


Techniques for Low Volume Roads in Saskatchewan

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Saskatchewan's Highway Network

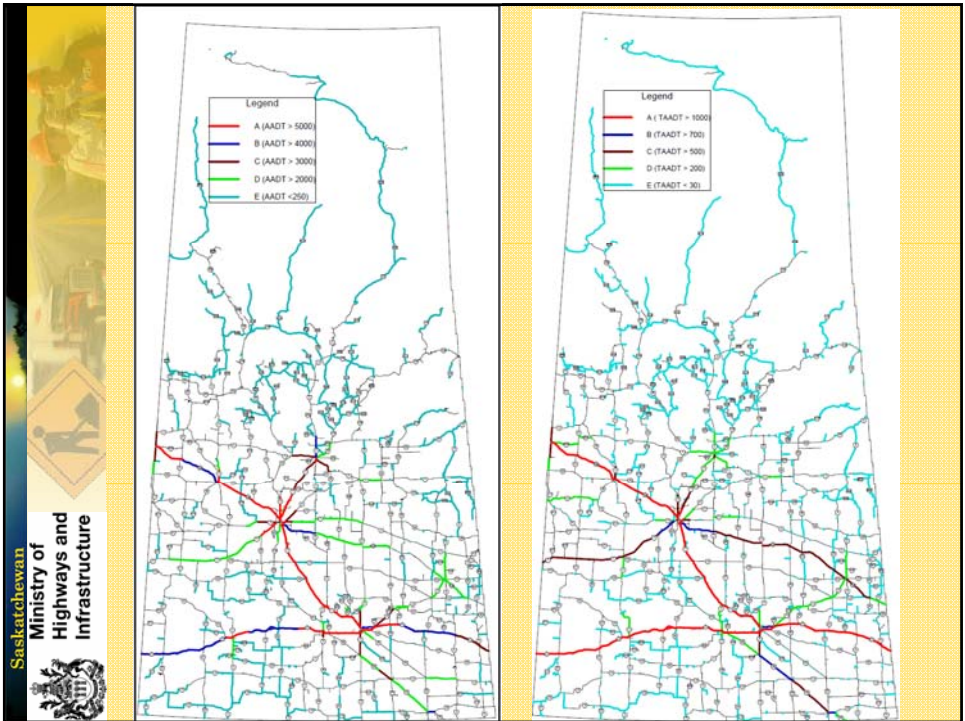
Surface Type	Length Maintained (km)	Length Maintained (%)
Asphalt Concrete Pavement	9,644.33	36.53
Granular Pavement	4,887.92	18.52
Thin Membrane Surface	5,644.74	21.38
Gravel	5,940.58	22.50
Winter Ice	280.11	1.06
Total	26,397.67	100.00

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Low Volume Roads in SK


- **LVR - no set definition (in progress)**
 - 2260 km less than 250 vpd - 9% network
 - 6456 km less than 610 vpd – 25% network
- **At 200-300 vpd begin discussions about surfacing**
- **Surface types: granular pavements, thin membrane surfaces, and gravel roads**
- **LVRs function as:**
 - Local access roads
 - Community access roads
 - Northern industry and recreational access



Rehab and Maintenance Techniques of Interest

1. Replacing double seal with thin AC on granular LVR with higher truck traffic
2. Engineered till subgrade case study
3. Stabilization of granular base with cement and emulsion
4. Maintenance Crews:
 - a) Use of base shims with calcium chloride on gravels and TMS
 - b) Use of geosynthetics for deep patching

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1. Replacing double seals with thin AC



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New Surface Treatment Policy

- **Granular pavements with low AADT, but high TADT now get an AC surface**
 - Ministry approved policy in 2009
 - Using threshold of 80 trucks per day
 - Initially used 35 mm of AC with soft AC binder
 - Currently using 40-50 mm of AC (not counted as structural)
 - First implemented as design exceptions in 2005
 - Good success so far
 - Looking to evaluate AC performance this coming year

2. Engineered Till Subgrade – Hwy 908

- **Access to a Northern Community**
 - Local traffic only, no through traffic
- **TMS with a glacial clay till subgrade**
- **Severely distorted and low gradeline**
- **High maintenance**
 - Intensive cold mix patching and sealing
- **AC -surfaced road needed**
 - But not a full highway structure
- **Good sand source along access road available**



Lab Assessment of Subgrade CBR

Sample Composition	CBR Swell (mm)	CBR Strength (%)
Unstabilized Subgrade	1.74	2.7
40% sand	0.26	3.9
50% sand	0.10	4.6
60% sand	0.00	4.6
70% sand	0.00	7.4

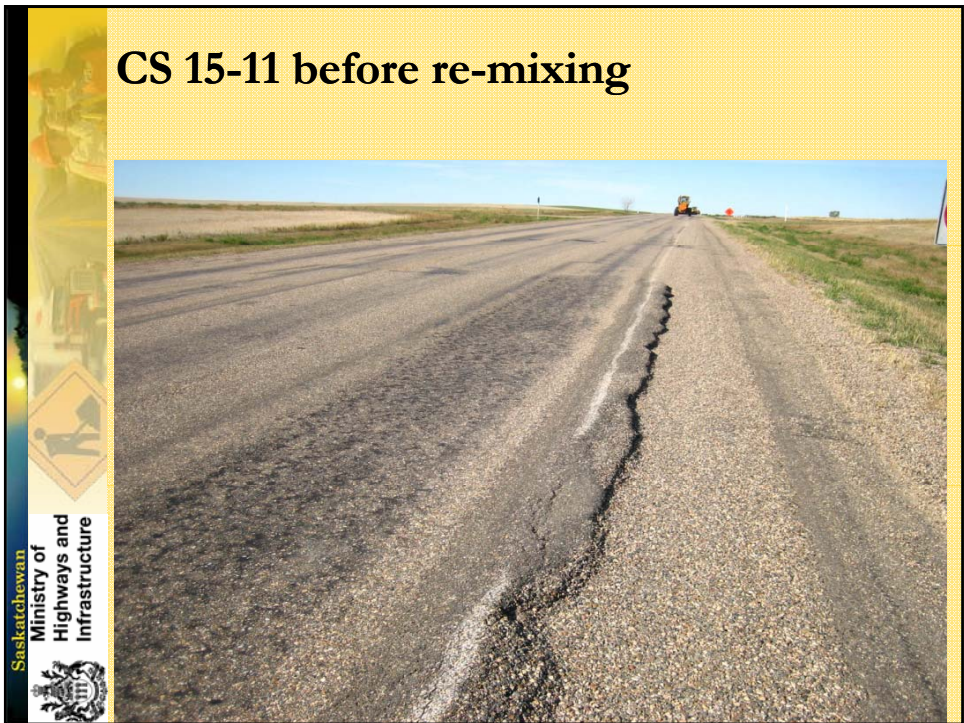
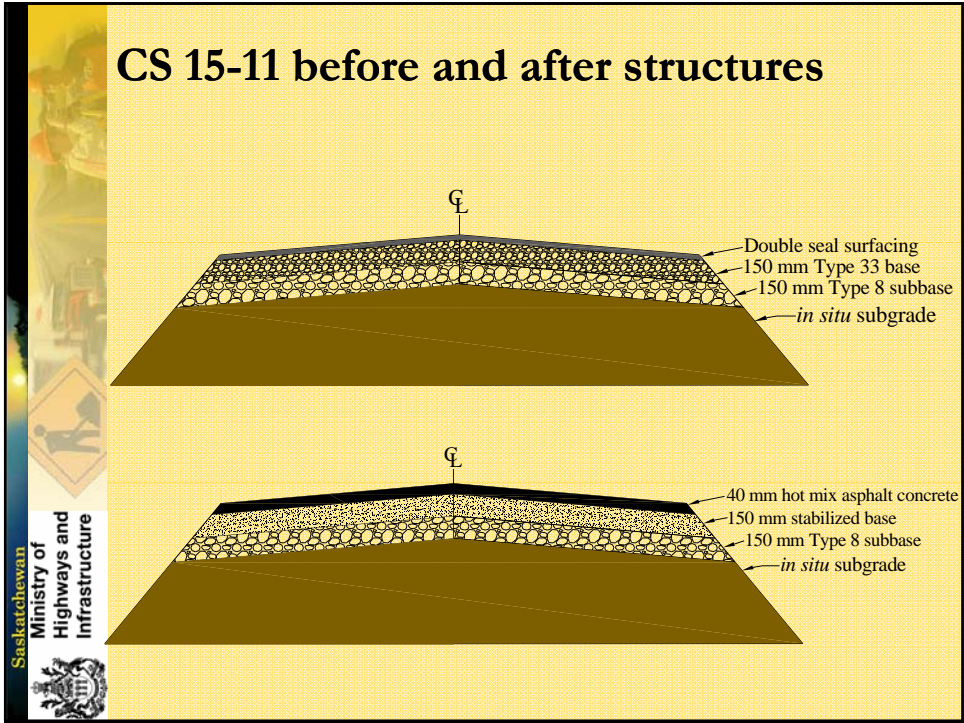


CS 908-01 surfacing



3. Strengthening Granular Pavements

- **Granular base course deteriorates over time**
 - Lab testing confirms CBR reduction
- **CS 15-11 granular base and seal re-mixed**
 - Extensive mechanistic testing for design
 - Sections built with base course treatment of:
 - 3% cement
 - 2% cement and 1% emulsion
 - untreated



CS 15-11 remixing with the Zipper



CS 15-11 adding cement and emulsion



CS 15-11 blading and compaction



CS 15-11 Construction and Performance

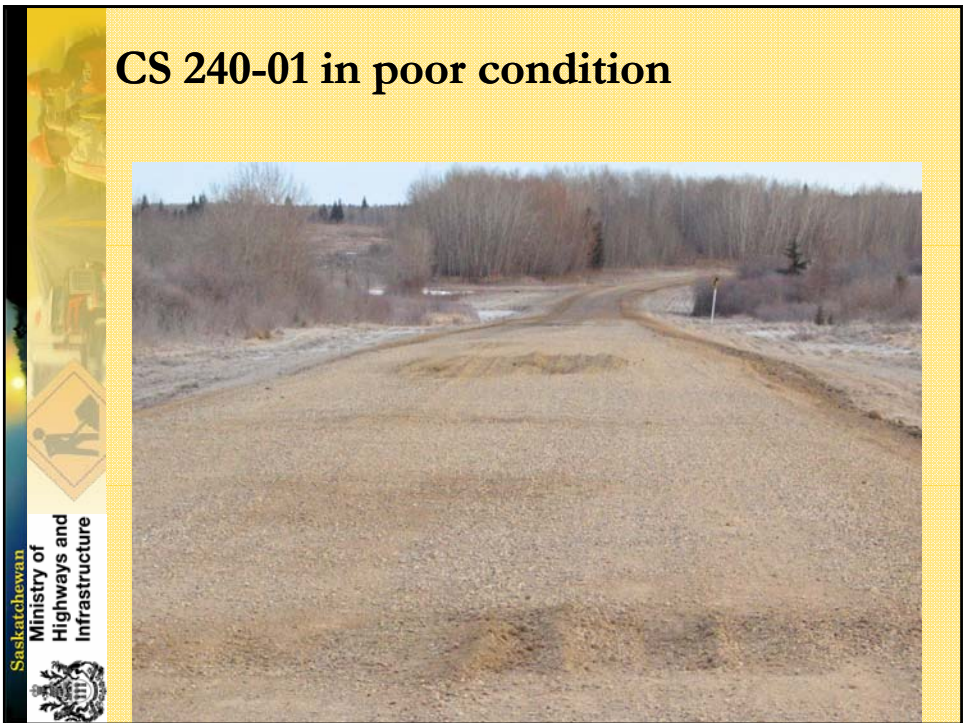
- **Constructed in Fall 2006**
 - Winter very well without surface treatment
 - 40 mm of AC in August 2007
- **Roto-mixed within granular layers only**
 - 200 mm remixing depth
 - Stayed out of subgrade (clay till soil)
- **Used CSS-1 emulsion and cement/flyash blend**
- **To date excellent performance in 4 years**
 - Periodically evaluated with FWD, GPR and visual inspection

4a. Thin Base Overlays in Maintenance

- **Granular base overlays used on TMS and gravel roads**
 - Useful especially when road grade is low
 - 100-150 mm thick
 - Incorporating calcium chloride into the surface

Thin Base Overlays in Maintenance

- **Calcium Chloride Use**
 - Applied at 2-6 flake tonnes/km
 - Used as a binding agent for top of base
 - Helps pack and provide stability
 - On gravel roads
 - Re-apply every year
 - On TMS roads
 - allows longer time before seal coat applied



CS 240-1 seal on base shim with CaCl_2



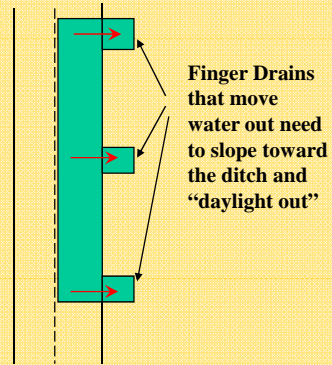
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4b. Using Geosynthetics for Maintenance

- Crews incorporating woven fabric
 - Deep patch repairs
 - Base shims
- Using non-woven fabric for separation on heavy clay subgrades

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Large Deep Patches



Concluding Remarks

- **Low Volume Roads are a challenge and an opportunity**
 - Very sensitive to damage from heavy haul
 - Can be the only access to a community
 - Justifying investment is tough when AADT is low
 - Usually very maintenance-intensive
 - Good place for innovation and thinking outside the box
 - Lesser consequences in case of failures

