


TRANSPORTATION INFRASTRUCTURE IN WISCONSIN: MORE THAN JUST ROADS



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MORE THAN JUST ROADS

HOW DO WE DEFINE TRANSPORTATION
INFRASTRUCTURE?

INFRASTRUCTURE : The underlying
framework or features of a system.



INFRASTRUCTURE

- CAPITAL / PUBLIC TREASURY
 - THE MEANS BY WHICH ROADS AND BRIDGES ARE CONSTRUCTED AND MAINTAINED
- SYSTEM MANAGEMENT
 - SYSTEM OVERSIGHT
 - PLANNING AND BUDGETING



INFRASTRUCTURE

- ENGINEERING AND DESIGN
 - DEFINING EXISTING CONDITIONS
 - DESIGNING FACILITIES TO STANDARDS
 - PREPARATION OF PLANS AND CONTRACT DOCUMENTS
- CONSTRUCTION
 - CONSTRUCT FACILITY TO PLAN AND SPECIFICATIONS



INFRASTRUCTURE

- MAINTENANCE
 - THE EFFORT REQUIRED TO MAINTAIN A GIVEN ROADWAY AS CLOSE AS POSSIBLE TO ORIGINAL CONDITION
 - PRESERVATION OF PUBLIC SAFETY
 - PROTECTING ROADWAY FROM HARMFUL EFFECTS OF CLIMATE AND ENVIRONMENT
 - PRESERVING ROAD'S LONGEVITY



INFRASTRUCTURE

- LAW ENFORCEMENT
 - TRAFFIC LAW ENFORCEMENT / PUBLIC SAFETY
 - PROTECT ROADS AND BRIDGES FROM DAMAGE AND PREMATURE FAILURE DUE TO OVERWEIGHT LOADS – WEIGHT ENFORCEMENT



EFFECTS OF OVERWEIGHTS ON INFRASTRUCTURE

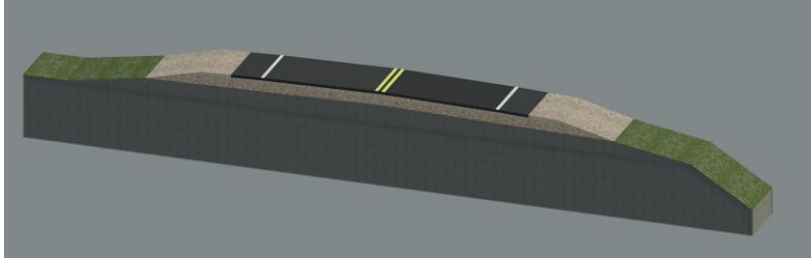
- LESS HIGHWAY LONGEVITY
- MORE DAMAGE TO HIGHWAYS
- MORE COST TO THE TAXPAYER
- WITHOUT INVESTMENT- LOWER QUALITY ROADS



HIGHWAY DESIGN 101

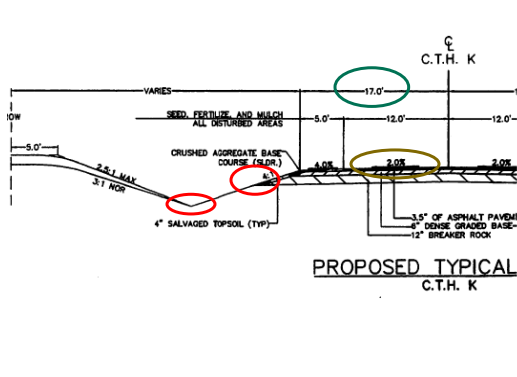
- You wouldn't put frosting on a rock and call it a cake...
- Roads: from the bottom up and from the outside in

TYPICAL SECTION



TYPICAL SECTION

- Elements
 - Cross-slopes
 - Materials
 - Dimensions



Reconstruction: How do you get to over \$1 million per mile?

- Design
- Right of Way Acquisition
- Utility Relocation
- Project Management/Administration
- Construction
- Structures or other unique situations

Pierce County

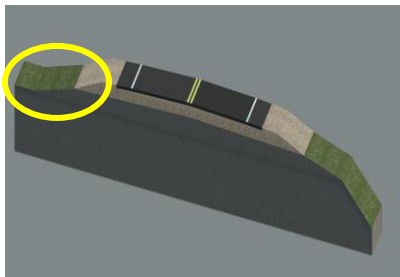
- Life of Roadway:
50 years
- Miles: 248
- Life cycle requirement for reconstruction:
5 miles per year
- Cost: \$5.79 million
- Likely appropriation:
\$2.5 million



SUBGRADE (IN SITU SOIL)

- Type of soil
- Grain size and ability to drain
- Freeze – Thaw: how does it react?

IMPROVING THE SUBGRADE



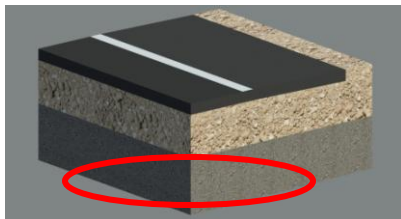
- Drainage! Drainage!
Drainage!
- Remove areas of undesirable soil:
 - EBS (Excavation Below Subgrade)
- Shape and Compact

SUBGRADE TREATMENTS



- Moisture management
- Products
 - Geogrids
 - Fabrics
- Stabilizations
 - Flyash
 - Lime

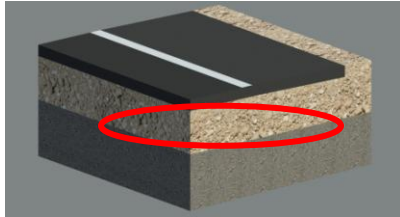
SUBBASE



- Above the subgrade, below the base course
 - Breaker rock
 - Sand



BASE COURSE



- 1 ¼" crushed limestone
- Sand and gravel
- WATCH THE P200!

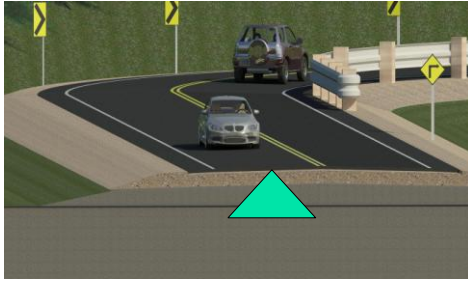
PAVEMENT



Types:

- Flexible
 - Hot Mix Asphalt
- Rigid
 - Concrete

PAVEMENT STRUCTURE



- Pavement does not carry the entire load, it also distributes it!

PAVEMENT DESIGN

- Factors
 - Traffic count
 - Truck percentage of the traffic count
 - Soils
 - Design Life



STANDARD DESIGN

- A Structure Number (SN) is established from the traffic and soil factors
- Layer coefficients for HMA, Base and Subbase are used to match or exceed the SN



PAVEMENT DETERIORATION

- 20-year life with proper maintenance
 - Crackfilling and sealcoat
- Fatigue from loading
- Fatigue from Freeze-Thaw and weather

WHAT IS AN ESAL?

- Equivalent Single Axle Load
 - A unit of damage – 18,000 lb single axle
 - A road is an ESAL bank
 - How many ESALs do you need for 20 years?

Axle Load Factors

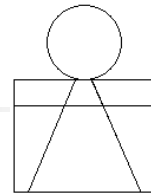


NATURE OF ESALS

- EXPONENTIAL INCREASE IN DAMAGE DUE TO INCREASED WEIGHT



SINGLE AXLE: load factors



Axle load	ESAL load factor
12 kips	0.23
14 kips	0.40
16 kips	0.65
18 kips	1.00
20 kips	1.49

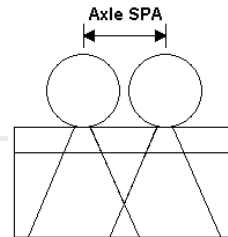
EXPONENTIAL NOT LINEAR DAMAGE

- 18 KIPS = 1.00 ESALS
- 20 KIPS = 1.49 ESALS

11% INCREASE IN WEIGHT =
50 % INCREASE IN DAMAGE

DUAL AXLES: load factors

*Adjusted for a 4'-2" axle spacing







Dual Axle load	ESAL load factor*
32 kips	0.90
33 kips	1.00
36 kips	1.40
38 kips	1.70
40 kips	2.09

EXPONENTIAL NOT LINEAR DAMAGE

- 36 KIPS = 1.40 ESALS
- 40 KIPS = 2.09 ESALS

11% INCREASE IN WEIGHT =
50 % INCREASE IN DAMAGE

Raw Forest Truck Configurations

Vehicles in Combination		Max. Gross Weight	Truck ESAL Factor
C		90K	3.76
D		98K	2.85
E		98K	3.11
F		90K	4.38

BRIDGES



BRIDGE LOADING

- AXLE LOAD AND SPACING MUST BE CONSIDERED
- LOW ESALS ON HIGHWAYS CAN EQUAL HIGH LOADINGS ON BRIDGES

ESAL BANK ROBBERS

- OVERWEIGHT VEHICLES AND EQUIPMENT
- UNANTICIPATED HAULING



HOW DO OVERWEIGHTS OCCUR?

- DELIBERATE OVERWEIGHTS
 - OVERWEIGHT HAULING IS PROFITABLE
 - OBEYING POSTINGS IS INCONVENIENT
 - NO FEAR OF ENFORCEMENT



HOW DO OVERWEIGHTS OCCUR?

- INADVERTENT OVERWEIGHTS
 - FAILURE TO SCALE LOAD
 - ASSUME EXEMPT OR EXCEPTION
 - DON'T UNDERSTAND POSTINGS APPLY TO THEM
 - NO FEAR OF ENFORCEMENT



HOW DO OVERWEIGHTS OCCUR?

- LEGAL OVERLOADS
 - STATE EXEMPTIONS
 - STATE EXCEPTIONS
 - STATE SPECIAL PERMITS
 - FAILURE OF LOCALS TO POST THEIR ROADS AND BRIDGES

WHAT IS UNANTICIPATED HAULING?

- FAILURE TO ESTIMATE LOADINGS IN DESIGN PROCESS
- UNEXPECTED SITING OF BUSINESS OR INDUSTRIES
- UNEXPECTED CHANGES TO TRAFFIC PATTERNS
- AVOIDANCE OF ENFORCEMENT

WHAT CAN BE DONE TO PREVENT ESAL BANK ROBBERIES?

- ENGAGE IN POLITICAL PROCESS
 - PROTECT LOCAL CONTROL OVER LOCAL ROADS
 - OPPOSE BLANKET EXEMPTIONS AND EXCEPTIONS
 - SHINE SPOTLIGHT ON DAMAGE CAUSED BY OVERLOADS



WHAT CAN BE DONE TO PREVENT ESAL BANK ROBBERIES?

- ENGAGE IN POLITICAL PROCESS (CONT'D)
 - DEMAND THAT CHANGES TO WEIGHT LAW BE DONE IN THE CONTEXT OF A "NO HARM" APPROACH
 - STRONGER ENFORCEMENT/ ZERO TOLERANCE FOR VIOLATORS
 - ✓ MORE ENFORCEMENT ON LOCAL SYSTEM
 - ✓ HIGHER FINES
 - ✓ LOSS OF PERMIT OR PRIVILEGES

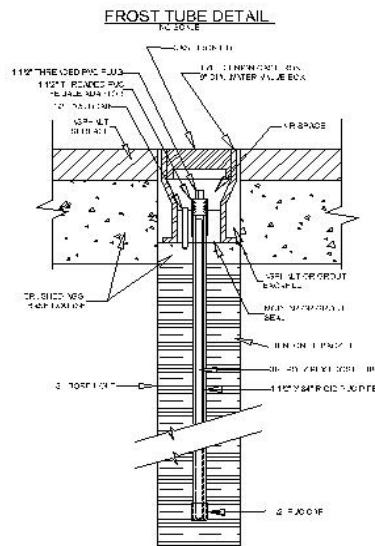


WHAT CAN BE DONE TO PREVENT ESAL BANK ROBBERIES?

- EXERCISE LOCAL AUTHORITY
 - POSTING
 - ✓ SPECIAL OR SEASONAL (SS 349.16)
 - ✓ CLASS "B" (SS 349.15)
 - REQUIRE BONDING
 - LOCAL ENFORCEMENT
 - ZONING/ LAND USE CONTROL
 - PROMOTE FROZEN ROAD HAULING

ASHLAND COUNTY POLICY

- POOR SOILS- CLAY AND FROST SUSCEPTIBLE TYPES
- DO NOT HAVE SUFFICIENT PAVEMENT STRUCTURE FOR SPRING CONDITIONS
- POST NEARLY ALL COUNTY TRUNKS DURING SPRING THAW
- USE FROST TUBES TO MEASURE FROST AND THAW





ASHLAND COUNTY SPRING POSTING POLICY

- NO SET DATE, DETERMINED PURELY BY THAW INFORMATION COLLECTED FROM FROST TUBES
- ADVANCE NOTICE FOR IMPENDING POSTING (ONE OR TWO WEEKS)
- SHORT NOTICE FOR ACTUAL POSTING (OFTEN ONLY A DAY OR TWO)



ASHLAND COUNTY SPRING POSTING POLICY

- TRY FOR A WEEKDAY MORNING POSTING
- TRY TO MAKE SURE ACTIVE ENFORCEMENT IS TAKING PLACE JUST BEFORE AND JUST AFTER POSTING
- USE NEWSPAPER, E-MAIL, RADIO STATIONS TO ANNOUNCE POSTING
- TRY TO COORDINATE WITH OTHER COUNTIES



ASHLAND COUNTY SPRING POSTING POLICY

- 4 TON PER AXLE LOAD LIMIT (EMPTY TRUCK)
- NO BLANKET EXEMPTIONS OR EXCEPTIONS
- ALLOW SPECIAL HAULING THROUGH PERMITS ISSUED BY HIGHWAY DEPARTMENT OFFICE



ASHLAND COUNTY SPRING POSTING POLICY

- SPECIAL HAULING PERMITS MUST MEET A REASONABLENESS TEST
- THERE ARE NO ORAL PERMITS, MUST HAVE A WRITTEN PERMIT IN VEHICLE
- THERE ARE NO RETROACTIVE OR POST ENFORCEMENT PERMITS
- GRANTED ONLY WHERE NO ALTERNATIVE ROUTE EXISTS



ASHLAND COUNTY SPRING POSTING POLICY

- SPECIAL HAULING PERMITS CONTAIN:
 - ✓ VEHICLE LICENSE NUMBER
 - ✓ DATE AND TIME FOR TRIP
 - ✓ SPECIFIC ROUTE
 - ✓ TOTAL WEIGHT/ LOAD SIZE (%)
 - ✓ CARGO
 - ✓ VEHICLE CONFIGURATION (AXLES)



ASHLAND COUNTY PROBLEMS – PAST & PRESENT

- FIRST TIME POSTINGS – POLITICAL
END RUNS
- COMPLAINTS ON LACK OF NOTICE
- ENFORCEMENT
 - LACK OF 24 HOUR/ DAY COVERAGE
 - LIMITED OR NO LOCAL ENFORCEMENT
 - CONFUSION ON HOW TO IDENTIFY
OVERLOAD



ASHLAND COUNTY PROBLEMS – PAST & PRESENT

- HOME BASED BUSINESSES
- SMALL BUSINESSES (BARS & RESTARAUNTS)
- AGRICULTURE – ASSUMED EXEMPTION
- ESSENTIAL SERVICES – FUEL HAULING
- COORDINATION WITH ZONING DEPARTMENT – ASSUMPTION COUNTY ZONING PERMIT ELIMINATES NEED TO OBEY POSTINGS
- TAKING TRUCKS HOME



ASHLAND COUNTY SUCCESSES

- GOOD COMPLIANCE
- ENFORCEMENT HAS IMPROVED, DUE TO A CLEARER UNDERSTANDING OF LIMITS
- COOPERATION FROM HAULERS IMPROVES EVERY YEAR
- BEHAVIOR HAS CHANGED – FEWER TRIPS, ALTERNATE APPROACHES AND BETTER PLANNING BY USERS



ASHLAND COUNTY SUCCESSSES

- FROST TUBES HAVE ELIMINATED GUESS WORK
- SEEMS TO BE A BETTER UNDERSTANDING OF THE VULNERABILITY OF HIGHWAYS IN SPRING
- **OVERALL PROTECTION OF THE HIGHWAY INFRASTRUCTURE HAS IMPROVED**



THANK-YOU

QUESTIONS?