



US Army Corps
of Engineers®
Buffalo District

Buffalo District
Great Lakes and Ohio River Division

Project Title: Black Rock Lock Bulkhead

Authority: OPERATIONS & MAINTENANCE

P2/Project Number: 503348

Review Plan

PREPARED
BY:

[Redacted]

Chief
NY/PA Operations and Maintenance Office
USACE, Buffalo District (LRB)

RECOMMENDED
BY:

[Redacted]

District Commander
USACE, Buffalo District (LRB)

ENDORSED
BY:

[Redacted]

Director
Review Management Organization Representative
USACE, Inland Navigation Design Center

APPROVED
BY:

[Redacted]

Chief, Engineering and Construction Division
USACE, Great Lakes and Ohio River Division

MSC APPROVAL DATE: *Pending*

REVIEW PLAN ENGINEERING AND DESIGN PRODUCTS

BLACK ROCK LOCK BULKHEAD BUFFALO DISTRICT (LRB)

Current Version Date: 03 February 2025

Mandatory Revision Date: 03 February 2028

1. PURPOSE AND REFERENCES

a. Purpose. This review plan describes necessary quality reviews for engineering and design (E&D) products for the Black Rock Lock Bulkhead (P2# 503348).

b. References.

- (1) Engineering Regulation (ER) 415-1-11, Biddability, Constructability, Operability, Environmental and Sustainability (BCOES) Reviews
- (2) Engineering Regulation (ER) 1165-2-217, Civil Works Review Policy
- (3) Ideagen 08504 LRD, Supplemental Quality Procedures for Civil Works (CW) Engineering and Design (E&D) Products
- (4) Program Management Plan (PgMP), Black Rock Lock, JAN 2022

2. REVIEW MANAGEMENT ORGANIZATION (RMO). The RMO for this project is the U.S. Army Corps of Engineers (USACE) Inland Navigation Design Center (INDC).

3. PROJECT SCOPE AND PRODUCTS

a. Project Description and Scope of Work. With no replacement of the original miter guard gates from the lock's construction completion in 1913, the Black Rock Lock miter guard gate leaves are over 100 years old and operates in a freshwater environment. Recent inspection reports (US Army Corps of Engineers, Buffalo District, 2017 and 2019) indicate that the gates are due for replacement. These reports have highlighted dramatic section loss of steel in multiple locations, as well as possible fatigue issues.

In May 2021, Buffalo District's project delivery team conducted a value-based design charrette in coordination with members of the Inland Navigation Design Center. The purpose of the value-based design charrette was 1) to investigate alternatives to the existing miter guard gates and all related elements and 2) develop multiple courses of action to provide a life-cycle cost-effective project to deliver a replacement closure structure with a 100-year design life.

Ultimately, the team conducting the charrette recommended that Buffalo District leadership select full chamber bulkheads and bulkhead slots, with retrofitting of the guard gate pockets and sills to accommodate. This is determined to be the most favorable option as it increased safety as well as meets standardization initiatives across USACE.

The scope of the project is to design and construct fiber reinforced polymer (FRP) bulkheads for the Black Rock Lock. The design and construction of new slots for the Black Rock Lock are to be performed in a separate project. This project includes the design and fabrication of new composite/FRP bulkhead sections and appurtenances such as a lifting beam, along with delivery of the bulkheads and appurtenances.

As USACE continues to increase its use of composite/FRP in the replacement of new/existing hydraulic steel structures (HSS), it becomes important to identify projects which can be used as a standard for its implementation. The Black Rock Lock Bulkheads has been identified as a first of its kind project utilizing composite/FRP in the fabrication of lock dewatering bulkheads. As such this project will be used to standardize how composite/FRP can be used in the construction/fabrication of lock dewatering bulkheads/stoplogs moving forward.



Figure 1. Black Rock Lock with Location of Miter Guard Gates Annotated

Project Number	503348
Business Line	Navigation
Project Type	Operations & Maintenance
Geographic Location	Black Rock Channel and Tonawanda Harbor, Buffalo, NY
Main Project Features	Composite Maintenance Bulkhead
Key Physical Components	Bulkhead
Estimated Construction Cost	██████
Inland Navigation Category	Category 2
E&D Product Method Delivery	Contractor Designed
Construction Delivery Method	Supply Contract, full and open best value

b. Products (Pre-Award). The E&D products to be reviewed prior to solicitation include the following:

- (1) Design Documentation Report (DDR)
- (2) Plans and Specifications (P&S)

c. Products (Post-Award). The contractor developed products to be reviewed include the following:

- (1) Contractors design calculations and report for the composite bulkheads
- (2) Contractor design P&S

4. DOCUMENTATION OF RISKS AND ISSUES

a. Life Safety Assessment: The District Chief of Engineering has reviewed the project requirements and determined there is not a significant threat to human life if the project were to fail.

- (1) Life safety risks are present with the usage of any structure used for dewatering of a lock chamber for maintenance/construction. As such, sound and proven engineering principles and techniques will be employed to assure life safety during design/construction of this project and ensure the adequacy of the bulkheads.

b. Technical Complexities and Risks. The project delivery team (PDT) performed a thorough risk analysis of the anticipated project construction and operations activities and identified the following key technical complexities and risks. Quality reviews will be focused to manage these risks.

- (1) Lack of PDT Labor Resources
- (2) Supply Chain Delays
- (3) Poor quality construction
- (4) Cost Increases
- (5) First of its kind project (length)
- (6) Lack of contractor availability

5. REVIEW EXECUTION

a. Project Delivery Team (PDT): PDT members are listed in Attachment 1. PDT members will work collaboratively with review team members to ensure effective execution of quality reviews.

b. District Quality Control (DQC): DQC is required for all E&D products. Follow DQC procedures in Chapter 4 of ER 1165-2-217 and District local work instructions. The Engineering Technical Lead and DQC Lead will collaborate to oversee and ensure effective DQC execution.

c. Quality Assurance (QA): QA includes those processes employed to ensure that QC activities are being accomplished in line with planned activities and that those QC activities are effective in producing a product that meets the desired end quality. Everyone has a role in QA, from Supervisors, PMs, Subject Matter Experts (SMEs), and the PDT. QA also includes verifying that products from brokered USACE, A-E (including D-B contracts), or Sponsor work has undergone QC. The geographic District ultimately owns the work and needs to assure the work product meets the needs of the customer. The QA team listed in Attachment 1 will review the Post-Award products listed in 3.c above.

d. Biddability, Constructability, Operability, Environmental, Sustainability (BCOES): BCOES reviews are required for all E&D products. Follow BCOES review procedures in ER 415-1-11 and District local work instructions. The Engineering Technical Lead and DQC Lead will collaborate to oversee and ensure effective BCOES execution.

e. Agency Technical Review (ATR): ATR is required for all products and will follow ATR procedures in Chapter 5 of ER 1165-2-217. ATR will address the technical complexities and risks described in sub-section 4.b. Required senior technical disciplines and expertise needed for ATR are shown in Table 1. Assigned ATR team members are listed in Attachment 1. ATR members in engineering disciplines are verified as certified in the Corps of Engineers Review and Certification Access Program (CERCAP). PDT and review team leaders will collaborate to oversee and ensure effective execution.

Table 1. ATR Technical Discipline(s) and Required Expertise	
Technical Discipline	Expertise Required
ATR Team Leader	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.
Structural Engineer	Shall have over 15 years of experience in the field of structural engineering including design, fabrication and maintenance of hydraulic steel structures and hydraulic composite structures. The reviewer shall have performed design and analysis of lock stoplog/bulkheads and associated appurtenant items (i.e. lifting beams, etc.) for inland navigation projects.
Operations	Shall have experience and knowledge in the operation and maintenance of navigation locks.
FRP/Composites Engineer	Shall have senior level experience in the design or the solicitation of designs for hydraulic composite structures (HCS). The reviewer shall have been personally involved in projects associated with HCS.
Cost Engineer	Shall have experience and knowledge in the cost estimation of fiber reinforced polymer bulkhead fabrication and general construction.

f. Safety Assurance Review (SAR): Per sub-section 4.a, an SAR is not required. When required, SAR will be performed per Chapter 6 of ER 1165-2-217. The signed SAR Risk-Informed Decision document can be found in ATTACHMENT 2.

b. ATR Team Leader: [REDACTED]

[REDACTED]

c. Review Management Organization (RMO): [REDACTED]

[REDACTED]

10. APPROVAL SIGNATURE:

[REDACTED SIGNATURE]

District Chief of Engineering

Sections Updated	Update Date

ATTACHMENT 1 – REVIEW TEAM MEMBERS

PROJECT DELIVERY TEAM			
Function/Discipline	Name (Last, First)	Office	Phone Number
Project Manager	[REDACTED]	[REDACTED]	[REDACTED]
Technical Lead/Structural Engineer	[REDACTED]	[REDACTED]	[REDACTED]
Cost Engineer	[REDACTED]	[REDACTED]	[REDACTED]
Senior Cost Engineer	[REDACTED]	[REDACTED]	[REDACTED]
Composites Technical Manager	[REDACTED]	[REDACTED]	[REDACTED]
INDC Technical Manager	[REDACTED]	[REDACTED]	[REDACTED]

DQC REVIEWERS			
Function/Discipline	Name (Last, First)	Office	Phone Number
DQC Lead/Structural Engineer	[REDACTED]	[REDACTED]	[REDACTED]
Cost Engineer	[REDACTED]	[REDACTED]	[REDACTED]
Specifications Engineer	[REDACTED]	[REDACTED]	[REDACTED]
Composites Subject Matter Expert	[REDACTED]	[REDACTED]	[REDACTED]

*To be backfilled in January 2025. New Chief of Cost Engineering will take over [REDACTED] at that point.

BCOES TEAM MEMBERS			
Function/Discipline	Name (Last, First)	Office	Phone Number
Biddability	[REDACTED]	[REDACTED]	[REDACTED]
Constructability	[REDACTED]	[REDACTED]	[REDACTED]
Operability	[REDACTED]	[REDACTED]	[REDACTED]
Environmental	[REDACTED]	[REDACTED]	[REDACTED]
Sustainability	[REDACTED]	[REDACTED]	[REDACTED]
NY/PA O&M	[REDACTED]	[REDACTED]	[REDACTED]
Safety Office	[REDACTED]	[REDACTED]	[REDACTED]
Office of Counsel	[REDACTED]	[REDACTED]	[REDACTED]
Real Estate	[REDACTED]	[REDACTED]	[REDACTED]
Black Rock Lock	[REDACTED]	[REDACTED]	[REDACTED]
Black Rock Lock	[REDACTED]	[REDACTED]	[REDACTED]

ATR TEAM MEMBERS			
Function/Discipline	Name (Last, First)	Office	Phone Number
ATR Leader	[REDACTED]	[REDACTED]	[REDACTED]
Structural Engineer	[REDACTED]	[REDACTED]	[REDACTED]
FRP/Composites Engineer	[REDACTED]	[REDACTED]	[REDACTED]
Operations	[REDACTED]	[REDACTED]	[REDACTED]
Cost Engineering	[REDACTED]	[REDACTED]	[REDACTED]

QA REVIEWERS of Contractor Designs			
Function/Discipline	Name (Last, First)	Office	Phone Number
Technical Lead/Structural Engineer	[REDACTED]	[REDACTED]	[REDACTED]
Composites Subject Matter Expert	[REDACTED]	[REDACTED]	[REDACTED]
Specifications Engineer	[REDACTED]	[REDACTED]	[REDACTED]
District Operations Reviewer	[REDACTED]	[REDACTED]	[REDACTED]

ATTACHMENT 2 – SAFETY ASSURANCE REVIEW RISK-INFORMED DECISION

**SAFETY ASSURANCE REVIEW (SAR) RISK-INFORMED DECISION
BLACK ROCK LOCK GUARD GATE REPLACEMENT WITH BULKHEADS**

In accordance with ER 1165-2-217, Paragraph 7.3, “SAR is conducted on PED and construction activities for projects where potential hazards pose a significant threat to human life (public safety).” Additionally, Paragraph 7.4 states the following: “The District Chief of Engineering, as the Engineer-In-Responsible-Charge, will consider life safety implications to make a risk-informed decision whether the project would benefit from a SAR and document the rationale to conduct or not conduct a SAR in the RP.”

Project Description and Scope of Work

With no replacement of the original miter guard gates since the lock’s construction completion in 1913, the Black Rock Lock miter guard gate leaves are over 100 years old and operate in a freshwater environment. Recent inspection reports indicate that the gates are due for replacement. In May 2021, Buffalo District’s Project Delivery Team (PDT) conducted a value-based design charrette in coordination with members of the Inland Navigation Design Center (INDC). The purpose of the value-based design charrette was to 1) investigate alternatives to the existing miter guard gates and all related elements, and 2) recommend a life-cycle cost-effective project to deliver a replacement closure structure with a 100-year design life. Ultimately, the team conducting the charrette recommended that Buffalo District leadership select full chamber bulkheads and bulkhead slots, with retrofitting of the guard gate pockets and sill to accommodate. This was determined to be the most favorable option – increased safety, as well as meeting standardization initiatives across USACE. Due to rising cost in steel fabrication, supply challenges, and increased lead times for hydraulic steel structure components, a decision was made to abandon the previous steel bulkhead design in favor a composite bulkhead system in August 2024.

The scope of the project is to create plans and specifications for the design and fabrication of composite bulkheads for the Black Rock Lock. The scope includes specifying the design requirements for the new bulkheads; fabrication of new bulkhead and appurtenances, such as a lifting beam.

Risk-Informed Decision Criteria (ER 1165-2-217, Paragraph 7.4.1.1)

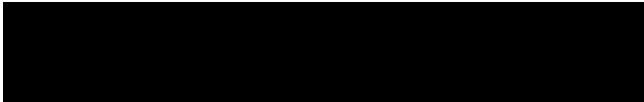

Criteria	Relevancy to this Project
Would the project’s failure pose a significant threat to human life?	No. While failure of the proposed bulkheads of the Black Rock Lock may pose a threat to human life under certain circumstances (i.e., during the brief periods of time they are in use, there may be workers in the dewatered lock chamber), this threat is not considered to be significant. Although unlikely, the failure mode would not be sudden/catastrophic, and as such, there would be sufficient warning signs to facilitate chamber evacuation, mitigating any risks to human life. As with all major heavy construction projects, there are inherent safety

	risks during execution of construction activities, however sound and proven engineering principles and techniques will be employed to assure life safety during construction of this project.
Does the project involve the use of innovative materials or techniques where the engineering is based on novel methods, presents complex challenges for interpretations, contains precedent-setting methods or models, or presents conclusions that are likely to change prevailing practices?	Yes. This project was originally designed for a steel bulkhead system, however is changing to a composite bulkhead system. Design work will be performed by the USACE Inland Navigation Design Center Mandatory Center of Expertise (INDC-MCX), including staff with expertise in composite materials, along with support from in-house Buffalo District staff. Composite bulkheads have been used successfully on a number of different navigation and flood risk management projects.

Based upon the nature of the work involved with this project, evaluation of the risk-informed decision criteria identified above, and factoring in the technical expertise that will be utilized for performance of the design work and associated District Quality Control (DQC), Biddability, Constructability, Operability, Environmental, and Sustainability (BCOES), and Agency Technical Review (ATR) reviews, a SAR is not recommended for this project

RECOMMENDATION REGARDING SAR

Based on the above assessment, it is the risk-informed recommendation of the PDT and the Buffalo District Chief of Engineering & Construction Division that a SAR is NOT required for this project.



 Chief, Design Branch

12 November 2024

 Date



 Chief, Engineering & Construction Division

12 November 2024

 Date