Pavement Sensor Specifications for Vaisala LX Processing Units

* Approved sensors: Vaisala FP2000
* Other sensors meeting these criteria:
  + Invasive pavement condition sensor(s) shall be a single solid-state electronic passive device with no moving parts, capable of measuring and recording road surface conditions and temperatures.
  + Invasive pavement condition sensor(s) shall be thermally passive
  + Providing stable operation and measurement over -40 to +140° F
  + Accuracy range of ±0.5° F
  + Weather conditions, traffic, or ice control chemicals shall not degrade the sensor’s performance.
  + Sensor must withstand plowing and normal traffic when the sensor face is installed flush to the roadway surface.
  + Sensors shall obtain the temperature no deeper than 0.25 inches below the roadway surface.
  + Sensors shall obtain the condition of the pavement surface including whether it is dry, wet, damp, or icy.
  + The sensor shall be constructed of materials that have thermal characteristics similar to common pavement materials.
  + The top of the sensor shall approximate the roadway pavement color.
  + Sensors shall be capable of communicating with existing LX Processing Units.
  + Sensors must be equipped with cable lengths of 300 feet and suitable for direct-bury, and capable of splicing to extension cables for distances more than 1000 feet.

Pavement Sensor Specifications for Lufft LCOM Processing Units

* Approved sensors: Lufft IRS31-PRO-UMB
* Other sensors meeting these criteria:
  + Invasive pavement condition sensor(s) shall be a single solid-state electronic passive device with no moving parts, capable of measuring and recording road surface conditions and temperatures.
  + Invasive pavement condition sensor(s) shall be thermally passive
  + Providing stable operation and measurement over -40 to +140° F
  + Accuracy range of ±0.5° F
  + Weather conditions, traffic, or ice control chemicals shall not degrade the sensor’s performance.
  + Sensor must withstand plowing and normal traffic when the sensor face is installed flush to the roadway surface.
  + Sensors shall obtain the temperature no deeper than 0.25 inches below the roadway surface.
  + Sensors shall obtain the condition of the pavement surface including whether it is dry, wet, damp, or icy.
  + The sensor shall be constructed of materials that have thermal characteristics similar to common pavement materials.
  + The top of the sensor shall approximate the roadway pavement color.
  + Sensors shall be capable of communicating with Lufft LCOM Processing Units.
  + Sensors must be equipped with cable lengths of 300 feet and suitable for direct-bury, and capable of splicing to extension cables for distances more than 1000 feet.

Subsurface Temperature Probes

* Approved sensors: High Sierra Electronics 5720-09
* Other sensors meeting these criteria:
  + Sensor shall be a single solid-state electronic “probe type” passive device with no moving parts, capable of measuring and recording temperature beneath the road surface
  + Providing stable operation and measurement over -40 to +140° F
  + Sensor shall withstand ice control chemicals
  + Accuracy range of ±0.5° F
  + Sensors shall be capable of communicating with Lufft LCOM Processing Units and similar.
  + Sensors must be equipped with cable lengths of 300 feet and suitable for direct-bury, and capable of splicing to extension cables for distances more than 1000 feet

Deep Subsurface Temperature Probes

* Approved sensors: HSE 5450-02
* Other sensors meeting these criteria:
* Sensor shall consist of an array of temperature probes, installed such that each probe is at a fixed spacing, to be installed vertically within the pavement to provide temperature readings at various depths.
* Providing stable operation and measurement over -40 to +140° F
* Sensor shall withstand ice control chemicals
* Accuracy range of ±0.5° F
* Sensors shall be capable of communicating with existing Lufft LCOM Processing Units and similar.
* Sensors must be equipped with cable lengths of 100 feet and suitable for direct-bury, and capable of splicing to extension cables for distances more than 1000 feet
* Minimum 6 readings at following spacing in inches: 0,3,6,9,12,18

Non-Invasive Pavement Sensor Requirements:

* Must be compatible with Lufft LCOM RWIS processing units or be capable of independent communication with NTCIP 1204 RWIS polling systems
* Operating temperature -40 to +110 °F
* Operating humidity 0 to 100 % RH
* Measuring distance at least 30 feet
* Eye-safe emitters
* Minimum installation angle from the horizontal line: 30 degrees or less
* Condition measurements (on both concrete or asphalt):
  + Surface state identification including at least “dry”, “wet”, “icy”, “snowy”
  + Water depth
  + Ice depth
  + Snow depth
  + Road grip (friction)
* Temperature measurements
  + Measurement range at least -40 to +150 °F
  + Resolution of 0.1 °F
  + Measuring area diameter less than 32 inches at 30 feet
  + Accuracy of +- 1°F at 32°F, or better
* Must be resilient to salt spray and vibration
* (Optional) mounting hardware suitable for round luminaire pole
* Cable length of at least 30 feet

Air Temperature and Relative Humidity Sensor

* Approved sensors: Thies 1.105.54.160, Vaisala HMP155
* Other sensors meeting these criteria:
  + Compatible with Vaisala LX and Lufft LCOM processing units
  + Measuring range of 0-100% RH and -30 to 115 F temperature
  + Accuracy: +- 0.5 F temperature, +-0.5% RH
  + 10-foot minimum cable length
  + Must be resilient to salt spray and vibration
  + Sensor radiation shield/protective housing for natural ventilation (list separately)
  + Mounting bracket for luminaire poles (optional, list separately)

Anemometer – Wind Speed and Direction sensor:

* Approved sensors: RM Young 5103, High Sierra Electronics 5712-00, Vaisala WM30
* Other sensors meeting these criteria:
  + Compatible with Vaisala LX and Lufft LCOM processing units
  + Measurement range of 0-125 MPH, 0-360 degrees
  + Accuracy: +- 1 MPH, +-5 degrees
  + 30-foot minimum cable length
  + Dimensions less than 24 inches
  + Must be resilient to salt spray and vibration
  + Mounting bracket for luminaire poles (optional, list separately)

Radar Based Precipitation Sensor

* Approved sensors: Lufft WS100
* Other sensors meeting these criteria:
  + Compatible with Vaisala LX and Lufft LCOM processing units
  + Radar-based technology
  + Able to distinguish between rain, snow, sleet, hail
  + Detects precipitation intensity from at least 0.01 to 3.0 inches per hour
  + Heated or otherwise invulnerable to ice and snow accumulation
  + 30-foot minimum cable length
  + Measurement accuracy resilient against salt spray, road grime, dust accumulation on the sensing lens
  + Must be durable in the roadside environment, especially with salt spray and vibration
  + Mounting bracket for luminaire poles (optional, list separately)