# Superior Materials, Advanced Test Methods and Specifications

International Technology Scanning Program

*presented to:*

NCAUPG
Omaha, NE
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*presented by:*
Lon Ingram, KS DOT

# International Scan Program

- Joint sponsorship between FHWA and AASHTO
- Started in 1991
- Over 50 scans completed
- Scan topics include:
  - Pavements
  - Bridges
  - Geotechnical
  - Planning and Environment
  - Safety
  - Winter Maintenance
  - Transportation Policy and Information

# Who we Are

- State Dept. of Transportation
  - Lon Ingram – Kansas (Co-Chair)
  - Jimmy Brumfield – Mississippi
  - Mark Felag – Rhode Island
  - Tom Baker – Washington
- Federal Highway Administration
  - Keith Herbold – National Resource Center (Co-Chair)
  - Max Grogg – Iowa Division Office
  - Laurin Lineman – Eastern Federal Lands
- Private Sector
  - Ted Ferragut, TDC Partners, Ltd. (Implementation Specialist)
  - Dr. Robert Otto Rasmussen, The Transtec Group, Inc. (Reporter)

# Where we Visited

- United Kingdom
- Denmark
- Germany
- The Netherlands

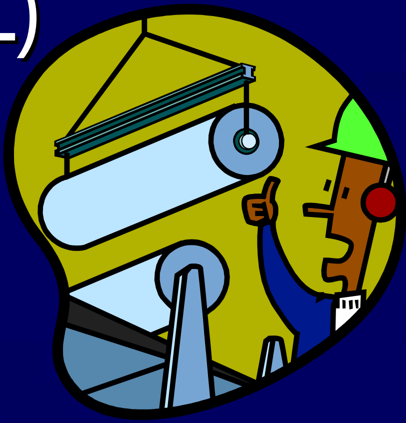

# Why this Scan?

- A desire for materials approvals and specifications in the U.S. to be:
  - More rapid
  - Less expensive
  - More efficient
  - Uniform from state-to-state

- Technology is rapidly advancing in:
  - Asphalt and concrete
  - Coatings and polymers
  - Composites and electronics

# What do we Use Today?

- Individual state DOT “approved product” lists
- Contract special or supplemental provisions
- National Transportation Product Evaluation Program (NTPEP)
- Highway Innovative Technology Center (HITEC)
- AASHTO Product Evaluation List (APEL)
- Federal Land Highways technology development team



# Objectives

- Seek out the processes used to approve and specify materials and test methods

and…

- Identify examples of superior materials.

# What is a Superior Material?

- Materials and manufactured products that:

  1. Significantly improve performance of the constructed facility;
  2. Are cost effective, both initial and/or life-cycle costs;
  3. Improve safety for both the traveling public and/or the construction worker; and
  4. Reduce time of construction.

# What did we Ask?

- What is your approval process?
- Without a performance history, what techniques are used to predict performance?
- How are standard tests developed or adapted for a new material?
- How are produced materials tested to assure consistent quality?

# What did we Learn?

- Process-Related Issues
- Evaluation Techniques
- Innovative Materials
- Other Issues and Considerations

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# Process-Related Issues

- European Union standardization
  - Intended to improve efficiency and competition
  - Standard specifications so vendors can more easily sell products across national borders
  - Harmonizing test procedures, quality thresholds, and language (English is official, French & German OK)
  - Specifications are commonly functionally driven
  - Tests are fixed, but use of “classifications” allows for degrees of quality

# Process-Related Issues

- European Union standardization
  - European standard specification organization – Comité Européen de Normalisation (CEN)
  - Centralized agency for testing and evaluation of non-standardized materials – European Organisation for Technical Approvals (EOTA)
  - Some parallels to AASHTO and ASTM, but notable differences also

# Process-Related Issues

- Contract mechanisms
  - Warranties generally address quality
  - Performance contracts often lead to innovation
  - Movement to performance specifications but performance standards are not easily defined
  - Maintenance contracts
  - Quality, life-cycle costs, and sustainability (eco-friendliness) are award considerations
  - Awardee is commonly not the lowest bid

# Process-Related Issues

- Independent product evaluation / certification
  - EOTA (Europe)
  - BBA HAPAS (U.K.)
    - Predetermined materials categories
    - Expert panels to set standards
    - Vendors get certificates, but revoked if quality drops
  - Independent lab certification – public, quasi-public, or private
  - BRE (U.K.), TRL (U.K.), DRI (Denmark), BASt (Germany), RWS (The Netherlands)
  - Functional requirements for materials

# Process-Related Issues

- R

# What did we Learn?

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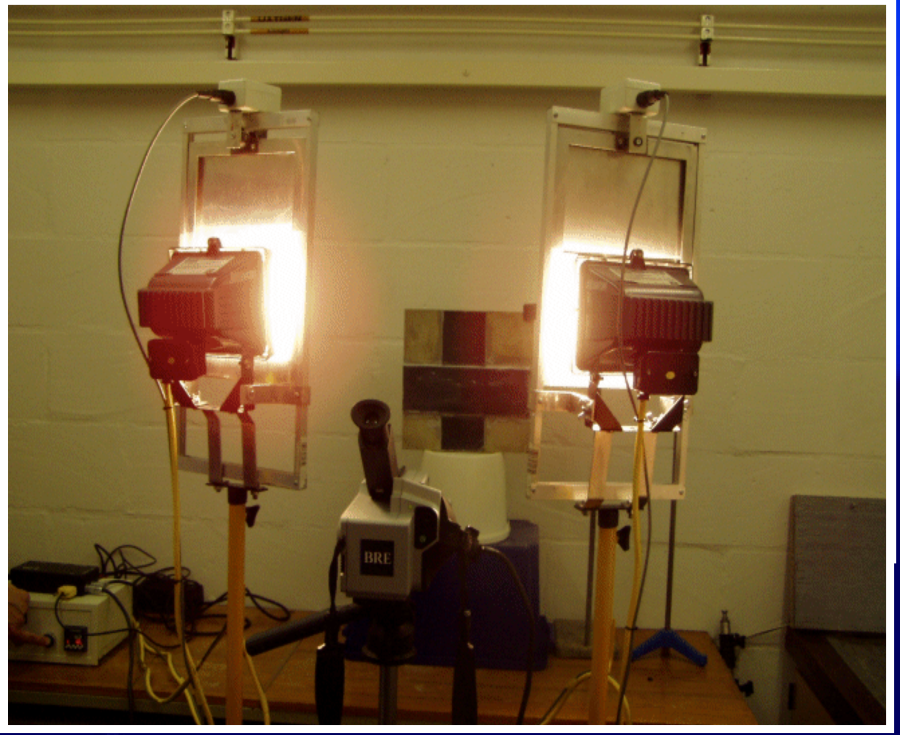
# Evaluation Techniques

- Accelerated load testing
- Test for performance instead of properties
- Specific techniques:
  - Torque bond test
  - Striping wheel test
  - Microscopy for stripping
  - Polymer content testing
  - Pulse thermography



# What did we Learn?

- Process-Related Issues
- Evaluation Techniques
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# Innovative Materials

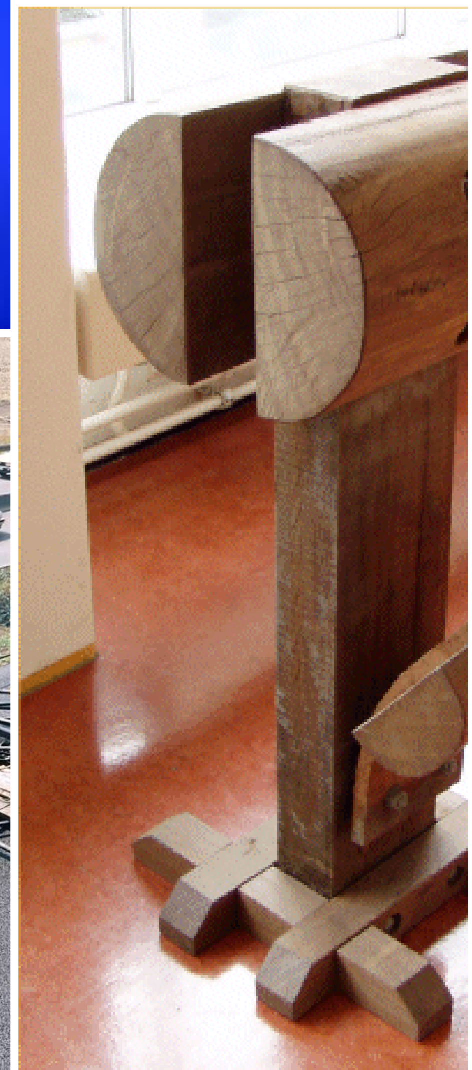
- Pavements
  - Noise attenuating
  - Friction surface treatments
  - Twin-layer asphalt
  - Low temperature asphalts
  - Semi-flexible asphalt
  - Composite pavement (HMA on CRCP)
  - Fiber-reinforced concrete inlays
  - Slag-bound material in concrete
  - Fabric between PCCP and LCB
  - Rapid concrete repairs

# Innovative Materials

- Bridges
  - Fiber reinforced polymer strengthening
  - Waterproofing orthotropic decks
  - Long-life wearing courses

# Innovative Materials

- Others
  - Dynamic road marking
  - Compact asphalt (two course paving)
  - Sustainability-driven:
    - Wooden guardrail
    - Wooden luminaire



# What did we Learn?

- Process-Related Issues
- Evaluation Techniques
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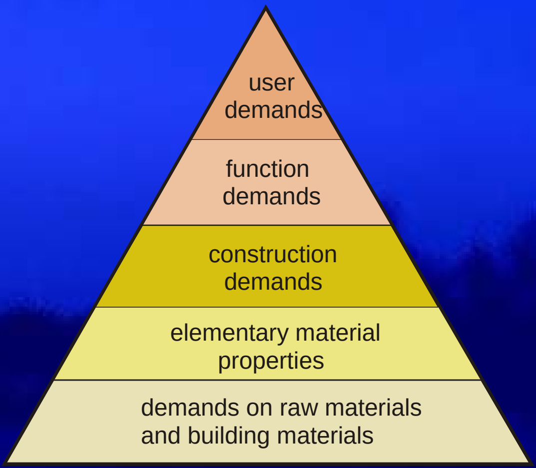
- Other Issues and Considerations

# Other Issues and Considerations

- Noise
  - Major impact on pavement type selection
  - Auto, tire, and pavements industries worked together for solutions
- Sustainability
  - Virgin aggregate taxes
  - 100% reuse policy
  - Eco-points for life-cycle costing

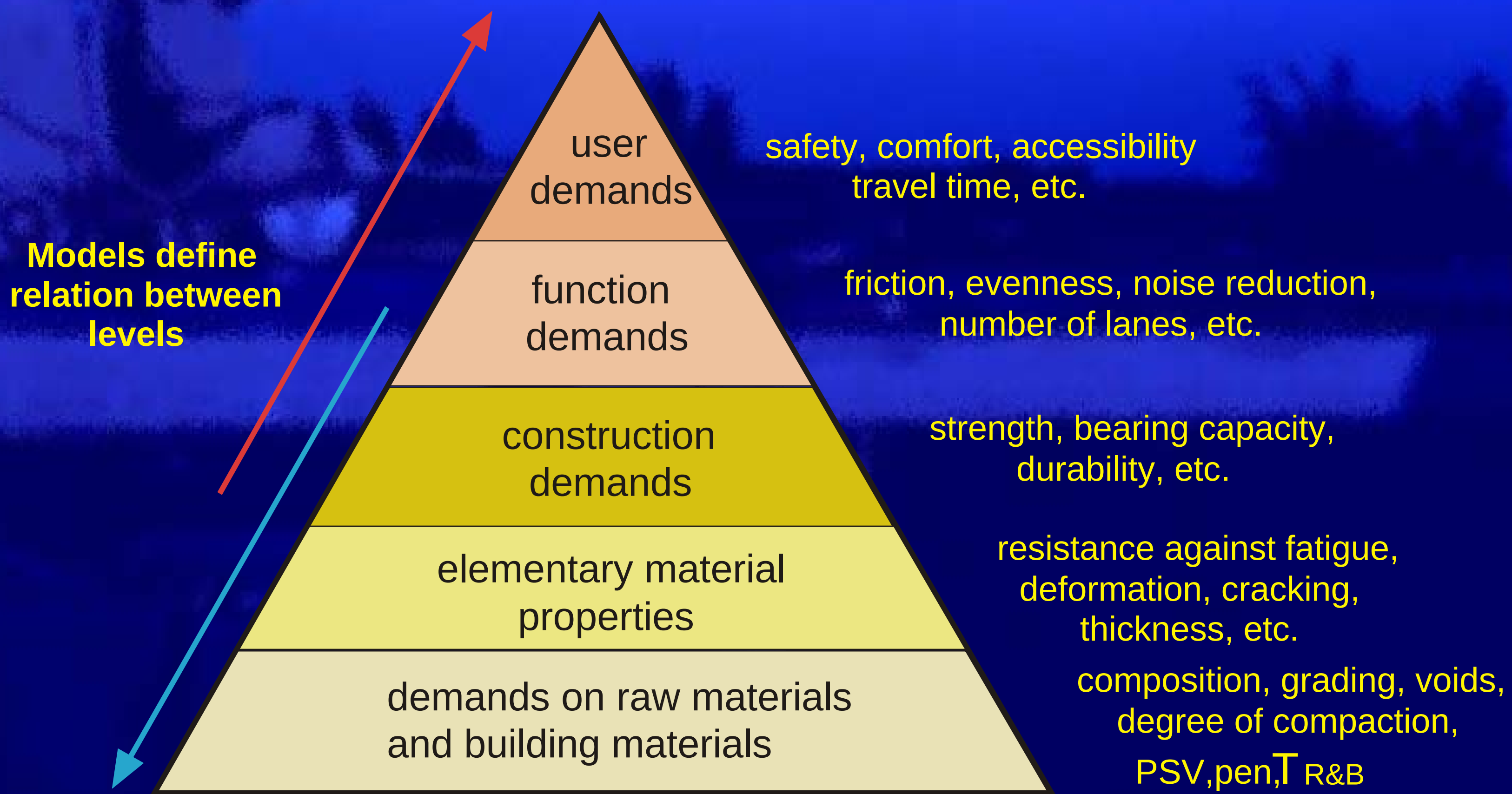
# What can we Conclude?

- Drivers for Innovation
  - Governmental policy
    - “Top down” mandates
    - Technology must respond
  - Standardization
    - A move to functional requirements
    - Recipe specifications limit innovation
  - First cost is not the primary driver



# What can we Conclude?

- Pyramid of Demands




**Pyramid of demands**

# What can we Conclude?

- Warranties and innovation
  - Warranties may not lead to innovation, but quality may improve
  - Warranties are typically 5 years or less, except for design-build-finance-operate (DBFO) of 30 years +
  - Warrant products with a track record of performance
  - Warranties lead to a transfer of risk from the agencies to the vendors

# What can we Conclude?

- Public versus private roles
  - Materials vendors often succeed more if they approach the contractor instead of the agency
  - No reward for agency employees to take risks with innovative products
  - Government typically supports long-term innovations
  - Contractors typically support short-term innovations
  - Sometimes long-term innovation can be explored with public-private partnerships (e.g. “Roads to the future”)
  - Transition from methods to functional specs is a joint effort

# What do we Recommend?

- Further investigation of the European Union standardization – what else can we learn?
- A follow-up with France?
- Assess the need for a national certification program by independent laboratories
- Start with a national pavement marking test facility?

# What do we Recommend?

- Explore a “Roads to the Future” concept
- Manufacturer certification of installation contractors

# The End