THE UNIVERSITY OF TEXAS AT AUSTIN
CENTER FOR TRANSPORTATION RESEARCH

0-7182 Guidebook for Improving the Effectiveness of Construction Management Plans (CMP)

1. Introduction

1.1. Purpose and Scope of the Guidebook

This guidebook transforms the empirical findings of TxDOT Research Project 0-7182 into an actionable manual for district and project personnel. It summarizes the key research findings and provides recommendations on how to make Construction Management Plans (CMPs) more effective.

This guidebook describes the methods, data inputs, and decision recommendations practitioners need to:

- Identify and classify potential conflicts early.
- Describe the conflicts and management plans.
- Use the CMP Standard Operating Procedure (SOP) is to establish uniform guidelines for the development, submission, and approval of a CMP.
- Size realistic clearance buffers.
- Integrate conflict activities into the CPM schedule.
- Monitor clearance progress after letting.

1.2. Audience and How to Use This Guidebook

This guidebook is written for the diverse team of professionals who plan, design, review, and deliver TxDOT highway projects that need a Construction Management Plan (CMP). Its primary readers include district design and construction engineers, project managers, utility and railroad coordinators, right-of-way agents, schedulers, and external consultants who prepare CMP documentation on TxDOT's behalf.

Other stakeholders—such as district leadership, divisions (e.g.: DES, ENV, TPP, and TRF), area engineers, maintenance supervisors, traffic-operations staff, and representatives of cooperating agencies—will find the material useful for understanding how their decisions influence conflict-clearance schedules and construction sequencing. The guidebook explains the relations between CMP tasks and related activities, like subsurface utility engineering (SUE), traffic-control planning, and right-of-way acquisition, so that all parties share a common reference.

The guidebook is organized so that its chapters can be consulted as needed throughout a project's life cycle. Early sections provide contextual background and risk-screening strategies that help determine whether a CMP is appropriate. Mid-document chapters walk practitioners through compiling Exhibit A (Conflict Information Table), Exhibit B (Construction Time Determination - Schedule), and Exhibit C (Traffic Control Plan). Later sections focus on post-letting management: monitoring clearance progress, linking change orders to conflict IDs, and updating the CMP when scope or schedule changes arise.

1.3. Relationship to TxDOT CMP Standard Operating Procedure (SOP)

Although the guidebook offers detailed recommendations, it does not supersede the Standard Operating Procedure for Construction Management Plans developed by TxDOT's Design Division in 2025. Users should treat the SOP as the governing policy for approval requirements and rely on this guidebook for recommended methods, benchmark values, and lessons learned from completed projects.

2. Key Findings from the 0-7182 Study

2.1. Profile of CMP Projects vs. Non-CMP Projects (Size, Complexity, Contract Value)

The research team compiled a five-year collection (FY 2019–FY 2024) of 4,950 highway construction contracts across all 25 TxDOT districts, let after the initial implementation of CMPs by TxDOT. While the subset of projects that required preparation of a Construction Management Plan (CMP) accounted for only 255 lettings (5.2%), they represented the most complex, highest-value work:

Contract size and value — The mean CMP contract was $70.8 million, while the maximum exceeded $600 million. By contrast, the mean of non-CMP projects was just $6.3 million. Although CMP projects were few, they accounted for 38% of the statewide construction contract amount.

Duration and complexity — The average planned construction duration for CMP projects was 39 months. For non-CMP projects, this number is 22 months, significantly less than the CMP projects.

These statistics confirm TxDOT's practice of reserving CMP requirements for the largest and most complex projects.

2.2. Key Quantitative Findings

2.2.1. Change-Order Trends Before and After CMP Implementation

The study examined 9,871 completed highway construction projects (2010-Q1 through 2024-Q3) to measure cost and schedule impacts of change orders:

Cost variation decline — Projects completed before TxDOT introduced CMPs had a project cost variation of 5.13% due to change orders. After implementation, cost variation on comparable projects fell to 2.70%—a 47% reduction.

Savings by project size — Large contracts ($50-150 million) saw the greatest improvement, with cost variation dropping from 7.75% to 3.81%. Medium-sized projects ($20-50 million) declined from 5.21% to 2.52%, while small projects (<$20 million) fell from 3.89% to 2.42%.

Reason-code analysis — Change orders coded "ROW/Utility Conflict" (Reason Code 6) are of particular interest. After CMP adoption, Code 6 costs variation declined slightly from 2.07% to 1.51%.

2.2.2. Change Orders on CMP Projects

The study examined all change orders on Completed and Active All-Cleared CMP projects let from 09/01/2018 to 09/30/2024.

- The impact of CMP-related change orders was relatively low but can be reduced.
- Although CMP-related change orders represented just 3.82% of total change order occurrences on completed CMP projects and 3.59% on Active-All Cleared CMP Projects, they contributed 13.5% and 2.16% of the total change order costs in these two groups of projects, respectively. This highlights the importance of a better conflict clearance management to prevent CMP-related change orders.
- CMP projects had higher than average project cost variation due to change orders. The project cost variation due to all change orders on Completed CMP projects was 4.78%, while the project cost variation due to all change orders on Active All-Cleared CMP projects was 7.18%. However, the vast majority of these change orders were not related to the unclear certifications.

2.2.3. Cost and Schedule Impacts Linked to Conflict-Clearance Delays

Projects that experienced delays in clearing right-of-way (ROW), utility (UTL), or railroad (RR) conflicts showed measurable increases in both change-order activity and overall project growth. A few examples from the findings:

- ROW and UTL delays were each moderately and positively correlated with the number of change orders ($r \approx 0.46$ and 0.42, respectively). Every additional week of delay in either clearance stream tended to trigger extra scope adjustments and contract modifications.
- RR clearance delays were more closely tied to cost escalation than to change-order counts: the correlation between RR delay and cost-growth ratio reached 0.48, the highest observed among the three conflict categories.
- Delays in conflict clearance are associated with an increased number of change orders and a higher rate of cost variation at the project level, highlighting the importance of timely conflict resolution.

Together, these findings confirm that late conflict clearance directly causes both cost and time overruns, and that proper planning of those activities within a CMP mitigates much of the exposure.

3. Recommendations

3.1. CMP Format & Content Aligned with SOP

3.1.1. Memo/Cover Page—Flagging High-Risk Conflicts

TxDOT's CMP-SOP designates the cover memo as an executive summary for Administration. It must be signed by the District Engineer (or TP&D Director) and include five elements: (1) basic project facts; (2) a statement on whether a convenience or compulsory delayed start is proposed, plus its duration and rationale; (3) a summary of each certification type (ROW, UTL, RR, ENV, etc.); (4) any details that clarify overall risk and explain how the plan avoids schedule delays; and (5) "any other information describing why the CMP is necessary." A Cover Memo Template is shown in Appendix C of the CMP-SOP.

Implementation tips:

- Summarize the project and unclear certifications.
- Highlight the main conflicts and items deserving more attention.

3.1.2. Exhibit A: Certifications

The SOP's certification templates list the required information that must appear for every unresolved conflict: owner, type, location, estimated clearance date, affected phase/step, phase start date, calculated buffer (in months), and a brief description of construction affected. An Example of a Construction Management Plan is shown in Appendix A of the SOP.

Implementation tips:

- Standardize Conflict Information Table.
- List each conflict individually based on its location and group by type and owner to facilitate its identification.
- Include columns in the Conflict Information Table for each distinctive conflict information, including owner, type, location, status, estimated clearance date, buffer time, phases impacted, and effects on construction.
- Have columns for estimated clearance date, buffer time, and phases impacted, since these enhance the ability to control and manage these conflicts during construction.
- Label right-of-way parcels and utilities with unique identifiers to help identify and manage each conflict, as well as to facilitate cross-reference of conflict information across different documents.

3.1.3. Exhibit B: Construction Time Determination (CTD)

Under the SOP, the CTD schedule must include unclear conflicts as activities. Buffers are the month-difference between the phase start and the clearance date; where needed, a critical date may be set later in the phase to enlarge that buffer.

Implementation tips:

- Provide guidelines on how to include conflict-related activities in the baseline schedule, prepare contingency plans, and also manage conflict clearance during execution.

- Include the conflict clearance schedule in the overall project schedule, showing dates before and after project letting.
- Have separate conflict clearance schedules with agreed-upon buffers to ensure they will be cleared by the estimated clearance dates.
- Add notes on the schedule to highlight major project milestones for better understanding of the key components of the project schedule.

3.1.4. Exhibit C: Traffic Control Plan (TCP) Phase Narrative

The SOP requires that activities related to conflicts be included in the TCP phase narrative, conflict layout sheet, and CTD. Each must show where the contractor cannot work while clearances are pending.

Implementation tips:

- Standardize the notations, identification/coloring schemes, and legends used to show conflicts in the TCP.
- Use colored notations to represent various owners, types, and components, since it is more effective to identify conflicts using visual aids.
- Mark conflict locations clearly on the TCP to pinpoint specific areas that are impacted by the conflicts.
- Match the colors of conflicts in the TCP with those in the Conflict Information Table, along with unique identifiers, to ensure consistency and clarity for conflict management and resolution.

3.2. Additional Recommendations

3.2.1. Centralized Data Storage & Tracking

The SOP outlines how CMPs are to be developed and approved, but it lacks specific instructions on how approved CMPs and associated conflict information (e.g., conflict types, clearance dates, buffer times, and owners) should be stored or integrated into TxDOT's centralized project systems. To ensure traceability and transparency of conflicts utilized for broader and future project management analyses, it is recommended that the SOP reference specific systems or platforms (e.g., SiteManager) for storing CMP documents and associated data. This would support post-approval conflict tracking and ensure that clearance progress is visible to all stakeholders throughout the project lifecycle, including closeout, and

support data-driven evaluation of project performance, schedule delays, and change order trends.

3.2.2. Standardizing Conflict-Location Documentation

While the CMP template provides standardized formats for conflict types, it does not clearly specify how to consistently document the location of each conflict. To improve clarity and comparability across projects, the SOP should include a standard method for noting conflict locations, such as stationing, GIS coordinates, or referencing specific plan sheets. This will facilitate accurate mapping, field verification, and tracking of conflict zones.

3.2.3. CMP Risk-Rating System

Although the SOP does not prescribe a formal scoring tool, it splits approval authority at the 3-month buffer mark: conflicts clearing ≤ 3 months post-letting may be approved at the district level, whereas anything beyond requires TxDOT Administration review. The current CMP format lacks a formalized method to assess the overall risk level or completeness of a plan. Introducing a risk rating system, based on factors such as the number of unresolved conflicts, the duration of delays, the number of agencies involved in clearance, and ROW litigation status, would provide a quick reference for TxDOT Administration. This system could help prioritize CMP reviews, allocate oversight resources more effectively, and promote early identification of high-risk projects.

3.2.4. Documenting Buffer Rationale & Contingency Plans

Although buffer time is defined in the SOP as the difference between the estimated clearance date and the construction phase start date, there is no requirement to explain how the buffer was determined or to account for possible delays. The SOP should require a brief justification for each buffer. Optionally, contingency plans can be included to assess how project schedules would be impacted if conflicts are not cleared as expected.

3.2.5. Visual Risk-Zone Mark-ups

The conflict layout sheet currently shows known conflicts and their estimated clearance dates, but does not highlight areas that may pose a high risk of potential unforeseen issues. Incorporating visual markups, such as color-coded high-risk zones or shading areas where unexpected conflicts historically arise, would help TxDOT to better anticipate and mitigate potential delays in conflict clearance and construction schedules.

3.2.6. Owner-Info Legends

To improve clarity and consistency in CMP conflict layout sheets, a standardized legend is suggested to be adopted across all districts. This legend should include defined symbols and distinctive line types for each conflict category, with the display of conflict owner information. A unified legend format will help ensure that contractors, designers, and internal reviewers can easily interpret the layout regardless of the project or district.

3.2.7. Managing Unforeseen Conflicts Post-Letting

The SOP describes all known conflicts at the time of certification, but does not address how to manage and document unforeseen conflicts, such as abandoned utilities or undocumented ROW usage after project letting. An additional provision is recommended to encourage optional notes on identification of potential conflicts during construction through field verification. In addition, it would be beneficial to establish a formal protocol for how unforeseen conflicts, once discovered during construction, should be documented, tracked, and resolved to maintain accountability and data consistency.

3.2.8. Minimum Buffer Requirements Calibrated to Historical Clearance Data

As a risk mitigation strategy, TxDOT should set a minimum buffer for unresolved utility conflicts and ROW conflicts, which tend to experience longer clearance timelines. These values can be further refined based on conflict type, past clearance performance, and the reliability of the responsible utility or ROW owner.

3.2.9. Linking Change Orders to Specific Conflicts

To mitigate significant cost and schedule impact of CMP-related change orders, TxDOT should enhance the conflict classification system to allow for traceability by conflict type and anticipated change order reasons. A tracking mechanism that links each change order to its specific cause and impact would enable more accurate identification of recurring issues.

3.2.10. Early Conflict Identification & Field-Condition Assessment

In the early phases of CMP development, it is critical to establish a systematic field investigation process to identify potential conflicts before letting. This includes expanding the use of SUE methods. The investigation sometimes should

extend beyond known utility lines to identify other physical obstructions, such as retaining walls, mature trees, drainage structures, and fences, that may interfere with conflict clearance activities.

3.2.11. Early Coordinating Interrelated Utility Systems & Sequencing Responsibilities

CMPs should include not only estimated clearance dates, but also clearly identify the responsible parties (e.g., utility owners, ROW agents), the sequence in which clearances must occur, and the overall coordination plan. However, in practice, CMPs lack sufficient detail regarding the interdependencies among conflicting elements, especially in cases involving potential interrelation between multiple third parties such as utility companies, railroad agencies, and ROW owners. To address this issue, CMPs should clearly specify which entity is accountable for each clearance activity, outline the required sequence of actions, and incorporate contingency measures in case of potential delays, if necessary.

3.2.12. Process for Revisiting CMPs After Scope Changes

When scope changes or additional work items are introduced after CMP approval, the CMP should be revisited and updated accordingly. A formal mechanism should be established to reassess potential impacts on utility relocation and ROW acquisition, ensuring that clearance assumptions remain valid. These updates should include a thorough evaluation of whether new conflicts have emerged, whether existing clearance dates and buffer times are still appropriate, and how the proposed changes affect the overall project schedule and cost. Updated versions of the CMP should be documented through revised certifications, adjusted CTD schedules, and amended conflict layouts if necessary.

3.2.13. Structured Peer-Review / Approval Checklists

To reduce the risk of omissions or inaccuracies during the CMP approval phase, a structured and comprehensive review process should be adopted. This includes the use of the standardized checklist to ensures all required items, such as conflict descriptions, clearance timelines, buffer durations, and phase start dates, are thoroughly reviewed and confirmed. In addition, for larger and complex projects, a peer review process involving an independent reviewer can provide an extra layer of quality assurance, helping to identify commonly overlooked details such as missing utility owners, vague clearance sequencing, or assumptions left undocumented.

3.2.14. Post-Approval CMP Management, Version Control & Conditional Approvals

The current CMP SOP provides detailed instructions for the development and approval of CMPs, but lacks direction on how they should be managed after approval. In practice, during the construction phase, it is common for issues such as delayed clearances, the emergence of unforeseen conflicts, or changes in the status of previously identified conflicts to arise. However, the SOP does not clarify whether these changes require formal modifications to the CMP or how such changes should be recorded or communicated. This lack of post-approval management guidance creates uncertainty for project teams and limits TxDOT's ability to maintain up-to-date oversight. To address these gaps, the SOP should include guidance on conditional approvals, procedures for CMP updates, and version tracking.