

ITEM 403 ASPHALT CONCRETE QUALITY CONTROL AND ACCEPTANCE

403.01 Description

403.02 General

403.03 Quality Control Program (QCP)

403.04 Plant Calibration

403.05 Quality Control Tests

403.06 Verification Acceptance (VA)

403.07 Not Used.

403.08 Acceptance Tables for 448 Mixes

403.01 Description. This specification outlines the Contractor requirements for controlling asphalt concrete, asphalt concrete base, or other asphalt mixtures as specified.

403.02 General. The City will determine acceptance by City Verification Acceptance (VA) tests and monitoring reviews as specified. If the Contractor fails to operate according to its Quality Control Program (QCP), the City will shut down production.

Acceptance does not relieve the Contractor of responsibility for supplying and installing a finished product conforming to all requirements of the Contract.

Follow City Supplement 1041 for the administration of a Quality Assurance Program on the Project with the exception that the membership of the Quality Control Qualification Committee (QCQC) will be determined by the City Engineer.

403.03 Quality Control Program (QCP). Create and implement a Quality Control Program (QCP) for each paving season. The QCP will cover processes conducted to provide an asphalt mixture at the paving site that is uniform in composition, conforms to the specification requirements and that when placed is free of any defect (e.g. segregation, lack of mixture and texture uniformity, raveling, rutting, holes, debris etc.) within the Contractor's control at project completion. A minimum of 3 weeks before mix production, but no later than February 28, submit the proposed QCP to the Laboratory for review and approval.

Send a copy of the approval letter and approved QCP to the Engineer. Keep copies of the approval letter and the approved QCP in each Contractor plant laboratory and plant operation control room.

Failure to comply with the approved QCP may result in removal of personnel in accordance with City Supplement 1041, removal from VA, and adversely affect the Contractor's Prequalification rating.

The QCP is a reflection of a Contractor's sincerity and ability in producing a quality product. Development of this program beyond the minimum requirements specified below is encouraged and is taken into consideration by the QCQC when reviewing Contractor plant operation for qualification for VA.

Include in the program:

A. The assignment of quality control responsibilities. Quality control includes all efforts required to achieve a product meeting specifications. The QCP will list

individuals as required below and note their designated responsibilities to meet QCP requirements. Provide a Quality Control Manager holding a City Supplement 1041 Level 3 approval and who is a company employee. Assign Level 2 technicians for all Level 2 QC testing duties only. If Level 2 consultant technicians are used, provide a document in the QCP and to the consultant listing designated responsibilities and expected actions (if different from employee expectations). Provide a Field Quality Control Supervisor, holding City Supplement 1041 Field Quality Control Supervisor approval and who is a company employee, who is routinely and usually at the paving site during placement of any non-temporary asphalt concrete pavement.

B. Provisions to meet the City mix specifications.

C. Procedures for extra testing when tests are outside warning band limits of the QCP (e.g., job start, responses to poor test results or field mix problems, aggregate stock testing, reclaimed asphalt concrete pavement checks, moistures) and any other testing necessary to control materials not already defined in these Specifications.

D. Copies of worksheets, test reports, and forms used in the quality control.

E. Procedures for record storage, test equipment maintenance, and documentation.

F. Method of Quick Calibration and documentation for each plant type.

G. Procedure for random sampling to be used and documentation method.

H. All procedures to meet the processing, testing and documentation requirements for RAP in 401.04 including test forms, record keeping, technician responsibilities, etc.

I. Procedure for ensuring that every Contractor employee involved in the testing of asphalt mix and operation of the asphalt plant facility has read the QCP and has on site access to all applicable City specifications, proposals, policies, and the current approved JMF.

J. Means to meet the handling and storage requirements of 402.08 and asphalt binder suppliers for all asphalt binders.

K. Means to meet delivered mixture uniformity/coating and hauling/trucking requirements.

L. Roles and responsibilities of the Field Quality Control Supervisors. List approved Field Quality Control Supervisors.

M. Signature of the Quality Assurance Manager and, if different, the person in authority to enforce all operations covered by the QCP as outlined in this subsection.

N. Warning bands to be used by technicians for all tests, including specific instruction on how they will be used for tests in concert with Table 441.10-1 specification requirements.

403.04 Plant Calibration. Conform to the requirements of Item 402.

Before manufacturing asphalt concrete, demonstrate to the Laboratory that the Contractor's facility adequately meets the specification requirements. Calibrate the plant using procedures approved by the City. Perform initial calibrations in the presence

403.05

of the Laboratory. The Laboratory may request a letter of certification and certified data documenting the calibration results, instead of having the Laboratory present.

Verify the calibrations biweekly using a Quick Calibration. However, the City may request additional Quick Calibrations if there are mix production problems or plant operation concerns. The Quick Calibration is a quality control procedure developed by the Contractor that verifies the accuracy of a facility to proportion materials to meet the current JMF. Include the Quick Calibration procedure and data forms in the QCP. If the difference between current calibration and the Quick Calibration is within ± 2 percent, then the current calibration is acceptable. If the 2 percent variation is exceeded, perform a recalibration of the facility. Document the Quick Calibration procedure as specified in the QCP and post the procedure and results in plain view in the plant control room and plant laboratory for reference by the Laboratory. Document all data from calibrations in a format approved by the Laboratory, and retain the data for review by the Laboratory.

If asphalt concrete is being produced from a batch type facility, verify the accuracy of the aggregate and asphalt binder weighing devices on a biweekly basis. Include the verification procedure in the QCP. Document the verification procedure as specified in the QCP and post the procedure and results in plain view in the plant control room and plant laboratory for reference by the Monitoring Team. Do not allow the deviation between the plant recorded weights and actual weights to exceed 1 percent. Record all data from verification of weighing devices in a format approved by the Laboratory, and retain the data for review by the Monitoring Team.

403.05 Quality Control Tests. Perform quality control tests to control the asphalt concrete mix within the appropriate specifications.

Perform all Item 448 mix testing and quality control according to 441.09. The Contractor may test a 448 Sublot sample instead of the required quality control test provided the sample is tested in the half day in which the Sublot sample mix was produced and is tested for all required quality control properties.

For mixes that do not use Item 448 acceptance (e.g. Items 301, and 302), test the mix according to 441.09 for asphalt binder content and gradation (Basic). Other requirements of 441.09 and 441.10 do not apply. Control the Basic mixes as follows:

A. If a single asphalt binder content is more than ± 0.5 percent beyond the JMF, immediately take and test an additional sample.

B. If two consecutive asphalt binder content tests are more than ± 0.5 percent beyond the JMF, notify the Monitoring Team and cease production until the problem is corrected.

C. If the Range difference in any three consecutive asphalt binder content tests is greater than 0.7 percent (for 302 mix) or 0.6 percent (Basic mix, other than 302) immediately notify the Monitoring Team.

D. If the Range difference in any three consecutive gradation tests for the No. 4 (4.75 mm) sieve is greater than 10.0 percent, immediately notify the Monitoring Team.

E. If Range deviations as specified continue, cease production.

Range is defined as the difference between the largest and the smallest test result.

403.06 Verification Acceptance (VA). The City will perform VA. If the random City sampling and testing verifies the accompanying Contractor tests, the results of all the Contractor's quality control tests for each day (for Basic mix) or the Contractor's tests for each Lot (for 448 mix) will determine acceptance.

A. Sampling. The City will perform the VA by testing independent and split samples taken and tested by the City.

For 441 quality control testing, the Contractor's technician will randomly select the truck in which to take a sample by using a random number procedure as outlined in the QCP. The Contractor's technician will give no indication to anyone of the time that the sample is to be taken. For other than job start, previous mix production problems, low production tonnage, or as requested by the Monitoring Team, exclude the first three trucks from sampling. Include the random number and sample tonnage location and time of taking on the daily Quality Control Report (Form TE-199) with each test. Tests, other than the required random sample tests, are at the Contractor's discretion according to the QCP.

Provide a clean area of sufficient size to perform sample splitting. Split samples by quartering according to AASHTO T 248, Method B and recombining for the City and Contractor's sample. The City split sample size required is generally 22 to 27 pounds (10,000 to 12,000 g). Ensure that every quality control or Item 448 Sublot sample taken by the technician has a labeled split for the City. Wrap and label the City split samples as to Lot or Sublot, time, location (tonnage), and accompanying Contractor test identification. The Monitoring Team will pick up all City split samples within 4 workdays. Sample mishandling (careless identification, changing sample size, consistency, or pre-testing) will result in shutdown of production.

For Basic mixes and Item 448 mixes, conform to the procedures of City Supplements 1038, 1039, and 1043 except take samples from a truck at the plant. If workmanship problems continue on the project (segregation, etc.) or if quality control problems persist, the Laboratory may require sampling on the road. Lots shall consist of one day or shift's production not to exceed 2000 tons (2000 metric tons), and lot will consist of four equal sublots. However, when production is limited to less than 750 tons (750 metric tons), consider the quantity produced as a partial Lot. For partial Lots of 200 to 500 tons (200 to 500 metric tons), sample and test at least two subplot samples regardless of the tons produced. For partial Lots less than 200 tons (200 metric tons), accept in accordance with Item 448. Split and test all subplot sample locations, as selected by the Engineer and taken by the Contractor. The Contractor may test a subplot sample instead of the required random quality control test provided the sample is tested in the half day in which the subplot sample mix was produced and is tested for all required quality control properties. A change in the location of the subplot sample must be approved by the City. This allowance does not apply to any other samples including City VA sample locations selected by the Laboratory. Label City split samples as subplot or quality control samples. Where more than one plant is simultaneously producing material for the job, the lot sizes shall apply separately for each plant.

B. Reporting. Report all testing performed and sample identification on a Quality Control Report (Form TE-199). Record on the TE-199 if the mixture produced was ran at the asphalt plant as a hot mix asphalt (HMA) or as a warm mix asphalt (WMA) produced according to 402.09 or another approved method. Deliver (fax, e-mail, hand)

403.06

completed Quality Control Reports by the end of each day in which testing is conducted. If desired by the Monitoring Team and always for unsigned E-mail versions, mail the originals. After startup adjustments, report any plant operation changes on the Quality Control Report. Ensure that each Quality Control Report contains technician comments as to production quality, input materials received, and condition and includes any other quality control activities as specified in the QCP. Ongoing problems with inadequate, incomplete, or illegible reporting will result in shutdown of production. The Contractor's technician must sign each Quality Control Report.

Report test results to the accuracy of the following decimal places. When the figures to be dropped in rounding off are exactly one-half of unity in the decimal place to be retained, round the value up or down to the nearest even number in the decimal place to be retained.

	Single Test	Mean
Asphalt Binder Content	0.1	0.01
No. 200 (75 µm) sieve	0.1	0.01
Other sieves	Whole number	0.1
BSG	0.001	0.001

For Item 448 mixes, track the Item 448 subplot and Lot tonnages through the project and identify on the Quality Control Report each random subplot test as to Lot number and subplot tonnage location. In addition to the Quality Control Report, submit the TE-448 form with lot identification and actual sieve weights for each subplot sample from the technician's gradation worksheets. Attach computerized plant printouts representing samples tested to that day's report, if desired by the Monitoring Team, or otherwise keep it with the quality control records. Ensure that the technician notes on the accompanying printout in which tonnage the quality control sample was taken with accompanying test results for asphalt binder content and percent passing the No. 4 (4.75 mm) sieve. Keep remaining printouts in the plant laboratory for the duration of the project. Keep a copy of all quality control reports for a project in the Contractor's plant laboratory.

C. City Verification Testing and Monitoring. The Monitoring Team will randomly choose one City sample in a maximum of every four production days for VA testing to confirm Contractor testing and mix control. More frequent VA samples can be taken when desired. The City VA sample location will be chosen randomly by the Monitoring Team, including where in the truck to take the sample. The Contractor technician will take the sample from the truck with the Monitoring Team witnessing. The Monitoring Team will keep the sample in the City's possession until delivered to the Laboratory or testing is complete. The Monitoring Team will have enough sample taken to split with the Contractor. The Monitoring Team will split the sample in the Contractor lab. The Monitoring Team will have the sample tested in the Laboratory or as noted below. The Contractor will test his split of the VA sample with the Monitoring Team witnessing. The City will use its VA test result, the Contractor's result of the split, and the most recent previous Contractor quality control and/or subplot test in the comparison for the City VA testing.

The Monitoring Team may opt to test the City VA sample in the plant laboratory with the Contractor's permission, according to the Contractor's safety practices, and

with the restriction of only the Contractor's technician physically placing a sample pan in the AC Gauge. Record the results and testing location in the project record. For all mixes, the City may increase the VA testing frequency if desired.

All City VA test results will be given to the Contractor by a reasonable arrangement acceptable to both. City VA sample testing not completed in a timely manner is of no value in verifying quality control testing quality for Contractor test acceptance and/or investigating problem causes. As such, if not completed in a timely manner, Contractor tests will automatically stand and the Engineer will note the problem in the City's VA record.

TABLE 403.06-1 VERIFICATION ACCEPTANCE AND QUALITY CONTROL TEST COMPARISON				
	Percent Asphalt Binder		Percent Passing No. 4 (4.75mm)	
	VA ^[1]	QC/lot test ^[2]	VA ^[1]	QC/lot test ^[2]
Basic	±0.3	±0.3	±4.0	±5.0
448	±0.4	±0.3	±4.0	±4.0
[1] VA mix test deviation from Contractor split.				
[2] VA mix test deviation from QC and/or lot test.				

If the City VA tests confirm Contractor testing is within the verification tolerances, but a pattern of high or low results exist that suggests mix control is not at the JMF, then investigate with the Monitoring Team's assistance to correct the problem to the Monitoring Team's satisfaction. Direct any questions regarding interpretation of circumstances to the Laboratory.

D. Contractor Tests are Verified. Production is acceptable if:

1. the Monitoring Team verifies the Contractor's QCP is being fully followed; and
2. the City VA tests are within the limits specified in 403.06.C; and
3. for Basic mixes, the remaining sieves do not exceed the limits of the applicable specification.

Failure on the Contractor's part to respond and resolve Monitoring Team concerns will result shutting down production.

Acceptance is based on Table 403.06-2.

TABLE 403.06-2 MIX ACCEPTANCE			
Mix Type	Acceptance Tolerances or Method		
Basic Mixes (no acceptance limits stated in appropriate specification)		Deviation from JMF	Range
	Asphalt Binder Content	± 0.5%	1.0
	No. 4 (4.75 mm) sieve	± 6%	12
Basic Mixes (acceptance limits stated in appropriate specification)	Use acceptance limits in appropriate specification		
448 Mixes	Calculate pay factor according to 403.08		

E. Contractor Tests not Verified. If the City VA test does not verify the accompanying Contractor tests within the verification tolerances, then the Monitoring Team will investigate.

If the deviation between the City and Contractor test is greater than the limits in Table 403.06-3, immediately cease production until resolved. If the deviation is less than the limits in Table 403.06-3 and discrepancies continue, perform additional tests to aid in problem solving.

TABLE 403.06-3 DEVIATION LIMITS		
Property	Mix	Limits
Asphalt Binder Content	All	± 0.5%
No. 4 (4.75 mm) sieve	All, except 302	± 6.0%
	302	± 7.0%

Additional tests may include any testing necessary to resolve the problem. If the additional testing does not resolve the problem by one-half production day or 500 tons (500 metric tons), whichever occurs first, to the Monitoring Team’s satisfaction, the Engineer may stop production until problems are resolved. Contact the Laboratory for assistance in resolving problems. If the City testing program is confirmed by the additional tests and Monitoring Team investigation and no reason to question the original test exists, then the original City VA tests will stand.

After the above investigation, one of the three following actions will occur:

1. Mix Production Compares Well to the JMF. If the City test and investigation shows mix is actually controlled well compared to the JMF in spite of the Contractor test, the City does not have to test additional samples if the Contractor testing problem is corrected.

2. Mix Production Does Not Compare Well to the JMF. If the City tests and investigation shows lack of Contractor mix control compared to the JMF, the City will test the remaining City split samples for the days or Lots represented by the original tests. The City will use the test results to calculate the acceptance. While working with

the City, immediately take steps to correct the problem according to the QCP. Failure to achieve a quick resolution will result in shutting down production.

3. Testing Problem. If the City testing program has a problem as confirmed by the additional testing and City review, the City will correct the problem, throw out the original City test results and take new samples from the samples representing the days or Lots in question for the VA tests.

F. Contractor Removal, Restoration. If repeated problems with poor comparison of tests are not the City's fault; or poor comparison of Contractor tests to the JMF; or with plant operation, input materials, or any of the other requirements of City specifications occur in a single project or successive projects, the City will request an opinion from the QCQC before notifying the Contractor of removal from City VA. The City will immediately notify the Contractor of the removal with a follow up letter from the Engineer. Restoration of the VA procedures may occur on a future project with a City recommendation to the QCQC based on consistent improved plant operation and mix control, a review of the Contractor problems and resolutions, and a review of the QCP by the QCQC.

403.08 Acceptance Tables for 448 Mixes. A Lot is considered acceptable for gradation and asphalt binder content if the deviation of the mean from the JMF and the Range is no more than the tolerances shown in Table 403.08-1.

TABLE 403.08-1 DEVIATION FROM THE JMF AND RANGE TOLERANCES^[1]

Mix Property	Deviation from JMF (Percent)	Range (Percent)
Asphalt Binder Content	0.3	1.0
1/2 inch (12.5 mm) sieve	6	15
No. 4 (4.75 mm) sieve	5	15
[1] Based on mean of four Sublot Acceptance tests.		

If the mean of the Lot acceptance tests for a particular sieve or sieves, or for asphalt binder content deviates from the JMF by more than the tolerances shown in Table 403.08-1, but falls within the tolerances shown in Table 403.08-2, then the Lot is considered reasonably acceptable and may remain in place with payment at a reduced pay factor as show in Table 403.08-2.

If the Range of the Lot acceptance tests for asphalt binder content or for any particular sieve, or sieves, exceeds the tolerance shown in Table 403.08-1, the City will apply a pay factor of 0.95.

TABLE 403.08-2 448 ACCEPTANCE SCHEDULE ^[1]

Mix Property	Pay Factor	2 Tests	3 Tests	4 Tests
Asphalt Binder Content	1.00	0 to 0.47	0 to 0.36	0 to 0.30
	0.98	0.48 to 0.54	0.37 to 0.42	0.31 to 0.35
	0.90	0.55 to 0.61	0.43 to 0.48	0.36 to 0.40
	0.80	0.62 to 0.68	0.49 to 0.54	0.41 to 0.45
	0.60	0.69 to 0.75	0.55 to 0.59	0.46 to 0.50
	^[2]	> 0.75	> 0.59	> 0.50
1/2 inch (12.5 mm) sieve	1.00	0 to 8.5	0 to 6.9	0 to 6.0
	0.99	8.6 to 9.9	7.0 to 8.1	6.1 to 7.0
	0.97	10.0 to 11.3	8.2 to 9.2	7.1 to 8.0
	0.94	11.4 to 12.7	9.3 to 10.4	8.1 to 9.0
	0.90	12.8 to 14.1	10.5 to 11.5	9.1 to 10.0
	^[3]	> 14.1	> 11.5	> 10.0
No. 4 (4.75 mm) sieve	1.00	0 to 7.1	0 to 5.8	0 to 5.0
	0.99	7.2 to 8.5	5.9 to 6.9	5.1 to 6.0
	0.97	8.6 to 9.9	7.0 to 8.1	6.1 to 7.0
	0.94	10.0 to 11.3	8.2 to 9.2	7.1 to 8.0
	0.90	11.4 to 12.7	9.3 to 10.4	8.1 to 9.0
	^[3]	> 12.7	> 10.4	> 9.0
<p>[1] Based on mean of Lot Acceptance tests from the JMF.</p> <p>[2] Remove and replace material</p> <p>[3] Engineer will determine if the material may remain in place. Pay factor for material allowed to remain in place is 0.70.</p>				

The City will determine payment for the Lot by multiplying the contract unit price by the pay factor. When two or more pay factors for a specific Lot are less than 1.00, use lowest pay factor to calculate the payment.

The City will base acceptance of partial Lots on the mean and the Range of the results of tests on the number of samples obtained.