



US Army Corps
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Prepared by:
**Southwestern
Division
Fort Worth District**

Canyon Service Bridge Repair, Design and Construction (TX 00004) Review Plan

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V1.3

Section 1

Introduction

1.1 Purpose

This Review Plan (RP) for Canyon Service Bridge (P2# 511753), will help ensure a quality-engineering project is developed by the Corps of Engineers in accordance with Engineer Regulation (ER) 1165-2-217, “Civil Works Review Policy”. As part of the Project Management Plan this RP establishes an accountable, comprehensive, life-cycle review strategy for Civil Works products and lays out a value-added process and describes the scope of review for the current phase of work. The ER outlines general levels of review: District Quality Control/Quality Assurance (DQC/QA), Agency Technical Review (ATR), Independent External Peer Review (IEPR), Safety Assurance Review (SAR), Biddability, Constructability, Operability, Environmental, and Sustainability (BCOES) Review, and Policy and Legal Compliance Review. This RP will be provided to the Project Delivery Team (PDT), DQC Team, ATR Team, IEPR/SAR Team, and BCOES Team. The District Chief of Engineering has assessed that the life safety risk of this project is not significant; therefore a SAR will not be required, see Paragraph 9.1.

1.2 Key References

- ER 5-1-11, USACE Business Process, 21 Jul 2019
- ER 1165-2-217, Civil Works Review Policy, 01 May 2021 <https://www.publications.usace.army.mil/USACE-Publications/Engineer-Regulations/u43546q/313136352D322D323137/>
- ECB 2019-15, Interim Approach for Risk-Informed Designs for Dam and Levee Projects, 08 October 2019
- ER 415-1-11, Biddability, Constructability, Operability, Environmental and Sustainability (BCOES) Reviews, 1 January 2013
- ER 1110-2-1156, Safety of Dams – Policy and Procedure, 31 Mar 2014
- ER 1110-1-8159, Engineering and Design, DrCheckssm, 10 May 2011
- ER 1110-2-1150, Engineering and Design for Civil Works Projects, 31 August 1999
- ER 1110-2-111, USACE Bridge Safety Program, 31 January 2020
- EM 1110-2-1102, Inspection and Evaluation of USACE Bridges, 31 January 2020
- RMC-AD-2022-01 Standard Operating Procedures for Agency Technical Reviews, 02 November 2021 [TechLib_Tmpl-RMC-AD-2022-01 ATR SOP](#)
- Project Management Plan (PMP), 28 March 2023 (<https://apps1.nww.ds.usace.army.mil/PMPBuilder/Home/Index/3724739>)

1.3 Review Management Organization

The USACE Southwestern Division (SWD) is the Review Management Organization (RMO) for this project. This RP will be updated for additional project phases and for the construction phase.

Section 2

Project Description

2.1 Project Description

Canyon Dam (National Inventory of Dams No. TX00004) is located approximately 12 miles northwest of New Braunfels in Comal County, Texas. The project was constructed in 1964 for the primary purpose of flood risk management. Canyon Dam consists of an earthen embankment, with a gated outlet works near the center of the main embankment including a control tower and service bridge (Corps of Engineers Bridge Inventory No. CENSWFTXODCNB01). The hydraulically operated slide gates located in the control tower are used for flood releases from the reservoir and must be manually operated by accessing the tower via the service bridge. Low flow releases are made through the non-federal hydropower plant located downstream of the dam at the base adjacent to the outlet structure.

Unexpected cracking of the center pier of the service bridge has been observed since 2013. The cracking was noted to initiate from the top of the center pier on the east face at the connection location between the concrete pier and the fixed bearings for the steel service bridge truss. The crack was repaired, and the pier was retrofitted in 2019, however crack development and concrete deterioration has continued. To investigate the root source of the cracking additional instrumentation was installed on the bridge in 2019; and in May 2022 USACE Philadelphia District performed a special inspection of the damaged center pier and concluded that the root cause is the frozen slide bearings on the end pier.

The service bridge is currently closed to vehicular traffic and pedestrian access to the structure is limited to authorized personnel. Immediate repair to the service bridge including the center pier is required as an interim measure to perform mission requirements for the authorized purposes of flood risk management. The interim repair will consist of a retrofit of the center pier to replace undersized compression plates at the top of the pier and add additional bearing area. In addition, the deteriorated concrete will be repaired, the fixed bridge bearings at the center pier will be reset, and the sliding bridge bearings at the end pier will be replaced.

The overall status of the project is 5% complete. The estimated cost for the project is \$2,100,000 at the FY2023 price level with an estimated duration of two years which includes one year of monitoring post interim repair. Information on the project and risk associated with the project is provided in Attachment 2.

2.2 Project Sponsor

Products and analyses provided by non-Federal sponsors as in-kind services are subject to DQC, ATR, SAR, BCOES, and Policy and Legal Compliance reviews. Sponsor Peer Review of In-Kind Contributions - There will not be in-kind contributions for this effort. There is no non-Federal sponsor for this O&M project.

Section 3

Risk Assessment During Design

Risk assessments during design will be performed in accordance with ECB 2019-15. The review activities associated with the risk assessment are to be defined in this RP. Once the risk assessment during design is completed, this RP will be re-visited by the District, and MSC to determine if the review requirements in this RP need to be revised.

The design and associated risks will be reviewed by subject matter experts as deemed appropriate for the project. The design reviews will determine if there is a major risk concern, if there is a controversial process being used or if there will likely be a design deviation request.

The review team will be composed of an ATR Lead, Geotechnical Engineer, and Structural Engineer. The same review team will be used for design and construction documents to the maximum extent possible. The final products and decision documents will be presented to SWD E&C and Operations for Quality Assurance Review.

Section 4

Project Delivery Team Reviews

PDT Reviews are in addition to the independent DQC Reviews described in Section 5. The PDT Reviews are to ensure consistency and effective coordination across all project disciplines for the work product. For example, the PDT will perform a complete reading of any reports and accompanying appendices prepared by the PDT to assure the overall coherence and integrity of the report, technical appendices, and the recommendations before approval. The PDT will normally include a variety of stakeholders, each with his/her own important project requirements and a different, but interlocking, review responsibility. The PDT Review may also include a plans-in-hand review at the end of development. PDT Reviews, as an extension of the DQC, will be conducted as directed in the MSC/District QMS processes.

Section 5

District Quality Control/Quality Assurance

5.1 Requirements

A robust DQC/QA establishes the foundation of quality through exhaustive reviews ensuring its own work is thorough, rigorous, and scientifically correct. Reviewers outside of the District place inherent trust in the DQC/QA process, believing that every calculation has been verified just like each report page has been spell-checked. Subsequent reviews will be weakened by insufficient DQC/QA and should not be relied upon as substitutes for comprehensive DQC/QA.

All implementation documents (including supporting data, analyses, reports, environmental compliance documents, water control manuals, etc.) and risk assessment reports shall undergo DQC/DQA in accordance

with ER 1165-2-217. Basic quality controls include quality checks and reviews, supervisory reviews, and PDT reviews. The district will manage and document the DQC.

Quality checks and reviews occur throughout the development process and are carried out as a routine management practice. Checks should occur for all calculations and models including those tool box models used in the analyses. A red dot shall be placed next to the calculation once the formula and results have been reviewed. These checks may be performed by staff responsible for similar work such as supervisors, work leaders, team leaders, or designated individuals from senior staff with the appropriate technical experience. These checks will not be performed by the same people who did the original work, including managing/reviewing the work in the case of contracted efforts.

All DQC review comments and responses will be documented in Dr. Checks/proj.net. Microsoft word using track changes or the comment feature in Adobe Acrobat may be used to provide typographical/grammar/formatting comments and suggested edits. Comments entered into Dr. Checks will comply with the four-part comment structure and three-part response structure identified in ER 1165-2-217.

As part of Quality Assurance, the MSC will be afforded the opportunity to review the design package and all supplemental documents. Documentation of the MSC review activities will be done in accordance with the MSC's Quality Management Plan. The MSC review will occur concurrently with DQC and ATR.

See Attachment 1, Table 8 DQC Reviewers for the DQC Lead, reviewers, and reviewer's disciplines.

5.2 Products to Undergo DQC/QA

The following are the specific products the DQC team will review.

- Plans
- Specifications
- Design Documentation
- Construction Completion Report

5.3 Schedule and Estimated Cost of DQC/QA

Although DQC/QA is a seamless process, the following milestone reviews are scheduled in Table 1. The cost for the DQC/QA will be approximately \$30,000.

Project Phase/Submittal	Review Start Date	Review End Date
DQC/DQA Interim Design Review	10 Apr 2023	21 Apr 2023
DQC/DQA Final P&S Review	11 May 2023	25 May 2023
Construction Completion Report	17 Oct 2023	31 Oct 2023

Table 1 DQC/QA Schedule

Section 6

Agency Technical Review

6.1 Requirements

All implementation documents (including supporting data, analyses, reports, environmental compliance documents, water control manuals, etc.) and risk assessment reports shall undergo ATR in accordance with ER 1165-2-217 and RMC-AD-2022-01, SOP for ATR. ATR reviews will occur seamlessly, including early involvement of the ATR team for validation of key design decisions, and at the scheduled milestones as shown in Section 6.5. A site visit will not be scheduled for the ATR Team during design as they visited the site during the initial issue assessment. The ATR team will visit the site once during the 2 months of construction. Documentation of ATR will occur using DrChecksSM, the four-part comment structure, responses from the PDT using the three-part structure, and back checking as outlined in ER 1165-2-217.

6.2 Products to Undergo ATR

The following are the specific products to be reviewed by the ATR team:

- Plans
- Specifications
- Design Documentation
- Construction Completion Report

Project Phase/Submittal	Review Start Date	Review End Date
Interim Design Review	10 Apr 2023	21 Apr 2023
Final P&S Review	11 May 2023	25 May 2023
Construction Completion Report	17 Oct 2023	31 Oct 2023

6.3 Required Team Expertise and Requirements

The ATR team disciplines and required expertise may vary for larger projects with multiple reviews, not all disciplines may be required for all reviews. Although the same ATR team members will be used to the maximum extent possible throughout the life of the project, it may be necessary to replace ATR team members based on availability or required expertise in the future. The ATR Lead and PDT will confirm ATR team member availability prior to each review. Changes in ATR team members will be coordinated through the ATR Lead with the RMO and tracked in Table 14 RP Revisions. The following disciplines will be required for ATR of this project:

ATR Lead: The ATR team lead is a senior professional outside the home MSC with extensive experience in preparing Civil Works documents and conducting ATRs. The lead has the necessary skills and experience to lead a virtual team through the ATR process. The ATR lead may also serve as a reviewer for a specific discipline, in this case, Structural Engineering, or Geotechnical Engineering.

Geotechnical Engineer - shall have experience in the field of geotechnical engineering, analysis, design, and construction of earthen dams on alluvial foundations. The geotechnical engineer shall have experience in rock and soil mechanics, slope stability evaluations, erosion protection design, and earthwork construction. The geotechnical engineer shall have knowledge and experience in the forensic investigation of seepage, settlement, stability, and deformation problems associated with high head dams and appurtenances constructed on rock and soil foundations.

Structural Engineer – shall have experience and be proficient in performing stability analysis, hydraulic steel structures (bridges in particular) and external stability analysis including foundations on high head mass concrete dams. The structural engineer shall have specialized experience in the design, construction, and analysis of bridges.

Milestone Reviews	Geotech	Structural
ATR Interim Review		X
ATR Final P&S Review	X	X
ATR During Construction	X	X
Construction Completion Report	X	X

Table 2. ATR Teams for Milestone Reviews

6.4 Statement of Technical Review Report/Certification

Each formal milestone review needs a Statement of Technical Review Report. At the conclusion of Draft and Final milestones, the ATR team will also prepare Certification of ATR. The report will be prepared in accordance with ER 1165-2-217.

6.5 Schedule and Estimated Cost of ATR

Although ATR is a seamless process, the preliminary ATR milestone schedule is listed in Table 3. The cost for the ATR will be approximately \$25,600. ATR will occur concurrently with DQC.

Project Phase/Submittal	Review Start Date	Review End Date
Interim Design Review	10 Apr 2023	21 Apr 2023
Final P&S Review	11 May 2023	25 May 2023
ATR During Construction	21 Aug 2023	25 Aug 2023
Construction Completion Report	17 Oct 2023	31 Oct 2023

Table 3 ATR Schedule

Section 7

Constructability Evaluation

ER 1110-2-1156 requires a constructability evaluation (CE) to ensure dam safety risks are adequately addressed by the designs and that all construction-related risks are fully identified and mitigated to an acceptable level. The CEs will be conducted by the ATR team and MSC QA review team for each review submittal.

Section 8

BCOES Review

8.1 Requirements

All implementation documents (including supporting data, analyses, reports, environmental compliance documents, water control manuals, etc.) shall undergo BCOES review in accordance with ER 415-1-11 and ER 1110-1-12. BCOES reviews are done during design for a project using the design-bid-build (D-B-B) method or during development of the request for proposal (RFP) for a design-build (D-B) project. The BCOES review results are to be incorporated into the procurement documents for all construction projects. The BCOES review will be documented in Dr. Checks and using the District's BCOES certification form. The BCOES reviewers are encouraged to include facility operators and maintenance staff. The BCOES roster is provided in Attachment 1, Table 12.

Section 9

Safety Assurance Review

9.1 Decision on SAR

The District Chief of Engineering has made a risk-informed-decision that this repair project does not pose a significant threat to human life (public safety) and therefore a SAR will not be performed. Upon completion of

the interim repair, should further action be deemed necessary, the District Chief of Engineering will reassess the determination of SAR requirement

The proposed repair activity shall not impact the ability to make flood or low-flow releases from the project. During implementation of the repair, the control tower will remain accessible to project personnel to make necessary gate changes.

No modifications are being made that affect the embankment, outlet works operation, or alter the design crest elevation of the dam.

The proposed repair is considered an interim repair until performance of the retrofitted structure can be evaluated for the need for a more permanent repair or replacement of the bridge. A separate SAR determination will be required for any future work.

A technical review for the interim repair will be performed in accordance with ER 1110-2-1156 Safety of Dams, and ER 1110-2-111 USACE Bridge Safety Program.

The design and construction activities will not increase hazards or the threat to human life.

Section 10

Review Plan Approval and Updates

The MSC Commander, or delegated official, is responsible for approving this RP. The Commander's approval reflects vertical team input (involving the District, MSC, and MCX) as to the appropriate scope, and level of review. The RP is a living document and should be updated in accordance with ER 1165-2-217. All changes made to the approved RP will be documented in Attachment 3, Table 14 RP Revisions and shared with the MSC. The latest version of the RP, along with the Commanders' approval memorandum, will be provided to the RMO.

Engineering Models

The use of certified, validated, or agency approved engineering models is required for all activities to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. The responsible use of well-known and proven USACE developed and commercial engineering software will continue and the professional practice of documenting the application of the software and modeling results will be followed. The selection and application of the model and the input and output data is still the responsibility of the users and is subject to DQC, ATR, SAR (if required), BCOES, and Policy and Legal Compliance review. Where such approvals have not been completed, appropriate independent checks of critical calculations will be performed and documented. The following engineering models, software, and tools are anticipated to be used:

Model Name	Version
Modeling software not required. Microsoft excel will be used for some calculations.	Office 365, latest version

Table 4 Engineering Models and Status

Section 11

Review Plan Points of Contact

Title	Organization	Phone
Project Manager	CESWF-PM-C	817-886-1787
Lead Engineer	CESWF-ECE	817-886-1831
Senior Reviewer	CESWT-ECD-I	918-606-9120

Table 5 RP POC's