



# StellarFlex GTRH



# Ground Tire Rubber



- Ground Tire Rubber (GTR) can contain a wide range of polymers
  - Natural rubber
  - Styrene Butadiene Rubber (SBR)
  - Polybutadiene
- GTR also contains non-polymer ingredients
  - Carbon black
  - Silica

# Ground Tire Rubber



- GTR contains polymers that have been locked-up by vulcanization
- Much of the GTR polymer is not available to create a network in the asphalt
- GTR imparts elastomeric properties to asphalt binder by adding discrete rubber particles

# Ground Tire Rubber

- Types of GTR asphalt products
  - Dry Process – “Plus Ride”
    - Add GTR into asphalt plant as an aggregate
    - Filler more than modifier



# Ground Tire Rubber

## – Asphalt Rubber (ASTM Designation) – Wet Process

- 15-20% GTR added to asphalt in processing unit at the asphalt plant
- GTR particles absorb light hydrocarbons and swell
- After swelling, asphalt rubber is used immediately
- Adequate agitation is necessary
- Amount of discrete rubber particles requires room in an asphalt mix
  - Used in open graded and gap-graded mixes
  - **Cannot** be used in dense graded mixes

# Ground Tire Rubber

- Types of GTR asphalt products
  - Terminal Blended GTR Modified Asphalt
    - Add GTR into asphalt at a terminal facility
    - Processing techniques and/or additives help stabilize the product
    - Adequate agitation at asphalt plant is suggested
  - Hybrid GTR Binder
    - Terminal blended GTR modified asphalt may add polymer and/or other additives
    - Polymer network helps to hold rubber particles in suspension
    - Adequate agitation at asphalt plant is suggested
- GTR modified asphalt products typically require agitation to prevent separation



# StellarFlex GTRH



- StellarFlex GTRH is a Ground Tire Rubber Hybrid asphalt binder produced with chemically-treated GTR and SBS polymer
- Formulated to meet PG 76-22 and PG 64E-22 specifications
- GTR content at least 50% more than SBS content

# StellarFlex GTRH



- Early results indicate StellarFlex GTRH is a very stable product not requiring agitation
- Viscosity and workability similar to SBS modified PG 76-22



# StellarFlex GTRH-Pennsylvania Experience

- First two GTRH projects supplied to PennDOT
  - Philadelphia District – 10,000 mix tons
  - Pittsburgh District – 2,000 mix tons
- Philadelphia project interrupted by Pope Francis visit
  - All construction halted for one week
- Tested GTRH Stability
  - Turned off agitation and circulation
  - Sampled tank daily for nine days
  - No change in properties or separation results



# StellarFlex GTRH

- Project information
  - Used existing 9.5mm mix designs with PG 76-22 – no changes to asphalt content required
  - Neither plant storage tank had agitation
  - No problems running the mix
  - Passing QC test results
    - Asphalt content
    - Volumetrics

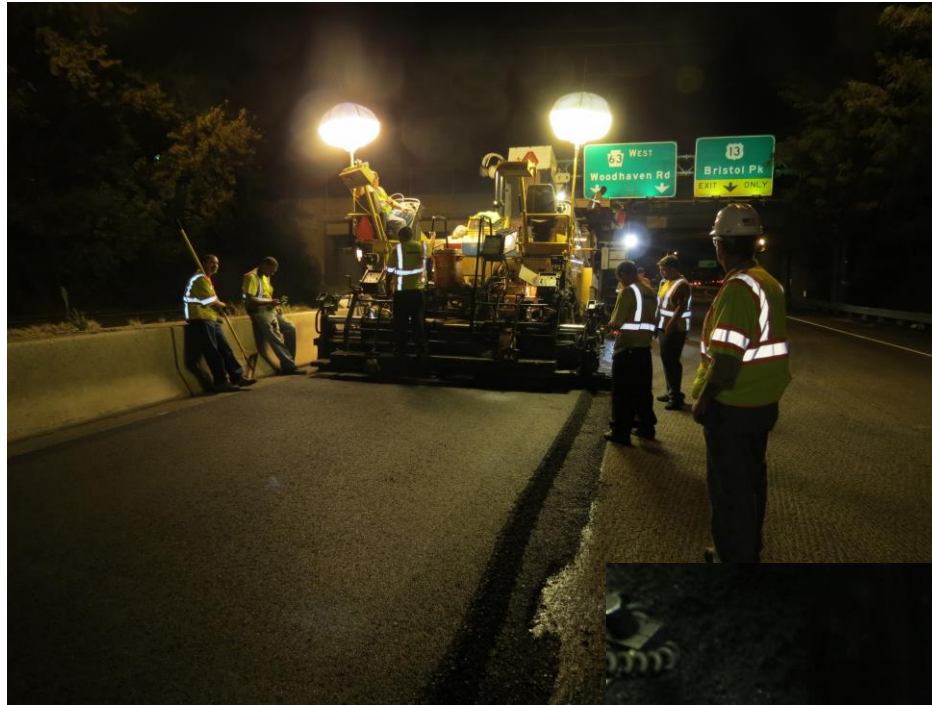


# StellarFlex GTRH

- Project information
  - Supplied StellarFlex GTRH with Evotherm warm mix additive
  - Plant temperatures 280-320°F
  - No problems running the mix through MTV and paver
  - 95% density after 4 passes of vibratory rollers



# StellarFlex GTRH





# StellarFlex GTRH



# StellarFlex GTRH-Florida Experience



- Project information
  - Florida DOT FC-5 Open Graded Friction Course (OGFC)
  - US 1 in Duval County
  - 4,000 tons
  - No problems running the mix
  - Passing QC test results
    - Asphalt content
    - Sieve analysis



# StellarFlex GTRH

- Project information
  - Supplied StellarFlex GTRH with Evotherm warm mix additive
  - Lay-down temperatures 260-290°F
  - No problems running the mix through MTV and paver



US Highway 1 – Jacksonville, FL

# StellarFlex GTRH



- Project information
  - Florida DOT FC 12.5C (Dense Graded)
  - SR 19 in Putnam County
  - 10,000 tons
  - 2 Hour haul from plant site to project

## Passing QC test results

- Asphalt content
- Volumetrics





# StellarFlex GTRH



SR 19 - Palatka, FL

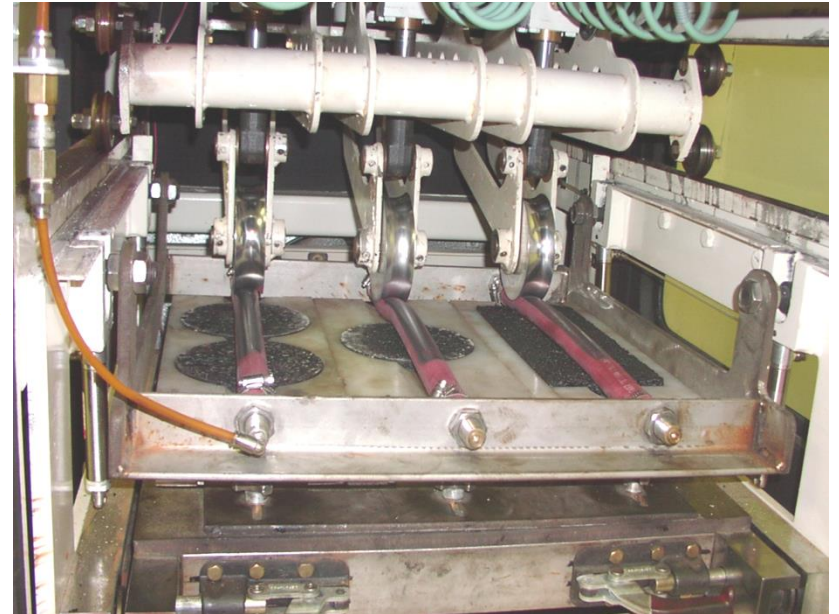
# **STELLARFLEX GTRH MIX PERFORMANCE**





# Asphalt Pavement Analyzer (APA)

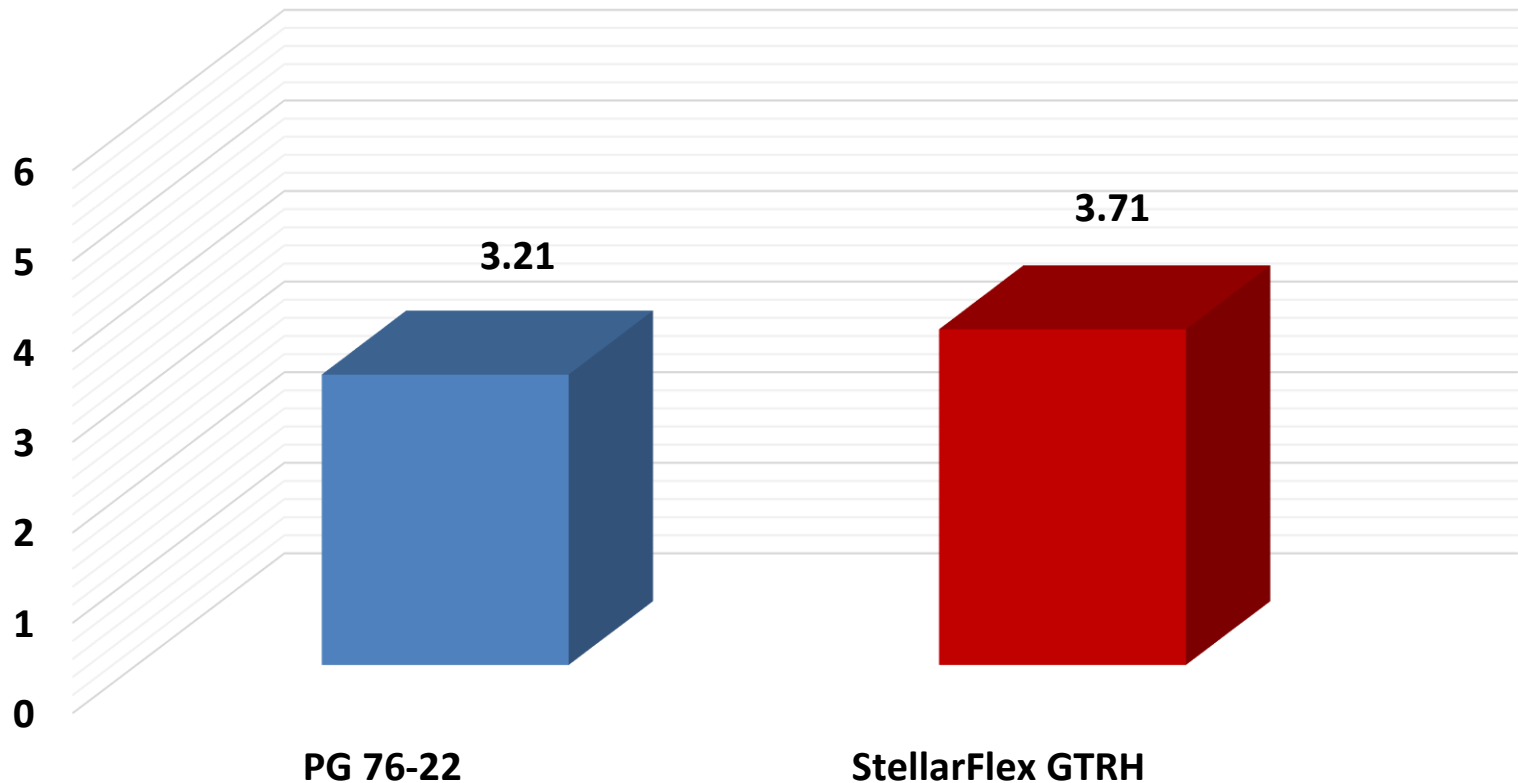
## – Rutting Evaluation of HMA



- Moving wheel load (100 lbs) applied to a pressurized hose (100 psi) which lies on top of asphalt samples
- Tested at 64°C for 8,000 loading cycles
- Computer data acquisition system

# StellarFlex GTRH Rutting Performance

APA Rutting, mm





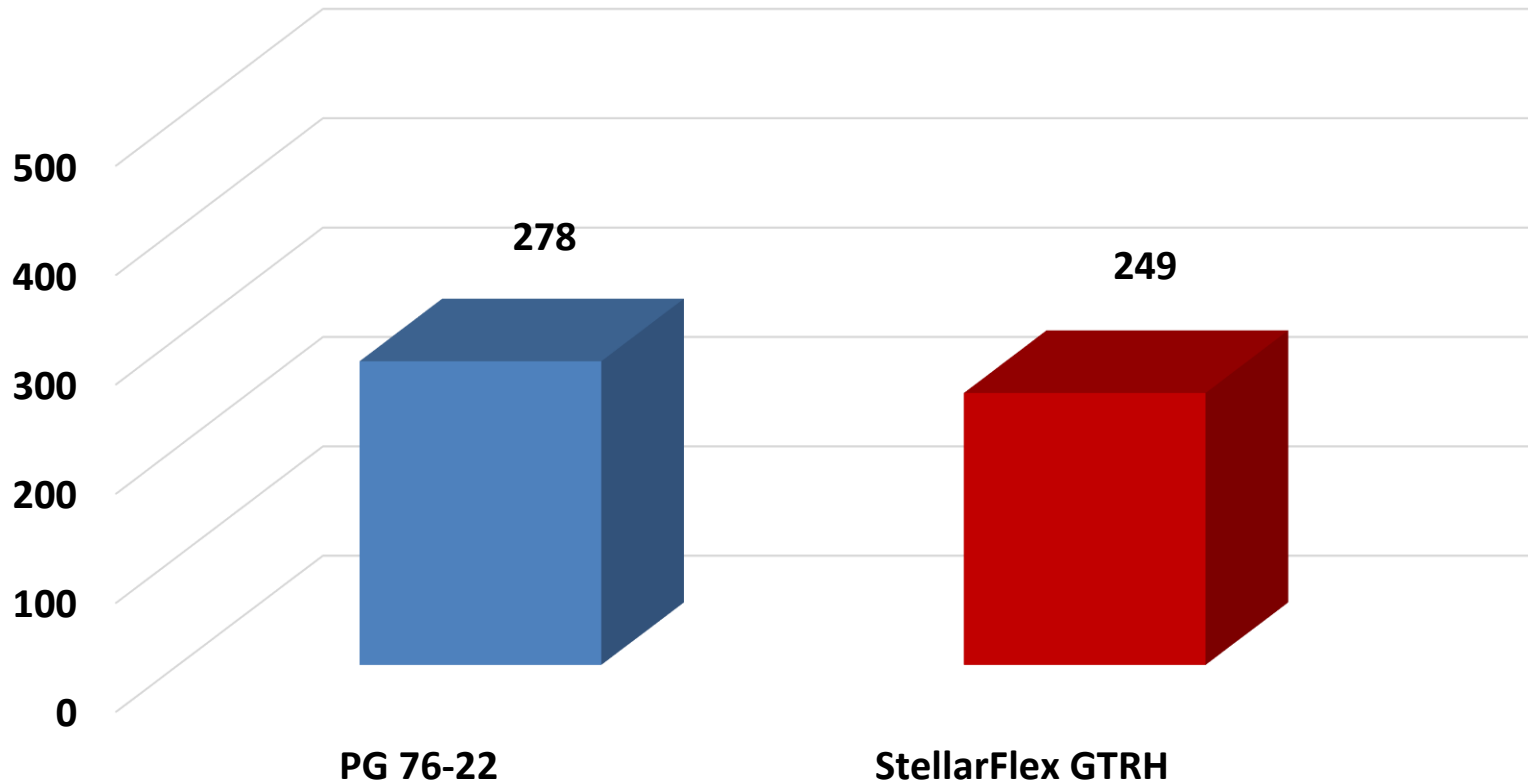
# Texas Overlay Tester – Fatigue Cracking



# StellarFlex GTRH

## Fatigue Performance

Texas Overlay Test, cycles

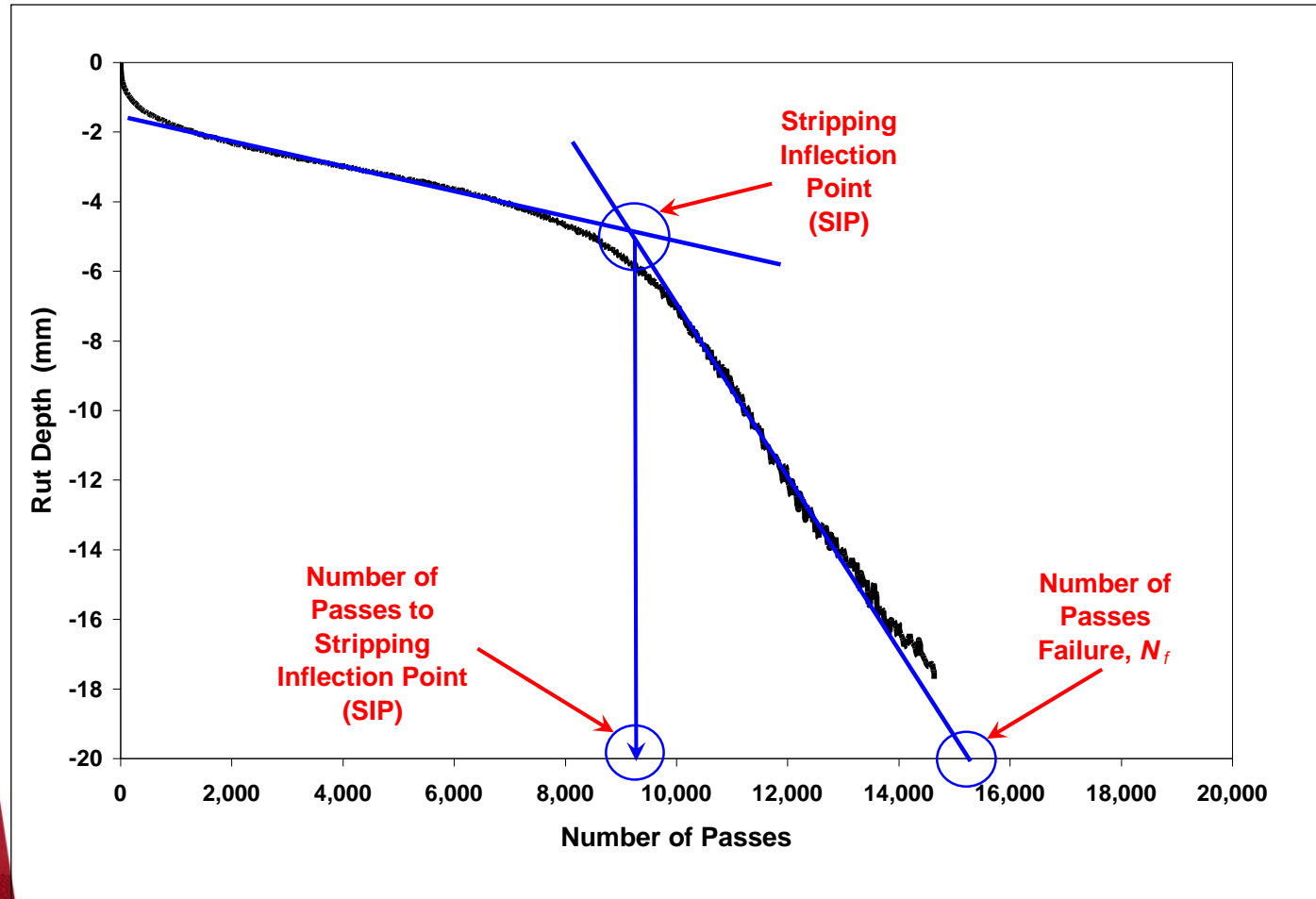


# Hamburg Wheel Tracking Test

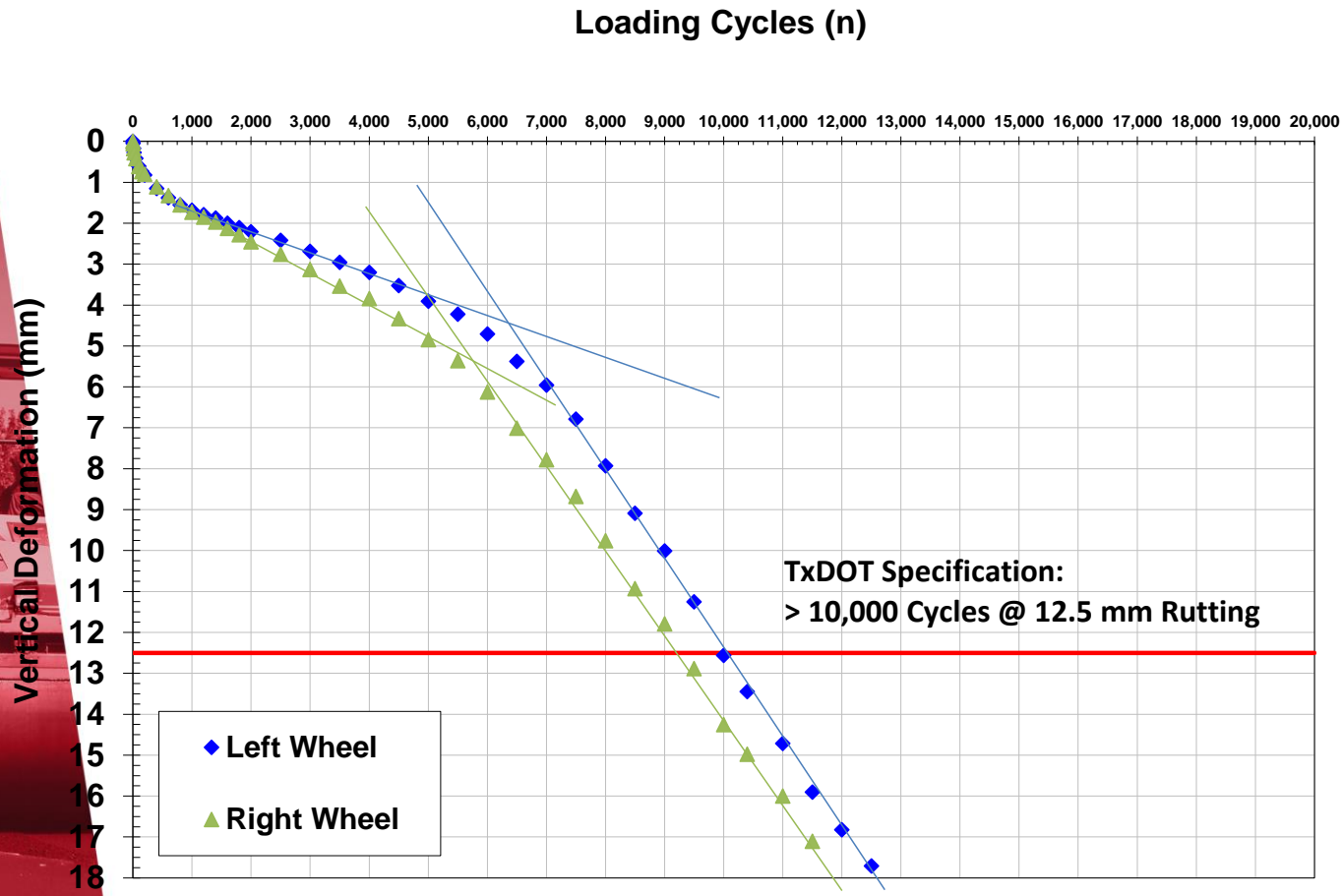


- Measures rutting and stripping potential
- Severe test
- Soak samples in 50°C water for 30 minutes
- Test temperature 50°C
- Steel wheel – 158 lbs.
- Number of cycles to 12.5mm rut depth (maximum 20,000 cycles)
- Number of cycles to Striping Inflection Point (SIP)

# Hamburg Wheel Tracking Test

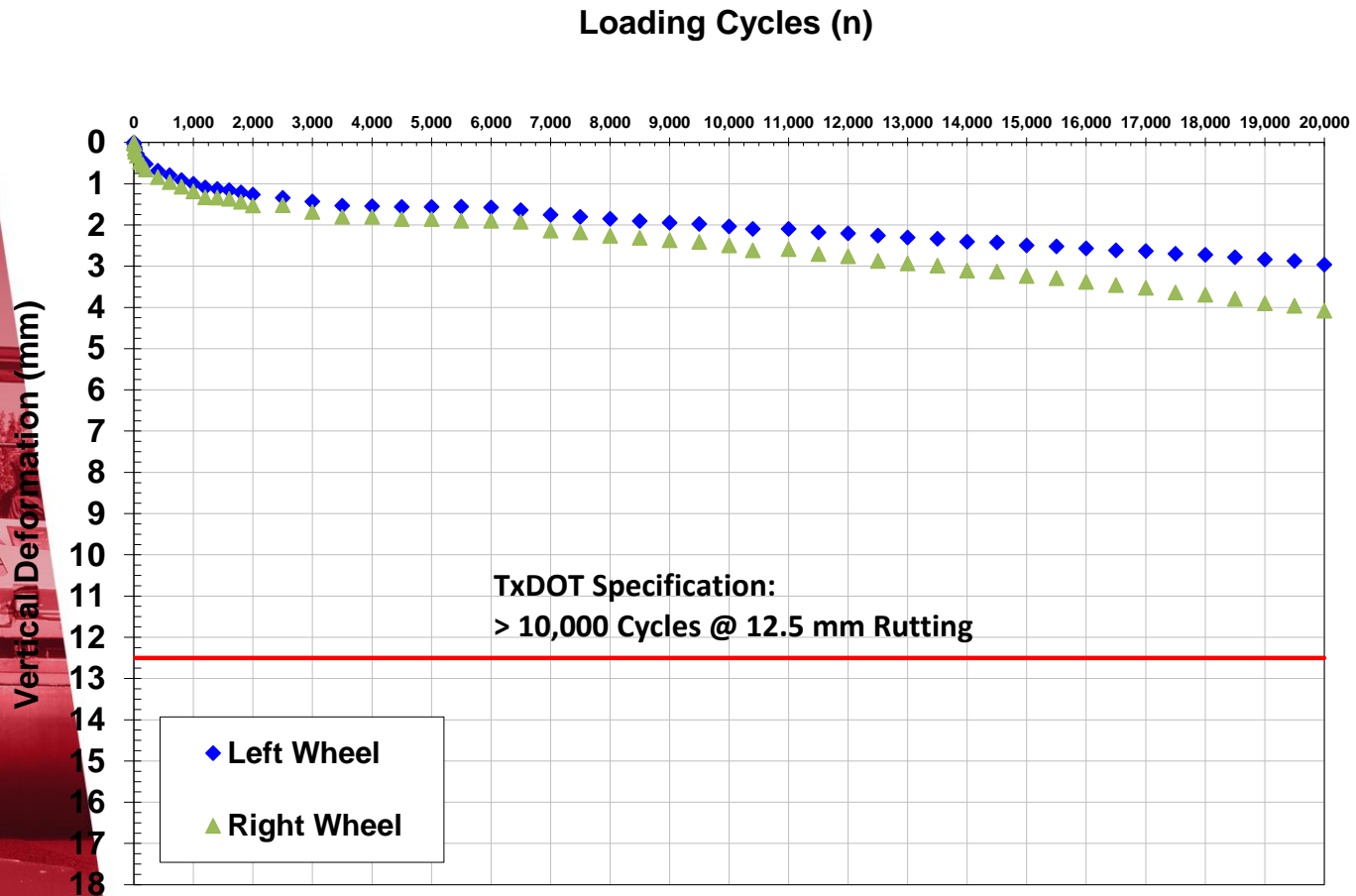


# Hamburg Wheel Tracking Test



PG 76-22 Mix

# Hamburg Wheel Tracking Test



StellarFlex GTRH Mix



# StellarFlex GTRH Mix Performance

- StellarFlex GTRH mix performs equally to PG 76-22 PMA mix in both APA rutting and Texas Overlay Fatigue Cracking
- StellarFlex GTRH mix substantially outperforms PG 76-22 PMA mix in Hamburg Loaded Wheel Test
- How does StellarFlex GTRH perform compared to Asphalt Rubber?
- Cannot put Asphalt Rubber in a dense graded mix



# Summary

- StellarFlex GTRH is an effective, high performance GTR product
  - Meets specifications for PG 76-22, including Elastic Recovery
  - Meets specifications for PG 64E-22, including MSCR Recovery
  - Mix performance equal to PG 76-22 (PG 64E-22) in rutting and cracking
  - Stable product – requires no agitation
  - Excellent workability
  - Works in any mix – including dense graded



# Questions and Comments

