

# Structure and Content of the Request for Proposal

The basic structure of the Request for Proposal (RFP) is discussed in Chapter 4, “Project Organizational Structure and Design Development” and is summarized below in Table 7-1. This chapter provides brief discussions of the content of the Books and sections of the RFP. The discussion is supported by templates provided in the online Appendix (available on the CDOT Innovative Contracting web page or by contacting CDOT Innovative Contracting) to assist in the development of the RFP. Prior to initiating the development of the RFP, novice project team members should consult with an experienced project team whose members can share their expertise. This transfer of knowledge helps ease the learning curve associated with Design-Build, encourages the application of best practices, and highlights the pitfalls that other projects have overcome so that they may be avoided from the outset.

## Book 1 – Contract

Book 1 is the Contract. It replaces Division 100 of the Colorado Department of Transportation (CDOT) Standard Specifications and provides the general provisions applicable to Design-Build delivery. Book 1 is largely a standardized document applicable to all CDOT conventional Design-Build projects (the exception being Streamlined Design-Build [SDB] delivery that incorporates modified general provisions from Section 100 of the CDOT Standard Specifications). CDOT’s Book 1 has gained a wide acceptance in the industry over the last decade, and its recognition promotes the efficiency of Design-Build delivery in Colorado.

Though it is largely standardized, it is nonetheless very important for the CDOT project team to be familiar with its terms, both the parts of the Book that must be tailored to the project-specific conditions and the key parts that drive the contractual relationships between CDOT and the Contractor.

**Any changes to Book 1 must be reviewed and approved by the Colorado State Attorney General’s Office and potentially the Colorado State Controller’s Office prior to issuance of the Draft RFP.**

Some of the key elements of Book 1 are discussed below.

### Book 1, Section 4.2: Notices to Proceed

In Design-Build delivery, there are typically two Notices to Proceed (NTPs). Following the First Notice to Proceed (NTP1), the Contractor may begin limited activities related primarily to design, development and initiation of various operational work plans, and the setup of project offices and other infrastructure necessary to support the project. There is a payment cap associated with NTP1, which is determined by the project team. The NTP1 Payment Cap should provide the necessary capital to accomplish startup activities, but it should be limited to encourage the Contractor to proceed expeditiously to the Second Notice to Proceed (NTP2). The NTP1 Payment Cap is provided in Book 1, Exhibit A: Defined Terms, and must be completed by the CDOT project team.

The NTP2 typically allows for the start of construction.

|  |
| --- |
| **Table 7-1. Design-Build Documents (same as Table 4-1 in Chapter 4)** |
| **Book 1 – Contract** |
| Book 1 is the overriding Contract that governs the design and construction of the project. Key elements of the book include: |
| * Contract Terms
* Defined Terms
* Warranties
* Equal Employment Opportunity/Disadvantaged Business Enterprise
* Bonding
* Insurance
* Payment
* Project Schedule
* Completion and Milestone Dates
 | * Processes and Procedures
	+ Dispute Resolution
	+ Change Management
	+ Partnering
	+ Third-Party Cooperation
	+ Audit and Inspection Rights
	+ Incentives and Disincentives
	+ Value Engineering
 |
| **Book 2 – Technical Requirements** |
| Book 2 provides the project-specific Technical Requirements of the project, including design criteria, methodology, and deliverables; project-specific construction requirements; and operational requirements. Book 2 is divided into 20 sections: |
| 01. General (includes the Basic Configuration)02. Project Management03. Quality Management04. Public Information05. Environmental06. Third-Party Agreements07. Utilities08. Right-of-Way09. Survey10. Geotechnical and Pavements | 11. Earthwork12. Drainage13. Roadways14. Signing, Pavement Marking, Signalization, and Lighting15. Structures16. Transportation Management Plan17. Landscaping18. Maintenance during Construction19. Intelligent Transportation System20. Modification of Standard Specifications |
| **Book 3 – Applicable Standards, Data and Reports** | **Book 4 – Contract Drawings** |
| Book 3 includes documents such as CDOT design guides, American Association of State Highway & Transportation Officials (AASHTO) design standards, *Manual on Uniform Traffic Control Devices* (MUTCD), local design standards, CDOT M & S standards, CDOT construction and materials manuals. | Book 4 contains drawings that are considered to be contractually binding. Typical Contract Drawings include ROW Plans, architectural plans and details, geotechnical boring logs, and binding third-party plans and details. |
| **Reference Documents** |
| Reference Documents are nonbinding plans, details, reports, and investigations related to the project. Elements of Reference Documents can become binding to the extent that they are referenced to in the Contract Document. Reference Documents communicate the design development done by the owner. Reference Documents typically include: |
| * Preliminary Plans and Details
* Preliminary Phasing Scenarios
* Preliminary Drainage Reports
 | * Surveys (if not in Book 3 or 4)
* Preliminary Geotechnical Recommendations
* NEPA Documents (EA, EIS, FONSI, ROD)
 |

### Book 1, Section 6.2: Utilities

Section 6.2 is very important because it defines utility responsibilities (along with Book 2, Section 7). It allocates the risk for existing utilities in terms of a defined “Reasonable Accuracy.” Reasonable Accuracy is typically defined as the utility horizontal location to within 10 feet, size to within 12 inches, and no depth accuracy. When the CDOT utility data meets Reasonable Accuracy, the Contractor is responsible for resolving conflicts; however, when utilities do not meet Reasonable Accuracy, CDOT is responsible for the impacts of the conflicts.

### Book 1, Section 7.2: Disadvantaged Business Enterprises

In Book 1, Section 7.2, the CDOT project team along with the Regional Equal Employment Opportunity (EEO) Office set both the design and the construction Disadvantaged Business Enterprise (DBE) participation goals, expressed as percentages of the total design and construction work established for the project.

### Book 1, Section 7.9: Key Personnel

Book 1, Section 7.9, along with Exhibit D, identifies the Contractor’s Key Personnel and Key Personnel commitments for the project.

### Book 1, Section 9.0: Insurance

Book 1, Section 9.0 must be completed on a project-specific basis. If an Owner Controlled Insurance Program (OCIP) is going to be used, the information pertaining to the OCIP must be provided in Exhibit L. The project team should consult with CDOT Risk Management to determine if an OCIP is necessary and provide the appropriate OCIP provisions in Book 1.

### Book 1, Section 11.0: Payment

After Notice of Award, the price on the Proposal Form J is transferred to be the Contract Price in Section 11.1.

### Book 1, Section 12.0: Value Engineering and Negotiated Changes and Section 13.0: Changes in the Work

Book 1, Sections 12 and 13 address the change management processes. The CDOT project team must be very familiar with these processes to effectively manage the project during implementation. Change order processes are described in this manual in more detail in Chapter 8, “Implementation.”

### Book 1, Section 17.0: Damages

This part of Book 1 must be modified on a project-specific basis. It defines the various liquidated damage terms of the Contract. Section 17 may also set the project completion dates and interim completion dates and penalties, if applicable. The project team should set completion and incentive and disincentive requirements for the project in a manner consistent with the project goals. Oftentimes these parameters are also incorporated in the selection criteria in the Instructions to Proposers (ITP).

### Book 1, Section 20: Acceptance of Project

Book 1, Section 20 provides the Acceptance requirements and processes for the project.

### Book 1, Exhibit A: Acronyms and Definitions

This section includes the definitions for acronyms and defined terms in the RFP. Any term (or acronym) that is capitalized in the RFP is a defined term with its definition provided in Exhibit A. There are certain defined terms that the CDOT project team must complete on a project-specific basis, including:

**Guaranteed Maximum Price (GMP):** This defined term sets the maximum price of the Contract for the project at the Proposal stage. The GMP is subject to change orders once the Contract is executed.

**NTP1 Payment Cap:** The maximum amount the owner may pay to the Contractor prior to NTP2.

There are a number of key terms that the CDOT project team must be familiar with. Of particular importance is understanding the definitions of Acceptance and Approval:

**Accept or Acceptance:** Formal conditional determination in writing by the CDOT Project Manager that a particular matter or item appears to meet the requirements of the Contract

Documents.

**Approve or Approval:** Formal conditional determination in writing by the CDOT Project Manager that a particular matter or item is good or satisfactory for the project. Such determination may be based on requirements beyond those set forth in the Contract Documents without payment of additional compensation or a time extension and may reflect preferences of CDOT.

Approval provides CDOT with an authority beyond the stated requirements of the project. Though it may seem that such authority is preferable to the owner, if it is used extensively it compromises the effectiveness of Design-Build delivery. Whenever Approval is used in the RFP, it creates an unknown requirement and corresponding risk to the Design-Builder. As a result, proposers may add contingency pricing to account for the risk. Once the project is in the implementation phase, the owner is exposed to potential disputes when exercising Approval authority to enforce requirements that could not have reasonably been anticipated by the Design-Builder in preparing the Proposal. Wherever possible, it is preferable to define specific requirements by which CDOT can Accept and minimize the use of Approval authority. Nonetheless, usually there are some critical elements of the project that CDOT wants Approval authority over. The Quality Management Plan and the Environmental Compliance Plan are typical examples.

### Book 1, Exhibit B: Completion Deadlines

The completion deadlines committed to in Form P of the Proposal are transferred to Exhibit B to be a part of the Contract.

### Book 1, Exhibit D: Key Personnel

The Key Personnel commitments in Form I of the Proposal are transferred to Exhibit D to be a part of the Contract. The Key Personnel commitments are provided initially in the Statement of Qualifications (SOQ) and then carried over to the Proposal and the Contract.

## Book 2 – Technical Requirements

Book 2 provides the project Technical Requirements. The Technical Requirements are organized by discipline. The Technical Requirements are primarily the governing design requirements for the project. They also include construction requirements where they vary from the CDOT Standard Specifications.

The Book 2 Technical Requirements should be developed through the use of discipline-oriented workshops. The process is illustrated in Figure 7-1.



**Figure 7-1. Development of Technical Requirements Workflow**

The following sections provide overviews of the sections of the Technical Requirements, with description of key investigations and design development activities as well as potential risks and risk mitigation activities.

### Book 2, Section 1: General

Book 2, Section 1 contains the project description, project goals, and a description of the Basic Configuration, and therefore it defines the primary scope of work and project limits. It also includes scope of work descriptions of any Additional Requested Elements (AREs) that can potentially be included in the project. Book 2, Section 1 typically includes exhibits for the Basic Configuration and AREs. Any proposer’s proposed changes to Book 2, Section 1 are considered changes to the Basic Configuration and are handled through the Alternative Configuration Concept (ACC) process during the procurement phase of the project. This includes any proposed additional scope committed to by the proposer augmenting the Basic Configuration. As changes to the Basic Configuration, ACCs are often significant changes, which should be considered carefully and should require Approval at the Executive Oversight Committee level.

Section 1 also includes critical Technical Requirements. An example is pavement type criteria, which are important to the character of scope of work and the makeup of the Contractor’s team.

**CDOT Investigations and Design Development Requirements:**

The preliminary design developed by CDOT and included with the Reference Documents provides the basis for the Basic Configuration. Refer to Chapter 4, “Project Organizational Structure and Design Development” in this manual for a more detailed description of the Basic Configuration and design development.

**Risk Mitigation and Risk Allocation:**

Book 2, Section 1 typically provides tolerances for horizontal and vertical alignments provided in the Reference Documents that the Contractor is required to maintain. To that extent, CDOT accepts the risk that the project can be designed and constructed within those tolerances and within the project limits while meeting project design criteria. From that perspective, the project development should be focused on minimizing that risk to ensure that the footprint provided to the Contractor (horizontally, vertically, and environmentally) is feasible to accomplish the requested improvements.

### Book 2, Section 2: Project Management

The Project Management section includes requirements for scheduling, Invoicing, facilities, meetings, document management, and safety management. Key elements that the CDOT project team should address on a project-specific basis are:

**Schedule:**

The Contractor is required to provide a schedule at the beginning of the project (the Baseline Schedule) to ensure the project will be completed within the required deadlines and to control costs. This deliverable is an Approval document and therefore may only be modified with CDOT Approval throughout the duration of the project. There are numerous variations of the schedule that are necessary to manage the progress of the project. The types of schedules that are used throughout the project include the following:

* Preliminary Baseline Schedule: due prior to NTP1
* Original Baseline Schedule: due prior to NTP2
* Current Schedule: ongoing for the duration of the project and measured against the Approved Baseline Schedule
* Revised Schedule: when the schedule is impacted by change order or agreed-upon delay, this schedule reflects the adjustment, acceleration, or recovery plan necessary to meet or extend the Contract deadlines or the revised drawdown necessary to meet the adjusted GMP
* Monthly Progress Schedule: due monthly and measured against the Approved Baseline Schedule
* As-Built Schedule
* Recovery Schedules (as needed)

The complexity and importance of scheduling on a Design-Build project require that the owner have a high degree of expertise. In particular Contractors use Primavera scheduling software, which CDOT staff do not typically have expertise in. To address scheduling concerns, it is strongly recommended that the project team includes the expertise to fully analyze a complex project schedule. In most cases, a scheduling consultant should be added to the CDOT team during the implementation phase of the project to provide the necessary expertise. The scheduling consultant should be retained throughout the implementation phase to provide continual review and monitoring of the schedule.

The project schedule developed by the Contractor defines the logic and critical paths used to calculate delay change orders and schedule disputes. The schedule risk belongs to the Contractor, to the extent that the work is within the Contractor’s control. It is important for the CDOT project team to fully understand the Baseline Schedule and ensure that the review times and Acceptance and Approval processes reflected in the logic are what has been agreed upon in the Contract before Approving it. Environmental clearances should be included in the project schedule, especially if they are required to be completed prior to the start of construction.

**Work Breakdown Structure:**

The primary tool to set up both schedule and cost control is the Work Breakdown Structure (WBS). WBS is a deliverable-oriented breakdown of the project into manageable sections. All of the work of the project is organized into WBS activities. The WBS activities then become schedule activities. In addition, payment is determined by a percentage complete assessment of each WBS element, concurrent with progressing the schedule on a monthly basis.

The CDOT project team develops the primary WBS activities, which are included in the RFP, allowing the Contractor to provide a higher level of detail in the Proposal. WBS activities should be divided into easily identifiable activities that describe project elements. Project elements should be selected that can be easily assessed for their percent completion. It may be necessary for CDOT to define certain WBS elements that reflect specific assets, such as assets that are funded by sources that have tracking requirements tied to their funding (e.g., Tiger Grants, Bridge Enterprise funding, Permanent Water Quality [PWQ] Pool Funds). The Contractor is paid according to completeness of each WBS activity. The major WBS activities should match the activities or sections on Form J in the ITP.

**Office Facilities:**

The Office Facilities subsection of Section 2 needs to be completed on a project-specific basis by the CDOT project team. This is the subsection where the Contractor’s co-location requirements are specified. The extent of co-location can vary significantly, from only the Contractor’s senior construction personnel to the Contractor’s entire construction and design staff. Contractor/owner co-location can greatly facilitate critical Design-Build collaboration. Co-location is key to fostering over-the-shoulder design reviews, which in turn allows the owner the best opportunity to collaboratively develop the project design with the Contractor’s designers. Co-location allows the owner and the Design-Builder an opportunity to take advantage of efficient and often expedited decision making by housing all the decision makers, who are all focused on meeting the project goals, in a single facility. But there are real costs associated with the Contractor providing co-located staff that should also be considered. However, the more complex a project, the greater the need for a strong co-location plan. For many Design-Build projects, co-location at a minimum should include required full-time co-location of the Contractor’s Key Personnel and key design discipline staff through the design phase of the project.

A co-location plan can be requested in the ITP as a part of the Proposal, providing an incentive for the Contractor to make contractual co-location commitments as a part of the Proposal.

### Book 2, Section 3: Quality Management

The Quality Management Section defines the structure and responsibilities for the Quality Assurance (QA) program for the project including both CDOT’s Acceptance responsibilities and the Contractor’s Quality Control (QC) responsibilities. It is important to note that quality management includes all aspects of the project, not just the material testing and construction inspection. Quality management must also address design and construction operations, such as environmental compliance, Public Information (PI), Maintenance of Traffic (MOT), and water quality.

The Quality Management Section also defines the design processes and deliverables leading to Released for Construction (RFC) Documents, Final Design Documents, and As-Built Documents.

Following are key definitions used in the CDOT Quality Management Section:

 ***Quality Assurance (QA):*** *All those planned and systematic actions necessary to provide confidence that a product or facility will perform satisfactorily in service. Quality Assurance is an “umbrella” term that includes Quality Control (QC) activities by the Design-Builder and Acceptance activities by CDOT for both design and construction.*

***Quality Control (QC):*** *The system used by the Design-Builder (design consultant, sub-consultants, prime contractor, subcontractors, producers, fabricators, manufacturers) to monitor, assess, and adjust their processes to ensure that a product will meet the specified level of quality. The Design-Builder is responsible for implementing a Design QC system and a Construction QC system. There are two tiers of Quality Control: Frontline QC (herein called “Process Control”) and Formal QC (herein called “Independent Quality Control”).*

***Design Process Control:*** *Frontline QC activities consisting of “self-checks” by the design production staff responsible for development of the design documents. This includes QC checking of design calculations, plans, studies, reports, and software validation.*

 ***Independent Design Quality Control (IDQC)****: Formal QC activities performed by a Design QC team independent of the design production staff. This includes independent technical reviews at key milestones in the design process and audits intended to confirm that the design process is functioning effectively.*

***Construction Process Control****: The system used by a Contractor to monitor, assess, and adjust its production or placement processes to ensure that the final product meets the specified level of quality. Construction Process Control includes sampling, testing, inspection, and corrective action (where required) to maintain continuous control of a production or placement process.*

***Independent Construction Quality Control (ICQC):*** *Formal QC activities performed by a separate Construction QC team that is independent from the production staff. This involves formal QC sampling, testing, and inspection to provide timely data to monitor and guide each production and placement process and to ensure the product conforms with the Contract requirements. Secondarily, this QC data may be included in CDOT’s Acceptance determination.*

***Owner Acceptance (OA):***  *All activities performed by CDOT to evaluate the degree of compliance with Contract requirements and to determine the corresponding value for a given product. Design Acceptance activities by CDOT include reviews of plans, specifications, and other documents prepared by the Design-Builder. Construction Acceptance activities include Acceptance sampling, testing, and inspection of the work by CDOT.*

***Owner Verification Testing (OVT):*** *OVT is the Acceptance testing performed by CDOT on projects where ICQC testing data is included in CDOT’s Final Acceptance determination. OVT is typically performed at a lower frequency than full Acceptance testing.*

***Independent Assurance (IA) Testing:*** *Activities that are an unbiased and independent evaluation of all the sampling and testing (or inspection) procedures used in the Quality Assurance program. IA provides an independent verification of the reliability of the Acceptance (or verification) data obtained by the agency and the data obtained by the Contractor. The results of IA testing or inspection are not to be used as a basis of Acceptance. IA provides information for quality system management.*

**Design Quality Assurance:**

The Design-Builder is responsible for implementing a Design QC system. This includes Design Process Control activities by the frontline design production staff and IDQC by a separate Design QC team that is independent of the design production staff.

CDOT performs Design Acceptance activities. These include over-the-shoulder reviews of the in-progress design and formal review and Acceptance of Final Design packages prior to issuance as RFC.

**Construction Quality Assurance:**

A Construction QC system is to be implemented by the Design-Builder. The first tier of the QC system is Construction Process Control performed by the construction production staff. The second tier of the QC system requires Formal QC inspection and testing performed by an ICQC team that is separate from the production staff. The construction quality organization is illustrated in Figure 7-2.

****

**Figure 7-2. Construction Quality Organization**

CDOT is responsible for the Construction Acceptance system. On Design-Build projects CDOT is always responsible for performing some level of Acceptance inspection and testing. However, there are two Acceptance approaches that may be used for CDOT’s Acceptance determination:

1. Use only CDOT Acceptance data
2. Include Contractor ICQC data with CDOT Owner Verification Testing (OVT)

Under either approach CDOT must retain the ultimate Acceptance authority (per 23 CFR Part 637). It is important to recognize that Contractor ICQC activities do not replace CDOT’s Acceptance activities; rather ICQC data is used to augment CDOT’s Acceptance data. When using Approach 2, CDOT Acceptance testing is referred to as “Owner Verification Testing” and the Contractor ICQC data must be mathematically validated by CDOT’s OVT data. A comparison of the two Acceptance system approaches is provided in Table 7-2.

**Table 7-2. Comparison of Construction Acceptance System Approaches**

|  |  |
| --- | --- |
| **Approach 1**(Use only CDOT Acceptance Data) | **Approach 2**(Include ICQC Data with CDOT Acceptance Data) |
| * Requires higher level of CDOT Acceptance inspection and testing staff and activities
* CDOT has more Acceptance data to assess and communicate quality concerns
* Final Acceptance determination made using only CDOT Acceptance data
* CDOT Acceptance staff and resources may be eligible to be included as a part of CDOT’s allocated indirect costs
 | * Contractor ICQC inspection and testing is required
* CDOT may reduce level of Acceptance inspection and testing staff and frequency of Acceptance activities
* Contractor ICQC data must be mathematically validated by CDOT’s OVT data
* Final Acceptance determination made using both CDOT Acceptance data and ICQC data
 |

For projects using Contractor ICQC data, it is important to structure the Quality Management Technical Requirements and/ or the ITP provisions to ensure the Contractor is committed to providing adequate ICQC resources. This can be accomplished through the Quality Management Technical Requirements by identifying training and certification requirements and minimum Contractor, producer, and fabricator operations that require full-time ICQC inspection and testing.

The ITP approach requires the Design-Builder to provide firm contractual commitments of QC resources (in terms of full-time equivalent staffing commitments and certification and training). Proposals are then scored based on those commitments.

These approaches are especially important to consider so that proposers are not inclined to reduce QC resources to minimize their Proposal prices.

Regardless of which Acceptance system approach is used, all Contractor QC testing performed must comply with the requirements of the current CDOT *Field Materials Manual*.

Other key considerations of the Quality Management Section are:

* Setting Contractor QC Key Personnel requirements
* Defining training and subcontractor indoctrination requirements
* Defining document control requirements
* Defining process requirements for RFC Documents
* Defining off-site product control requirements
* Defining Contractor QC Materials Testing and Inspection Plan (MTIP) requirements
* Defining minimum Hold Point requirements
* Defining procedures for identifying and correcting Nonconforming Work, including corrective and preventative actions
* Defining final design and construction Acceptance

### Book 2, Section 4: Public Information

Book 2, Section 4 contains requirements for handling information to and from the public. It plays a strategic role in obtaining public consensus for the project and minimizes the impacts to the traveling public. By providing current and reliable information to the public, the Contractor can reduce delays and improve safety for the duration of the project.

Section 4 should include information on the following topics:

* The requirements of the Public Information Plan (PIP)
* Contractor Public Information Manager (PIM) duties
* The requirements of the Public Information Task Force
* The relationship between MOT and PI notifications
* Identification of key stakeholders
* Stakeholder communications
* Public/stakeholder contact data collection and management
* PI approaches and tools
* PI meetings
* Crisis communication procedures
* Travel Demand Management requirements

There are two primary approaches to providing PI: a CDOT-led PI program and a Contractor-led PI program.

In a CDOT-led program, the Contractor provides CDOT with the necessary project information and CDOT takes the primary responsibility for disseminating the information to the public and to stakeholders. If CDOT leads the PI program, then it has more control over the program, but CDOT must have the available resources and the commitment to continuously coordinate with the Contractor for the program to be successful.

In a Contractor-led PI program, the Contractor has most of the responsibilities for dissemination of information and coordination with the public and stakeholders and CDOT primarily has an oversight role.

The correct approach for the project depends on the sensitivity of the public and the availability of resources.

The CDOT project team, which should include the personnel from the Office of Communications (at headquarters or regional level), determines the best approach and the requirements for this section. CDOT has a Project Special Provision Worksheet Revision of Section 626 that may assist the project team in developing this requirement and determining an approach.

The PIP can be prepared by CDOT or by the Contractor. The roles and responsibilities for PI are somewhat dependent on who has responsibility for preparing the PIP. An important component of the PIP is to ensure the project undertakes an appropriate PI effort regarding traffic management during construction. To that extent, the PI Technical Requirement should be coordinated with the Transportation Management Plan (TMP) Technical Requirement. In particular, both requirements should require that a joint PI/MOT committee be convened on a regular basis throughout the implementation phase of the project.

When developing Section 4, consideration must be given to the flow of PI. Generally, the Contractor PIM provides information to the CDOT communications manager and the information is distributed to the public. The flow of PI must consider the general public, stakeholders, media, and governmental agencies. Each group has unique requirements and deadlines for receipt or dissemination of information. The CDOT project team must consider each group’s needs and determine the best method and timelines for handling information.

Section 4 should also include requirements for public outreach such as a hotline, project signs, and project websites. Public outreach may also require meetings with the general public, stakeholders, media, and governmental agencies.

### Book 2, Section 5: Environmental

Environmental compliance in Design-Build can pose a considerable risk to both CDOT and the Contractor. The Contract allows the Contractor latitude in developing a design that varies from the design presented in the Reference Documents, allowing the Contractor the opportunity to develop the most efficient design. However, the variations in the design relative to Reference Documents may affect environmental impacts, which in turn may affect project clearances, the schedule, and so forth. As a result, wherever possible, it is best to make the mitigation measures—such as preparing, documenting, implementing, and gaining third-party approvals of the changes and maintaining those measures—the responsibility of the Contractor until project Acceptance. Regardless, CDOT retains the ultimate responsibility for the mitigation measures and therefore must carefully monitor their progress.

CDOT must provide a thorough scope with clear definition for all environmental activities. The National Environmental Policy Act (NEPA) decision document typically must be completed and incorporated into the final RFP. Additional discussion on NEPA processes for Design-Build delivery is provided in this manual in Chapter 5, Section 5.4, “Design-Build Delivery Interface with Other Processes.” The environmental requirements of the project must be consistent with those of the NEPA document and specify consequences for deviating from the NEPA document. Modifications to the environmental requirements could result in changes to the project clearances, schedule, and so forth. The Contractor is responsible for preparing and/or acquiring all new environmental supporting studies and permits as a result of Contractor-initiated changes and is responsible for time delay risks. All necessary permits and regulatory approvals must be defined, and responsibilities must be clearly assigned to both CDOT and the Contractor for implementing, maintaining, and documenting permits.

CDOT’s Environmental Manager and Project Manager must work together in the development of the project scope and RFP and during the administration of the Contract to identify how the design can be flexible and innovative and what risk allocation is best suited on the project while ensuring environmental compliance.

The content of the environmental Technical Requirements should include the following:

* Identify Key Personnel requirements for the Contractor’s environmental team.
* Identify the Contractor’s requirements for developing and executing an Environmental Compliance Plan for the project, including QC for environmental operations.
* Identify all permits that the Contractor is required to obtain.
* Identify the permits that CDOT is required to obtain.
* Identify the Contractor’s responsibilities to adhere to CDOT-obtained permits.
* Identify permitting processes and time frames.
* Identify environmental resources mitigation requirements (these may include: air quality; noise; cultural, historical, archaeological, recreational 4(f) and 6(f); biological; visual; wetlands and riparian areas; and water quality requirements).
* Identify all rules, requirements, and regulations that the Contractor is required to follow.
* Identify requirements and responsibilities for mitigation measures for impacted wetlands and riparian areas.
* Identify investigation and mitigation responsibilities for hazardous substances.
* Identify Contractor responsibilities for developing and implementing a Hazardous Waste Management Plan.
* Require full compliance with the mitigation requirements of the NEPA decision document.
* Identify the steps to obtain environmental clearance for the Contractor’s design when it changes the environmental conditions of the project.

**Risk Mitigation and Risk Allocation:**

The environmental Technical Requirements can present some of the most significant risks to the Contractor and the project as a whole if not properly addressed. Environmental permitting and mitigation requirements typically involve institutional third-party processes and approvals that are difficult to control and can lead to both schedule and cost risks to the project. During the RFP process, the project team needs to identify which mitigation measures need to be managed by CDOT and which should be the responsibility of the Contractor. If the mitigation measures are the responsibility of the Contractor, they need to be clarified in the RFP with specific Contract language so they are understandable and implementable.

The RFP should include prescriptive requirements for documentation and reporting. In practice, there can be significant differences of opinion between CDOT and the Contractor regarding reporting requirements. CDOT should consider all items necessary to document compliance with the environmental decision document requirements and require sufficient documentation from the Contractor so this information can be easily passed on to third parties when appropriate.

Typically, environmental permitting can be more effectively managed by the owner because the owner has stronger working relationships with the permitting agencies and a better understanding of the processes. However, certain environmental approvals and processes that can be well defined can be allocated to the Contractor. In situations where permitting can be clearly defined and allocated to the Contractor, scheduling benefits can be realized.

Agreements with permitting agencies that define approval requirements and processes can significantly reduce risks to the Contractor. Memorandums of understanding (MOUs) can be valuable documents in that regard, however they are not contractually binding and are difficult to obtain. Any form of documentation is helpful in reducing misunderstanding and minimizing permitting and regulatory risks.

Specific requirements should be included in the RFP to ensure that the Contractor includes environmental requirements as part of the quality program. Failure of the Contractor to have a robust quality program for the environmental requirements transfers the burden for environmental quality requirements to CDOT.

Risks associated with individual environmental resources, as well as lessons learned, are identified in the online Appendix on the CDOT Innovative Contracting web page or by contacting CDOT Innovative Contracting.

Preexisting hazardous substances present a risk to both parties. CDOT should be careful to precisely define the risk allocation in the environmental Technical Requirements. If CDOT has performed physical investigations that fully characterize the nature and extent of hazardous materials, the Contractor can be assigned the responsibility and risk for the required mitigation. More typically, investigations by CDOT allow for only a general understanding of the conditions. In those situations, the risk is often shared: CDOT accepts the cost risk through a time and materials change order to compensate all related mitigation costs for identified pre-existing hazardous materials, and the Contractor accepts the risk of scheduling the project to accommodate mitigation work. The Contractor has the responsibility of making every effort to avoid hazardous materials. If a Contractor’s design increases the impacts relative to the Basic Configuration, then the Contractor accepts full responsibility for the increased mitigation efforts, including possible remediation, disposal, and scheduling delays.

Noise mitigation risk needs to be carefully addressed in the environmental Technical Requirements. Typically, CDOT performs a noise analysis and develops proposed mitigations as a part of the NEPA process. The NEPA mitigation often includes stakeholders’ interests. The Contractor’s design may change the geometric conditions of the Basic Configuration, which may invalidate parts of CDOT’s noise analysis. The recommended approach is for CDOT to accept the risk for noise mitigation provided the Contractors design does not fall outside of defined vertical and horizontal tolerances. CDOT’s noise analysis should provide those tolerances relative to the sensitivity of the noise analysis. If the Contractor’s design falls outside of the defined tolerances or otherwise proposes revised noise mitigation, then the Contactor accepts the risk of performing a revised noise analysis (that must be Approved by CDOT) and obtaining any necessary stakeholder consensus as well as any other revised environmental clearance requirements.

Temporary water quality and PWQ risks are always present. When the project is within a Municipal Separate Storm Sewer System (MS4) boundary, whether CDOT’s or a local agency’s, additional requirements to meet water quality are necessary. Ideally, water quality risks can be minimized by CDOT defining the characteristics of an acceptable PWQ for the project. Temporary water quality is based upon the state or federal stormwater construction permit. Any work that disturbs soil is subject to construction water quality requirements. More detailed water quality information can be found within Book 2, Section 12.

**CDOT Investigations and Design Development Requirements:**

In the NEPA decision document there are important factors that should be considered during design development. Advanced investigations may be necessary by CDOT for further design development. For example, if contamination is identified during the NEPA process, the risks associated with the project environmental compliance can be significantly reduced through advanced investigation by CDOT. An important design development activity by CDOT is to advance the permitting process as much as possible given the limited advancement of the project design in the pre-bid phase.

### Book 2, Section 6: Third-Party Agreements

Book 2, Section 6 contains requirements for third-party agreements and coordination with local agencies and railroads. The special cases of third-party agreements with environmental permitting agencies and utilities are addressed in Book 2, Section 5 and Section 7, respectively.

Third-party agreements are required to ensure the affected facilities of third parties are properly addressed through the design, and that third-party processes are well defined and adhered to by both the owner and the Contractor.

Section 6 should contain a discussion of following topics, as needed:

* Identification of third-party facilities affected by the project
* Third-party facilities design requirements
* Third-party review and approval processes
* Intergovernmental agreements (IGAs) and MOUs
* Railroad Construction and Maintenance agreements
* Railroad Right-of-Entry agreements

**Third-Party Involvement:**

In general, third -party involvement can be most effectively managed by the owner. Railroad companies, the Federal Highway Administration (FHWA), public utilities commissions, adjacent jurisdictions, funding partners, and other third parties often have established relationships with the owner that the owner can more effectively manage. In particular, third-party agencies that have contributed funding to the project often participate in the owner’s project management organization and decision-making process. It is important that Book 2, Section 6 communicates to the Contractor the nature of the relationships that CDOT has with third parties and any agreements or processes between CDOT and the third party that may have an effect on the schedule or other aspects of the project.

**Railroads:**

The railroad companies are particularly challenging third parties to manage in Design-Build projects. They often require very advanced designs before executing construction and maintenance agreements, which constitute their formal approval of grade separation structures over or under their facilities and easements. Railroad processes introduce a high level of risk to the Contractor whenever it is necessary to include the costs and schedules for work that interfaces railroad facilities.

**Risk Mitigation and Risk Allocation:**

CDOT is usually in a better position to manage risks by executing third-party agreements. Statutes do not allow the Contractor to enter into agreements with some third parties such as railroads. Where local jurisdictions are involved, IGAs defining the design requirements and the process requirements significantly reduce project risks. In particular, agreements that obligate the third party to certain review and approval timelines allow the Contractor to commit to a more aggressive schedule for the project.

Railroad approvals are of particular concern. When schedule risk associated with the railroad process is allocated completely to the Contractor it may result in conservative scheduling and/or the potential for disputes between the Contractor and the owner during the implementation phase of the project. A suitable approach to consider is for CDOT to accept some of the scheduling risk by committing to assumed railroad review times provided the Contractor’s submittals meet well-defined deliverable requirements. This adequately balances the risk of railroad approvals; if the railroad does not meet the review times, it provides the basis for change orders to reflect any resultant project delays.

Railroad impacts can also result in additional environmental clearance requirements for the project. In particular, historic railroads can trigger the National Historic Preservation Act, Section 106 process, which can take 9 to 12 months to complete.

**CDOT Investigations and Design Development Requirements:**

The CDOT project team should identify all third parties that are affected by the project. CDOT should perform advance coordination with third parties with the intent of executing IGAs prior to the release of the final RFP. For situations where the agreement has not been finalized, it is recommended that draft agreements be included in the final RFP at a minimum.

Advance coordination with railroads is particularly important. To the extent possible, the CDOT project team should strive to fully define the project-specific requirements to obtain railroad construction and maintenance agreements and right of entry agreements. The CDOT project team should investigate track configuration, future track requirements, off-track maintenance access, and other issues that dictate the geometry of grade separation structures prior to the issuance of the RFP. Temporary crossings and any other required railroad work should be identified early and discussed and commenced as soon as possible in the RFP phase to minimize potential project delays. Where railroad flagging is necessary, it is important to define the specific flagging requirements, estimated hourly costs, and train operation timelines (with the recognition that train operation timelines can change). Effective communication is needed between the CDOT Project Manager and the railroad leader.

Because of the difficulty of defining railroad design and process requirements, the CDOT project team should advance to a higher level or even complete the design of facilities that interface with railroads. As a best practice it is recommended that the CDOT project team obtain approvals for concept and 30 percent design for overhead structures and obtain approvals for concept, 30 percent design, and 60 percent design for underpass (railroad supported) structures. The requirements for the various submittals are identified in *BNSF Railway – Union Pacific: Railroad Guidelines for Railroad Grade Separation Projects*.[[1]](#footnote-1)11

On projects with significant interface with railroads it is also recommended as best practice that the CDOT project team include a consultant with knowledge and experience with the specific railroad companies that are impacted by the project.

### Book 2, Section 7: Utilities

Book2, Section 7 contains requirements for utilities and includes the following topics:

* Definitions
* General Utility work obligations
* Exclusions from Utility work
* Identification of Utilities
* Utility coordination
* Utility work procedures
* Exhibits
	+ Exhibit A – Utility Tracking Report (Template)
	+ Exhibit B – Not Applicable
	+ Exhibit C – Utility No-Conflict Closeout Form
	+ Exhibit D – Design of Relocation Acceptance Letter (DRAL)
	+ Exhibit E – Construction of Relocation Acceptance Letter (CRAL)
	+ Exhibit F – CDOT Utility Relocation Permit
	+ Exhibit G – Utility Work Order

Utility Relocation Agreements (URAs) are provided in the Reference Documents.

Utility responsibilities need to be clearly defined in the Contract requirements and appropriately allocated to either the Contractor or to CDOT:

**Private utilities:** The owner needs to define coordination and schedule responsibilities. It is preferable to have URAs executed with each private utility before issuance of the final RFP. This is usually difficult to do, and often a reasonable approach is to provide draft URAs with the final RFP and then execute the final URAs prior to NTP. The agreements should define the scope of anticipated relocations relative to the Basic Configuration and any AREs, relocation responsibilities (both construction and design), and the schedule for the relocations. If the Contractor’s design varies from the Basic Configuration, the Contractor accepts the responsibility for the revised utility relocations.

**Public Utilities:** If the work and approval processes are fully defined in the Technical Requirements, design and construction responsibilities can usually be allocated to the Design-Builder. If the public utilities work is on behalf of a third-party agency, an IGA should be developed to formalize the Technical Requirements and process requirements of the third party. As with private utilities, if the Contractor’s design revises the relocation requirements, the Contractor accepts the responsibility for the revised relocations.

**Risk Mitigation and Risk Allocation:**

Utilities have historically represented one of the significant risks on transportation projects. The risk is a result of the difficulty in fully defining existing subsurface utilities conditions combined with the need to coordinate conflict relocations with work that is often performed by third-party utility agencies. Design-Build delivery provides the opportunity to share the risk between the owner and the Contractor in a manner that better manages the overall risk, but care must be exercised to properly allocate the risk and to minimize it through advance coordination and design development.

It is important to note that Colorado Design-Build regulations (C.R.S. § 43-1-1411) authorize CDOT to perform utilities relocations (both private and public) if necessary to eliminate delays, and CDOT can assess delay damages to utilities companies that are not responsive. The regulatory language is provided in Chapter 1 in this manual. This is strong leverage to minimize utilities risks on the project, and utility agencies should be informed of CDOT’s authority when developing URAs.

As noted earlier in this chapter, Book 1, Section 6.2 defines Reasonable Accuracy of utilities investigations provided by CDOT. By the requirements of that section, CDOT accepts the risk of providing horizontal locations of existing utilities and to a limited extent the size of the utilities, and the Contractor accepts the risk of the vertical depth of the utility.

URAs define both design and construction cost responsibilities and, importantly, process and schedule. Typically, utilities are required to relocate at their own expense unless they have exclusive utilities easements or permits within the CDOT Right-of-Way (ROW).

**CDOT Investigations and Design Development Requirements:**

Utility information is important to define in the project scope. It establishes an equal baseline for Design-Build teams. CDOT’s standard utility investigation procedures should be followed during the initial design development of the project. This includes identification of the utility by owner, utility location, and anticipated conflicts and relocation requirements. The CDOT project team should provide a utility matrix for the project. The matrix should be continuously updated through the procurement phase of the project. When the project advances to the implementation phase the Contractor is required to take over responsibility for the matrix and continuously update the matrix through the Design-Build of the project. The matrix should include the following:

* Identification of existing utilities within the project limits
* Identification of utilities owners
* Identification exclusive utilities easements and permits
* Potential conflicts and adjustments and relocations
* Status of URAs with corresponding cost and work responsibilities
* Anticipated schedules for utility work

Utilities risks can be substantially reduced if the project team performs comprehensive utilities investigations during the initial design development. This effort can extend into the procurement process, up to the issuance of the final RFP. At the very least utilities should be well defined relative to their plan locations, and all surface features should be surveyed. Ideally the investigations should extend to pot-holing of utilities at key locations to identify vertical depth, confirm horizontal location, and confirm the character of the facility.

Utilities may be made of hazardous materials such as asbestos and may require handling in accordance with Section 5 – Environmental. The CDOT 250 specification will need to be adhered to in these situations. The CDOT project team should make efforts to determine if the utilities contain hazardous material to reduce risk during construction.

The footprints of utilities impacts need to be assessed relative to the environmental clearance footprint of the project. If utility impacts exceed the limits of the environmental footprint, then additional environmental and FHWA clearances may be required prior to construction.

Field investigations should be coordinated with the development of the URAs. The CDOT project team should aggressively pursue URAs throughout the initial design development and into the procurement phase of the project. The combination of extensive site investigations and well defined URAs will allow the proposers to assess utilities impacts relative to their designs and fully understand the responsibilities of CDOT, the utilities agencies, and the Contractor, thus minimizing to the extent possible the significant risks of utilities.

### Book 2, Section 8: Right-of-Way

Book 2, Section 8 contains information on the following:

* Responsible parties for ROW acquisition
* Status of ROW
* Property management
* Acquisition and relocation requirements
* Condemnation process
* Construction requirements
	+ Demolition
	+ Restoration
	+ Protection of property
* ROW Plans (provided in Book 4)
* ROW acquisition schedule commitments (in the Section 8 Appendix)
* Schedule commitments of demolitions (in the Section 8 Appendix)
* ROW acquisition process and responsibilities (in the Section 8 Appendix, if applicable)

**Risk Mitigation and Risk Allocation:**

Typically, the Contractor relies on CDOT to acquire ROW in accordance with the acquisition schedule provided in the RFP. CDOT then holds the risk for obtaining the ROW on or before the date provided in the acquisition schedule. Generally, it is a risk management best practice for CDOT to retain full ownership and control of all actions requiring acquisition of ROW under the Uniform Relocation and Real Property Acquisition Act of 1970, as amended (Uniform Relocation Act), 49 CFR Part 24. CDOT is able to best manage the ROW process; should acquisitions require condemnation and or immediate possession, CDOT has the legal authority to execute those processes through the Attorney General’s Office. Any acquired ROW needs to go through the environmental clearance process.

For large and complex projects, CDOT does have the option to assign some or all of the risk associated with the acquisition process to the Contractor, which allows the Contractor to integrate the ROW process into its schedule to develop the most efficient project schedule. Care should be exercised in those cases to ensure that language in the Contract requires that Contractor acquisitions are in full compliance with the URA. Though the Contractor can be assigned acquisition process responsibilities, usually CDOT retains the cost risk for the acquisitions. CDOT must retain control over legal proceedings related to condemnation and immediate possession.

The risks of temporary easements, which are identified and defined as a result of the Contractor’s design or construction approach, are fully assigned, including costs and expense, to the Contractor. Temporary easements must be acquired in full compliance with the Uniform Relocation Act. The Contractor must hire, retain, and use personnel that are experienced and familiar with CDOT policies, processes, manuals, and the URA.

Often design concepts proposed by Contractors require additional or modified acquisitions. In these situations, the process and cost risk of the revised acquisition should be completely assigned to the Contractor, and they are subject to CDOT Approval. These risks include meetings; investigations; clearances; permits; delays; damages; and all other associated actions, costs, and expenses necessary to acquire the impacted parcel in accordance with the Uniform Relocation Act. However, the acquisition process typically remains under the control and direction of CDOT.

During the acquisition of ROW or easements the Contractor is responsible for:

* requesting authorization for all temporary easements and ROW acquisitions.
* preparing and documenting appraisals.
* preparing and documenting value findings.
* submitting appraisals and value findings for review and approval.
* completing a Phase 1 Environmental Assessment for easements and ROW not identified in the NEPA decision document.
* completing any other environmental permitting and clearances that are necessary to comply with the NEPA decision document.
* documenting all actions, meetings, and negotiations undertaken for temporary easements.
* ensuring ROW personnel communicate with design and construction forces to maintain compliance with temporary easement processes and restrictions.
* complying with the requirements of the current CDOT *Right of Way Manual*.

**CDOT Investigations and Design Development Requirements:**

The primary design development activity that CDOT must perform is to develop a complete set of ROW Plans for the project. The activities and final deliverables necessary for developing the ROW Plans are identical to those of a traditional Design-Bid-Build (D-B-B) project. The ROW Plans are included both in the RFP and in the Contract within Book 4 – Contract Drawings, as they provide the contractually binding ROW limits of the project.

The ROW process follows a specialized approach in Design-Build because it is based on preliminary designs rather than a final project design and plans. The limits of ROW acquisition are generally more generous than for traditional D-B-B projects, but even so the approach does not typically result in significant increases in the project costs. At locations where acquisitions are more impactful, the CDOT design should be furthered advanced to provide a better definition of the ROW needs, which reduces the risk to both CDOT and the Contractor. However, it is important to recognize that the more defined the owner’s design becomes, the less opportunity there is for competitive proposers to look for innovative and efficient solutions, so a balance needs to be struck that mitigates the risk while providing design flexibility.

The design developed by CDOT must be fully accommodated within the proposed ROW. Because the Contractor’s design is typically allowed to be within horizontal and vertical tolerances relative to the design in the Reference Documents, it is often beneficial to account for those tolerances when setting the proposed ROW. In setting the proposed ROW it is also important to account for historic drainage, noise, maintenance, accessibility, and “finish” (the area between the improvement and ROW line). Possession, entry, and use of a parcel must be managed with care to prevent significant negative impacts to the project and CDOT.

Though on traditional D-B-B projects ROW is usually fully acquired prior to issuance of the NTP, this is frequently not the case in Design-Build projects. Formal clearance is required from the ROW department before the project is allowed to go to construction. If all of the ROW has not been acquired, then the ROW authorization can be a conditional clearance, but it is still required. The ROW process can have a significant effect on how the Contractor schedules the work on the project. The ROW Technical Requirements should contain sufficient information for the Contractor to schedule the project, primarily in terms of property acquisition date commitments.

Where an acquisition schedule is provided for ROW to be acquired after the NTP is issued, detailed ROW process timelines should be developed to identify the acquisition dates committed to by CDOT and then provided in the RFP. The processes to obtain condemnation and immediate possession are prescriptively defined in the Uniform Relocation Act and can be used to identify worst-case acquisition dates for the RFP.

The CDOT project team must work diligently to meet the ROW schedule because any delays in the ROW process may cause delays in the overall project schedule and require change orders. Immediate possession or condemnation actions should be initiated when necessary in accordance with all applicable regulations and guidelines, concurrent with ongoing negotiations to ensure a worst-case schedule can be maintained. Care must also be taken to ensure all right of entry permits are secured prior to need. The Contract should restrict the duration and use of local streets and ROW to prevent prolonged or undesirable use during construction of the improvements.

### Book 2, Section 9: Survey

Book 2, Section 9 contains the requirements for survey, and directs the Contractor regarding the performance of design and construction surveys. It should include the following information

* Standards
* Project Survey Coordinator requirements
* CDOT-supplied survey data
* Contractor survey data
* Preservation of monuments
* Survey records
* Design survey requirements
* Construction survey requirements

**Risk Mitigation and Risk Allocation:**

CDOT typically accepts the risk for the accuracy of the control survey. The design survey is more of a shared risk, with the Contractor having the responsibility for verifying the accuracy of the CDOT survey. The following statement is usually included in the Technical Requirement:

“The Contractor is responsible for verifying all survey information, including but not limited to tie-ins to all existing features. If the Contractor identifies any inaccuracies in the CDOT-provided survey information, it shall be the Contractor’s responsibility to provide additional surveys as necessary to resolve the inaccuracies and complete the work.”

The Contractor accepts the risk for any supplemental design surveys it performs and for construction surveying and as-built surveys.

**CDOT Investigations and Design Development Requirements:**

CDOT’s initial design development should include both a control survey and a design survey. The control survey establishes horizontal and vertical control for the project, for use both by CDOT and the Contractor. The control survey establishes a consistent baseline for all survey data developed by CDOT and the Design-Builder.

The design survey by CDOT is required for both CDOT’s preliminary design and for the proposers’ designs. If adequate design survey information is not provided during the procurement phase of the project, proposers need to individually obtain the information. This results in redundant surveys, as well repeated and unnecessary impacts to the facility during the investigations. The need for a CDOT-completed design survey is especially acute when railroads are involved, because the information relieves the proposers of the time and expense of obtaining right-of-entry agreements with the railroads and eliminates the need for the railroad to accommodate multiple requests to survey on their property. CDOT should obtain a complete design survey for the project. Proposers and the selected Contractor can then provide any supplemental surveys that are necessary for their specific designs.

CDOT’s surveys should generally:

* establish control throughout the project.
* provide stationing and control lines.
* identify existing roadway and drainage inventory items by type and location.
* survey all surface utility facilities and subsurface utilities at locations of critical conflicts.
* display existing ROW lines.
* display proposed ROW lines based on the conceptual design.
* provide topographic information.
* identify existing alignments.
* conduct wetland delineation.
* identify hazardous material or landfill locations.

The Contractor must provide all necessary construction and as-built surveys for the project. The Contractor also must replace any monuments damaged or lost during the work.

### Book 2, Section 10: Geotechnical and Roadway Pavements

Book2, Section 10 provides information on geotechnical investigations and pavement design performed by CDOT and the procedures to be followed by the Contractor when conducting additional geotechnical investigations and proposing alternate pavement designs.

Geotechnical and roadway pavements Technical Requirements generally include information regarding the following:

* Geotechnical investigation requirements
* Roadway pavements analysis and design
* Recommended pavement sections and pavement types
* Procedures for alternative pavement design, if allowed
* Detour pavement requirements
* Pavement mix design requirements
* Pavement construction requirements
* Pavement smoothness requirements
* Project Special Provisions related to pavements
* Geotechnical investigations and test results (provided in Book 4 – Contract Drawings)
* Geotechnical recommendations, optional (provided with Reference Documents)
* Pavement designs and life-cycle cost analyses (provided with Reference Documents)

**Risk Mitigation and Risk Allocation:**

Geotechnical Data

The sampling methods used represent specific conditions at specific known locations, but geotechnical conditions may change between sampling locations. Book 1 of the RFP clearly states in its definition of “Differing Site Conditions” that CDOT accepts the risk for the subsurface conditions only at the specific locations of the geotechnical investigations and not for any interpolated conditions between investigations. Through this risk management approach, the risk of changed conditions or Differing Site Conditions is fully assigned to the Contractor. CDOT should allow sufficient time, including access and permit requirements, for proposers to perform supplemental investigations to verify and develop geotechnical data to reduce risk to both CDOT and the Contractor

Pavement Design

CDOT typically designs the pavement section(s) and accepts the sole risk for the performance of the roadway pavement sections provided in the RFP. The pavement sections are based on known geotechnical data. With the use of Mechanistic-Empirical Pavement Design, as described in the CDOT *Pavement Design Manual*, the probability of the pavement lasting the design life is considered.

The Contractor may or may not be allowed to submit an Alternative Technical Concept (ATC) for pavement section design. If the ATC is Approved by CDOT, then the Contractor assumes the sole risk for the pavement section performance.

The maintenance risks of temporary and detour pavements should be placed completely on the Contractor. Design of temporary or detour pavements should be based on existing traffic data and existing or proposed subgrade conditions.

**CDOT Investigations and Design Development Requirements:**

CDOT performs initial geotechnical investigations, preliminary designs of structures foundations, and the final design of the pavement sections.

Geotechnical Data

CDOT must perform geotechnical investigations, including shallow borings and existing pavement cores as necessary to develop the pavement section design. The shallow borings also provide valuable information to the proposers in developing their earthwork design.

CDOT geotechnical investigations should also include deep borings at locations of the proposed structures in the Basic Configuration structures. Recognizing that the Contractor’s final design may change the location of the structures, it is not advisable to provide all of the borings that are typically required at structure locations. One or two deep borings should be provided at each structure location identified in the Basic Configuration to allow the proposers to advance their substructure designs with a reasonable level of confidence concerning foundation support designs. Otherwise each proposer would have to individually perform deep boring investigations, resulting in redundant investigations. The proposers can then supplement any geotechnical investigations that are necessary to reflect their specific designs.

The CDOT project team may also choose to obtain geotechnical recommendations as a part of the preliminary investigations. The recommendations can provide valuable information in the CDOT design development for:

* developing risk management plans.
* establishing design parameters (structure foundations, pavement designs, earthwork).
* establishing the basis for determination of changed conditions.
* assisting in developing an estimated project cost.

If geotechnical recommendations are obtained, the information should be provided in the Reference Documents; it must be nonbinding, and the Contractor is not allowed to rely on it because the Contractor must accept full responsibility for the project design.

Pavement Design

Industry sensitivity to pavement types and life cycle cost analysis (LCCA) procedures do not make it practical to allow the Design-Builder complete latitude in the selection of pavement types and the development of pavement designs. CDOT has developed an approach for determining the appropriate pavement types for Design-Build projects that responds to industry concerns while incorporating the benefits of Design-Build innovation.

**Pavement Alternatives in Design-Build**

To determine the pavement alternatives included in a Design-Build project, the total dollar amount of the pavement materials for ***the lowest cost pavement alternative*** should be estimated. For Design-Build projects “pavement materials” is defined as all material used to build the pavement portion of the project and to overlay or remove the present roadway in order to construct CDOT’s recommended design. This includes subgrade, aggregate base course (ABC), rubblization (if applicable), and the actual pavement materials (asphalt or concrete). This also includes importing embankment material, along with complete removal of the existing roadway, full depth reclamation, or milling of the present roadway within the limits of construction.

When a LCCA is performed, a Final Draft LCCA is provided for Industry review for a two-week comment and review period. Industry comments are evaluated by CDOT and adjustments are made, if appropriate, to complete the Final LCCA. It is recommended that the LCCA process be completed prior to the start of the Design-Build procurement process. At the latest, the LCCA process should be completed prior to the issuance of the Draft RFP. The Final LCCA will be incorporated as part of the Draft RFP for the short-listed project teams. CDOT’s approach to pavement design depends on the total cost of pavement materials for the project, as follows:

**For projects with less than $30 million in pavement materials:**  If pavement life cycle costs for the alternatives differ by greater than 10 percent, then in Book 2, Section 1 CDOT specifies the most cost-effective alternative as the required pavement alternative.

CDOT provides a complete pavement design for the desired pavement type in the Proposal, and ATCs for alternative designs (using the predetermined pavement type) are considered.

If the pavement life cycle costs differ by less than or equal to 10 percent, then CDOT may elect to allow alternate pavement sections on the project. However, CDOT may still have the option, at its own discretion, to select the pavement alternative pursuant to the Pavement Type Selection Committee procedures in the CDOT *Pavement Design Manual*.

If alternative pavement types are allowed, CDOT provides the complete pavement design for each alternative type of pavement in Book 2, Section 10, but ATCs for alternative designs are considered.

**For projects with greater than $30 million and less than $60 million in pavement materials:** If pavement life cycle costs for the alternatives differ by greater than 15 percent, then in Book 2, Section 1 CDOT specifies the most cost-effective alternative as the required pavement alternative.

CDOT provides a complete pavement design for the desired pavement type in the Proposal, but ATCs for alternative designs (using the predetermined pavement type) are considered.

If the pavement life cycle costs alternatives differ by less than or equal to 15 percent, then CDOT may elect to allow alternate pavement sections on the project. However, CDOT may still have the option, at its own discretion, to select the pavement alternative pursuant to the Pavement Type Selection Committee procedures in the CDOT *Pavement Design Manual*.

If alternative pavement types are allowed, CDOT provides the complete pavement design for each alternative type of pavement in Book 2, Section 10, but ATCs for alternative designs are considered.

**For projects with greater than $60 million in pavement materials:** CDOT allows alternative pavement sections on the project. CDOT provides the complete pavement design for each alternative type of pavement, but ATCs for alternative designs are considered.

When the Region allows alternative pavement type bidding:

* for SDB projects, the bids will be adjusted by the factor specified in the Contract. The adjustment factors are calculated pursuant to the most recent version of the Alternative Pavement Type Bidding Specification currently used for D-B-B projects. Selection of the lowest bidder is based on the lowest adjusted bid.
* for Design-Build projects, a cost adjustment factor shall be set by CDOT for projects with pavement material costs greater than $60 million. The cost adjustment shall be determined by CDOT through a LCCA. The Design-Builder is required to construct the section(s) specified in the RFP, unless an ATC is Accepted that modifies the Approved section. Criteria for best-value assessment is determined by CDOT.

Pavement Information Provided in the RFP

Pavement design data provided with the Design-Build documents should consist of condition reports, existing subgrade information, or supplemental as-built plans. End result designs, or performance provisions, should be developed based on the LCCA and future traffic. A LCCA should be performed between the pavement alternatives to select a preferred pavement alternative to be used on the project. This LCCA is performed pursuant to the requirements of the CDOT *Pavement Design Manual*.

### Book 2, Section 11: Earthwork

The Book2, Section 11 describes the following requirements:

* Removal of structures
* Clearing and grubbing
* Excavation
* Embankment requirements
* Embankment settlement requirements, if applicable
* Subgrade requirements
* Compaction requirements
* Reuse of material
* Supplemental soil surveys
* Potential source of materials

**Risk Mitigation and Risk Allocation:**

For earthwork operations, the Contractor accepts the risk to design and construct the project in accordance with the Technical Requirements, and CDOT accepts the risk for the long-term performance of the embankment structures. The risk allocation is a result of the inherent performance characteristics of embankments, which are long term and generally exceed the limits of a reasonable warranty period.

**CDOT Investigations and Design Development Requirements:**

Earthwork requirements can have a significant impact on project costs and long-term performance. The CDOT project team should assess the geotechnical characteristics of both the existing roadway embankment and adjacent materials that are likely to be used as a part of the final embankment. The assessment allows CDOT to identify appropriate Technical Requirements for embankment and subgrade materials for the project. On projects that require a significant quantity of borrow materials, it is valuable to assess the costs and haul distances of potential borrow sites in developing project cost estimates and earthwork Technical Requirements.

At locations where there is a potential of significant primary and secondary settlement of the foundation materials supporting large embankments, it is critical that CDOT perform a geotechnical investigation to characterize the potential settlements and develop Technical Requirements that minimize settlement after construction. These requirements can include foundation material treatments, embankment surcharging and settlement monitoring and duration requirements. Settlement Technical Requirements can have a significant effect on the project schedule and cost, but they are sometimes necessary to ensure the long-term performance of the facility.

If there is reason to suspect the presence of subsurface features that can affect the project, then the project team should consider further investigations to identify and characterize those features and reduce the potential for change orders resulting from the discovery of unforeseen conditions during construction.

### Book 2, Section 12: Drainage

Book 2, Section 12 specifies requirements for design and construction of drainage facilities and includes information on the following:

* Standards
* Design guides
* Coordination with other agencies and disciplines
* Permits
* Stormwater Management Plans
* Control Measures/Best Management Practices
* Temporary drainage
* Permanent drainage
* Permanent Water Quality (PWQ)
* Floodplain requirements
* Drainage Design Report requirements
* Construction requirements

**Risk Mitigation and Risk Allocation:**

The Contractor accepts the risk to design and construct the project in accordance with the Technical Requirements. The Contractor also assumes the risk to manage temporary drainage and water quality during construction, in conformance with regulatory requirements enforced by the Colorado Department of Public Health and Environment (CDPHE). This is typically a high risk effort that is sometimes not fully accounted for in the Contractor’s cost Proposal. Contractor construction water quality responsibilities should be emphasized in the Technical Requirements.

CDOT is typically in the best position to manage third-party drainage risks and can reduce those risks by working with adjacent jurisdictions to identify contributory flows onto and off of third-party facilities.

The complexity of PWQ criteria sometimes warrants consideration of CDOT accepting some of the design risk for water quality by requiring the Contractor to comply with a baseline design. The Contractor then has the opportunity to improve on the baseline design with an approved ATC.

When significant bridge structures cross waterways, it is usually beneficial for CDOT to provide a bridge opening geometry that the Contractor can rely on. Otherwise all of the proposers need to redundantly perform costly floodplain analyses to determine bridge sizes. Also, when working across waterways, a stream crossing plan needs to be developed by the Contractor and accepted by CDOT to satisfy the United States Army Corps of Engineer (COE) 404 permit requirements.

When the project affects a regulated floodplain a Conditional Letter of Map Revision (CLOMR) may be required to be approved by the Federal Emergency Management Agency (FEMA) prior to the start of construction. CLOMRs can take six months to a year to complete and therefore pose a significant schedule risk. If possible, CDOT should obtain a CLOMR prior to release of the RFP. Where it is not reasonable given the project schedule for CDOT to obtain the CLOMR, the Contractor can be assigned the responsibility for processing the CLOMR. This approach also has the advantage of matching the CLOMR to the Contractor’s design and allowing the Contractor more design flexibility. Regardless of which party obtains the CLOMR, the overall project risk of the CLOMR can be reduced through advance coordination between the local floodplain administrator and the CDOT project team.

**CDOT Investigations and Design Development Requirements:**

Drainage design development by CDOT sometimes requires more advancement than other design disciplines to best manage its risks, due to conditions where there is the need to:

* identify the limits of the drainage system and to coordinate with off-site flow contributors and releases to off-site jurisdictions and facilities.
* develop a preliminary design that coordinates drainage and water quality design and provides a feasible benchmark for the final design by the Contractor.
* provide a clear definition of the Contractor’s water quality design criteria and requirements (simply referring to water quality permit requirements may result in a contentious interpretation of the permit requirements).
* provide preliminary floodplain analysis to set the required scope of work and size of bridge crossings and to coordinate floodplain analysis, design, and CLOMR requirements with the local floodplain administrator.
* preliminarily price the costs of the drainage system to an appropriate level of accuracy when determining the project budget.
* resolve subsurface conflicts between utilities and drainage facilities.

The design effort necessary to address these issues can sometime be significant and may require more than a 30-percent level of design advancement at specific locations of concern. Often the Contractor’s design significantly changes the preliminary design provided by CDOT, through ATCs during the procurement phase and through design revisions during the implementation phase. Nonetheless, CDOT’s preliminary design provides a standard benchmark from which all proposers advance their designs.

### Book 2, Section 13: Roadways

Book 2, Section 13 contains information on the following topics:

* Standards to be used
* Traffic analysis and design
* Roadway element design requirements
	+ Cross slope
	+ Superelevation
	+ Stopping sight distance
	+ Decision sight distance
	+ Fill slope
	+ Cut slope
	+ Clear zones
	+ Roadside slopes
	+ Retaining walls
* Guardrails and Barriers
* FHWA Interstate Access Requirements
* Trail design (if needed)
* Design exceptions
* Construction requirements
* Exhibits
	+ Exhibit A – Roadway Design Criteria
	+ CDOT Design Exception Variance Request Form

**Risk Mitigation and Risk Allocation:**

The Contractor accepts the risk to design and construct the project in accordance with the Technical Requirements. CDOT accepts the risk for the performance of the roadway, provided it is designed and constructed in conformance with the Technical Requirements. The Roadway Technical Requirements are generally prescriptive in nature, using project typical sections, the CDOT *Roadway Design Guide* and the American Association of State Highway & Transportation Officials (AASHTO) “Green Book” to set the geometric design requirements of the project. Alternatively, the Technical Requirements can allocate more of the performance risk to the Contractor by incorporating performance-based criteria such as Levels of Service (LOS) criteria. Care must be exercised in the use of performance-based criteria, such as LOS criteria, to prevent potential disputes than can arise over the interpretation of the criteria and evaluation methodologies.

CDOT should accept the risk of coordination with the FHWA concerning roadway design requirements, such as the interstate access approval, or FHWA approval of design exceptions. If a proposer’s ATCs require changes of FHWA approvals, the risk for FHWA approval of the revised design becomes the Contractor’s. Similar to environmental mitigation, any increase in time/cost due to processing the ATC change is solely the responsibility of the Contractor.

**CDOT Investigations and Design Development Requirements:**

Roadway design and plans developed by CDOT must demonstrate the ability of the project to be built within its limits (usually within the limits of the proposed ROW). Book 2, Section 13 typically provides tolerances that the Contractor’s design is required to stay within relative to the horizontal and vertical alignments provided in the Reference Plans. CDOT accepts the risk that the project can be designed and constructed to within those tolerances and within the project limits while conforming to the project design criteria. From that perspective, the project design development should be focused on minimizing that risk and ensuring that the footprint provided to the Contractor (horizontally, vertically, and environmentally) is feasible to accomplish the requested improvements.

CDOT should identify controlling guidelines such as the CDOT *Roadway Design Guide* or AASHTO *Roadside Design Guide*. Where minimum criteria called out in the design guides are not the desired end result, CDOT should identify controlling criteria that meets the needs of the project. In this case the CDOT should specify revisions to LOS, minimum lane widths, minimum shoulder widths, minimum temporary alignment designs, safety requirements, and other criteria as necessary. To avoid potential misunderstandings in interpretation of the controlling criteria, CDOT has established a best practice of including a table of roadway design criteria at the end of Book 2, Section 13.

It is usually best for CDOT to provide design year traffic volumes. Design year volumes are often required for the Contractor to design to operational project requirements. Calculation of proposed volumes can require extensive modeling, which would be a redundant effort for proposers, and also entails subjective engineering judgments, which are best made and benchmarked by the owner. With proposed volumes set by CDOT, the Contractor can then provide operational analysis on an objective basis.

### Book 2, Section 14: Signing, Pavement Markings, Signalization, Lighting

Book2, Section 14 contains requirements for signing, pavement markings, signalization, and lighting. On projects with only minor Intelligent Transportation System (ITS) requirements, ITS can also be covered in Section 14, eliminating the need for Section 19. Section 14 should contain the following topics:

* Design requirements and standards and materials
	+ Signing
	+ Pavement marking
	+ Lighting
	+ Traffic Signals
* Construction requirements
* Operational traffic signal requirements for construction (if applicable)
* Project Special Provisions – if applicable

**Risk Mitigation and Risk Allocation:**

The Contractor accepts the risk to design and construct the project in accordance with the Technical Requirements. CDOT accepts the risk for the performance of the features that are designed and constructed in conformance with the Technical Requirements.

The Contractor accepts the risk for providing adequate signing, pavement markings, signalization, and lighting during the construction of the project, typically to comply with operational Technical Requirements. For example, the Technical Requirement for temporary lighting during construction is usually to provide lighting at a minimum equivalent to the existing lighting for the facility.

**CDOT Investigations and Design Development Requirements:**

The signing, pavement marking, signalization, and lighting design for the project does not typically need to be advanced to a very high level in the CDOT design development phase. For the most part, the work can be sufficiently scoped and defined with a narrative in the Technical Requirements. A common approach is to provide conceptual-level signing and striping plans, showing major signing, general striping layouts, and locations of signalized intersections.

Design development to the extent of providing major signing legends and locations is of particular value, recognizing the significant costs of major sign structures and foundations.

Often, the FHWA *Manual on Uniform Traffic Control Devices* (MUTCD) is invoked into the Technical Requirements by reference. Care should be exercised when referencing the manual as it is written as a design guide and not as a project specification. The MUTCD provides both standards and guidance statements and often refers to using “engineering judgment” in determining the design. Therefore, it provides latitude to the Contractor’s designer that may not be consistent with the owner’s desires. As a result, the project Technical Requirements should either provide prescriptive designs or provide definitive direction on the use of the MUTCD.

CDOT design development should extend to developing agreements with agencies responsible for maintaining the lighting (usually an electrical utility or a city) and the signalization (typically a city or county). Oftentimes the maintaining party has explicit material specifications for their facilities to ensure they can be efficiently maintained.

### Book 2, Section 15: Structures

Book 2, Section 15 defines the requirements for bridges, retaining walls, noise walls, box culverts, and other large structures. This section contains the following topics:

* List of existing structures
* Standards
* Software for design
* Design requirements
	+ Materials
	+ Loads and forces
	+ Geotechnical
	+ Structure aesthetics
	+ Bridges
	+ Box culverts
	+ Retaining walls and noise walls
	+ Sign structures
	+ Tunnels
* Plans and reports
* Construction requirements

The Structural Technical Requirements are fairly prescriptive, maintaining the rigorous approach to structures design required by Headquarters Staff Bridge to ensure the safety and performance of these critical elements.

**Risk Mitigation and Risk Allocation:**

A common approach is for CDOT to take the risk for the location and general layout for the structures on the project, exclusive of superstructure and substructure types. The Contractor then takes the risk for determining the structure type that best suits its construction methods and cost.

The typical structural Technical Requirements include a provision for the use of structures not historically used by CDOT. If the Contractor chooses to use a structure that is not historically used by CDOT, then the RFP requires CDOT Approval of the Contractor’s proposed system.

**CDOT Investigations and Design Development Requirements:**

The design development by CDOT should be advanced as necessary to identify the location of all major structures (bridges and box culverts with a total length greater than 20 feet and retaining walls with a length greater than 100 feet and an exposed face height at any location of more than 5 feet).

Structures design and construction is one of the better opportunities to recognize both the cost and schedule advantages of Design-Build. Contractors have different areas of expertise, resources, and subcontractors, which can be most efficiently utilized in Design-Build if they have flexibility in determining structure types. To facilitate the process, it is best to not to prescribe structure types in the Technical Requirements. Nonetheless, preferably the Reference Drawings provide structure conceptual designs to help guide the Design-Builder’s design and provide CDOT with a basis for cost estimating the GMP.

With regard to bridges, a reasonable approach is to provide a general layout for the bridge structure similar to that of a preliminary design for a traditional D-B-B. The purpose of the general layout is to define the geometric requirements for the bridge. The general layout however should not identify either the superstructure type or the substructure type. The exception to this approach is railroad structures, which should be taken to a higher level of design by CDOT, as is discussed above in Section 7.2.6, “Third-Party Agreements.”

### Book 2, Section 16: Transportation Management Plan

The TMP defines strategies for managing the work zone impacts of the project. Book 2, Section 16 contains the information on the following topics:

* TMP requirements
* TMP Task Force
* Travel Demand Management requirements
* Business and private access requirements
* MOT variance process
* Coordination with CDOT Traffic Management Center (CTMC)
* Incident Management Plan (IMP) requirements
* Traffic Control Plan (TCP) and Methods of Handling Traffic (MHTs)
* Work zone design speeds
* Minimum lane and shoulder requirements
* Lane closure requirements
* Construction requirements
* Detour pavement requirements

The TMP Technical Requirement is an operational Technical Requirement in that it defines construction processes and not the end product. As an operational requirement, it is important to address performance requirements such as the effectiveness of MHTs, traffic delays, queues and congestion, traffic safety (accident assessments), and other measures. It is also important to address the relationships between the Contractor, CDOT, and project stakeholders.

The TMP requirements should be closely coordinated with the PI (Book 2, Section 4) requirements, recognizing that a key objective of both sections is to ensure the best possible flow of traffic for local stakeholders and the traveling public through responsive and informative Traffic Management and PIPs. The formation and regular meetings of a joint TMP/PI task force is typically a required element of both Technical Requirements. On past projects, the two required task forces have met sequentially with staff rosters overlapping into both meetings.

The TMP requirements should identify the need for traffic management strategies such as Travel Demand Management and ITS requirements and coordination with CTMC.

**Risk Mitigation and Risk Allocation:**

The most common approach for the TMP and MOT is for the Contractor to accept the risk of providing the traffic control in conformance with the Technical Requirements and for CDOT to accept the risk for the resultant operational performance of the facility during construction of the project. Alternatively, the Contractor can be assigned operational risk by requiring compliance to certain operational LOS, but the subjective nature of LOS determinations makes LOS compliance a significant risk to both CDOT and the Contractor and can lead to potential disputes. Often the MOT performance is a project goal and MOT Proposal commitments are encouraged in the RFP, which can change the MOT risk allocation for the project.

The Contractor has the responsibility for integrating the MOT Technical Requirements with its construction phasing plan and determining a traffic control plan for the project. The Contractor also has the overall responsibility for developing the overall TMP for the project, which sets the framework for the management of traffic during the construction of the project.

The Contractor’s TCP identifies the need for temporary pavements and detours. Typically, the Contractor accepts the risk for the design and performance of temporary pavements.

**CDOT Investigations and Design Development Requirements:**

CDOT should consider the operational impacts during construction, including both local and corridor-wide traffic operations; local access, business, and other stakeholder impacts; and transit, pedestrian, and bicycle impacts. This effort often requires development of conceptual construction phasing and traffic control plans as well as traffic analyses to confirm the feasibility of maintaining the desired traffic operations during construction. The construction phasing analysis is also necessary to confirm constructability within the proposed ROW of the project.

CDOT should determine whether the documented regional lane closure strategies will be followed or whether project-specific lane closure strategies are required for the project. Lane closure policies of the affected local agencies should also be considered.

CDOT should consider whether to allow lane closures durations that exceed those found in the published *Region Lane Closure Strategy*, and the requirements the Contractor must fulfill in order to receive CDOT approval.

CDOT determines the amount for the work time violation incidents. A road user cost analysis can be performed to determine the appropriate amount for work time violations.

### Book 2, Section 17: Landscaping

This section contains the information on the following topics:

* Requirements for the landscaping plans
* Requirements for noxious weed management
* Delineation of riparian and wetland protection areas
* Requirements for handling trees and shrubs, including tree replacement criteria
* Requirements for establishing landscaping
* Requirements for Acceptance of landscaping, such as topsoil, seeding, and plant requirements
* Requirements for landscaping warranty periods
* Requirements for Project Special Provisions providing landscaping technical specifications

The landscaping Technical Requirements are generally prescriptive. Where the proposed landscaping is minimal and native in its nature, the landscaping Technical Requirements are fairly simple and straightforward, with little opportunity for innovative Design-Build approaches. Where an enhanced landscape and aesthetics plan is desired, prescriptive specifications are preferred due to the subjective nature of the design.

Hardscape aesthetic requirements when applicable, should be included in the Landscaping and Aesthetics Technical Requirements.

**Risk Mitigation and Risk Allocation:**

The Contractor accepts the risk to design and construct the project in accordance with the Technical Requirements. CDOT accepts the risk for the performance and context sensitivity of the features that are designed and constructed in conformance with the Technical Requirements.

When enhanced landscaping and hardscape aesthetics are included in the project, it is often in response to stakeholder concerns, and the landscaping and aesthetics design is dependent to some degree on stakeholder approval. This is a process that CDOT is in the best position to manage. As a result, landscaping and aesthetic design is usually best performed by CDOT to avoid assigning the stakeholder approval risk to the Contractor.

**CDOT Investigations and Design Development Requirements:**

All exposed land needs to have some form of cover (grass or other) and is required to inactivate the stormwater construction permit identified in Book 2 Section 5 and 12. When landscaping is minimal and native in its nature, the design development required by CDOT does not usually require a significant amount of effort. Most of the work effort is focused on the landscaping requirements for wetlands and riparian mitigations necessary to comply with the project NEPA requirements, Senate Bill 40 (SB 40), and the COE permitting requirements. Wetlands and riparian area surveys, including existing tree assessments, are usually necessary to coordinate with the permitting agencies and to develop the appropriate landscaping Technical Requirements.

When the project has enhanced landscaping and/ or architectural hardscape needs, the CDOT design development typically includes the development of a fairly detailed set of architectural and landscaping plans that are included in Book 4 as Contract Drawings. Those plans are then supported by fairly detailed Technical Requirements in Book 2, Section 17. Most often, the architectural and landscaping plans are developed through a stakeholder coordination process, which should be completed prior to the issuance of the final RFP. The stakeholder coordination process is iterative and time consuming, typically requiring multiple meetings to develop the design and obtain a consensus.

Careful consideration needs to be given to the landscape establishment and warranty process. Often it is best to specify a separate completion and acceptance and warranty process for landscaping improvements because the establishment period for the landscaping usually extends beyond the acceptance of the project as a whole.

### Book 2, Section 18: Maintenance During Construction

Book 2, Section 18 contains the information on the following topics:

* Maintenance of LOS plan
* Contractor maintenance responsibilities
* CDOT maintenance responsibilities
* Limits and durations of Contractor maintenance
* Maintenance of acquired ROW and easements

**Risk Mitigation and Risk Allocation:**

Generally, the Contractor accepts the risk and responsibilities for all of the facility maintenance through the entire limits of the project from its first mobilization for Work on the project until final project Acceptance. Contractor maintenance responsibilities are typically contractually defined in this Technical Requirement to start at NTP2. A common exception to this general approach is for snow removal and ice control, which are activities that CDOT is better equipped to perform than the Contractor. CDOT should take on the snow removal and ice treatment responsibilities on traveled lanes within the project limits and coordinate the snow removal on the local agency roads within the project limits with the local agencies.

**CDOT Investigations and Design Development Requirements:**

The CDOT project team should perform an initial maintenance condition survey to set a baseline for the maintenance responsibilities of the Contractor. Preferably CDOT should perform preconstruction maintenance of the facility to bring it up to the desired LOS before turning the maintenance responsibilities over to the Contractor. It is highly recommended that the project team meet exclusively with the CDOT maintenance forces in charge of the facility within the project limits in order to discuss all maintenance-related issues to bring the facility up to the desired LOS.

Often when CDOT maintenance forces become aware of a large project, they will divert their funding and resources to other areas of need, and as a result there may be outstanding maintenance issues that need to be addressed immediately within the project limits. It is best to include any outstanding maintenance issues, as well as any deadlines as to when they should be addressed (e.g., prior to NTP1), in the Technical Requirements and account for them in the GMP. The project team should coordinate with maintenance to perform an inventory walkthrough in an attempt to identify and schedule these items into the Technical Requirements and the GMP.

### Book 2, Section 19: Intelligent Transportation Systems (ITS)

This section contains the information on the following topics, as applicable to the project:

* Electrical power
* Location and protection of existing facilities
* Communication systems
* Variable Message Signs (VMSs)
* Ramp Meter Stations (RMSs)
* Microwave Vehicle Radar Detectors (MVRDs)
* Travel Time Indicators (TTIs)
* Automatic Traffic Recorders (ATRs)
* Variable Toll Message Signs (VTMSs)
* Toll points
* Automatic Vehicle Identification (AVI) readers
* Automatic License Plate Recognition (ALPR)
* Electronic Toll Collection (ETC) lane controller
* Pull boxes, manholes, and ITS device cabinets
* Construction requirements
* Operational requirements during construction
* Testing and integration
* Maintenance periods
* ETC system coordination

The ITS Technical Requirements can vary considerably in their complexity and detail depending on the ITS system of the facility and the corridor that it is within. If ETC is required on the project, the tolling requirements are included in Section 19. ITS and ETC include a variety of specialized equipment, which is summarized in Table 7-3.

**Table 7-3. ITS and ETC Equipment**

|  |  |
| --- | --- |
| **System** | **Equipment** |
| ITS | Variable Message Signs (VMSs), Closed Circuit Television (CCTV) Cameras, Ramp Meter Stations (RMSs), Microwave Vehicle Radar Detectors (MVRDs), Travel Time Indicators (TTIs), Automatic Traffic Recorders (ATRs), Doppler Radar, Road Weather Information Systems (RWISs), and Variable Toll Message Signs (VTMSs) |
| ETC | Automatic Vehicle Identification (AVI) Readers, Automatic License Plate Recognition (ALPR) Cameras, Loop Detectors, and ETC Lane Controller Cabinets |

On complex ITS and tolling projects, it is beneficial to provide the proposers a concept of operations, a systems engineering analysis, and the functional requirements for the project.

**Risk Mitigation and Risk Allocation:**

The Contractor accepts the risk to design and construct the project in accordance with the Technical Requirements. CDOT accepts the risk for the performance of the features that are designed and constructed in conformance with the Technical Requirements. The need to maintain a consistent approach for equipment and infrastructure facilities dictates the use of prescriptive requirements rather than performance requirements for the ITS system.

**CDOT Investigations and Design Development Requirements:**

CDOT ITS expertise is critical to the development of the ITS Technical Requirements. If the facility and the corridor it is within include existing or proposed ETC systems, then the development of the ITS Technical Requirements requires a high degree of specialized expertise. In these cases, outside technical expertise should be retained and added to the CDOT project team for both the development of the RFP Technical Requirements and the oversight of design and construction, as well as during the implementation of the ITS system.

Because ETC systems most likely require third-party coordination to integrate the systems into the existing tolling infrastructure (such as the E-470 Authority), most likely IGAs also are required and should be developed and executed (if possible) prior to the issuance of the final RFP.

When developing ITS standards for the project, FHWA established National Intelligent Transportation Systems Architecture and Standards should be adhered to in accordance with 23 CFR Part 940.

Development of the ITS Technical Requirements (Book 2, Section 19) should be closely coordinated with Book 2, Section 14, which covers signing, pavement marking, signalization, and lighting. On projects with only minor ITS elements, the ITS Technical Requirements can be included in Section 14 and Section 19 can be eliminated.

### Book 2, Section 20: Modifications to Standard Specifications

Book 2, Section 20 consists of modification to CDOT *Standard Specifications for Road and Bridge Construction* (Standard Specifications). In general, the Standard Specifications are used for controlling the construction on CDOT projects. In Design-Build delivery, they are also used for that purpose, however certain parts of the Standard Specifications are superseded by the Design-Build Contract Documents. Book 2, Section 20 contractually identifies the modifications to the Standard Specifications for Design-Build delivery. Therefore, this section is generally standardized for all Design-Build projects. Nonetheless it is important for the CDOT project team to be very familiar with this section in order to understand the key differences in the construction specifications between Design-Build and D-B-B delivery.

The most significant difference for Design-Build delivery is relative to the Standard Specifications in Section 100 – General Provisions. The majority of the Section 100 provisions are superseded by Book 1 of the Design-Build Contract Documents.

Some other key modifications to the Standard Specifications are:

* All references to “Engineer” refer to the Contractor’s Engineer, unless the context requires otherwise. This is an important terminology change for the CDOT project team to recognize. When a requirement is subject to an action by CDOT’s engineer, it must be stated as a “CDOT” requirement.
* Pavement incentive payments are generally included in the GMP and are not paid as part of the cost loaded schedule, but disincentives still apply. The Contractor is also not allowed the option of accepting a price reduction for nonconforming pavements; that action is subject to the Approval of CDOT.
* In Divisions 200 through 600 of the Standard Specifications, the method of measurement and basis of payment provisions are superseded by the provisions set forth in Books 1 and 2 of the Contract Documents because Design-Build is a lump sum and not a unit price contract.

Book 2, Section 20 also includes the list of CDOT Standard Special Provisions that are applicable to the project. Project Special Provisions are typically incorporated into the Construction subsections of the applicable Technical Requirement sections.

## Book 3 – Applicable Standards, Data and Reports

Book 3 includes such documents as CDOT design guides, AASHTO design standards, MUTCD design standards, local design standards, CDOT M & S standards, CDOT construction and materials manuals, and project-specific reports that are binding parts of the Contract. The documents are generally included as a list of documents, but the documents are not actually a part of the project database. The exceptions to that approach are project-specific reports that are included in the database.

The documents included in Book 3 are considered to be contractually binding Contract Documents, so care must be exercised in determining which documents to include and in how they are referred to elsewhere in the Contract Documents. Many design manuals include language such as “the designer should consider…” or “It is desirable....” Such ambiguous language is subject to interpretation and can lead to disputes. At the other extreme, arbitrarily referenced documents may include onerous requirements that the owner is unaware of and can result in unnecessary project risk and cost.

Project reports also should be carefully examined before being included in Book 3. Many project reports include recommendations and preliminary designs that should not be considered contractually binding and should be included as Reference Documents and not part of Book 3. If there are certain elements of those documents that are to be Contract requirements, then those elements of the Reference Documents can be incorporated into the Contract by reference in the Technical Requirements. Project documents that are often a part of Book 3 include environmental decision documents, permits, third-party agreements and IGAs, and FHWA Interstate Access Reports.

Generally, key project requirements should be clearly stated in the Technical Requirements, even if they are a part of Book 3 documents, to avoid any potential ambiguities. For example, Book 2, Section 13 includes detailed roadway design criteria for the project even though much of that same criteria can be found in CDOT’s *Roadway Design Guide* and the AASHTO Green Book.

## Book 4 – Contract Drawings

Book 4 includes project-specific drawings that are contractually binding. Sometimes Book 4 is misinterpreted to include the preliminary plans for the project. The preliminary plans as a whole are not contractually binding and should not be included in Book 4, but they should be included as Reference Documents. Elements of preliminary plans, such as typical sections, could be included in Book 4; more often, however, if they are desired to be Contract requirements, then they are simply referenced as such in the Technical Requirements without being included in Book 4. Book 4 usually includes the project ROW Plans and sometimes physical investigations, such as geotechnical and hazardous materials borings and test results. When geotechnical information is provided, it should not include geotechnical recommendations because that represents design, which should not be provided by the owner.

1. 11 Union Pacific Railroad, *BNSF Railway – Union Pacific: Railroad Guidelines for Railroad Grade Separation Projects,* January 24, 2007, https://www.up.com/cs/groups/public/documents/document/pdf\_rr\_grade\_sep\_projects.pdf. [↑](#footnote-ref-1)