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Prepared by:
Mississippi Valley Division
St Louis District

Review Plan: Melvin Price Locks and Dam Main Lock Overlooks Alterations

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Section 1

Introduction

1.1 Purpose

This Review Plan (RP) for Melvin Price Locks and Dam, Main Lock Overlook Alterations will help ensure a quality-engineering project is developed by the Corps of Engineers in accordance with EC 1165-2-217, “Review Policy for Civil Works” and ER 1110-1-12 “Quality Management”. 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 EC outlines five general levels of review: District Quality Control/Quality Assurance (DQC), Agency Technical Review (ATR), Biddability, Constructability, Operability, and Sustainability (BCOES) Review, Independent External Peer Review (IEPR), and Policy and Legal Compliance Review. Additionally, the ER outlines procedures for quality checks and reviews, PDT reviews; Biddability, Constructability, Operability, Environmental, and Sustainability (BCOES) review; and quality control certification. Further, additional requirement of the BCOES review will be per ER 415-1-11 This RP will be provided to the Project Delivery Team (PDT), DQC, ATR, and BCOES. The technical review efforts addressed in this RP, DQC and ATR, are to augment and complement the policy review processes. The St. Louis District Chief of Engineering and Construction Division has assessed that the life safety risk of this work to design and perform alterations to the main lock overlooks is not significant; therefore a Type II IEPR/Safety Assurance Review (SAR) will not be required, see Section 7.

1.2 References

- EC 1165-2-217, Review Policy For Civil Works, 20 February 2018
- ER 1110-1-12, Quality Management, 31 Mar 2011
- ER 415-1-11, Biddability, Constructability, Operability, Environmental and Sustainability (BCOES) Reviews, 1 January, 2013
- MVD Quality Management Plan (QMS100.1-MVD) and MVS Supplement (QMS100.1-MVS)
- ER 1110-1-8159, Dr. Checks

1.3 Review Management Organization

The USACE Inland Navigation Design Center (INDC) is the Review Management Organization (RMO) for this project. The RMO is responsible for managing the ATR described in this RP.



Section 2

Project Description

The Lock and Dam 26 Replacement, later renamed Melvin Price Locks and Dam, was constructed two miles downstream from the original Lock and Dam No. 26. The replacement consisted of three stages of construction each with its own cofferdam system. The first stage and second stage cofferdams, adjacent to the Missouri bank, included construction of seven Tainter gate dam monoliths and the main 1200-ft lock chamber, respectively; construction of the first stage was finished in 1985 and the second stage was finished in 1989. The third stage cofferdam, which was adjacent to the Illinois bank, included the construction of an additional two Tainter gate dam monoliths and the auxiliary 600-ft lock chamber; construction of the third stage was finished in 1994.

The upstream gate of the main lock is a three leaf system lift gate. During construction of the main lock, the existing lift gate leafs were installed prior to the construction of the main lock overlooks. The main lock overlooks consist of a visitor overlook on the Missouri side of the main lock and the electrical equipment room for the entire main lock on the Illinois side. The overlooks project over the lift gate slots and prevent complete removal and installation of the lift gate leaves. Alterations to the overlooks are required in order to remove the existing lift gate and install the replacement lift gate, which the St. Louis District is currently in the process of designing. The alterations will consist of removal and reconstruction on portions of the overlook to allow for an unobstructed installation and removal of the lift gate leaves.

Removal of a portion of the building also impacts the existing 5kV Switchgear line-up in the electrical equipment room. The existing switchgear, which has exceeded its design life, will be replaced and relocated to meet code requirements for electrical working clearances inside the electrical equipment room.

Section 3

Documentation of Issues/Risks

3.1 Description of Issues

Other than the minor issues with the Main Lock Overlooks and the 5kV switchgear in the Electrical Equipment Room exceeding its design life, there are no known issues with the Main Lock Overlooks. The Overlooks require removal of portions of the overlook and reconstruction to facilitate the replacement lift gate installation and the ability to remove the lift gate leaves in the future. A replacement lift gate leaf is being designed due to the fact that the existing three leaf lift gate system experiences frequent operation issues and has inherent issues with the overall design of the system that has led extensive fatigue cracking in the lift gate. Some of the fatigue cracking in critical areas are unable to be repaired or inspected to monitor the crack growth due to a lack of



access to repair or inspect these areas. The original low profile requirement, which is no longer a project requirement, for the three lift gate leaves resulted in a non-optimal span-to-depth ratio for supporting vertical hydraulic loads and results in extremely high deflections under normal loading and operation. The low profile nature of the existing lift gate leaves makes it necessary to operate a minimum of two leaves for every lockage and under certain river levels all three leaves must be operated with very little overlap of the individual leaves. This complication of gate operation requires unreasonable precision by the lock control system and instrumentation and makes the entire system more susceptible to lock outages from gate leaf separation and/or other operational interlocks.

The existing 5kV switchgear in the Electrical Equipment Room has exceeded its design life and requires replacement in order to maintain the level of performance and reliability required for the facility.

3.2 Risks Associated with Failure

Catastrophic failure of the lift gate, structural failure of the overlooks, or failure of the electrical equipment components in the electrical equipment room would render the lift gate and/or main lock components inoperable and result in the lengthy closure of the main lock. A lengthy closure of the main lock would have significant economic consequences to the navigation industry.

3.3 DQC/ATR Review Level

Due to the importance of the project to the St. Louis District's navigation mission, District Quality Control (DQC) Review and Agency Technical Review (ATR) will be performed on product deliverables (P&S and DDR) at a 35% Level, a 65% Level, and on the Final Package. See **Error! Reference source not found.** for details regarding DQC Review. See **Error! Reference source not found.** for details regarding ATR.

3.4 Risk Register

Documentation of the risks identified in the course of the design and construction will be maintained in a Risk Register, which will be kept on file in the ProjectWise folder setup for this project.

Section 4

Project Delivery Team

The PDT will have discipline leads with extensive professional and technical experience in their assigned areas of responsibility. Additional, PDT members with lesser experience may be assigned to project but will perform the design under the guidance of the discipline lead. Should future requirements require the application of different skills or experience than initially planned, appropriate additional personnel will be added to the PDT.



See **Error! Reference source not found.**, **Error! Reference source not found.** for the PDT member list.

Section 5

District Quality Control

5.1 Requirements

All implementation documents (including plans, specifications, design document report, supporting data, analyses, reports, environmental compliance documents, water control manuals, etc.) shall undergo DQC in accordance with EC 1165-2-217 and ER 1110-1-12. MVS will manage the Structural and Electrical DQC reviews while MVR will manage the Mechanical and Architectural DQC Reviews. The DQC reviews shall be performed in accordance with the MVD Quality Management Plan (QMS100.1-MVD) and the MVS Supplement (QMS100.1-MVS). Both documents are stored on the USACE Quality Management System (QMS) Portal. In addition to this, red dot checking or equivalent method will be used to check all documents per guidance EC 1165-2-217.

See **Error! Reference source not found.**, **Error! Reference source not found.** for the DQC Lead, reviewers, and reviewer’s disciplines.

5.2 Documentation of DQC

Documentation of project DQC activities is required and will be implemented by the processes referenced in paragraph 5.1. At the conclusion of the DQC effort, the Technical Lead will prepare a DQC certification memo. The final quality report will be prepared in accordance with EC 1165-2-217 and included in the DDR. The certificate templates for project DQC are located in **Error! Reference source not found.**

5.3 Products to Undergo DQC

Products that will undergo DQC include the Plans, Specifications, and DDR.

5.4 DQC Schedule and Estimated Cost

Although DQC is always seamless, the following milestone reviews are scheduled in Table 1. The cost for the DQC is approximately \$25,000.

Project Phase/Submittal	Review Start Date	Review End Date
DQC 35% P&S/DDR Review	7/15/20	7/21/20
DQC 65% P&S/DDR Review	10/21/20	10/30/20
DQC Final P&S/DDR Review	2/8/21	2/14/21



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Table 1 DQC Schedule

Section 6

Agency Technical Review

6.1 Requirements

All implementation documents (including supporting data, analyses, reports, environmental compliance documents, water control manuals, etc.) shall undergo ATR in accordance EC 1165-2-217. 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 6.6. An ATR team site visit will only be scheduled as deemed necessary and be evaluated for each discipline to determine if an in-person review of current site conditions, features, and assessment of life safety is required to ensure the quality and credibility of the government's scientific information. Additional data required by the ATR team will be gathered by PDT members and will be disseminated to the ATR team.

6.2 Documentation of ATR

Documentation of ATR will occur using the requirements of EC 1165-2-217. This includes the four part comment structure and the use of DrChecksSM. ATR may be certified when all ATR concerns are either resolved or referred to HQUSACE for resolution and the ATR documentation is complete. Certification of ATR should be completed, based on work reviewed to date, for the Design Documentation Report (DDR). The certificate templates for project DQC are located in **Error! Reference source not found.**

6.3 Products to Undergo ATR

Products that will undergo ATR include the Plans, Specifications, and DDR.

6.4 Required Team Expertise and Requirements

ATR teams will be established in accordance with EC 1165-2-217. All ATR members should be registered with CERCAP as a reviewer, unless approved separately, with qualifications matching the project requirements and their perspective roles. To assure independence, the leader of the ATR team will be outside the MSC. The ATR team shall have expertise related inland navigation to include the design and fabrication of navigation lock components and hydraulic steel structures (HSS). See **Error! Reference source not found.**, **Error! Reference source not found.** for the list of ATR reviewers. The following disciplines will be required for ATR of this project:

ATR Lead: The ATR team lead shall be a senior professional engineer 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. The ATR team lead shall have an extensive background in inland navigation projects.

Architect: Reviewer shall be a senior level engineer with extensive experience in architectural design of buildings. The reviewer shall have a minimum of 10 years of experience.

Electrical Engineer: Reviewer shall be a senior level engineer with extensive experience in electrical rehabilitation of inland navigation projects. The reviewer shall have a minimum of 10 years of experience.

Mechanical Engineer: Reviewer shall be a senior level engineer with extensive experience in design of HVAC and piping systems. The reviewer shall have a minimum of 10 years of experience.

Structural Engineer: Reviewer shall be a senior level engineer with extensive experience in the design and rehabilitation of concrete buildings or structures, along with experience in seismic design. The reviewer shall have a minimum of 10 years of experience.

6.5 Statement of Technical Review Report

At the conclusion of the ATR effort, the ATR team will prepare a review report with a completion and certification memo. The report will be prepared in accordance with EC 1165-2-217.

6.6 ATR Schedule and Estimated Cost

Although ATR is always seamless, the preliminary ATR milestone schedule is listed in Table 2. The cost for the ATR is approximately \$35,000.

Project Phase/Submittal	Review Start Date	Review End Date
ATR 35% P&S/DDR Review	7/27/20	8/2/20
ATR 65% P&S/DDR Review	11/09/20	11/22/20
ATR Final P&S/DDR Review	3/01/21	3/14/21

Table 2 ATR Schedule



Section 7

Independent External Peer Review (IEPR)

7.1 Decision on Type II IEPR (SAR)

The following evaluations indicate whether or not a Type II IEPR (SAR) is recommended for the contracts within the project currently in the PED Phase. The MVS Chief of Engineering and Construction has made a risk-informed-decision that this work does not pose a significant threat to human life (public safety). Therefore, a SAR will not be required for the work included in this effort.

(1) Does failure of the project pose a significant threat to human life or is the project justified by life safety?

This work involves the alterations to the main lock overlooks. At this low-head navigation structure, a failure of the main lock overlooks affects the operability of the lock but does not cause flooding to exceed flood stage and does not pose a significant threat to human life, nor is the project justified by life safety. There are no identified potential failure modes for the overlooks that would pose a significant threat to human life and public safety. The alterations for the overlooks will not produce any new failure modes or a progression of existing failure modes to the lock and dam. The overlook alterations will be designed for the appropriate level of vertical and lateral loadings required by applicable structural codes based on the building occupancy and site specific characteristics. The base level loadings used to design the overlook alterations are the minimum code requirements intended to prevent structural failure and protect the life and safety of the public. The structural members will be designed and detailed to prevent a sudden catastrophic collapse during the design level seismic event and allow occupants to evacuate the buildings safely afterwards. The likelihood of the design level seismic event, which is the controlling structural load case, occurring is low. The design level seismic event from applicable design codes has a 2% exceedance in 50 years. The overlook buildings are constructed of commonly used reinforced concrete moment frames, therefore no additional risk of failure is anticipated when compared to any other building of the same construction type using the required design codes.

(2) Does the project involve the use of innovative materials or techniques?

The alterations to the overlooks will utilize standard construction methods and procedures. There is nothing in the project that would be considered innovative or unusual.

(3) Does the project design require redundancy, resiliency, or robustness?

The project design requires appropriate levels of redundancy, resiliency, and robustness per the structural requirements of standard building codes.

(4) Does the project have a unique construction sequencing or a reduced or overlapping design construction schedule?

The design is not innovative and is not using design or construction techniques that are precedent setting; nor is the project using unique construction scheduling or ECI delivery systems.



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Based upon the assessment above, a Type II IEPR (SAR) will not be required. The signed memo justifying the rationale not to conduct a Type II IEPR (SAR) is shown in **Error! Reference source not found.**

Section 8

BCOES Review

8.1 Requirements

The Technical Lead is the review leader for all BCOES reviews and, as such, is responsible for managing all BCOES reviews and assuring all DrChecks comments are resolved and closed. BCOES reviews are done during design for a project using design-bid-build (D-B-B) method. The BCOES review will be performed in accordance with ER 415-1-11 and ER 1110-1-12 on all implementation documents (including supporting data, analyses, reports, environmental compliance documents, water control manuals, etc.) to ensure:

- (1) Clarity of the acquisition documents, the soundness of the government's evaluation and selection criteria for negotiated acquisitions, and the ease of bidders or proposers to understand the government's requirements, allowing the submission of a competitive bid or proposal that is responsive to the government's requirements.
- (2) Ease of constructing a specified or designed project according to the government's requirements, including the proposed construction duration, and the ease of understanding and administering the contract documents during their execution.
- (3) Ability to efficiently operate and maintain a facility or facilities over their life cycle when the facility or facilities are built according to the project's plans and specifications.
- (4) Ability to best achieve stewardship of air, water, land, animals, plants, and other natural resources when constructing and operating the project, and complying with the Environmental Impact Statement or Assessment or other environmental related project requirements. The USACE Environmental Operating Principles (EOPs) in ER 200-1-5 provide direction on achieving synergy between the environment and the execution of projects. The Environmental part of a BCOES review shall address all EOPs including compliance with all applicable local, state, and Federal environmental requirements.
- (5) The design is using methods, systems, and materials that optimize incorporation of a site's natural land, water, and energy resources as integral aspects of the development and minimize or avoid harm to the air, water, land, energy, human ecology and nonrenewable resources on- and off-site of the project.

See **Error! Reference source not found.**, Table 8 for the list of BCOES reviewers.



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8.2 Documentation

Engineering Considerations and Instructions (ECIs) will be included with the documents reviewed during BCOES. The designer will resolve comments from the BCOES review. All comments and comment resolutions will be performed and documented in DrChecks as per ER 1110-1-8159.

The BCOES review, incorporating all required facets, will occur after all ATR comments are resolved and the ATR is completed and certified. The start of the final BCOES review is currently scheduled for April 2021. Upon completion of a BCOES review and prior to final approval of the P&S, the Technical Lead will document all comments, resolutions and identify the actual personnel who performed the BCOES review. A BCOES certification will be completed in accordance with ER 415-1-11. The certificate template is located in **Error! Reference source not found.**

Section 9

Value Based Design Charrette

A Value Based Design Charrette, which was coordinated through the INDC, was completed for the project in October 2019. There were a total of nine proposals recommended by the Value Based Design Charrette Team as a part of the Mel Price Lift Gate Replacement Project, two of which involve the overlooks. MSC concurrence for rejection of individual proposals was obtained as required.

Section 10

Public Posting of Review Plan

As required by EC 1165-2-217, the approved RP will be posted on the District public website (<https://www.mvs.usace.army.mil/Missions/Programs-Project-Management/Plans-Reports/>). This is not a formal comment period and there is no set timeframe for the opportunity for public comment. If and when comments are received, the PDT will consider them and decide if revisions to the RP are necessary.

Section 11

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 INDC) as to the appropriate scope, level of review, and endorsement by the INDC. The RP is a living document and should be updated in accordance with EC1165-2-217 and ER 1110-12. All changes made to the



approved RP will be documented in Attachment 4, **Error! Reference source not found.**ns. The latest version of the RP, along with the Commanders’ approval memorandum, will be posted on the District’s webpage and linked to the HQUSACE webpage. The approved RP should be provided to the RMO.

Section 12

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, BCOES, policy and legal review, and SAR (if required). 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.

Software/Model/Tool Name	Model Description	Model Type
Microstation V8i SS4	CADD	Engineering
STAAD Pro SS6	Structural Analysis and Design	Engineering
MathCad Prime 3.1	Computational Analysis	Engineering
Microsoft Excel	Computational Analysis	Engineering

Table 3 Models and Status

Section 13

Review Plan Points of Contact

Title	Organization	Phone
Review Manager	CEMVS-EC	314-331-8281

Table 4 RP POC