shall not be part of the review team.

Format of the Review

When the delivery/project engineer has determined the final quantities of all pay items and completed required documentation for the project, the region construction engineer shall be advised that the project is ready for a final estimate review. It is important for the delivery/project engineer to complete the project closeout in a timely manner to allow adequate processing time for the entire final estimate review process, and post review submission of the final estimate within 120 calendar days of project completion. If a project closeout is not completed within the department's established timelines, the delivery/project engineer will be required to provide the region construction engineer with an explanation. This information will also be reported to the MDOT administration monitoring the overdue project finals.

Each individual project involving a non-certified delivery/project engineer must be reviewed separately. The review will cover two major areas:

1. Construction pay item documentation, including contract related project documentation.
2. Materials documentation.

Overall Documentation Review

The Final Estimate Review Team shall review the project records for the following items, at a minimum:

1. Required administrative documents, per MDOT's File Manual for Construction Records, which are attached to BOH IM 2008-09.
2. Contractor Certified Payroll documentation that has been properly reviewed by the delivery/project engineer in accordance with current department policy.

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3. Contract modifications containing overruns, extras, adjustments, and any necessary project contract change to ensure that they contain proper formatting and content, and are consistent with the procedure for processing contract modifications.
4. Supporting documentation for extensions of time approved with or without liquidated damages, incentives, and/or value engineering change proposals are included in the project files.
5. Confirmation that the person performing office technician duties for the certified delivery/project engineers on MDOT, local agency, and consultant projects have successfully completed office technician training.

Pay Item Selection

The selection of pay items to be reviewed shall be based on the following:

1. Measurement characteristics, including volume, weight, length, area, lump sum, unit, removal, force account, and adjustment items.
2. A minimum of 10 pay items per project. For projects with less than 100 pay items, 10 percent of the items will be reviewed, with a minimum of 3 items.
3. If irregularities or deficiencies are found with a pay item, the review must be expanded into similar or related items.
4. Pay items covering major items of work such as removal, earthwork, hot mix asphalt (HMA), concrete, aggregate surfaces, and structures.
5. Items containing significant increases/decreases, adjustments, or other funding related changes during construction.
6. At least one force account pay item, when applicable.

Documentation requirements for most pay items can be found in the Documentation Guide (Minimum Acceptance Requirements for Material Approvals, and Documentation), which is available on MDOT's Web site at: www.michigan.gov/mdot, Maps & Publications, Manuals, Guides, and Advisories & Memos.

Individual Pay Item Review

The individual pay item review shall include, at a minimum, the following items:

1. Pay items measured and paid in accordance with the applicable specifications and special provisions.
2. Supporting documentation that is properly identified (MDOT control section and job number) and signed.
3. Documentation that is properly completed on current contract time frame prescribed forms.
4. Component materials for each pay item properly documented, approved, and accepted.
5. A sample of the Inspector's Daily Reports (IDRs) containing each pay item, which demonstrates conformance with MDOT's policies and procedures.

If irregularities or deficiencies are found, the review should be expanded into similar or related items.

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Materials Review

For each pay item reviewed, the acceptance of the materials component shall also be examined. If irregularities or deficiencies are found, the review should be expanded into similar or related items.

During the review, ensure that documentation for the following emphasis areas is adequate:

1. Signed Material Source List forms are included in project files.
2. The materials were approved in accordance with the MDOT Materials Quality Assurance Procedures Manual and Materials Source Guide.
3. Sufficient quantity of each material was approved for materials accepted by test for all pay items reviewed.
4. All materials approved for use under General Certification, Test Data Certification, and Approved Manufacturer/Supplier are in accordance with BOH IM 2002-05, or as superseded.
5. All required testing was completed at appropriate intervals.
6. All testing personnel were properly qualified.
7. Items included on the Qualified Product List are noted on an IDR, including a reference to the product and manufacturer as verified in the field, placement of a label/copy, or tag in the project files.
8. Materials approved by visual inspection are noted on the appropriate IDRs, and quantities are within the threshold limits in accordance with the Materials Source Guide in effect at the time of letting.
9. Proper sampling and testing of concrete items, including frequency and results of slump tests, modulus of rupture, atmosphere and concrete temperatures, air content, and yield/evaporation (bridge projects only) tests.
10. Verification of proper sampling and testing of HMA items, including frequency and results of mix and air temperatures tests, application yield rate data, loose mixture tests, density tests, and all other information required in the MDOT Construction Manual, and clarified in Construction Advisory 2006-07, or as superseded.
11. Steel and iron certifications for Buy America provisions.

The Materials Review Worksheets (Form #1972) should include reference to specific test documents examined, so that an auditor can easily trace these documents. Also, total quantities tested must be reported.

Independent Assurance Testing

Independent Assurance Testing (IAT) is required for all federally funded projects on the National Highway System (NHS). IAT is also required for each individual inspector or tester, and their equipment in four areas:

1. Concrete sampling and testing.
2. Aggregate sampling and testing.
3. In-place density testing.
4. HMA mixture testing.

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A listing of current IATs for an individual can be found in the Independent Assurance Testing Database. The Final Estimate Review Team must verify and document that all required IATs were completed.

Final Estimate Review Report

The Final Estimate Review Report contains the review work papers documenting the findings of the review. The report, developed by the Final Estimate Review Team, should provide sufficient data for the delivery/project engineer, FHWA, region personnel, and external department project auditors to make an assessment of the level of administrative compliance of the documentation. The evaluation of the final estimate review determines whether a timely payment of federal funds will be made.

The following forms, which are available on MDOT's Web site, shall be used to develop the Final Estimate Review Report:

1. Contract and Related Document Checklist (Form #1969).
2. Construction Item/IDR Checklist (Form #1970).
3. HMA Item Checklist (Form #1971).
4. Material Review Checklist (Form #1972).
5. Concrete Item Checklist (Form #1973).

MDOT's control section and job number should appear on each sheet to properly identify the work papers. Clearly identify the pay item or material reviewed on each form. Fill in the MDOT standard specifications for construction section number for the item, and/or proposal reference page of the special provision for the item detailing the basis of measurement and payment. The special provision modifies the standard specification for the item reviewed. The support documents examined by the Final Estimate Review Team should be listed on the forms. All forms should be signed by the member of the review team who completed that portion of the review.

Verify that pay items documentation is:

1. Cross-referenced in Field Manager under the documentation tab.
2. Identified by MDOT project number, date, inspector, and file reference number.
3. Properly identify indexed and cross-referenced to source documents in the field measurement books.

Final Estimate Review Summary

The Final Estimate Review Team will complete the Final Estimate Review Summary and meet with the delivery/project engineer to discuss their findings. If deficiencies are found the engineer will be required to address the deficiencies and notify the Final Estimate Review Team when all issues have been addressed. The Final Estimate Review Team will then conduct a follow-up review.

Once all deficiencies noted in the review have been resolved, and the project records are in substantial conformance with current department policies/procedures, the Final Estimate Review

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Team leader shall sign the Final Estimate Review Summary. The original signed Final Estimate Review Report is then placed in the official project files. On local agency projects, provide the overseeing TSC with a copy for their records. The TSC delivery engineer shall verify that the final estimate review summary has been completed and signed, and that all deficiencies noted on the form have been resolved prior to submitting the final project estimate for payment.

If you have any questions, please contact Mohammad Azam, Operations Review Engineer, Construction Contracts Unit, by telephone (517-636-0832) or e-mail (AzamM1@michigan.gov).

Chief Operations Officer

Bureau Director of Statewide Field Services

FHWA Approval: 07-06-11

BOHD:C/T:MA:mmm

Index: Operations Reviews

cc: C & T Division Staff
M. DeLong
B. O'Brien
P. Collins
B. Wieferrich
C. Rademacher
P. Sebenick
G. Moore
L. Wieber
D. Calabrese, FHWA
ACM
ACEC
APAM
CRAM
MAA
MCA
MCPA
MITA
MML



OFFICE MEMORANDUM

DATE: February 12, 2013

TO: Region Engineers
Region Associate Operations Engineers
Region Construction Engineers
TSC Construction Engineers
TSC Managers

FROM: Gregory C. Johnson, P.E.
Chief Operations Officer

Randel R. Van Portfliet, P.E.
Bureau Director of Field Services

SUBJECT: Bureau of Highway Instructional Memorandum 2013-01
Special Provision for Source of Steel and Iron (Buy America)
(Supersedes BOH IM 2012-06)

The Michigan Department of Transportation (MDOT) and the Federal Highway Administration (FHWA) have partnered to address compliance with Buy America requirements on all state and local projects that include federal-aid funding.

Buy America requirements state that all steel and iron materials/products and manufacturing processes of the steel and iron material in a product, including but not limited to, smelting, rolling, melting, extruding, machining, bending, grinding, drilling, welding, galvanizing, and coating must occur within the United States. Work items and materials specifically shown in the project plans, specifications and contract documents and that are listed on the MDOT maintained Buy America step certification list that are permanently incorporated into the project, regardless if they are defined as temporary or not, must meet the requirements in the Special Provision for Source of Steel and Iron (Buy America).

Examples of products that are subject to Buy America coverage include, but are not limited to, the following:

- Steel or iron products used in pavements, bridges, tunnels or other structures, which include, but are not limited to, the following: fabricated structural steel, reinforcing steel, piling, high strength bolts, anchor bolts, dowel bars, permanently incorporated sheet piling, bridge bearings, cable wire/strand, pre-stressing/post-tensioning wire, motor/machinery brakes and other equipment for moveable structures;
- Guardrail, guardrail posts, end sections, terminals, cable guardrail;

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- Steel fencing material, fence posts;
- Steel or iron pipe, conduit, grates, manhole covers, risers;
- Mast arms, poles, standards, trusses, supporting structural members for signs, luminaires, or traffic control systems; and
- Steel or iron components of precast concrete products, such as reinforcing steel, wire mesh and pre-stressing or post-tensioning strands or cables.

The miscellaneous steel or iron components, subcomponents and hardware necessary to encase, assemble and construct the above components (or manufactured products that are not predominantly (90 percent) steel or iron) are not subject to Buy America coverage. Examples include, but are not limited to, cabinets, covers, shelves, clamps, fittings, sleeves, washers, bolts, nuts, screws, tie wire, spacers, chairs, lifting hooks, faucets, door hinges, etc.

The contractor must obtain and submit manufacturer and/or fabricator step certification for all items identified on MDOT's Buy America - Pay Items and Materials that Require Step Certification list. The most current list can be found at the following website under the *Construction Field Services* heading:

http://www.michigan.gov/mdot/0,1607,7-151-9622_11044_11367---,00.html

Step certification is defined as the certification by the respective manufacturer or fabricator for their specific process (step) of the fabrication or manufacturing process of the product, material or component. All process steps must occur in the United States unless otherwise stated in the Special Provision for Source of Steel and Iron (Buy America). The step certification documentation for all items on the MDOT Buy America - pay item and material list is to be submitted to the engineer in a package covering each step concurrent with material delivery and prior to incorporation into the project. Sample certification and step certification documents are shown in Appendix A. These documents have been developed to ensure that all companies provide a consistent certification document.

Buy America certification or step certification is required in the following cases:

- Pay items listed on the MDOT Buy America - Pay Items and Materials that Require Step Certification list.
- Pay items, work items, and/or products included in the notes section of the MDOT Buy America - Pay Items and Materials that Require Step Certification list.
- Pay items, work items, and/or products requiring Buy America certification or step certification in a contract document (e.g. special provisions, addendums, notice to bidder, etc.).

Buy America certification is not required for items that do not fall into one of the cases described above.

Construction Field Services (CFS) has contacted manufacturers/fabricators of qualified products, approved manufacturers, and tested stock suppliers regarding their compliance with Buy America for any products containing steel/iron shown on their respective lists within the MDOT Materials Source Guide. The responses from these companies related to Buy America compliance has been compiled into a single source document that notes the level of compliance

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with Buy America. This document, **Buy America – Compliance Listing for Approved Manufacturers, Qualified Products List, and Tested Stock Suppliers**, can be found at the following website under the *Construction Field Services* heading:

http://www.michigan.gov/mdot/0,1607,7-151-9622_11044_11367---00.html

The companies on this list are either completely or partially compliant with Buy America as noted by the legend and each company name or they do not contain any steel/iron. All of these companies have provided Buy America certification documentation or correspondence that CFS will maintain on an annual basis.

If a contractor provides a product from a company noted as fully compliant with Buy America, the contractor will not be required to provide Buy America certification to the engineer. The Buy America certification will be maintained by CFS and will not be required to be located in the project files. The contractor will simply need to provide a bill of lading, product label, or shipping record to document that the products are from the respective manufacturer or fabricator. Project inspection staff will simply note the material source on their Inspector's Daily Report (IDR) as the certification will be maintained by CFS.

If a contractor provides a product from a company noted as partially compliant (contains a portion of foreign steel or iron) with Buy America, the contractor is required to submit the respective Buy America certification from the manufacturer/fabricator. This documentation is required to be submitted prior to delivery or concurrent with material delivery and prior to incorporation, noting the value of foreign steel/iron. This value must be maintained by the contractor on their minimal usage of foreign steel/iron documentation.

Minimal use of foreign steel and iron is allowed provided the total invoice cost of foreign steel and iron permanently incorporated into the project does not exceed 0.1 percent (0.1%) of the total contract amount or \$2,500, whichever is greater. The total invoice cost is the invoice amount charged for the steel or iron within the product, material or component delivered to the project. The contractor is required to maintain this minimal usage amount and provide the monetary values with product or material delivery prior to incorporation.

The use of foreign steel and iron under the minimal usage amount does not need to be approved by the FHWA. This amount is not considered a waiver to the Buy America requirements. The minimal usage amount is to be approved by the engineer as long as the maximum values are not exceeded. The contractor is to provide the engineer with the monetary amount of foreign steel and iron in each pay item, product, material or component. The contractor is also required to maintain a list of all foreign steel and iron incorporated into the project and provide this list as requested by the engineer.

The FHWA has established a Buy America waiver process for steel and iron products, components, and materials that are not domestically produced or processed, but are required per the contract. Waiver approvals are to be pursued during the preliminary engineering/design phase of projects and do not include after-the-fact discovery of an inadvertent incorporation of foreign iron and steel into a federal-aid project.

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Buy America waivers are only issued per item and on a project basis and are not transferrable to other projects. These waivers are issued by the Washington D.C. headquarters of the FHWA and are not issued by project staff of any other agency or office. Waiver processing may be necessary after letting for products or components that are no longer domestically produced or processed. This discovery may impact a project schedule and, therefore, waiver discussions must occur as soon as possible upon discovery that domestically produced or processed steel or iron products or processes are not available. Managing offices are to work with the Construction Contracts Unit in the CFS Division for processing and submittal of the waiver request with supporting information to the FHWA Michigan Division Office. The FHWA approval process will take at least six months so prompt submittal of waiver requests are required. Supporting information that is to be provided to the Construction Contracts Unit is as follows and examples can be provided:

- MDOT Contract ID
- FHWA Project Number
- Federal Item Number
- Brief Project Description (from contract inquiry system)
- Original Project Amount
- Current Project Amount (at time of waiver submittal)
- Waiver Pay Item, Product or Process
- Cost of Waiver Pay Item, Product or Process
- Country of Origin of the Pay Item, Product, or Process (if known)
- Reasons for the Waiver Request
- Description of the efforts made by the contractor and MDOT to locate a domestically manufactured product
- Analysis of re-design of the project using alternate or approved equal domestic product

Buy America requirements are applicable for products and components when they arrive at the project work site. Once these products and components are on the work site it is expected that additional manufacturing and fabricating will not be necessary off site. However, if the products or components leave the work site and any process is completed related to the products and components, the steel and/or iron must again be certified by the affecting company. Any work at the project location related to bending, coating, welding, etc., completed by the contractor is not a part of the Buy America process and step certification is not necessary for this work, but Buy America step certification is necessary for any steel or iron material permanently incorporated into the project when delivered to the project work site.

For clarification, there is also a federal requirement and specification for **Buy American** (note the additional letter "n" in American). Buy American does not apply to road and bridge projects; it is a requirement for direct federal grants (e.g. aeronautics projects). Project staff must ensure that they receive the Buy America certification and not Buy American certification as there is a substantial difference between the two requirements.

No payment, including stockpile and delivered payments, is to be made for any materials or products containing steel or iron on the MDOT Step Certification List until all certifications have been approved by the engineer. The only exception to this requirement is for fabricated products

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that are stamped "Approved for Use" by MDOT's Structural Fabrication Unit (internal or contracted inspection personnel) performing shop inspection at fabrication facilities (e.g. structural steel and structural precast concrete). The Structural Fabrication Unit verifies Buy America for materials with fabrication inspection as the basis for acceptance per the Materials Source Guide (MSG). All products that have been stamped "Approved for Use" by the Structural Fabrication Unit must be visually inspected after being unloaded at the project site before being accepted by the engineer. These products may then be partially or fully paid provided the inspector was given an "Approved for Use" stamped shipping document (Shipper) upon arrival of the products (structural steel) or after they receive a digitally signed shipping memorandum from the Structural Fabrication Unit (structural precast concrete). The fabricator is required to maintain a listing of all step certification materials that do not meet Buy America and obtain approval from the engineer prior to incorporation of foreign steel or iron into any fabricated products. MDOT's Structural Fabrication Unit will not seek approval from the project office for incorporation of foreign steel or iron into a project, but will verify that the engineer has approved the use of foreign steel or iron prior to stamping "Approved for Use". The Structural Fabrication Unit will issue partial (structural precast concrete inspection only) and final shipping memorandums to the engineer, for projects requiring structural steel and structural precast concrete fabrication inspection. These memorandums summarize the fabrication inspection and states Buy America has been verified at the fabrication facility. Please note that partial shipment memorandums are issued for structural precast concrete inspection projects to provide the inspector with the required documentation to make partial payment when requested.

This BOH IM and the revised Special Provision for Source of Steel and Iron (Buy America), 12SP105(A) dated 01/08/13, are effective immediately for all projects. The revised special provision can be incorporated into all existing projects as requested by the contractor via a contract modification for a zero (\$0) cost change to the contract. If a cost increase is requested by the contractor the existing contract specifications are to be utilized.

If you have any questions please contact Jason Gutting, Engineer of Construction Operations, at guttingj@michigan.gov or 517-636-6334.

Chief Operations Officer

Bureau Director of Field Services

FHWA Approval: 01/29/2013

BOFS:CFS:JG-mnn

Index: Special Provisions

cc:	CFS Division Staff	B. Wiefelich	P. Collins	L. Wieber	ACM	MCA
	M. Chaput	M. DeLong	D. Wedley	D. Calabrese	APAM	MITA
	B. O'Brien	C. Rademacher	T. Schutte	ACEC	CRAM	MML

Appendix A

The following information is provided as a sample letter of step certification for Buy America compliance. Documentation must be provided on company letterhead.

Date

Company Name
Company Address
City, State Zip

Subject: Buy America Step Certification for Project (XXXXX-XXXXXX4)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided to the subject project is in full compliance with the Federal Highway Administration (FHWA) Buy America requirements as specified in Title 23 of the Federal Code of Regulations (CFR) Section 635.410.

Pay Item, Products and/or Materials

Joint, Expansion, E2

- *Dowel Bar, Buy America compliance for cutting and coating the bars*

Reinforced Concrete Pipe, 24 inch

- *Reinforcing Steel, Buy America compliance for melting, manufacturing and cutting*

Reinforced Concrete Pipe, 24 inch

- *Reinforcing Steel, Buy America compliance for casting into final pipe product*

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

It should be noted that a complete list of the associated manufacturing and/or fabricating steps is to be provided with the step certification documentation along with which steps the respective letter(s) are addressing. This will allow MDOT to document the steps in the process to ensure documentation compliance with federal regulations.

The following information is provided as a sample letter of certification for Buy America compliance. Documentation must be provided on company letterhead.

Date

Company Name
Company Address
City, State Zip

Subject: Buy America Certification for Project (XXXX-XXXXX4)

I, (company representative), certify that the following products and/or materials shipped/provided to the subject project are in full compliance with the Federal Highway Administration (FHWA) Buy America requirements as specified in Title 23 of the Federal Code of Regulations (CFR) Section 635.410.

Pay Item, Products and/or Materials

Water Main, DI, 24 in
- *Buy America compliance.*

Joint, Expansion, E2
- *Dowel Bar, Buy America compliance.*

Spun Concrete Poles
- *Buy America compliance.*

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

It should be noted that a complete list of the associated manufacturing and/or fabricating steps is to be provided with the step certification documentation along with which steps the respective letter(s) are addressing. This will allow MDOT to document the steps in the process to ensure documentation compliance with federal regulations.

Construction Advisory

CA 2007-01
February 13, 2007

From Brenda O'Brien, Engineer of Construction and Technology

MDOT-Construction and
Technology Division
P.O. Box 30049
Lansing, Michigan 48909
Phone/517-322-1087
Fax/517-322-5664
www.michigan.gov/mdot/

Index: Traffic Control

Questions regarding this
Construction Advisory should
be directed to:

Jeff Grossklous, Construction
Staff Engineer – Traffic and
Safety, at 517-322-5769 or
grossklousj@michigan.gov



BJO:JKG

Temporary Concrete Barrier

The Special Provision for Temporary Concrete Barrier states all new temporary concrete barrier (TCB) fabricated after September 1, 2006, must meet NCHRP 350 crashworthy criteria, along with additional MDOT requirements. For the TCB to be acceptable for use on MDOT projects, the contractor must provide the following documentation before it is placed in the field:

1. A letter from FHWA verifying the TCB meets NCHRP 350 criteria.
2. A drawing to verify that the bottom width does not exceed 28 inches, and the top is at least 6 inches wide and flat.
3. Crash tests results to verify the deflection was 6.5 feet or less. The FHWA letter will state the deflection distance. If the FHWA letter states the TCB is acceptable based on a comparison to another crash tested TCB design, then the compared TCB deflection results must be provided. For example, Mack Industries has a TCB design based on a combination of designs by the Ohio and New York DOTs. In this case, the contractor will need

to provide the FHWA acceptance letter for each of these designs. In those letters, it will indicate that the Ohio design deflected 5.5 feet, and the New York design deflected 1.27 meters (4.2 feet).

If a sloped end section is needed for a run of NCHRP 350 accepted TCB, the following is required:

1. The connection side profile should match the full size TCB section being used, along with the connection design.
2. The opposite end of the section should have a 6 inch high lip, with the top edge rounded with an 8 inch radius. This is similar to the "Temporary Concrete End Section" elevation view shown on page 5 of 6 of Standard Plan R-52-E.
3. The slope should be 1:5 as a maximum.
4. A minimum of 10 feet long.
5. Reinforcement determination will be the manufacturer's responsibility. Adequate reinforcement shall be used to maintain structural integrity of the section.

The end section will be paid as Concrete Barrier, Temporary Furnished and Operated.

Intermixing of TCB shapes on a given run is discouraged. If intermixing is necessary, a transition section shall be used. The transition section as a minimum should:

1. Be 10 feet long or greater.
2. Develop a smooth transition between the two TCB shapes, with no snag points.
3. Provide connections between each TCB shape that match each section.

The transition section will be paid as Concrete Barrier, Temporary Furnished and Operated.

Please share this information with consultants and local agencies in your area.

Construction Advisory

CA 2009-15
September 17, 2009

From Brenda O'Brien, Engineer of Construction and Technology

MDOT-Construction and Technology Division
P.O. Box 30049
Lansing, Michigan 48909
Phone/517-322-1087
Fax/517-322-5664
www.michigan.gov/mdot/

Index: Concrete

Questions regarding this Construction Advisory should be directed to:

Mohammad Azam,
Operations Review Engineer, at 517-636-0832 or azamm1@michigan.gov



BJO-MA

Concrete Delivery Ticket Requirements From Certified National Ready Mixed Concrete Association (NRMCA) Plants

This construction advisory serves to clarify the acceptance requirements for concrete delivery tickets from certified NRMCA plants.

Concrete delivery tickets must be computer generated except the customer information, which may be hand printed on each ticket. In accordance with FHWA requirements, EACH concrete delivery ticket must contain the following information:

1. Concrete producer's name and plant number, if more than one plant
2. Ticket serial number
3. Contractor name and MDOT project number
4. Grade of concrete and cyd batched
5. Date and time the batch was loaded
6. Type and name of admixtures and amount batched
7. Signed certification executed by the producer stating all materials are tested and approved, or certified as meeting MDOT's specifications. Plants dedicated to only one project are excluded from this requirement.
8. An automated printout of actual batch weights must accompany each delivery ticket.
9. The inspector must sign all concrete delivery tickets.

In addition, fax Form 1155, *Weekly Summary of Certified Concrete From Commercial Central Mix and Transit Mix Plants* to the region materials staff on the Monday of the week following the production week.

Please share this information with project staff and consultants performing construction engineering.

Construction Advisory

CA 2011-08
June 20, 2011

From Brenda O'Brien, Engineer of Construction and Technology

MDOT-Construction and
Technology Division
P.O. Box 30049
Lansing, Michigan 48909
Phone/517-322-1087
Fax/517-322-5664
www.michigan.gov/mdot/

Index: Culverts

Questions regarding this
Construction Advisory should
be directed to:

Dave Gauthier, Grading and
Drainage Engineer,
Construction and
Technology Division, at
517.322.5710 or
dgauthier@michigan.gov



BJO:DG

Mandrel Testing of Corrugated Polyethylene Pipe (CPE)

This construction advisory is intended to emphasize and clarify the requirements for mandrel testing of CPE pipe. During the preconstruction meeting it should be pointed out if CPE pipe is installed, **at least 50 percent of each size must be mandrel tested.** The engineer should select those runs of pipe that may have been problematic during installation or in areas subjected to a high volume of construction traffic. The mandrel testing should be conducted 5 to 10 work days prior to paving.

Prior to testing, the contractor must provide an approved mandrel which is appropriate for testing CPE pipe (mandrel size for PVC is smaller). The mandrel must have at least nine points and be 95 percent of the nominal diameter of the pipe. Per AASHTO M 294 *Corrugated Polyethylene Pipe*, nominal pipe diameter is defined as 12", 15", 18", etc. Mandrels can be a fixed size or a variable size and are commercially available for most pipe sizes up to 48". The diameter of the mandrel, whether it is fixed or variable size, must be verified with a proving ring. As a rule of thumb, the length of the mandrel should be equal to or greater than the diameter.

The pipe should be cleaned thoroughly before testing. Even the smallest amount of debris can hinder the passage of the mandrel. During the test, the mandrel must be pulled through the pipe by hand. The use of a winch, come-along or other mechanical means is prohibited. If the mandrel can not be pulled through the pipe, the test fails and corrective action is required.

Prior to any corrective action, the contractor may opt to video the pipe to determine the cause of the mandrel not passing through or attempt to clean the pipe again and re-run the mandrel test. If the test still fails, the CPE pipe may be removed and reinstalled providing it has been inspected for damage and approved for re-use. The other option is to remove and replace the damaged pipe with new CPE or other acceptable pipe type. If CPE pipe is used it must be mandrel tested after installation. The use of a pipe "re-rounder" is not an acceptable method for corrective action. Video taping of CPE pipe for acceptance should be conducted only after passing mandrel tests have been achieved.

Two forms have been created to document CPE pipe installation and mandrel testing results for sewers and culverts, form numbers 1974 and 1975, respectively. **All CPE pipe installed on a project must be recorded on these forms along with mandrel test results.** This information must also be documented on the IDR. Upon completion of the form(s), the original version must be placed in the project files (file folder # 304 Drainage Items Testing) and a copy sent to the Grading and Drainage Engineer at C&T for inclusion in the mandated annual report to the legislature.

Construction Advisory

CA 2011-09
July 28, 2011

From Brenda O'Brien, Engineer of Construction and Technology

MDOT-Construction and Technology Division
P.O. Box 30049
Lansing, Michigan 48909
Phone/517-322-1087
Fax/517-322-5664
www.michigan.gov/mdot/

Index: Documentation

Questions regarding this Construction Advisory should be directed to:

Alan C. Robards, Supervising Geologist, Aggregate Quality Control, at 517.322.1357, or arobards@michigan.gov

Changes to Materials Testing Documentation Requirements for Pre-Qualified Aggregates

All aggregates supplied to Michigan Department of Transportation (MDOT) projects from pre-qualified sources must have quality assurance (QA) testing conducted by MDOT personnel at frequencies established in the MDOT Materials Quality Assurance Procedures Manual, Section C6, part 7, and in the Materials Acceptance Requirements Table in the Materials Source Guide. Region materials personnel will monitor and conduct quality assurance testing for pre-qualified aggregate sources within their jurisdiction.

As part of the materials testing documentation, the delivery/project engineer must verify and document that the QA testing has been completed for the material received from pre-qualified aggregate sources. The delivery/project engineer will need to contact the region's material supervisor for verification. The materials supervisor will confirm that QA testing has been properly completed and provide the delivery/project engineer with written documentation for the project files to be placed in file folder 306. The documentation can include one or more of the following:

- A copy of the QA test report;
- A written statement verifying completion of the QA testing;
- A telephone record memo verifying completion of the QA testing;
- Other written documentation that QA testing has been completed.

Additional documentation required for pre-qualified aggregates include properly completed delivery tickets. The tickets must include the following:

- MDOT aggregate source number;
- Date of shipment;
- Control section and job number;
- Concrete plant number (if applicable);
- Michigan series number and class letter of aggregate;
- Weight or volume shipped;
- Suppliers name, telephone number and location.

In addition, the following statement shall be printed or stamped on each ticket: "I attest that aggregate as delivered from this pre-qualified source meets specification requirements for the listed Michigan series and class for quantity stated. Date _____ Signature _____." This statement must be signed by an authorized company representative. This statement does not signify acceptance by MDOT of the aggregate.

Failure to provide properly completed delivery tickets with shipment can be cause for rejection of the aggregate.



BJO:MA

Construction Advisory

CA 2012-08
May 8, 2012

From Brenda O'Brien, Engineer of Construction Field Services

MDOT-Construction Field Services Division
P.O. Box 30049
Lansing, Michigan 48909
Phone/517-322-1087
Fax/517-322-5664
www.michigan.gov/mdot/

Index: Materials

Questions regarding this Construction Advisory should be directed to:

Jason Gutting, Engineer of Construction Operations, at 517-636-6324 or jgutting@michigan.gov



BJO:JG

Aggregate Material Acceptance

This construction advisory serves as a reminder to all project staff that aggregate material acceptance is to be performed in accordance with the Materials Source Guide (MSG) available at the following website:

http://www.michigan.gov/mdot/0,4616,7-151-9622_11044_11367-22505--00.html

Project staff must ensure that aggregates are tested as required in the MSG. Field staff should not arbitrarily accept a stamp on an aggregate ticket that contains approval language. All aggregate material pre-qualified or otherwise still requires testing by MDOT. **Please see the information below that specifies different testing requirements dependent on the aggregate source.** The information below is from the Materials Acceptance Requirements Table in the MSG.

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Non Pre-qualified Aggregates
Test the following aggregate classes for acceptance at least once per 1000 tons prior to incorporation in the work: Coarse, Dense-graded, Open-graded, and Fine aggregates, as well as Granular Material Class I.

- *Test Granular Material Class IIIA for acceptance at least once per 1000 cubic yards.*
- *Test Granular Material Class II and IIA for acceptance at least once per 3000 cubic yards.*
- *Test Granular Material Class II (Abutment Back Fill) for acceptance at least once per structure.*
- *Test Granular Material Class III for acceptance at least once per 10,000 cubic yards.*

Pre-qualified Aggregates
Quality Assurance tests will be conducted by Department personnel at the frequencies stated in Part 7 of the Pre-Qualified Supplier Program, found in Section C6 of the Materials Quality Assurance Procedures Manual.

Every Project Engineer will verify passing quality assurance tests by contacting the Region/Transportation Service Center's Material's Supervisor. Enter a telephone record memo or copy of the test report in the project file.

The statement on each delivery ticket required in Part 5.2 of the Pre-Qualified Supplier Program, Section C6, is to be provided by the supplier, and represents the results of quality control testing. This statement does not signify acceptance by MDOT.

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MICHIGAN
DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION
FOR
QUALITY CONTROL AND ACCEPTANCE OF PORTLAND CEMENT CONCRETE
(FOR LOCAL AGENCY PROJECTS ONLY)

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FHWA:APPR:11-29-11

a. **Description.** The Contractor must administer quality control (QC) and the Engineer will administer quality assurance (QA) procedures that will be used for acceptance of and payment for all Portland cement concrete (PCC) for the project. Except as explicitly modified by this special provision, all materials, test methods, and PCC mixture requirements of the standard specifications and the contract apply.

Provide the Engineer a minimum 24 hours notification prior to each concrete placement.

1. Terminology.

Air Content of Fresh Concrete. The recorded total air content of fresh concrete sampled and tested according to this special provision.

Air Content Test Results. The recorded total air content of fresh concrete that is used to mold corresponding strength test specimens for acceptance.

Alkali-Silica Reactivity (ASR). A chemical reaction which occurs over time within concrete between high alkaline cement paste and reactive forms of silica found in some aggregates. In the presence of moisture, an expansive ASR gel is formed which can exert pressure within the concrete, causing random cracking and premature deterioration of the concrete. See subsection c.5.A.

Concrete Mix Design. The process, by which the concrete mixture performance characteristics are defined, based on selected materials, performance requirements, environmental exposure considerations, placement methods, and other factors that control the plastic and hardened properties of the concrete in efforts to produce an economical and durable product.

Job Mix Formula (JMF). The actual batch quantities (mixture proportions) of each constituent included in the concrete mixture, based on adjustments to the target weights from the mix design, necessary to optimize the concrete mixture properties. Submit mix design and JMF on the MDOT Job Mix Formula (JMF) Concrete Field Communication form (MDOT Form Number 1976); include accompanying documentation.

Production Lot. A discrete cubic yard quantity of concrete containing the same JMF and used for the same application, as described in subsection d.2.

Pay Factor (PF). The factor that is determined according to the formula herein, used to calculate the price adjustment for a discrete quantity of concrete. Pay factor determination

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will be in accordance with the requirements in subsection d.3 and can not exceed 1.00. Therefore, there will never be a positive pay adjustment.

Quality Assurance (QA). Activities administered by the Engineer dealing with acceptance of the product, including, but not limited to, materials sampling, testing, construction inspection, and review of Contractor QC documentation. All concrete QA sampling and testing will be performed by the Agency. The Agency administered QA is described in section d of this special provision.

Quality Control (QC). All activities administered by the Contractor to monitor, assess, and adjust production and placement processes to ensure the final product will meet the specified levels of quality, including, but not limited to, training, materials sampling, testing, project oversight and documentation. Contractor administered QC is described in section c of this special provision.

QC Action Limits. A range of values established by the Contractor in the QC plan that, if exceeded, requires that corrective action be taken by the Contractor to restore the continuity and uniformity of the mixture and methods in conformance with specification requirements. The QC action limits must not exceed the QC suspension limits.

QC Plan. The project-specific plan developed by the Contractor describing, in detail, all aspects of production and construction for the project to ensure consistent control of quality to meet specification requirements.

QC Plan Administrator. An employee of, or consultant engaged by the Contractor, responsible for developing and overseeing all aspects of QC for the project. This includes, but is not limited to preparing the QC plan, managing the Contractor QC personnel, communicating routinely with the production personnel to ensure quality, initiating corrective action and suspending operations when the process is found to be producing non-conforming materials, and preparing and submitting all necessary QC documentation to the Engineer within the specified time period. The QC Plan Administrator must be a certified concrete technician (Michigan Level II), or have direct authority over a certified concrete technician (Michigan Level II) for the project.

QC Suspension Limits. A range of values defined in Table 1 that, if exceeded on a single QC test, requires that the Contractor suspend operations and determine, correct, and document the deficiencies before resuming production. The Engineer must approve all changes prior to resuming production. The QC suspension limit must not exceed specification requirement thresholds.

Sample. A representative quantity of concrete taken during production which is used to measure the quality characteristics for a respective production lot of concrete.

Sampling Rate. The number of times the fresh concrete is sampled by the Engineer for acceptance. The sampling rate will be determined by the Engineer as described in subsection d.2.B.

Small Incidental Quantity. A single day's placement of less than 20 cubic yards of concrete used for non-structural or non-pavement related applications, including, but not limited to: curb and gutter, sidewalks and sidewalk ramps (excluding driveways and driveway ramps), installing sign or fence posts, guard rail or cable rail foundations

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(excluding end anchorage foundations), or other contract items where the small quantity of concrete is not paid for separately, as directed by the Engineer. Price adjustment will not be applied to small incidental quantities provided all other provisions are met for the respective contract item. Requirements for small incidental quantity consideration are described in subsections c.5.G and d.2.B. The corresponding weekly QA 28-day compressive strength test results described in subsection d.2.B must meet specification limits defined in Table 2. ASR requirements specified in subsection c.5.A are not required for small incidental quantities.

Specification Limits. The threshold values defined in Table 2 assigned to each quality characteristic used to evaluate the quality of the material.

Strength Sample Test Result. A strength sample test result consists of the 28-day compressive strength of the 6-inch by 12-inch or 4-inch by 8-inch cylindrical strength test specimens. A strength sample test result is the average of the two companion strength test specimens taken from the same sample of concrete.

Strength Test Specimen. A strength test specimen is defined as each individual 6-inch by 12-inch strength test cylinder or 4-inch by 8-inch strength test cylinder molded and cured according to AASHTO T 23/ASTM C 31 and tested according to AASHTO T 22/ASTM C 39. All respective QC or QA strength test specimens must be the same nominal size.

Note: Strength test specimen cylinder size of 4-inch by 8-inch is permitted only if the nominal maximum coarse aggregate particle size, as specified for the coarse aggregate in the concrete mixture, is 1-inch, or less.

b. **Materials.** Mixture requirements must be in accordance with the contract.

c. **Contractor Administered Quality Control (QC).**

1. **Contractor Quality Control Plan (QC Plan).** Prepare, implement, and maintain a QC plan specific to the project for concrete that will provide quality oversight for production, testing, and control of construction processes. The QC plan must identify all procedures used to control production and placement including when to initiate corrective action necessary to maintain the quality and uniformity of the work.

Develop concrete mix designs and JMFs, as specified, and conduct QC sampling, testing, and inspection during all phases of the concrete work at the minimum frequency, or at an increased frequency sufficient to ensure that the work conforms to specification requirements.

Project-specific items and quality characteristics required in the QC plan include, but are not limited to the following:

- A. Organization chart.
- B. QC Plan Administrator and contact information.
- C. The name(s) and credentials of the QC staff.

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- D. Methods for interaction between production and QC personnel to engage timely corrective action, including suspension of work.
- E. Coordination of activities.
- F. Documentation, procedures, and submittals.
- G. Project and plant specifics.
- H. Concrete production facilities inspections and certifications.
- I. Current testing equipment calibration documentation including calibration factor.
- J. Testing and initial field curing facilities for QC and QA strength test specimens (AASHTO T 23/ASTM C 31).
- K. Stockpile management plan.
- L. Corrective action plan.
- M. Mixing time and transportation, including time from batching to completion of delivery and batch placement rate (batches per hour), along with the manufacturer's documentation relative to the batching equipment's capabilities in terms of maximum mixing capacity and minimum mixing time.
- N. Placement and consolidation methods including monitoring of vibration, depth checks, and verification of pavement dowel bar alignment.
- O. Process for monitoring stability of air content of fresh concrete during concrete production and placement.
- P. Hot and cold weather protection considerations and methods.
- Q. Control charts with action and suspension limits.
- R. Verification for non-deleterious alkali-silica reactivity (see subsection c.5.A).
- S. Mix design and JMFs.
- T. Proposed location for use of each JMF on the project.
- U. The frequency of sampling and testing.
- V. Handling, protection, initial curing, and transporting of strength test specimens (AASHTO T 23/ASTM C 31).
- W. Methods to monitor construction equipment loading and open-to-traffic strengths.
- X. Finishing and curing procedure.
- Y. Ride quality control.

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Submit the QC plan, for the appropriate items of work, to the Engineer for review a minimum of 10 working days before the start of related work. The Engineer will notify the Contractor of any objections relative to the content of the QC plan within 5 working days of receipt of the QC plan. Do not begin concrete placement before acceptance of the QC plan by the Engineer.

2. QC Records. Maintain complete records of all QC tests and inspections. Document what action was taken to correct deficiencies. Include sufficient information to allow the test results to be correlated with the items of work represented.

Furnish one copy of all QC records and test reports to the Engineer within 24 hours after the date covered by the record in a format acceptable to the Engineer. The Engineer will withhold acceptance of the concrete for failure to provide properly documented and timely QC records and reports.

If the Engineer is performing QA sampling and testing at the same time the Contractor is performing QC sampling and testing, all associated QC records must include the appropriate identification number that correlates with the Engineer's QA identification number.

3. Personnel Requirements. The QC Plan Administrator must have full authority and responsibility to take all actions necessary for the successful implementation of the QC plan, including but not limited to, the following:

A. Monitoring and utilizing QC tests, control charts, and other QC practices to ensure that delivered materials and proportioning meets specification requirements.

B. Monitoring materials shipped to the project, prior to their use, to ensure their continued compatibility toward producing consistent quality.

C. Periodically inspecting all equipment utilized in transporting, proportioning, mixing, placing, consolidating, finishing, and curing to ensure proper operation.

D. Monitoring materials stockpile management, concrete batching, mixing, transporting, placement, consolidation, finishing, and curing to ensure conformance with specification requirements.

E. Maintaining and submitting all QC records and reports.

F. Directing the necessary corrective action to ensure continual conformance within the QC action limits.

G. Suspending production for the project when suspension limits are exceeded.

H. Conducting or monitoring adjustments to the JMF.

Individuals performing QC tests must demonstrate that they are proficient and capable of sampling and testing concrete or aggregate, where applicable, in accordance with the associated test procedures and Agency requirements prior to commencement of related

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work. Any adjustments to the JMF must be made by a certified concrete technician (Michigan Level II).

4. QC Laboratory Requirements. Laboratories, including field laboratories and all associated testing equipment that prepare concrete mixes or perform QC testing, must demonstrate to the Engineer that they are equipped, staffed, calibrated, and managed so as to be capable of batching, and testing Portland cement concrete in accordance with the applicable test procedures. Mix designs and their accompanying JMFs must include a statement, signed by a certified concrete technician (Michigan Level II), that all applicable standard test methods have been followed in verifying the mix design and JMF.

5. Mix Design and Documentation. Design concrete mixtures meeting the requirements specified in Tables 601-2 and 701-1 of the Standard Specifications for Construction. Provide the grade of concrete for the section number reference application specified in Tables 601-2 and 701-1, or as specified in the contract. Request variance in writing when proposing a mix design and JMF that exhibits temperature, slump or air content other than those specified. Include the proposed mix design, JMF, and associated trial batch verification test data. Do not use a grade of concrete with a minimum specified 28-day compressive strength greater than what is designated for the application. The maximum water/cementitious ratio must not exceed 0.45.

The maximum slump for Grades P1 and P2 concrete is 3 inches or as documented on the approved JMF. All other grades of concrete will be according to Tables 701-1 A and B of the Standard Specifications for Construction

The specified air content of fresh concrete is 5.5 - 8.0 percent. Air content of fresh concrete less than 5.5 percent for concrete that lies in the finished work at least 3 feet below the surface of the ground or entirely under water will not be cause for rejection.

Use aggregates from only geologically natural sources.

Secure prior approval from the Engineer to use concrete intended for early opening to traffic to facilitate driveway gaps or other features necessary for required local access.

Unless specified otherwise, do not exceed 40 percent substitution by volume of the total cementitious materials with slag cement or fly ash. Use the combined weight of all cementitious materials to determine compliance with the maximum water-cementitious ratio and cementitious material content requirements specified above. Include provisions for cold and hot weather protection in the QC plan.

Use admixture dosage as indicated in the Qualified Products List to reduce mixing water. For night casting, where applicable, a water-reducing admixture may be used in lieu of a water-reducing and retarding admixture, provided the concrete can be placed and finished in the sequence specified on the plans prior to initial set, is not subjected to residual vibration, or is not within the areas influenced by dead load deflections as a result of adjacent concrete placement operations.

A. Alkali-Silica Reactivity. Provide documentation to the Engineer that the concrete mixture does not present the potential for excessive expansion caused by alkali-silica reactivity (ASR). Provide a Test Data Certification with the latest test results (valid for 2 years) conforming to the specified criterion for one of the following standard test

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methods ASR requirements specified in subsection c.5.A are not required for small incidental quantities.

(1) Method 1. ASTM C 1260. Mortar Bar Test. If the expansion of the mortar bars is less than 0.10 percent at 14 days of immersion, the fine aggregate is considered non-deleterious to ASR reactivity and may be used in the concrete without the need for ASR mitigation.

(2) Method 2. ASTM C 1293. Concrete Prism Test.

- If the expansion of concrete prisms is not greater than 0.040 percent after 1 year, the fine aggregate is considered non-deleterious to ASR reactivity and may be used in the concrete without the need for ASR mitigation.
- If the expansion of concrete prisms is greater than 0.040, but not exceeding 0.120 percent after 1 year, the fine aggregate is considered moderately deleterious to ASR reactivity and mitigation is required, as follows. A Low-Alkali cement with equivalent alkalis ($\text{Na}_2\text{O} + 0.658 \times \text{percent K}_2\text{O}$) not exceeding 0.60 percent may be used in the concrete mixture to mitigate the potential for ASR reactivity provided the total alkali content for the cementitious materials combination does not exceed 3.0 pounds per cubic yard (Na_2O equivalent).

(3) Method 3. ASTM C 1567. Mortar Bar Test. If no previous test data are available for the fine aggregate that shows it is resistant to ASR using either Method 1 or 2, above, replace 25 to 40 percent of the Portland cement in the concrete mixture with Class F fly ash or Slag Cement (Grade 100 minimum). A blended cement meeting the requirements of ASTM C 595 containing Portland cement and slag cement or Class F fly ash may also be used.

Demonstrate the ability of the fly ash or slag cement to control the deleterious expansion caused by ASR by molding and testing mortar bars according to the standard test method described in ASTM C 1567 using the mix proportions for both the aggregates and the cementitious materials proposed for the project. Make at least three test specimens for each cementitious materials-aggregate combination. If the average of three mortar bars for a given cementitious materials-aggregate combination produces an expansion less than 0.10 percent at 14 days of immersion, the JMF associated with that combination will be considered non-deleterious to ASR reactivity. If the average expansion is 0.10 percent or greater, the JMF associated with that combination will be considered not sufficient to control the deleterious expansion caused by ASR and the JMF will be rejected.

If the expansion exceeds the respective threshold limits for the ASTM used, then the Engineer will not approve the use of that concrete mixture.

B. Contractor Provided Mixes. Provide mix design and accompanying JMFs using the methods of verification included in this special provision. Include sufficient information on constituent materials and admixtures along with trial batch verified physical properties of the fresh concrete, mix proportions per cubic yard for all constituents and compressive strength test results necessary to allow the Engineer to fully evaluate the expected performance of the concrete mixture.

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(1) Mix Documentation. Prepare mix designs for each grade of concrete required on the project. Submit JMF for each mix design, including all required documentation, to the Engineer for review 10 working days before the anticipated date of placement. The Engineer will notify the Contractor of any objections within 5 working days of receipt of the mix documentation. Number or otherwise identify each JMF and reference all accompanying documentation to this number. Reference each JMF to the appropriate method of verification. Mix design and JMF submittals that do not include all required documentation will be considered incomplete and the Engineer will return them without review.

Provide all supporting mix documentation, including test reports and mix proportion adjustment calculations. All mix designs and accompanying JMFs must be traceable to a laboratory meeting the requirements of this special provision. Include the necessary documentation described in subsection c.5.

Submit mix design and JMF on the MDOT Job Mix Formula (JMF) Concrete Field Communication form (MDOT Form Number 1976); include accompanying documentation. List the source of materials, bulk density (unit weight) of coarse aggregate (rodding procedure or shoveling procedure), absorption of aggregates, relative density (specific gravity) of aggregates, aggregate correction factors, batch weights, and project specific or historical laboratory test data. Include the recorded air content of fresh concrete using the same admixture and cementitious material sources to be used in the production of the concrete for the project. The 28-day compressive strength and air content of fresh concrete for the concrete which is reported as part of the mix documentation submittal must meet the specification limits described in Table 2.

(2) Job Mix Formula (JMF). Select proportions for concrete mixtures according to ACI Standard 211.1. The volume of coarse aggregate per unit volume of concrete must be 65 to 75 percent, inclusive.

Four methods of verification of proposed JMF are acceptable.

(a) Method 1. Trial Batches. Base trial batches on the same materials and proportions proposed for use on the project. Prepare at least one trial batch for each mix design in sufficient time before starting concrete placement to allow for review according to subsection c.5.B.(1). Provide the results of temperature, slump, density (unit weight), air content of fresh concrete, 28-day compressive strength, and age of concrete at the time of strength testing, for a minimum of three independent samples. For JMF trial batch verification purposes only, 7-day compressive strength test results which report at least 70 percent of the specified 28-day minimum design strength will be sufficient documentation in lieu of 28-day compressive strengths. The average of at least two strength test specimens represents one compressive strength sample test result for each independent sample. A JMF will be considered approved for use only if all of the physical properties of the concrete (as described above) are within specification limits. Provide the necessary ASR documentation as described in subsection c.5.A.

(b) Method 2. Same Mix. Verification based on experience with the same mix design, JMF, and the same materials. Provide the results of temperature,

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slump, density (unit weight) air content of fresh concrete, 28-day compressive strength, and age of concrete at the time of strength testing, for a minimum of three independent samples. The average of at least two strength test specimens represents one compressive strength sample test result for each independent sample. Do not substitute material types or sources, including admixtures or cementitious materials, nor change mix proportions in the JMF. A JMF will be considered approved for use only if all of the physical properties of the concrete (as described above) are within specification limits. Provide the necessary ASR documentation as described in subsection c.5.A.

(c) Method 3. Similar Mix. Verification based on experience with a mix design and JMF similar to the proposed mix design that used similar coarse aggregate materials. Substitution of coarse aggregate source is permitted only if the new source is of the same geologic type and meets minimum physical properties as the original aggregate and conforms to the specification requirements for the respective application. Verify, prior to batching, that the proposed changes to the JMF will not affect the properties of the fresh concrete (slump, temperature, air content, density (unit weight), workability), nor result in excessive mortar bar expansion as a result of deleterious reactivity between the aggregates and cementitious materials as described in subsection c.5.A.

Provide the supporting laboratory test documentation as for Method 1. Include all material properties for the original and substituted aggregates. Submit calculations showing how the mix proportions in the JMF were adjusted, based on the documented differences in relative density (specific gravity), bulk density (unit weight) and absorption of the substituted aggregate sources, to produce a theoretical yield of 100 percent.

(d) Method 4. Annual Verification. At the Engineer's option, verification may be accepted annually for a concrete plant rather than on a project basis provided the sources and proportions of the constituent materials, including cementitious materials and source and types admixtures, do not change. If the project is the continuation of work in progress during the previous construction season and written certification is submitted to the Engineer that materials from the same source and with the same mixture properties are to be used, the Engineer may waive the requirement for annual renewal verification of the JMF for the project. Provide the necessary ASR documentation as described in subsection c.5.A.

C. Agency Provided Mixes. Unless otherwise specified in the contract, the Engineer will provide the concrete JMF for the following types of concrete regardless of the total quantity for the project.

- Structural concrete patching mixtures, mortar and grout.
- Prestressed concrete.
- Bridge deck overlay concrete mixtures.
- Project-specific concrete mixtures and grades not defined in Tables 601-2 and 701-1 of the Standard Specifications for Construction.

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D. Changes in Materials and Proportions. Any changing from one approved JMF to another for the same grade of concrete must have prior approval by the Engineer. Record all changes to JMF in the QC records along with the rationale for the change. Verify, prior to batching, that the proposed changes to the JMF will not affect the properties of the fresh concrete (slump, temperature, air content, density (unit weight), workability), nor result in excessive mortar bar expansion as a result of deleterious reactivity between the aggregates and cementitious materials as described in subsection c.5.A.

E. QC Sampling and Testing. Conduct startup sampling and testing for temperature, slump, density (unit weight), and air content on the first load. Do not place concrete until testing verifies that the fresh concrete properties have not exceeded the QC action and suspension limit thresholds specified in Table 1. Continue testing subsequent loads as described in the QC plan, for each grade of concrete delivered to the work site each day. The QC sampling and testing must be random and independent from the Engineer's QA sampling and testing.

Ensure that the curing facilities are on site and are equipped to provide the proper environment for initial curing of the QC and QA concrete strength test specimens.

Perform QC sampling and testing of the fresh concrete for air content loss at least once during each week of concrete production, or whenever QC tests have shown that QC action limits have been exceeded, whichever is more frequent. Sample and test a representative haul unit of concrete immediately after its discharge but before the paver or pump hopper, where applicable. Sample and test the concrete representing the same haul unit, again, after the paver or after discharge from the pump and after vibration, where applicable. If the difference in measured air content between the two test locations for the same concrete is greater than two percent air by volume of concrete, suspend operations and administer corrective action. Resume concrete placement only after taking the necessary corrective action to reduce the loss in air content of fresh concrete between the two test locations, as approved by the Engineer. Document the corrective action to be taken in the QC records and make the necessary changes to the QC plan, where applicable.

Concrete exceeding the maximum specification limits for slump or temperature must be rejected regardless of the total mixing time or number of mixing revolutions at the time of arrival to the project.

The Engineer may require the Contractor to administer additional QC sampling and testing if the Engineer determines the Contractor's current QC sampling and testing methodology is shown to be insufficient to ensure continual control of the quality of the concrete.

Take the appropriate corrective action, as described in the QC plan, when QC testing shows the QC action limits for any quality characteristic are exceeded. Suspend production if any of the QC suspension limits are exceeded or if the corrective action is not sufficient to restore the quality to acceptable levels.

Resume production only after making all necessary adjustments to bring the mixture into conformance with all applicable specifications and receiving approval to resume work from the Engineer. Document these adjustments in the QC records.

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Quality Characteristic	Action Limits	Suspension Limits
Air Content (percent)	As Defined in the Contractor QC Plan	< 5.5 or > 8.0
Air Content Loss (percent)		Greater than 2.0
Conc. Temp. (Deg. F)		< 45 or > 90 at time of placement
Slump (max.) (inch)		See subsection c.5
Density (unit weight)		N/A

F. Work Progress Test Specimens. Determine the strength of concrete for opening to construction traffic or regular traffic, for removing shoring and forms, or for other similar purposes in accordance with subsections 104.11, 601.03.H and 701.03.D of the Standard Specifications for Construction, and as approved by the Engineer. Cure work progress test specimens in the same manner as the in-situ concrete. Allow the Engineer to witness testing of work progress cylinder or beam specimens and non-destructive testing, including calibration tests.

For pavement repairs described in section 603 of the Standard Specifications for Construction, the maturity method may be used to determine the in-place, opening-to-traffic flexural strength, provided the necessary preliminary flexural strength versus opening-to-traffic time correlations, using the same materials and JMF, are established and approved by the Engineer before placing the concrete.

G. Reduced QC for Small Incidental Quantities. Reduced levels of on-site QC testing for concrete may be considered for small incidental quantities defined in subsection a.1 provided provisions for administering reduced QC testing and oversight are included in the approved QC plan and the following criteria are met.

- (1) The small incidental quantity of concrete will be limited to a single day's concrete placement.
- (2) The small incidental quantity is not an integral part of a structural load bearing element.
- (3) The Engineer received written certification from the Contractor that the concrete supplier has a current QC plan in place and available for review upon request by the Engineer.
- (4) The concrete supplier employs a certified concrete technician (Michigan Level II) available at the plant or on call during concrete placement to validate and authorize modifications to the concrete JMF, as necessary.
- (5) Prior to the first concreting operation, concrete representing the JMF for the small incidental quantity has been sampled and tested by a certified concrete technician (Michigan Level I or II) to verify that, historically, the JMF produced a concrete mixture meeting the minimum requirements for density (unit weight), slump, air content, and strength. Annual verification may be acceptable provided there are no changes to the material types or sources, including cementitious materials and admixtures.

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(6) The Engineer verified that the temperature, slump, and air content conform to specification requirements at the start of the day's concreting operation associated with the small incidental quantity.

(7) The Engineer is notified and provided sufficient opportunity to witness concrete placement.

d. Agency Administered Quality Assurance (Acceptance).

1. Agency Quality Assurance Plan (QA plan). The Engineer will be responsible for administering the quality-based acceptance and will institute any actions necessary toward its successful implementation.

Acceptance of concrete for full-depth pavement repairs will be according to section 603 of the Standard Specifications for Construction.

The Engineer will develop and follow a QA plan. The Engineer will provide the QA plan to the QC Plan Administrator a minimum of 7 calendar days prior to the pre-production meeting. The QA plan will be reviewed at the pre-production meeting and any proposed changes will be documented.

The nominal QA strength test specimen size, defined in subsection a.1 will be noted in the QA plan.

A. Personnel Requirements. The personnel responsible for field inspection and for obtaining QA samples will possess the required qualifications to collect QA samples. Sampling will be performed by qualified personnel possessing the current applicable certification through the Michigan Concrete Association (Michigan Level I or II) or through the Michigan Concrete Paving Association (Level I or II) certified concrete technicians, or where applicable, (MCAT) certified aggregate technician.

B. QA Testing Correlation. The testing equipment and associated testing personnel for both the Engineer's QA and Contractor's QC will conduct side by side testing of the same concrete representing the first production placement for the project to verify correlation of both the Engineer's and the Contractor's test results for slump, temperature, and air content of fresh concrete. The temperature measuring devices used for QC and QA must correlate relative to each other within 2 degrees F. The Engineer will request an Independent Assurance Test in the event the air content results of two tests conducted between the Engineer's and the Contractor's testers differ by more than 1.0 percent air by volume of concrete.

C. Laboratory Facilities. The testing laboratory with responsibility for acceptance testing on this project is the Agency testing laboratory, or a qualified facility under the authority of the Engineer.

2. QA Sampling and Testing. The Engineer will conduct QA sampling and testing, monitor the Contractor's adherence to the QC plan, and inspect field placed materials. Initial approval is required prior to concrete placement for, temperature, slump and air content, and is based on the Engineer's observance of QC startup sampling and testing described in subsection c.5.E.

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A. Production Lot Size and Make Up. A production lot will be defined as a single day of concrete, or as determined by the Engineer. A production lot will not include more than one grade of concrete, concrete of the same grade having different specified slump or air content, or concrete of the same grade having different material sources, mix designs or JMFs.

B. Sampling. Representative QA sampling and testing will be determined by the Engineer during concrete placement. The sampling rate will be one sample per 50 cubic yards, approximately, plus or minus, based on the anticipated total quantity of concrete to be placed and site conditions, with a minimum of one sampling for each day of production.

At the option of the Engineer, small incidental quantities as defined in subsection a.1 may be accepted (visually inspected and noted on the Inspector's Daily Report) without daily 28-day compressive strength QA test specimens provided there is a current acceptable strength test history of the JMF for the project prior to placement of the small incidental quantity. One set of compressive strength QA test specimens will then be molded for each small incidental quantity JMF at least once per week during production, thereafter, as directed by the Engineer (note the test results or identification number for the corresponding weekly QA compressive strength test result on the Inspector's Daily Report for each small incidental quantity). Quality control testing and daily QA testing for temperature, slump, and air content are still required as described in subsection c.5.G.

Samples will be taken from the concrete at the location as close to its final placement into the forms or on the grade as practical.

Samples for acceptance will not be taken at the concrete production facility (batch plant), nor prior to discharge from a concrete pump (excluding tremie seal placement applications). Mix adjustments (beyond normal QC) to the haul unit selected for QA sampling and testing will not be permitted prior to QA sampling and testing. QA sampling will be random and without prior notification.

C. Testing. The location(s) within the project limits for QA testing of the fresh concrete and placement of curing facilities for initial curing of the 28-day compressive strength QA test cylinders will be determined by the Engineer in conformance with the following criteria:

- (1) The elapsed time between obtaining the first and the final portion of the composite sample must not exceed 15 minutes.
- (2) Testing for slump, temperature, and air content of fresh concrete must begin within 5 minutes after obtaining the final portion of the composite sample.
- (3) Molding of the 28-day compressive strength QA test cylinders must begin within 15 minutes after obtaining the final portion of the composite sample.
- (4) The concrete sample must be protected from the sun, wind, and other sources of rapid evaporation, and from contamination.

The Contractor will provide curing facilities equipped to ensure the proper environment for the Engineer's QA concrete strength test specimens during initial cure. Each initial

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cure facility must provide ventilation or insulation, where applicable, to ensure the ambient temperature surrounding the specimens is maintained according to AASHTO T 23. Failure by the Contractor to maintain the proper curing environment during initial cure will not be basis for rejection of QA samples. Each initial curing facility must be capable of being locked, using an Agency provided padlock. The Contractor will ensure that all initial curing facilities are accounted for at all time, and protected against theft and damage. The Contractor will locate and secure each initial cure facility throughout the project limits in such a manner so as to minimize excessive transport of the test specimens prior to initial cure, as follows:

- Immediately after finishing molded specimens, the Engineer will move the QA concrete strength test specimens to the closest initial cure facility provided by the Contractor.
- Immediately after all QA concrete strength test specimens are placed into the cure facility and the proper initial curing conditions have been established, the Engineer will secure the facility using the Agency provided padlock. Access to the QA concrete strength test specimens, thereafter, must be coordinated with the Engineer and will only be permitted in the presence of the Engineer.
- The Engineer will transport the QA concrete strength test specimens within 48 hours after molding, but not prior to 8 hours after final set of the concrete, from the initial curing facility to the Agency designated testing laboratory for final curing and strength testing. The specimens will be protected with a suitable cushioning material to prevent damage from jarring during transport. The total transportation time must not exceed 4 hours prior to commencement of final curing.

D. QA Stop Production Criteria. The Engineer will issue a Notice of Non-Compliance with Contract Requirements (Form 1165) and concrete production must stop when one or more of the following are observed.

(1) The QA testing shows that one or more of the suspension limits for quality characteristics defined in Table 1 are in non-compliance.

(2) The QC plan is not being followed.

(3) Segregation, excessive slumping of unsupported slipformed edges, or other notable changes in the fresh concrete properties is observed that may prevent proper placement, consolidation and finishing, or compromise the performance or long-term durability of the finished product.

(4) The required curing system is not being applied in a timely manner, as specified by the contract.

(5) If the difference in measured air content between the two testing locations for the same concrete is greater than two percent air by volume of concrete, as follows:

(a) immediately after discharge but before the paver or pump hopper (where applicable), and

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(b) after the paver or discharge from the pump (where applicable).

The Engineer will issue a Notice to Resume Work (Form 1165) only after all necessary adjustments are made to restore conformance with all applicable specifications, and the appropriate documentation is made in the QC records.

E. QA Records. The Engineer will maintain a complete record of all QA tests and inspections. The records will contain, as a minimum, signed originals of all QA test results and raw data, and resulting calculations. The QA test results will not be provided to the Contractor until the corresponding QC test results are received by the Engineer.

3. Pay Factor Determination and Price Adjustment. The Engineer's QA test results will be used to determine the pay factor (PF) and price adjustment (ADJ). The Contractor's QC test results will not be used for pay factor and price adjustment analysis. The Engineer will complete pay factor and price adjustment analysis within 7 days after completion of all 28-day compressive strength testing for the representative production lot.

Table 2: Specification Limits

Quality Characteristic	Specification Limits
Air Content (percent)	5.5 – 8.0
Conc. Temp. (Deg. F)	45 - 90 at time of placement
Slump (max.) (inch)	See subsection c.5
28-day Compressive Strength	LSL, subsection c.5
Rejection Limit - Lower 28-day Compressive Strength	0.75 x (LSL)

The specification limits for the fresh concrete properties are defined in subsection c.5. Concrete not conforming to the requirements specified in subsection c.5 may be rejectable and subject to further evaluation, as directed by the Engineer.

Use the following formula to calculate the PF and associated price ADJ for each concrete item.

$$PF = \frac{\text{Tested Strength}}{LSL}$$

$$ADJ = (PF-1) (\text{Price})$$

Tested Strength = QA 28-day compressive strength sample test result

LSL = Lower specification limit (Minimum Design Strength, see subsection c.5)

PF = Pay Factor (carried to two decimal places, not to exceed 1.00)

ADJ = Price adjustment to be applied to the quantity represented by the QA test

Price = Contract unit price bid for the pay item

4. Re-evaluation of Rejectable Concrete. If the tested strength does not achieve the lower rejection limit specified in Table 2, the associated concrete will be rejected and the Engineer will require additional evaluation to decide what further action may be warranted. If the Engineer determines that non-destructive testing (NDT) or coring is necessary, this work will be done by the Contractor in the presence of the Engineer within 45 days from

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concrete placement. All costs associated with this work will be borne by the Contractor. The Engineer will take custody of all cores intended for re-evaluation immediately after coring. If NDT is used to estimate the in-situ strength, a calibrated relationship between the concrete mixture and the NDT apparatus must have been established prior to NDT testing according to its respective standard test method. Test results from re-evaluation of rejectable concrete using NDT or coring will not be used for pay factor (PF) and price adjustment (ADJ) purposes. If the results from re-evaluation confirm that the lower rejection limit for 28-day compressive strength has been achieved, the represented quantity of concrete will remain in place and a pay factor (PF) of 0.75 will be applied for price adjustment (ADJ) determination. However, if the results from re-evaluation confirm that the lower rejection limit for 28-day compressive strength has not been achieved, as described above, the Engineer will elect to do one of the following.

A. Require removal and replacement of the entire represented quantity of concrete with new initial tests and pay factor and price adjustment analysis procedure conducted.

B. Allow the represented quantity of concrete to remain in place and apply an adjustment of minus 50.00 percent to all concrete items in the lot.

C. Allow the Contractor to submit a plan for corrective action for the Engineer's approval, to address the disposition of the rejectable concrete. If the Engineer does not approve the plan for corrective action, subsection d.4.A or d.4.B will be applied.

e. Measurement and Payment. If a price adjustment is made for reasons included in this special provision, that adjustment will be made using the original unit price bid for the specific item. If a contract unit price requires adjustment for other reasons not described in this special provision, the adjustments will be made using the original unit price and the adjustments will be cumulative.

Separate payment will not be made for providing, implementing, and maintaining an effective QC program. All costs associated with this work will be included in the applicable unit prices for the concrete items. Failure by the Contractor to maintain the proper curing environment during initial cure will not be basis for claim against the Agency.

All costs associated with providing, locating, relocating, maintaining, and securing the adequate number of portable curing facilities for the project, necessary to provide sufficient initial curing for the Contractor's QC and Engineer's QA strength test specimens will be included in the applicable unit prices for the concrete items. No additional payment will be permitted. The Contractor is responsible for damage, theft, subsequent replacement, and removal after completion of the work for each curing facility used on the project.

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MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
QUALITY CONTROL AND ACCEPTANCE OF PORTLAND CEMENT CONCRETE

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a. Description. The Contractor must administer quality control (QC) and the Department will administer quality assurance (QA) procedures that will be used for acceptance of and payment for all Portland cement concrete (PCC) for the project. Except as explicitly modified by this special provision, all materials, test methods, and PCC mixture requirements of the standard specifications and the contract apply.

Percent-within-limits (PWL) analysis for payment applies to mainline, shoulder, miscellaneous concrete pavement (including ramps), unbonded concrete overlay, and bridge deck applications of 175 cubic yards or greater. Small production quantity analysis will apply for all other applications.

Provide the Engineer a minimum of 24 hours notification prior to each concrete placement.

1. Terminology.

Acceptable Quality Level (AQL). The threshold limit that would warrant 100 percent payment for the production lot of concrete. AQL only applies for PWL quality index analysis.

Air Content of Fresh Concrete. The recorded air content of fresh concrete sampled and tested according to this special provision.

Air Content Test Results. The recorded air content of fresh concrete corresponding to the strength test specimens that were molded for acceptance.

Alkali-Silica Reactivity (ASR). A chemical reaction which occurs over time within concrete between highly alkaline cement paste and reactive forms of silica found in some aggregates. In the presence of moisture, an expansive ASR gel is formed which can exert pressure within the concrete, causing random cracking and premature deterioration of the concrete. See subsection c.5.A.

Concrete Mix Design. The process, by which the concrete mixture performance characteristics are defined, based on selected materials, performance requirements, environmental exposure considerations, placement methods, and other factors that control the plastic and hardened properties of the concrete in efforts to produce an economical and durable product.

Dispute Resolution. The process used to referee discrepancies between the Contractor's QC test results and the Department's QA test results. Dispute resolution applies for PWL quality index analysis of 28-day compressive strength only.

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Job Mix Formula (JMF). The actual batch quantities (mixture proportions) of each constituent included in the concrete mixture, based on adjustments to the target weights attained from the mix design process necessary to optimize the concrete mixture properties.

Optimized Aggregate Gradation. The method described in Appendix 1 to produce a well-graded blend of aggregates used for high performance concrete pavement (Grade P1M) and bridge deck (Grade DM) applications, when specified.

Pay Factor (PF). The factor that is determined according to subsection d.4 using the MDOT Concrete PWL Worksheet, used to calculate the price adjustment for a discrete quantity of concrete relative to its respective level of quality. Pay factor determination for PWL applications will be according to subsection d.4. Pay factor determination for all other applications will be according to small production quantities described in subsection d.5.

Percent Within Limits (PWL). The method used to determine acceptance and payment for mainline, shoulder, miscellaneous concrete pavement (including ramps), unbonded concrete overlay, and bridge deck applications only. The PWL is the cumulative area under a standard curve which represents the estimated percentage of a production lot that falls above the Lower Specification Limit (LSL), beneath the Upper Specification Limit (USL), or between the LSL and USL.

Price Adjustment (ADJ). The price adjustment applied to the quantity of concrete represented by the respective quality index analysis described in subsection d.3. The maximum potential positive price adjustment (quality initiative) for concrete acceptance items subject to PWL quality index analysis is five percent of the original contract unit price for the pay item. Small production quantities and small incidental quantities, regardless of the pay item, are not eligible for positive price adjustment (quality initiative) consideration.

Production Lot. A discrete cubic yard quantity of concrete containing the same JMF and used for the same application, typically made up of five sublots, as described in subsection d.2.A.

Quality Assurance (QA). Activities administered by the Department dealing with acceptance of the product, including, but not limited to, materials selection, sampling, testing, construction inspection, and review of Contractor QC documentation. All concrete QA sampling and testing will be administered by the Engineer. Department administered QA is described in section d of this special provision.

Quality Control (QC). All activities administered by the Contractor to monitor, assess, and adjust production and placement processes to ensure the final product will meet the specified levels of quality, including, but not limited to, training, materials selection, sampling, testing, project oversight and documentation. Contractor administered QC is described in section c of this special provision.

QC Action Limits. A range of values established by the Contractor in the QC plan that, if exceeded, requires that corrective action be taken by the Contractor to restore the continuity and uniformity of the mixture and methods in conformance with specification requirements. The QC action limits must not exceed the QC suspension limits.

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QC Plan. The project-specific plan developed by the Contractor describing, in detail, all aspects of production and construction for the project to ensure consistent control of quality to meet specification requirements.

QC Plan Administrator. An employee of, or consultant engaged by the Contractor, responsible for developing and overseeing all aspects of QC for the project. This includes, but is not limited to preparing the QC plan, managing the Contractor QC personnel, communicating routinely with the production personnel to ensure quality, initiating corrective action and suspending operations when the process is found to be producing non-conforming materials, and preparing and submitting all necessary QC documentation to the Engineer within the specified time period.

QC Suspension Limits. A range of values defined in Table 2 that, if exceeded on a single QC test, requires that the Contractor suspend operations and determine, correct, and document the deficiencies before resuming production. The QC suspension limit must not exceed specification requirement thresholds.

Quality Index. The calculated percent of material that meets specification.

Quality Index Parameter. The quality characteristics that are evaluated under the Department's QA program and on which payment for material is based. The quality index parameters used for PWL price adjustment are 28-day compressive strength and air content of fresh concrete. The quality characteristic used for small production quantity price adjustment is 28-day compressive strength (LSL).

Quality Initiative. A budgeted amount established to cover the potential positive price adjustment for concrete acceptance items subject to PWL quality index analysis only. Small production quantities and small incidental quantities, regardless of the pay item, are not eligible for positive price adjustment (quality initiative) consideration.

Rejectable Quality Level (RQL). The threshold limit (defined in Table 3) for the quality index parameters that if not met, would require rejection of the concrete production lot. RQL only applies for PWL quality index analysis.

Sample. A representative quantity of concrete taken during production which is used to measure the quality characteristics for a respective production lot of concrete.

Sampling Rate. The number of times the fresh concrete is sampled for acceptance, as described in subsection d.2.

Small Incidental Quantity. A single day's placement of less than 20 cubic yards of concrete used for non-structural or non-pavement related applications, including, but not limited to: curb and gutter, sidewalks and sidewalk ramps (excluding driveways and driveway ramps), installing sign or fence posts, guard rail or cable rail foundations (excluding end anchorage foundations), or other contract items where the small quantity of concrete is not paid for separately, as approved by the Engineer. Requirements for small incidental quantity consideration are described in subsections c.5.G, d.2.A, d.2.B, and d.3.C. The corresponding weekly QA test results must meet specification limits defined in Table 4.

Small Production Quantity. Any concrete placement that is less than 50 cubic yards, regardless of the pay item or application. Quality index analysis using PWL will not apply.

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Pay factor determination and price adjustment for each small production quantity will be according to subsection d.5.

Specification Limits. The threshold values placed on a quality characteristic used to evaluate the quality of the material.

Strength Sample Test Result. The average of the two companion 28-day compressive strength test specimens taken from the same sample of concrete is considered a strength sample test result. For PWL quality index analysis, described in subsection d.3, each individual strength test specimen from the sample of concrete is considered a strength sample test result.

Strength Test Specimen. A strength test specimen is an individual 6-inch by 12-inch strength test cylinder or 4-inch by 8-inch strength test cylinder molded and cured according to AASHTO T 23/ASTM C 31 and tested according to AASHTO T 22/ASTM C 39. All respective QC or QA strength test specimens must be the same nominal size. Strength test specimen cylinder size of 4-inch by 8-inch is permitted only if the nominal maximum coarse aggregate particle size, as specified for the coarse aggregate in the concrete mixture, is 1-inch or less (not permitted for Grade P1M concrete).

Sublot. A portion of a production lot, from PWL applications only, represented by a complete set of QA tests, as described in subsection d.2.A. The Engineer and the Contractor may agree to reduce the typical sublot size based on project staging or other project conditions.

b. Materials. Mixture requirements must be in accordance with the contract.

c. Contractor Administered Quality Control (QC).

1. Contractor Quality Control Plan (QC Plan). Prepare, implement, and maintain a QC plan specific to the project for concrete that will provide quality oversight for production, testing, and control of construction processes. The QC plan must identify all procedures used to control production and placement including when to initiate corrective action necessary to maintain the quality and uniformity of the work.

Develop concrete mix designs and JMFs, as specified, and conduct QC sampling, testing, and inspection during all phases of the concrete work at the minimum frequency, or at an increased frequency sufficient to ensure that the work conforms to specification requirements.

Project-specific items required in the QC plan include (where applicable), but are not limited to the following:

- A. Organization chart.
- B. QC Plan Administrator and contact information.
- C. The name(s) and credentials of the QC staff.
- D. Methods for interaction between production and QC personnel to engage timely corrective action, including suspension of work.

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- E. Coordination of activities.
- F. Documentation, procedures, and submittals.
- G. Project and plant specifics.
- H. Concrete production facilities inspections and certifications.
- I. Current testing equipment calibration documentation including calibration factor.
- J. Testing and initial field curing facilities for QC and QA strength test specimens (AASHTO T 23/ASTM C 31).
- K. Stockpile management plan.
- L. Corrective action plan.
- M. Mixing time and transportation, including time from batching to completion of delivery and batch placement rate (batches per hour), along with the manufacturer's documentation relative to the batching equipment's capabilities in terms of maximum mixing capacity and minimum mixing time.
- N. Placement and consolidation methods including monitoring of vibration, depth checks, and verification of pavement dowel bar alignment.
- O. Process for monitoring stability of air content of fresh concrete during concrete production and placement.
- P. Hot and cold weather protection considerations and methods.
- Q. Control charts with action and suspension limits.
- R. Verification for non-deleterious alkali-silica reactivity (see subsection c.5.A).
- S. Mix design and JMFs.
- T. Proposed production lot size and location for use of each JMF on the project.
- U. Frequency of sampling and testing.
- V. Handling, protection, initial curing, and transporting of strength test specimens (AASHTO T 23/ASTM C 31).
- W. Methods to monitor construction equipment loading and open-to-traffic strengths.
- X. Finishing and curing procedure.
- Y. Ride quality control.

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Z. List of QC records to be submitted to the Engineer in accordance with subsection c.2.

Submit the QC plan, for the appropriate items of work, to the Engineer for review a minimum of 10 working days before the start of related work. The Engineer will notify the Contractor of any objections relative to the content of the QC plan within 5 working days of receipt of the QC plan. Do not begin concrete placement before acceptance of the QC plan by the Engineer.

2. QC Records. Maintain complete records of all QC tests and inspections. Document what action was taken to correct deficiencies. Include sufficient information to allow the test results to be correlated with the items of work represented.

Furnish one copy of all QC records, including test reports for the fresh concrete placement and optimized aggregate (where applicable), to the Engineer within 24 hours after the date covered by the record in a format acceptable to the Engineer. The Engineer will withhold acceptance of the concrete, and the Contractor will forfeit eligibility for dispute resolution consideration described in subsections d.6 through d.8, for failure to provide properly documented and timely QC records and reports.

If the Engineer is performing QA sampling and testing at the same time the Contractor is performing QC sampling and testing, all associated QC records must include the appropriate production lot identification number that correlates with the Department's QA production lot identification number.

3. Personnel Requirements. The QC Plan Administrator must have full authority and responsibility to take all actions necessary for the successful implementation of the QC plan, including but not limited to, the following:

A. Monitoring and utilizing QC tests, control charts, and other QC practices to ensure that delivered materials and proportioning meets specification requirements.

B. Monitoring materials shipped to the project, prior to their use, to ensure their continued compatibility toward producing consistent quality.

C. Periodically inspecting all equipment utilized in transporting, proportioning, mixing, placing, consolidating, finishing, and curing to ensure proper operation.

D. Monitoring materials stockpile management, concrete batching, mixing, transporting, placement, consolidation, finishing, and curing to ensure conformance with specification requirements.

E. Maintaining and submitting all QC records and reports.

F. Directing the necessary corrective action to ensure continual conformance within the QC action limits.

G. Suspending production for the project when suspension limits are exceeded.

H. Conducting or monitoring adjustments to the JMF.

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Individuals performing QC tests must demonstrate that they are proficient and capable of sampling and testing concrete or aggregate, where applicable, in accordance with the associated test procedures and Department requirements prior to commencement of related work. Any adjustments to the JMF must be made by a certified concrete technician (Michigan Level II).

QC tests may be considered eligible to initiate consideration for dispute resolution only if the respective QC sampling and testing was conducted by qualified personnel possessing the current applicable certification through Michigan Concrete Association (Michigan Level I or II) or through the Michigan Concrete Paving Association (Level I or II) certified concrete technicians, or (MCAT) certified aggregate technician, where applicable. QC sampling and testing must have been conducted in the same manner, but not concurrently, as the QA sampling and testing for the associated production lot of materials. Dispute resolution applies for PWL quality index analysis only.

4. QC Laboratory Requirements. Laboratories, including field laboratories and all associated testing equipment that prepare concrete mixes or perform QC testing, must demonstrate to the Engineer that they are equipped, staffed, calibrated, and managed so as to be capable of batching and testing Portland cement concrete in accordance with the applicable test methods and procedures. Mix designs and their accompanying JMFs must include a statement, signed by a certified concrete technician (Michigan Level II), that all applicable standard test methods have been followed in verifying the mix design and JMF.

5. Mix Design and Documentation. Design concrete mixtures meeting the requirements specified in Table 1. Provide the grade of concrete for the section number reference application specified in Table 1 or as specified in the contract. Request variance in writing when proposing a mix design that exhibits temperature, slump or air content other than those specified. Include the proposed mix design, JMF, and associated trial batch verification test data. Do not use a grade of concrete with a lower specification limit (LSL) 28-day compressive strength greater than what is designated for the application. Unless specified otherwise, concrete mixtures using optimized aggregate gradation may be used in lieu of standard concrete mixtures for other applications, as approved by the Engineer.

Secure prior approval from the Engineer to use concrete intended for early opening to traffic to facilitate driveway gaps or other features necessary for required local access.

Provide concrete mixture (Grade P1M) for high performance mainline pavement, shoulder, miscellaneous pavement (including ramps), and unbonded concrete overlay applications. Provide concrete mixture (Grade DM) for high performance bridge deck applications. Provide either concrete Grade P1M or Grade DM for bridge approach slab applications. The Engineer may approve Grades P1M or DM for other applications. Use Appendix 1 for Optimized Aggregate Gradation, included in this special provision, to develop and monitor the optimized gradation. For Grades P1M and DM, replace 25 to 40 percent of the Portland cement in the concrete mixture with slag cement (Grade 100 minimum), or replace 15 to 30 percent of the Portland cement in the concrete mixture with Class F fly ash. Class C fly ash is not permitted. Do not exceed 40 percent total replacement of the Portland cement if both Class F fly ash and slag cement are used in the concrete mixture. Use the combined weight of all cementitious materials to determine compliance with the maximum water-cementitious ratio and cementitious material content requirements specified in Table 1.

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Table 1: Minimum Mix Design Requirements for Concrete

Mix Design Parameter	Grade of Concrete								
	D,DM a,b,e	P1 (a,b)	P1M (a,b,e)	T	S1 (a)	S2 (a,b)	S3/P2 (a)		
PWL Applications									
Lower Specification Limit (LSL) (28-day compressive, psi)	4500	3500	3500	—	—	—	—		
Rejection Limit for an Individual Strength Sample Test Result - Lower	3500	2500	2500						
Small Production Quantities									
Lower Specification Limit (LSL) (28-day compressive, psi)	4500	3500	3500	4000	4000	3500	3000		
Rejection Limit for an Individual Strength Sample Test Result - Lower	0.75 x (LSL)								
All Concrete Applications									
Maximum Water/Cementitious Ratio (lb/lb) (c)	0.45								
Cementitious Material Content (lb/yd ³) (d)	517-858	517-811	470-564	517-811	517-811	517-811	500-564		
Air Content (percent) (f)	5.5 – 8.0								
Slump (inch) (max.)	(g)								
Section Number Reference (h)	706, 711, 712	602, 603, 801,802, 803,810	602,603	706, 718	705	401, 706, 712, 713, 718, 801, 802, 803, 810, 819	402, 403, 802, 803, 804, 806, 808, 810, 813, 814		
<p>a. If the local average minimum temperature for the next 10 consecutive days is forecast to be below 40 degrees F, submit a revised QC plan, for the Engineer's approval, addressing, in detail, changes in materials, concrete batching and mixing processes, construction methods, curing, and protection of the in situ concrete to ensure that the necessary quality characteristics of the hardened concrete product will not be compromised as a result of the cold weather. The revised QC plan must be approved by the Engineer prior to cold weather concrete placement.</p> <p>b. Use aggregates from only geologically natural sources for pavement, shoulder, miscellaneous pavement (including ramps), unbonded concrete overlay, structures, drilled shaft, bridge railing, and bridge sidewalk applications.</p> <p>c. Use admixture quantities specified by the Qualified Products Lists to reduce mixing water. Admixture use is required for Grade D, Grade S2, and Grade S3, concrete with reduced cement content. Use a water-reducing retarding admixture at the required dosage for Grade D concrete to provide the setting retardation required. When the maximum air temperature is not forecast to exceed 60 °F for the day, the Contractor may use a water-reducing admixture or a water-reducing retarding admixture. Ensure Grade D concrete in concrete diaphragms contains a water-reducing admixture, or a water-reducing retarding admixture. For night casting, the Contractor may use a water-reducing admixture in lieu of water-reducing retarding admixture, provided that the concrete can be placed and finished prior to initial set.</p> <p>d. Type III cement is not permitted.</p> <p>e. Grades P1M and DM concrete requires an optimized aggregate gradation (See Appendix 1 for Optimized Aggregate Gradation). Provide concrete mixture (Grade P1M) for high performance mainline pavement, shoulders, miscellaneous pavement (including ramps), and unbonded concrete overlay applications. Provide concrete mixture (Grade DM) for high performance bridge deck applications. Aggregates must meet the physical requirements specified in subsection 902.03.C.</p> <p>f. For action, suspension, and specification limits, see Tables 2, 3 and 4, where applicable. Air content of fresh concrete less than 5.5 percent for concrete that lies in the finished work at least 3 feet below the surface of the ground or entirely under water will not be cause for rejection.</p> <p>g. The maximum slump for Grades P1, P1M, and P2 concrete is 3 inches or as documented on the approved JMF. All other grades of concrete will be according to Tables 701-1 A and B of the Standard Specifications for Construction.</p> <p>h. Section Number Reference:</p> <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top;"> 401 Culverts 403 Drainage Structures 603 Concrete Pavement Restoration 706 Structural Concrete Construction 712 Bridge Rehabilitation-Concrete 718 Drilled Shafts 802 Concrete Curb, Gutter and Dividers 804 Concrete Barriers and Glare Screens 808 Fencing 813 Slope Protection 819 Electrical and Lighting </td> <td style="vertical-align: top;"> 402 Storm Sewers 602 Concrete Pavement 705 Foundation Piling 711 Bridge Railings 713 Bridge Rehabilitation-Steel 801 Concrete Driveways 803 Concrete Sidewalk, Sidewalk Ramps, and Steps 806 Shared Use Paths 810 Permanent Traffic Signs and Supports 814 Paved Ditches </td> </tr> </table>								401 Culverts 403 Drainage Structures 603 Concrete Pavement Restoration 706 Structural Concrete Construction 712 Bridge Rehabilitation-Concrete 718 Drilled Shafts 802 Concrete Curb, Gutter and Dividers 804 Concrete Barriers and Glare Screens 808 Fencing 813 Slope Protection 819 Electrical and Lighting	402 Storm Sewers 602 Concrete Pavement 705 Foundation Piling 711 Bridge Railings 713 Bridge Rehabilitation-Steel 801 Concrete Driveways 803 Concrete Sidewalk, Sidewalk Ramps, and Steps 806 Shared Use Paths 810 Permanent Traffic Signs and Supports 814 Paved Ditches
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Use admixture dosage as indicated in the Qualified Products List to reduce mixing water. For night casting, where applicable, a water-reducing admixture may be used in lieu of a water-reducing and retarding admixture, provided the concrete can be placed and finished in the sequence specified on the plans prior to initial set, is not subjected to residual vibration, or is not within the areas influenced by dead load deflections as a result of adjacent concrete placement operations.

A. Alkali-Silica Reactivity. Provide documentation to the Engineer that the concrete mixture does not present the potential for excessive expansion caused by alkali-silica reactivity (ASR). Provide a Test Data Certification, for ASR testing of the fine aggregate that is proposed to be used in the concrete, from an independent testing laboratory with the latest test results (valid for 2 years from completion of testing). Test results must conform to the specified criterion for one of the following standard test methods. ASR requirements specified in subsection c.5.A are not required for concrete pavement repairs.

(1) Method 1. ASTM C 1260. Mortar Bar Test. If the expansion of the mortar bars is less than 0.10 percent at 14 days of immersion, the fine aggregate is considered non-deleterious to ASR and may be used in the concrete without the need for ASR mitigation.

(2) Method 2. ASTM C 1293. Concrete Prism Test.

(a) If the expansion of concrete prisms is not greater than 0.040 percent after 1 year, the fine aggregate is considered non-deleterious to ASR and may be used in the concrete without the need for ASR mitigation.

(b) If the expansion of concrete prisms is greater than 0.040 percent, but not exceeding 0.120 percent after 1 year, the fine aggregate is considered moderately deleterious to ASR and mitigation is required, as follows: A Low-Alkali cement with Na_2O equivalent alkalies ($\text{Na}_2\text{O} + 0.658 \times \text{percent K}_2\text{O}$) not exceeding 0.60 percent must be used in the concrete mixture to mitigate the potential for ASR. Slag cement or Class F fly ash may be used in conjunction with the low-alkali cement. The total alkali content for the cementitious materials combination must not exceed 3.0 pounds per cubic yard of Na_2O equivalent.

(3) Method 3. ASTM C 1567. Mortar Bar Test. If no previous test data are available for the fine aggregate that shows it is resistant to ASR using either Method 1 or 2, above, replace 25 to 40 percent of the Portland cement in the concrete mixture with Class F fly ash or slag Cement (Grade 100 minimum). A blended cement meeting the requirements of ASTM C 595 containing Portland cement and slag cement or Class F fly ash may also be used.

Demonstrate the ability of the fly ash or slag cement to control the deleterious expansion caused by ASR by molding and testing mortar bars according to the standard test method described in ASTM C 1567 using the mix proportion and constituent sources for both the aggregates and the cementitious materials that will be used for the project. Make at least three test specimens for each cementitious materials-aggregate combination. If the average of three mortar bars for a given cementitious materials-aggregate combination produces an expansion less than 0.10 percent at 14 days of immersion, the JMF associated with that combination will be

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considered non-deleterious to ASR. If the average expansion is 0.10 percent or greater, the JMF associated with that combination will be considered not sufficient to control the deleterious expansion caused by ASR and the JMF will be rejected.

The Engineer will not approve the use of the JMF if the expansion exceeds the respective threshold limits for the respective ASTM test method used.

B. Contractor Provided Mixes. Provide mix design and accompanying JMFs using the methods of verification included in this special provision. Include sufficient information on constituent materials and admixtures along with optimized aggregate gradation analysis (where applicable), trial batch verified physical properties of the fresh concrete, mix proportions per cubic yard for all constituents and compressive strength test results necessary to allow the Engineer to fully evaluate the expected performance of the concrete mixture.

(1) Mix Documentation. Prepare mix designs for each grade of concrete required on the project. Submit JMF for each mix design, including all required documentation, to the Engineer for review 10 working days before the anticipated date of placement. The Engineer will notify the Contractor of any objections within 5 working days of receipt of the mix documentation. Number or otherwise identify each JMF and reference all accompanying documentation to this number. Reference each JMF to the appropriate method of verification. Mix design and JMF submittals that do not include all required documentation will be considered incomplete and the Engineer will return them without review.

Provide all supporting mix documentation, including test reports and mix proportion adjustment calculations. All mix designs and accompanying JMFs must be traceable to a laboratory meeting the requirements of this special provision. Include the necessary documentation described in subsection c.5.

Submit mix design and JMF on the MDOT Job Mix Formula (JMF) Concrete Field Communication form (MDOT Form Number 1976); include accompanying documentation. List the source of materials, bulk density (unit weight) of coarse aggregate (rodding procedure or shoveling procedure), absorption of aggregates, relative density (specific gravity) of aggregates, aggregate correction factors, batch weights, and project specific or historical laboratory test data. Include the recorded air content of fresh concrete using the same admixture and cementitious material sources to be used in the production of the concrete for the project. A JMF will be approved only if all of the minimum mix design requirements specified in Table 1 have been met.

All chemical admixtures used in a JMF must be from the same manufacturer.

(2) Job Mix Formula (JMF). Select proportions for concrete mixtures according to ACI Standard 211.1. The bulk volume (dry, loose) of coarse aggregate per unit volume of concrete must be 65 to 75 percent, inclusive. For concrete mixtures using optimized aggregate gradation, the above specified volume of coarse aggregate per unit volume of concrete includes the intermediate aggregate.

Four methods of verification of proposed JMF are acceptable.

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(a) Method 1. Trial Batches. Verification of JMF is based on trial batches with the same materials and proportions proposed for use on the project. Prepare at least one trial batch for each mix design in sufficient time before starting concrete placement to allow for review according to subsection c.5.B.(1). Provide the results of temperature, slump, density (unit weight), air content of fresh concrete, 28-day compressive strength, and age of concrete at the time of strength testing, for a minimum of three independent samples. All samples may be taken from a single trial batch for a mix design provided the trial batch is at least four cubic yards in volume. For JMF trial batch verification purposes only, 7-day compressive strength test results which report at least 70 percent of the specified 28-day lower specification limit (LSL) will be sufficient documentation in lieu of 28-day compressive strengths. The average of at least two strength test specimens represents one compressive strength sample test result for each independent sample. Provide the necessary ASR documentation as described in subsection c.5.A.

(b) Method 2. Same Mix. Verification of JMF is based on experience with the same mix design, JMF, and the same materials. Provide the results of temperature, slump, density (unit weight) air content of fresh concrete, 28-day compressive strength, and age of concrete at the time of strength testing, for a minimum of three independent samples. The average of at least two strength test specimens represents one compressive strength sample test result for each independent sample. Do not substitute material types or sources, including admixtures or cementitious materials, nor change mix proportions in the JMF. Provide the necessary ASR documentation as described in subsection c.5.A.

(c) Method 3. Similar Mix. Verification of the JMF is based on experience with a mix design and JMF similar to the proposed mix design that used similar materials. Substitution of coarse and intermediate aggregate sources is permitted only if the new source is of the same geologic type and meets minimum physical properties as the original aggregate and conforms to the specification requirements for the respective application. Substitution of fine aggregate is permitted only if the new source has been tested for ASR and is accompanied by current documentation verifying that it meets the requirements specified in subsection c.5.A.

Verify, prior to batching, that the proposed changes to the JMF will not affect the properties of the fresh concrete (slump, temperature, air content, density (unit weight), workability). Provide the supporting laboratory trial batch documentation and accompanying calculations showing how the mix proportions in the JMF were adjusted, based on the documented differences in relative density (specific gravity), bulk density (unit weight) and absorption of the substituted aggregate sources, to produce a theoretical yield of 100 percent and the required fresh concrete properties.

(d) Method 4. Annual Verification. At the Engineer's option, verification may be accepted annually for a concrete plant rather than on a project basis provided the sources and proportions of the constituent materials, including cementitious materials and source and types admixtures, do not change. If the project is the continuation of work in progress during the previous construction season and written certification is submitted to the Engineer that materials from the same

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source and with the same mixture properties are to be used, the Engineer may waive the requirement for annual renewal verification of the JMF for the project. Provide the necessary ASR documentation as described in subsection c.5.A.

C. Department Provided Mixes. Unless otherwise specified in the contract or approved by the Engineer, the Engineer will provide the concrete JMF for the following types of concrete regardless of the total quantity for the project.

- (1) Structural concrete patching mixtures, mortar and grout.
- (2) Bridge deck overlay concrete mixtures.
- (3) Project-specific concrete grades not defined in Table 1.

Provide all other mix designs and accompanying JMF's according to subsection c.5.B.

D. Changes in Materials and Proportions. Any change from one approved JMF to another for the same grade of concrete must have prior approval by the Engineer. Record all changes to JMF in the QC records along with the rationale for the change. Verify, prior to batching, that the proposed changes to the JMF will not affect the properties of the fresh concrete (slump, temperature, air content, density (unit weight), workability), nor result in excessive mortar bar expansion as a result of deleterious reactivity between the aggregates and cementitious materials as described in subsection c.5.A.

Resubmittal of a mix design and its accompanying JMF, as described in subsection c.5.B, is not required when making adjustments to the aggregate mix proportions included in the approved JMF in order to maintain optimization of the aggregate gradation in accordance with Appendix 1.

E. QC Sampling and Testing. Conduct startup sampling and testing for temperature, slump, density (unit weight), and air content on the first load. Do not place concrete until testing verifies that the fresh concrete properties have not exceeded the QC action and suspension limit thresholds specified in Table 2. Continue testing subsequent loads as described in the QC plan, for each grade of concrete delivered to the work site each day. Startup or initial sampling and testing will not be eligible for consideration to initiate PWL dispute resolution process. The QC sampling and testing must be independent from the Department's QA sampling and testing.

Provide the curing facilities in accordance with subsection d.2.c prior to start of concrete production.

Perform QC sampling and testing of the fresh concrete for air content loss, as follows:

- (1) At least once during each week of production.
- (2) Whenever QC tests have shown that QC action limits have been exceeded.
- (3) Whenever the concrete pump is relocated, where applicable.

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(4) Whenever there is a significant change in the boom angle of the concrete pump during concrete placement, where applicable.

Sample and test a representative haul unit of concrete immediately after its discharge but before the paver or pump hopper, where applicable. Sample and test the concrete representing the same haul unit, again, after the paver or after discharge from the pump (after vibration), where applicable. If the difference in measured air content between the two test locations for the same concrete is greater than two percent air by volume of concrete, suspend operations and administer corrective action. Resume concrete placement only after taking the necessary corrective action to reduce the loss in air content of fresh concrete between the two test locations, as approved by the Engineer. Document the corrective action to be taken in the QC records and make the necessary changes to the QC plan, where applicable.

The Contractor's QC and the Department's QA strength test specimens for 28-day compressive strength must be the same size (either 6-inch by 12-inch or 4-inch by 8-inch) for lot dispute resolution consideration. Dispute resolution only applies for PWL quality index analysis.

Independent QC sampling and testing must be conducted on each subplot within a respective production lot in order for the production lot to be considered for dispute resolution.

Concrete exceeding the maximum specification limits for slump or temperature must be rejected regardless of the total mixing time or number of mixing revolutions at the time of arrival to the project.

The Engineer may require the Contractor to administer additional QC sampling and testing if the Engineer determines the Contractor's current QC sampling and testing methodology is shown to be insufficient to ensure continual control of the quality of the concrete.

Take the appropriate corrective action, as described in the QC plan, when QC testing shows the QC action limits for any quality characteristic are exceeded. Suspend production if any of the QC suspension limits are exceeded or if the corrective action is not sufficient to restore the quality to acceptable levels.

Resume production only after making all necessary adjustments to bring the mixture into conformance with all applicable specifications and receiving approval to resume work from the Engineer. Document these adjustments in the QC records.

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Table 2: QC Action and Suspension Limits

Quality Characteristic	Action Limits	Suspension Limits
Air Content (percent)	See Note Below (a)	< 5.0 or > 8.5
Air Content Loss (percent)	As Defined in the Contractor QC Plan	Greater than 2.0
Conc. Temp. (deg. F)		< 45 or > 90 at time of placement
Slump (max.) (inch)		See Table 1, footnote (g)
Density (unit weight)		N/A
Aggregate Gradation	Appendix 1 for Optimized Aggregate Gradation (for optimized aggregate gradation only)	
a. Action limits to be defined in the Contractor QC Plan and cannot exceed 5.5 to 8.0 inclusive.		

F. Work Progress Test Specimens. Determine the strength of concrete for opening to construction traffic or regular traffic, for removing shoring and forms, or for other similar purposes in accordance with subsections 104.11, 601.03.H, and 701.03.D of the Standard Specifications for Construction, and as approved by the Engineer. Cure work progress test specimens in the same manner as the in-situ concrete. Allow the Engineer to witness testing of work progress test specimens.

For pavement repairs described in section 603 of the Standard Specifications for Construction, the maturity method may be used to determine the in-place, opening-to-traffic flexural strength, provided the necessary preliminary flexural strength versus opening-to-traffic time correlations, using the same materials and JMF, are established and approved by the Engineer before placing the concrete.

G. Reduced QC for Small Incidental Quantities. If approved by the Engineer, reduced levels of on-site QC testing for concrete may be considered for small incidental quantities defined in subsection a.1.

Unless approved by the Engineer, multiple small incidental quantities, including ones that are consecutively placed throughout the project on the same day, are not eligible for reduced QC consideration if the total plan quantity of concrete for the item exceeds 100 cubic yards in volume. Include details for reduced QC testing and oversight in the approved QC plan, and as follows:

- (1) The small incidental quantity of concrete will be limited to a single day's concrete placement of 20 cubic yards in volume.
- (2) The small incidental quantity is not an integral part of a structural load bearing element.
- (3) The Engineer received written certification from the Contractor that the concrete supplier has a current QC plan in place and available for review upon request by the Engineer.
- (4) The concrete supplier employs a certified concrete technician (Michigan Level II) available at the plant or on call during concrete placement to validate and authorize modifications to the concrete JMF, as necessary.

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(5) Prior to the first concreting operation, concrete representing the JMF for the small incidental quantity has been sampled and tested by a certified concrete technician (Michigan Level I or II) to verify that, historically, the JMF produced a concrete mixture meeting the minimum requirements for density (unit weight), slump, air content, and strength. Annual verification may be acceptable provided there are no changes to the material types or sources, including the cementitious materials and admixtures.

(6) The Engineer verified that the temperature, slump, and air content conform to specification requirements at the start of the day's concreting operation associated with the small incidental quantity.

(7) The Engineer is notified and provided sufficient opportunity to witness concrete placement.

d. Department Administered Quality Assurance (Acceptance).

1. Department Quality Assurance Plan (QA plan). The Engineer will be responsible for administering the quality-based acceptance and will institute any actions necessary toward its successful implementation.

Acceptance of concrete for full-depth pavement repairs will be according to section 603 of the Standard Specifications for Construction.

Acceptance of concrete for prestressed and precast applications will be according to section 708 of the Standard Specifications for Construction.

The Engineer will develop and follow a QA plan. The Engineer will provide the QA plan to the QC Plan Administrator a minimum of 7 calendar days prior to the pre-production meeting. The QA plan will be reviewed at the pre-production meeting and any proposed changes will be documented.

The nominal QA strength test specimen size, defined in subsection a.1 will be noted in the QA plan.

A. Personnel Requirements. The personnel responsible for field inspection and for obtaining QA samples will possess the required qualifications to collect QA samples. Sampling will be performed by qualified personnel possessing the current applicable certification through the Michigan Concrete Association (Michigan Level I or II) or through the Michigan Concrete Paving Association (Level I or II) certified concrete technicians, or (MCAT) certified aggregate technician, where applicable.

B. QA Testing Correlation. The testing equipment and associated testing personnel for both the Engineer's QA and Contractor's QC will conduct side by side testing of the same concrete representing the first production lot (or at a greater frequency as directed by the Engineer) for the project to verify correlation of both the Department's and the Contractor's test results for temperature and air content of fresh concrete. Side by side testing correlation must be conducted whenever there is a change in QC or QA equipment and/or personnel for the project. The temperature measuring devices used for QC and QA must correlate relative to each other within 2 degrees F. The Engineer will request an Independent Assurance Test in the event the air content results of two

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tests conducted between the Department's and the Contractor's testers differ by more than 1.0 percent air by volume of concrete.

C. Laboratory Facilities. The testing laboratory with responsibility for acceptance testing on this project is the Region testing laboratory, or a qualified facility under the authority of the Engineer. Dispute resolution testing for 28-day compressive strength, where applicable, will be conducted at the Department's Central CFS laboratory or an independent AASHTO Accredited laboratory facility designated by the Department.

2. QA Sampling and Testing. The Engineer will conduct QA sampling and testing, monitor the Contractor's adherence to the QC plan, and inspect field placed materials in such a manner so as to ensure that all concrete for the project is represented. Initial approval is required prior to concrete placement for temperature, slump, air content and aggregate gradation (if utilizing an optimized aggregate gradation), and is based on the Engineer's observance of QC startup sampling and testing described in subsection c.5.E.

The following ASTM test methods will apply. The Department's established procedures for sampling and testing are acceptable alternatives.

- C 31 Practice for Making and Curing Concrete Test Specimens in the Field
- C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens
- C 78 Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
- C 138 Test Method for Density (Unit Weight), Yield and Air Content (Gravimetric) of Concrete
- C 143 Test Method for Slump of Hydraulic-Cement Concrete
- C 172 Practice for Sampling Freshly Mixed Concrete
- C 173 Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
- C 231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- C 293 Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading)

A. Lot Size and Make Up. A production lot will not include more than one grade of concrete, concrete of the same grade having different specified slump or air content, or concrete of the same grade having different mix designs, or JMFs. Small production quantities will not be included in PWL production lots.

Consecutively placed concrete mixes where the aggregate proportions were adjusted to maintain an optimized gradation may be included in the same production lot provided they are the same grade and same JMF.

(1) PWL Applications. PWL applies to mainline, shoulder, miscellaneous concrete pavement (including ramps), unbonded concrete overlay, and bridge deck applications of 175 cubic yards or greater. The minimum subplot size will be approximately 50 cubic yards.

(2) Small Production Quantities. Small production applies for any concrete placement quantity of less than 50 cubic yards, as determined by the Engineer.

(3) Small Incidental Quantities. At the option of the Engineer, daily 28-day compressive strength QA test cylinders for small incidental quantities of concrete, as

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defined in subsection a.1, may not be required provided QA test cylinders representing the same JMF as the small incidental quantity of concrete were sampled and molded at least once during the same week (see subsection d.2.B). Unless approved by the Engineer, multiple small incidental quantities, including ones that are consecutively placed throughout the project on the same day are not eligible for reduced QC consideration if the total plan quantity of concrete for the pay item exceeds 100 cubic yards in volume.

B. Sampling. Except as modified herein, QA sample locations will be determined as described in section A-12 of the *Materials Quality Assurance Procedures Manual*.

Samples will be taken from the concrete at the location as close to its final placement into the forms or on the grade as practical. If sampling from the discharge of the haul unit, the representative sample must be taken from the middle one-third of the load.

Samples for acceptance will not be taken at the concrete production facility (batch plant), nor prior to discharge from a concrete pump (excluding tremie seal placement applications). Mix adjustments to the concrete contained within the haul unit selected for QA sampling and testing (beyond normal QC) will not be permitted prior to QA sampling and testing. QA sampling will be without prior notification.

(1) PWL Applications. The random number method for PWL sampling will be used to determine the sampling locations. A random number will be generated for each respective subplot. The anticipated subplot/sampling frequency for a production lot is five sublots per lot with one sampling per subplot.

(a) Prior to the pre-production meeting, the Engineer will generate a list of random numbers using a computer spreadsheet program or a calculator. The random numbers will be used to designate when QA samples are to be taken, based on cubic yard quantities.

(b) At the pre-production meeting, each page that lists random numbers will be signed by the QC Plan Administrator and the Engineer. Each sheet containing the random numbers will be covered by a separate sheet of paper so as to prevent disclosure of the random numbers.

(c) The original signed list will be placed in the project file and a copy will be provided to the Engineer's field inspector for the project.

(d) When the project is completed, a copy of the list of random numbers will be provided to the Contractor upon request.

If a subplot is not completed in sufficient quantity to permit it to be randomly sampled during its respective production day, as planned, the quantity of concrete for the subplot that was not placed as part of the day's production will be sampled during the following production day according to the original random number sampling protocol. The random sample will then represent the total quantity of concrete for the subplot placed over the respective multiple days of production.

If the quantity of a grade of concrete to be sampled on the last day of production for the project is not sufficient to make up three or more equivalent sublots, combine the

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test results for these one or two remaining sublots, or fraction thereof, with the previous day's production lot for quality index analysis.

At the option of the Engineer, occasional small individual quantities of concrete up to 50 cubic yards may be combined with a larger production lot provided they are of the same grade, contain the same JMF, and are used for the same PWL application.

(2) Small Production Quantities. Representative QA sampling and testing will be conducted by the Engineer during concrete placement. The sampling rate will be one sample per 50 cubic yards, approximately, based on the anticipated total quantity of concrete to be placed and site conditions, with a minimum of one sampling for each day of production.

(3) Small Incidental Quantities. At the option of the Engineer, small incidental quantities as defined in subsection a.1 may be accepted (visually inspected and noted on the Inspector's Daily Report) without daily 28-day compressive strength QA test specimens provided there is a current acceptable strength test history of the JMF for the project prior to placement of the small incidental quantity. One set of compressive strength QA test specimens will then be molded for each small incidental quantity JMF at least once per week during production thereafter, as determined by the Engineer (note the test results or identification number for the corresponding weekly QA compressive strength test result on the Inspector's Daily Report for each small incidental quantity). Quality control testing and daily QA testing for temperature, slump, and air content are still required as described in subsection c.5.G.

C. Testing. The location(s) within the project limits for QA testing of the fresh concrete and placement of curing facilities for initial curing of the 28-day compressive strength QA test cylinders will be determined by the Engineer in conformance with the following criteria:

(1) The elapsed time between obtaining the first and the final portion of the composite sample must not exceed 15 minutes.

(2) Testing for slump, temperature, and air content of fresh concrete must begin within 5 minutes after obtaining the final portion of the composite sample.

(3) Molding of the 28-day compressive strength QA test cylinders must begin within 15 minutes after obtaining the final portion of the composite sample.

(4) The concrete sample must be protected from the sun, wind, and other sources of rapid evaporation, and from contamination.

Two QA concrete strength test specimens per sample will be molded for 28-day compressive strength QA testing. For PWL applications only, two additional concrete strength test specimens will be molded and cured in the same manner as the QA specimens, to be retained by the Department in the event of dispute resolution. The dispute resolution QA concrete strength test specimens will be tested by the Engineer only in the event of dispute resolution according to subsection d.6.

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The Contractor will provide curing facilities equipped to ensure the proper environment for the Department's QA concrete strength test specimens during initial cure. Each initial cure facility must provide ventilation or insulation, where applicable, to ensure the ambient temperature surrounding the specimens is maintained according to AASHTO T 23/ASTM C 31. Failure by the Contractor to maintain the proper curing environment during initial cure will not be basis for rejection of samples, dispute resolution, or claims against the Department. Each initial curing facility must be capable of being locked, using a Department provided padlock. The Contractor will ensure that all initial curing facilities are accounted for at all time, and protected against theft and damage. The Contractor will locate and secure each initial cure facility throughout the project limits in such a manner so as to minimize excessive transport of the test specimens prior to initial cure, as follows:

(5) Immediately after finishing molded specimens, the Engineer will move the QA concrete strength test specimens to the closest initial cure facility provided by the Contractor.

(6) Immediately after all QA concrete strength test specimens are placed into the cure facility and the proper initial curing conditions have been established, the Engineer will secure the facility using the Department provided padlock. Access to the QA concrete strength test specimens, thereafter, must be coordinated with the Engineer and will only be permitted in the presence of the Engineer.

(7) The Engineer will transport the QA concrete strength test specimens within 48 hours after molding, but not prior to 8 hours after final set of the concrete, from the initial curing facility to the Department's designated testing laboratory for final curing and strength testing. The specimens will be protected with a suitable cushioning material to prevent damage from jarring during transport. The total transportation time must not exceed 4 hours prior to commencement of final curing.

D. QA Stop Production Criteria. The Engineer will issue a Notice of Non-Compliance with Contract Requirements (Form 1165) and concrete production must stop when one or more of the following are observed.

(1) The QA testing shows that one or more of the suspension limits for quality characteristics defined in Table 2 are in non-compliance.

(2) The QC plan is not being followed.

(3) Segregation, excessive slumping of unsupported slipformed edges, or other notable changes in the fresh concrete properties is observed that may prevent proper placement, consolidation and finishing, or compromise the performance or long-term durability of the finished product.

(4) The required curing system is not being applied in a timely manner, as specified by the contract.

(5) If the measured air content loss between the two testing locations for the same concrete is greater than two percent air by volume of concrete as described in subsection c.5.E.

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The Engineer will issue a Notice to Resume Work (Form 1165) only after all necessary adjustments are made to restore conformance with all applicable specifications, and the appropriate documentation is made in the QC records.

E. QA Records. The Engineer will maintain a complete record of all QA tests and inspections. The records will contain, as a minimum, signed originals of all QA test results and raw data, random numbers used (where applicable) and resulting calculations. The QA test results will not be provided to the Contractor until the corresponding QC test results are received by the Engineer.

3. Quality Index Analysis. The Engineer's QA test results will be used to determine the pay factor (PF) and price adjustment (ADJ). The Contractor's QC test results will not be used for pay factor and price adjustment analysis. The Engineer will complete pay factor and price adjustment analysis within 7 working days after completion of all 28-day compressive strength testing for the represented production lot or quantity of concrete.

A. PWL Applications. The PWL, PF and associated ADJ will be determined according to subsection d.4 using the MDOT Concrete PWL Worksheet. The AQL, RQL, LSL and USL used in the quality index analysis are shown in Table 3. The Engineer will perform the quality index analysis for all concrete represented by sufficient lot size and makeup necessary for random sampling according to subsections d.2.A and d.2.B. All values of PWL, PF, and OLPF in these formulae are percent, not decimal. All values of PWL and OLPF are rounded to whole numbers. All values of PF are rounded to two decimal places.

B. Small Production Quantities. The PF and associated ADJ will be determined according to subsection d.5. All values of PF in these formulae are decimal, not percent. All values of PF are carried to two decimal places.

C. Small Incidental Quantities. Price adjustment will not be applied to small incidental quantities provided the concrete is of acceptable quality and all other provisions are met for the contract item.

Table 3: Quality Index Parameter Specification Limits for PWL Applications

Quality Index Parameters	Grade of Concrete	
	D/DM	P1/P1M
28-Day Compressive Strength		
Specification Limit – Lower (LSL) (psi)	4500	3500
Specification Limit – Upper (USL)	N/A	N/A
Acceptable Quality Level (AQL)	95 PWL	
Rejectable Quality Level (RQL)	50 PWL	
Air Content of Fresh Concrete		
Specification Limit – Lower (LSL) (percent)	5.5	
Specification Limit – Upper (USL) (percent)	8.0	
Acceptable Quality Level (AQL)	90 PWL	
Rejectable Quality Level (RQL)	50 PWL	
Suspension Limits (percent)	< 5.0 or > 8.5	

4. Pay Factor (PF) Determination and Price Adjustment for Percent Within Limits (PWL) Applications. The MDOT Concrete PWL Worksheet uses the following formulae to calculate

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the PF and associated ADJ for each production lot. The maximum calculated numerical values for PF and OLPF will not exceed 105.00

A. Pay Factor for 28-Day Compressive Strength (PF_s). If PWL for 28-day compressive strength (PWL_s) is 95 to 100 inclusive, use the following formula to determine PF_s .

$$PF_s = 5 + PWL_s$$

If PWL_s is 50 to less than 95, use the following formula to determine PF_s .

$$PF_s = 47.22 + (0.5556 \times PWL_s)$$

If PWL_s is less than 50, the production lot is rejectable and the Engineer will require additional evaluation to decide what further action may be warranted as described in subsection d.9.

B. Pay Factor for Air Content of Fresh Concrete (PF_{ac}). If PWL for air content of fresh concrete (PWL_{ac}) is 70 to 100 inclusive, use the following formula to determine PF_{ac} .

$$PF_{ac} = 55 + (0.5 \times PWL_{ac})$$

If PWL_{ac} is 50 to less than 70, use the following formula to determine PF_{ac} .

$$PF_{ac} = 37.5 + (0.75 \times PWL_{ac})$$

If PWL_{ac} is less than 50, the Engineer will elect to do one of the following.

(1) Require removal and replacement of the entire production lot with new testing conducted on the replacement concrete and repeat the evaluation procedure.

(2) Allow submittal of a corrective action plan for the Engineer's approval. If the Engineer does not approve the plan for corrective action, subsection d.4.B.(1) above will be applied. All costs associated with plan submittal and corrective action under this subsection will be borne by the Contractor. Positive ADJ (quality initiative) will not apply for production lots subject to corrective action.

C. Overall Lot Pay Factor (OLPF). The following formulae are used to calculate the OLPF and ADJ. Both pay factors (PF_s and PF_{ac}) must be 100.00, or greater for the production lot to be eligible for positive ADJ (quality initiative) consideration. If either individually calculated pay factor (PF_s or PF_{ac}) is less than 100.00, the maximum value for its companion pay factor (PF_s or PF_{ac}) to be used in the OLPF calculation for the respective production lot will not exceed 100.00.

$$OLPF = (0.60 \times PF_s) + (0.40 \times PF_{ac})$$

$$ADJ = (OLPF - 100)(Price) / 100$$

ADJ = Price adjustment per pay unit to be applied to the production lot quantity
Price = Original contract unit price bid for the pay item

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5. Pay Factor Determination and Price Adjustment for Small Production Quantities. Use the following formulae to calculate the PF and associated ADJ for each concrete item. Positive ADJ (quality initiative) does not apply for small production quantities. Each individual QA strength sample test result will be used to determine the PF and ADJ for the respective quantity of concrete that it represents, based on the sampling rate described in subsection d.2.B.(2).

The specification limits for small production quantities are defined in Table 4. Concrete not conforming to the requirements specified in Table 4 is rejectable and subject to further evaluation, as described in subsection d.9.

Table 4: Specification Limits for Small Production Quantities

Quality Characteristic	Specification Limits
Air Content of Fresh Concrete (percent)	5.5 – 8.0
Conc. Temp. (deg. F)	45 - 90 at time of placement
Slump (max.) (inch)	See Table 1, footnote (g)
28-day Compressive Strength (psi)	For LSL see Table 1: see below for rejection limit
Rejection Limit - Lower 28-day Compressive Strength	0.75 x (LSL)

$$PF = \frac{\text{Tested Strength}}{LSL}$$

$$ADJ = (PF - 1)(\text{Price})$$

Where:

PF = Pay Factor (not to exceed 1.00)

Tested Strength = QA 28-day compressive strength sample test result

LSL = Lower specification limit (see Table 1)

ADJ = Price adjustment per pay unit to be applied to the quantity represented by the QA test

Price = Original contract unit price bid for the pay item

6. Lot Dispute Resolution. Dispute resolution pertains to production lots subject to quality index analysis for PWL applications only. The air content of fresh concrete is not eligible for dispute resolution. The Contractor's 28-day compressive strength QC test results must be submitted to the Engineer, accompanied by a signed statement certifying that the QC test results are true and accurate, prior to the Engineer's release of any QA test results for the respective production lot. The 28-day compressive strength QA test results for a production lot of concrete may be eligible for dispute resolution only if the following criteria are met:

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A. The request for dispute resolution testing was submitted by the Contractor in writing within 2 working days of receipt of the results of the quality index analysis for the production lot.

B. Complete records and reports for all QC tests and inspections as described in subsection c.2, including documentation of what action was taken to correct deficient concrete, along with sufficient information and production lot identification to allow the test results to be correlated with the items of work represented, were submitted to the Engineer within 24 hours after the date covered by the records and reports.

C. QC sampling and testing procedures were conducted in the same manner as the Department's QA sampling and testing procedures.

D. The Contractor's QC and Department's QA 28-day compressive strength test specimen for the production lot in dispute are the same nominal size (either 6-inch by 12-inch or 4-inch by 8-inch).

E. The pay factor for 28-day compressive strength (PF_s), as re-calculated by the Engineer using the Contractor's QC test results, is greater than that determined by the Engineer using the QA test results.

F. Each subplot within the respective production lot under dispute is represented by complete QC test results.

G. The QC sampling and testing for the production lot in dispute was conducted by qualified personnel possessing the current applicable certification through Michigan Concrete Association (Michigan Level I or II) or through the Michigan Concrete Paving Association (Level I or II) certified concrete technicians.

H. A current and complete QC plan, for the appropriate items of work, was submitted and approved by the Engineer prior to start of related work.

I. The QC sampling and testing was performed on the same production lot of concrete as the Department's QA sampling and testing, and all associated QC records include the appropriate production lot identification number that coincides with the Engineer's QA production lot identification number.

J. The corresponding Contractor QC and Department QA 28-day compressive strength test specimens for the production lot in dispute were properly secured during initial curing in the curing facility provided and maintained by the Contractor.

K. The QC test results and documentation for aggregate gradation (where applicable), slump, air content of fresh concrete, temperature, and density (unit weight) of the fresh concrete were complete and within specification requirements.

L. The appropriate corrective action was taken in the event QC action limits were exceeded, as described in the QC plan.

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M. QC suspension limits for the associated production lot of concrete were not exceeded.

Dispute resolution will not be considered if it is shown that the Contractor QC has not been completed in accordance with the approved QC plan.

If the Engineer determines, based on the above criteria, that further evaluation is not warranted, the ADJ for the production lot will be based on the Engineer's original 28-day compressive strength QA test results.

7. Dispute Resolution Schedule.

If the Engineer determines, based on the above criteria, that lot dispute resolution is warranted, the following schedule and testing process will be initiated.

A. The Engineer will document receipt of the request for dispute resolution and will deliver the dispute resolution samples along with the appropriate sample identification submittal forms to the MDOT CFS Central Laboratory for testing within 3 working day of the receipt of the request.

B. The Department's CFS Central laboratory will test all dispute resolution test specimens within 2 working days of their receipt.

C. The 28-day compressive strength (psi) LSL specified in Table 3 will be increased 10 psi for each additional day beyond 28 days after molding of the test specimens associated with the production lot under dispute, up to and including 60 days after molding (32 additional days after 28 days; 320 psi to account for additional strength gain after the 28-day standard curing period).

D. The MDOT CFS Central laboratory will return the dispute resolution test results to the Engineer within 10 working days from receipt of the dispute resolution samples.

8. Dispute Resolution Testing Process.

A. All lot dispute resolution samples will be tested for the production lot under dispute resolution.

B. All dispute resolution test results will replace respective original QA test results.

C. The adjusted LSL described in subsection d.7.C will then be used to determine the PWL for the production lot under dispute.

D. The PF_s for the production lot under dispute will be recalculated using the compressive strength test results from the dispute resolution test specimens.

E. If the recalculated lot PF_s is less than or equal to the original corresponding PF_s , the costs for dispute resolution sample testing will be borne by the Contractor.

F. If the recalculated lot PF_s is greater than the original corresponding PF_s , the costs for dispute resolution sample testing will be borne by the Department.

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G. The OLPF will then be recalculated using the PF_s from the compressive strength dispute resolution test results and the original corresponding PF_{sc} .

9. Evaluation of Rejectable Concrete. The Engineer will require additional evaluation to decide what further action may be warranted, as described below.

If the Engineer determines that non-destructive testing (NDT) is appropriate, this work will be done by the Contractor in the presence of the Engineer within 45 calendar days from concrete placement. All costs associated with this work will be borne by the Contractor. A complete set of non-destructive tests must be conducted (in accordance with the respective standard test method) at a minimum three randomly selected locations. If NDT is used to estimate the in-situ strength, a calibrated relationship between the project JMF under evaluation and the NDT apparatus must have been established prior to NDT testing according to its respective standard test method.

A. PWL Applications. If the quality index analysis for 28-day compressive strength shows that the RQL has not been met (50 PWL, min.) for a production lot (as specified in Table 3) or the lower rejection limit for the individual strength sample test result represented by the rejected subplot within a production lot has not been achieved (as specified in Table 1), the associated concrete will be rejected.

(1) If the results from evaluation of the rejected concrete report that the RQL has been met (50 PWL, min.) for the rejected production lot, or the lower rejection limit for the individual strength sample test result represented by the rejected subplot within a production lot has been achieved, the represented quantity of concrete under evaluation will remain in place and a pay factor for 28-day compressive strength (PF_s) of 50.00 will be applied for overall lot pay factor (OLPF) and price adjustment (ADJ) determinations according to subsection d.4.

(2) If the results from evaluation of the rejected concrete confirm that the RQL has not been met (50 PWL, min.) for the rejected production lot, or the lower rejection limit for the individual strength sample test result represented by the rejected subplot within a production lot has not been achieved, the Engineer will elect to do one of the following:

(a) Require removal and replacement of the entire rejected production lot, or the individual rejected subplot within a production lot, including new initial tests for quality index analysis conducted according to subsection d.3.

(b) Allow the Contractor to submit a plan for corrective action, for the Engineer's approval, to address the disposition of the rejected concrete. If the Engineer does not approve the plan for corrective action, subsection d.9.A.(2).(a) will be applied. All costs associated with plan submittal and corrective action under this subsection will be borne by the Contractor.

B. Small Production Quantities. If the 28-day compressive strength QA test results show that the lower rejection limit (as specified in Table 1) has not been achieved, the small production quantity under evaluation will be rejected and the Engineer will require additional evaluation to decide what further action may be warranted.

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Propose an evaluation plan and submit it to the Engineer for approval before proceeding. The results from NDT will be used only to decide what further action is required. This determination will be made by the Engineer, as follows:

(1) If no test result from non-destructive testing falls below the lower specification limit (LSL), the Engineer may accept the in-situ small production quantity under evaluation at 100 percent of the contract price.

(2) If one or more of the non-destructive test results fall below the lower specification limit (LSL), the Engineer may elect to do one of the following:

(a) Require removal and replacement of the entire rejected small production quantity, including new initial tests for pay factor (PF) determination and price adjustment (ADJ) according to subsection d.5.

(b) Allow the in-situ small production quantity under evaluation to remain in place and apply a pay factor (PF) of 0.50 for price adjustment (ADJ) according to subsection d.5.

(c) Allow submittal of a corrective action plan, for the Engineer's approval. If the Engineer does not approve the plan for corrective action, subsections d.9.B.(2).(a) or d.9.B.(2).(b) will apply. All costs associated with plan submittal and corrective action under this subsection will be borne by the Contractor.

e. **Measurement and Payment.** Any positive adjustment payment made in connection with this special provision will use the following pay item:

Pay Item	Pay Unit
Conc Quality Initiative	Dollar

Conc Quality Initiative is a budgeted amount established in the contract to cover the potential positive ADJ for the pay items associated with the PWL application.

If a price adjustment is made for reasons included in this special provision, that adjustment will be made using the original unit price bid for the specific item. If a contract unit price requires adjustment for other reasons not described in this special provision, the adjustments will be made using the original unit price and the adjustments will be cumulative.

Separate payment will not be made for providing, implementing, and maintaining an effective QC program. All costs associated with this work will be included in the applicable unit prices for the concrete items. Failure by the Contractor to maintain the proper curing environment during initial cure will not be basis for claim against the Department.

All costs associated with providing, locating, relocating, maintaining, and securing the adequate number of portable initial curing facilities for both the QC and QA strength test specimens will be included in the applicable unit prices for the concrete items. No additional payment will be permitted. The Contractor is responsible for damage, theft, subsequent replacement, and removal after completion of the work for each curing facility used on the project.

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**APPENDIX 1
FOR
OPTIMIZED AGGREGATE GRADATION**

1. Scope.

1.1 This method covers the procedures for determining optimized aggregate gradations for Portland Cement Concrete (PCC).

2. Applicable Documents.

2.1 Michigan Department of Transportation (MDOT) Standard Specifications for Construction.

2.2 ASTM and AASHTO Standards:

ASTM D 4791 Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate

AASHTO T 11 Materials Finer than No. 75 μm (No. 200) Sieve in Mineral Aggregates by Washing

AASHTO T 27 Sieve Analysis of Fine and Coarse Aggregates

AASHTO T 248 Reducing Samples of Aggregate to Testing Size

2.3 Michigan Test Methods (MTM):

MTM 107 Sampling Aggregates

MTM 108 Materials Finer than No. 75 μm (No. 200) Sieve in Mineral Aggregates by Washing

MTM 109 Sieve Analysis of Fine, Dense Graded, Open Graded and Coarse Aggregates in the Field

MTM 110 Determining Deleterious and Objectionable Particles in Aggregates

3. Materials.

3.1 Refer to 902.03.C in the Standard Specifications for Construction for coarse, intermediate, and fine aggregate size definitions and physical requirements, except that the maximum Loss by Wash per MTM 108 for intermediate aggregate is 3.0 percent.

No more than 15 percent of aggregates from a quarried carbonate source may pass the #4 sieve.

Aggregate with a freeze-thaw dilation greater than 0.040 percent retained on the 1/2 inch sieve cannot constitute more than five percent of the total combined aggregate.

3.2 General Aggregate Requirements.

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3.2.1 **Aggregate Sources.** A listing of aggregate sources meeting the specified values for freeze-thaw dilation and absorption is available from the Engineer.

3.2.2 **Stockpiles.** The Contractor must provide a detailed stockpile management plan, describing process controls for shipping, handling, and storage of each aggregate (including the use of radial stackers with elevating conveyors) to minimize segregation and contamination, including proposed method(s) for aggregate quality control.

Production mixes can only be produced from stockpiles tested under the Contractor's Quality Control Plan for materials that represent that day's production gradation.

3.2.3 **Preconditioning.** All coarse and intermediate aggregates must be maintained at a minimum of saturated surface-dry condition prior to batching concrete.

3.2.4 **Verification of Physical Requirements.** The Contractor must provide the Engineer with written verification from the aggregate supplier(s) that the coarse, intermediate, and fine aggregates meet the specified physical requirements. Acceptable verification must include records of the supplier's quality control tests and supporting documentation, including most current MDOT freeze thaw test results.

3.3 **Aggregate Particle Size Requirements.** Maximum aggregate size for each optimized gradation will depend on the minimum concrete pavement thickness and application.

Pavements with a minimum thickness of concrete ≥ 6 inches = 2 inch maximum particle size aggregate

Pavements with a minimum thickness of concrete < 6 inches = 1½ inch maximum particle size aggregate

All other applications = 1½ inch maximum particle size aggregate

4. Procedure.

4.1 Sampling.

4.1.1 Obtain three samples of each individual coarse, intermediate, and fine aggregate using the mini-stockpile method in accordance with MTM 107. One mini-stockpile of each individual coarse, intermediate, and fine aggregate can be used to obtain all three samples of each individual coarse, intermediate, and fine aggregate.

Development of the initial Job Mix Formula may utilize historical pit gradations along with the aggregate samples described above.

4.1.2 All sampling must be performed by a Michigan Certified Aggregate Technician (MCAT).

4.2 Mechanical Analysis.

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- 4.2.1 Combine the three samples from each individual coarse and intermediate aggregate and reduce using Method B from AASHTO T 248. Combine the three samples from each fine aggregate and reduce using Method C from AASHTO T 248. After combining and reducing samples, perform a mechanical analysis on each of the coarse, intermediate and fine aggregate samples in accordance with AASHTO T 11 and AASHTO T 27. Use the following nest of sieves for the mechanical analysis:
- 2 inch, 1½ inch, 1 inch, ¾ inch, ½ inch, ⅜ inch, No.4, No. 8, No. 16, No. 30, No. 50, and No. 100
- 4.2.2 All mechanical analyses must be performed by a Michigan Certified Aggregate Technician (MCAT).
- 4.3 Use the gradations for each of the coarse, intermediate, and fine aggregates as determined in sections 4.1 and 4.2 of this Appendix for all calculations described in section 4.4 of this Appendix.
- 4.4 Determination of Optimum Aggregate Proportions.
- 4.4.1 Combining Aggregate Gradations. Multiply the relative percentage for each classification of individual aggregate by the percent passing for each respective sieve. Add the resulting values based on each sieve size, for all aggregate classifications and divide by 100.

Note: "Relative Percentage" is the percent that each individual aggregate classification represents of the total combined aggregate blend. The sum of the relative percentages must equal 100 percent.

$$P = \frac{C(c) + I(i) + F(f)}{100}$$

P = Theoretical combined percent passing of a given sieve

C,I,F = Percent passing given sieve for Coarse, Intermediate, and Fine aggregate classification, respectively.

c,i,f = Relative percentage of total aggregate content.

Example from Table 1:

Theoretical combined percent passing the ½ inch sieve ($P_{1/2 \text{ inch}}$)

$$P_{1/2 \text{ inch}} = \frac{35(51.0) + 100(8.0) + 100(41.0)}{100} = 66.9\% \text{ passing}$$

Convert the theoretical combined gradation percent passing to the theoretical combined gradation percent retained by subtracting the theoretical combined percent passing on the top sieve from 100. The theoretical combined gradation percent retained for each subsequent sieve is then calculated by subtracting its respective theoretical combined gradation percent passing from the preceding larger sieve's theoretical combined gradation percent passing.

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This procedure may require a number of iterations to determine the desired proportion for each coarse, intermediate, and fine aggregate in efforts to produce an optimized combined gradation that meets the requirements for the project. There are software programs available to assist in the process.

Table 1: Example of Combining Aggregate Gradations

Sieve	Aggregate Classification			Theoretical Combined Gradation %Passing	Theoretical Combined Gradation %Retained
	Coarse Aggregate	Intermediate Aggregate	Fine Aggregate		
Relative Percent	51.0	8.0	41.0		
	Percent Passing				
2 inch	100	100	100	100.0	0.0
1½ inch	100	100	100	100.0	0.0
1 inch	83	100	100	91.3	8.7
¾ inch	65	100	100	82.2	9.2
½ inch	35	100	100	66.9	15.3
⅜ inch	14	100	100	56.1	10.7
No. 4	2.1	33	96	43.1	13.1
No. 8	0.9	2.8	82	34.3	8.8
No. 16	0.8	2.3	63	26.4	7.9
No. 30	0.7	1.8	37	15.7	10.8
No. 50	0.5	1.2	9.4	4.2	11.5
No. 100	0.4	0.7	1.0	0.7	3.5

4.4.1.1 Additional Requirements. The following conditions must also be met by the optimized aggregate blend.

- 4.4.1.1.1 The maximum theoretical combined gradation percent retained on a single sieve must be on a sieve larger than the ¾ inch sieve.
- 4.4.1.1.2 The maximum theoretical combined gradation percent retained value must be equal to or greater than the theoretical combined gradation percent retained on any sieve smaller than the ½ inch sieve.
- 4.4.1.1.3 The sum of the theoretical combined gradation percent retained on any two adjacent sieves must be at least 13 percent, except for the maximum sieve size, nominal maximum sieve*, No. 100, and No. 200 sieves.
- 4.4.1.1.4 The theoretical combined gradation percent retained must be at least five percent for each sieve, except for the maximum sieve size, nominal maximum sieve*, No. 100, and No. 200 sieves, and at least eight percent retained on the 1 inch sieve for optimized blends with 2 inch maximum size aggregate or at least five percent retained on the

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$\frac{3}{4}$ inch sieve for optimized blends with $1\frac{1}{2}$ inch maximum size aggregate.

*The nominal maximum sieve is the $1\frac{1}{2}$ inch sieve for an aggregate with a 2 inch maximum size and the 1 inch sieve for an aggregate with a $1\frac{1}{2}$ inch maximum size.

- 4.4.2 Coarseness Factor. Use the optimized aggregate blend and the following formula to calculate a Coarseness Factor (CF).

$$CF = \frac{[\text{combined \% retained on } \frac{3}{8} \text{ inch sieve and above}]}{[\text{combined \% retained on No.8 sieve and above}]} \times 100$$

Example (see Table 1):

$$CF = \frac{10.7+15.3+9.2+8.7}{8.8+13.1+10.7+15.3+9.2+8.7} \times 100 = 66.7 \approx 67$$

- 4.4.3 Workability Factor. Use the optimized aggregate blend and the following formula to calculate a Workability Factor (WF).

$WF^* = \text{Combined \% Passing No.8 Sieve}$

Example (see Table 1):

$$WF = 34.3 \approx 34$$

*Increase the calculated WF by 2.5 percent for each increase of 94 pounds of cementitious material over 564 pounds per cubic yard.

- 4.4.4 CF vs. WF Chart. Plot the coarseness factor vs. workability factor (CF calculated in 4.4.2 and the WF calculated in 4.4.3) on the CF vs WF chart (see Figure 1).

4.4.4.1 Job Mix Formula (JMF) Zone. The Contractor's initial proposed optimized aggregate gradation to be used in production, as submitted to the Engineer in the Initial Mix Design, must plot within the Job Mix Formula Zone Boundary of the CF vs WF chart (see Figure 1).

4.4.4.2 Operating Zone. The Contractor must not use an optimized aggregate gradation for production that plots outside of the Operating Zone Boundary of the CF vs WF chart (see Figure 1).

- 4.4.5 Loss by Wash (LBW). The combined aggregate gradation must not have a loss by wash (MTM 108; percent passing No. 200) of greater than 2.0 percent based on dry weight.

- 4.4.6 Finalized Combined Gradation Report. The Contractor must submit to the Engineer a report containing the individual gradation analysis report for each

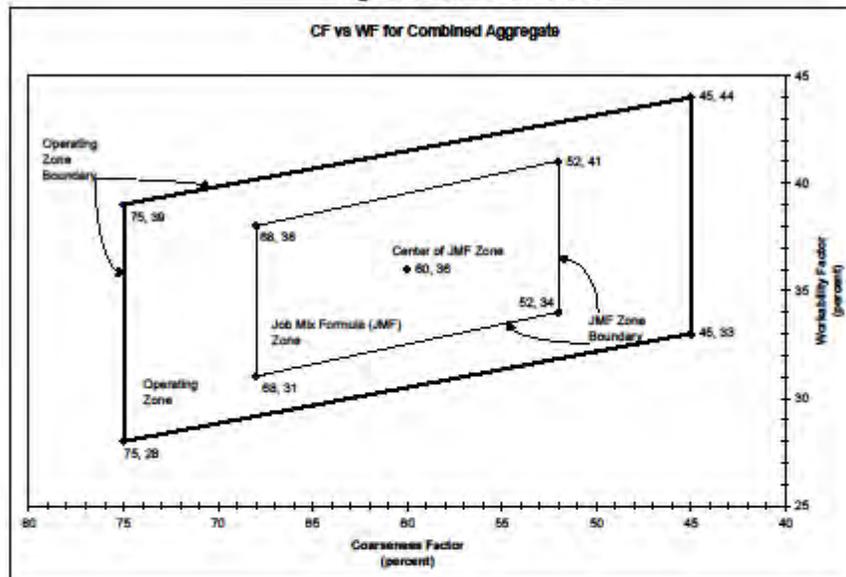
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course, intermediate, and fine aggregate, and the Combined Aggregate Gradation documentation (see Table 1) and corresponding Coarseness Factor and Workability Factor charts (see Figure 1) with each Job Mix Formula for the Engineers approval prior to concrete production.

Figure 1: CF vs WF Chart



5. Process Control During Concrete Production.

5.1 Production Gradation. A Production Gradation is a combined aggregate gradation (described in section 4 of this Appendix) that is used during concrete production.

Produce aggregate batch weights to reflect most current Production Gradation results.

5.1.1 The Contractor must produce one Production Gradation prior to initial startup and one randomly during each subsequent day of production thereafter that represents materials to be used during the next day's production. When approved by the Engineer, projects using 20 cubic yards or less of concrete per day for elements other than bridge decks may reduce the Production Gradation frequency to one per week of production. Each of these Production Gradations must be performed and completed, including aggregate proportion adjustments, to ensure that the CF vs WF will plot within the Action Limits Boundary (see subsection 5.2) prior to concrete production.

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5.1.2 The Contractor must provide a Production Gradation Report verifying the completion, and results, of a Production Gradation to the Engineer prior to any production for that day. The Contractor must also provide a Production Gradation Report to the Engineer for any additional Production Gradation performed under the Contractor's Quality Control (see subsection 6.1.1.2).

5.1.2.1 The Production Gradation Report must include, but is not limited to, the following:

5.1.2.1.1 Contract Number (Control Section/Job Number).

5.1.2.1.2 Name of Contractor.

5.1.2.1.3 Date of Sampling and Testing and date test represents.

5.1.2.1.4 Individual aggregate gradations.

5.1.2.1.5 Combined aggregate gradations including the Theoretical Combined Gradation Percent Retained for each sieve (see Table 1).

5.1.2.1.6 Optimized aggregate proportions – report in relative percentages and resulting batch weights.

5.1.2.1.7 CF and WF calculations.

5.1.2.1.8 Signed by a responsible representative of the Contractor.

5.2 Corrective Action Limits. Action Limits will be determined and documented by the Contractor in the Quality Control Plan. Action Limits must not extend beyond the Operating Zone Boundary described in 4.4.4.2 (see Figure 2). Any Production Gradation (5.1) that plots outside of the Action Limits will require the Contractor to perform all necessary corrective actions detailed in the Quality Control Plan (see subsection 6.1.1.3) to return to within the documented Action Limits Boundary. The Contractor must notify the Engineer whenever the process approaches an action limit.

5.3 Suspension of Work Limits.

5.3.1 The Contractor must stop production and perform all necessary corrective actions detailed in the Quality Control Plan (see subsection 6.1.1.3) to return to within the documented Action Limits Boundary if any Production Gradation (5.1) has a plotted CF vs WF value that is outside the Operating Zone Boundary described in 4.4.4.2.

The Contractor must notify the Engineer whenever the process approaches a Suspension Limit.

After corrective action has been performed, a new Production Gradation (5.1) must be established to verify that the corrective actions were successful. Production will not be allowed to continue until a new Production Gradation (5.1) results in a CF vs WF that plots within the Action Limits Boundary. This new

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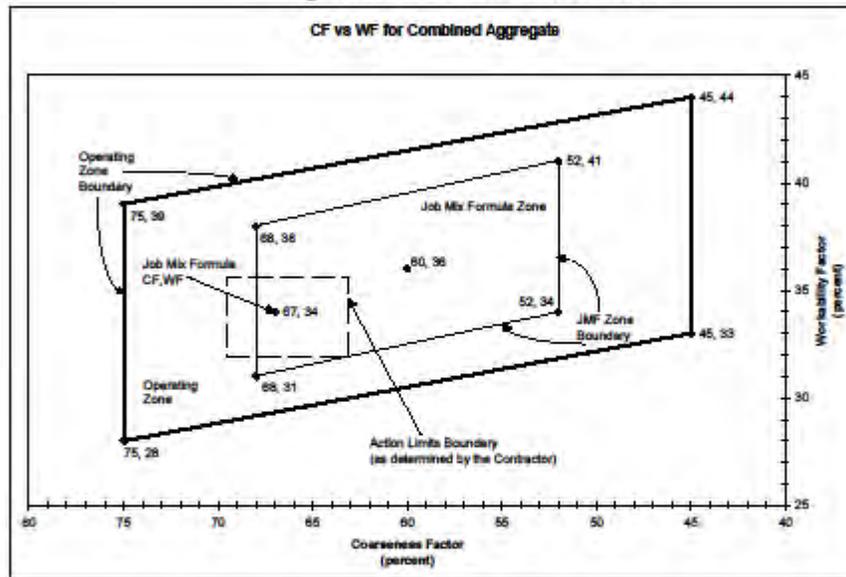
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Production Gradation (5.1) must then be used for process control and a new Production Gradation Report must be given to the Engineer.

- 5.3.2 The Contractor must stop production, perform all necessary corrective actions detailed in the Quality Control Plan (see subsection 6.1.1.3), and notify the Engineer and Region Materials Supervisor if any combined individual gradation (see 4.1 and 4.2) does not meet the requirements described in section 7 of this Appendix. Resume production only after receiving a Notice to Resume Work (Form 1165) from the Engineer.

Figure 2: CF vs WF with Action Limits



6. Quality Control for Optimized Aggregate Gradation.

6.1 Quality Control Plan.

6.1.1 Elements of the Plan. The plan must address all elements that affect the quality of the aggregate, including but not limited to, the following:

- 6.1.1.1 Stockpile management (see subsection 3.2.2).
- 6.1.1.2 The frequency of sampling and testing including additional Production Gradation beyond the minimum required in subsection 5.1.1 of this Appendix.

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6.1.1.3.1 Corrective actions to be taken when CF vs WF is outside of Action Limits Boundary.

6.1.1.3.2 Corrective actions to be taken when CF vs WF is outside of Operating Zone Boundary.

6.1.1.3.2 Corrective actions to be taken when an averaged gradation is non-compliant with section 7 of this Appendix.

6.1.1.4 Methods for verifying Production Gradations.

6.2 Documentation. The Contractor must maintain records of all inspections and tests. The records must indicate the nature and number of observations made, the number and type of deficiencies found, the quantities represented by the test, and any corrective action taken. Copies must be submitted to the Engineer as work progresses.

6.2.1 A control chart and running tabulation of individual test results must be prepared for the following tests. These must be available to the Engineer at any time and submitted to the Engineer weekly in a format acceptable to the Engineer.

6.2.1.1 Gradations for both individual and combined aggregates.

6.2.1.2 Moisture content of aggregates.

6.2.1.3 Coarseness Factor.

6.2.1.4 Workability Factor.

6.2.2 Submit within 24 hours of sampling a copy of all documentation for each Production Gradation to the Engineer, including a copy of the respective Production Gradation Report (see subsection 5.1.2). Report coarse, intermediate, and fine aggregate proportions from each Production Gradation in relative percentage and resulting batch weights for each aggregate. Attach a copy of all respective concrete production batch tickets to the documentation for each Production Gradation.

6.3 Non-Compliant Materials. The Contractor must establish and maintain an effective and positive system for controlling non-compliant materials, including procedures for their identification, isolation and disposal. Reclaiming or reworking of non-complying materials must be in accordance with procedures acceptable to the Engineer.

All non-compliant materials and products must be separated and clearly identified to prevent use, shipment, and contamination with conforming materials.

The Contractor must take prompt action to correct and document conditions that have resulted, or could result, in the incorporation of non-compliant materials and update the Quality Control plan if necessary.

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6.4 All sampling and testing performed under the Contractor's Quality Control Plan for optimized aggregate gradation must be performed by a Michigan Certified Aggregate Technician (MCAT). Each quality control person performing quality control sampling of aggregates on the project will be required to demonstrate to MCAT certified Department personnel proper sampling of coarse, intermediate and fine aggregate prior to batching concrete. The sampling will be done according to Michigan Test Method 107 using the mini-stockpile procedure.

7. Aggregate Physical Properties Reports.

7.1 Prior to the pre-production meeting, the Contractor must submit test reports from the aggregate producer verifying that the aggregates meet the physical requirements of this appendix. The reports must include, but are not limited to:

7.1.1 Coarse Aggregate:

- Freeze-thaw Report (MDOT report)
- Flat and Elongation Report (Aggregate Producer report)
- Mechanical Analysis (Aggregate Producer report)
 - Includes Gradation, Loss By Wash and Deleterious results.
 - Deleterious results will include at least the following: Soft Particles %, Chert Particles %, Sum of Soft and Chert %, sum of Coke and Coal %, and Clay-Ironstone %.

7.1.2 Intermediate Aggregate:

- Freeze-thaw Report (MDOT report)
- Mechanical Analysis (Aggregate Producer report)
 - Includes Gradation, Loss By Wash, and Deleterious results
 - Deleterious results include at least the following: Soft Particles %, Chert Particles %, Sum of Soft and Chert %, sum of Coke and Coal %, and Clay-Ironstone %.

7.1.3 Fine Aggregate:

- Organic Impurities results (Aggregate Producer report)
- Mechanical Analysis (Aggregate Producer report)
 - Includes Gradation, Loss By Wash, and Fineness Modulus

8. Acceptance.

8.1 Acceptance of the coarse, intermediate and fine aggregates will be conducted in accordance with the *Michigan Quality Assurance Procedures Manual*, except for the following:

8.1.1 The minimum sampling and testing frequency for each individual aggregate will be one per 5,000 tons (one per project for projects less than 5,000 tons).

8.1.2 Sampling for acceptance will be taken from aggregate stockpiles located at the concrete batching facility on a per project basis. Sampling will be taken using the mini-stockpile method in accordance with MTM 107.

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- 8.1.3 The Department will perform a mechanical analysis for each individual aggregate in accordance with MTM 108 and MTM 109 utilizing the sieve nest listed in subsection 4.2.1 of this appendix.
- 8.1.3.1 The Department will verify the Loss by Wash of each aggregate based on the results included in the aggregate physical properties reports described in section 7 of this appendix.
- 8.1.3.2 The Department will verify the ability of the aggregates to be optimized. The mechanical analysis generated from the acceptance tests for each individual aggregate will be combined as described in subsection 4.4 of this appendix. The relative percentage for each classification of individual aggregate will be the actual relative percentages used during concrete production at the time the acceptance samples were obtained by the Department, as documented by the Contractor generated Production Gradation report. Acceptance will be based on the ability of the combined aggregate gradation to plot within the Operating Zone Boundary of the CF vs WF chart described in subsection 4.4.4.2 of this appendix.