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Best Practices for Cost Recovery

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16. Abstract

The Massachusetts Department of Transportation (MassDOT) Highway Division amended and reissued its Cost Recovery Procedure in 2017. Overall, the procedure has been successful; however, there is still room for improvement, including earlier participation of design consultants in addressing conflicts and discrepancies that result in construction change orders, and better coordination with design consultants who can be found liable for additional construction costs related to design errors. The objective of this research was to gather and analyze information regarding best cost recovery practices used by state DOTs and to identify opportunities to modify and enhance, as appropriate, MassDOT's existing Cost Recovery Procedure. The research team found that many of the key elements are already included in the current MassDOT Cost Recovery Procedure. Overall, the completeness and level of detail of the 2017 MassDOT Cost Recovery Procedure are on a level similar to that of the elite group of six state DOT cost recovery procedures analyzed in this research. Several areas where the current MassDOT Cost Recovery Procedure could be further improved are presented in this report.

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Best Practices for Cost Recovery

Final Report

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Disclaimer

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Executive Summary

This study of "Best Practices for Cost Recovery" was undertaken as part of the Massachusetts Department of Transportation (MassDOT) Research Program. This program is funded with Federal Highway Administration (FHWA) State Planning and Research (SPR) funds. Through this program, applied research is conducted on topics of importance to the Commonwealth of Massachusetts transportation agencies.

The MassDOT Highway Division last amended and reissued its Cost Recovery Procedure in 2017. Overall, the procedure has been successful; however, there is still room for improvement, including earlier participation of design consultants in addressing conflicts and discrepancies that result in construction change orders, and better coordination with design consultants who may be found to be liable for additional construction costs related to design errors.

The objective of the research was to gather and analyze information regarding best cost recovery practices used by state DOTs and to identify opportunities to modify and enhance, as appropriate, MassDOT's existing Cost Recovery Procedure.

The research team identified 25 state DOTs, including MassDOT, that have some kind of formal, written cost recovery procedures, either as a stand-alone document or a chapter in a larger document such as a contractor's manual. Six other state DOTs mentioned the designer's responsibility for additional costs in construction projects due to errors and omissions; however, the research team was not able to identify formal, written cost recovery procedures for these states.

The selection of state DOT cost recovery procedures for further analysis was done based on MassDOT's primary interests, including:

1. State DOTs with transportation infrastructure budgets and types of construction projects comparable to MassDOT.
2. State DOTs from coastal states or states located in the New England area.

In addition, the research team selected cost recovery procedures from states that the team identified as delivering the largest percentage of projects at or below the estimated construction costs provided by the designer.

Based on in-depth analysis of cost recovery procedures and practices for the selected state DOTs (those for the states of California, Florida, Georgia, Mississippi, New Jersey, and Texas), as well as a review of cost recovery documents prepared by federal transportation agencies and other stakeholder organizations, the research team concluded that there are 13 key elements that should be considered for inclusion in the development of a comprehensive state DOT cost recovery procedure.

The research team found that many key elements are already included in the current MassDOT Cost Recovery Procedure. Overall, the completeness and level of detail of the 2017 MassDOT Cost Recovery Procedure are on a level similar to that of the elite group of six state DOT cost recovery procedures analyzed in this research. Several areas where the current MassDOT Cost Recovery Procedure could be further improved are presented in this report.

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List of Acronyms

Acronym	Expansion
AASHTO	American Association of State Highway and Transportation Officials
ACE	Assistant Chief Engineer
ACEC	American Council of Engineering Companies
A&E	Architect-Engineer (Caltrans)
Caltrans	California Dept. of Transportation
CCEI	Consultant Construction Engineering and Inspection (FDOT)
CCO	Contract Change Orders (Caltrans)
CES	Consultant Evaluation System (NJDOT)
CSU	Consultant Services Unit (MDOT)
DOT	Department of Transportation
DPM	Design Project Manager
E&O	Errors and Omissions
EOR	Engineer on Record
FDOT	Florida Dept. of Transportation
FHWA	Federal Highway Administration
GDOT	Georgia Dept. of Transportation
MassDOT	Mass. Dept. of Transportation
MDOT	Mississippi Dept. of Transportation
MRP	Management Review Panel (Caltrans)
MTC	Mississippi Transportation Commission
NCHRP	National Cooperative Highway Research Program
NJDOT	New Jersey Dept. of Transportation
PDB	Potential Design Breach (Caltrans)
PMO	Program Management Office (NJDOT)
PRS	Project Reporting System (NJDOT)
PS&E	Plans, Specifications, and Estimates
SPR	State Planning and Research
TxDOT	Texas Dept. of Transportation

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1.0 Introduction

This research project, "Best Practices for Cost Recovery," was undertaken as part of the Massachusetts Department of Transportation (MassDOT) Research Program. This program is funded with Federal Highway Administration (FHWA) State Planning and Research (SPR) funds. Through this program, applied research is conducted on topics of importance to the Commonwealth of Massachusetts transportation agencies.

1.1 Problem Statement

The MassDOT Highway Division amended and reissued its Cost Recovery Procedure in 2017. Overall, the procedure has been successful; however, there is still room for improvement, including earlier participation of design consultants in addressing conflicts and discrepancies that result in construction change orders, and better coordination with design consultants who may be found to be liable for additional construction costs related to design errors.

1.2 Research Objectives

The objectives of this research were:

1. To gather and analyze information regarding best cost recovery practices used by state DOTs.
2. To identify opportunities to modify and enhance, as appropriate, MassDOT's existing Cost Recovery Procedure, which was last revised in 2017.

This report provides MassDOT with a review and analysis of best cost recovery practices to address design errors and omissions (E&O) in transportation infrastructure construction projects and offers a set of recommendations to improve MassDOT's current Cost Recovery Procedure. The report includes a set of modified flowchart guides designed to help MassDOT's Cost Recovery Unit prevent or minimize potential design errors and omissions during early project development, as well as to improve the efficiency of cost recovery procedure during the later stages of construction projects.

1.3 Report Outline

The remaining sections of this report are organized as follows. Section 2 describes the research tasks. Section 3 presents the results of the literature synthesis on state DOT cost recovery procedures. Section 4 gives the study's conclusions and recommendations. Section 5 provides the list of references used in this study. Section 6 includes appendices with additional information on state DOT cost recovery procedures.

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2.0 Research Tasks

Task 1 of this project was to conduct a detailed literature search on past and current state DOT cost recovery practices and experiences related to design errors and omissions.

Task 2 of the project was to perform an analysis on the collected data from Task 1 and to prepare a synthesis of the best methods and practices of cost recovery.

Task 3 was to prepare and deliver this Final Report.

The following Subsections 2.1 and 2.2 provide details on Research Task 1, and Subsections 2.3 and 2.4 provide details on Research Task 2.

2.1 Literature Search and Preliminary Evaluation

The research team conducted a detailed literature search on past and current state DOT cost recovery practices and experiences related to design errors and omissions, with an emphasis on highway infrastructure construction projects.

The literature search was conducted in the following order:

1. A comprehensive online search was conducted.
2. The FHWA District Office in Cambridge, Massachusetts, was contacted to find information on state DOT procedures and practices that were not available online.
3. Selected state DOTs that were of keen interest to MassDOT and the research team were contacted directly to obtain more complete information about their cost recovery practices.

The research team identified 25 state DOTs, including MassDOT, that have some kind of formal, written cost recovery procedures, either as a stand-alone document or a chapter in a larger document such as a contractor's manual. Six other state DOTs mentioned the designer's responsibility for additional costs in construction projects due to errors and omissions; however, no description of a cost recovery procedure was provided. As a result of the preliminary review, comprehensive cost recovery procedures from 8 state DOTs were suggested for further analysis.

The final selection of state DOT cost recovery procedures for further analysis was made from those eight state DOTs and was based on MassDOT's primary interests, including:

1. State DOTs with transportation infrastructure budgets and types of construction projects comparable to MassDOT.
2. State DOTs from coastal states or states located in the New England area.

In addition, the research team also selected cost recovery procedures from states that the team identified as delivering the largest percentage of projects at or below the estimated construction costs provided by the designer.

2.2 Review of Current Cost Recovery Procedures and Practices

As mentioned in the previous subsection, the research team identified 25 state DOTs that document their cost recovery procedures. The states included Arizona, California, Florida, Georgia, Idaho, Illinois, Indiana, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, North Dakota, Oregon, Pennsylvania, Texas, Washington, and Wisconsin. A summary of key elements presented in identified state DOT cost recovery-related documents can be found in Appendix A.

As a result of this review, it was found that:

- Many of the state DOT cost recovery documents indicate that the primary goal of their cost recovery procedures is not a collection of monetary compensation for additional costs associated with E&O but rather relates to the improvement of design quality of transportation projects.
- All 25 of the state DOTs agree that it is not possible to eliminate all errors and omissions during the design stage.
- Most state DOTs call for cost recovery procedures only when apparent "negligence" and "lack of proper care" have occurred, while a few others invoke procedures due to a possible "breach of contract."
- All 25 of the state DOTs recommend resolving issues related to design errors and item omissions at the lowest possible level while leaving the litigation as the absolute last resort.

To make the literature review more complete, the research team also examined available documents on cost recovery from federal transportation agencies and other stakeholder organizations. These documents were obtained from the American Association of State Highway Traffic Officials (AASHTO) (*1,2*), American Council of Engineering Companies (ACEC) (*3*), National Cooperative Highway Research Program (NCHRP) (*4*), and U.S. Army Corps of Engineers (*5*). The documents listed the best design-related E&O cost recovery practices (*1,2,3*), provided the research team with useful information on the state DOTs with the highest percentage of construction projects completed at or below the budget (*4*), and offered an additional perspective on issues associated with the handling of E&O-related issues (*3,5*). These documents also offered additional insights from multiple perspectives on the benefits and drawbacks associated with a comprehensive cost recovery procedure. For example, one study concluded that the vast majority of cost overruns associated with design-related E&O issues typically occurred in the category of large transportation infrastructure construction projects with an original bid award amount of $10 million or more. Among the 39 states surveyed in that study, over 80% of projects in this category were not completed for less than their original contract award amount and the average cost at the completion of the construction phase exceeded the original award by $2.8 million, while most of the smaller projects have been completed on budget or with minimal cost overruns (*4*).

2.3 Selection of Best State DOT Design E&O Cost Recovery Procedures

The following criteria were used to identify a final group of state DOTs whose documents on E&O cost recovery procedures and practices were then further reviewed and analyzed.

- Construction projects of similar type as those in Massachusetts (e.g., older infrastructure, articulated bridges, construction in highly urbanized areas).
- Regional location (e.g., coastal state DOTs, New England and Northeast region state DOTs).
- Annual construction programs and project budgets comparable to those of MassDOT.
- Recent performance (e.g., delivering projects on or below initially approved budget).

The final list of the six state DOTs whose cost recovery procedures and practices were selected for further analysis were those for the states of California (Caltrans), Florida (FDOT), Georgia (GDOT), Mississippi (MDOT), New Jersey (NJDOT), and Texas (TxDOT). As shown in Table 1, each of these procedures satisfies two or more of the criteria listed above. The documented cost recovery procedures at these six state DOTs were then analyzed in terms of purpose, scope, and basic principles; key definitions; quality control and assurance methodology; problem discovery and immediate action plans; case evaluation and assessment; and other important considerations related to setting a monetary threshold to initiate the cost recovery process, E&O insurance requirements, and designer participation during the construction and operations of the facility. The analysis helped the project team to develop a set of conclusions and recommendations for MassDOT to consider, to help further enhance its current Cost Recovery Procedure.

Table 1. Selection of final set of state DOT E&O cost recovery procedures

State	Project Similarity	Regional Location	Budget Size	Recent Performance	Final Selection
California	Y	Y		Y	Y
Florida	Y	Y			Y
Georgia	Y	Y	Y	Y	Y
Mississippi	Y	Y	Y		Y
New Jersey	Y	Y	Y		Y
Texas	Y	Y		Y	Y

2.4 Analysis of the Best Current Cost Recovery Procedures and Practices

An individual analysis of each of the selected six state DOT's cost recovery procedures and practices is presented as follows.

California

Caltrans published its *Guidelines for Consultant Design Liability* in 2004, and it was perhaps the first comprehensive document of its kind. Still considered among the best 17 years since its publication, the document provides policy, procedures, insurance requirements, and contract language governing consultant design errors and omissions and associated cost recovery *(6)*.

The document provides the following key definitions related to E&O policy:

- Error: an incorrect or insufficient plan detail.
- Omission: an instance where plans are silent on an issue.

The policy also describes some other design flaws, such as the following:

- Designer produces specifications that are "flawed by being contradictory, ambiguous, omitting material, or by being 'canned' and not properly tailored to the particular project circumstances" *(6)*.
- Designer commits breaches of contract administration through "untimely reviews of submittals, and/or untimely and inadequate responses to requests for information" *(6)*.
- There may also be issues regarding the preparation of cost estimates and conduct of construction inspections.

The guidelines for the designer's professional liability are issued by the acting chief engineer and cover design deficiencies identified during construction. The guidelines focus on early identification and administrative solutions to consultant design problems. Acknowledging that some number of minor design problems or changes is expected during project delivery, the guidelines are intended to promote uniform procedures statewide to improve design quality and accountability for the additional costs due to E&O. The goals and objectives include establishment of clear benchmarks to evaluate consultant design performance; the introduction of a timely and equitable dispute-resolution process; and improvement of project management and design quality.

The performance of a consultant designer is assessed according to two major criteria:

- In performing professional services, a designer must have the "degree of learning and skill ordinarily possessed by reputable design professionals, practicing in the same or a similar locality and under similar circumstances" *(6)*.
- A designer has a further duty to "use the care and skill ordinarily used in like cases by reputable members of the same profession practicing in the same or a similar locality under similar circumstances, and to use reasonable diligence and best judgment in the exercise of professional skill and in the application of learning, in an effort to accomplish the purpose for which the professional was employed" *(6)*.

The second criterion is referred to as a "standard of care" requirement. The document includes several examples of ways in which a consultant design engineer could fail to meet the requisite standard of care. When a breach of these "standards of care" has been determined, the resulting damages must be evaluated.

The resolution of identified E&O and cost recovery process tries to achieve an administrative solution before resorting to legal action. The major steps in this process include the following:

- Caltrans staff compile a list of significant design changes and Contract Change Orders (CCOs) on consultant-designed projects and provide the list to the designer every quarter. All potential design breaches (PDBs) are forwarded to the Region Design Chief/ Deputy District Director of Construction, while the Project Manager is also kept in the loop. As a guideline, CCOs greater than $200,000 that are related to design changes, conflicts, ambiguities, errors, and omissions, as well as cumulative CCOs exceeding 10% of the construction project bid price, likely warrant further review.
- The Region Division Chief/Deputy District Director of Construction meets with other Region Division Chiefs/Deputy District Directors, Design and Program/Project Management, to review the PDBs according to these guidelines.
- If the team members feel that further review and action are warranted, the matter is forwarded to the Chairperson of the Management Review Panel (MRP).
- The MRP comprises two members: a Chairperson (the Headquarters Construction Coordinator assigned to the district) and a Headquarters Design Coordinator and/or State Bridge Engineer assigned to the district. The panel reviews the facts of the case, considering these guidelines to assess potential design liability. The MRP submits its recommendation to the Chief Engineer, recommending either that no action be taken or that further action should be pursued against the consultant design professional.
- If the Chief Engineer approves further action, he or she will appoint a representative or team to provide notice to the consultant designer and enter into informal discussions to try to resolve the matter. Caltrans' Legal Division and the Chief Engineer will be kept apprised of the status of discussions. Alternative dispute resolution methods, such as non-binding dispute review boards and facilitated dispute resolution, may be considered and, if agreeable to both parties, will be submitted to the Chief Engineer for approval and implementation. The consultant should be allowed to take part in discussions of additional costs due to design liability, and to review and comment on project changes that will increase the cost and for which the consultant may be held liable. If a mutual resolution is not attained, the representative will consult with the Legal Division and recommend to the Chief Engineer whether additional action should be taken.
- If the Chief Engineer approves legal action, the Legal Division will obtain a certificate of merit, i.e., a certification through an impartial third party that there is a fundamental basis for the complaint, a step required by California state law to reduce unnecessary lawsuits. State law also requires the plaintiff (in this case, Caltrans) to retain a consultant in the same discipline as the defendant and to present the facts of the case to that consultant for review and analysis. The consultant retained by Caltrans must also come to the opinion that the consultant design professional was negligent.

The entire Consultant Design Liability Assessment Process is also presented in an easy-to-read flowchart (see Appendix B, Figure 1) to visualize and enhance its implementation *(6)*.

Contract provisions governing the treatment of E&O are covered in Caltrans' standard agreement with consultant design professionals, Exhibit D, Section XVIII, "Damages Due to Errors and Omissions," which states the following *(7)*:

A. Architect-Engineer Consultants shall be responsible for the professional quality, technical accuracy, and coordination of all services required under this Agreement. A firm may be

liable for Department costs resulting from errors or deficiencies in designs furnished under its Agreement.

B. When a modification to a construction contract is required because of an error or deficiency in the services provided under this A&E Agreement, the contracting officer (with the advice of technical personnel and legal counsel) shall consider the extent to which the A&E Consultant may be reasonably liable.
C. Department's contracting officer shall enforce the liability and collect the amount due, if the recoverable cost will exceed the administrative cost involved or is otherwise in the Department's interest. The contracting officer shall include in the Agreement file a written statement of the reasons for the decision to recover or not to recover the costs from the firm.

Professional Liability insurance requirements are also included in Caltrans' Standard Agreement with consultant design professionals, Exhibit D, Special Terms and Conditions, Section XVII and carry the following requirements to E&O claims *(7)*:

- The consultant design professional must provide certificates of insurance for the minimum coverage below. The consultant is responsible for all deductibles and any self-insured retention.
- Professional liability insurance is required in an amount not less than $1 million per claim and $2,000,000 in the aggregate for low to medium risk and $4,000,000 for high risk.
- The consultant is required to maintain the insurance in effect throughout the term of the Agreement. The consultant shall maintain, or make a good faith effort to maintain, the Professional Liability insurance for three years after completion of work under the Agreement.

While the verbiage of these requirements is typical to that of other state DOT contract documents, the minimum required amount for professional insurance liability and its differentiation by the level of risk are not as common.

Caltrans performs the designer evaluation after PS&E at the early "Draft Contract" stage and then later again at the "PS&E Ready" stage. An evaluation may also be performed if there are addenda to the bid package during the advertisement period. The work of the designer is evaluated on a zero-to-five scale (5 = best, 0 = worst), considering the type and quality of the PS&E overall. The evaluation criteria reflect errors and omissions that are identified during design review but do not relate to design errors and omissions that are identified during construction *(1)*.

Finally, Caltrans has implemented a checklist as part of its quality control on the design. It lists several categories of items that must be checked to minimize errors and ambiguities. The items in the list are organized in the following six categories *(1)*.

- **Design**: Design calculations, check calculations, and supporting documentation are bound and properly identified; all differences have been properly resolved; and registration seals and signatures are affixed.
- **Plans**: Plans conform to Caltrans drafting standards and requirements (e.g., standard plans are listed; standard abbreviations and symbols are used; spelling is correct; trade

names and proprietary items are not shown; staged construction and traffic control are shown as applicable; are consistent in details and cross-references among sheets; are readable when reduced; and are properly signed and sealed.

- **Special Provisions**: Requirements for conformity, consistency, legibility, proper sealing, and signatures similar to those listed above; plus, the inclusion of complete, correct information for all items covered in the Special Provisions.
- **Estimates**: Quantity calculations and independent checks are bound, properly identified, and within allowable tolerances; estimates are appropriately rounded; quantities on forms are consistent with those in calculations; standard units of measure are used; reasonable unit prices and a working day schedule are included; and format and presentation requirements similar to those in above items are met.
- **Late Plan Changes**: Design calculations, independent checks, and supporting documentation have been prepared and submitted; road plans and bridge plans are consistent in details; Special Provisions have been modified as necessary; and quantities and estimates have been revised as necessary.
- **General**: Typical cross-sections, layouts, profile grades, super elevations, contour grades, and structure plans are consistent with approved project geometrics and current road plans; on structure projects with PS&Es produced by two or more consultants, elements of plans and details are coordinated and consistent; railroad requirements are coordinated; and justification for non-standard items of work is provided.

Florida

FDOT has a document entitled, *Resolution of Errors, Omissions, and Contractual Breaches by Professional Engineers on Department Contracts* (2019). The goal described in this document was to "establish a procedure to identify, investigate, and document errors, omissions, and contractual breaches in consultant-prepared construction plans and contract documents, or the performance of consultant construction engineering and inspection services on Department contracts; to determine and document the extent of consultant's responsibility for the cost of plan revisions and certain added construction costs or claims resulting from errors, omissions, and contractual breaches; and to establish a process to pursue recovery of certain added project costs" *(8)*.

The document provides the following key definitions:

- Errors and Omissions (E&O): Acts of negligence committed by the Engineer of Record (EOR) in the performance of engineering design service or creative work, and acts of negligence committed by a CCEI (Consultant Construction Engineering and Inspection) in the performance of construction engineering inspection services.
- Negligence: As defined in Rule 61G15-19.001(4), Florida Administrative Code: "A professional engineer shall not be negligent in the practice of engineering. The term negligence outlined in Section 471.033(1) (g), F.S., is herein defined as the failure by a professional engineer to utilize due care in performing in an engineering capacity or failing to have due regard for acceptable standards of engineering principles" *(8).*
- Contractual Breach: The failure of the EOR or CCEI to perform or comply with one or more aspects of its contractual obligations.

The document states: “When consultant errors or omissions, or contractual breaches, cause added project costs the Department shall evaluate whether to prosecute recovery of these added project costs. … the Department may utilize the Office of the General Counsel to assist with prosecuting the recovery of these costs. For this procedure only, “errors, omissions, and contractual breaches” shall be collectively referred to as “Errors and Omissions. … the Department shall vigorously pursue recovery of incurred construction Premium Costs which are considered to be due to consultant E&O. Recovery of undisputed E&O Premium Costs shall be pursued regardless of the dollar amount. The decision to pursue recovery of debatable E&O Premium Costs shall be based on a Benefit/Cost (B/C) analysis. Errors and Omissions – Benefit/Cost Analysis Evaluation Guidelines have been developed for use in these cases” *(8).*

The policy indicates that if E&O has been identified during the construction phase of a project, these issues may require design revisions and/or contract modification as a result of the performance of the designer. In this situation, all parties must work together to resolve these issues as quickly as possible in order to minimize construction interruptions. The Design E&O procedures involve the following steps:

- **Discovery**: Discovery by Construction starts the E&O management process.
- **Early Notification**: If the project issues appear to have been caused by designer E&O, the Design Project Manager (DPM) has the responsibility of providing the designer formal written notification of the nature and scope of the design issues and, if known, the resulting premium costs and contract time.
- **Evaluation**: All involved parties shall work together to identify, clarify, and evaluate a resolution of the project design issues. The DPM shall work with the designer to clarify the project issues by reviewing the plans and specifications, the designer’s original scope of services, and any specific requirements the department imposed on the designer to identify if any E&O issue is present.
- **Resolution Development**: All parties shall work collaboratively to determine an appropriate course of action for the resolution of the design issues. The designer may provide revised drawings, calculations, and specification changes to resolve the design project issues.
- **Negotiation and Implementation of Resolution with the Construction Contractor**: The department shall negotiate any additional cost and time required to implement the proposed resolution with the construction contractor. The construction contractor shall document the time and cost of a resolution with the construction contractor by a Work Order, Supplemental Agreement, or Unilateral Payment document.
- **Initial Assessment**: Successful recovery of damages caused by E&O is highly dependent on the initial assessment of the project issues.
- **Documentation and Evaluation of Premium costs and Coding**: The DPM shall evaluate the issue further to determine if the premium costs were the result of the designer E&O.
- **Designer E&O Notification**: The DPM shall evaluate the issue further to determine if the premium costs were the result of the designer E&O. The DPM shall notify the designer in writing of the department’s intent to correct project issues with the construction contractor. The notification letter shall state the department’s initial assessment of the project issues (premium costs, contract time and/or money, designer’s

responsibility) and request a written response. The DPM shall also notify the designer as a follow-up to the Early Notification if it was determined that there no consultant fault for the project issues.

- **Designer E&O Premium Cost Claim Settlement**: Upon receiving the response from the designer, the department should reevaluate the designer's responsibility for premium cost resulted from E&O. If the department determines that the consultant is only partially responsible for E&O, the DPM shall determine a lower amount which will be the basis for negotiation with the designer. If the department determines that the consultant is not responsible for E&O, the DPM shall promptly notify the designer of the results, and all reasonable costs incurred by the designer during this process shall be billable as post-design services.

The department should pursue the recovery of any premium costs that are the result of consultant errors and omissions. However, the extent of the department's recovery effort should be guided by the anticipated recovery amount and the likelihood of a successful recovery effort. Administrative costs, the expense of litigation, and the consultant's performance history may all affect the department's decision to pursue recovery. If at any point in the process, the department decides not to pursue recovery, the appropriate project manager shall justify and document the decision in the project file and notify the designer.

The department may accept services in-kind from a consultant, instead of money, as restitution for damages caused by errors and omissions. Such services shall be equivalent to the value of the damages incurred by the department and stipulated in a settlement agreement.

The department reserves the right to use legal actions against the designer if all negotiations fail. There is a two-year time period to bring a lawsuit for designer E&O cases. There is a $100K threshold to initiate a litigation process for E&O issues.

The entire Design E&O process is also presented in an easy-to-read flowchart (see Appendix B, Figures 2–6) to visualize and enhance its implementation. A similar cost recovery process is also developed to seek E&O against the construction contractors *(8)*.

The designer's performance is evaluated by FDOT and focuses on the following topics (*1*):

- **Schedule**: performance in meeting the project schedule. This rating is completed only for the design phase.
- **Management**: performance in managing the contract, including contract administration, management of issues and resources, communication/ documentation/ coordination, execution of work, and post-design services (included with the constructability evaluation). This rating is completed for both the design and the construction phases.
- **Quality**: performance in adhering to the established quality assurance plan and producing a quality product. Quality evaluations will be conducted for each major type of work that is advertised when the department announces its intention to contract for project design services. This rating is completed only for the design phase.
- **Constructability**: performance in providing practical, accurate, complete, and cost-effective construction plans. Constructability evaluations are provided for different

design features: e.g., roadway design plans and details, signing and pavement marking features, drainage features, and so forth. These ratings are completed during and following project construction. Comments will be entered by the Construction Project Manager based upon input from the construction contractor. The Construction Project Manager will also complete a management evaluation for the construction phase. These comments will be reviewed by the DPM for concurrence.

Ratings for all evaluations above are made on the following 1 to 5 scale: 1: Unacceptable performance; 2: Below Satisfactory performance; 3: Satisfactory performance; 4: Above Satisfactory performance; 5: Outstanding performance.

FDOT offers training on the E&O resolution process for both FDOT staff and consultants. It is intended to improve the overall quality of transportation infrastructure construction projects *(1)*.

Georgia

GDOT's *Procedure 22-6 - Errors and Omissions Cost-recovery* (2021) outlines the procedure and the responsibilities of employees and offices within the department to recover costs following the discovery of potential errors or omissions in design plans prepared by consultants. This procedure focuses specifically on issues discovered during the construction phase and is further supported by GDOT Policy 4020-4 and by the E&O Cost-Recovery Process Chart 22-6a. This is one of the most recently revised cost recovery procedures among state DOTs *(9)*.

The document provides the following key definitions *(1)*:

- Errors: Items in plans or other contract documents that are shown incorrectly.
- Omissions: Items in the plans or other contract documents that are not shown or included.
- Errors and Omissions: Design deficiencies in the plans and specifications, which must be corrected for the project to function or be built as intended.
- Degree of Care: The level of caution, prudence, or forethought legally required to avoid causing harm or loss to another person.
- Diligence: The degree of care and caution required by the circumstances of a person.
- Engineering Negligence (applying to the practice of engineering): The failure of a professional engineer to utilize due care in performing in an engineering capacity or failing to have due regards for acceptable standards of engineering principles.

Problem Discovery, Early Notification, and Assessment: When a problem arises in project construction, the Construction Project Manager determines whether the cause is due to a design error or omission. If so, the Design Project Manager (DPM) is notified to begin working on a response. This response will determine what should be done to correct or mitigate the problem and apparent responsibility for the problem. If the correction requires additional funds for redesign, an allotment will be requested, and net design costs will be estimated. The GDOT Office Administrator evaluates the E&O-related redesign and construction costs on each project against threshold values: $20,000 for a single occurrence, and $50,000 for cumulative occurrences. These threshold values reflect estimated administrative expenses to pursue an E&O claim. However, under certain circumstances, GDOT reserves an option to pursue the claim if the threshold is not met *(1)*.

Designer E&O Cost Recovery Procedure: The Chief Engineer reviews those E&O issues that were identified as warranting cost recovery. Once the cost recovery procedure is confirmed, the Office Administrator notifies the designer. The Office Administrator is responsible for conducting negotiations with the designer in an attempt to resolve the issue without litigation. If direct negotiations are unsuccessful, non-binding mediation with a third party (mediator) may be considered to help in reaching an agreement between the department and the designer regarding an equal share of associated costs and expenses.

If an agreement is reached, the designer can compensate GDOT with either direct payment and/or pro bono design services. Instances of design errors and omissions should be documented and included in the record of the consultant's past performance for consideration in future contracting opportunities. An errors and omissions cost recovery process flowchart (see Appendix B, Figure 7) outlines the process that will be followed by GDOT with respect to cost recovery following the discovery of potential errors or omissions in plan sets prepared by consultants under contract to GDOT *(9).*

Mississippi

The MDOT *Consultant Services Unit (CSU) Manual* (2020) does not provide term definitions or list professional standards of care; however, it describes the process of discovery, mitigation, and resolution of errors and omissions on projects and includes a graphical flow chart of the entire cost recovery process *(10).*

The introduction of Section 11 of the document states: "Errors and/or omissions can be identified at any time during the delivery of transportation improvement projects. In cases where an error and/or omission by the consultant is discovered before the construction phase of a project, the consultant shall correct the error and/or omission to MDOT and the MTC's satisfaction at no additional cost to MDOT or the MTC." Design E&O found during the construction stage of the project may be subject to cost recovery procedures. The E&O Process flowchart provides a visual guide for all steps of the cost recovery process *(10).*

Identification of Potential E&O: If potential E&O is discovered during the construction phase of a project, the MDOT Project Engineer assigned to the construction project should be immediately notified. Next, the MDOT Project Engineer shall promptly notify the District Construction Engineer and District Engineer, to determine if the issue could be due to negligence by the design consultant and to perform an initial assessment of the issue.

Internal Review: Once the E&O initial assessment is completed, the Assistant Chief Engineer (ACE) is notified and the Internal Research Team (IRT) is assembled to review the potential error and/or omission to determine the validity, responsibility, and extent of the problem. If the IRT decides that the consultant may be responsible for an error and/or omission on the project, the IRT will review additional details, including the potential effectiveness of cost recovery actions.

Designer Notification: If the IRT determines a potential error and/or omission does exist and if determined to proceed with further actions, the ACE shall promptly notify the consultant. This should help to minimize potential costly delays to the project and provides the consultant the

earliest opportunity to participate in determining a solution. The consultant should promptly present any findings from their internal investigation.

Meeting with the Designer: MDOT should arrange a meeting with the designer to discuss the situation in further detail and to determine the corrective actions to mitigate any additional costly delays to the project.

Recovery of Damages: As there is no specific formula for determining damages, the IRT may consider all relevant factors such as costly delays to the project to calculate damages due as a result of the alleged error and/or omission. Also, there is no minimum or threshold dollar value of damages required to trigger the process to recover such damages.

Appeal Process: The consultant has the right to appeal to MDOT's E&O Panel. The panel is assembled of MDOT staff appointed by the Chief Engineer.

Designer Performance Evaluation: The final performance evaluation for the designer should include an account of the E&O and how the consultant resolved the E&O issues.

An errors and omissions flowchart (see Appendix B, Figure 8) outlines the process that will be followed by MDOT to pursue cost recovery procedures *(10).*

New Jersey

NJDOT's "Potential Design Errors & Omissions Process Summary" and "Capital Program Management's Negotiation/Review Process for Potential Error and Omission against a Designer" were published in 2008 with the goal "to reinforce Design accountability and recover additional project costs due to carelessness or negligence from Consultant Designers" *(11,12).*

The primary objectives of the procedure are to communicate, as soon as possible, to the designer when a potential E&O is discovered, to minimize costly delays to the project, to provide the designer with the earliest opportunity to participate in determining a solution, to resolve issues and mitigate damages, and to establish a relationship between NJDOT and the designer that is fair and cultivates a working partnership *(11).*

The process includes the following steps:

- **Discovery**: The department is notified about the potential designer E&O issue.
- **Notification**: Once a potential E&O issue is identified, the department contacts the designer in writing as soon as possible.
- **Investigation/Verification**: The department conducts its inquiry and considers the consultant's response when verifying if there was an E&O issue and if the costs are recoverable. A designer may use several steps in defending, mitigating, or making a settlement.
- **Negotiation**: The department will enter into negotiations with a designer to recover a settlement. The negotiation process may take several steps.

- **Recovery/Collection**: The department and the designer may enter into a formal agreement to settle the E&O issue.
- **Tracking/Reporting**: The department utilizes its Project Reporting System (PRS) to track and report the status of each E&O issue.
- **Training/Evaluation**: The department's Program Management Office (PMO) will assist in conducting training of all involved personnel and in evaluating the procedures.

NJDOT set up different monetary limits of negotiating authority, depending on the rank/position of its personnel involved in E&O settlement. Administrative costs may be considered when weighing the decision to pursue the alleged E&O issue at different steps of the process, though there is no specific threshold to initiate the cost recovery process. Also, non-monetary factors may need to be taken into account that may be more important to NJDOT from a legal or functional perspective than costs when determining if the department needs to pursue damages from the designer, with the decision to be made on a case-by-case basis *(12)*.

NJDOT has implemented a design submission process involving quality assurance and quality control concepts. One of the objectives of this process is to identify design errors during the actual design, when they are more easily corrected, rather than at the end of the design phase *(1)*.

Finally, NJDOT has developed a Consultant Evaluation System (CES) to provide objective, consistent measures for assessing consultant performance. Consultant ratings allow the department to recognize good work, provide reference data for consultant selection in future projects, and give feedback to consultants as an opportunity to improve performance where needed *(1)*.

Texas

TxDOT's *Consultant Errors & Omissions Correction and Collection Policy and Procedures* (2014) offers a detailed description of the E&O cost recovery process and procedures. The document is designed to further improve the E&O policy issued in 2007 and has the following primary objective *(13)*: "…to enforce its contracts with engineering, architectural, and surveying consultants to ensure the delivery of quality professional services, the prudent expenditure of public funds, and the preservation of cooperative business relationships."

To implement this policy, TxDOT issued procedural guidelines for handling claims arising out of apparent errors and omissions. These procedural guidelines include instructions for special coding that will make clear if a change order results from E&O; whether E&O resulted from work performed by a consultant, by a TxDOT employee, or from some other cause; and a process for determining the cost to fix the issue.

According to the document, E&O identified before the construction stage should be corrected at the designer's expense with no additional cost to TxDOT. E&O identified during and after construction and resulting in additional costs that TxDOT would not have incurred if the construction plans had been correct are considered damages that the department is entitled to collect.

TxDOT recognizes that E&O issues can be found even in the best contracts and that communication with the designer is the key to minimize delays and additional costs associated with the resolution of the problem. The department recommends, when practical, to keep the designer contract active through the construction phase, as well as including the designer and TxDOT Design Project Manager (DPM) in the pre-construction meeting.

If an apparent E&O that may result in a change order is discovered, TxDOT must notify the designer and allow them to assist in addressing the problem. To find responsibility for E&O resulting in change orders, adequate communication should occur between appropriate TxDOT staff to assess all related factors. Examples of appropriate factors to be considered include are as follows *(13)*:

- Specific directions provided by TxDOT during the design stage.
- Designer's scope of work.
- Project information provided to the designer.
- The type of project and necessity for assumptions.
- Applicable standards and specifications in effect when the work was done.
- Changes to department policy, standards, and specifications that occurred during the design.
- Changes in site conditions after the project was let (e.g., new development, redevelopment).
- The relationship of the problem to previous changes approved in the construction contract.
- The decision by TxDOT or the contractor to redesign, move, extend, or change something because of field conditions that could not have been reasonably anticipated by the designer.
- The construction contractor's use of applicable plan sheets and the irresponsibility to comply with the construction contract and notify the department of a potential conflict or problem.
- Any other design coordination issues that may have affected the development of the plans.

Change orders are tagged with a reason code identifying the cause of the modification. There are seven categories that include over 40 change order reason codes. The E&O category includes five reason codes, with only three codes that may indicate the designer's responsibility. The reason codes applicable to TxDOT designer's plans are provided in Table 2.

Table 2: TxDOT Reason Codes applicable to designer's plans

Reason Code	No Additional Cost	Recoverable Additional Cost	Responsibility cannot be identified and no basis for negotiating the distribution of responsibility
1B Incorrect PS&E	X		
1E Delay/rework		X	
1C Other			X

However, in some cases, change order costs resulting from E&O presented under reason code 1E are not automatically and fully the responsibility of the designer. Many factors should be taken into consideration while determining the designer's degree of responsibility, such as:

- The level of services provided.
- The cost to TxDOT of the services provided and of the apparent E&O.
- The value of the services provided.
- The consultant's overall performance.
- Other appropriate factors listed earlier.
- Any negotiation or compromise with the consultant.

When the designer's degree of responsibility is determined, TxDOT must notify the designer and allow the designer to address the matter and document all communications. After all negotiations with the designer and the final determination of the recoverable costs, TxDOT will proceed with the formal payment request. The department does not accept in-kind services as payment for additional costs owed.

In Texas, the statute of limitations is four years. If payment is not received, the Attorney General's Office has four years from the time the designer's contract terminates to file suit for cost recovery.

Finally, TxDOT has a web-based designer evaluation system that inputs rating data directly into the department's Consultant Contract Information System. The evaluations have two purposes: (1) to provide a tool for feedback to consultants on their performance, and (2) to establish a database for consultant selection on future projects.

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3.0 Results

All state DOTs are required by federal regulations *(14)* to have written procedures regarding E&O by consultant design professionals. However, many state DOTs only have written documentation for contract provisions; professional liability insurance requirements, as well as implementation and enforcement of these procedures, are still often on a case-by-case basis rather than on a systematic approach. The research team identified 25 state DOTs that document their cost recovery procedures and selected six state DOTs with the most comprehensive and relevant procedures for further analysis to serve as a guide to improve MassDOT's current Cost Recovery Procedure.

Based on the analysis of the six state DOT cost recovery procedures and practices reviewed, as well as a review of cost recovery documents prepared by federal transportation agencies and other stakeholder organizations, the research team concluded that there are a number of key elements that should be considered for inclusion in state DOT cost recovery procedures. They include the following:

1. **A statement on the purpose, foundational principles, and scope of the policy**. For example, a good purpose could be the improvement of the overall quality of design rather than just cost recovery. Foundational principles may include close cooperation between the DOT, the designer, and the construction contractor in analyzing and correcting errors and omissions efficiently; the recognition that even the best project design can have some E&O; the expectation that the designer should perform to the standard of care established for the business; and the application of the cost recovery policy in cases where a breach of the contract or reasonable standards of care, such as negligence, is apparent.
2. **A clear definition of all major terms, such as "error," "omission," and "negligence,"** should be provided in the policy to avoid any misinterpretation.
3. **Implementation of a Quality Assurance and Control (QA&C) element should be initiated during the design submission process** to identify design errors during the actual design, when they are more easily corrected. Depending on the project complexity and some other factors, this QA&C element can be done in-house by the department and/or may involve a third-party consultant. Note that this process is intended to eliminate the most obvious design-related mistakes and is not intended to completely eradicate the possibility of E&O.
4. **Notification of the designer should be done immediately upon the potential problem discovery** to (a) ensure that the design intent is properly interpreted; and (b) find the most effective and efficient solution if there are any design deficiencies.
5. **Acknowledgement of the "betterment" principle** by recognizing that the designer should not be responsible for additional materials or construction that are required to complete the project and/or desired by the department even though they were omitted or miscalculated on the design plans; had they been properly identified initially, the costs of the omitted items would have been paid by the department, regardless.
6. **The decision to pursue the cost recovery should be made at the end of the project,** when the totality of the services can be taken into consideration to fully appreciate the level of quality, performance, and value of the entire project.

7. **The evaluation of potential E&O should be based on negligence or the failure to adhere to the standard of care** established in the business.
8. **The costs associated with the recovery process should be weighed versus the actual damages, amount being pursued, and likelihood of recovery**.
9. **A threshold to initiate the cost recovery process** to minimize unnecessary workload to the department cost recovery team and to let them focus on the most significant issues. At the same time, reserve the right of the department to pursue the cost recovery, even if the threshold is not met in cases of severe negligence from the designer.
10. **A multi-stage negotiation process that includes the ability for the designer to appeal** and to involve a third party for an independent review of the case.
11. **Steps to release the designer from future liabilities** regarding that issue when the case is resolved to encourage proactive participation and the timely closure of issues.
12. **The designer should be actively involved in construction and initial operation stages**.
13. **The department should evaluate the designer for each completed project in several categories**, including a record of encountered major E&O issues and how such issues have been resolved.

4.0 Conclusions and Recommendations

The research team found that many key elements listed in the previous section are already included in the current MassDOT Cost Recovery (CR) Procedure. Overall, the completeness and level of detail of the 2017 MassDOT CR procedure are on a similar level with the elite group of six state DOT cost recovery procedures analyzed in this report. A few areas where the current MassDOT procedure could be further improved include the following:

- Develop better and clear definitions of key terminology and use them consistently in contract documents; Caltrans and FDOT can be used as an example.
- Revise the evaluation of potential E&O to focus on negligence and/or the failure to adhere to the standard of care. Appropriate language should be added to all design projects with MassDOT.
- Encourage the designer's involvement in the construction and early operation stages of the project.
- Reconsider the threshold to initiate a cost recovery process; the current amount of $5,000 is based on the dated 1997 CR policy and much lower construction costs. Consider at least $20,000 for a single occurrence and $50,000 for cumulative occurrences.
- Consider establishing a threshold to initiate litigation, with at least $100,000 as a starting point.
- Improve the designer evaluation process; consider the implementation of evaluation methods as outlined in the Caltrans and FDOT cost recovery policies; and establish a designer's rating database with MassDOT.
- Expand a training program on both project delivery and cost recovery process for MassDOT employees, designers, and construction contractors. Such training could be offered through the Bay State Roads Program. The training can be added as an independent module to the existing training program.

Finally, it is recommended that the MassDOT Highway Division provide a higher level of oversight for the large (particularly those over $10 million of initial certified estimate of cost) and complex construction projects which, based on the study and national survey *(4)* cited in Section 2, tend to run over budget more often than smaller projects and thus create significant cost overruns. These projects also constitute just a small percentage of all contracts. This change could reduce the workload for the MassDOT Cost Recovery Standing Committee and other participants in the cost recovery process; reduce cases of severe cost overruns, which become especially costly if not addressed until later stages of the project; and help to improve the quality of design in large construction projects.

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6.0 Appendices

Appendix A: Identified State DOT Cost Recovery-Related Documents: A Summary

Table 3: Summary of state DOT cost recovery procedures

State	Year	Threshold to Initiate CR Procedure	Stand-Alone Document	Insurance	Flowchart	Level of Details
Arizona	‘19	5% or $20K	Y		Y	**High**
California	‘04	10% or $100K	Y	Y	Y	**High**
Florida	‘19		Y		Y	**High**
Georgia	‘21	$20K/$50K	Y		Y	**High**
Idaho	‘17					
Illinois	‘17	$20K/1% over $2M				
Indiana	‘17					
Louisiana	‘16		Y			
Maryland	‘18		Y			
Massachusetts	**‘17**	**$5K**	**Y**	**Y**	**Y**	**High**
Michigan	‘05					
Minnesota	‘13		Y			
Mississippi	‘20				Y	**High**
Missouri	‘12					
Montana	‘19				Y	**High**
Nebraska	‘16					
New Hampshire	‘16					
New Jersey	‘08		Y			**High**
New Mexico	‘18		Y	Y		
North Dakota	‘07		Y			
Oregon	‘07		Y			
Pennsylvania	‘19					
Texas	‘14		Y			**High**
Washington	‘16					
Wisconsin	‘21					

Note: High level of details indicates cost recovery documents with comprehensive description of the cost recovery procedure that exceed Federal requirements. Such documents represent the initial set of selected documents that was considered for further analysis during this study.

Appendix B: Selected State DOT Cost Recovery Process Flowcharts

Flowcharts of cost recovery process from selected state DOTs are presented in this appendix. Selected DOTs include Caltrans, FDOT, GDOT, and MDOT.

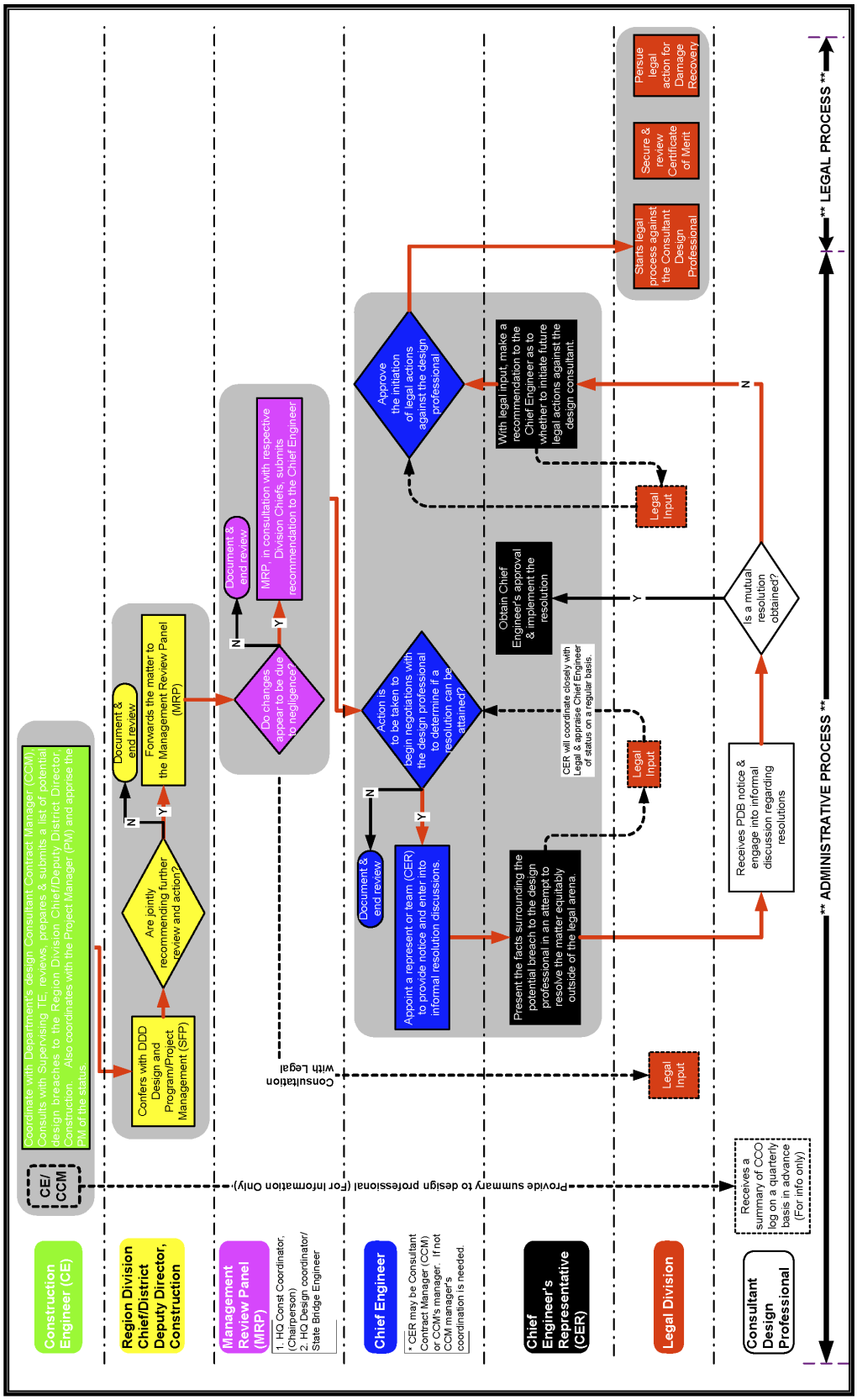

Figure 1: Caltrans Consultant Design Liability Assessment Process

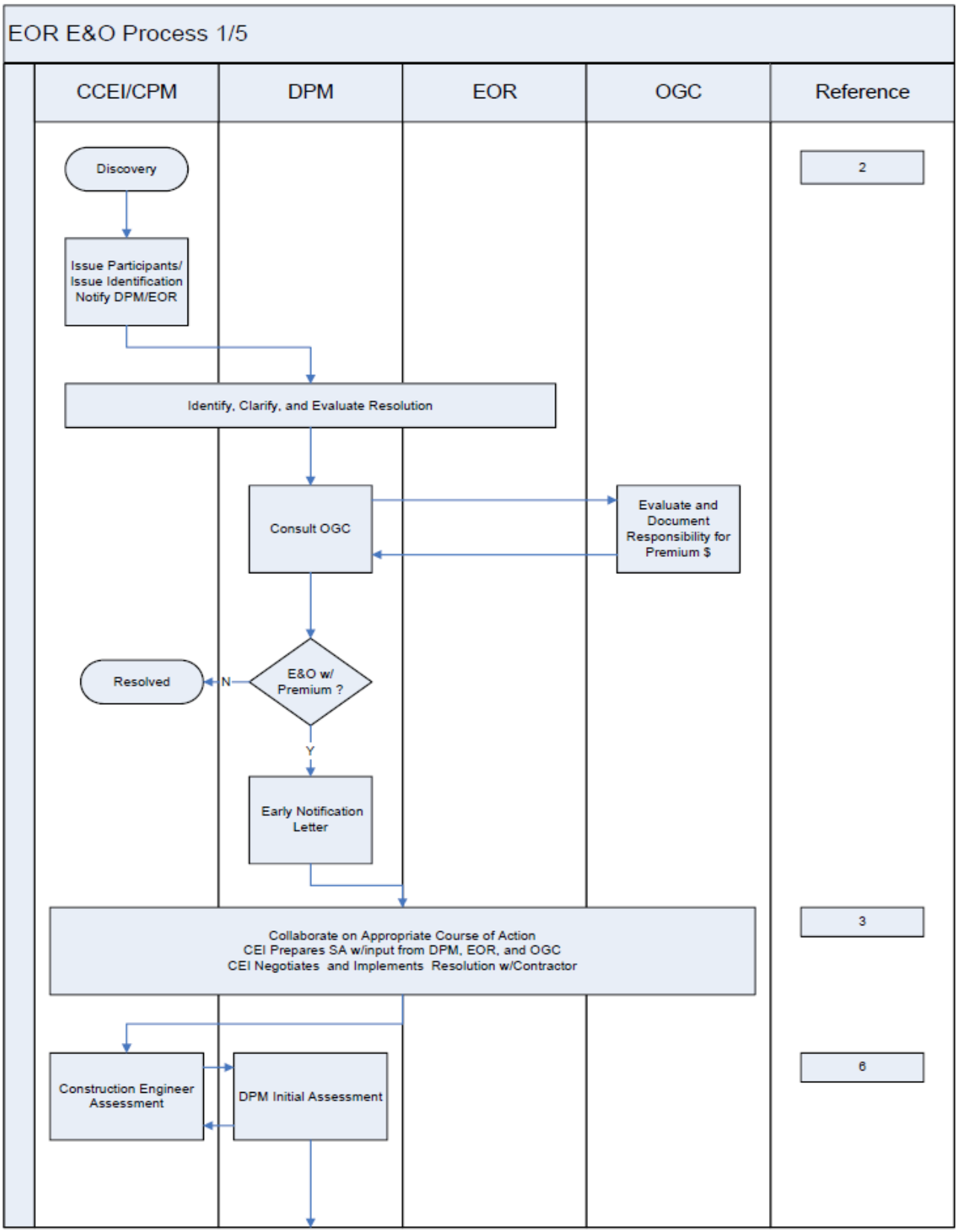

Figure 2: FDOT Design E&O Process flowchart

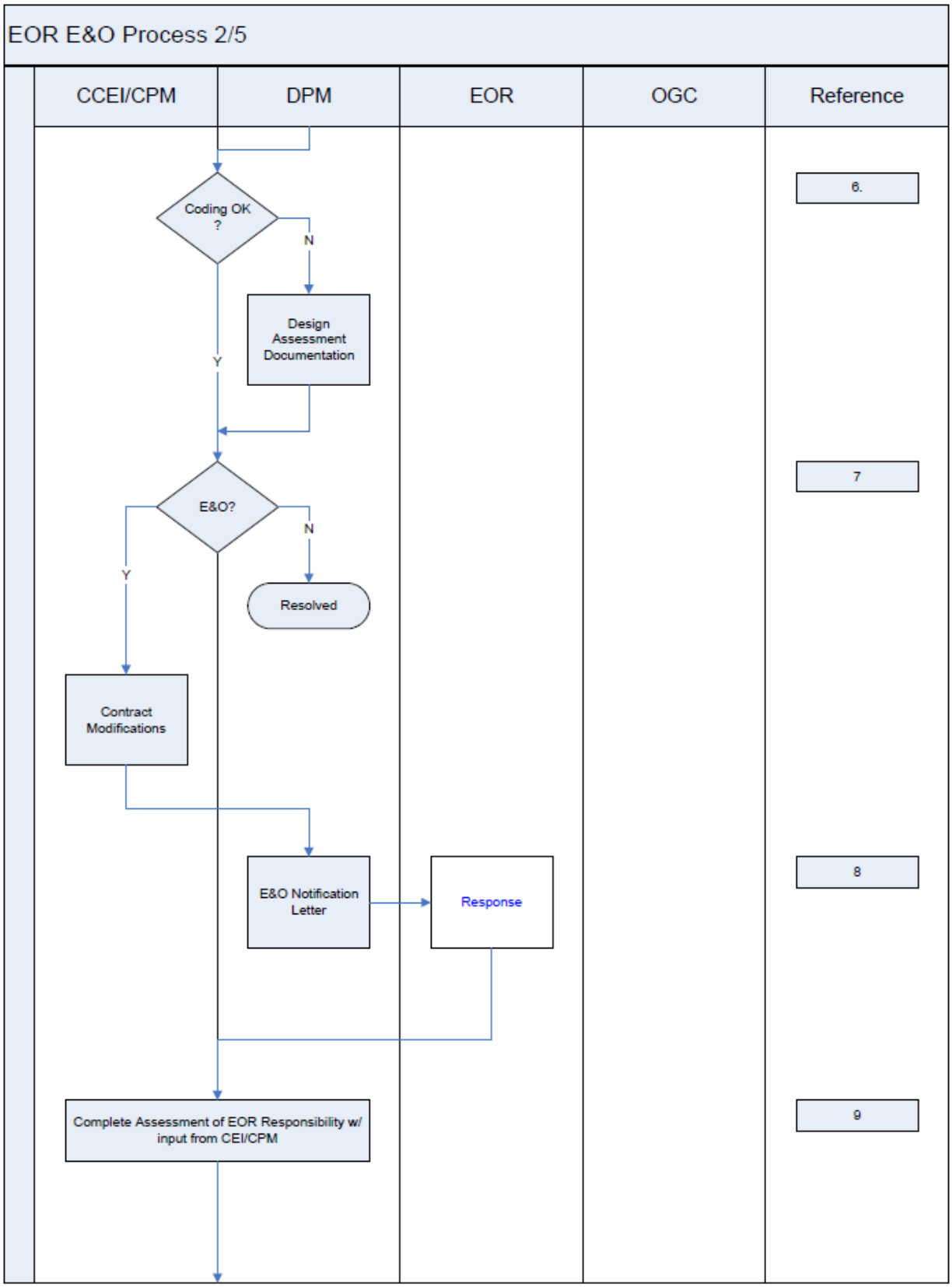

Figure 3: FDOT Design E&O Process flowchart (Part Two)

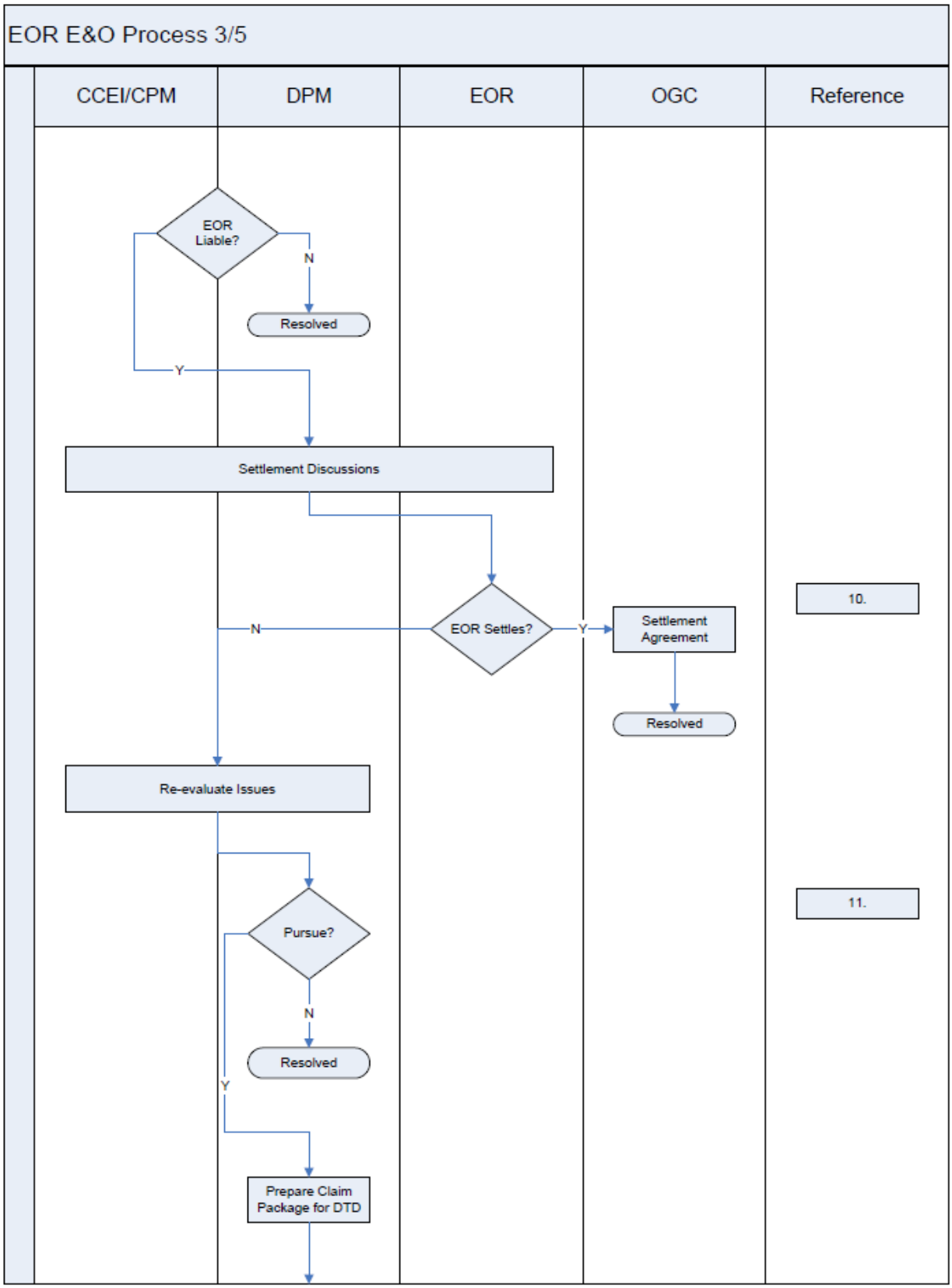

Figure 4: FDOT Design E&O Process flowchart (Part Three)

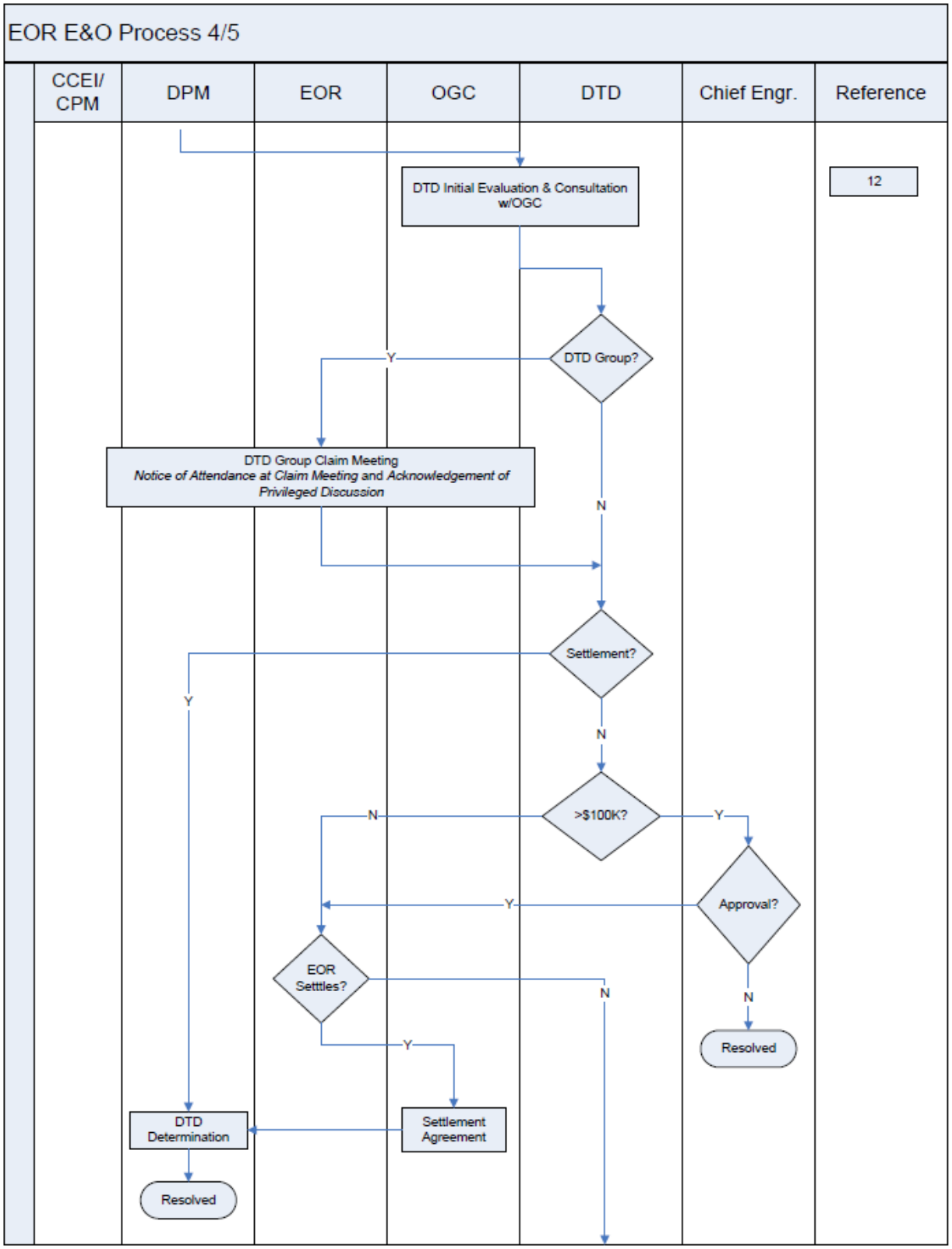

Figure 5: FDOT Design E&O Process flowchart (Part Four)

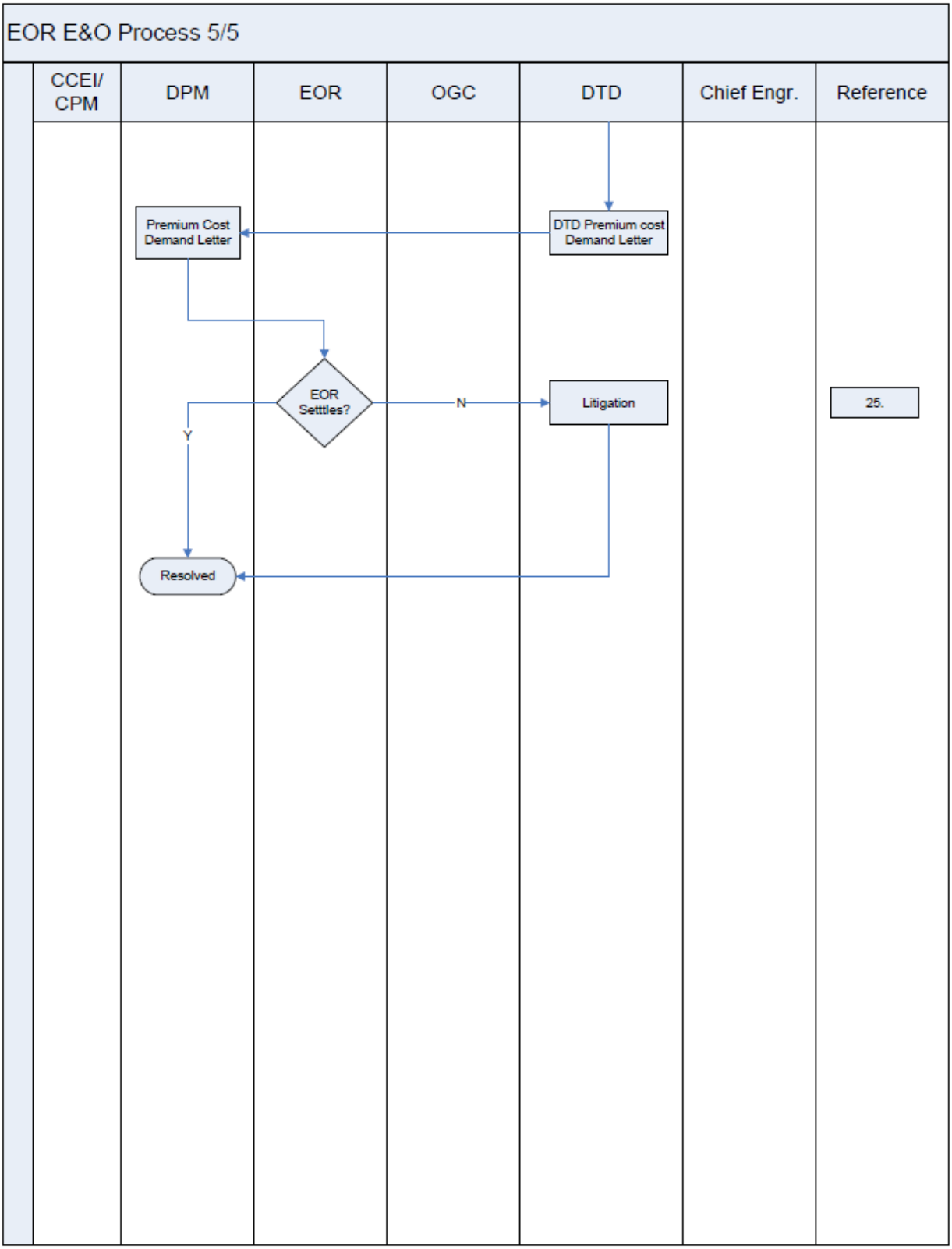

Figure 6: FDOT Design E&O Process flowchart (Part Five)

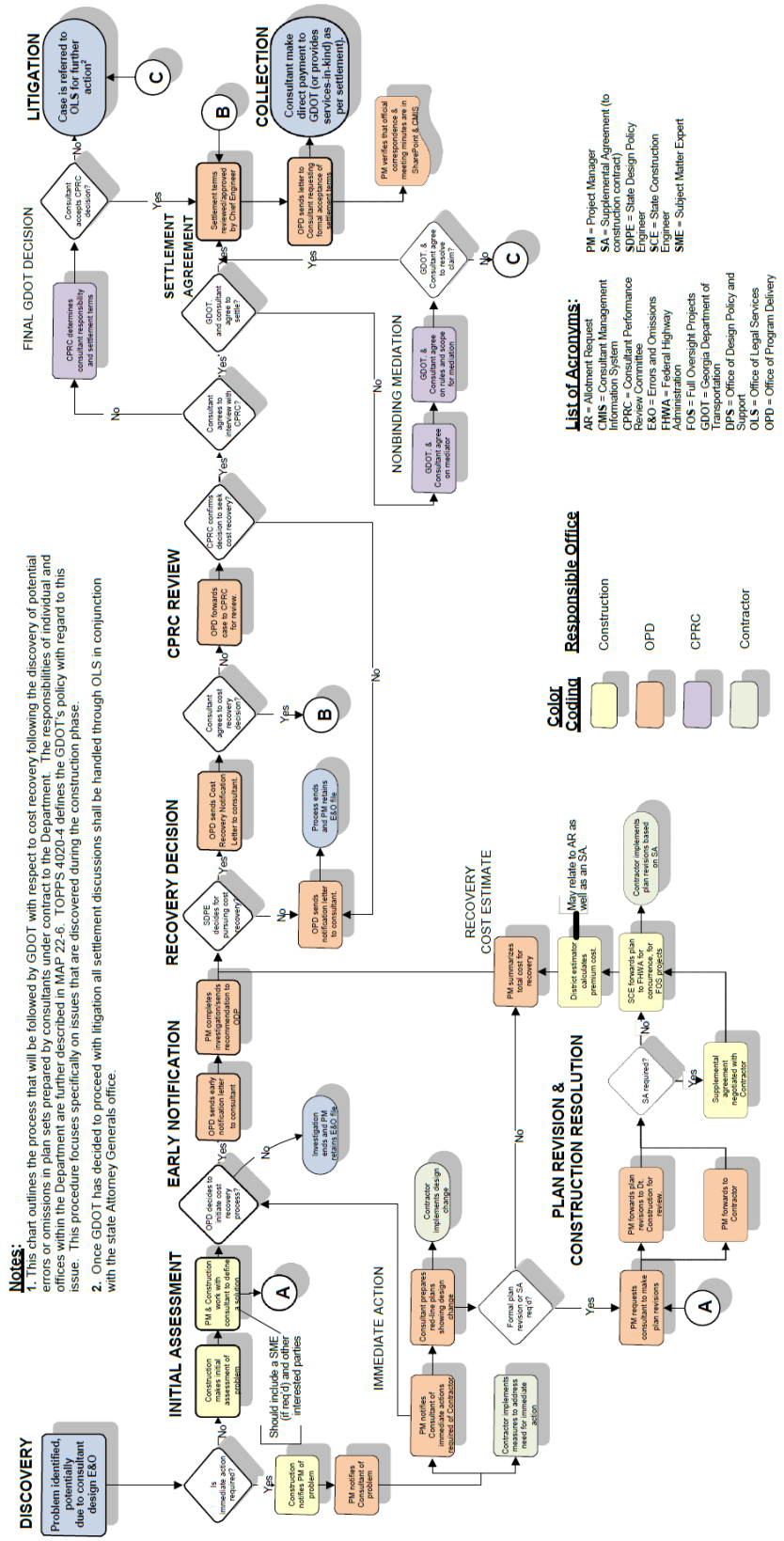

Figure 7: GDOT Design Errors and Omissions Cost Recovery Process

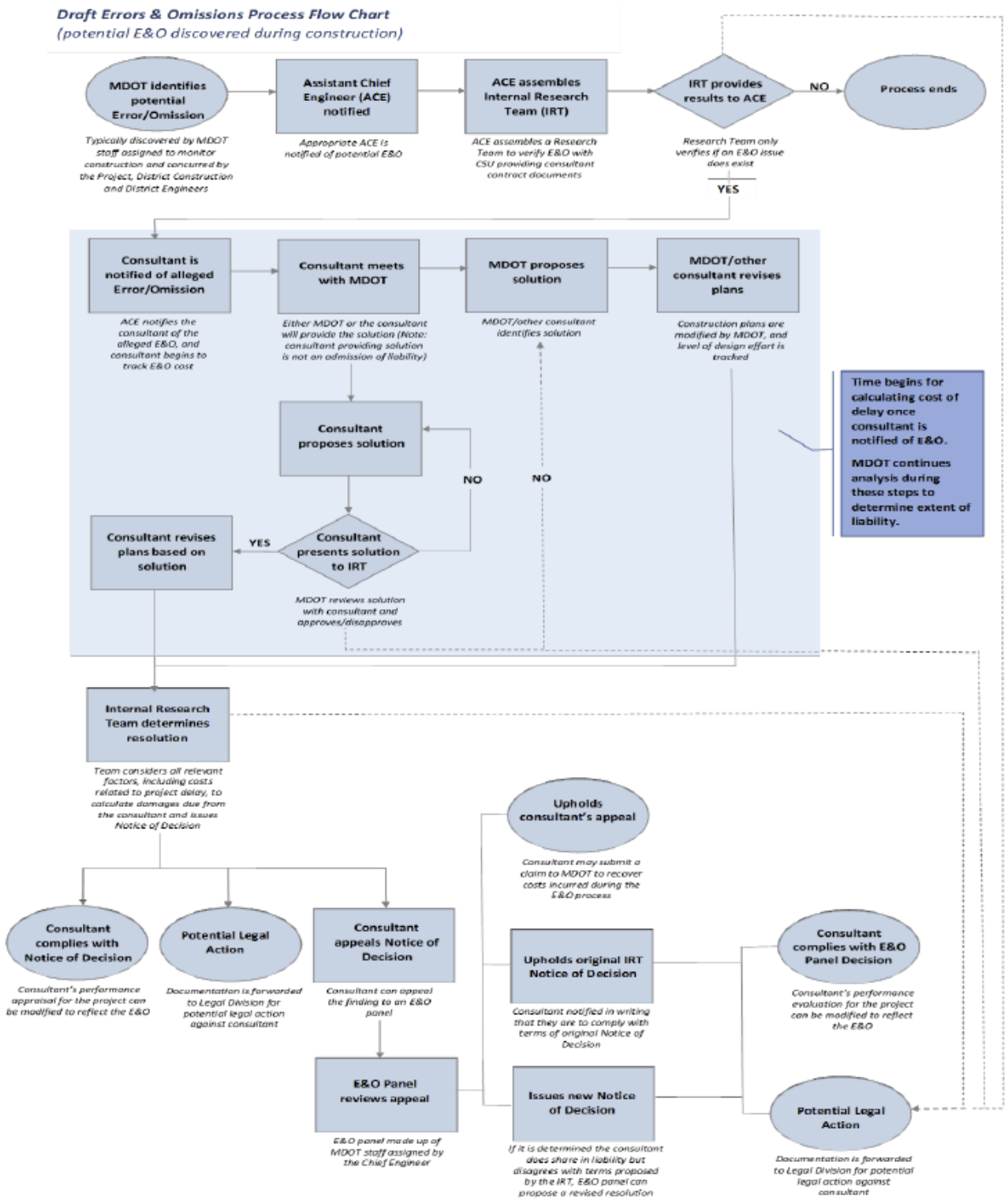

Figure 8: MDOT Errors and Omissions Process flowchart

Appendix C: MassDOT Cost Recovery Process Modified Flowchart

A modified flowchart of the MassDOT cost recovery process is presented as follows. Proposed changes are highlighted.

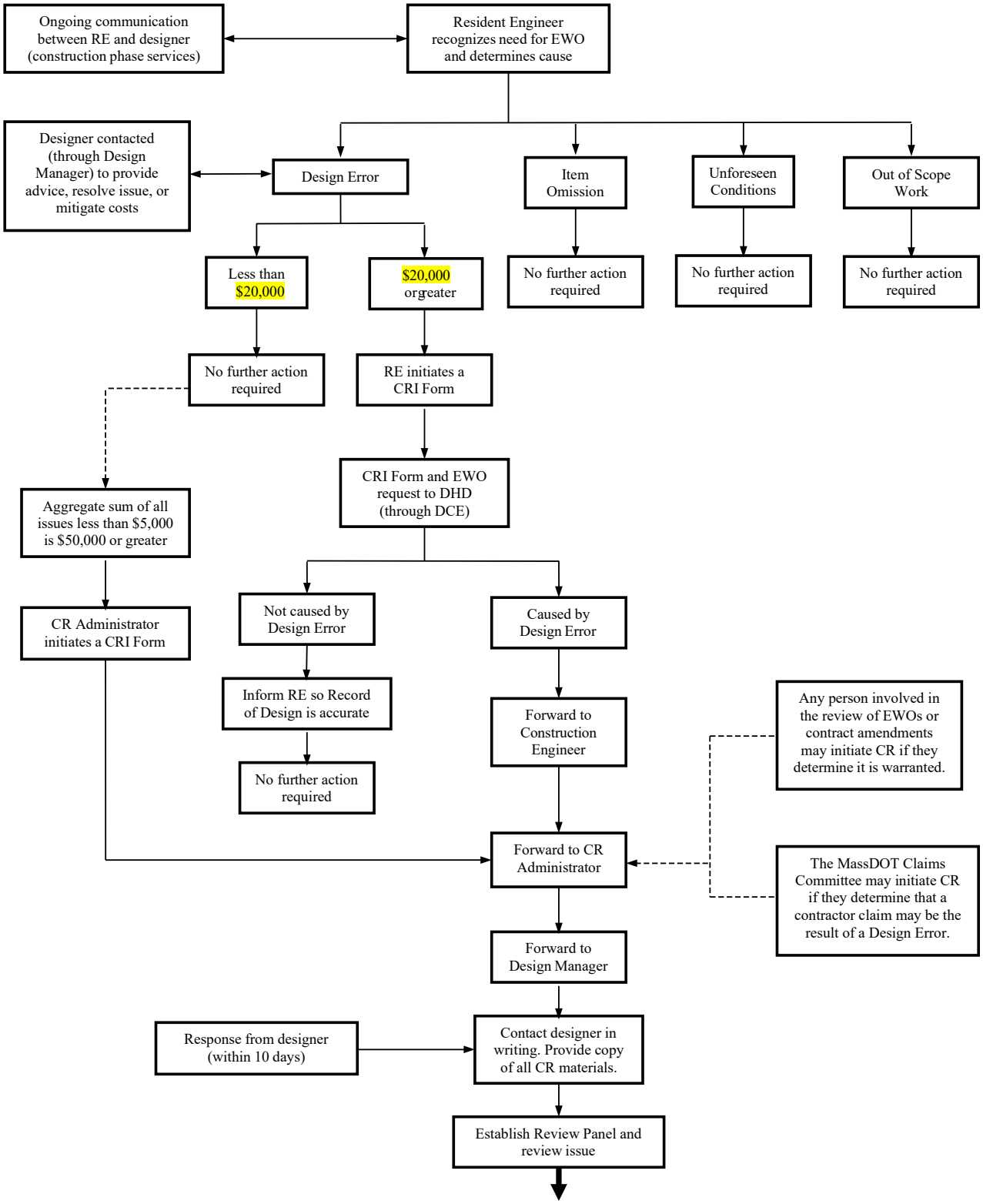

Figure 9: Flowchart of MassDOT Cost Recovery Process

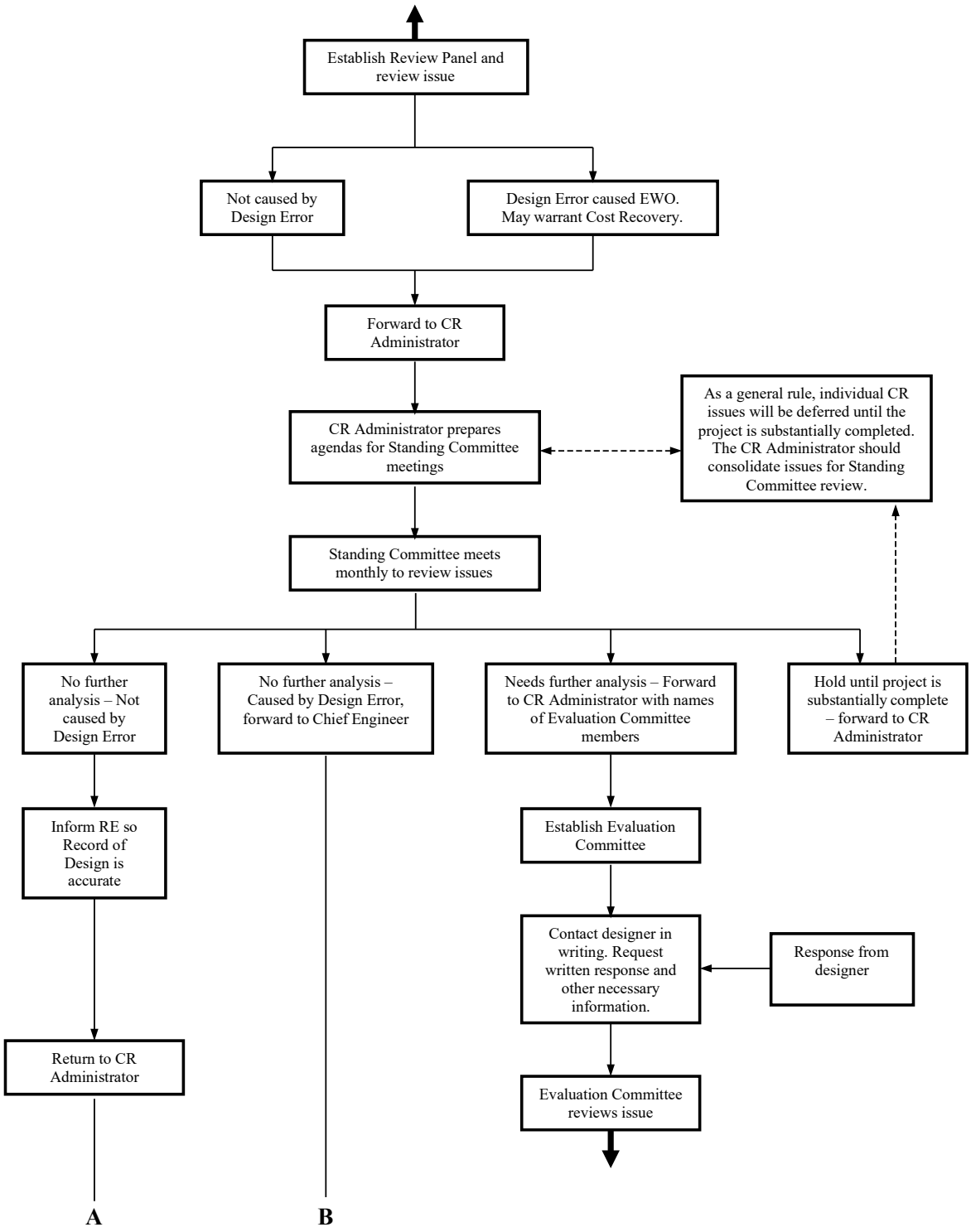

Figure 10: Flowchart of MassDOT Cost Recovery Process (Part Two)

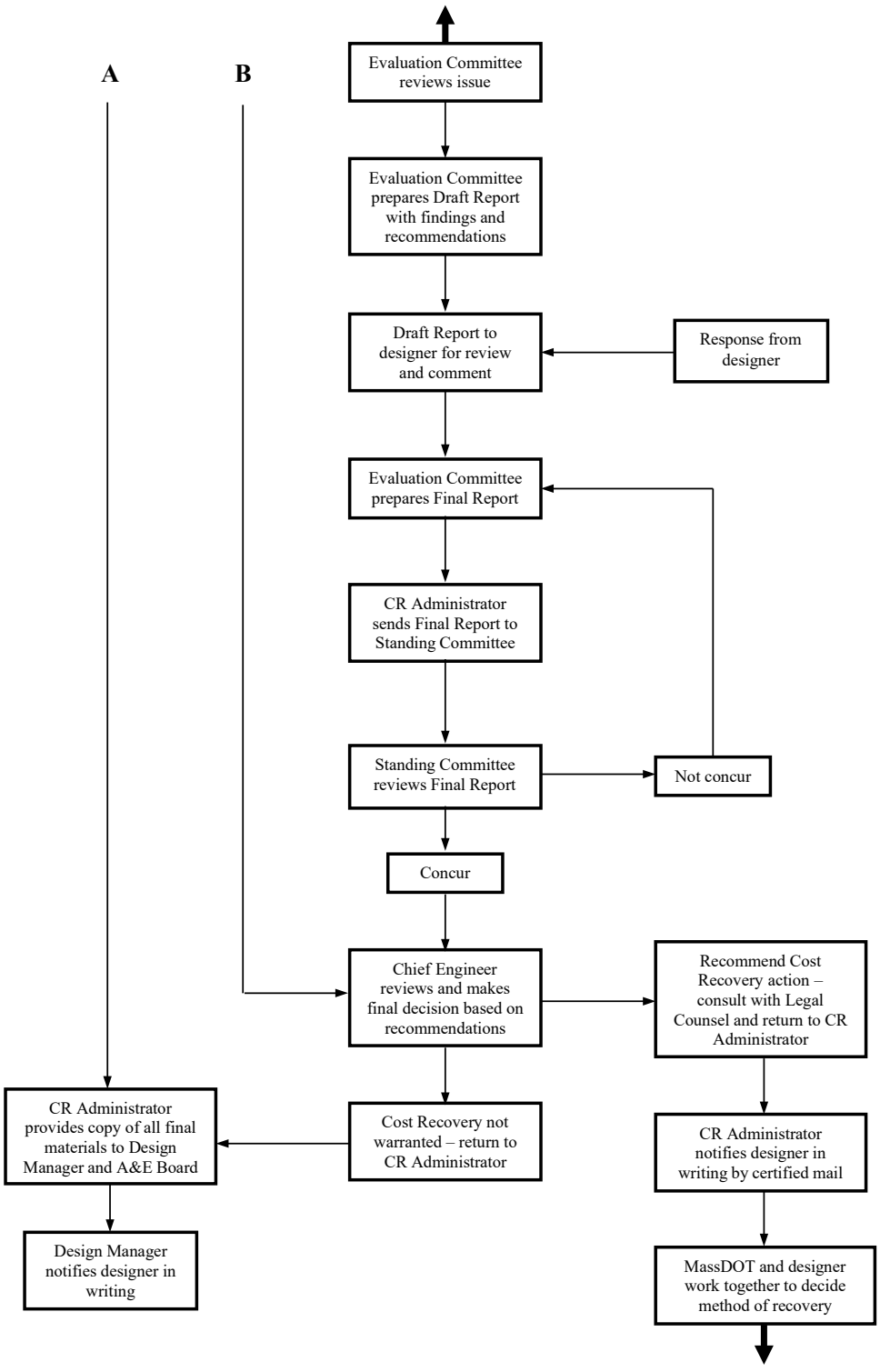

Figure 11: Flowchart of MassDOT Cost Recovery Process (Part Three)

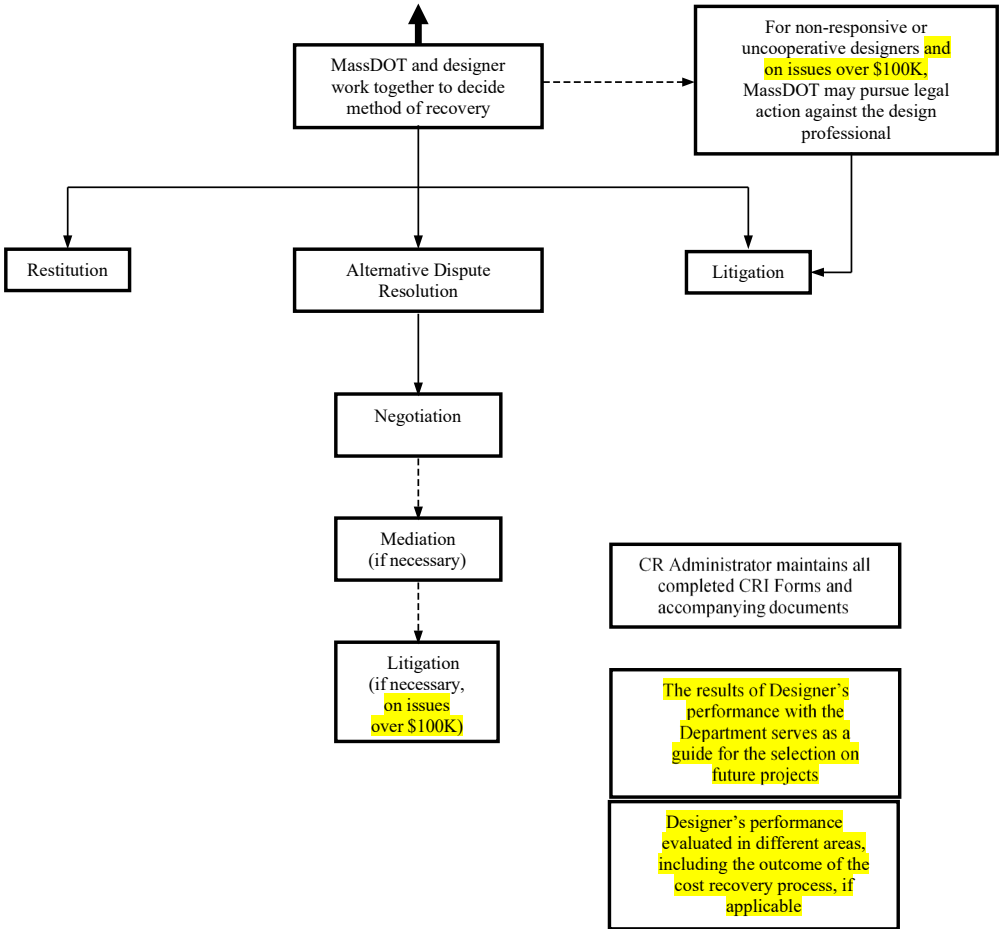

Figure 12: Flowchart of MassDOT Cost Recovery Process (Part Four)