Page 169 of 204: insert the following:

ITEM 9240050 – MISCELLANEOUS WORK (INTELLIGENT COMPACTION OF ASPHALTIC CONCRETE MIXTURES):

1. Description:

The work under this item shall consist of compaction of asphaltic concrete mixtures utilizing Intelligent Compaction (IC) as additional means to achieve the required compaction of asphaltic concrete placed under Section 416 of the specifications. IC is defined as the process that uses vibratory rollers equipped with a measurement/documentation system that automatically records various critical compaction parameters correlated to agency standard testing protocols in real-time during the compaction process. IC uses roller vibration measurements to assess the mechanistic properties of the underlying compacted materials to ensure optimum compaction is achieved through continuous monitoring of the compaction operation. The IC information is displayed visually and mapped on on-board monitors relative to Global Positioning System (GPS) information.

The contractor shall supply IC rollers and other associated equipment necessary to complete the compaction requirements for the asphaltic concrete mixture specified herein. The contractor shall determine the number of IC rollers to use depending on the scope of the project. IC roller(s) shall be positioned in the initial (breakdown) and intermediate phases in the paving compaction sequence. The intention of the IC roller(s) placed in the breakdown phase is to obtain stiffness, temperature, and rolling coverage data. The primary intention of the IC roller placed in the intermediate phase is to collect temperature and rolling coverage data as vibratory compaction (stiffness data) should only occur if temperatures are sufficient for such compactive effort.

2. Equipment:

The equipment supplied by the contractor to accomplish the IC compaction as specified herein shall consist, at a minimum, of IC compatible rollers, IC equipment including integrated on-board display, Global Positioning System (GPS) equipment, and IC data processing, recording, and transfer software.

2.01 IC Rollers:

All breakdown and intermediate rollers shall be IC rollers. IC rollers shall be self-propelled double-drum vibratory rollers equipped with an accelerometer mounted in or about each drum to measure the interactions between the rollers and compacted asphaltic concrete in order to evaluate the applied compactive effort. IC rollers shall also be equipped with a non-contact temperature sensor on both the front and rear of the roller for measuring pavement surface temperatures.

The IC rollers may be either rollers manufactured as such or rollers that are retrofitted with IC equipment meeting the requirements specified herein.

Each IC Roller shall be equipped with GPS radio and receiver units to monitor the drum locations and track the number of passes of the rollers.

The data obtained and output from the IC rollers is designated as Intelligent Compaction Measurement Values (IC-MVs) that represent the stiffness of the asphaltic concrete mixture to which the compactive effort is being applied based on the vibration of the roller drums and the resulting response from the underlying materials.

The IC rollers shall include an integrated on-board documentation system that is capable of displaying real-time color-coded maps which include IC-MVs, pavement surface temperatures, and number of roller passes. IC roller speed and roller drum vibration frequency and amplitude shall also be indicated on the display.

IC display units shall be mounted on each roller such that the roller operator can clearly observe and interpret the real-time IC information as it is presented on the display for purposes of making adjustments to improve the rolling operation. The display units shall be capable of transferring the IC data by means of a USB port or wirelessly to a web-based user interface providing network storage, also known as the "cloud."

Optionally, the IC rollers may have an on-board printer capable of printing the identity of the roller, the date of the measurements, construction area being mapped, percentage of the construction area mapped, target IC-MVs, and areas not meeting the target IC-MVs.

2.02 Global Positioning System (GPS):

(A) General:

The contractor shall provide a GPS system that meets the following requirements. The intent of the GPS requirements is to achieve accurate and consistent GPS measurements among all GPS devices on the project. Conversions of GPS data need to be minimized to avoid errors introduced during the process.

All GPS devices for this project shall be set to the same coordinate datum/system regardless of whether GPS or grid data are originally recorded. The State Plane Coordinate System is the preference and shall be set to "0202 – Arizona Central" for this project. If State Plane coordinates are not available, the Universal Transverse Mercator (UTM) coordinate system can be used and set to "Zone 12S" for this project. Use of UTM will facilitate GPS data checks on-site. The records shall be recorded in standard US units, converted from metric units if necessary. Ad-hoc local coordinate systems will not be permitted.

(B) Definitions:

1. Global Positioning System (GPS): A space-based satellite navigation system that provides location and time information in all weather, anywhere on or near the Earth to determine the location in geodetic coordinates. In this specification, GPS refers to all GPS-related signals including US GPS and other Global Navigation Satellite Systems (GNSS).

2. Hand-Held GPS rover: A portable GPS radio/receiver for in situ point measurements.

3. GPS Base Station: A single ground-based system that consists of a GPS receiver, GPS antenna, radio and radio antenna to provide L1/L2 differential GPS correction signals to other GPS receivers within a range limited by radio, typically 3 miles (4.8 km) in radius without repeaters.

4. RTK-GPS: Real Time Kinematic Global Positioning Systems based on the use of carrier phase measurements of the available GPS signals where a single reference station or reference station network provides the real-time corrections in order to achieve centimeter-level accuracy.

5. Network RTK: A system that uses multiple bases in real-time to provide high-accuracy GPS positioning within the coverage area that is generally larger than that covered by a ground-based GPS base station; e.g. Virtual Reference Station (VRS).

6. GPS Correction Service Subscription: A service that can be subscribed to receive VRS signals in order to achieve higher accuracy GPS positioning normally via cellular wireless data services; i.e., without the need for a ground-based station. Examples of GPS Correction Service subscriptions are: Trimble VRSTM, Trimble VRS NOWTM, OmniSTAR, etc.

7. UTM Coordinates: Universal Transverse Mercator (UTM) is a 2-dimensional Cartesian coordinate system that divides the surface of the Earth between 80°S and 84°N latitude into 60 zones, each 6° of longitude in width and centered over a meridian of longitude. "Zone 12S" is bounded by longitude 108° to 114°W and is centered on the 111th west meridian. The UTM system uses projection techniques to transform an ellipsoidal surface to a flat map that can be printed on paper or displayed on a computer screen. Note that UTM is metric based.

8. Geodetic Coordinates: A non-earth-centric coordinate system to describe a position in longitude, latitude, and altitude above the imaginary ellipsoid surface based on a specific geodetic datum.

WGS-84 and NAD83 datum are required for use with UTM and ADOT Plans, respectively.

9. ECEF XYZ: Earth-Centered, Earth-Fixed Cartesian X, Y, Z coordinates.

10. Grid: Referred to as ECEF XYZ in this specification.

11. GUI Display: Graphical User Interface Display.

12. State Plane Coordinate System: A set of 124 geographic zones or coordinate systems designed for specific regions of the United States. Each state contains one or more state plane zones, the boundaries of each, usually follow county lines. The current State Plane coordinate system is based on NAD83. Issues may arise when a project crosses state plane boundaries. "Zone 0202 – Arizona Central" includes the counties of Coconino, Maricopa, Pima, Pinal, Santa Cruz, and Yavapai.

13. UTC: Coordinated Universal Time (UTC) is commonly referred to as Greenwich Mean Time (GMT) and is based on a 24-hour time scale from the mean solar time at the Earth's prime meridian (zero degrees longitude) located near Greenwich, England.

(C) GPS System Requirements:

The contractor shall provide the GPS system, including GPS receivers on IC rollers and hand-held GPS receivers (Rovers), which makes use of a single reference system that can be either a ground-based base station or a network-RTK, to achieve RTK-GPS accuracy. Examples of combinations are:

1. GPS receivers on IC rollers and hand-held GPS rovers referenced to the same on-ground base station.

2. GPS receivers on IC rollers and hand-held GPS receivers referenced to the same network-RTK.

(D) GPS Data Records and Formats:

The recorded GPS data, whether from the IC rollers or hand-held GPS rovers, shall be in the following formats:

1. Time: The time stamp shall be in military format, hhmmss.ss in either UTC or local time zone. The required differential sequence of IC data points during post process is 0.01 seconds.

2. GPS: Latitudes and longitudes shall be in ddmm.mmmmmmmm or decimal degrees, dd.dddddddd. Longitudes are negative values when measuring westward from the Prime Meridian.

3. Grid: Coordinates shall be recorded to the nearest 0.01 feet.

When importing IC-MV data into the data analysis management program, the GPS data and associated IC measurements shall be stored with minimum data conversions and minimum loss of precision. Users can then select the unit of preference to allow real-time unit conversion for the GUI display.

(E) Post-Process GPS Check:

The contractor shall import the IC roller data and GPS point measurement from the roller into standard data analysis software (Veda) following vendor-specific instructions for exporting IC-MV data to Veda compatible formats and visually inspect the IC map and point measurements on the Veda display to confirm consistency.

2.03 Data Analysis Software:

Veda is available on the website www.intelligentcompaction.com. The software program will utilize the IC-MV data from the IC roller for analysis of coverage, uniformity, and stiffness values during construction operations. As a minimum, the following Essential IC Data Header Information and Essential IC Data Elements shall be available for post-processing.

(A) Essential IC Data Header Information for each Data File or Section:

1. Section (Direction, Route, Lane, Stationing)
2. Machine Manufacturer
3. Machine Type
4. Machine Model
5. Drum Width (ft)
6. Drum Diameter (ft)
7. Machine Weight (tons)
8. Name index of intelligent compaction measurement values (IC-MVs)
9. Unit index for IC-MVs
10. Reporting resolution for independent IC-MVs (90 degrees to rolling direction, ft)
11. Reporting resolution for independent IC-MVs (in the rolling direction, ft)
12. UTM Zone
13. Offset to UTC (hrs) or local time zone

14. Number of IC data points

(B) Essential IC Data Elements for Each Data Point:

1. Date Stamp (YYYYMMDD), e.g. 20140912
2. Time Stamp (HHMMSS.SS – military format), e.g. 090504.00 (9 hr 5 min. 4.00 sec.)
3. Longitude (decimal degrees), e.g. 94.85920403
4. Latitude (decimal degrees), e.g. 45.22777335
5. Easting (ft), e.g. 454062.30
6. Northing (ft), e.g. 3891641.94
7. Elevation (ft), e.g. 7254.45 (if available)
8. Roller Pass Number, e.g. 2
9. Direction Index, e.g. 1 forward, 2 reverse
10. Roller Speed (mph), e.g. 2.0
11. Vibration on, e.g. 1 for yes, 2 for no
12. Frequency (vpm), e.g. 3500.00
13. Amplitude (ft), e.g. 0.01
14. Surface Temperature (°F), e.g. 240
15. IC-MV, e.g. 20.0

In 2.03(B), either items 3 and 4, or items 5 and 6, may be utilized for all data points. Item 14 is only required for asphaltic concrete applications. The size of the data mesh after post-processing shall be less than 18 inches (300mm) by 18 inches (300mm) in the X and Y directions.

3. IC Contractor Quality Control:

3.01 IC Contractor Quality Control Plan:

The contractor shall prepare and submit a written IC Quality Control Plan (IC-QCP) for the project at least 15 days prior to the start of paving operations. As a minimum, the IC-QCP shall contain the following information:

1. IC Quality Control Technician. The name and qualifying information of the person responsible for ensuring that the IC process is accomplished in accordance with the IC-QCP and the specifications herein.

2. IC Roller Operator(s). The person responsible for operating the IC roller(s) and attached IC equipment. Sufficient training for the roller operator(s) shall be supplied by a representative of the manufacturer or supplier of the equipment. The representative shall provide documentation, which indicates the individuals to whom training was provided, to be included in the IC-QCP, or added to the IC-QCP if such training is to occur during the On-Site Training described in 4.02.

3. IC Equipment. The roller supplier, make, roller model, number of IC rollers to be provided, and the GPS system supplier to be utilized.

4. IC Roller Data. The minimum frequency for obtaining the data from the roller shall be two times per day of asphaltic concrete compaction operations. Should the data be collected for a period of time spanning less than 4 hours in a single day, the data need only be obtained once at the completion of paving operations for such days. The data is date/time stamped which permits for external evaluation at a later time. Data from the on-board printer, if required, shall be given to the Engineer when requested.

5. Temperature Controls. The contractor shall provide details of their plans to achieve compaction prior to experiencing minimum mat temperatures. The IC roller compaction process should be completed (final IC roller pass) before the mat temperature falls below a minimum of 240° F (115° C) for the initial phase (breakdown) and 200° F (93° C) for the intermediate phase.

6. Test Sections. The contractor shall provide details indicating the optimum rolling pattern sequences and associated mat temperatures, roller speed, vibration frequency and amplitude, and roller direction obtained through analysis of the test strip IC-MVs.

3.02 IC Quality Control Technician:

The contractor shall designate a qualified quality control technician who will be responsible for the following minimum functions:

1. Daily GPS check testing for IC roller(s) and rover(s). Prior to the start of production, the contractor and representatives of the GPS and IC roller

manufacturer shall conduct the following to check the proper setup of the GPS, IC roller(s) and the rover(s) using the same datum:

a. On a location nearby, or within the project limits, the GPS base station (if required by the GPS system) shall be established and the IC roller and the GPS rover tied into the same base station.

b. Verification that the roller and rover are working properly and that there is a connection with the base station.

c. Production shall not begin until proper GPS verification has been obtained. IC vendors' recommended verification process can be used to augment the following procedure:

1. Move the IC roller around until the GPS header computation is initialized.

2. Move the IC roller and park the roller at a selected location.

3. Record the GPS measurements from the IC roller, ensuring the distance offsets are applied so that the GPS coordinates are recorded at the center or at the left/right edges of the front drum.

4. Mark two locations on the ground adjacent to the right and left edges of the front drum contact patch.

5. Move the IC roller from the marked locations.

6. Use a hand-held rover to obtain a GPS measurement at the marked locations.

7. If the roller GPS measurement is offset from the center of the front drum, average the rover GPS measurements. The difference between the roller GPS measurement and the measurement determined by the rover shall be within 12 inches for northing and easting.

d. The project plan file provided by ADOT shall be uploaded into the IC Data analysis software and depending on the roller manufacturer, the on-board IC computer.

e. GPS check testing shall be conducted daily during production operations to ensure consistency and accuracy of GPS measurements for all GPS devices prior to the paving and compaction operations.

2. Test section construction to establish target compaction pass counts, roller speed and vibration frequency and amplitude, and target values for the

density of the asphaltic concrete using standard testing practices; i.e. nuclear density gauges, pavement cores, etc.

3. Monitoring of the construction operations and specifically of the IC roller(s) during production and final evaluation operations.

4. Quality control testing to monitor the pavement temperature and the required level of compaction.

5. Daily download, storage, and analysis of the IC data from the roller(s). A copy of the raw IC data shall be provided to the Engineer within one working day of obtaining the roller data and test results.

6. Daily set-up, take-down, and secure storage of GPS and IC roller components.

3.03 IC Test Sections:

IC test section evaluations are intended to verify the asphaltic concrete mixture volumetric properties and determine a curve of the asphaltic concrete compaction in relationship to the number of roller passes, roller settings, and to the stiffness of the mixture to optimize the rolling operation while meeting in-place compaction requirements as specified in Subsection 416-7.05.

IC test section evaluations shall be conducted for each lift and shall be approximately 500 to 1000 tons of mainline mixture or may correspond to a mix/compaction test strip. The IC roller in the initial phase should use low vibration amplitude and the same settings (speed, frequency) throughout the section. After each roller pass, a non-destructive nuclear density device shall be used to estimate the density of the asphaltic concrete at a minimum of five locations uniformly spaced throughout the test section. The density readings and the number of roller passes that are necessary to achieve the desired compaction shall be recorded.

(A) Breakdown Phase:

For the initial (breakdown) phase, the target density will be the peak of the non-destructive readings within the desired compaction temperature range for the asphaltic concrete mixture. The IC data analysis software will create an IC compaction curve for the mixture using the IC roller data. The target IC-MV is the point when the increase in the IC-MV of the mixture between consecutive roller passes is less than five percent on the compaction curve. The IC compaction curve is defined as the relationship between the IC-MV and the roller passes.

Linear regression relationships between the density point test results and the IC-MV results shall be used to establish a target IC-MV and optimum rolling pattern.

(B) Intermediate Phase:

For the intermediate phase, the target density will be that which corresponds to the target in place air voids content. The IC data analysis software will create an IC compaction curve for the mixture using the IC roller data. The target IC-MV is the point where the IC-MV of the material is within -2% to +1% of the target in-place air voids content. From this curve the optimum rolling pattern shall be determined.

A linear regression relationship between the density point test results and the IC-MV results shall be used to establish a target IC-MV which corresponds to acceptable in-place compaction requirements.

Core information shall be used to confirm that the target IC-MVs and the optimum rolling pattern result in achieving desired compaction. If such results are not achieved, an additional IC test section shall be constructed. Should subsequent core results not correlate with IC data from the additional IC test section, IC stiffness data obtained during the Intermediate Phase shall be informational only and the rolling pattern used during normal production shall be established by conventional in-place quality control density tests. In such cases, the coverage criteria, as described in 4.04(A), will remain applicable to the paving operation.

The rolling pattern used to achieve the target IC-MV for both the breakdown and intermediate phase shall be included in the documentation submitted to the Engineer for the test section.

3.04 Mapping:

(A) Pre-Paving Mapping:

Pre paving mapping with an IC roller of the underlying materials is recommended to be completed prior to the tacking operation to identify weak areas and may be part of the test section evaluation(s) on the project or independently performed. Pre-paving mapping should be at least 500 feet in length and conducted on mainline paving areas. Underlying materials include treated or non-treated subgrades, treated or non-treated aggregate bases, and milled or non-milled pavement. However, pre-paving mapping on milled or non-milled asphalt pavements is recommended but should only be performed if such activity is considered permissible by the manufacturer or vendor of both the roller and the IC equipment. Pre-paving mapping operations are intended to provide the contractor an understanding of the stiffness of the existing surface to be paved. Subsequent pre paving mapping may be conducted at any time prior to the paving operation to understand the changes in the roadway that affect the target IC-MV or the density verification testing. The contractor's intentions and procedures for performing pre-paving mapping should be included in the IC-QCP.

(B) Mapping During Production:

During production, analysis of the IC data should indicate complete and uniform compaction coverage with the IC roller(s) and consistent IC-MV data. Should the data indicate otherwise, and if not anticipated due to pre-paving mapping, the contractor shall investigate to determine the cause and take corrective action to obtain uniform compaction coverage. If the cause cannot be determined, the contractor shall obtain assistance from the IC equipment vendor's representative to further investigate and determine the cause of the inconsistent data. The cause, and corrective action taken, shall be explained and provided in writing to the Engineer. Increased coverage and variations in IC-MVs are expected where pre-paving mapping has indicated underlying materials to be relatively less stiff when compared to the prevailing stiffness values.

3.05 Response to Test Results:

The response to quality control tests for the test sections and during production compaction shall include the following:

1. Temperature. The procedures for corrective action when the QC or IC temperature readings are not within the recommended laydown values for the asphaltic concrete mixture.

2. Compaction. The procedures for corrective action when the in-place void content falls below or exceeds the acceptable range as specified in Subsection 416-7.05(B).

3. IC Coverage Area and Uniformity Criteria. The procedures for corrective action when the IC criteria for coverage or minimum IC-MV target criteria, as specified in 4.04, are not being satisfied.

3.06 IC Documentation:

A comprehensive IC Report shall be submitted to the Engineer at completion of the project. A Weekly IC Report shall be included with submission of the Weekly Quality Control Report required by Subsection 106.04(C)(6). IC roller data shall be submitted daily. The documentation shall include the following information pertaining to the IC operation:

1. Equipment. Documentation of the manufacturer, model, and type of paver and rollers used each day of paving operations. The positioning of the IC roller(s) in the paving operations shall be noted.

2. IC Roller Data. The electronic data (from the IC roller(s) and the data analysis software) shall be provided to the Engineer upon the completion of each Test Section and compaction of each IC lot as defined in 4.03.

3. IC Roller Analysis. The contractor shall analyze the IC roller data for conformance to the requirements for coverage area and uniformity

and will submit the results to the Engineer at the completion of each lot and prior to paving of a subsequent lot. The submission shall include identification and discussion of any IC related compaction or coverage deficiencies or discrepancies between IC data and conventional quality control test results.

4. Contradicting Information. Should quality control tests differ significantly from the information indicated on the on-board display, such discrepancies shall be documented, the areas identified by stationing and offset from centerline, and the information included in the weekly submittal.

All-passes data includes the data from all of the passes, and final coverage data is the data from the final pass within a given area. For submission, the analyzed IC data and the original IC data shall be exported from the vendor's software in both all-passes of data and final coverage data files.

Each submission of the IC documentation shall be identified by reference to the corresponding compaction lot(s).

The comprehensive IC Report shall include a summary of the daily IC roller operations and the overall effectiveness of IC as an additional means of quality control and any benefits realized or detriments suffered relating to implementation and utilization of IC. The Report shall also include a discussion of the IC lots for which the target values for IC-MV and uniformity were not achieved. Additional commentary relating to any aspect of the IC operation is encouraged.

4. IC Implementation:

4.01 Technical Assistance:

The contractor shall coordinate for on-site technical assistance from the IC roller representatives during the initial seven days of production and then as needed during remaining operations. As a minimum, the roller representative shall be present during the initial setup and verification testing of the IC roller(s). The roller representative shall also assist the contractor with data management using the data analysis software, including IC data input processing.

4.02 On-Site Training:

The contractor shall coordinate with IC equipment and software vendors to provide on-site training for contractor's and Department project personnel related to operation/utilization of the IC technology. Contractor personnel shall include the Project Manager, Paving Superintendent, QC technicians(s), and roller operator(s). Department personnel shall include, at a minimum, the Engineer, project supervisor, materials coordinator, field inspectors, and other ADOT personnel as directed by the District Engineer, Regional Materials Engineer, or District Maintenance Supervisor. The contractor shall provide an enclosed facility with electrical availability and a projector for

presentations approximately 4-8 hours in duration. The Department may assist in providing such a facility if resources are available.

Minimum training topics include:

1. Background information for the specific IC system(s) to be used.
2. Setup and checks for IC system(s), GPS receiver, base-station, and hand-held rovers.
3. Operation of the IC system(s) on the roller; i.e. setup data collection, start/stop of data recording, and on-board display options.
4. Transferring raw IC data from the roller(s); i.e. via USB connections.
5. Operation of vendor's software to open and view raw IC data files and exporting all-passes and final coverage data files in Veda-compatible format.
6. Operation of Veda software to import the all-passes and final coverage data files, inspection of IC maps, input point test data, analyze data, and produce reports for project requirements.
7. Coverage and uniformity requirements.

The contractor shall provide documentation of On-Site Training which identifies the individuals who will be performing IC related activities, the specific IC related activity(s) each individual is responsible for performing, and the specific training topics received by each identified individual. All contractor personnel shall have received, at minimum, training associated with the IC activity(s) for which the individual is responsible, prior to the individual performing any such IC related work.

4.03 IC Lots

The limits of each IC lot shall correspond to the associated compaction lot. All compaction lots placed under Section 416 shall be compacted using IC.

4.04 IC Construction Operations Criteria:

If during the rolling operations, quality control tests do not reasonably correlate to the IC information on the on-board display, or if IC lots do not meet the IC criteria (coverage and/or uniformity), such areas may be investigated by the Department prior to continuing the paving operation. Gross discrepancies, as determined by the Engineer, shall require the contractor to investigate and determine the cause for such discrepancies and take corrective action satisfactory to the Department. The IC Construction Operations Criteria does not affect the standard ADOT acceptance processes for the materials or construction operation.

(A) IC Coverage:

A minimum of 90% of each IC lot should have the same number of roller passes for each phase and meet or exceed the optimal number of roller passes. An exception to the coverage recommendation may be made if either the IC-MV target value is achieved prior to the optimum number of roller passes or the IC-MV values achieved at the optimum number of roller passes are significantly less than the target IC-MV. Such areas must be identified and discussed in the IC report.

(B) IC Uniformity:

A minimum of 75% of each IC lot should meet or exceed target IC-MV values determined from the test sections.

5. Method of Measurement:

Intelligent Compaction will be measured for payment by the lump sum as a single complete unit of work.

6. Basis of Payment:

Payment for Intelligent Compaction, measured as provided above, will be made at the contract unit price adjusted as hereinafter provided, and shall include full payment for the work related to providing the IC equipment and roller(s) including the fuel, roller operator(s), GPS system, training, data and statistical analysis, preparation of reports, and all other equipment, personnel, and activities associated with implementation and utilization of Intelligent Compaction of Asphaltic Concrete Mixtures.

Partial payments under this item will be made in accordance with the following four categories pertaining to implementation and documentation of the IC operation, each contributing a percentage, which will be adjusted based on acceptance.

The four categories and associated maximum contributing percentages are as follows:

Proper Implementation	30%
Daily Submittal of IC Data	20%
Weekly IC Reports	20%
Comprehensive IC Report	30%

Proper Implementation of IC is that which meets the requirements, as specified herein, for daily IC related activities and use of real-time IC data to achieve the criteria for IC coverage and uniformity described in 4.04(A) and (B). The contributing percentage for Proper Implementation will be calculated based on the maximum contributing percentage (30%) multiplied by the percentage of IC lots for which IC was properly implemented.

The contributing percentage for Daily Submittal of IC Data will be calculated based on the maximum contributing percentage (20%) multiplied by the percentage of IC lots and IC Test Sections for which Daily Submittal of IC Data occurred in accordance with the requirements specified herein.

The contributing percentage for Weekly IC Reports will be determined by the timely and accurate submittal of such fully completed reports. The contributing percentage will be calculated based on the maximum contributing percentage (20%) multiplied by the respective percentage of acceptable reports. Weekly IC Reports shall be submitted prior to, or with, the Weekly Quality Control Report. Weekly IC Reports that are deemed by the Engineer to be incomplete or inaccurate, after the contractor has received notification of such, will be allowed an additional two working days for revision and re-submission. Weekly IC Reports not submitted in accordance with these requirements will not be accepted.

The contributing percentage for the Comprehensive IC Report will be determined by the timely and accurate submittal of the fully completed report. If the report is acceptable, the contributing percentage will be the maximum contributing percentage (30%). The Comprehensive IC Report shall be submitted within 10 working days after the completion of IC operations. If the report is deemed by the Engineer to be incomplete or inaccurate, after the contractor has received notification of such, an additional 10 working days will be allowed for revision and re submission of the Comprehensive IC Report. If the Comprehensive IC Report is not submitted in accordance with these requirements, the maximum contributing percentage will be reduced by a value of 5% each working day for which an acceptable Comprehensive IC Report has not been submitted.

The Percent of Completion for Intelligent Compaction will be the sum of the four adjusted maximum contributing percentages.

REVISIONS TO THE BID SCHEDULE:

Attached is a revised Bid Schedule. Remove the existing Bid Schedule from your proposal pamphlet, insert the revised Bid Schedule and be guided accordingly.

fw Steve Hull
Engineer Manager

Attachment: Revised Bid Schedule

Expires 09/30/2017

November 26, 2014

ADDENDUM

(4)

TO ALL CONTRACTORS AND OTHERS INTERESTED IN PROJECT

040 CN 204 H812501C
IM-040-D(226)T
FLAGSTAFF – HOLBROOK HWY (I-40)
WALNUT CANYON TO TWIN ARROWS

SCHEDULED FOR BID OPENING ON
FRIDAY, DECEMBER 12, 2014, AT 11:00 A.M. (M.S.T.)

ADDITIONS AND REVISIONS TO ADDENDUM NO. 2:

Page 2 of 16:

ITEM 9240050 – MISCELLANEOUS WORK (INTELLIGENT COMPACTION OF ASPHALTIC CONCRETE MIXTURES): is revised as follows:

1. Description: is revised to read:

The work under this item shall consist of utilizing Intelligent Compaction (IC) technology to generate data and reports to evaluate the effectiveness of Intelligent Compaction processes in achieving the requirements of Section 416 of the specifications. However, unless otherwise specified, all provisions of Section 416 shall apply.

IC is defined as the process that uses steel drum, vibratory rollers equipped with a measurement/documentation system that automatically records various critical compaction parameters correlated to agency standard testing protocols in real time

during the compaction process. IC uses roller vibration measurements to assess the mechanistic properties of the underlying compacted materials to ensure optimum compaction is achieved through continuous monitoring of the compaction operation. The IC information is displayed visually and mapped on on-board monitors relative to Global Positioning System (GPS) information.

The intention of the IC roller(s) placed in the breakdown phase is to obtain stiffness, temperature, and rolling coverage data.

2.01 **IC Rollers:** the first paragraph is revised to read:

The contractor is advised that the first Subsection 416-7.05(B) of the specifications has been revised.

All steel drum breakdown and intermediate rollers shall be IC rollers. IC rollers shall be self-propelled double-drum vibratory rollers equipped with an accelerometer mounted in or about each drum to measure the interactions between the rollers and compacted asphaltic concrete in order to evaluate the applied compactive effort. IC rollers shall also be equipped with a non-contact temperature sensor on both the front and rear of the roller for measuring pavement surface temperatures.

Page 8 of 16:

3.01 **IC Contractor Quality Control Plan:** item five is revised to read:

5. Temperature Controls. The contractor shall provide details of their plans to achieve compaction prior to experiencing minimum mat temperatures. The IC roller compaction process should be completed (final IC roller pass) before the mat temperature falls below a minimum of 240° F (115° C) for the initial phase (breakdown) and 200° F (93° C) for the intermediate phase. However, the contractor remains responsible for meeting the compaction requirements as specified in Section 416. Failure to meet such requirements may result in a reduction in payment for material placed under Section 416.

Page 10 of 16:

3.03 **IC Test Sections:** the second paragraph is revised to read:

IC test section evaluations shall be conducted for each lift and shall be approximately 500 to 1000 tons of mainline mixture or may correspond to a mix/compaction test strip. In the initial phase, the IC roller(s) shall use low vibration amplitude and the same settings (speed and frequency) throughout the section. After each roller pass, a non-destructive nuclear density device shall be used to estimate the density of the asphaltic concrete at a minimum of five locations uniformly spaced throughout the test

section. The density readings and the number of roller passes that are necessary to achieve the desired compaction shall be recorded.

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6. Basis of Payment: the first paragraph is revised to read:

Payment for Intelligent Compaction, measured as provided above, will be made at the contract unit price adjusted as hereinafter provided, and shall include full payment for the work related to providing the IC equipment and data including the GPS system, training, data and statistical analysis, preparation of reports, and all other equipment, personnel, and activities specifically associated with implementation and utilization of Intelligent Compaction technology.

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6. Basis of Payment: the last paragraph is revised to read:

The Percent of Completion for Intelligent Compaction will be the sum of the four adjusted maximum contributing percentages. Any reductions in payment for the Intelligent Compaction payment categories specified herein will be in addition to any such reductions resulting from failure to meet the requirements of Section 416.

ADDITIONS AND REVISIONS TO THE SPECIAL PROVISIONS:

Page 32 of 204: insert the following:

(101DEFN, 7/14/14)

SECTION 101 DEFINITIONS AND TERMS:

101.02 Definitions:

Working Day: of the Standard Specifications is revised to read:

A day, exclusive of Saturdays, Sundays and State-recognized holidays, beginning at midnight, extending for a twenty-four hour period, and ending at midnight. Any Saturday, Sunday, or State-recognized holiday on which the contractor has been approved to work will also be counted as a working day. Working days on which weather conditions do not permit work on the project to proceed, as determined by the Engineer, will not be charged.