

# DSA

## Administrative Webinar

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5/19/16

Starts at 9am

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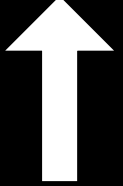
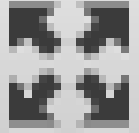
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ask Questions

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## Note:

Today is brief “administrative”  
DSA Overview to highlight  
changes

June 15<sup>th</sup> will be a Longer  
“technical” DSA webinar.



# Driving Surface Aggregate

- Background
- Evolution of DSA spec
- Walkthrough of new spec and changes
- Overview of Handbook
- Implementation





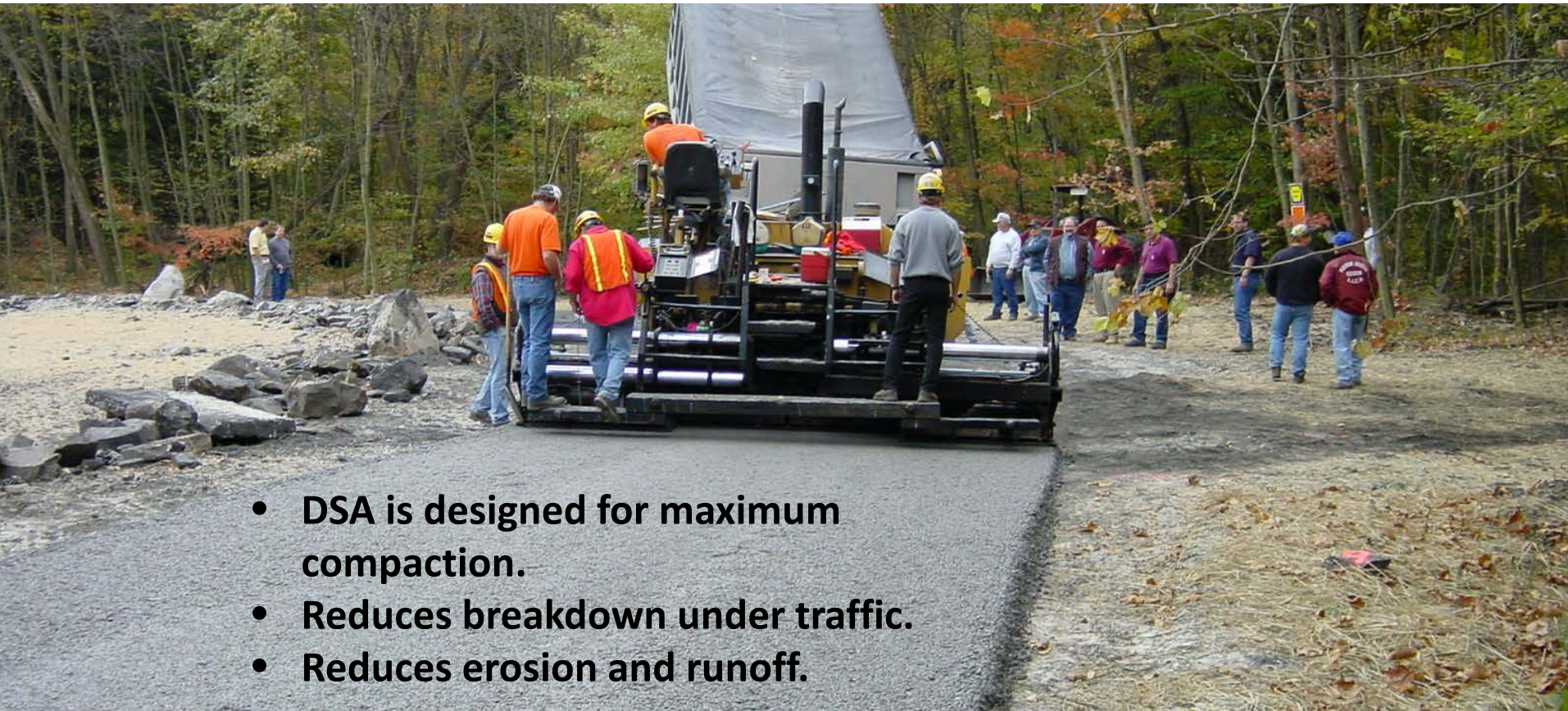
# Driving Surface Aggregate

- **Background**
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- **What is it?**

- Specific blend of unbound aggregate designed as a wearing course for unpaved roads.
- Only approved surface aggregate in the Program.



- DSA is designed for maximum compaction.
- Reduces breakdown under traffic.
- Reduces erosion and runoff.

- **DSA History**

- Historically, ~ 50% of funding has been spent on DSA

- **DSA History**

- Historically, ~ 50% of funding has been spent on DSA
- In 2015 Annual Report:
  - 139,000 tons of DSA reported
  - Equivalent to 42 miles of road (@18' width)
  - Equivalent to ~3.5million (@ \$25/ton)
  - That is ~47% of the \$7.5million spent on 248 completed projects in 2015



## A word about DSA use:

- Originally intended to be used near streams where drainage to stream was unavoidable.
- Has evolved into the “standard solution”.
- **Drainage must be addressed first!**
- We realize it is a “carrot” for municipalities, but DSA is not required on every project.
- DSA and the spending game...

# Driving Surface Aggregate

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- **DSA History**

- Center developed DSA in 2000.
- PennDOT adopted DSA spec in 2006.
- Program adopted PennDOT spec for use in 2006.

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- Center developed DSA in 2000.
- PennDOT adopted DSA spec in 2006.
- Program adopted PennDOT spec for use in 2006.
- DSA Clearinghouse at Center in 2015.
- SCC DSA Spec approved 5/10/2016 (separate from PennDOT spec)



## Reason for new Spec

- Several DOT requirements that did not fit Program:
  - DOT approved quarry
  - Required paver
  - Required sub-grade compaction and density testing
  - Required in-place density testing
- Flexibility to make changes
- Local Control

## Timeline on new Spec

- Program’s “Policy and Planning” advisory workgroup met several times last winter to provide input.
- All Conservation Districts were given comment opportunity on spec in Feb 2016. *PA Aggregate and Concrete Association*
- Met twice and received comments from PACA.
- Final specification approved by SCC 5/10/16.

- **Purpose of new Spec**
  - Make DSA more available (more suppliers)
  - Insure you get what you pay for
  - Improve overall quality of placements
  - Allow more Program control by not being tied to DOT spec.

A vertical photograph on the left side of the slide shows a yellow Caterpillar roller paving a road surface with dark aggregate material. A worker in an orange safety vest and hard hat is visible in the operator's cab. The background shows green trees and a clear sky.

# Driving Surface Aggregate

- Background
- Evolution of DSA spec
- **Walkthrough of new spec and changes**
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## Draft SCC Spec Walkthrough

- 2 pages
- Walkthrough of changes

DRAFT 2/23/2016

### PA State Conservation Commission Driving Surface Aggregate Standard and Specification

- I. **Definition** - This document is for the purchase and placement of Driving Surface Aggregate (DSA) for the Pennsylvania State Conservation Commission's Dirt, Gravel, and Low Volume Roads Maintenance Program (DGLVRMP). DSA is an aggregate mixture of crushed stone designed specifically as a surface-wearing course for unpaved roads. DSA provides a durable road surface with longer maintenance cycles than conventional road surface aggregates.
- II. **Use** - For the purposes of funding under the Dirt, Gravel, and Low Volume Roads Maintenance Program (DGLVRMP), DSA must be used in areas where it will have an environmental benefit (reduced erosion, reduced runoff). DSA shall only be placed after drainage and subgrade issues have been addressed by utilizing practices that promote Environmentally Sensitive Maintenance. DSA was originally designed to reduce erosion and runoff on road segments close to streams where drainage improvements were limited. DSA is not required on every project.
- III. **Material** - Material to be used on DGLVRMP projects shall be tested prior to delivery by an independent lab that has no affiliation with the source quarry. Samples shall be obtained by Conservation District (CD) Staff, Center for Dirt and Gravel Road Studies (CDGRS) staff or otherwise approved by the SCC. Material must meet the following requirements:

- A. **Gradation**: The required sieve sizes and allowed ranges, determined by weight, for DSA components are shown in Table 1.

Sieve Size	Percent Passing
1.5"	100
0.75"	65 – 95
#4	30 – 65
#16	15 – 30
#200	10 – 15

Table 1 – DSA Gradations

- B. **Abrasion Resistance**: The loss of mass (LA Abrasion) shall be less than 40%. Determine the resistance to degradation using the Los Angeles Abrasion test, AASHTO T-96 (ASTM C 131).
- C. **pH**: Aggregate shall be in the range of pH 6 to pH 12.45 as measured by EPA 9045C.
- D. **Moisture**: Upon delivery to the site, material shall be well mixed and placed at optimum moisture content or up to 2% below that value as determined for that particular source. The optimum percentage moisture is to be determined using Proctor Test ASTM D698, Procedure C, Standard.

DRAFT 2/23/2016

- E. **Plasticity**: Material shall not exceed Plasticity Index (PI) of 6. The laboratory test required for these results is the ASTM D4318 – Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- F. **Aggregate**: All Driving Surface Aggregate (DSA) shall be derived from natural rock formations that meet program specification for abrasion resistance, pH and freedom from contaminants.
- G. **Fines**: The fines passing the #200 sieve shall be rock material. No clay or silt soil may be added. All added material passing the #200 sieve must be derived from rock material that conforms to program specifications. The amount of particles passing the #200 sieve shall be determined using the washing procedures specified in PTM No. 100.
- H. **Mixing**: DSA shall be properly mixed and at the proper moisture content before it is loaded onto the transport vehicles.

#### IV. Delivery and Placement

- A. **Preparation of subgrade**: Unsatisfactory drainage and subgrade conditions shall be corrected prior to placement by scarifying, reshaping, and re-compacting, or by replacing or importing subgrade/sub-base. The subgrade/sub base shall be crowned or side sloped to ½ to ¾ inch per foot (4%-6% slope). Beginning and ending of DSA placements shall include a paving notch across the width of the subgrade. The paving notch shall have a minimum depth equal to the compacted DSA placement, and a sufficient length to facilitate transition into existing road surface.
- B. **Transport**: Tarps shall be used to cover 100% of the load's exposed surface from the time of loading until immediately before placement.
- C. **Certification**: A properly executed SCC DSA Certification Form (attached) shall be provided at the time of initial delivery and subsequent certification forms shall be provided if quarry conditions change. This Certification Form is to apply to the specific stockpile of DSA material being delivered from the source. The form certifies that the DSA material meets all of the specifications and requirements.
- D. **Placement**: The use of a motorized paver is highly recommended for all DSA placements. For projects and/or contracts including over 1,000 tons of DSA, a motorized paver is required. A track mounted paver is preferred. DSA placements should be placed in a single pass. The crown or cross slope must range from ½ to ¾ inch per foot (4-6%). Material shall be placed in a single 6-8 inch loose lift. This lift is to be compacted with a vibratory roller as specified in Section V Compaction. If freezing temperatures or precipitation are forecast that may cause the material to freeze, or prevent the material from drying out, placement shall be postponed by the road owner.

#### V. Compaction

- A. **Vibratory Roller**: After placement, the material shall be compacted using a minimum ten-ton vibratory roller. DSA material shall be compacted to a minimum of 95% of the dry-mass (dry-weight) density according to ASTM D698, Procedure C, Standard as determined by pre-sampling (refer to Materials, Section III.D). The road owner, or its designated representative, reserves the right to determine the in-place moisture and density according to AASHTO T310.

- VI. **Maintenance** - Properly placed and compacted DSA provides a durable road surface with longer maintenance cycles than traditional aggregates, but it is not maintenance free. Refer to the Center for Dirt and Gravel Roads "Driving Surface Aggregate Handbook" for additional guidance.

## Use of Bulletin 14 (DOT approved Quarry)

- In DOT spec, not in SCC draft
- Restricts availability
- Non-DOT approved quarries can make good DSA

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## DSA Use:

- SCC Spec defines use in Program: only after drainage and base issues are addressed, etc.

DRAFT 2/23/2016

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## Material: Gradation

- **NEW: Material must be tested prior to delivery.**

III. **Material** - Material to be used on DGLVRMP projects shall be tested prior to delivery by an independent lab that has no affiliation with the source quarry. Samples shall be obtained by Conservation District (CD) Staff, Center for Dirt and Gravel Road Studies (CDGRS) staff or otherwise approved by the SCC. Material must meet the following requirements:

- A. **Gradation:** The required sieve sizes and allowed ranges, determined by weight, for DSA components are shown in Table 1.



## Material: Gradation

- **NEW: Material must be tested prior to delivery.**
- **Easier to fix problems before you have aggregate on the road.**
- **Since Clearinghouse began in 2015:** *through 4/2016*
  - 118 samples tested (72 met DSA spec, 46 did NOT)
  - **39% of samples tested did NOT meet spec**

III. **Material** - Material to be used on DGLVRMP projects shall be tested prior to delivery by an independent lab that has no affiliation with the source quarry. Samples shall be obtained by Conservation District (CD) Staff, Center for Dirt and Gravel Road Studies (CDGRS) staff or otherwise approved by the SCC. Material must meet the following requirements:

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## Material: Gradation

### – Gradation itself did not change

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**Table 1 – DSA Gradations**

## Material: Details

- Minor re-wording
- Soundness

Measures resistance to freeze/thaw weathering

Already done for DOT approved Quarries

- B. **Abrasion Resistance:** The loss of mass (LA Abrasion) shall be less than 10% after 1000 cycles of abrasion using the Los Angeles Abrasion test, ASTM C131.
- C. **pH:** Aggregate shall be in the range of pH 6 to pH 12.45 as measured in accordance with ASTM D153.
- D. **Moisture:** Upon delivery to the site, material shall be well mixed and the moisture content shall be within 1% above or up to 2% below that value as determined for that particular material. Moisture content is to be determined using Proctor Test ASTM D698, Proctor Test is encouraged to perform moisture testing prior to loading material.
- E. **Plasticity:** Material shall not exceed a Plasticity Index (PI) of 6. The test method used for this results is ASTM D4318 – Standard Test Method for Liquid Limit, Plasticity Index, and Shrinkage Swell of Soils.
- F. **Soundness:** Determine the percentage of mass (weight) loss of aggregate after five cycles of immersion and drying using a sodium sulfate solution. The maximum weighted percent loss allowed is 20%. The Conservator shall perform the soundness test if it can be demonstrated that the material has a maximum weighted percent loss of 20% or less.
- G. **Aggregate:** All DSA shall be derived from natural rock formation and shall meet abrasion resistance, pH and freedom from contaminants.
- H. **Fines:** If fines need to be added to the aggregate to meet DSA gradation, the material passing the #200 sieve must be derived from rock material meeting the same specifications. No mineral clay or silt soil may be added. The amount of fines shall be determined using the washing procedures specified in Part 705.
- I. **Mixing:** DSA shall be properly mixed and at the proper moisture content for transport vehicles.

## Delivery and Placement

- Removed subgrade testing (required in DOT)
- SCC Spec has more details on subgrade prep

### IV. Delivery and Placement

- Preparation of subgrade:** Unsatisfactory drainage and subgrade conditions shall be corrected prior to placement by scarifying, reshaping, and re-compacting, or by replacing or importing subgrade/sub-base. The subgrade/sub base shall be crowned or side sloped to  $\frac{1}{2}$  to  $\frac{3}{4}$  inch per foot (4%-6% slope). Beginning and ending of DSA placements shall include a paving notch across the width of the subgrade. The paving notch shall have a minimum depth equal to the compacted DSA placement, and a sufficient length to facilitate transition into existing road surface.
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- Certification:** A properly executed SCC DSA Certification Form (attached) shall be provided at the time of initial delivery and subsequent certification forms shall be provided if quarry conditions change. This Certification Form is to apply to the specific stockpile of DSA material being delivered from the source. The form certifies that the DSA material meets all of the specifications and requirements.



## Delivery and Placement

### – Use of paver to place DSA

- DOT spec is unclear

*PennDOT DSA MS-0450-0004:*

.03(a)3, Paver preferred  
08.05(c) 3.a, 3.b, 3.e, 4.

Placement. Place the (DSA) on the subgrade using a paver with

- SCC spec requires pavers on jobs >1,000 tons

### – SCC spec includes weather limitations on placement

D. **Placement:** The use of a motorized paver is highly recommended for all DSA placements. For projects and/or contracts including over 1,000 tons of DSA, a motorized paver is required. A track mounted paver is preferred. DSA placements should be placed in a single pass. The crown or cross slope must range from  $\frac{1}{2}$  to  $\frac{3}{4}$  inch per foot (4-6%). Material shall be placed in a single 6-8 inch loose lift. This lift is to be compacted with a vibratory roller as specified in Section V Compaction. If freezing temperatures or precipitation are forecast that may cause the material to freeze, or prevent the material from drying out, placement shall be postponed by the road owner.

## Compaction

### – In-place density testing

- DOT requires for every 3,000 sqyd (*~1,500' of road*)
- SCC spec recommends density testing (local control)

#### v. **Compaction**

- A. **Vibratory Roller:** After placement, the material shall be compacted using a minimum ten-ton vibratory roller. DSA material shall be compacted to a minimum of 95% of the dry-mass (dry-weight) density according to ASTM D698, Procedure C, Standard as determined by pre-sampling (refer to Materials, Section III.D). The road owner, or its designated representative, reserves the right to determine the in-place moisture and density according to AASHTO T310.

# Driving Surface Aggregate

- Background
- Evolution of DSA spec
- Walkthrough of new spec and changes
- **Overview of Handbook**
- Implementation



This DSA Handbook is intended for use in Pennsylvania's Dirt, Gravel, and Low-Volume Road Maintenance Program.



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### What is DSA?

Driving Surface Aggregate (DSA) is a well-graded, unbound

[open](#)



# [www.dirtandgravelroads.org](http://www.dirtandgravelroads.org): Resources: DSA

<http://www.dirtandgravel.psu.edu/general-resources/driving-surface-aggregate-dsa>



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Center for Dirt and Gravel Road Studies

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ESM Field Guide



## Driving Surface Aggregate (DSA)

Driving Surface Aggregate (DSA) is a well-graded, unbound mixture of aggregate designed for use as a wearing course on unpaved roads. DSA is designed to achieve maximum density to resist erosion and traffic wear. Properly installed DSA roads will have greatly reduced sediment loss and maintenance cycles. DSA is the only approved surface aggregate for purchase in the Dirt and Gravel Road Program. On May 10, 2016, the State Conservation Commission approved a new version of the DSA specification for use in the Program, see below.

# [www.dirtandgravelroads.org](http://www.dirtandgravelroads.org): Resources: DSA

<http://www.dirtandgravel.psu.edu/general-resources/driving-surface-aggregate-dsa>

## DSA Reference Documents

- [DSA Handbook](#) (3.27 MB): A comprehensive guide to using Driving Surface Aggregate and understanding the SCC DSA specification. Topics include site prep, purchasing, sampling, placement, compaction, maintenance, and more. (5/16/16)
- DSA Handbook Appendices: Provided here separately for download/printing convenience.
  - [Appendix A: SCC DSA Standard and Specification](#) (141 KB): 3-page Specification for Driving Surface Aggregate to be used by Conservation Districts in the PA DGLVR Program. (5/10/16)
  - [Appendix B: DSA Certification Form](#) (78.4 KB): Form for supplier to verify DSA meets specifications.
  - [Appendix C: Sample Collection Form](#) (96.7 KB): Form for CD or Center Staff that accompanies DSA sample for testing.
  - [Appendix D: DSA Notification Form](#) (116 KB): Form for CDs to use to notify Center of upcoming DSA placement.
  - [Appendix E: Sample Request for Quote and Quote Form](#) (72.1 KB): Use is optional to assist in bidding process.
  - [Appendix F: Road Aggregates 101](#) (401 KB): A summary of size, gradation, and typical use for some of the more common aggregates for road maintenance in Pennsylvania. Includes course aggregates and rip-rap.
  - [Appendix G: Municipal DSA Guide](#) (185 KB): An abridged 2-page guide to DSA meant for townships and other applicants.



# DSA “Technical” Webinar

**June 15<sup>th</sup>, 2016, 9am**

- Time for you to review handbook.
- Webinar will walk through handbook sections, discuss technical details.
- Webinar may be longer than normal.
  
- Contact Center or SCC with immediate questions

A vertical photograph on the left side of the slide shows a yellow Caterpillar roller paving a road. The roller is moving from left to right, leaving a fresh, dark aggregate surface behind it. A worker in an orange safety vest and hard hat is visible in the operator's cab. The background consists of green trees and a clear sky.

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- **Implementation**

**What do I do now?**

**When does the new spec take effect?**

- **Immediately (5/10/2016)**

## What do I do now?

### What about current contracts and bids?

- Current signed contracts: may continue to use old specification (*could also be re-bid*).
- Project that have been bid, but do not have a signed contract: Districts can accept bids under old spec, or re-bid under new spec.
- Projects that have not been bid yet: use new SCC spec

## What do I do now?

**So DSA needs to be sampled before my project?**

- Yes, pre-delivery testing is now required.
- Will take more planning and lead time with placements.
- Center, District, or third party can perform sampling.
- Testing of samples must be done by independent lab.
- Contact Center with questions.

## What do I do now?

### Can I sample the DSA myself?

- Yes
- Sampling guidance in handbook
- Must follow AASHTO spec.
- Center will assist in training you
- Please share result with Center



## What do I do now?

### Do I still need the DSA Certification from the quarry?

- Yes, it must still be delivered with the first load of DSA.
- Required for legal reasons: quarry attesting DSA meets spec and is same material that was tested pre-delivery.

- **Purpose of new Spec**
  - Make DSA more available (more suppliers)
  - Insure you get what you pay for
  - Improve overall quality of placements
  - Allow more Program control by not being tied to DOT spec.