NDDOT Chip Seal Oil
Fargo District

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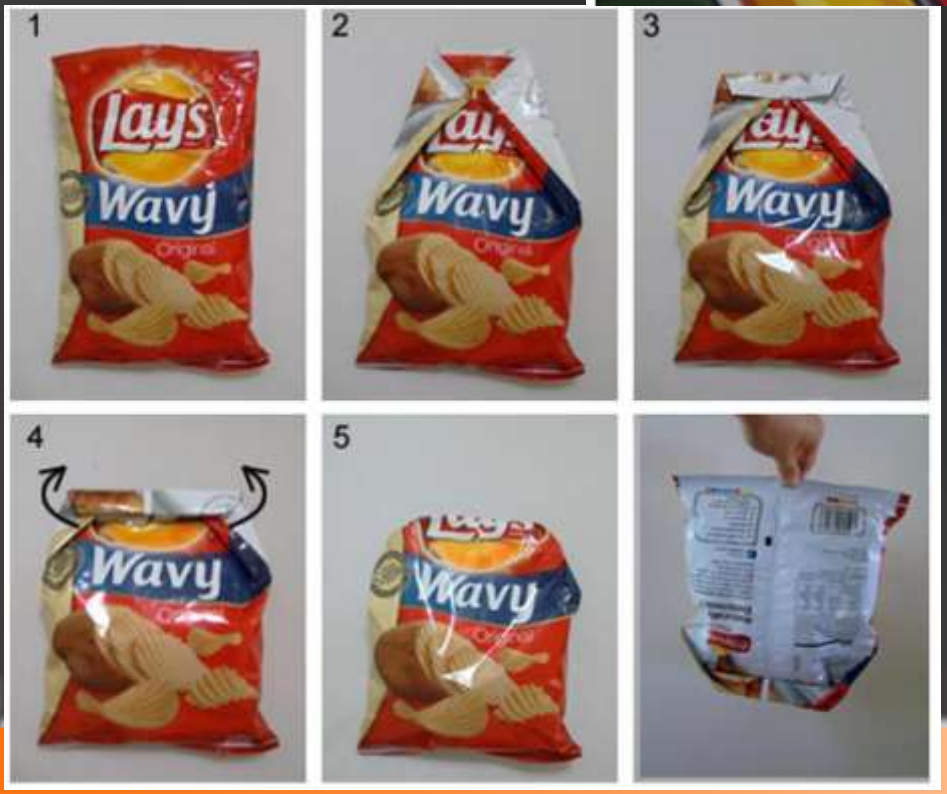
NDDOT


THAT WAY
3200
THIS WAY


Cheetos
Crunchy


1
Lay's
Wavy
2
Wavy
3
Wavy
4
Wavy
5
Wavy


Lay's
LOCOMOLIFE
LOCOMO

Fargo District Perspective

- Tried Different Oils In Fargo
  - CRS-2P – 2013
  - HFMS-2 – 2013 & 2014
  - CHFRS-2P – 2015+
- Different Chips
  - Class 41M – w\ CRS-2P
  - & CHFRS-2P
  - Class 43 – w\ HFMS-2

Table 816-02
Aggregates for Blotter and Seal coats

Sieve Size Or Testing Method	Aggregate Class					
	41	41M	42	43	44	45
	Percent Passing or Testing Requirement					
5/8 inch					100	
3/8 inch	100					100
No. 4	20-70				90-100	85-100
No. 8	0-17		2-20	0-17		
No. 16						45-80
No. 50						10-30
No. 200	0-1.5		0-5	0-2	0-20	0-3
ND T 113, Shale (max %)	8.0%					3.0%
AASHTO T 96, L.A. Abrasion (max %)	40%					
NDDOT 4, Fractured Faces[1]		50%				

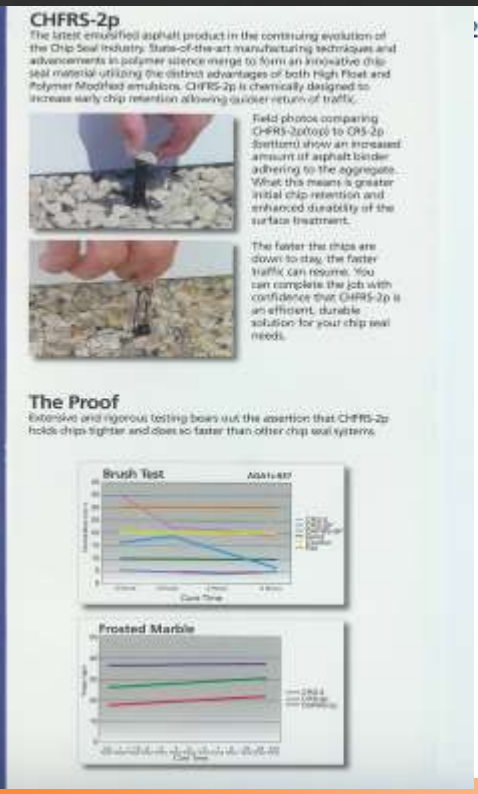
[1] Minimum weight percentage allowable for the portion of the aggregate retained on a No. 4 sieve having at least 1 fractured face for Class 41M.

History

- CRS-2P
  - Concerns from maintenance and oil on plows
  - Losing chips during winter operations
    - Chips not clean enough?
- HFMS-2
  - Virtually eliminated concerns from maintenance
  - Slow setting created chip loss at intersections
  - Rural communities

History

- CHFRS-2P
  - Great chip retention
  - Quick setting
  - No appearance of a wave during placement



20-P04 EMULSIFIED ASPHALT: Use an Emulsified Asphalt that meet the following requirements: **CHFRS-2P**

Test	Specification Minimum	Maximum	AASHTO Method
Viscosity, Saybolt Furol @ *122°F,Sec*	100	400	T-59
Storage Stability Test, *1Day*, %	---	1	T-59
Demulsibility, *35 ml 0.8% Sodium*			
Dioctyl Sulfosuccinate,%	60	---	T-59
Sieve Test, %	---	0.10	T-59
Particle Charge Test	Positive		T-59

Test	Specification Minimum	Maximum	AASHTO Method
Distillation Test: (1)			
Oil Distillate, *By Volume of Emulsion*,%	---	0.5	T-59
Residue, % *by Wt*	65	----	T-59
Test on Distillation Residue:			
Polymer Content, *wt. % (solids base)*	3.0	----	TEX-533-C
Softening Point, *°F*	130		T-53
Float Value *at 140°F, Sec*	1800	----	T-50
Penetration *77°F, 100G, 5 Sec.*	90	160	T-49
Viscosity *@ 140°F, Poise*	1300	----	T-202
Solubility *in Trichloroethylene*, %	95	----	T-44
Elastic Recovery *@ 10°C(50°F)*, % (2)	55	----	T-301

(1) Exception to AASHTO T-59: Bring the temperature on the lower thermometer to 350°F plus or minus 10°F. Maintain at this temp. for 20 minutes. Complete total distillation in 60 plus or minus 5 minutes from first application of heat.
(2) Elastic Recovery @ 10°C(50°F): Hour glass sides, pull 20 cm, hold 5 minutes then cut, let sit 1 hour.

Cost – 2016 Annual Bid Prices

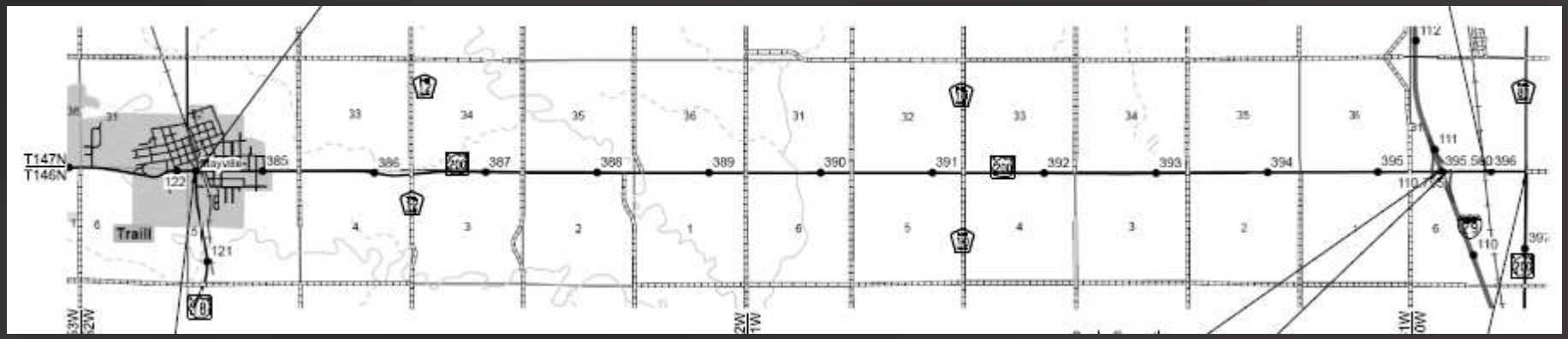
- CRS-2P $1.93/gal
- HFMS-2 $2.37/gal
- CHFRS-2P $2.34/gal
  - About $2,600/mile additional cost between CRS-2P and CHFRS-2P at 26’ wide
- Class 43 $1.10/SY, small quantity
- Class 41M $0.45/SY

Project Cost

- 2016 Chip Seal on ND 13
  - About 26 miles long
  - Epoxy Edge line w/ Tape at an Intersection
  - About $32,000/mile
- 2017 Chip Seal on ND 11
  - About 9 miles long
  - Epoxy edge line w/tape at an intersection
  - About $36,000/mile
- 2017 Chip Seal on ND 200
  - About 9 miles long
  - About $25,000/mile but all paint

2014 HFMS-2

2014 Project

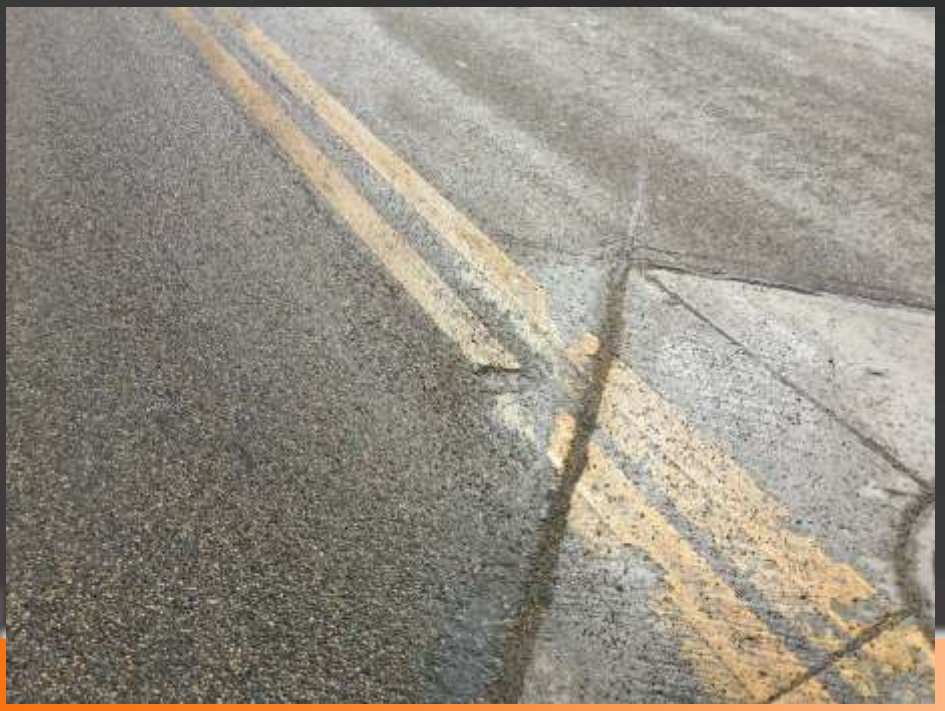


NDDOT
North Dakota
Department of Transportation

2014 CHFRS-2P

2014 CHFRS-2P

2014 CHFRS-2P




2016 CHFRS-2P

Chocolate Chip Cookies:

Ingredients:

- 532.35 cm^3 gluten
- 4.9 cm^3 $NaHCO_3$
- 4.9 cm^3 refined halite
- 236.6 cm^3 partially hydrogenated tallow triglyceride
- 177.45 cm^3 crystalline $C_{12}H_{22}O_{11}$
- 177.45 cm^3 unrefined $C_{12}H_{22}O_{11}$
- 4.9 cm^3 methyl ether of protocatechuic aldehyde
- Two calcium carbonate-encapsulated avian albumen-coated protein
- 473.2 cm^3 theobroma cacao
- 236.6 cm^3 de-encapsulated legume meats (sieve size #10)

To a 2-L jacketed round reactor vessel (reactor #1) with an overall heat transfer coefficient of about 100 Btu/F-ft^2-hr, add ingredients one, two and three with constant agitation. In a second 2-L reactor vessel with a radial flow impeller operating at 100 rpm, add ingredients four, five, six, and seven until the mixture is homogenous. To reactor #2, add ingredient eight, followed by three equal volumes of the homogenous mixture in reactor #1. Additionally, add ingredient nine and ten slowly, with constant agitation. Care must be taken at this point in the reaction to control any temperature rise that may be the result of an exothermic reaction.

Using a screw extrude attached to a #4 nodulizer, place the mixture piece-meal on a 316SS sheet (300 x 600 mm). Heat in a 460K oven for a period of time that is in agreement with Frank & Johnston's first order rate expression (see JACOS, 21, 55), or until golden brown. Once the reaction is complete, place the sheet on a 25C heat-transfer table, allowing the product to come to equilibrium.