



**Environmental Conditions  
and Its Impact on Coatings**



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**Environmental Conditions and Its Impact**

Environmental conditions has effects on many aspects of a coatings system application. From Surface Preparation, Coating Application to overall Curing of the coating system being applied.



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**Environmental Conditions and Its Impact**


- What is Dew Point?

Area where surface is above the Dew Point

Area where surface is below the Dew Point



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### Environmental Conditions and Its Impact

- The dew point is the temperature at which air is saturated with water vapor, which is the gaseous state of water.
- When air has reached the dew-point temperature at a particular pressure, the water vapor in the air is in equilibrium with liquid water, meaning water vapor is condensing at the same rate at which liquid water is evaporating.
- Below the dew point, liquid water will begin to condense on solid surfaces (such as blades of grass) or around solid particles in the atmosphere forming clouds or fog.

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### Environmental Conditions and Its Impact

- What is Relative Humidity?

How much water vapor is in the air compared to how much can fit in it



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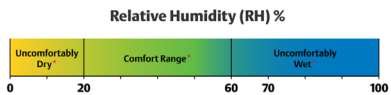
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### Environmental Conditions and Its Impact

Relative Humidity is the ratio of the amount of water vapor in the air at a specific temperature to the maximum amount that the air could hold at that temperature, expressed as a percentage.



\* For 80% or more of the occupants in a space

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### Environmental Conditions and Its Impact

- If air temperature and relative humidity are such that moisture from the air condenses on the surface, the surface may rust bloom, or rust back prior to coating
- Verify that the temperature of the surface is at least 5°F (3°C) higher than the dew point temperature to preclude condensation onto the prepared substrate or previously applied coating.



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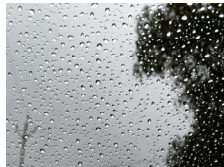
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### Environmental Conditions and Its Impact

- Theoretically, a small increase in surface temperature over dew point will preclude moisture formation on the surface.
- Minimum increase of 5°F (3°C) compensates for:
  - Instrument tolerances
  - Varying conditions
  - Changing conditions



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### Environmental Conditions and Its Impact

- Air Temperature (min. & max.)
- Surface Temperature (min. & max.)
- Relative Humidity (min. or max)  
 "Typically 85% max."
- Surface Temperature [min. 5 °F (3°C)] above Dew Point Temperature.
- Wind Speed (max.) as well as direction.  
 What is Down Wind??



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### How We Can Control The Impact



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### Environmental Conditions and Its Impact

- Air Temperature
  - Too cold or too hot can affect coating application & curing
- Relative Humidity
  - Too damp or too dry can affect coating application & curing
- Surface Temperature
  - Too cold or too hot can affect application & curing
- Surface temperature at or below dew point temperature will result in condensation

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### Environmental Conditions and Its Impact

- Wind Speed
  - Too windy can affect application (dry spray) and cause overspray damage
- Mixing/application of coatings under adverse weather conditions can void the manufacturer's warranty and is considered a specification non-conformance

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### Environmental Conditions and Its Impact

- Measuring Instruments
  - Sling Psychrometers\*
  - Battery-powered Psychrometers\*
  - Electronic Psychrometers
  - Analog, Thermocouple-type & Non-contact Surface Thermometers



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### Using Sling Psychrometers

- ASTM E337 Standard Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures)
- Verify wick cleanliness
- Saturate wick and/or fill reservoir with DI water
- Whirl 20-30 second intervals until wet bulb stabilizes (2 readings within 0.5°)
- Record wet & dry bulb temperatures



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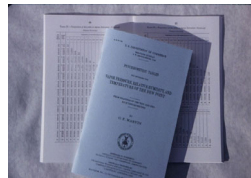
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### Using Psychrometric Charts

- Locate Chart (relative humidity or dew point)
- Verify Barometric Pressure (e.g., 30.0 in.)
- Intersect air temperature with wet bulb depression ( $T_a - T_w$ )
- Where temps intersect will be your current condition.



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### Measuring Surface Temperature

- Dial-Type Thermometer
  - Position & stabilize for minimum of 2 minutes
- Electronic Type Thermometers
  - Time to acclimate is needed
- Infrared (non-contact) Thermometers
  - Watch distance

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### Electronic Psychrometers

- Measure/Record:
  - Air Temperature
  - Surface Temperature (ST)
  - Relative Humidity
  - Dew Point Temperature (DP)
  - Spread between DP and ST
- Features
  - Auto-logging allows for automatic data collection
  - Magnetic surface probe
  - Data graphing and Blue Tooth uploading
  - Audio/visual alarm

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### Assessing Wind Speed

- Analog wind meters
- Digital wind meters
- Rotating Vane Anemometers
  - Air flow inside containment
  - Wind speed

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### Documenting Ambient Conditions and Surface Temperature

Condition	Data
Date	10/29/2020
Time	1230 hours
Dry Bulb Temperature (DB)	60°F (16°C)
Wet Bulb Temperature (WB)	55°F (13°C)
Depression (DB-WB)	5°F (3°C)
Relative Humidity	73%
Dew Point Temperature	51°F (11°C)
Surface Temperature	59°F (15°C)
Wind Speed	7 mph (11 km/h)
Measurement Location	North side of tank, ground level

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### Environmental Conditions and Its Impact

**Polyurea Quality Control Daily Report Log**

Date: \_\_\_\_\_ Qualified Applicator: \_\_\_\_\_  
 Project Description: \_\_\_\_\_  
 \_\_\_\_\_  
**I. Environmental Conditions: (Taken every 3 hours)**

Time of Day	Wet Bulb Temp	Dry Bulb Temp	Relative Humidity	Dew Point	Solvent Temp.	Wind Velocity

Description of general weather conditions: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

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### Environmental Conditions and Its Impact

- SSPC/NACE Joint Technical Report
- SSPC-TR3/NACE 6A192, "Dehumidification and Temperature Control During Surface Preparation, Application and Curing for Coatings/Linings of Steel Tanks, Vessels and other Enclosed Spaces"

ASTM E337 Standard Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures)

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### Environmental Conditions and Its Impact

### Questions ?

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