

Tennessee Department of Transportation Division of Materials and Tests

INDEPENDENT ASSURANCE PROGRAM (SOP 1-2)

- Purpose- The purpose of this document is to establish the procedures and requirements to conduct assurance sampling and testing and split sample comparisons for the Independent Assurance Program (IAP).
- Background- Federal requirements state that each State Highway Agency shall develop a Quality Assurance program which assures all materials, on projects in which Federal monies are used, conform with the requirements of the approved plans and specifications. The IAP helps to assure that proper acceptance sampling and testing is being conducted so the best products are provided. In addition, the Federal requirements state that Quality Assurance program shall include an Independent Assurance Program.
- Policy- On all TDOT projects in which there are federal funds, Independent Assurance Sampling and Testing (IA) must be conducted in accordance with the program established herein. Bridge replacement projects located off the state highway system may be exempt from this program.
- The IAP shall be an unbiased, independent evaluation of the acceptance program, therefore, the individuals conducting the IA testing shall have no direct responsibility for acceptance testing on the individual projects.
- Independent Assurance (IA) tests are conducted to assure that acceptance sampling and testing procedures are done in accordance with the specified procedures and to compare testing equipment. Samples for IA testing shall be split samples (except for density testing). The testing equipment for the IA testing shall also be different from that used for acceptance, such that the equipment can also be evaluated.
- Independent Assurance testing shall be conducted at the minimum frequencies identified in TABLE 1. Independent Assurance testing will only be required on items of work that are permanent and will remain in place, and not temporary items (i.e. temporary detours).
- Independent Assurance sampling and testing results shall be immediately compared to acceptance results to assure that testing personnel and testing equipment are acceptable. The test results for both acceptance and IA shall be documented, and variations determined on TDOT form DT-1550. The allowable variation in test results are listed in TABLE 2. If the results are not in the normal deviation range, then action will be necessary.
- Procedure- Prior to construction of a federally funded project, the Regional Materials and Tests shall determine the amount of IA testing needed for that project. The amount of testing will be documented and the Project Supervisor will be provided the information. The Project Supervisor and Regional Materials and Test Supervisor shall maintain communication so IA sampling and testing can be conducted at the required frequencies.
- Before conducting any sampling or testing, the IA technician should inspect the field laboratory and test equipment. This inspection will supplement the biennial laboratory qualification requirements. Each laboratory should have a checklist of all items or procedures included in the annual plant checks.

It will be the IA technicians responsibility to observe the Acceptance technician obtain a representative sample (in accordance with TDOT procedures) and then split the sample (also in accordance with TDOT procedures). Density samples cannot be split, therefore density testing shall be taken in close proximity to each other. This will assure that if there is a unacceptable testing variance, then it would not be due to a non-representative sample.

The Acceptance technician and the IA technician will then conduct their respective testing following the proper testing procedures. The IA technician will be responsible for observing the acceptance technician conduct the tests to assure that the proper techniques and procedures are followed.

After the sample is tested, the test results shall be compared to TABLE 2 for acceptable variations.

TABLE 1- FREQUENCY TESTING FOR INDEPENDENT ASSURANCE

TYPE OF CONSTRUCTION	MATERIAL	TEST	SAMPLED BY	FREQUENCY	LOCATION OR TIME OF SAMPLING	REMARKS
Portland Cement Concrete – All EXCEPT Pre-stressed, Pre-cast, Pavement, and Base	Completed Mix	Strength, Slump, Air Content, and Temperature	Materials & Tests	1 between 200 CY (150 m ³) & 600 CY (460 m ³) 1 for each 1500 CY (1150 m ³) or fraction thereafter. None if < 200 CY (150 m ³)	Project Site	Determine Slump, Air Content, and temperature from same sample of concrete that cylinders are made from. (Total number of tests required will be based on the sum of total amount of concrete in the plans for Class A, D, S, and L for major structures as defined in 604.12 of the specifications.
Portland Cement Concrete – Pavement & Base	Completed Mix	Strength, Slump, and Air Content	Materials & Tests	1 between 10,000 SY and 40,000 SY 1 for each 40,000 S.Y. (33,600 m ²) or fraction thereafter. None if less than 10,000 S.Y. (8400 m ²).	Roadway	Determine Slump and Air Content from same sample of concrete that cylinders are made from.
Portland Cement Concrete- Prestressed/ Precast	Completed Mix Aggregate	Cylinders, Slump, and Air Content Gradation	Materials & Tests	1 per month min.	Fabrication Plant	To be plant specific and time based, not project and quantity based. Records to be maintained at plant office by Reg. M&T

TYPE OF CONSTRUCTION	MATERIAL	TEST	SAMPLED BY	FREQUENCY	LOCATION OR TIME OF SAMPLING	REMARKS
Embankment, Road and Drainage, and Borrow	Soil	Density, Moisture	Materials & Tests	1 between 25,000 CY (19,000 m ³) and 50,000 CY (38,000 m ³) . 1 per each 50,000 C.Y. (38,000 m ³) or fraction thereafter. None required if less than 25,000 C.Y. (19,000 m ³).	To be tested at approximately same location as project inspector takes tests Sample shall be taken if IA and Acceptance results are not in normal deviation range for proctor.	Density tests will not be required for embankment containing more than 50% of plus 3/4 inch (19 mm) material. 2 individual tests to be conducted (The number of tests needed shall be based on the plans tabulated quantities for earthwork)
Sub-grade Treatment (Granular)	Aggregate	Gradation	Materials & Tests	1 between 10,000 (9,000 tonnes) and 25,000 tons (22,500 tonnes). 1 each 25,000 tons (22,500 tonne) or fraction thereafter. None if less than 10,000 tons (9,000 tonne).	Sampled before incorporating in work.	
		Density Moisture	Materials & Tests	1 between 10,000 tons (9,000 tonnes) and 25,000 tons (22,500 tonnes). 1 each 25,000 tons (22,500 tonne) or fraction thereafter. None if less than 10,000 tons (9,000 tonne).	After stabilization completed.	2 individual tests to be conducted
Conditioning Mineral Aggregate Base (Section 310 of Specifications)	Aggregate	Density, Moisture	Materials & Tests	1 between 10,000 SY (8400 m ²). and 50,000 SY (42,000 m ²). 1 per each 50,000 S.Y. (42,000 m ²) or fraction thereafter. None required if less than 10,000 S.Y. (8400 m ²).	After base completed.	2 individual tests to be conducted

TYPE OF CONSTRUCTION	MATERIAL	TEST	SAMPLED BY	FREQUENCY	LOCATION OR TIME OF SAMPLING	REMARKS
Mineral Aggregate Base & Surface	Aggregate	Gradation	Materials & Tests	1 between 10,000 (9,000 tonnes) and 25,000 tons (22,500 tonnes). 1 each 25,000 tons (22,500 tonne) or fraction thereafter. None if less than 10,000 tons (9,000 tonne).	From source during construction, or from roadway after spreading.	At least 33% of these tests should be taken from roadway.
		Density, Moisture	Materials & Tests	1 between 10,000 (9,000 tonnes) and 25,000 tons (22,500 tonnes). 1 each 25,000 tons (22,500 tonne) or fraction thereafter. None if less than 10,000 tons (9,000 tonne).	During construction after compaction.	Density not required in all cases - check specifications. 2 individual tests to be conducted
Soil-Cement Base	Soil-Cement Mixture	Density, Moisture	Materials & Tests	1 between 10,000 SY (8400 m ²). and 50,000 SY (42,000 m ²). 1 per each 50,000 S.Y. (42,000 m ²) or fraction thereafter. None required if less than 10,000 S.Y. (8400 m ²).	After base completed.	2 individual tests to be conducted
Sub-grade Treatment - Lime	Soil - Lime Mixture	Density, Moisture	Materials & Tests	1 between 10,000 SY (8400 m ²). and 50,000 SY (42,000 m ²). 1 per each 50,000 S.Y. (42,000 m ²) or fraction thereafter. None required if less than 10,000 S.Y. (8400 m ²).	After stabilization completed.	2 individual tests to be conducted
Aggregate Cement Base	Aggregate	Gradation	Materials & Tests	1 between 10,000 (9,000 tonnes) and 25,000 tons (22,500 tonnes). 1 each 25,000 tons (22,500 tonne) or fraction thereafter. None if less than 10,000 tons (9,000 tonne).	Before mixed with cement.	

		Density, Moisture	Materials & Tests	1 between 10,000 (9,000 tonnes) and 25,000 tons (22,500 tonnes). 1 each 25,000 tons (22,500 tonne) or fraction thereafter. None if less than 10,000 tons (9,000 tonne).	After base completed.	2 individual tests to be conducted
TYPE OF CONSTRUCTION	MATERIAL	TEST	SAMPLED BY	FREQUENCY	LOCATION OR TIME OF SAMPLING	REMARKS
Aggregate Lime Fly Ash Base	Aggregate	Gradation	Materials & Tests	1 between 10,000 (9,000 tonnes) and 25,000 tons (22,500 tonnes). 1 each 25,000 tons (22,500 tonne) or fraction thereafter. None if less than 10,000 tons (9,000 tonne).	Before mixed with Lime Fly Ash.	
		Density, Moisture	Materials & Tests	1 between 10,000 (9,000 tonnes) and 25,000 tons (22,500 tonnes). 1 each 25,000 tons (22,500 tonne) or fraction thereafter. None if less than 10,000 tons (9,000 tonne).	After base completed.	2 individual tests to be conducted
Bituminous Plant Mix Pavements	Plant Mix Asphalt	Gradation & Asphalt Content	Materials & Tests	1 between 5,000 tons (4,500 tonne) and 10,000 tons (9,000 tonne) . 1 each 10,000* tons (9,000 tonne) or fraction thereafter. None if less than 5,000 tons (4500 tonne). * 15,000 tons for A, A-S, and A-CRL mixes	Same location as acceptance samples.	Extraction, bin or belt sample as determined by the acceptance sample. Asphalt content not required on A, A-S , or A-CRL mixes (Total number of tests required will be by mixture type regardless of PG grade)

		Density	Materials & Tests	1 core each 15,000 S.Y.(12,600 m ²). Not required on projects with less than 10,000 S.Y.(8400 m ²) of paving.	On project.	Not required on shoulders. Nuclear density readings may be substituted for cores if a properly correlated gauge (i.e. during test strip construction) is used.
Bituminous Surface Treatment (Chip seals, micro-surface, slurry seals)	Aggregate	Gradation and Wash	Materials & Tests	1 sample of each size used. None required if less than 1,000 tons (900 tonne) total used.	At source or at project prior to being incorporation into work.	

* Example- If plan quantities have a total of 2,200 CY of Class A and 600 CY of Class D, Total Concrete is 2800 CY, then three (3) IA tests are required for project

**Example- Plan quantities for B-M 2 mix with PG 64-22 is 11,300 tons, and BM-2 with PG 76-22 is 32,100 tons. Total BM-2 is 43,400 tons, therefore five (5) IA tests would be required for BM-2 Mixtures.

TABLE 2- ACCEPTABLE DEVIATIONS₁

Test results	Normal Deviation Range	Review Range	Unacceptable Range
Concrete - Air - Slump - Temperature - Strength	Less than 0.5% Less than 0.5 in. Less than 3°F Less than 1000 PSI	0.5% to 0.8% 0.5 in. to 1.0 in. 3°F to 5°F 1000-1500 PSI	Greater than 0.8% Greater than 1.0 in. Greater than 5°F Greater than 1500 PSI
Bituminous Plant Mix Extraction/burn off or belt sample -Aggregate #4 and larger #8 and smaller - Asphalt Content	Less than 5% Less than 3% Less than 0.4%	5% to 8% 3% to 6% 0.4 % to 0.6%	Greater than 8% Greater than 6% Greater than 0.6%
Density Including all IA items	Less than 4%	4% to 6%	Greater than 6%
Gradations Including all IA items except extractions Coarse Aggregate #4 and larger #8 and smaller Fine Aggregate #4 and smaller	Less than 5% Less than 3% Less than 3%	5% to 8% 3% to 6% 3% to 6%	Greater than 8% Greater than 6% Greater than 6%
All other test results not specified above	Less than 10 % of numerical difference	10% to 20% of numerical difference	Greater than 20% of numerical difference

NOTES – 1 The deviations shown are actual differences between test results, except for “All other test results not specified” which is a percentage of the difference of the two test results.

Normal Deviation Range-No action required, acceptable deviation

Review Range- An in-depth review is required to determine cause of deviation, documentation required for corrective action taken and immediate retest, record both test results.

Unacceptable Range- Test results exceed allowable limits, immediate review and resample required, must document both initial results and retest results, and corrective action taken. If retest results not in normal range, immediately notify Regional Materials Supervisor.

Examples: Split samples are taken and tests are completed with the following results:

Air Content- Acceptance result 5.3%, IA result 5.7%, Actual difference is 0.4% (5.7% -5.3%) so normal deviation range and acceptable

Asphalt Content- Acceptance result 6.2%, IA result 5.7%, Actual difference is 0.5% (6.2%-5.7%) so review range and in-depth review required, with corrective action and re-test

Revision October 1, 2004- Adjusted frequencies to clarify number of test needed, clarifications base on IA process review.