Cat® SDX Screed Plate System

INFLUENCING DENSITY & SMOOTHNESS

Video: Revolutionizing the Paving Industry

ASPHALT SCREEDS

CAT® SDX SCREED PLATE SYSTEM

DYNAMIC MATERIAL FLOW, EASIER REPLACEMENT, MORE UPTIME

UP TO 25% QUALITY INCREASE

- Reduced IRI (International Roughness Index) scores
- Density increase up to 91% behind the screed
- Firmer edge profiles improve joint-matching

FASTER SERVICE

- Screed plate changes in as little as 4 hours
- Durable, light weight plates offer field installation
- Hardware-free fastening system

UP TO 3X LONGER PLATE LIFE

- Up to three-times longer plate life
- Angular design runs flatter, reduces wear
- Interchangeable plates help increase longevity

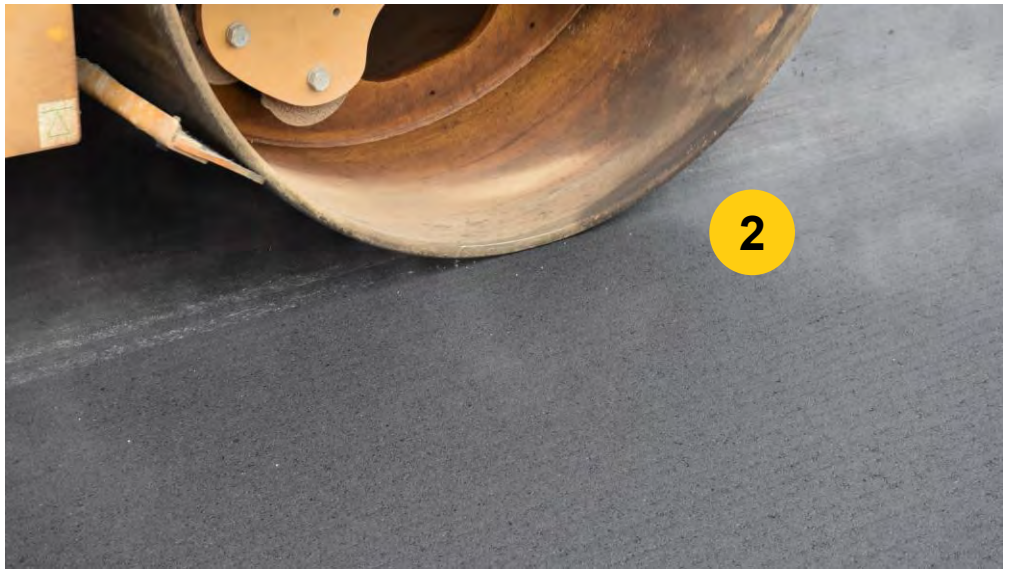
*All comparisons to; Quality, Service and Longevity vary by application: Performance improvements are based on test data.

INNOVATIVE MATERIAL FLOW

- Angular surface provides a kneading action as it passes through the diamond channels
- Tapering flat surface at the back of the plates provides a smooth finished surface
- Confined mixing manipulates the aggregates to reduce air voids and increase density
- Manipulation of aggregates helps create a more uniform surface texture
- Optimized aggregate structure promotes surface temperature uniformity for more consistent compaction
- Enhanced structural integrity minimizes roller shoving for better smoothness
- Increased stiffness strengthens unconfined edges, promotes better joint matching

Cat® SDX Screed Plates

Higher Density/Smoother Results



- Aggregate orientation can help increase stiffness and density and lead to better quality surfaces
- Cars driving over the uncompacted mat (1) shows the asphalt stiffness delivered by the Cat® SDX screed plates
- First pass with a compactor (2) demonstrates the elimination of the bow-wave that is often created in front of the drum when compacting asphalt

INCREASED DENSITY AND SMOOTHNESS

- IRI reductions up to 10 inches per lane mile have been realized
- Densities reaching up to 91% and higher from the screed has led to fewer compaction passes, and in some cases, the elimination of an asphalt compactor
- Consistently higher densities have led to increased bonus opportunities
- Increased stiffness leads to better longitudinal edge profiles and higher joint densities due to less lateral movement of the mix under the drums


CAT® SDX SCREED
PLATE SYSTEM

Customer #3 Review

Density Measurements / Bonus Pay

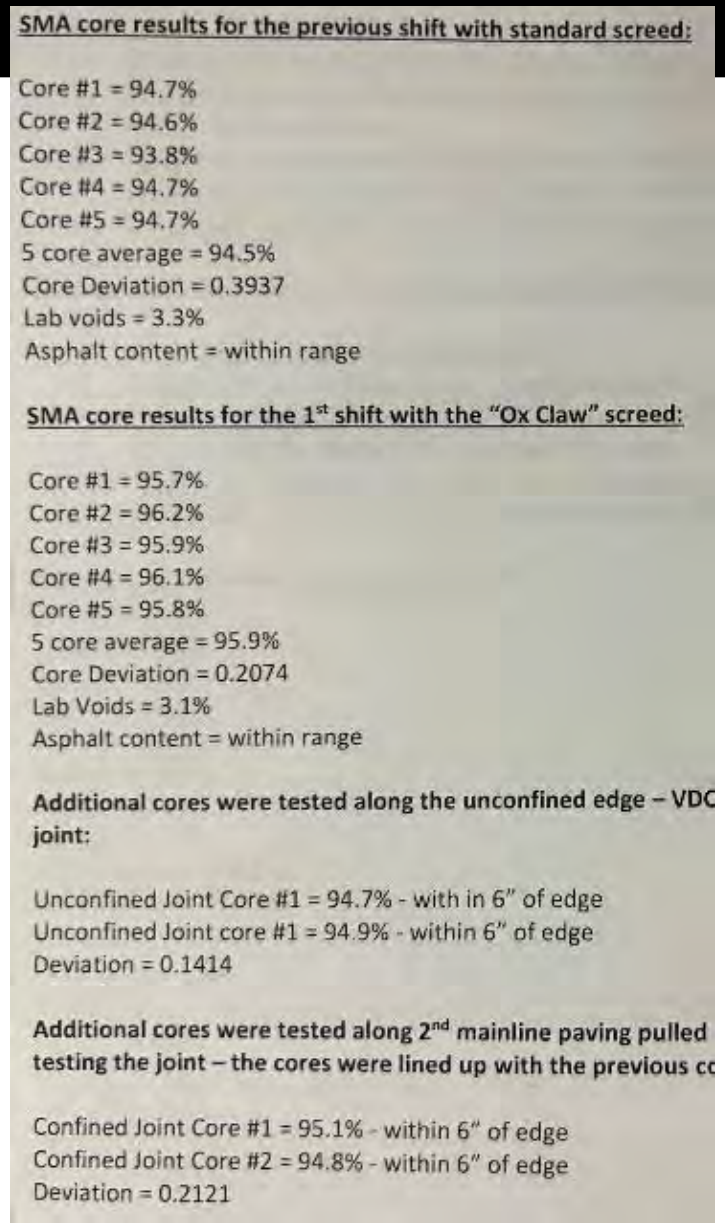
- **Paving:** Paving Contractor #3 – Mid-west
  - Surface lift, 14ft wide, 2-3/8 in loose with a 92% density spec. 30-35 ft/min
  - Mix Design: PG 58-34, 47% RAP at 280º – 306º
  - 92.3% density behind the screed
  - Mat rolled out at 14’ with SDX and was rolling out at 14’ 3” the day before with a standard screed
- **Compaction Train:**
  - Compaction consisted of 1 static pass and 2 vibratory passes with high-frequency
  - 93.8% after a single breakdown pass
  - 100% Pay starts at 92% compaction, achieved 100% of the bonus
- **Comments:**
  - QC guy statement, “hey, there is gonna be something extra in your paycheck next week!”.
  - DOT inspector first saw the mat and questioned the lines, but the customer shared the **Cat SDX Screed Plate animation**, and the inspector loved the theory. He described the mat as “excellent texture”. “We are hitting density, and the texture is more aesthetically pleasing. **It looks like the road was put down by people that care”.**

WERNER CONSTUCTION

- US-136, IN ORLEANS & EAST
  - Mix: SPR
  - Project Length: 5.25 Miles
  - Typical Design (Most of the Project)
    - Two 2” Lifts 14’ Wide with a 1’ trench widening
  - Density Results (ML) (JD)
    - Job Average: 94.2% 94.4%
    - Bottom Lift: 94.4% 94.2%
    - Top Lift: 93.9% 94.8%

PQI 380	Used On	Not Used on Project	Rolling Pattern:			
Gauge Serial Number	1802	**Lot Average of 5 Density**				**Joint Density**
Date Core Cut/Gauge	5/9/2023	5/11/2023	5/12/2023	5/15/2023	5/17/2023	5/15/2023
Date Core Tested	5/9/2023	5/11/2023	5/12/2023	5/15/2023	5/17/2023	5/15/2023
Lot/Sublot Number	1-1	1-2	1-3	1-4	1-5	1-1.
Gmm (Rice SG)	2.418	2.406	2.409	2.418	2.421	2.418
Voidless Density (Rice SG x 62.3)	150.64	149.89	150.08	150.64	150.83	150.64
Req. % of Voidless Densi	92.5	92.5	92.5	92.5	92.5	91.0
Station	224+21	245+43	293+21	280+31	240+03	280+31
Offset (ft) from edge Lt/Rt Centerline	4' Rt.	3' Rt.	3' Rt.	7' Rt.	7' Lt.	1 inch from Out
Nominal Thickness	>3"	>3"	>3"	>3"	>3"	>3"
Core Thickness	2 1/2"	2 3/4"	3 1/4"	3 1/4"	2 1/2"	3 1/4"
Lift (Bottom, Top, etc.)	BOTTOM	BOTTOM	BOTTOM	BOTTOM	BOTTOM	BOTTOM
	Density Cores					
A) Weight in Air	2330.3	3133.0	2700.2	2515.5	2061.2	2456.3
B) S.S.D. Weight	2332.3	3133.9	2701.2	2516.7	2062.1	2460.2
C) Weight in Water	1302.5	1760.6	1545.0	1431.8	1174.5	1362.4
D) Roadway Core SG (A/(B-C))	2.263	2.281	2.335	2.319	2.322	2.237
E) Roadway Core Density (D) x 62.3	140.98	142.13	145.50	144.45	144.67	139.39
% of Voidless Density	93.6	94.8	96.9	95.9	95.9	92.5
	Field Report of Density Tests for Asphalt (Density Gauge)					
Density 1 (lb/ft^3)						
Density 2 (lb/ft^3)						
Density 3 (lb/ft^3)						
Density 4 (lb/ft^3)						
Density 5 (lb/ft^3)						
Average Density						
Correction Factor (+/-)						
Corrected Density						
% of Voidless Density						
	Final Density Calculations					
Original or Re-cut?	Original Density	Original Density	Original Density	Original Density	Original Density	Original Density
Edge Density?	No	No	No	No	No	Unconfined Edge
Final Density	93.6	94.8	96.9	95.9	95.9	92.5
Lot Average	95.4					----------

Customer #7 Review



SMA core results for the previous shift with standard screed:

Core #1 = 94.7%
Core #2 = 94.6%
Core #3 = 93.8%
Core #4 = 94.7%
Core #5 = 94.7%
5 core average = 94.5%
Core Deviation = 0.3937
Lab voids = 3.3%
Asphalt content = within range

SMA core results for the 1st shift with the "Ox Claw" screed:

Core #1 = 95.7%
Core #2 = 96.2%
Core #3 = 95.9%
Core #4 = 96.1%
Core #5 = 95.8%
5 core average = 95.9%
Core Deviation = 0.2074
Lab Voids = 3.1%
Asphalt content = within range

Additional cores were tested along the unconfined edge – VDC joint:

Unconfined Joint Core #1 = 94.7% - with in 6" of edge
Unconfined Joint core #1 = 94.9% - within 6" of edge
Deviation = 0.1414

Additional cores were tested along 2nd mainline paving pulled testing the joint – the cores were lined up with the previous co

Confined Joint Core #1 = 95.1% - within 6" of edge
Confined Joint Core #2 = 94.8% - within 6" of edge
Deviation = 0.2121

Overall Benefits

- **Comments:** Paving Contractor #7 – Eastern U.S.
  - Paved with the same mix/application as done with traditional plates, rolling patterns remained the same, cores were ~1.5% better final density with the SDX plates, as well as density increases on joints.
  - Roll-down reduced from ¼" normally to 1/8" with SDX as the plates knead the material tighter directly under the screed, meaning the first breakdown pass is full compaction, not just setting the material in place and wasting a roller pass.
  - Rolling pattern went from 3 vibe/4 static to 2 vibe/5 static to keep the compaction within range and reduce the vibe passes to help achieve better IRI values. IRI results were ~10 better with SDX and bonus payout is directly benefited
- **Final Observations:**
  - With SMA, the plates are really doing their job, the screed does the work and rollers just clean up. The system eliminates compaction issues with a lower tier crew but makes a good crew world-class.
  - SMA 19 is most common mix design, 100% pay is at 94-98%, and can be very difficult. There were times when we would not have passed with traditional screeds, but with SDX, it kept us in the game at the low end, but still passed and stayed out of penalty.
  - Density is 1.4% higher and deviation is about ½ as much
  - Joint density is higher than standard screed final density

Customer #7 Review continued

Visual Concern

- **Comments:** Paving Contractor #7 – Eastern U.S.
  - "The concern was raised due to what visually looked like ridges in the mat and that it would trap or hold water. These concerns were evaluated and no ridges or evidence of holding water was discovered."

Customer #1 Review

Measured Densities

- **Paving:** Paving Contractor #1 – Midwest
  - Highway, 16 feet wide, 1-5/8” loose, 40 fpm, screed vibe at 2,200 rpm.
  - Mix Design: PG 58-28, AC = 6.5%, 18.4% FRAP at from 295º – 305º
- **Compaction Train:**
  - Two, Cat CB13’s with Oscillation and a CB13 finish roller with Oscillation
  - Original plan consisted of a 5-pass pattern but was reduced to 3-passes
- **Comments:**
  - Superintendent comments were positive with ~2 - 3% better density behind the SDX screed and 1 – 1.5% overall density increase after compaction when compared to the traditional screed plates.
  - Contractor was pleased with the 86.9% behind the screed, normal is around 81%
  - Supervisor commented that “This is very different, it’s amazing how tight the mat is.”
  - State Representatives were impressed with the edge tightness and joint densities.

MEASURED DENSITIES

Behind the Screed		Roller Pass 1		Roller Pass 2		Roller Pass 3		After Finish	
Cat SDX Plates	Traditional Plates	Cat SDX Plates	Traditional Plates	Cat SDX Plates	Traditional Plates	Cat SDX Plates	Traditional Plates	Cat SDX Plates	Traditional Plates
86.9%	82.9	90.5%	88.7	92.4%	91.4	93.2%	92.9	93.9	93.3

The specification was 93-94%, so the final pass with another CB13 was a simple static pass to clean up any lines.

Customer #2 Review

Cat SDX Plates vs. Standard Plates

- **Comments:** Paving Contractor #2 – Southern U.S
  - **IRI (International Roughness Index):** There was a significant result of 24.4 inches/mile (IRI) which was about 24.6% better using the Cat SDX Screed than our regular screed. This suggests that the SDX screed helps produce a smoother mat compared to the normal screed.
  - **Air Voids Behind the Screed:** The difference between the two screeds in air voids behind the paver is 1% in density. This indicates that using the regular screed tends to have more air voids behind the paver than with the Cat SDX Screed Plate.
  - **Compacted Air Voids with the Same Rolling Pattern:** There is a 0.6% difference in air voids between the regular and Cat SDX Screed while using the same rolling pattern.
- **Final Observations:**
  - These differences imply improvements in road quality, surface smoothness, and compaction when comparing the regular screed plates and the Cat SDX Screed plates. **The SDX screed plates produce higher initial density behind the screed and generally result in a smoother finished surface with higher densities on the longitudinal joints and on the mainline sections.**

Customer #4 Review

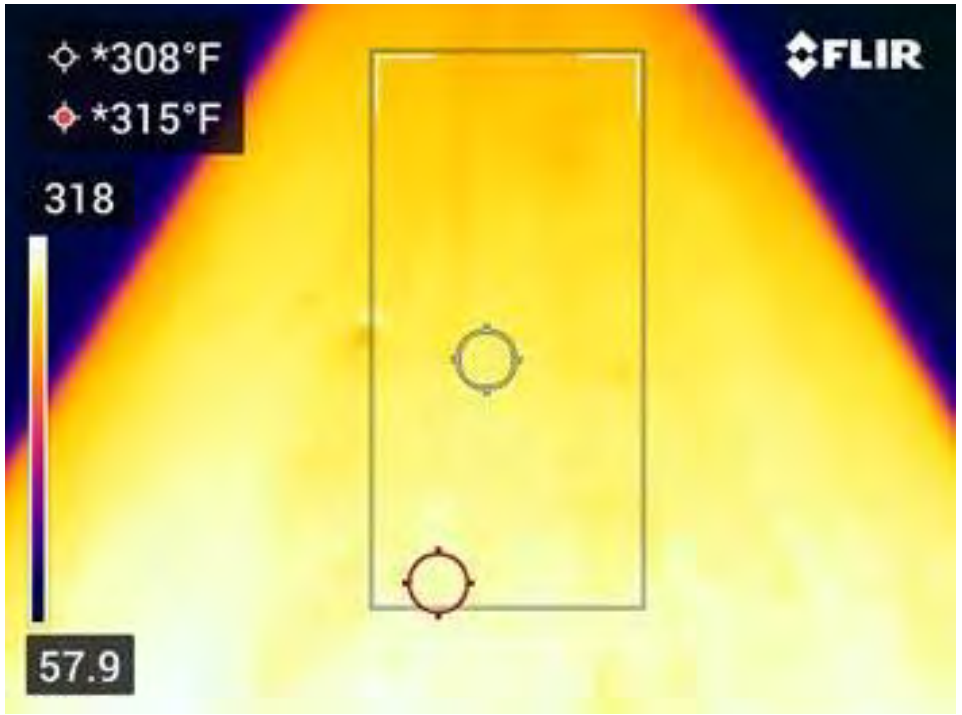
Fast Density Increase

- **Paving:** Paving Contractor #4 – Southern U.S.
  - Road widening and re-building, 5 inches of 1" base mix compacted to 4 1/8” to be covered with 11 inches of concrete.
  - AP1000F w/SE60 V XW equipped with SDX screed plates, 91% - 92% behind the screed
  - AP600F w/SE50 V equipped traditional screed plates, 89% - 90% behind the screed
  - Target density of 95%
- **Comments: Quality Control**
  - QC guy likes the plates, commented on less footprints and the ability to drop a vibratory breakdown roller. He said the plates “make his job easier”.
  - Says one vibratory pass gets him 1% increase each time, but the pneumatic takes 2 passes to get the 1% additional density. He is also stated that the thermal camera showed uniform and consistent temperatures across the width of the screed.
  - Definitely could remove the pneumatic from the train and just make 3 passes with the double drum behind the SDX screed plates.
  - Improved joints, the edges stand-up better, even with the end gates up

Customer #5 Review

Open-Graded Friction Course

- **Paving:** Paving Contractor #5 – Southeast
  - Highway, 40 - 45 fpm, 13’ wide, 1” final, screed vibe at 1,600 rpm
  - Mix temperature was 308º – 315º at the screed
  - Shows great thermal uniformity
  - Mix Design: High-polymer PG76 – 22, 6.3% polymer liquid. Spec allows up to 15% RAP, but this was virgin oil. Aggregate was 92% #7 crushed granite, 8% granite screening
- **Compaction Train:**
  - CB13 breakdown roller made a single static pass
  - Finish roller made a single static pass and left minimal marking
- **Comments:**
  - Job foreman commented that the “screed does exactly what it was designed to do”.
  - SDX plates were installed the first week of January 2023
    - 180 hours and 70 miles of asphalt paved, the SDX plates measured ~0.060 - 0.070 inches of wear measured off the trailing edge using a caliper.
    - Traditional screed plates were replaced every season at around (~1,200 hours, some have been pushed to 1,500 hours and were completely worn through.
    - Contractor loves using this on Open Graded Friction Course because it minimizes the chunks and the dragging of chunks.



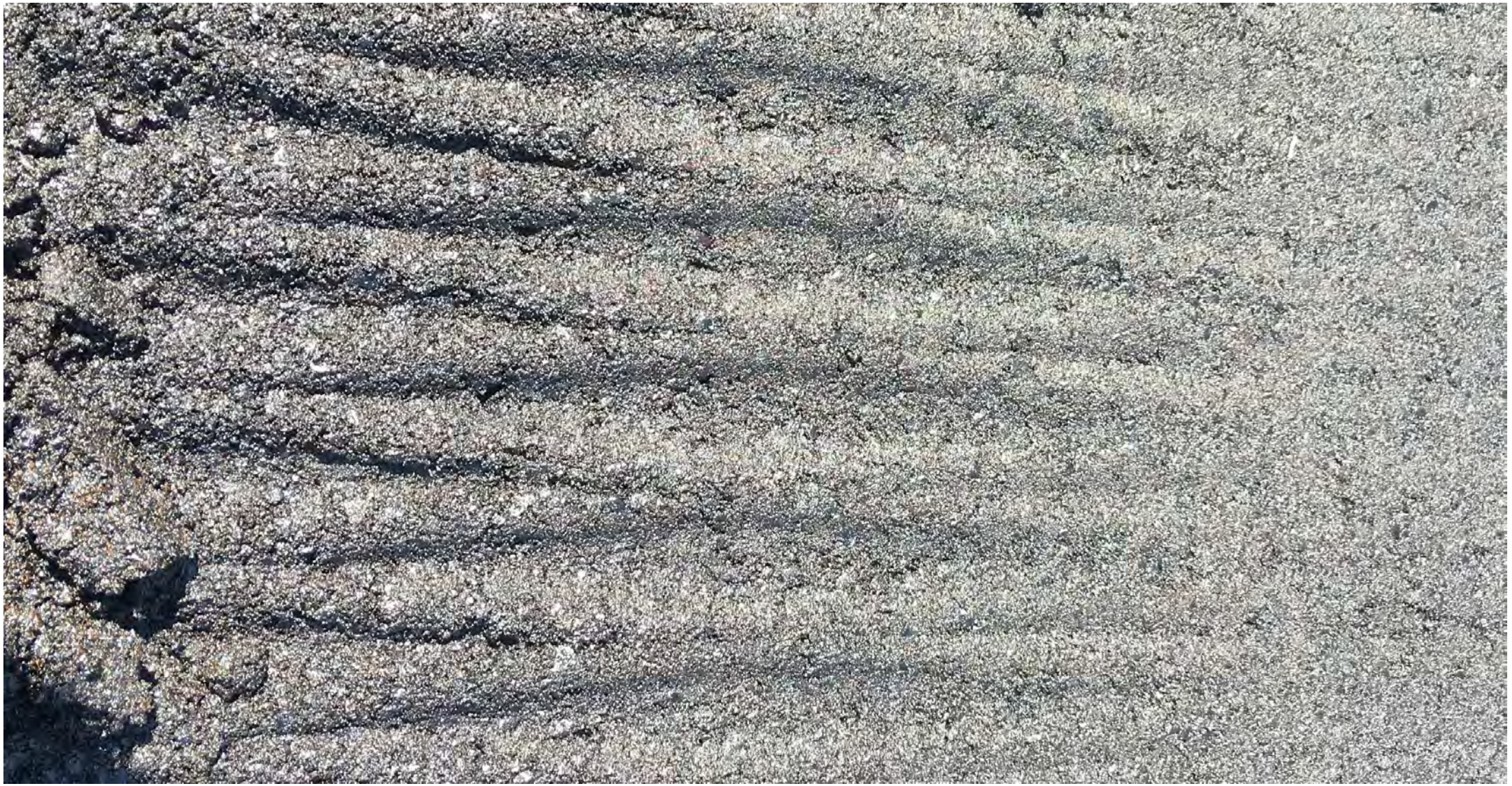
Customer #6 Review

Smoothness Results

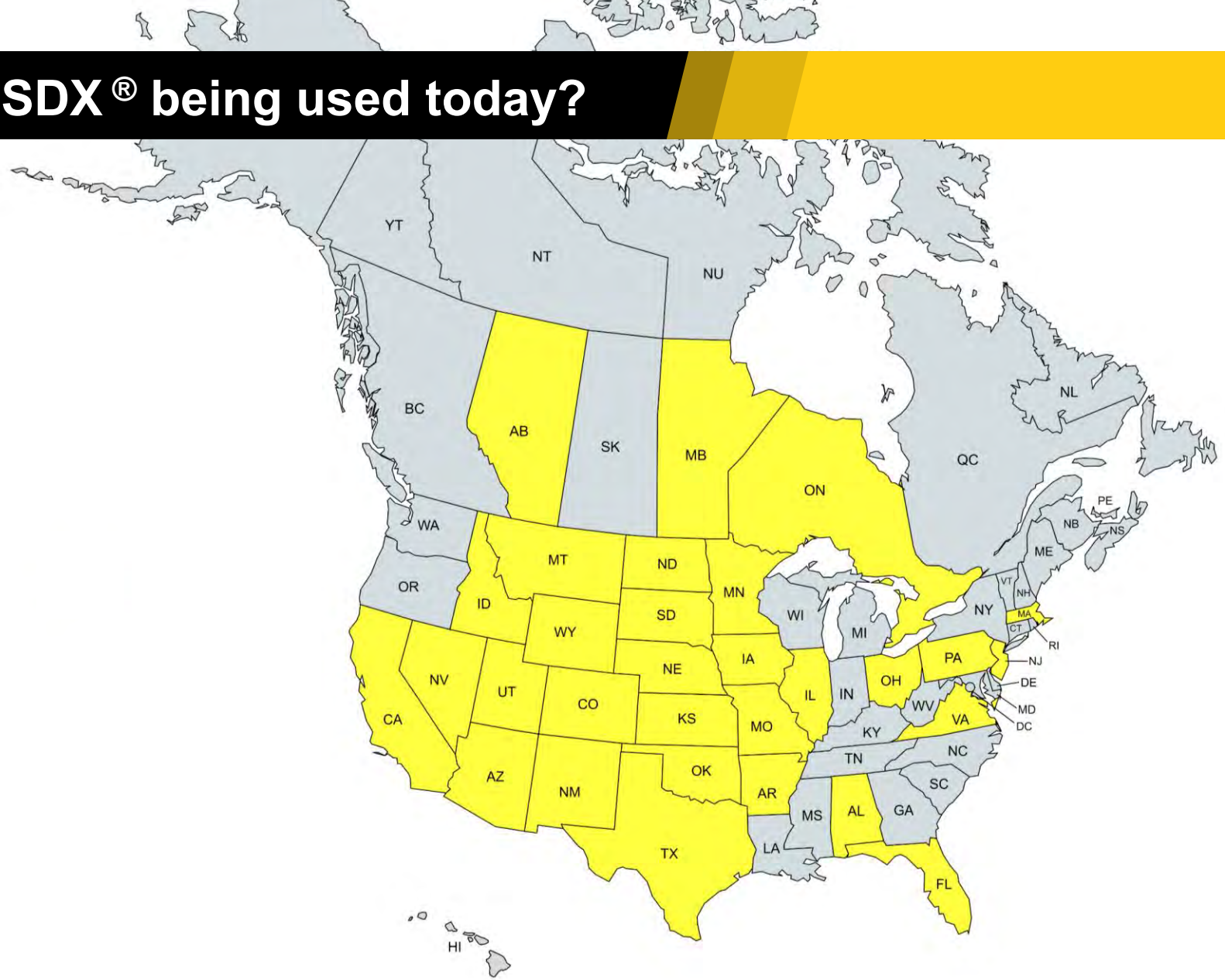
- **Paving:** Paving Contractor #6 – Northern Plains
  - Interstate Mill and Fill: 3 in overlay over 1 inch mill, 2 lifts of 1 ½ in, width of 12 - 16 ft, at 45 - 55 fpm
  - Mix: Superpave FAA 45, resists rutting with higher traffic loads
- **Compaction:**
  - Three CB15, with the breakdown at 2 vibratory passes and a single static on the edge, intermediate followed with 2 more passes focusing on a vibratory in the middle and static on the edge. The final static pass to clean any lines was made once the mat cooled
- **Smoothness Results:**
  - **IRI of 25**, overall (total, not just a segment or two), earning full incentive

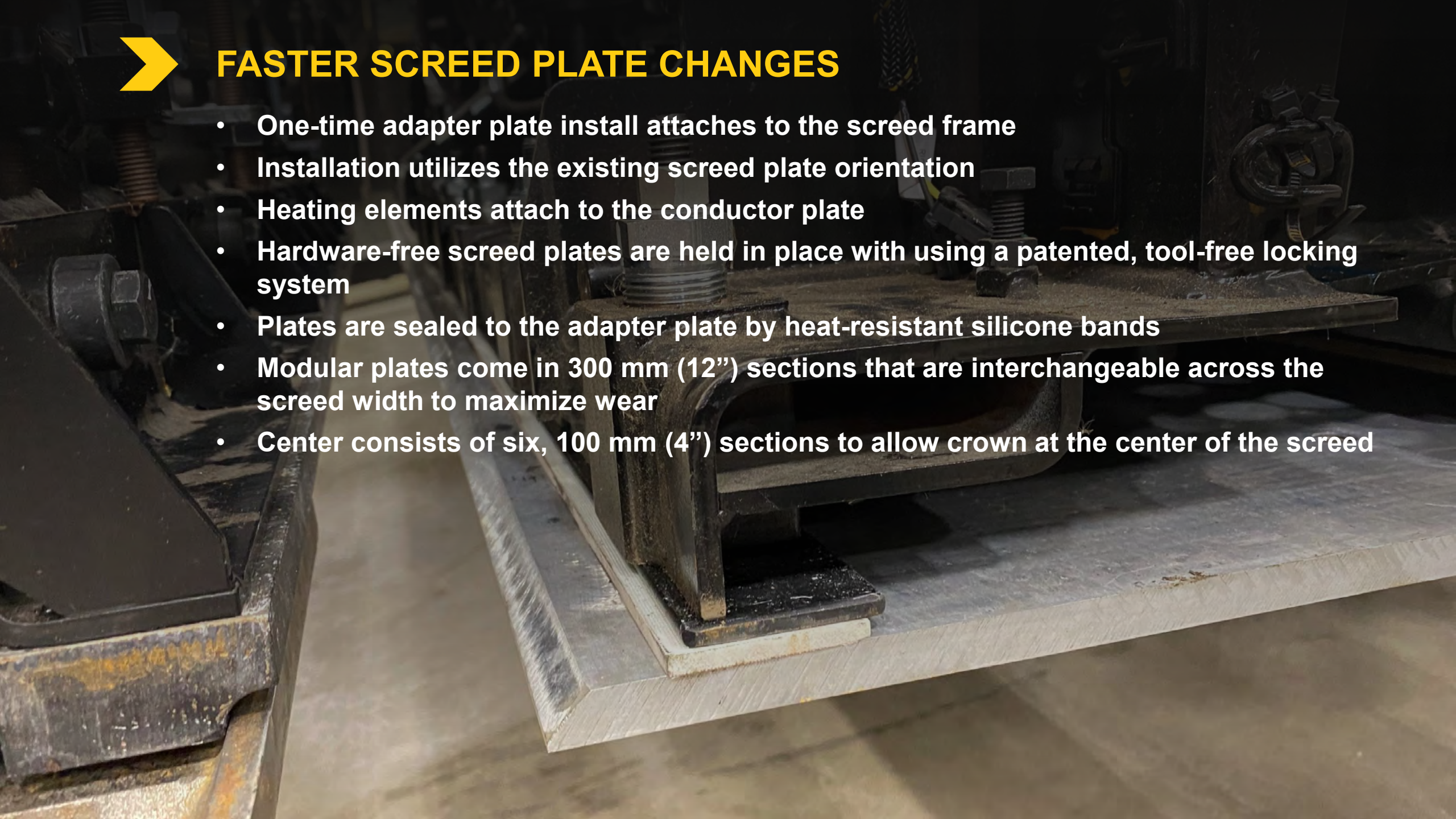
Cat SDX Screed Plates

The Pile



Where is SDX® being used today?





FASTER SCREED PLATE CHANGES

- One-time adapter plate install attaches to the screed frame
- Installation utilizes the existing screed plate orientation
- Heating elements attach to the conductor plate
- Hardware-free screed plates are held in place with using a patented, tool-free locking system
- Plates are sealed to the adapter plate by heat-resistant silicone bands
- Modular plates come in 300 mm (12”) sections that are interchangeable across the screed width to maximize wear
- Center consists of six, 100 mm (4”) sections to allow crown at the center of the screed

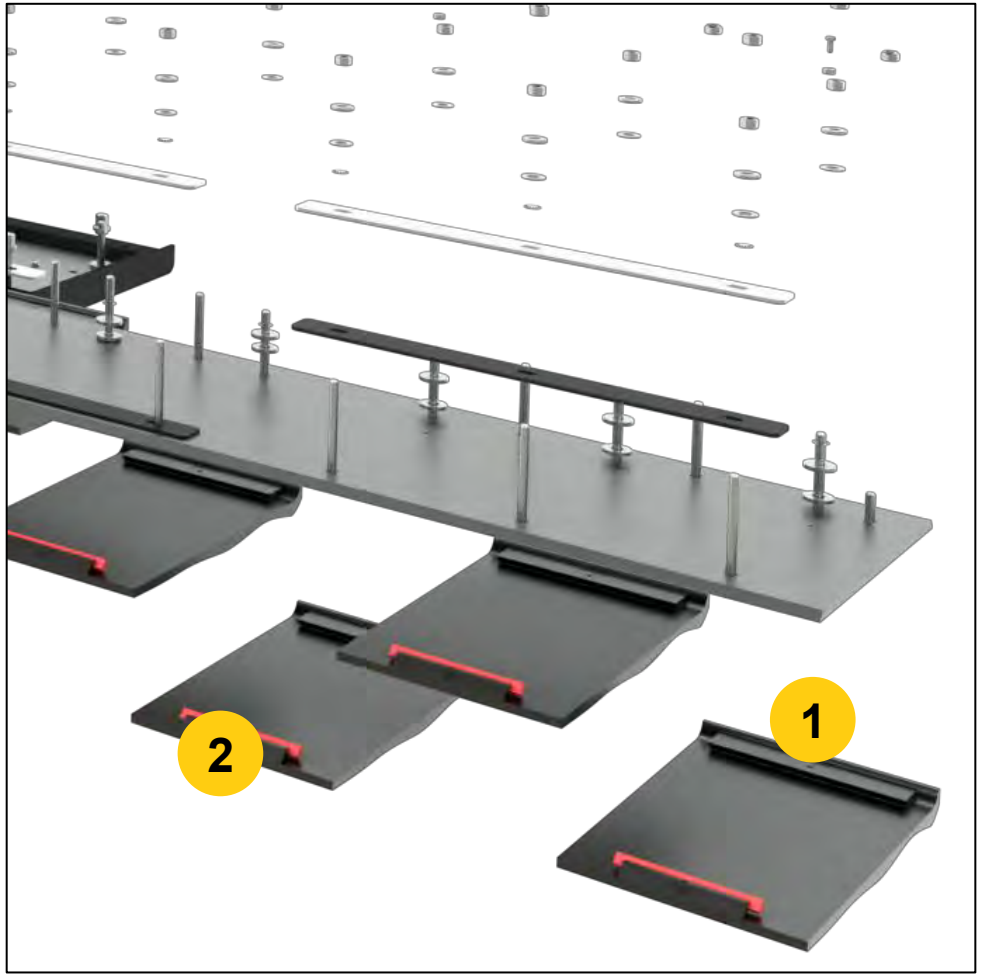
Cat SDX Screed Plates

Heating Elements

- Heating elements attach to the aluminum adapter plates and provide efficient, uniform heat distribution
- Heating element replacement remains unchanged
- Thermal paste **is required** to be utilized between the adapter plates and the screed plates to optimize heating efficiency

Hardware-Free Attachment

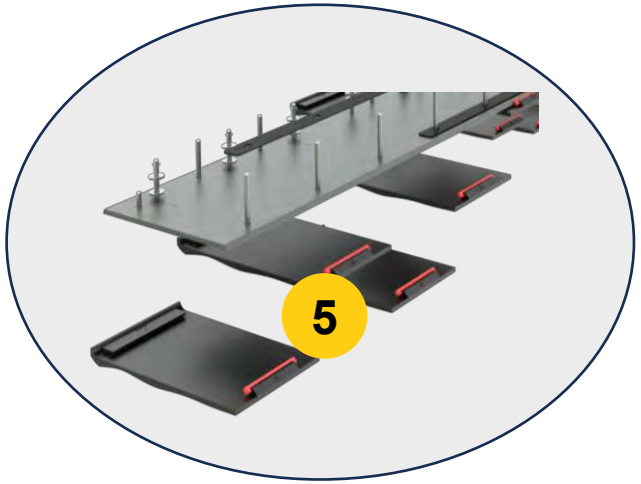
- The screed plates are equipped with integrated tapered blocks (1) that fit over the front and rear of the adapter plates
- High-temperature silicone locking bands (2) apply tension to the plates to keep them in position for excellent reliability and performance
- This unique design significantly reduces standard hardware and can lessen screed plate replacement time by up to 80%

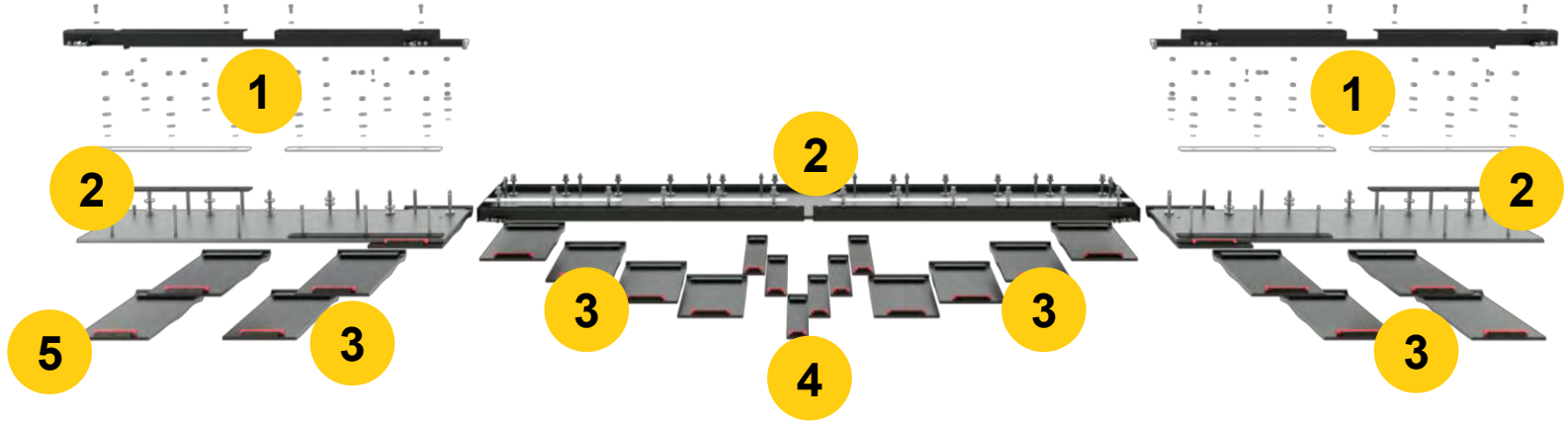


Cat® SDX Screed Plates

System Components

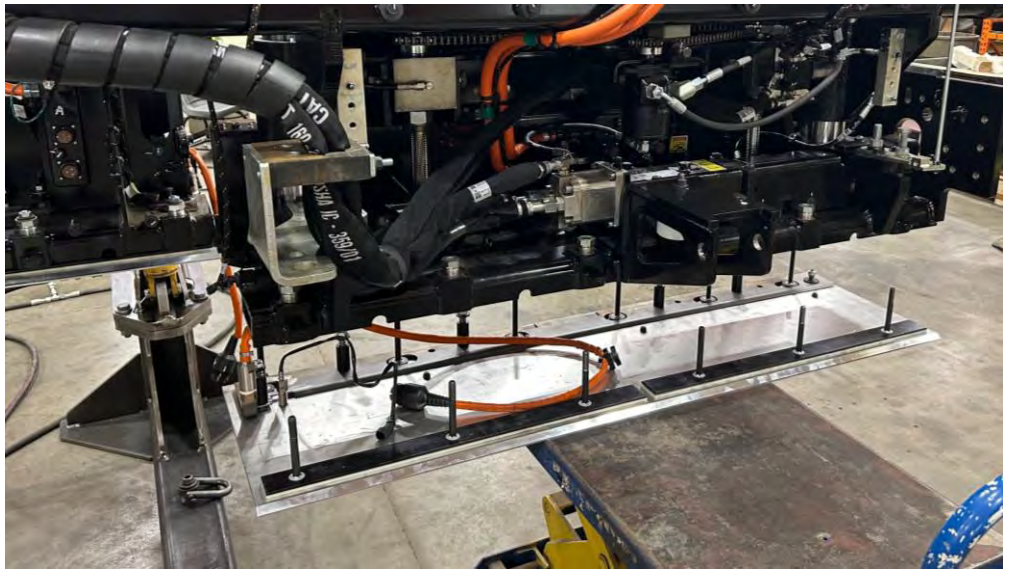
1. Adapter Plate Hardware
2. Adapter Plates
3. Screed Plates – 300 mm (12 in.)
4. Screed Plates – 100 mm (4 in.)
5. Silicone Retainers (Red)





Cat SDX Screed Plates

Aluminum Adapter Plates



- The adapter plates attaches to the screed frame
- Beveled edges on the adapter plate act as a tool carrier to accept the SDX Screed Plates
- The adapter plates transfer heat from the heating elements to the screed plates for uniform heat distribution

The End! (or so)