HR-305 Development of Expert System for Forecasting Frost on Bridges and Roads in Iowa

Key Words: Frost, Winter Maintenance, Predicting Road Conditions

ABSTRACT

An expert system has been developed that provides 24 hour forecasts of roadway and bridge frost for locations in Iowa. The system is based on analysis of frost observations taken by highway maintenance personnel, analysis of conditions leading to frost as obtained from meteorologists with experience in forecasting bridge and roadway frost, and from fundamental physical principles of frost processes. The expert system requires the forecaster to enter information on recent maximum and minimum temperatures and forecasts of maximum and minimum air temperatures, dew point temperatures, precipitation, cloudiness, and wind speed.

The system has been used operationally for the last two frost seasons by Freese-Notis Associates, who have been under contract with the Iowa DOT to supply frost forecasts. The operational meteorologists give the system their strong endorsement. They always consult the system before making a frost forecast unless conditions clearly indicate frost is not likely. In operational use, the system is run several times with different input values to test the sensitivity of frost formation on a particular day to various meteorological parameters. The users comment. that the system helps them to consider all the factors relevant to frost formation and is regarded as an office companion for making frost forecasts.