Terminology for Winter Pavement Conditions
Measured by Pavement Sensors

In Canada, the use of road weather information systems (RWIS) is growing, and it will become important, as needs mature, to be able to compare information and conduct analyses using data from different stations and different jurisdictions. This will allow road network managers using RWIS to obtain and analyze comparable point data and will also allow agencies to, ultimately, convert this information into standardized winter road conditions to cover road segments of variable lengths. This will result in improved communications with the motoring public, the broadcast media and emergency services personnel. It has been determined that a standard terminology to describe the information provided by pavement sensors is critical.

Under the auspices of the Maintenance and Construction Standing Committee of the TAC Chief Engineers' Council, a project was undertaken to investigate the development of a common language to describe winter pavement conditions measured by pavement sensors, and to consider a specification, based on scientific terminology, for pavement conditions defined in the current version of the NTCIP-ESS protocol.

As a result of this study, TAC has adopted a set of terms, definitions and specifications for winter pavement conditions as attached. Background work is described in a project report, entitled *Terminology for Winter Pavement Conditions Measured by Pavement Sensors*, which is available in the TAC library.

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National Standards and Data Dictionary (with NTCIP cross-reference): Terms, Definitions and Specifications – Winter Pavement Conditions

Pavement Temperature
Definition: The temperature of the pavement at its surface.
Test: Tested at the five temperature levels +/-1C; from +5C to –15C. The temperatures of the chamber and cold table are set at predetermined values and the temperature is allowed to stabilize for two hours. The surface and sensor temperatures are recorded for an hour at 6 minute intervals. The procedure is done for all five levels of ambient temperature. The *surface and sensor results must be within +/-1.0C to be true.*
The sensor is reporting surface temperature, acceptably, if it fails not more than X times in Y tests.
Pavement Condition – Term : Ice – NTCIP code : 8
Definition: Thin or spotty film of moisture at or below freezing
Test: The ice cover on the pavement sensor is created by spraying a film of water over its surface, which has been brought to a temperature of −5°C. A constant condition is established at −5°C ($T_{surface}$ and T_{air}). The ice cover is obtained by spraying on a film of water about 0.1 mm thick. (The initial temperature of the water droplets is about +2°C.) *The detection of ice cover must be achieved within 12 minutes after spraying.*
The sensor is reporting ice condition, acceptably, if it fails not more than X times in Y tests.
Pavement Condition – Term : Frost – NTCIP code : 13
Definition: The sensor detects the formation of frost **_or_** moisture on pavement at or below freezing, with a pavement temperature at or below the dewpoint temperature.
Test: Frost cover is obtained by condensation of ambient air water vapour on the pavement sensor surface, which is maintained at about −5°C. A constant condition is established at −5°C ($T_{surface}$ and T_{air}). The ambient air temperature in the chamber is raised to +3°C to cause solid condensation (frost) on the pavement surface.
The sensor is reporting frost condition, acceptably, if it fails not more than X times in Y tests
Pavement Condition – Term : Dry – NTCIP code : 3
Definition: The sensor does not detect any moisture or unusual condition
Test: A dry condition is achieved by drying, with compressed air or heat gun, at +5C and -5C. *record a visual determination of pavement surface state and reported pavement surface state (from RPU) at two-minute intervals until the RPU reports a dry surface state or ten minutes have expired. The detection of a dry state must be achieved within ten minutes or the test fails*
The sensor is reporting dry condition, acceptably, if it fails not more than X times in Y tests
Pavement Condition – Term : Wet – NTCIP code : 5
Definition: The sensor detects a significant amount of moisture indicating a wet roadway.
Test: With pavement temperature above 0C, uniformly spray a 0.5 mm tap water film on the surface of the sensor. Check film thickness with a feeler gauge. If the film does not stay on the sensor, place a wet paper towel on the sensor and continue to perform the procedure. *record a visual determination of pavement surface state and reported pavement surface state (from RPU) at two-minute intervals until the RPU reports the wet surface state or ten minutes have expired. The detection of a wet state must be achieved within ten minutes or the test fails*
The sensor is reporting wet condition, acceptably, if it fails not more than X times in Y tests
Pavement Condition – Term: Chemically Wet - NTCIP code: 6
Definition: The sensor detects a significant amount of moisture mixed with a de-icing or anti-icing material
Test: Prepare solutions of sodium chloride (NaCl); calcium chloride (CaCl) and magnesium chloride (MgCl) at 4%, 8%, 12%, 16% and 20% concentration; record their theoretical freezing points. spread on road sensor with micropipette or spray - 0.5mm thick - using feeler gauge for check. run test at 2C, -5C and -10C. Determine the average of four stable readings - stability is met when pavement sensor freezing point has varied less than 2C between four successive readings. *record observed differences between RPU report of "freezing temperature": the test fails if reported differences are more that 1.5C*
The sensor is reporting freezing temperature, acceptably, if it fails not more than X times in Y tests