SYSTEM-BASED INDEPENDENT ASSURANCE AT VDOT

Chaz Weaver, PE, CPEM, F.ASCE
Staunton District Materials Engineer

Image: VDOT, Route 130 over Maury River

What is Independent Assurance?

Per 23 CFR 637.207:

Acceptance Program

- Frequency Guide Schedules for Verification Testing
- Specific Locations for Sampling/Testing
- Specific Attributes to be Inspected

What is Independent Assurance?

Per 23 CFR 637.207:

Independent Assurance Program

- Schedule of Frequency
  - Project or System Basis
- Testing Equipment
  - Calibration Checks, Split-Samples, or Proficiency Samples
- Testing Personnel
  - Observation and Split-Samples, or Proficiency Samples
- Test Tolerance Limits

What is Independent Assurance?

The DOT may use Contractor Quality Control results as part of the acceptance decision provided:

- **Qualified Laboratories and Qualified Technicians**
- **Verification Testing Taken Independently of QC**
- **QC is Evaluated by an IA Program**
- **Dispute Resolution System**

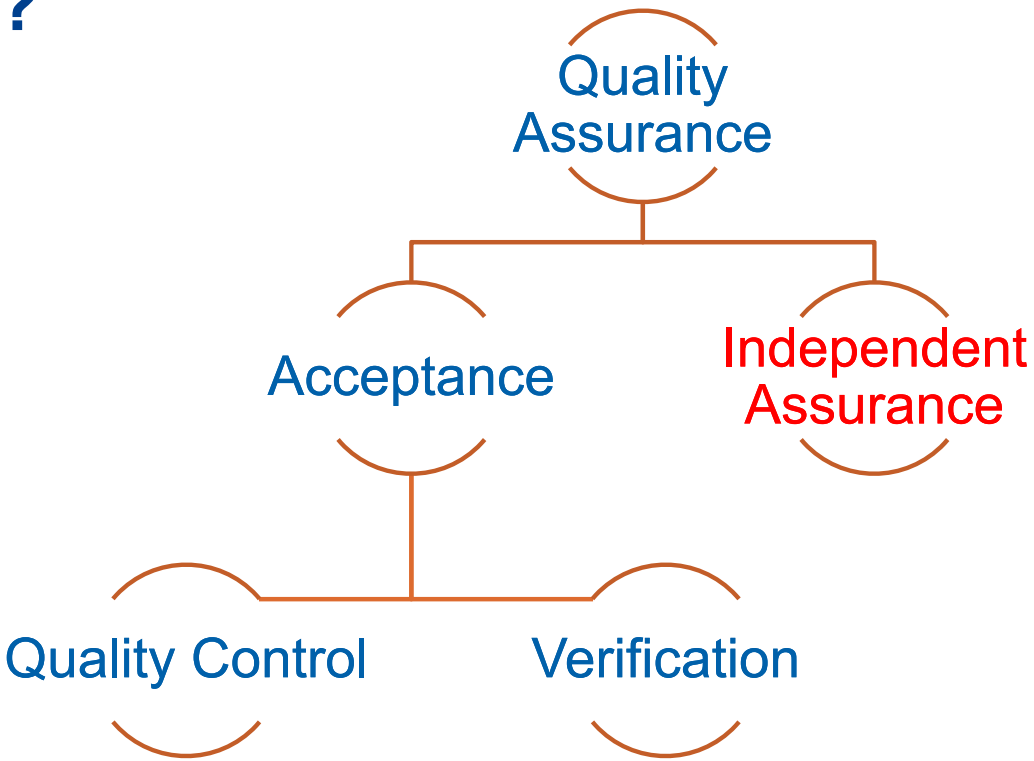
What is IA at VDOT?

An independent assessment of the reliability of QC, acceptance, or verification test results.

1. **Technician Qualification (VDOT Materials Certification)**
2. **Equipment Calibration**
3. **Technician Proficiency**
   a) **Observation**
   b) **Split-Sample**
4. **Dispute Resolution**

Performed by party independent of project (Materials Section), with different equipment.

What is IA?


Quality Assurance
Acceptance
Independent Assurance
Quality Control
Verification

What is IA?

QC → Must meet specifications

Verification → Must meet specifications

IA → Must meet IA tolerances

Test Comparison Tolerances:

Test Number	Test Name	Comparison Tolerance
ASTM C1064	Temperature	2 ° F
ASTM C143	Slump	0" to 1.5" 0.75" 1.75" to 3.5" 1.0" 3.75" to 5" 1.25" 5.25" to 6.5" 1.5" ≥ 6.75" 1.75"
ASTM C138	Unit Weight	2.5 pcf
ASTM C231	Air Content (pressure meter)	0.0 to 3.5 % 0.5 % 3.6 to 4.5 % 0.6 % 4.6 to 5.5 % 0.8 % 5.6 to 6.5 % 1.0 % 6.6 to 7.5 % 1.1 % 7.6 to 8.5 % 1.3 % > 8.5 % 1.4 %
ASTM C173	Air Content (volumetric)	should not differ from each other by more than 32 %
ASTM C31	Making Cylinders	Complete Evaluation Sheet
ASTM C39	Compressive Strength*	10.6 % difference (average of three 4"x 8" cylinders) or 9.0% (average of two 6" x 12" cylinders)
VTM-112	Permeability*	Within 42 % for same testing lab; Within 51 % for different testing labs

*Design Build Projects Only

Image: VDOT

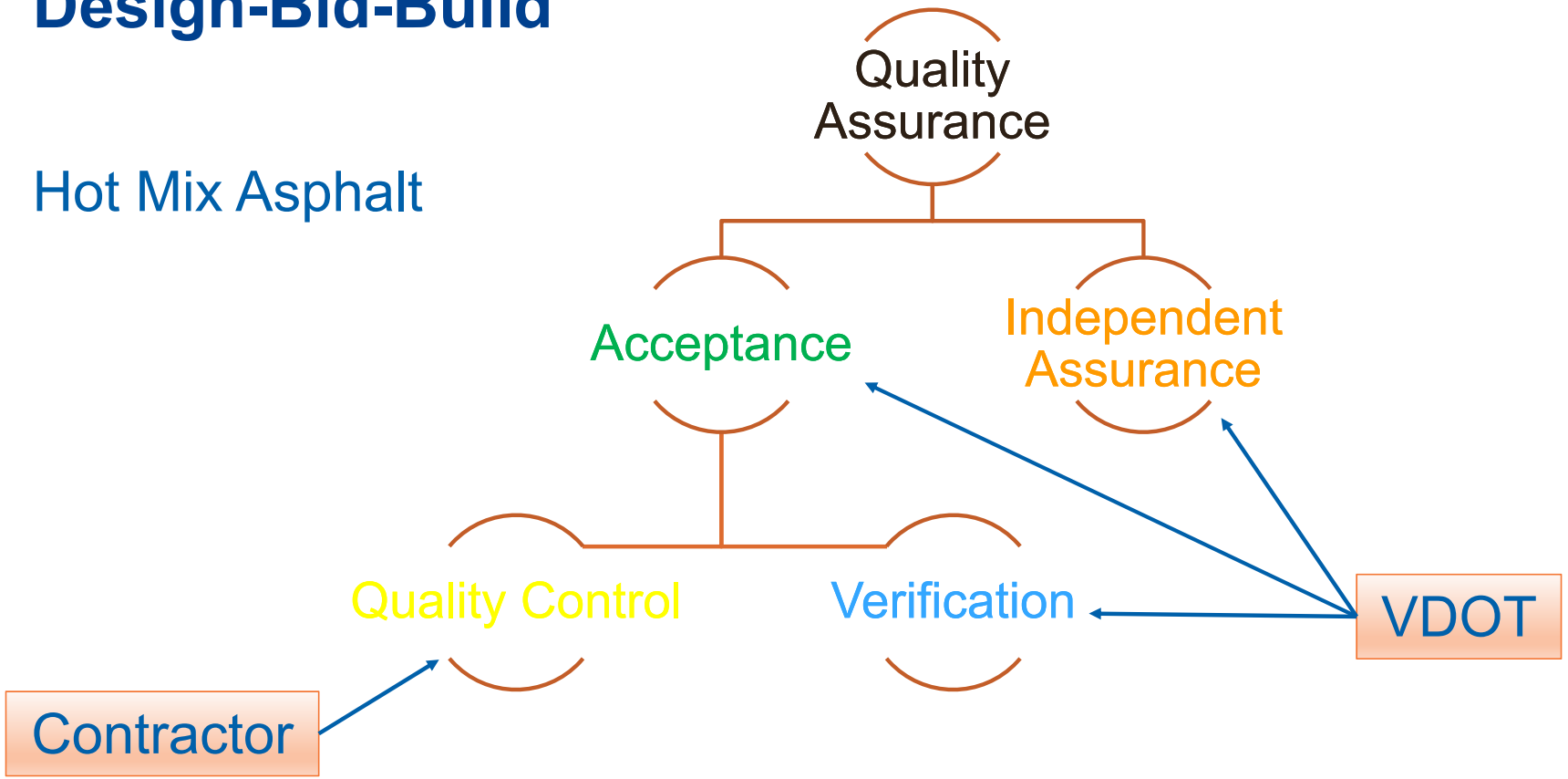
Out of Tolerance

If an IA test is out of tolerance, a few things might happen:

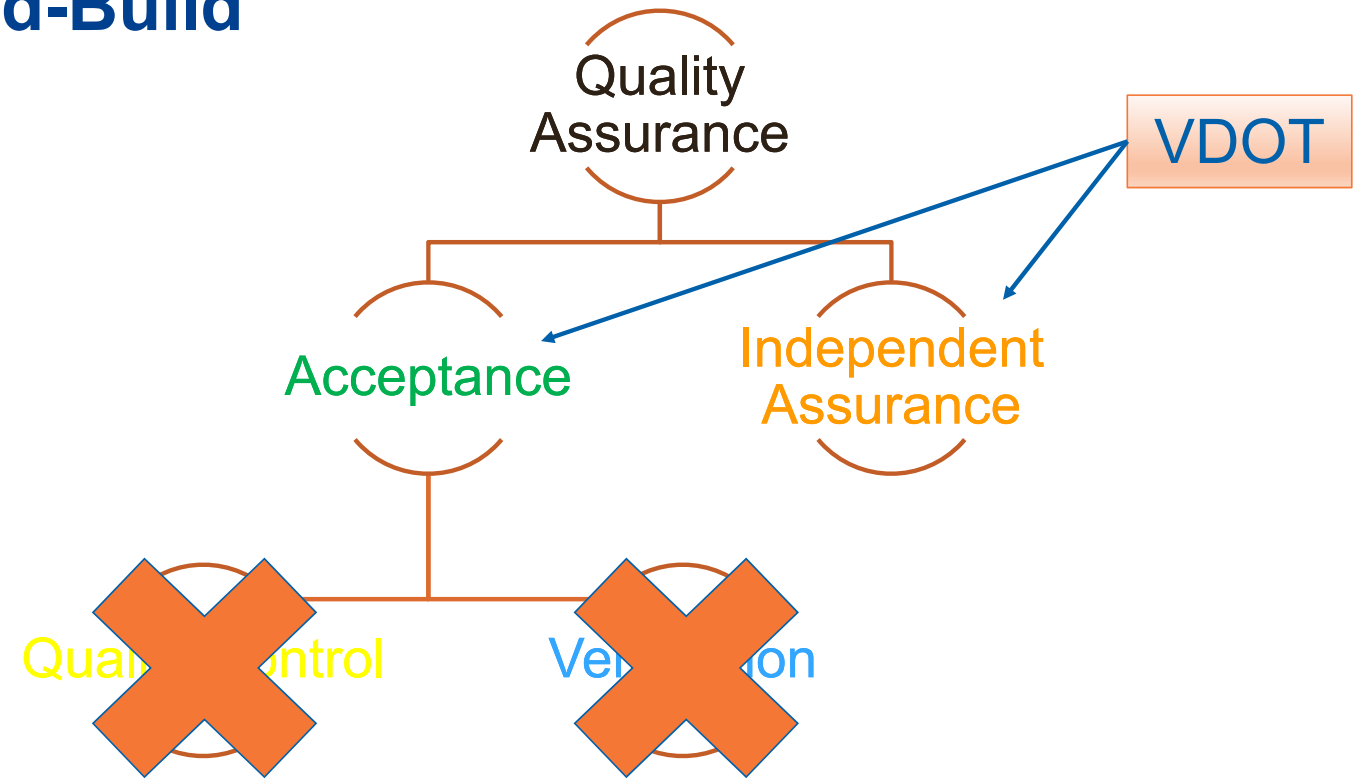
1. **Re-training of the tester,**
2. **Re-testing to verify test results,**
3. **Re-calibration of the equipment, and/or**
4. **In severe cases, invalidating tester materials certification.**

Design-Bid-Build

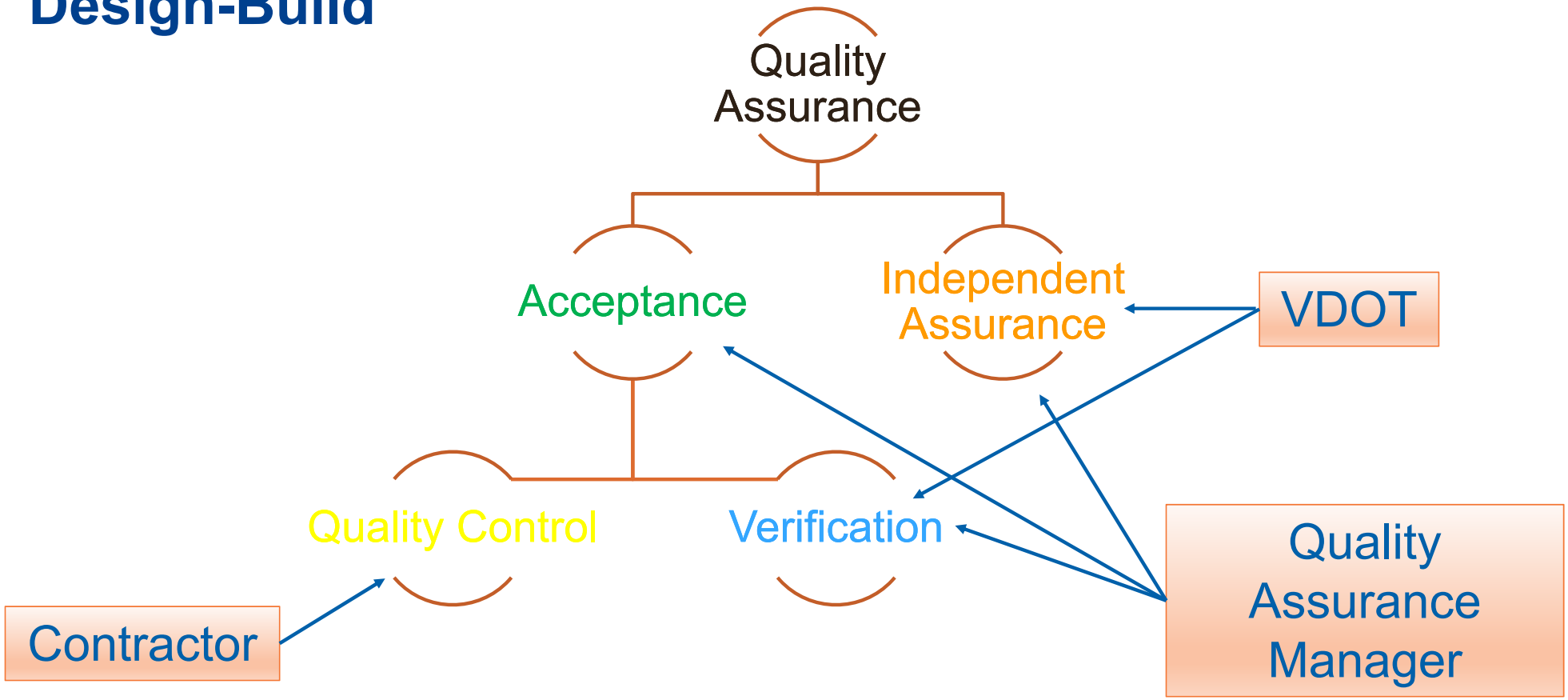
Hot Mix Asphalt



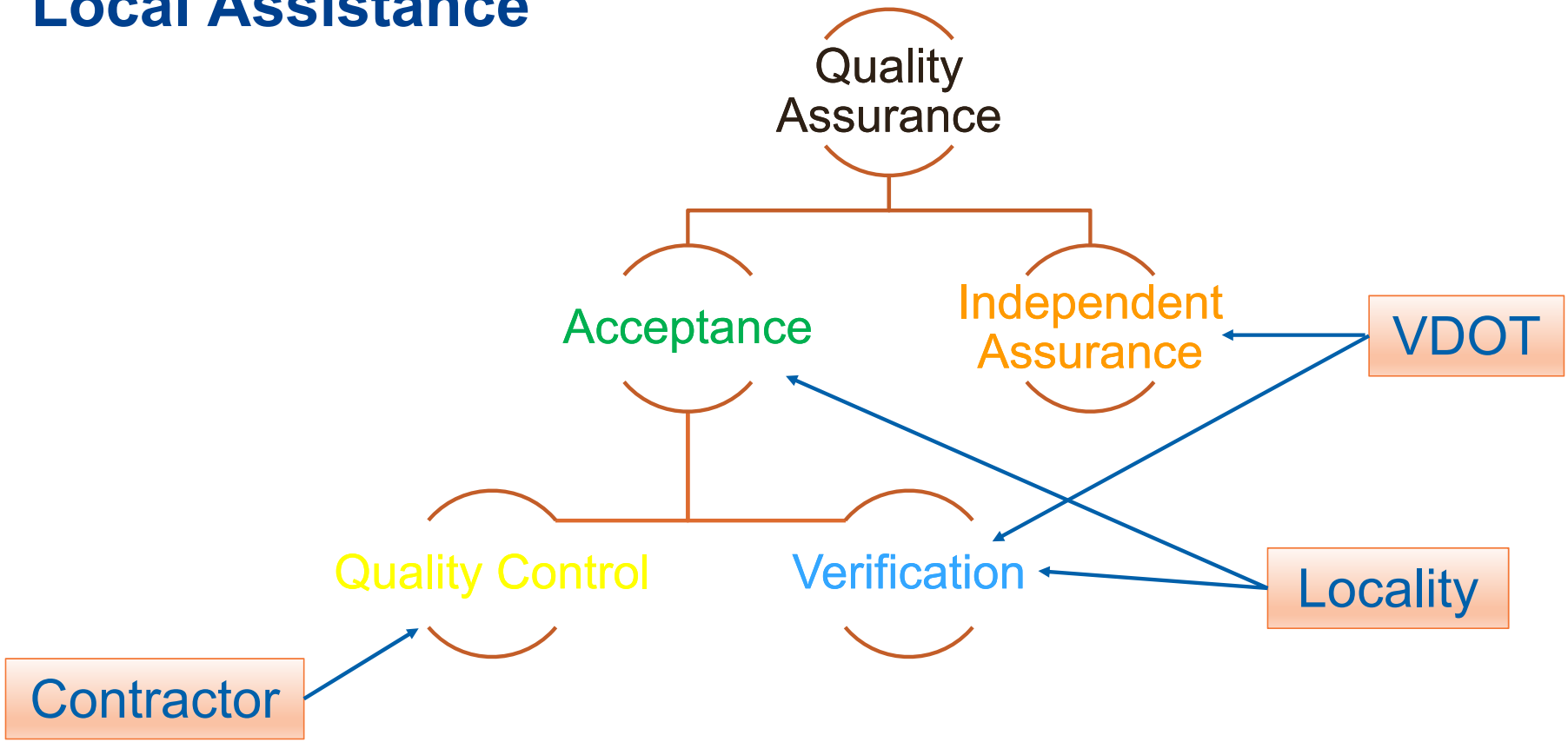
Design-Bid-Build



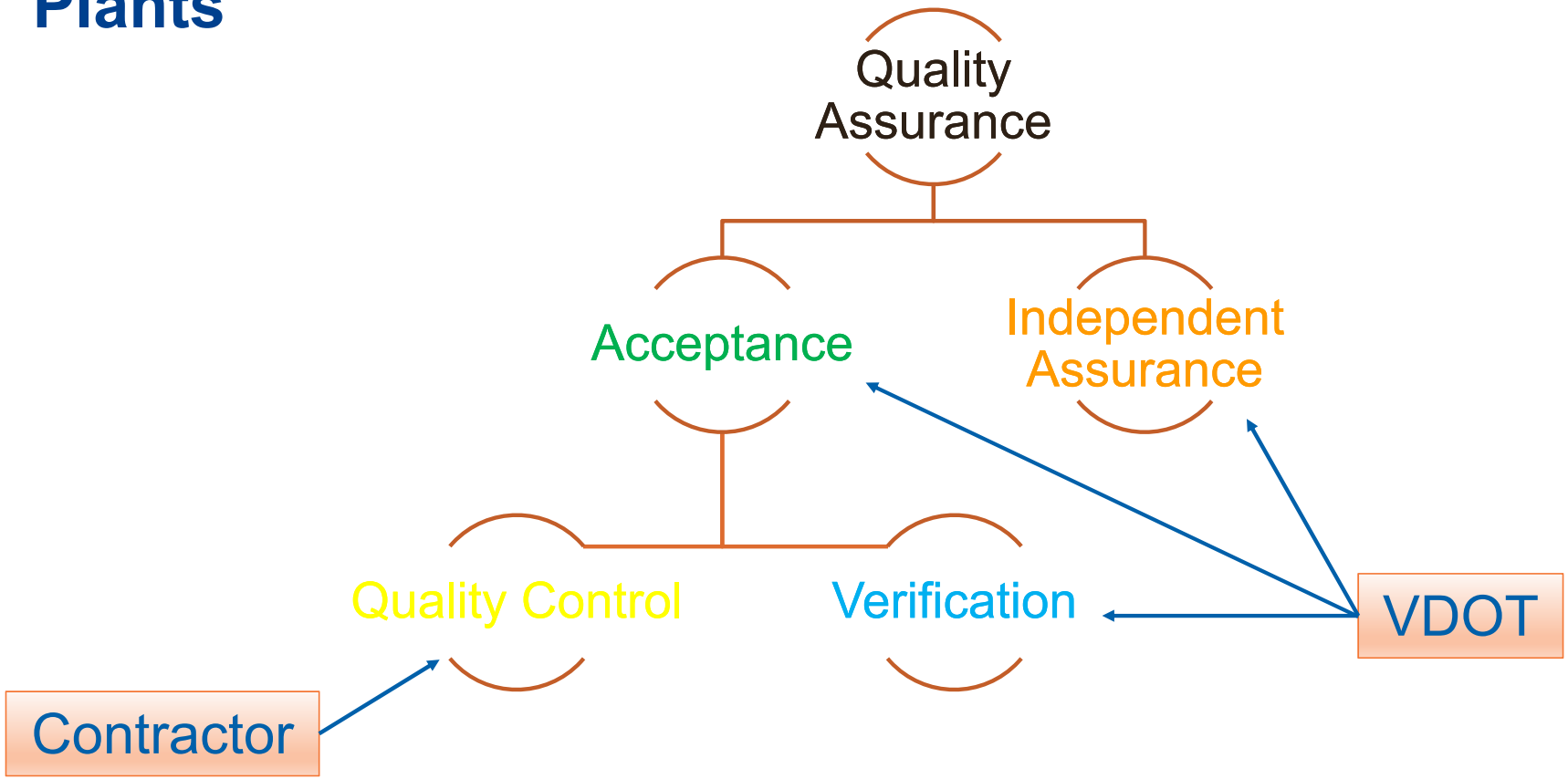
Design-Build



Local Assistance



Plants


Quality Assurance
Acceptance
Independent Assurance
Quality Control
Verification
VDOT
Contractor

Then: Project-Based IA

Number of IA Tests was ~ 1% of QC Tests

Regardless of Number of QC or QAM Inspectors

So, I perform an IA check on Jimmy (who will only test 2% of the project's concrete) to meet this requirement; meanwhile Pam (who will end up testing 98% of the concrete) and her equipment goes without an IA check

Also, many QAMs weren't tracking/sharing numbers of QC tests

Then: Project-Based IA

Rex performs asphalt testing for a DB firm, and will work on five (5) different VDOT projects this year. There is a good chance that Rex will receive five (5) different IA checks.

Laura works at VDOT, and performs IA checks on Rex (sometimes in the same week) on five (5) different projects across several counties to fulfill the each project's minimum IA requirement.

Now: System-Based IA

DBB and DB Projects:

VDOT IA is now System-Based IA

- It's just a part of VDOT's QA Program
- Includes QA and QC Inspectors

DB Projects:

QAM is still required to perform Project-Based IA

- On QC Inspectors only

Now: System-Based IA

VDOT will perform IA on 80% (soils and concrete) or 75% (asphalt) of Technicians performing QC, acceptance, or VST testing:

1. DME will contact DCE/DB QAM to obtain names of all Technicians anticipated to perform testing. Final list by end of March*.
2. VDOT QAM or DB QAM evaluate Technicians throughout year.
3. At the end of the calendar year, list evaluated to determine percentage of Technicians evaluated. Any Technicians not evaluated this year will be prioritized during the following year.
4. District lists are compiled by Materials Division in its IA report to FHWA.

*Technicians that become inactive during the year are taken off of this list.

Now: System-Based IA

2019 Hydraulic Cement Concrete System-Based IA										
Inspector	Organization	VDOT Certification Expiration Date	ACI Certification Expiration Date	Construction Manager (VDOT) or QC/QA Manager (DB)	Equipment Calibration Expiration Date Verified	Air Content IA Date (Observation & Split Sample)	Slump/Temperature IA Date (Observation & Split Sample)	Cylinder/Sampling IA Date (Observation)	Unit Weight IA Date (Observation & Split Sample)	
Allwine, Chris	VDOT	12/31/2022	4/13/2023	Umstead						
Baldwin, David	VDOT	12/31/2022	12/1/2021	Somers	Yes	7/26/2019	7/26/2019	7/26/2019		
Berry, Mike M.	VDOT	Not Required	9/1/2021	Parlett	Yes	9/24/2019	9/24/2019	9/24/2019		
Brown, Jeremy A.	VDOT	12/31/2022	12/1/2021	Duquette						
Camden, Johnny	VDOT	12/31/2020	2/26/2020	Duquette	Yes	6/24/2019	6/24/2019	N/A		
Catron, Dick	VDOT	12/31/2020	2/26/2020	Somers	Yes	7/26/2019	7/26/2019	7/26/2019		
Fisher, Chris	AMT	12/31/2024	3/7/2024	Parlett	Yes	7/11/2019	7/11/2019	7/11/2019		
Frye, Charles	AMT	12/31/2024	3/7/2024	Tucker	Yes	9/18/2019	9/18/2019	9/18/2019		
Gochenour, Jeff	AMT	12/31/2020	2/26/2020	Parlett	Yes	9/6/2019	9/6/2019	9/6/2019		
Griffith, Jacob	VDOT	12/31/2021	6/9/2021	Parlett	Yes	9/24/2019	9/24/2019	9/24/2019		
Hedrick, Steve	VDOT	12/31/2022	3/9/2022	Simmers	Yes	7/3/2019	7/3/2019	7/3/2019		
Housman, William	VDOT	12/31/2022	3/9/2022	Simmers	Yes	7/3/2019	7/3/2019	7/3/2019		
McLamb, Kevin	VDOT	12/31/2024	11/29/2023	Duquette	Yes	2/4/2019	2/4/2019	2/4/2019		
Phillips, Chris	VDOT	12/31/2024	9/7/2022	Duquette	Yes	2/4/2019	2/4/2019	2/4/2019		
Phillips, Robert	VDOT	12/31/2022	10/26/2022	Duquette	Yes	2/4/2019	2/4/2019	2/4/2019		
Pierce, Chris	VDOT	12/31/2020	3/7/2024	Somers	Yes	7/16/2019	7/16/2019	7/16/2019		
Quinlan, Justin	VDOT	12/31/2021	12/1/2021	Simmers	Yes	7/3/2019	7/3/2019	7/3/2019		
Wasiewski, Nick	VDOT	12/31/2022	3/9/2022	Tucker	Yes	11/6/2019	11/6/2019	11/6/2019		
Wojciechowski, Aaron	Viola	12/31/2024	6/7/2023	Contractor	Yes	5/29/2019	5/29/2019	5/29/2019		
Woodward, J.B.	VDOT	12/31/2022	4/2/2020	Duquette	Yes	6/24/2019	6/24/2019	N/A		
Taylor, Joel	AMT	12/31/2024	3/7/2024	Simmers	Yes	9/18/2019	9/18/2019	9/18/2019		
21 Technicians						19 Technicians	90.50%			

Image: VDOT

Now: System-Based IA

2019 Soils/Aggregate System-Based IA								
Inspector	Organization	Construction Manager (VDOT) or QC/QA Manager (DB)	Soils/Aggregate Certification Expiration Date	Nuclear Gauge Calibration Exp Date	Soil Kit Calibration Expiration Date	Density IA Date (Observation & Split Sample)	Depth IA Date (Observation & Split Sample)	Observations/Notes
Allwine, Chris	VDOT	Umstead	12/31/2022	3/1/2020	N/A	8/28/2019	N/A	
Baldwin, David	VDOT	Somers	12/31/2022	3/1/2020	N/A	6/17/2019	N/A	
Berry, Mike M.	VDOT	Parlett	12/31/2021	3/1/2020	N/A	6/17/2019	N/A	
Brown, Jeremy A.	VDOT	Duquette	12/31/2022	3/1/2020	N/A	7/1/2019	7/1/2019	
Camden, Johnny	VDOT	Duquette	12/31/2022	3/7/2020	N/A	7/1/2019	7/1/2019	
Catron, Dick	VDOT	Somers	12/31/2022	2/15/2020	N/A	8/28/2019	N/A	
Fisher, Chris	AMT	Parlett	12/31/2024	2/1/2020	N/A	8/16/2019	8/16/2019	
Frye, Charles	AMT	Tucker	12/31/2019	6/1/2019	N/A	2/5/2019	2/5/2019	Inspector advised of certification expiration date
Gochenour, David	VDOT	Parlett	12/31/2019	4/26/2021	N/A	11/4/2019	11/4/2019	Inspector advised of certification expiration date
Gochenour, Jeff	AMT	Parlett	12/31/2024	2/1/2020	N/A	6/14/2019	6/14/2019	
Griffith, Jacob	VDOT	Parlett	12/31/2021					
Hensley, Greg	AMT	-	12/31/2024	2/1/2020	N/A	6/14/2019	6/14/2019	
Housman, William	VDOT	Simmers	12/31/2022	6/1/2019	N/A	2/5/2019	2/5/2019	
McLamb, Kevin	VDOT	Duquette	12/31/2023	3/1/2020	N/A	7/1/2019	7/1/2019	
Phillips, Chris	VDOT	Duquette	12/31/2019	6/1/2019	N/A	3/27/2019	N/A	Inspector advised of certification expiration date
Phillips, Robert	VDOT	Duquette	12/31/2022	6/1/2019	N/A	3/27/2019	N/A	
Pierce, Chris	VDOT	Somers	12/31/2020	3/1/2020	N/A	8/28/2019	N/A	
Quinlan, Justin	VDOT	Simmers	12/31/2022					
Vann, Al	VDOT	Umstead	12/31/2019	5/2/2021	N/A	11/4/2019	11/4/2019	Inspector advised of certification expiration date
Wasiewski, Nick	VDOT	Tucker	12/31/2022					
Wojciechowski, Aaron	Viola	Contractor	12/31/2024	3/28/2020		9/11/2019	9/11/2019	LAP - 0788-034-R13
Woodward, J.B.	VDOT	Duquette	12/31/2019	3/1/2020	N/A	7/1/2019	7/1/2019	Inspector advised of certification expiration date
Ben Benavides	Viola	QAM	12/31/2024	3/5/2020		9/11/2019	9/11/2019	LAP - 0788-034-R13
23 Technicins						20 Technicians	87%	

Image: VDOT

Now: System-Based IA

2019 Hot Mix Asphalt System-Based IA							
Inspector	Organization	Construction Manager (VDOT) or QC/QA Manager (DB)	Certification Expiration Date	Nuclear Gauge Calibration Exp Date*	Scale Calibration Expiration Date*	Density IA Date* (Observation & Split Sample)	Observations/Notes
Alderson, David	B&S	Contractor	12/31/2021	3/1/2020	3/1/2020	10/21/2019	
Aldridge, Collin	Adams	Contractor	12/31/2024	1/1/2020	3/20/2020	11/21/2019	
Bekhet, Mahmoud	ESI	Contractor	12/31/2020	4/4/2020	6/1/2020	6/11/2019	(NOVA Technician)
Carver, Jack	Viola	Contractor	12/31/2022	2/1/2020	2/1/2020	4/16/2019	
Casady, Susan	SL Williamson	Contractor	12/31/2022	1/23/2020	5/2/2020	9/24/2019	
Creasey, Calvin	Adams	Contractor	12/31/2024	2/1/2020	3/1/2020	6/18/2019	
Elliott, Robert	Viola	Contractor	12/31/2024	5/2/2020	2/1/2020	5/21/2019	
English, Adam	Chemung	Contractor	12/31/2020	1/30/2020	3/5/2020	9/18/2019	(NOVA Technician)
Gray, Ryan	PavCon	Contractor	12/31/2023	2/1/2020	1/9/2020	5/15/2019	
Holliday, Austin	Viola	Contractor	12/31/2022				
Howell, Krystal	Adams	Contractor	12/31/2021	1/1/2020	3/20/2020	4/1/2019	
Kaplan, Josh	Viola	Contractor	12/31/2024	2/13/2020	2/1/2020	5/30/2019	
Long, Samantha	B&S	Contractor	12/31/2022	3/1/2020	1/8/2020	3/20/2019	
Oseitawaih, Grace	ESI	Contractor	12/31/2019	10/10/2019	6/1/2020	7/9/2019	(NOVA Technician)
Shick, Darin	Viola	Contractor	12/31/2022	2/28/2020	1/1/2020	8/19/2019	
Willett, Andrew	Viola	Contractor	12/31/2021				
16 Technicians				14 Technicians	87.50%		

*VDOT Inspectors (and VDOT Consultants) do not perform HMA testing. HMA Field Level 1 cert is required for sampling.

Image: VDOT

Minimum Requirements for Quality Assurance and Quality Control on Design-Build and P3 Projects
July 2018
Appendix 2 Table A-2, Part 1
Minimum Requirements for Materials Testing

No.	Material Type	Spec. Section	Test Reference	General Contractor			Department (Owner)	
				Contractor	Quality Assurance Manager			
				QC Frequency	IA Frequency*	VST Frequency*	OIA Frequency*	OVST Frequency*
6.	**STONE MATRIX ASPHALT PLACEMENT**	VDOT 2016 R&B Section 317						
	In Place Pavement Density QAM to take possession of QC, IA and VST asphalt cores/plugs taken on project.		VTM-6, VTM-22	Establish trial section and test sections Three (3) stratified random cores or six 6 plugs per trial section Five (5) stratified random density tests per test section (5000 LF)	Observe one (1) trial section per ten (10) trials sections established by the QC technician Reweigh the three (3) cores or six (6) plugs taken from this trial section Minimum of one (1) trial section observed per project and reweighing of cores or plugs from trial section	Two (2) stratified random cores per 25,000 LF of paver width Both cores obtained from the same test section Minimum five (5) cores per project	System Based IA	Two (2) stratified random cores per 25,000 LF of paver width Both cores obtained from the same test section Minimum two (2) cores per project
	Asphalt Tack applications		VTM-137	One (1) tack plate for every 5000 LF (per lane)	NA	One (1) tack plate per ten (10) QC tests Minimum one per project	System Based IA	One (1) tack plate per twenty (20) QC tests Minimum one per project

Image: VDOT

2018 Enhancements to DB Manual/Materials MOI

TL-142DB/LAP published

- Ensures consistent use statewide
- Revised for DB requirements – simplifies DB QAM documentation
- Tracking quantities in Materials Notebooks

Testing Log required

- Organizes QC, QAM VST, QAM IA, VDOT VST, and VDOT IA
- Ensures QAM review of frequencies/results
- Improves communication during project

Local Assistance Projects

IA for LAP projects remains Project-Based.

If you have an LAP project that is following the DB Manual, it should be using System-Based IA*.

***Unless it is Locality-maintained.**

Image: www.abcnews.com

Issues with Contractor QC

2019 ASPHALT MIX VOLUMETRIC FAILURE

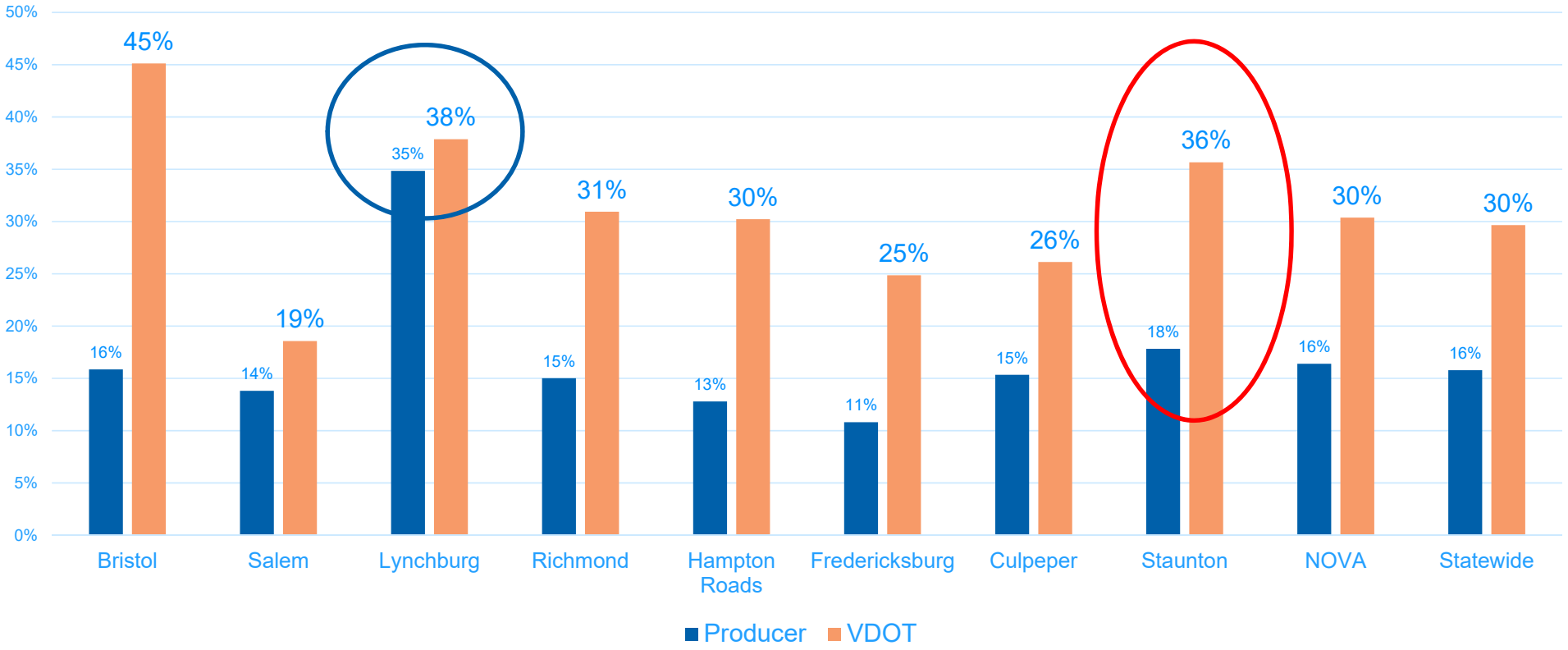


Image: VDOT Materials Division

Issues with Contractor QC

2019 **Non-Matched SAMPLE FAILURE RATE**

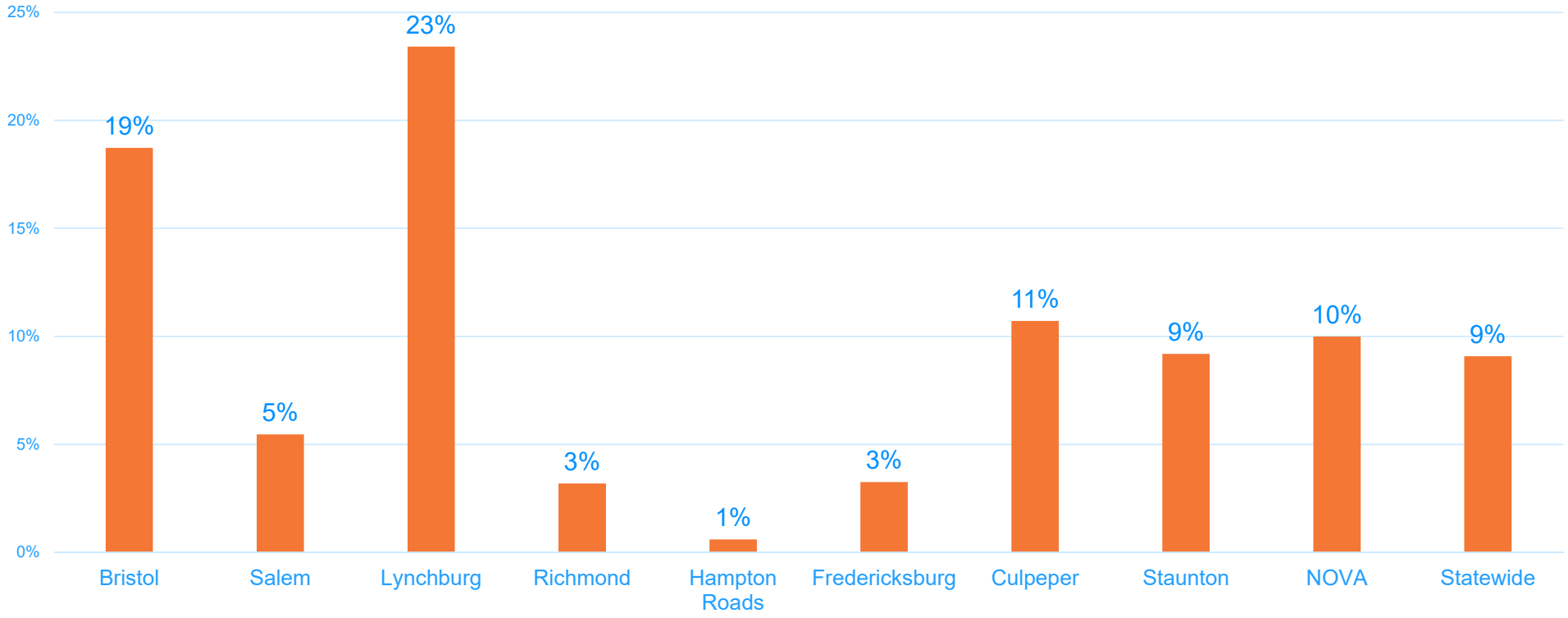


Image: VDOT Materials Division

Issues with Contractor QC

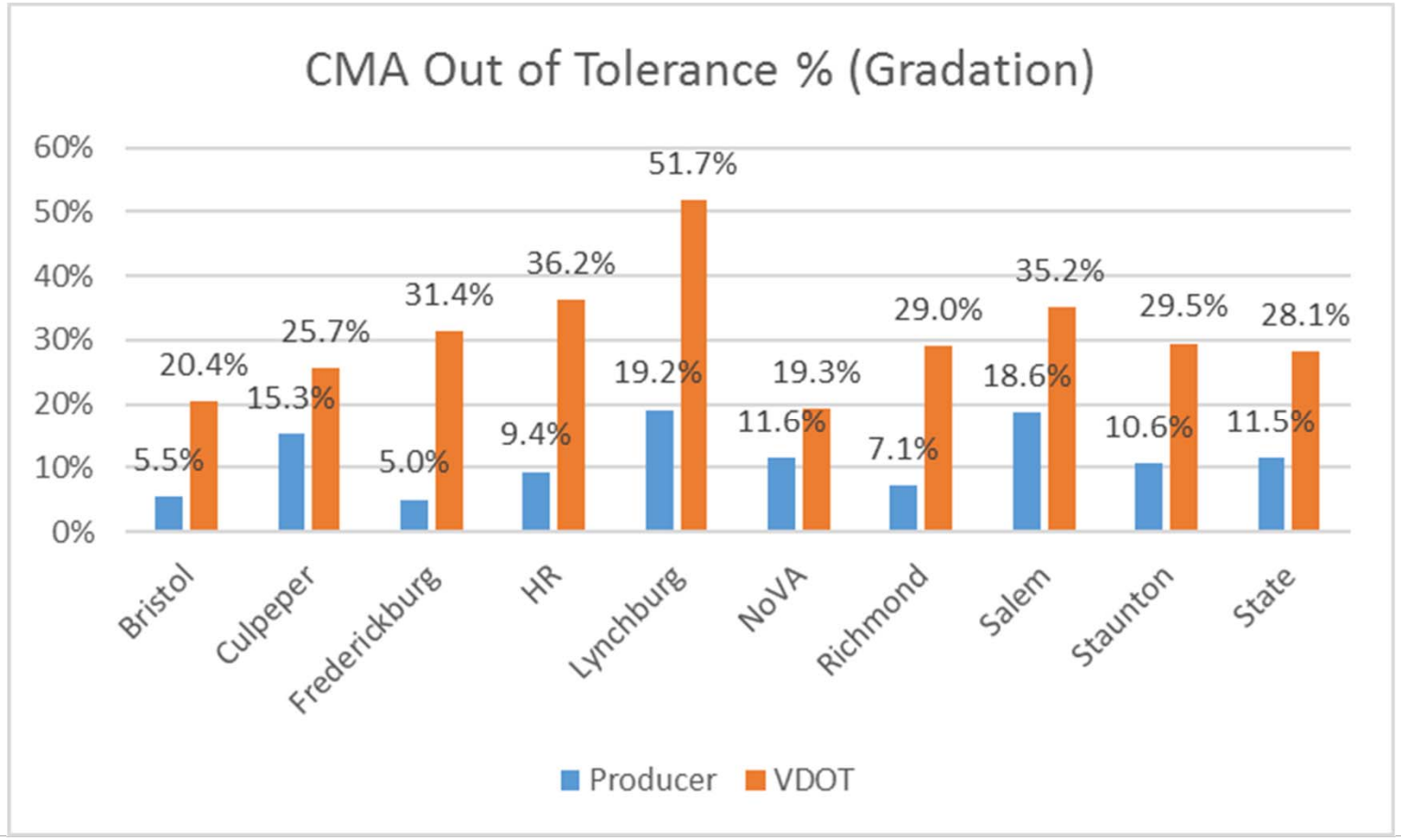


Image: VDOT Materials Division

Issues with Contractor QC

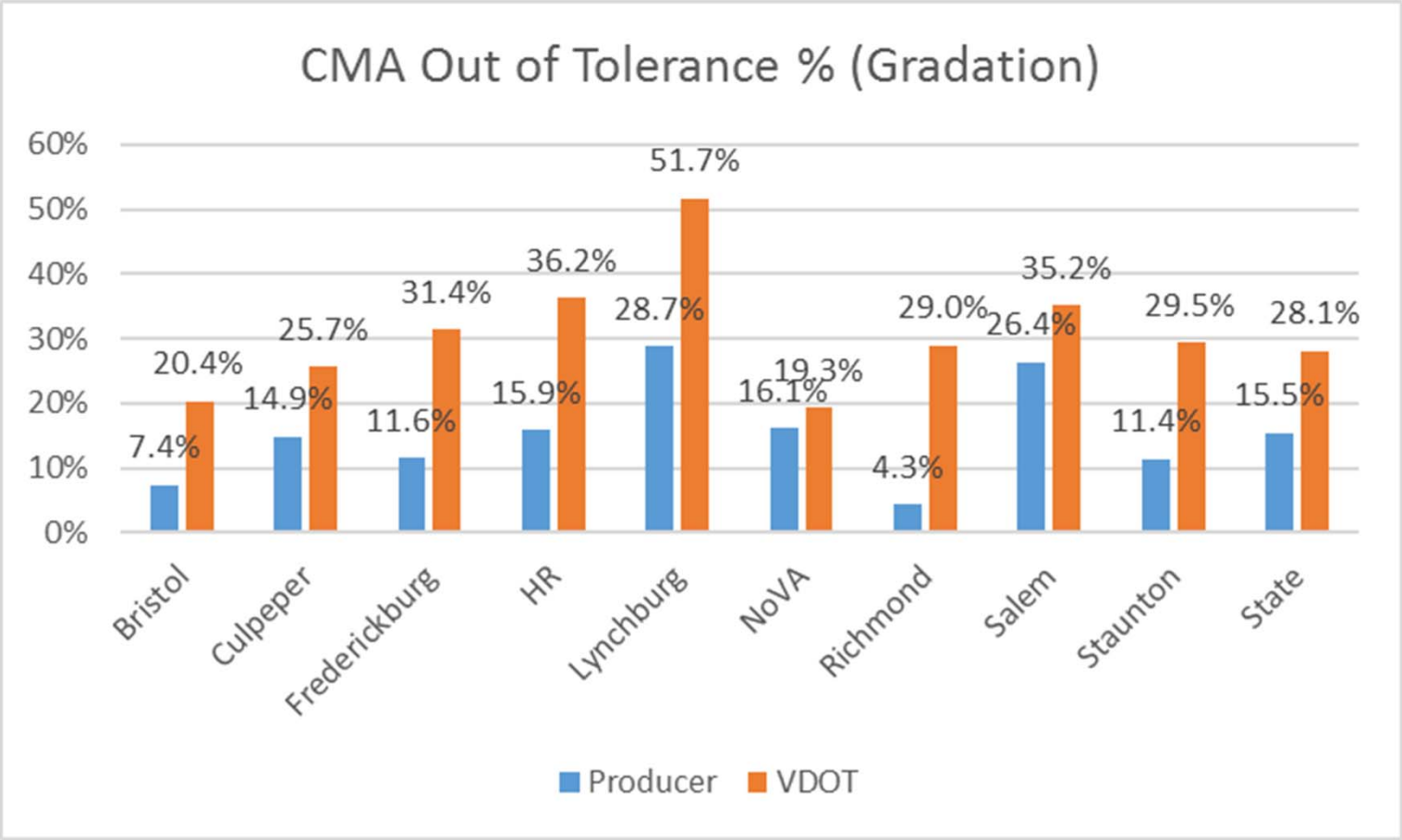


Image: VDOT Materials Division

Lab Accreditation

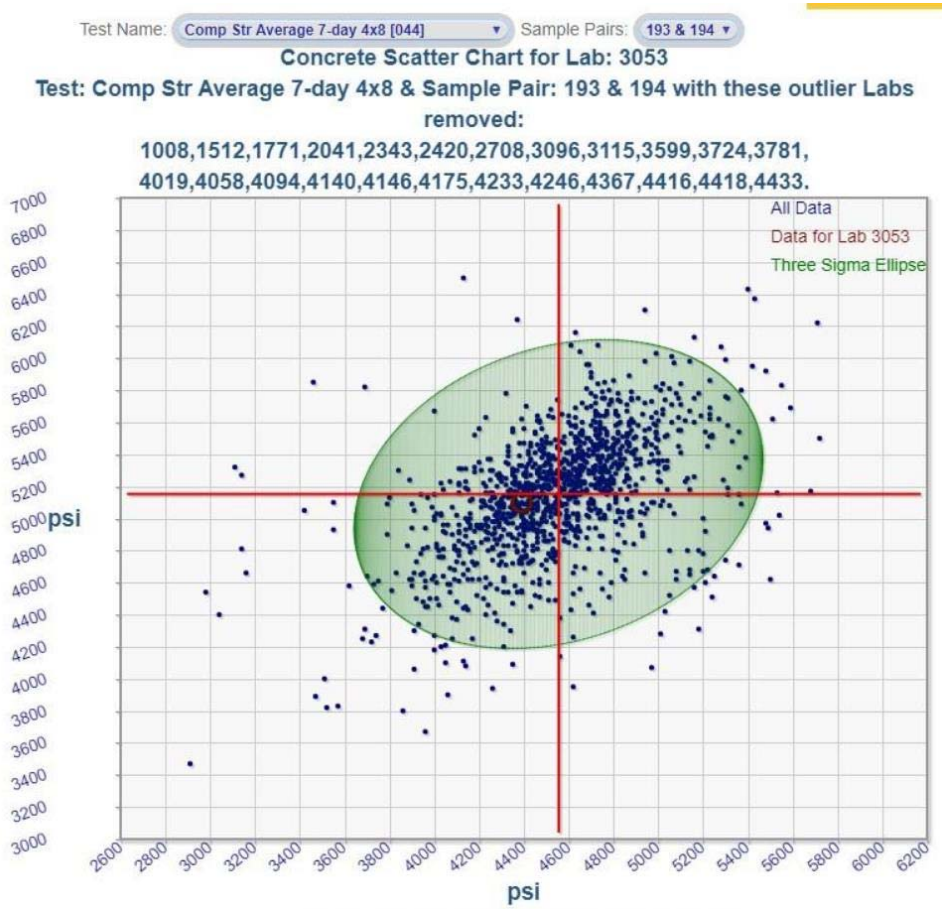


Image: CCRL

Thanks!

Any questions?

It's unwise to pay too much, but it's worse to pay too little. When you pay too much, you lose a little money – that's all. When you pay too little, you sometimes lose everything, because the thing you bought was incapable of doing the thing it was bought to do. The common law of business balance prohibits paying a little and getting a lot - it can't be done. If you deal with the lowest bidder, it is well to add something for the risk you run, and if you do that you will have enough to pay for something better.

- John Ruskin