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MANAGEMENT

Good Practice Guide
GPG-FM-015

Project Reviews

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Department of Energy
Office of Field Management
Office of Project and Fixed Asset Management

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1. INTRODUCTION

This Guide is not mandatory but it is designed to inform the project manager of various types of project reviews that can be performed at various stages of a project for effective project management. This Guide describes the purpose, scope, and circumstances that dictate reviews of a project at various stages of its life cycle. Individual types of reviews are listed under each review category section, and details can be found in documents referenced in the Suggested Reading section. Alternative implementation methods are also presented.

This Guide is applicable to any project management environment in which multiple efforts and uncertainty exist. These reviews are essential for the program/project managers to maintain confidence that project systems, processes, and technical efforts are integrated and coordinated effectively, progress of the project at an effective and acceptable rate, to support of project objectives.

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2. PROJECT REVIEW PRINCIPLES AND PROCESSES

Purpose for Project Reviews

A structured review process provides knowledge to make necessary decisions, and demonstrate and confirm project's accomplishments at various stages in its life cycle and its ultimate success through achievement of the following review objectives:

- ensure readiness to proceed to subsequent project phase(s);
- ensure orderly and mutually supportive progress of various project efforts;
- confirm functional integration of project products and efforts of organizational components;
- enable identification and resolution of issues at the earliest time, lowest level, and lowest cost;
- support event-based decisions; and
- control risk.

Many variables such as size, scope, and regulatory pressures exist that cause individual projects to vary significantly. Project processes and functions necessarily tend to be more rigorous and formalized on larger more complicated projects than on smaller projects. However, many universally applied basic functions and processes must be performed effectively to achieve successful project completion based on a graded approach considering project size, complexity and other specifics. The project manager in consultation with HA program managers must establish a review process for each project at various stages of its life cycle to ensure successful execution and completion.

Project Review Application

Project reviews can be performed on a checklist or professional peer review basis. The checklist basis tends to be more objective and the peer review tends to be more subjective and qualitative in nature.

A review checklist can be completely developed for the specific review subject, can be based on existing generic checklists, or can be based on similar topical checklists from other projects as shown on Attachment 1, Preoperational Checklist (also see section 4, Suggested Reading). If other checklists are utilized, they should be tailored to the specific needs and circumstances of the subject project and project component being reviewed.

Peer reviews may be facilitated with predetermined lists of questions to be posed by professional peers. However, peer reviews should rely on the professional judgement of a competent review official whose area(s) of expertise directly corresponds to the subject matter, and should not need such predeveloped material. Peer reviews can be extremely effective, especially regarding recognition of unforeseen (in review planning) problems and areas that warrant further scrutiny, understanding and validation of extraordinary actions or processes, in offering constructive criticism, and in suggesting innovative enhancements and solutions.

Regardless of whether the review is peer judgement or checklist based, the following components of any review should be previously identified, planned, and/or coordinated:

- specific review objectives;
- organizations/personnel to be reviewed;
- review officials; and
- risk areas (to be reviewed at greater levels of detail).

Project review processes should be balanced. Impact to the project can be mitigated by planning for the review and clearly defining the review objectives and policy to both the review and project team members.

A risk-based graded approach should be applied in determining the quantity and level of detail to be reviewed. Simpler areas that offer low risk of project impact should necessarily receive less scrutiny than high risk areas; those potentially costly areas, or areas on which problems seem to be developing.

Depending on the objectives and type of review, review officials may be internal knowledgeable personnel involved in the project, or preferably, external, independent, unrelated personnel.

The level of proficiency and acceptability of the review subject can be judged based on a variety of methods including any combination or degree of application of the following approaches:

- strict adherence checklist;
- weighted component checklist;
- peer review analysis and report; and
- follow-up to previous review findings.

A strict adherence checklist approach requires that all checklist items be satisfied and useful.

A weighted component checklist can be used as a project assessment system for the project manager when the items to be reviewed have significantly varying degrees of importance and 100 percent checklist compliance is not essential for approval. The value or "weight" can be applied to each of the elements on the checklist, representing the element's relative importance to the project (it can be simpler to make all of the weights add to 100) . Each item can then be graded by the review officials using a uniform (and preferably simple) scale (i.e., excellent, good, fair, poor :: 4,3,2,1). Weight x Grade = Weighted Value for each element. Σ Weighted Value can be taken as a percentage of total possible value to indicate how well the review subject performs against the assessment model.

2.1 Types of Project Reviews

Reviews can be categorized into two major types:

- technical reviews
- decision point reviews

Both technical and decision point reviews often include reviews of project control systems, and decision point reviews often include technical review content.

Technical Reviews

Technical reviews are often necessary for determination of whether complex issues have been resolved satisfactorily, for determination of whether or not such issues exist, and for assistance in resolution of such issues.

The specific types of technical reviews listed below are performed as either incremental or major reviews, and are further described under section 2.2, Review Application and Project Phasing.

- Alternative Systems Review (ASR)
- System Requirements Review (SRR)
- System Functional Review (SFR)
- Preliminary Design Review (PDR)
- Detailed Design Review (DDR)
- System Verification Review (SVR)
- Physical Configuration Audit (PCA)
- Test Readiness Review (TRR)
- Functional Configuration Audit (FCA)

The performance of technical reviews is necessary virtually whenever uncertainty about the outcome of a project effort exists. If a design is new, untried and unproven, and no standards against which judgements regarding viability can be made, then a review by appropriately trained and knowledgeable peers is probably in order. However, if credible standards for judgement of adequacy do exist, then specific quantified criteria for approval can be predeveloped and tested, often successfully by less senior people.

Technical reviews include reviews of project control systems. Project control systems are the means by which project scope, schedule, and cost baselines are documented, maintained, monitored, analyzed, and reported, and are integral to successful project management and execution. They facilitate effective project execution and timely project completion within reasonable cost when applied appropriately. It is doubtful that complicated projects could be executed effectively without such systems. When over applied, these systems can defeat their purposes and be ineffective and costly. Therefore it is necessary to assure that these systems exist, are applied and integrated commensurate with project complexity and risks, provide meaningful, necessary, and appropriate services and information, and are cost effective, especially prior to embarking on major project efforts or phases.

Project control system reviews should be performed at various project phases and at programmed times to assure project status and performance is correct for input into budget process or secretarial actions. Project control system reviews should also be performed whenever a project manager suspects over-, under-, or ineffective application of project controls.

Reviews should result in a knowledge of the degree to which the following attributes are inherent in the system, and what can be done to correct any deficiencies:

- efficient operation (minimal redundancy, imposition on project participants, and cost);
- effective, meaningful, and practical analysis and reporting; and
- support to project objectives.

Additionally, subordinate project control elements may become subjects of independent reviews. For example, change control and baseline management, scheduling, progress assessment, cost control, project cost forecasting, and estimating are each subtopics of project controls that might warrant exclusive scrutiny.

Project control system reviews are often performed as a component of decision point reviews because it is imperative that sound management systems exist for effective initiation of key project phases. However, performance of independent project control system reviews is often appropriate. Complicated projects often require sophisticated and therefore complicated project control systems. A project manager may wish to insure that a system can provide the value for which it exists without excessive cost to the project, prior to initiation of the system. Also, during the course of a project, it may become obvious that the manager is not receiving the significant, timely information necessary for effective management. Remedial actions beginning with in-process review of certain appropriate management systems may be warranted.

The project manager should clearly identify the reason for an in-process review of the project control system, and the objectives of the review for both project and review team personnel. The review should be planned well and executed rapidly. The project manager should also consider using external, unemotionally attached resources for performance of reviews, because project control systems often affect most project participants and can provoke bias in internal project review personnel.

Decision Point Reviews

Decision point reviews are performed to verify that sufficient (often prescribed) progress has been achieved, level of information has been developed, and requirements have been satisfied to effectively initiate performance of subsequent activities.

The nature of decision point reviews can be project control systems oriented, technically oriented, or both. Generally the higher level the decision, the greater the need to have a mixed review. Depending on the project needs and the subject, the scopes of decision point reviews vary; they can range from simple reviews of minor project elements to

critical decisions of which there exist four. The four project critical decisions are described in section 2.2, Review Application and Project Phasing.

The content of decision point reviews should be predetermined and as a general rule, they should be included on the baseline schedule. In planning the project, the project manager should determine the necessary decision points and review criteria that must be satisfied. The *Critical Decision Criteria*, GPG-FM-002, should be used to assist in determination of what type of and how to incorporate critical decision reviews.

2.2 Review Application and Project Phasing

Needs for different types of reviews and different applications of the same type of review exist during the different project phases outlined in Figures 3.2-1 through 3.2-4. Discussions on various review types and applications at different project phases follow.

Preconceptual Phase

This phase exists for the establishment of mission need, culminating with the review of mission justification documentation necessary for the Approval of Mission Need Critical Decision as shown in Figure 3.2-1 below. This approval is necessary for initiation of the conceptual project phase which follows.

Conceptual Phase

The conceptual phase is dedicated to conceptual design and development of a project baseline as described in *Project Management Overview*, GPG-FM-001, and illustrated in Figure 3.2-2 below. Application of high level Alternative Systems Reviews (ASRs) to determine optimum design concepts may be appropriate during this phase. A Conceptual Design Review should be performed during this phase and may include ASRs or the results of ASRs, and System Requirements Reviews (SRRs) and System Functional Reviews (SFRs). SFRs and SRRs can be applied as described below.

System Requirements Review (SRR). SRR is conducted to demonstrate progress in converging on viable, traceable system requirements that are balanced with cost, schedule, and risk by confirming that:

a. customer requirements (including environments, usage modes, and other pertinent factors) were analyzed and translated into system-specific functional and performance requirements;

b. technology validation and demonstration plans are completed and closure plans on technical demonstrations and maturations are achieving required progress;

c. critical technologies for people, product, and process solutions have been identified and assessed;

d. risks are identified and where appropriate, quantified, and risk mitigation actions are achieving progress; and

e. the total system approach to satisfying requirements (including interfaces) for the primary system functions has been identified (draft system and initial development specifications).

System Functional Review (SFR). SFR is conducted to demonstrate convergence on and achievability of system requirements and readiness to initiate preliminary design by confirming that:

a. system functional and performance requirements have converged and characterize a design approach that satisfies established customer needs and requirements.

b. the systems physical architecture and related documentation establish the adequacy, completeness, and achievability of functional performance requirements (sufficient design and systems analyses including assessment and quantification of cost, schedule, and risk);

c. critical technologies for people, products, and process solutions have been verified for availability, achievability, needed performance, and readiness for transition;

d. the process completely defined system functional and performance requirements including:

- system solutions for people, products, and processes satisfy all system functions.
- a correlation with SRR is established with changes substantiated,
- risks are mitigated such that remaining risks are acceptable, and
- the system functional baseline can be established;

e. the specification tree represents the physical architecture applicable for the next phase or engineering effort;

f. the WBS is compatible with the specification tree;

g. the risk handling approach has been defined for the next phase or technical effort;

h. preplanned product and process improvement and evolutionary development requirements and plans have been defined;

i. implementation requirements for technology transition have been defined; and

j. the critical accomplishments, success criteria, and metrics have been defined for the next phase or continued technical effort.

Alternative Systems Review (ASR). After establishment of the functional requirements and achievement of the Approval of Mission Need Critical Decision, it may be appropriate to develop multiple alternative conceptual design technology approaches during this phase. Section 3.2.2 of *Engineering Tradeoff Studies*, GPG-FM-010, and section 6.3 of *Project Execution and Engineering Management Planning*, GPG-FM-003, describe the roles of value engineering and tradeoff studies in the conceptual design oriented alternative systems review and selection process. Sections 2.5 and 2.8.2 of *Test and Evaluation*, GPG-FM-005, describe processes by which decision criteria can be developed and applied for effective alternative systems review and selection.

Project Controls Review (PCR). The project control system with its scope, schedule and cost management components is defined and developed during this project phase so that it can be implemented in support of successful project execution during the next phase. It is essential that a sound system, integrated and detailed at levels commensurate with project complexity, risks, and management needs be defined and subsequently developed. Project controls system description documents should be reviewed for the purposes described above, and the system should be reviewed upon completion, and prior to implementation during the next project phase to insure the following:

- The project controls system is consistent with the definition documentation
- The system is practical, appropriate for project needs, and will be effective

This project phase should complete with review of the baseline and the Approve Baseline Critical Decision, which should precede the start of the execution phase. It is important

for the project manager to have confidence that both the developing project baseline and project control system are sound so that the job can be managed effectively during the subsequent execution phase.

Execution Phase

Preliminary design, definitive design, and construction/as-built design occur during the execution phase as discussed in *Project Management Overview*, GPG-FM-001, and illustrated in Figures 3.2-3 and 3.2-4 below. During this major project phase it may be appropriate to apply many different types of reviews as follows, using a graded approach.

Alternative Systems Review (ASR). After establishment of the conceptual design and during the preliminary design stage of this phase, it may be appropriate to develop and review multiple alternative physical design approaches for selection of that which is optimum. As further described in section 3.2.3 of *Engineering Tradeoff Studies*, GPG-FM-010, and section 6.2.3 of *Project Execution and Engineering Management Planning*, GPG-FM-003, the alternative systems review and selection process should include value engineering and engineering tradeoff studies. Section 2.5 of *Test and Evaluation*, GPG-FM-005, describes a process by which decision criteria should be developed and applied.

Project Controls Review (PCR). As more design detail is developed during the preliminary and definitive design stages of the execution phase, and the project becomes better defined, it is generally appropriate to revise project control fundamentals such as the estimate and scope, schedule, and cost baselines, and elevate confidence in these fundamentals. Generally, each stage of this phase offers significantly more information with which profound and necessary changes can be made to the project control system. Additionally, as the project progresses into and through this phase concurrent activity increases and implementation of error correction, adverse trend reversal, and revision to execution strategy becomes less effective and more costly. To limit problem potential and increase probability for success, project control reviews should at least be considered as follows during this phase:

- During the less complicated preliminary design stage to ensure that the analyses performed and reports published are in fact consistent with those required during earlier project phases.

- During all stages to ensure that the analyses and information provided address all risk areas, are meaningful, and are presented at manageable levels of detail.

- During all stages to ensure that information provided is accurate and correct.

Preliminary Design Review (PDR). PDR is conducted to confirm that the approach for system detailed design (as an integrated composite of people, product, and process solutions) satisfies the functional baseline; risks are mitigated with closure plans for remaining risks demonstrating required progress; and the total system is ready for detailed design.

Detailed Design Review (DDR). The DDR is conducted to demonstrate that the system detailed design (as an integrated composite of people, product, and process solutions) is complete, meets the requirements, and that the system is ready for fabrication, coding, or construction, as appropriate. DDR confirms the following:

a. issues for the system, functional areas, and subsystems are resolved;

b. the process completely defined system design requirements such that:

- the design is balanced across schedule, cost, risk, and performance for the life cycle,
- the system physical architecture is an integrated detailed design for people, products, and processes to satisfy requirements, including interoperability and interfaces,
- a correlation with PDR is established with changes substantiated, and
- allocated baselines for subsystem are refined;

c. the system design compatibility with external interfaces (people, products, and processes) has been established;

d. system design and interface requirements and design constraints are consistent with test and evaluation results;

e. test and evaluation results support critical system design and interface requirements and design constraints;

f. the risk handling approach is refined for the next phase or technical effort;

g. preplanned product and process improvement and evolutionary development requirements and plans have been refined; and

h. the critical accomplishments, success criteria, and metrics are valid for continued technical effort.

System Verification Review (SVR). SVR is conducted primarily in software development to demonstrate that the total system (people, products, and processes) was verified to satisfy requirements in the functional and allocated configuration documentation, and to confirm readiness for production, support, training, deployment, operations, continuing verifications, continuing development (if any), and disposal. SVR confirms the completion of all incremental accomplishments for system verification (e.g., Test Readiness Reviews and Functional Configuration Audits) and confirms that;

a. issues for the system, functional areas, and subsystems are resolved;

b. system and subsystem verification procedures were complete and accurate (including verification by test and demonstration of critical parameters as well as key assumptions and methods used in verifications by analytical models and simulations);

c. the subsystems and system were confirmed ready for verification;

d. verifications were conducted in accordance with established procedures; were completed for people, products, and processes; and system processes are current, executable, and meet the need;

e. correlation with CDR exists, changes are substantiated, and the system and subsystems are verified;

f. the risk handling approach is refined for the next phase or technical effort;

g. preplanned product and process improvement and evolutionary development requirements and plans have been refined;

h. planning is complete and procedures, resources, and other requisite people, products, and processes are available (or programmed to be available) to initiate operations, support, training, production, deployment, disposal, and continuing verifications and development (if any); and

i. the critical accomplishments, success criteria, and metrics have been refined and validated for the next phase or continued technical effort.

Start of Construction/Remedial Action Critical Decision. Detailed design and project baselines should be reviewed to assure that the project team is ready to commence and sustain a continuous, effective construction effort. This review results in the Start of Construction/Remedial Action Critical Decision for which details are explained in *Critical Decision Criteria*, GPG-FM-002.

Acceptance and Turnover Phase

The acceptance and turnover phase is the final project phase and the transitional period between project execution and operations. Care, custody, and responsibility are transferred from the project manager to the operations manager, and the following types of reviews assist in giving the operations manager confidence that the product is ready for acceptance:

Physical Configuration Audit (PCA). In software development, a system PCA is conducted in accordance with established configuration management procedures to confirm that; all subsystem PCAs have been satisfactorily completed; the current state of the integrated decision database is valid and accurately represents the system, items (including processes) that can be baselined only at the system level have been baselined; required changes to previously completed baselines have been implemented (e.g., deficiencies discovered during testing have been resolved and corrections implemented); and system processes are current, practicable, and support needs. A system PCA may be conducted after a full set of production representative subsystems has been baselined.

Functional Configuration Audit (FCA). FCAs can be conducted to verify that subsystems have achieved the functional requirements specified in configuration documentation.

Test Readiness Review (TRR). TRRs are conducted for each subsystem to confirm completeness of test procedures, to assure that the subsystem is ready for testing, and to assure that the performing element is prepared for formal testing. TRR confirms the following:

a. test procedures comply with test plans and descriptions, demonstrate adequacy to accomplish test requirements, and satisfy subsystem specification requirements for verifications;

b. pretest predictions and informal test results (if any) indicate testing will confirm necessary performance;

c. new or modified test support equipment, facilities, and procedure manuals required to accomplish planned test and evaluation are available;

d. required operation and support documents are complete and accurate; and

e. data acquisition, handling, and analysis provisions have been met.

Operations Readiness Review (ORR). The ORR is conducted to support turnover of the facility to the customer. The following list of review scope items should be performed:

a. assess the adequacy of the constructed facility in performance of its required function;

b. evaluate operator training and skill levels to determine if they are prepared to satisfactorily perform the necessary functions to safely and efficiently operate the facility;

c. assess the safety of the facility including the planned safety procedures;

d. evaluate the as-built system to ensure conformance with regulatory considerations and support the key decision readiness review for facility operation approval; and

e. assess configuration management procedures to ensure that the as-built design is maintained over the life of the facility or system in order that D&D activities may be properly addressed at closeout.

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3. MEASURING FOR RESULTS

Meaningful measures can be developed to determine the degree of success enjoyed by the project for many review circumstances. The measures should be directly related to and reflective of the review objectives stated by the project manager. For example, if a review is conducted specifically for the purpose of identifying problem causes and solutions, the measure should be a direct measure of the problem and possibly a related trend.

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4. SUGGESTED READING

- *Critical Decisions Criteria*, GPG-FM-002
- MIL-STD-1521 B (USAF)
- *Project Management Overview*, GPG-FM-001

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5. DEFINITIONS

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6. ASSISTANCE

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7. RELATED TRAINING

Pre-Conceptual Activities

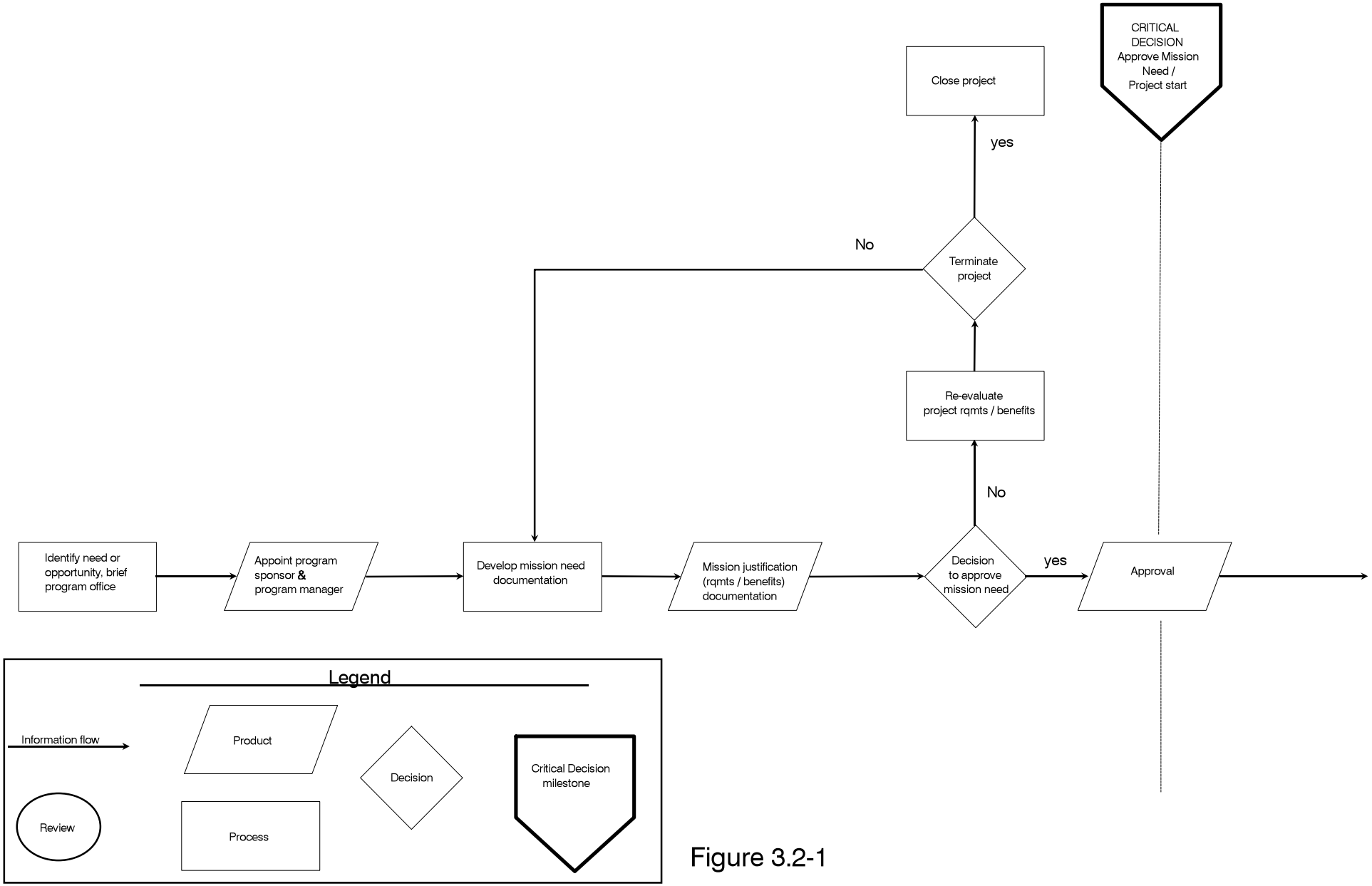

Figure 3.2-1

Conceptual Phase

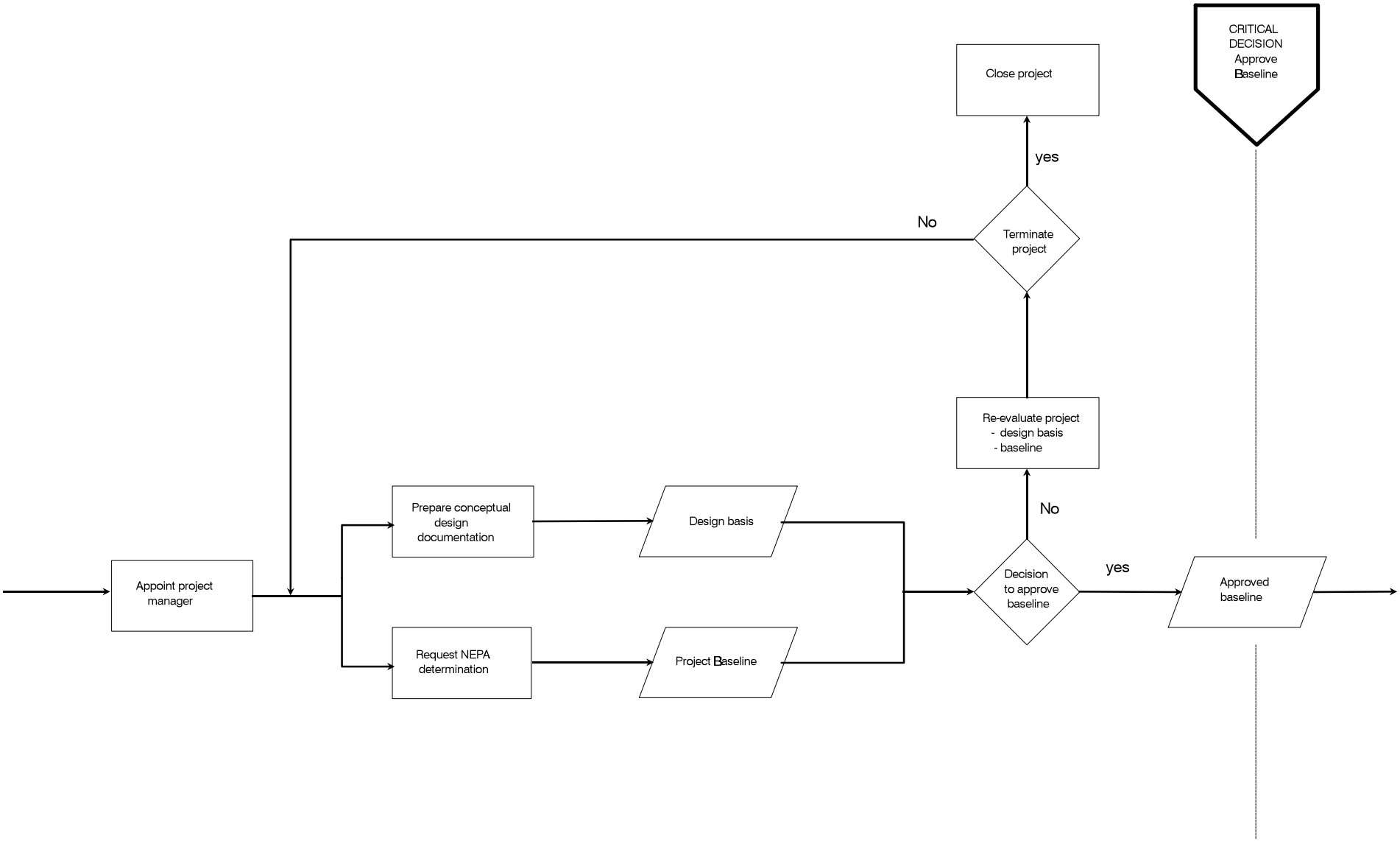

Figure 3.2-2

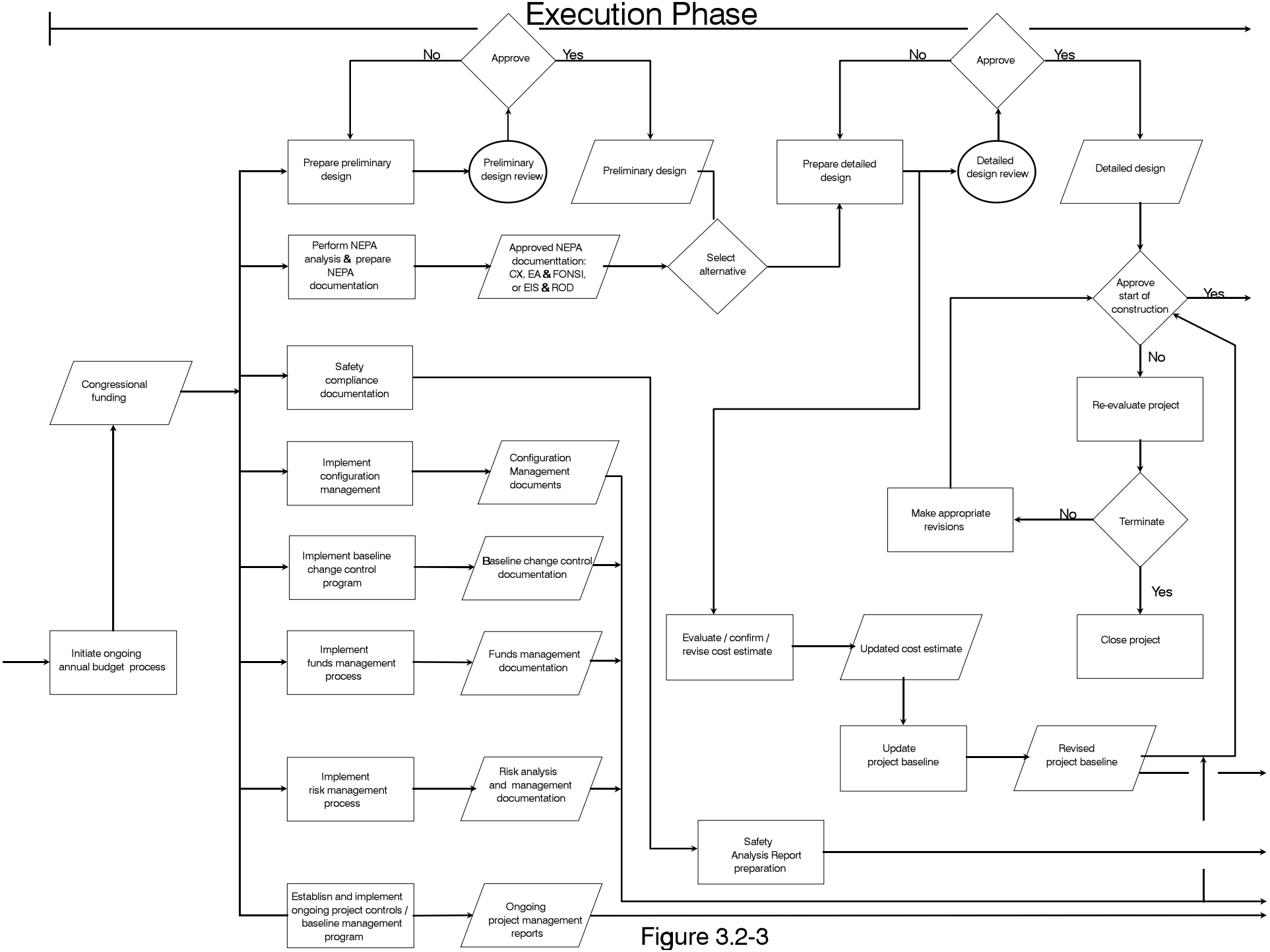
Execution Phase
Approve
No
Yes
Prepare preliminary design
Preliminary design review
Preliminary design
Approve
No
Yes
Prepare detailed design
Detailed design review
Detailed design
Perform NEPA analysis & prepare NEPA documentation
Approved NEPA documenttation: CX, EA & FONSI, or EIS & ROD
Select alternative
Approve start of construction
Yes
No
Re-evaluate project
Congressional funding
Safety compliance documentation
Implement configuration management
Configuration Management documents
Make appropriate revisions
No
Terminate
Yes
Implement baseline change control program
Baseline change control documentation
Initiate ongoing annual budget process
Implement funds management process
Funds management documentation
Evaluate / confirm / revise cost estimate
Updated cost estimate
Close project
Update project baseline
Revised project baseline
Implement risk management process
Risk analysis and management documentation
Safety Analysis Report preparation
Establisn and implement ongoing project controls / baseline management program
Ongoing project management reports

Figure 3.2-3

Execution Phase

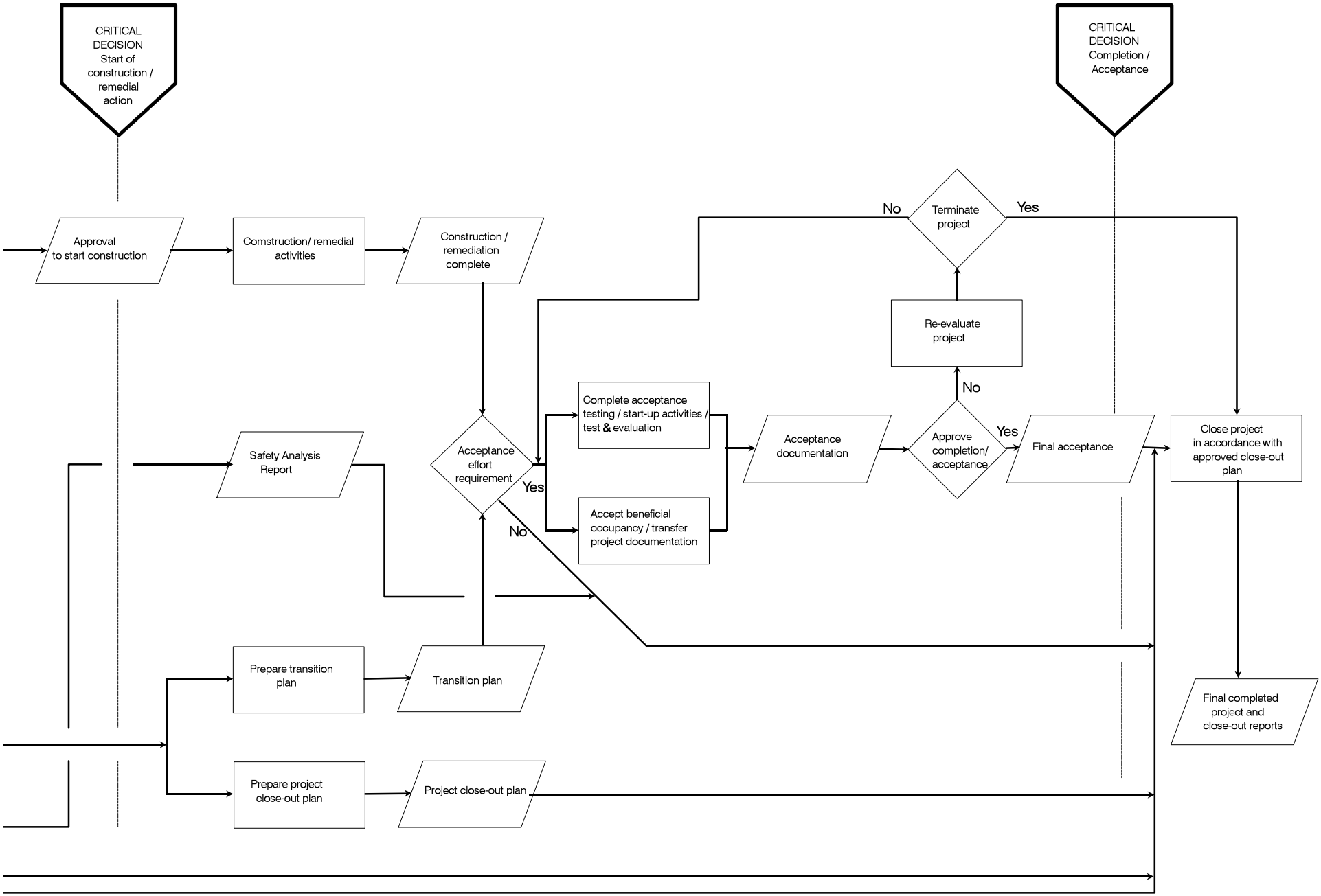

Figure 3.2-4