Adverse Weather Conditions

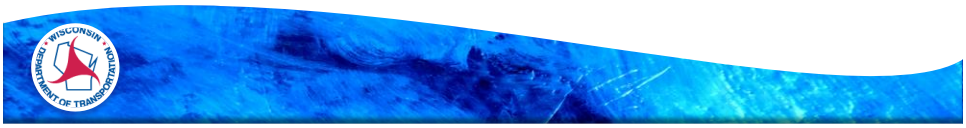
Session 9

Potential Weather Conditions

- High winds
- Rain
- Sleet
- Snow
- Temperature

Factors for Wind

- PPE requirements to protect vision
- Awareness of visibility issues
- Traffic control concerns
- Raised truck boxes
- May affect HMA mixture
  - Surface temperature of mix (rapidly cooling)
  - Prone to segregation
  - Workability issues



Stop Compaction Temp. = 130 F

Temp	Wind Speed 0	5	10	15	20	25	30	35
36	43	35	32	29	28	26	25	24
37	43	35	32	30	28	26	25	24
38	43	36	32	30	28	26	25	24
39	43	36	32	30	28	26	25	24
40	43	36	32	30	28	27	25	24
41	43	36	32	30	28	27	25	24
42	43	36	33	30	28	27	26	25
43	43	36	33	30	28	27	26	25
44	43	36	33	30	28	27	26	25
45	44	36	33	30	29	27	26	25
46	44	36	33	31	29	27	26	25
47	44	37	33	31	29	27	26	25
48	44	37	33	31	29	27	26	25
49	44	37	33	31	29	28	26	25
50	44	37	33	31	29	28	26	25

Ample Time to Compact
Acceptable Time to Compact
Not Enough Time to Compact

Factors for Rain

- How hard is it raining
  - Drizzle
  - Continuous
  - Downpour
- Weather forecast
- May affect HMA mixture
  - Bonding of tack coat
  - Temperature of mixture (rapid cooling)
  - Density gauge operations are affected

Factors for Sleet

- How much and for how long
- Weather forecast
- May affect HMA mixture
  - Bonding of tack coat
  - Temperature of mixture (rapid cooling)
  - Density gauge operations are affected

Factors for Snow

- How much and for how long
- Weather forecast
- May affect HMA mixture
  - Bonding of tack coat
  - Temperature drops
    - HMA mixture
    - Existing pavement structure
    - Possible joint issues
    - Aesthetics affected

Placing Mixture

Cold Weather Paving

TABLE 3
Minimum Laydown Temperatures for Various Thicknesses*

Base Temperature °C (°F)	Recommended Minimum Laydown Temperatures, °C (°F)					
	13 mm (0.5 in)	19 mm (0.75 in)	25 mm (1 in)	38 mm (1.5 in)	50 mm (2 in)	75 mm (>3 in)
- 7 to 0 (20 – 32)	– –	– –	– –	– –	– –	141* (285)*
1 – 4 (33 – 40)	– –	– –	– –	152 (305)	146 (295)	138 (280)
5 – 10 (41 – 50)	– –	– –	154 (310)	149 (300)	141 (285)	135 (275)
11 – 16 (51 – 60)	– –	154 (310)	149 (300)	146 (295)	138 (280)	132 (270)
17 – 21 (61 – 70)	154 (310)	149 (300)	143 (290)	141 (285)	135 (275)	129 (265)
22 – 27 (71 – 80)	149 (300)	143 (290)	141 (285)	138 (280)	132 (270)	129 (265)
28 – 32 (81 – 90)	143 (290)	138 (280)	135 (275)	132 (270)	129 (265)	127 (260)
> 32 (> 90)	138 (280)	135 (275)	132 (270)	129 (265)	127 (260)	124 (255)
Rolling Time, min.	4	6	8	12	15	15+

* Place only on bases made of treated material not on frozen soils or untreated aggregates.

Reprinted from *Shell Bitumen Handbook*, Fig. 5.3.

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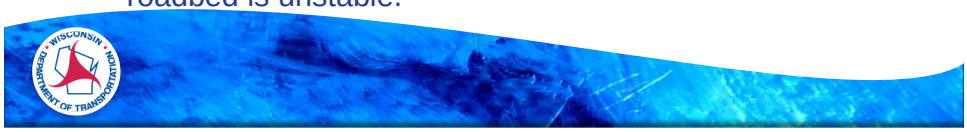
WisDOT Standard Specification 450

- Constructing Asphaltic Mixtures
  - Notify engineer prior to paving
  - Do not place material if temperatures are less than 36 F for upper layers and 32 F for lower layers.
  - Should place material

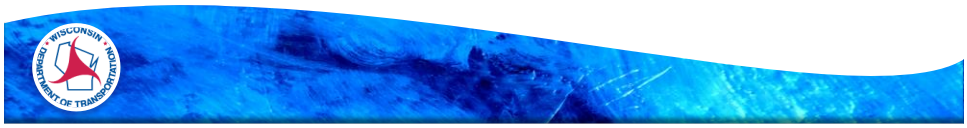
New language will change divisions to Northern/Southern Asphalt Zones

  - Place mixture only on a prepared, firm, and compacted base, foundation layer, or existing pavement substantially surface-dry and free of loose and foreign material. Do not place over frozen subgrade or base, or where the roadbed is unstable.



WisDOT Standard Specification 450

- Cold Weather Paving Plan
  - Must be submitted at the Pre-Con meeting
  - Goes in effect for air temperatures less than 40 F
  - Requires the contractor to incorporate a warm mix additive to an approved mix design (cannot use foaming)
  - Requires the contractor to use additional rollers (per contractor paving plan)



WisDOT Standard Specification 450

- Cold Weather Paving Operations
  - Do not place mixture when air temperatures are less than 40 F without a cold weather paving plan in effect
  - If the national weather service predicts temperatures below 40 F within paving timeframes (24 hours in advance) engineer must validate paving plan prior to paving.
  - Once plan is accepted (daily), the plan remains in effect for the balance of that work day regardless of temperature

WisDOT Standard Specification 450

- Payment for Cold Weather Paving
  - Payment is by the ton and full compensation for additional materials and equipment specified for cold weather paving.
  - If the bid item is not in the contract, the department will pay for additional costs as extra work. The department will pay separately for HMA pavement under the appropriate HMA pavement bid items.

WisDOT Standard Specification 450

- If due to an excusable compensable delay, the engineer directs the contractor to pave when temperatures are less than 36 F for upper layers or less than 32 F for lower layer the department:
  - Will relieve the contractor of responsibility for damage and defects the engineer attributes to cold weather paving
  - Will not assess disincentives for density or ride

CMM 4-58

- Warm mix additive is used as a compactive aid-foaming with the addition of water is not allowed
- 4-58.10.1 provides additional options that could assist with achieving densities in cold weather
- 4-48.10.2 lays out a checklist of inspection items to look for and provide documentation
- NAPA's MultiCool Pavement Software tool to identify rolling times (online, app, downloadable) https://www.asphaltpavement.org/index.php?option=com_content&view=article&id=178&Itemid=331

FDM Chapter 19

- Construction should be completed prior to the following:
  - Northern Asphalt Zone (September 15-June 1)
  - Southern Asphalt Zone (October 1-May 15)
- Estimate 25% of the quantity placed during this timeframe and estimate $3/ton (use item 460.4000)
- There is also language for guidance as to when to "carry over" a project to the following construction season

Alternatives for Cold Weather

- Warm mix technology was developed as a way to reduce emissions generated by HMA production. The temperature reductions vary anywhere from 30-100° F, and is done by adding additives to the liquid binder during mixture production
  - This methodology has been used throughout WI on projects both public and private
- Joint Heaters
- Carry project over until following Spring