

JOINT TRANSPORTATION RESEARCH PROGRAM

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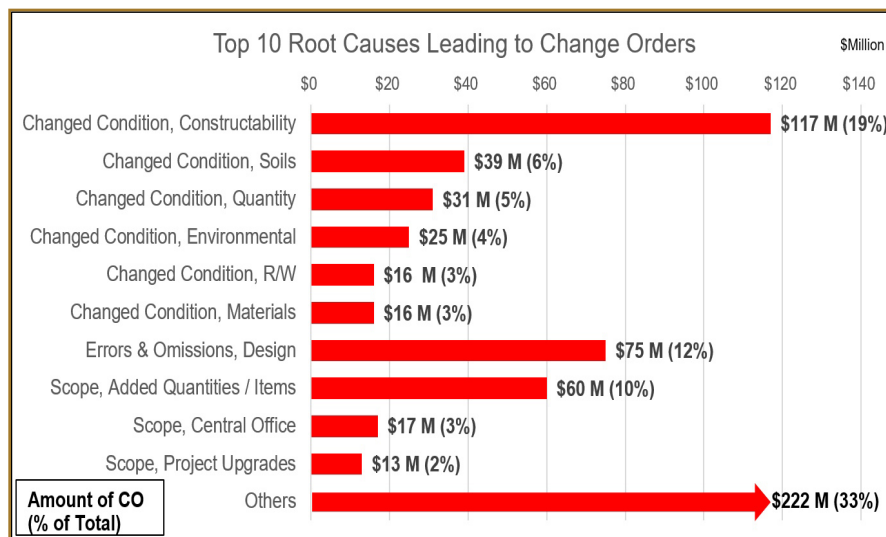
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INDOT Project Change Orders: Root Causes and Recommendations

Introduction

The Indiana Department of Transportation commissioned this study to understand the historical trends in change orders (COs) associated with state highway projects, and to investigate correlations between change orders and base factors (district, project type, contract type, award amount, and geographical area (rural vs. urban)). These base factors are known before the start of construction. This study also sought to understand the effect of the root causes, but not to predict CO based on root causes. Unlike the base factors, the root causes of a project are unknown before the start of construction. Using the base factors as the explanatory

variables, INDOT also requested models to forecast CO frequency (count), severity (magnitude), and CO impacts in terms of cost overrun and schedule delay (SD). The study analyzed historical project data (2010–2020) from INDOT's highway contracts, which involved approximately 5,000 contracts worth just over \$10 billion. A descriptive analysis of the trends and patterns of COs (including root causes) was carried out over a 10-year period for different types of projects administered at various administrative districts in the state; contract types and project types that are generally more likely to experience CO were identified; and the impact of COs on project schedule delay was analyzed. For the analysis, the study used various model specifications to observe



Top ten root causes for change orders.

the relationships between CO and the base factors to enhance INDOT's ability to anticipate and estimate the likelihood of COs for future projects.

Findings

Sixty-five percent (65%) of the contracts had at least 1 CO; 30% had at least 5 COs; 10% had at least 12 COs; and 4% had over 20 COs. Greenfield District had the most COs: 28% of statewide total CO count and 29% of the statewide total net monetary value (overrun). On the other hand, Vincennes had the least (10%) of the statewide total count of COs, but it accounted for 23% of the total statewide CO amount.

This report provides results for each of the three CO outcomes and schedule delay and the impacts of each base factor on each outcome. The prediction model factors exclude CO root causes because, unlike the base factors, the root causes are unknown before the construction starts.

Sixty-five percent (65%) of the contracts experienced cost overruns and 40% had schedule delays. The average cost overrun rate across all contracts was 5.6%. The breakdown is as follows: bridge-related contracts (2.52%); road-related contracts (3.55%); and maintenance/traffic-related contracts that exclude projects where COs were related to contract renewals (9.20%). The average cost overrun rate due to COs varies across districts: from 3.9% (Seymour) to 11.2% (Greenfield). Generally, districts that experienced higher cost overruns also had longer schedule delays, except for Vincennes.

The study also analyzed the CO impacts by the dominant root causes—changed conditions (9,544 COs, \$266M); errors and omissions (6,507 COs, \$139M);

scope changes (2,371 COs, \$109M), and final quantity adjustments (cost adjustment) (\$193M). The study also identified the district-wise top 5 root causes of the COs.

This study proposed guidelines to mitigate the incidence and severity of change orders. The guidelines covered issues that were related to constructability, soils and environment, errors and omissions, and scope and final quantity adjustments.

Implementation

The study results can help INDOT move further towards achieving its strategic goal of “on-time and on-budget project delivery.” Effective management of change orders aligns with specific provisions that recur across previous and current federal legislation (the Infrastructure Investment and Jobs Act), which emphasizes the importance of efficient project management and adherence to budgets and timelines in highway infrastructure development.

Recommended Citation for Report

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