

SPATIAL DATA ANALYSIS FOR THE DEVELOPMENT OF EXPECTED ADVERSE WEATHER CHARTS FOR TRANSPORTATION CONSTRUCTION PROJECTS

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Abstract

Problem - Seasonal and daily weather events impact construction projects across the various climate regions of South Dakota in differing fashions. Additionally, the impacts for similar weather events can impact grading, surfacing, and structural construction activities in various ways. Adverse weather conditions can cause major delays which may lead to time extensions and increase project cost.

Purpose – To address these issues, South Dakota Department of Transportation (SDDOT) developed Working Day Weather Charts in 1998. However, advances in construction practices and weather prediction as well as climatic changes have occurred over the interim 25 years. This study is focused on developing updated zones, tables, charts, and recommendations for roads and bridges construction in South Dakota.

Nuance – The tables and charts are planned to be developed on both weekly and monthly basis to determine the impact of adverse weather events on construction projects and for use in future contracts.

Data - Weather, soil, and hydrographic data for South Dakota state are being considered for this study. The primary importance is on the weather data which is collected for 30 years (1991-2020) period from National Oceanic and Atmospheric Administration (NOAA). The important weather data parameters are temperature, snow, rainfall, and wind. The soil data have been collected from the broad-based inventory of soils and non-soil areas of the United States namely State Soil Geographic (STATSGO2). The key focus is to analyze the soil parameters in combination with adverse weather events that affect the construction of roads and bridges. The hydrographic data is focused on the peak flow at major water bodies in South Dakota that may cause flooding or ponding which affects road and bridge construction. Additionally, interviews with SDDOT personnel and construction contractors were conducted to determine factors important to the industry. Starting with data exploration of all the available data, key parameters will be analyzed to develop updated expected adverse weather day chart and updated zones.

Prior Studies – A considerable amount of work has been done on effects of weather on construction type categories and various Department of Transportation agencies evaluate the use of adverse weather in contract time calculations. The Virginia Department of Transportation place contract determination guidelines online. The VDOT document provides steps in determining contract time but contained little information on the impact of adverse weather on contract time calculations. Another document from the National Research Council of Canada on construction work protocols during winter in 1971. Beyond that, a recent (2022) publication from the National Cooperative Highway Research Program (NCHRP) covers a systematic approach for determining construction contract time. However, in most papers, little information is documented on the impact of adverse weather and how to implement that in tables and charts for construction type activities across South Dakota.

Impact – The results can directly help SDDOT engineers and contractors to estimate the appropriate contract time and warranted time extension due to unexpected adverse weather for variety of transportation construction projects across the diverse geographical terrains and climates of South Dakota.

Keywords: Transportation, Adverse Weather, Construction, NOAA