

Review Plan – MACARTHUR LOCK REPLACEMENT OF CULVERT BULKHEADS, FY14

REVIEW PLAN

**IMPLEMENTATION PHASE
DESIGN DOCUMENTATION REPORT AND PLANS & SPECIFICATIONS**

FOR

**MACARTHUR LOCK REPLACEMENT OF CULVERT BULKHEADS
SOO AREA OFFICE
SAULT STE. MARIE, MI**

Initial MSC Approval Date

TBD

Last Revision Date

JUNE 2014

**U.S. ARMY CORPS OF ENGINEERS
DETROIT DISTRICT**

JUNE 2014

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REVIEW PLAN

DESIGN DOCUMENTATION REPORT AND PLANS & SPECIFICATIONS

MACARTHUR LOCK REPLACEMENT OF CULVERT BULKHEADS SOO AREA OFFICE SAULT STE. MARIE, MI

24-JUNE-2014

1. PURPOSE AND REQUIREMENTS

a. Purpose. This Review Plan (RP) is an implementation phase document that defines the scope, level of risk, and level of peer review for the design and construction activities associated with the MacArthur Lock Culvert Bulkhead Replacement. The project includes the preparation of plans and specifications for the fabrication of two culvert bulkheads.

b. References

- (1) Engineer Circular (EC) 1165-2-214, Civil Works Review, 15 December 2012
- (2) Engineer Regulation (ER) 1110-1-12, Quality Management, 31 July 2006
- (3) CELRE Quality Management Plan, CELRE DC 5-1-1 and, in particular, Appendix C-3 – Engineering Subplan dated November 30, 1998
- (4) Quality Control Plan (QCP)

c. Requirements. This review plan was developed in accordance with EC 1165-2-214, which establishes an accountable, comprehensive, life-cycle review strategy for Civil Works products by providing a seamless process for review of all Civil Works projects from initial planning through design, construction, and Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R). It provides the procedures for ensuring the quality and credibility of U.S. Army Corps of Engineers (USACE) decision, implementation, and operations and maintenance documents and work products. The EC outlines three levels of review: District Quality Control, Agency Technical Review, and Independent External Peer Review.

- (1) District Quality Control (DQC). DQC is an internal review process of basic science and engineering work products focused on fulfilling the project quality requirements defined in the Project Management Plan (PMP). Basic quality control tools include a Quality Management Plan providing for seamless review, quality checks and reviews, supervisory reviews, Project Delivery Team (PDT) reviews, etc. It is managed in the home district. Quality checks may be performed by staff responsible for the work, such as supervisors, work leaders, team leaders, designated individuals from the senior staff, or other qualified personnel. However, they should not be performed by the same people who performed the original work, including managing/reviewing the

work in the case of contracted efforts. Additionally, the PDT is responsible for a complete reading of any reports and accompanying appendices prepared by or for the PDT to assure the overall coherence and integrity of the report, technical appendices, and the recommendations before approval by the District Commander. The Major Subordinate Command (MSC)/District Quality Management Plans address the conduct and documentation of this fundamental level of review. DQC is addressed later in this review plan.

- (2) Agency Technical Review (ATR). ATR is an in-depth review, managed within USACE, and conducted by a qualified team outside of the home district that is not involved in the day-to-day production of the project/product. The purpose of this review is to ensure the proper application of clearly established criteria, regulations, laws, codes, principles and professional practices. The ATR team reviews the various work products and assures that all the parts fit together in a coherent whole. ATR teams will be comprised of senior USACE personnel, preferably recognized subject matter experts with the appropriate technical expertise such as regional technical specialists (RTS), and may be supplemented by outside experts as appropriate. To assure independence, the leader of the ATR team shall be from outside the home MSC.
- (3) Independent External Peer Review (IEPR). IEPR is the most independent level of review, and is applied in cases that meet certain criteria where the risk and magnitude of the proposed project are such that a critical examination by a qualified team outside of USACE is warranted. For clarity, IEPR is divided into two types, Type I is generally for decision documents and Type II is generally for implementation documents.

A Type II IEPR (SAR) shall be conducted on design and construction activities for hurricane and storm risk management and flood risk management projects, as well as other projects where potential hazards pose a significant threat to human life. This applies to new projects and to the major repair, rehabilitation, replacement, or modification of existing facilities. External panels will review the design and construction activities prior to initiation of physical construction and periodically thereafter until construction activities are completed. The review shall be on a regular schedule sufficient to inform the Chief of Engineers on the adequacy, appropriateness, and acceptability of the design and construction activities for the purpose of assuring that good science, sound engineering, and public health, safety, and welfare are the most important factors that determine a project's fate.

2. PROJECT INFORMATION

- a. Project.** FY14 MacArthur Lock Bulkhead Replacement
- b. General Site Location and Description.** Project is located at the MacArthur Lock as part of the Soo Locks Complex.
- c. RP Points of Contact.** N/A

- d. **Project Delivery Team (PDT).** The PDT in charge of designing this project includes the following:

N/A

3. **RISK INFORMED DECISION / HIGHEST LEVEL OF REVIEW**

- a. **Project Risks**

- (1) Low Loss of Life Risk (Maintenance Staff Behind Bulkhead During Structural Failure)

- b. **Risk Analysis.**

The MacArthur Lock Bulkhead Replacement project utilizes standard USACE designs and practices for the fabrication of structures that will be used for maintenance purposes in a predictable environment. The project is not a hurricane, storm risk management or flood risk management project as it primarily supports navigation. The project is located at the Soo Locks and doesn't have potential hazards that pose a significant threat to human (public) life. There is a low loss of life risk as it only applies to a structural failure when workers are present behind the bulkhead. In addition, public life risk is low and there are no significant design schedule pressures. No significant complexities are presented in the project. The bulkheads will be designed with structural redundancy which is standard practice for hydraulic steel structures. These structures will be installed for maintenance purposes (approximately every 10 years). Prior to each use, the bulkheads will be thoroughly inspected to insure their suitability for installation. In addition, the bulkheads will be installed in the lock emptying culverts which are a very predictable environment, thus limiting the overall resiliency and robustness demand.

Based on this assessment, it has been determined that an ATR level review is appropriate, due to the low life loss risk, and a Type II IEPR is not required. The project utilizes standard USACE designs and practices for the fabrication of structures that will be used for maintenance purposes in a predictable environment. In addition, overall public life risk is low and there are no significant design schedule pressures. An ATR review by a Structural Engineer with experience in the design of similar structures will mitigate any remaining risks.

4. **REVIEW TYPES AND REQUIRED DISCIPLINES**

- a. **District Quality Control (DQC).** DQC efforts will include the necessary expertise to address compliance with published Corps policy. The PDT will develop a Quality Control Plan (QCP) for this project. The Detroit District will execute three types of formal DQC reviews on this project: Independent Technical Review (ITR), BCOES review and Supervisory Review. All ITR, PIH, and BCOES review comments will be submitted into

DrChecks. This will be done in addition to everyday quality control and calculation checks performed on the product during design.

The following disciplines will be represented during the DQC process: Structural Engineering.

- (1) **ITR Review:** An independent technical review of the DDR will be done within the Detroit District to ensure that the design conforms to proper criteria, that appropriate design methods have been followed, that an internal check of the design has been completed and is indicated on the drawings and computation sheets and that the completed project design is adequately documented in the DDR. The ITR reviewers are as follows:

- (2) **Plan-In-Hand (PIH) Review:** A Plan-In-Hand review for this project has been waived. A PIH for this project would require dewatering of the MacArthur Lock. However, prior to the beginning of design, and during a lock dewatering period, a site visit was conducted to assess the condition of the culverts, recesses, and to confirm as-built dimensions.

- (3) **BCOES Reviews:** Review to assure solicitation documents are readily understood; the product can be bid, built, operated and maintained efficiently; environmental concerns are protected, and sustainability is addressed. Three reviews will be conducted: a Concept Level BCOES Review, a 95% BCOES review, and a 95% BCOES backcheck review. Design team members will conduct the BCOES reviews utilizing DrChecks. All DrChecks comments must be resolved and closed out by the reviewer. Comments not entered in DrChecks, but discussed during the BCOES meeting will be recorded and inserted in the BCOES Technical Memorandum.

Prior to the start of the BCOES Review, the Technical Coordinator (TC) should contact each office element listed above in paragraph 4.a. to ascertain the name(s) of their representative(s) participating in the review. The TC should also determine from each office element listed above the number of Certified Final Submittals – BCOES Review Plans and Specifications required for the review. The plans and specifications shall be distributed to the office elements by memorandum or email link to the appropriate ProjectWise folder. As a minimum, the memorandum should state:

- (i) Whether the plans and specs were prepared in-house, by an A-E or both
- (ii) Start and end dates for the Review
- (iii) Review Comments will be entered into DrChecks
- (iv) Project Review Name in DrChecks
- (v) Labor Cost Codes and amounts (Provided by PM)

The BCOES reviewers are as follows:

N/A

- (4) **Supervisory Review:** Review to ensure Ready to Advertise (RTA) package is ready for final routing, all reviews have been completed and back checked, all files are properly labeled as dictated by project milestone and filed in ProjectWise, and package is ready for advertisement. The Supervisory reviewers are as follows:

N/A

- b. **Agency Technical Review (ATR)** For this project an ATR will be required based on the Risk Analysis summarized in paragraph 3.a.

- (1) **General.** ATR will be managed and performed outside of the Detroit District. EC 1165-2-214 requires the MSC to serve as the RMO for this project. There shall be appropriate coordination and processing through CoPs; relevant PCXs, and other relevant offices to ensure that a review team with appropriate independence and expertise is assembled and a cohesive and comprehensive review is accomplished. The ATR shall ensure that the product is consistent with established criteria, guidance, procedures, and policy. The ATR will assess whether the analyses presented are technically correct and comply with published USACE guidance, and that the document explains the analyses and the results in a reasonably clear manner for the public and decision makers. Members of the ATR team will be from outside the Detroit District. Due to the specific structural nature of this project and the high level of expertise in LRH relating to bulkhead design, the Structural review ATR team member will be from LRH. Only an ATR Team leader and a Structural reviewer are required due to the fact that the bulkheads are strictly structural elements. The bulkhead design did not require any engineering disciplines other than structural, therefore only a review by a structural engineer, in addition to the team lead, is required.
- (2) **Products to be Reviewed.** The ATR team will be reviewing the Design Documentation Report (DDR) and associated Plans & Specifications supporting the DDR.
- (3) **Documentation of ATR.** DrChecks review software will be used to document all ATR comments, responses and associated resolutions accomplished throughout the review process. Comments should be limited to those that are required to ensure adequacy of the product. The four key parts of a quality review comment will normally include:
 - (i) The review concern – identify the product’s information deficiency or incorrect application of policy, guidance, or procedures;

- (ii) The basis for the concern – cite the appropriate law, ASA (CW)/USACE policy, guidance or procedure that has not been properly followed;
- (iii) The significance of the concern – indicate the importance of the concern with regard to its potential impact on the plan selection, recommended plan components, efficiency (cost), effectiveness (function/outputs), implementation responsibilities, safety, Federal interest, or public acceptability; and
- (iv) The probable specific action needed to resolve the concern – identify the action(s) that must be taken to resolve the concern.

In some situations, especially addressing incomplete or unclear information, comments may seek clarification in order to then assess whether further specific concerns may exist. The ATR documentation in DrChecks will include the text of each ATR concern, the PDT response, a brief summary of the pertinent points in any discussion, and lastly the agreed upon resolution. The ATR team will prepare a Review Report which includes a summary of each unresolved issue; each unresolved issue will be raised to the vertical team for resolution. Review Reports will be considered an integral part of the ATR documentation.

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 DDR and Plans and Specifications.

- (4) **Required ATR Team Expertise.** ATR teams will be comprised of senior USACE personnel (Regional Technical Specialists (RTS), etc.), and may be supplemented by outside experts as appropriate. The disciplines represented on the ATR team will reflect the significant disciplines involved in the planning, engineering, design, and construction effort. These disciplines include structural only. To assure independence, the leader of the ATR team will be outside of the MSC. A list of the ATR members and disciplines is provided below. The chief criterion for being a member of the ATR team is knowledge of the technical discipline and hydraulic steel structure design experience. ATRs may be omitted after an evaluation of the project against EC 1165-2-214 Paragraph 15. The Technical Coordinator has assessed the project further and has determined that an ATR is appropriate.

The ATR reviewers are as follows:

N/A

c. Independent External Peer Review (IEPR) Not Required

- (1) **General.** Type I and Type II IEPRs are conducted in accordance with the guidance promulgated in EC 1165-2-214. Type I IEPRs are conducted on project studies. It is of critical importance for those decision documents and supporting work products

where there are public safety concerns, significant controversy, a high level of complexity, or significant economic, environmental and social effects to the nation. However, it is not limited to only those cases and most studies should undergo Type I IEPR. In accordance with EC 1165-2-214 a Type II IEPR (SAR) shall be conducted on design and construction activities for hurricane and storm risk management and flood risk management projects, as well as other projects where potential hazards pose a significant threat to human life. This applies to new projects and to the major repair, rehabilitation, replacement, or modification of existing facilities

(2) **Decision on Type II IEPR.** In accordance with EC 1165-2-214 a Type II IEPR (SAR) is not required. The project is not a hurricane, storm risk management or flood risk management project. The project is located at the Soo Locks and doesn't have potential hazards that pose a significant threat to human life. There is a low loss of life risk as it only applies to a structural failure when workers are present behind the bulkhead. In addition, the following factors were considered. The evaluation of each factor follows the factor description

a. The project involves 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;

Evaluation: The replacement of the culvert bulkheads utilizes standard USACE details, design techniques, and design criteria. The methods used for the project have been utilized in other USACE facilities with positive performance. No significant complexities are presented in the project.

b. The project design requires redundancy, resiliency, and robustness.

Evaluation: The bulkheads will be designed with structural redundancy which is standard practice for hydraulic steel structures. These structures will be installed for maintenance purposes (approximately every 10 years). Prior to each use, the bulkheads will be thoroughly inspected to insure their suitability for installation. In addition, the bulkheads will be installed in the lock emptying culverts which are a very predictable environment, thus limiting the overall resiliency and robustness demand.

c. The project has unique construction sequencing or a reduced or overlapping design construction schedule; for example, significant project features accomplished using the Design-Build or Early Contractor Involvement (ECI) delivery systems.

Evaluation: The fabrication of the bulkheads will not require any unique or reduced construction scheduling. The design package sent out for advertisement will be complete and will not require any additional design or early involvement of the contractor.

Based on the assessment of the above answers and the overall Risk Analysis for this project, it has been determined that a Type II IEPR would not be required. The project utilizes standard USACE designs and practices for the fabrication of structures that will be used for maintenance purposes in a predictable environment. In addition, public life risk is low and there are no significant design schedule pressures.

(3) **Decision on Type I IEPR.** This document is not a decision document. Therefore, Type I IEPR is not required.

d. Value Engineering: Value Engineering (VE) studies will not be performed for this project in accordance with ER 11-1-321, 01 Jan 2011, change 1 and ER 1110-2-1150, Para. 14.7, 31Aug 99. The total cost is less than the 2 million dollar threshold.

5. PUBLIC INVOLVMENT

a. Public Comment Period: This Review Plan will be posted to the LRE web site to allow the public an opportunity to comment. This will not result in a formal comment period and there is no set timeframe for public comment. If and when comments are received, the PDT will consider them and decide if revisions to the review plan are necessary.

b. Review Participation from Public: There is no expectation of obtaining support from personnel outside of the USACE to conduct reviews.

6. ANTICIPATED NUMBER OF REVIEWERS

a. Number of DQC Reviewers: 2

b. Number of ATR Reviewers: 2

c. Number of IEPR Reviewers: N/A

7. IN-KIND CONTRIBUTION BY SPONSOR

There are no in-kind contributions from the sponsor for the development of the implementation documents.

8. MODEL CERTIFICATION AND APPROVAL

EC 1105-2-412 mandates the use of certified or approved models for all planning activities to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. Planning models, for the purposes of the EC, are defined as any models and analytical tools that planners use to define water resource management problems and opportunities, to formulate potential alternatives to address the problems and take advantage of the opportunities, to evaluate potential effects of alternatives and

to support decision making. The use of certified/approved planning model does not constitute technical review of the planning product. The selection and application of the model and the input and output data still are the responsibility of the users and is subject to DQC, ATR, and IEPR reviews (if required).

EC 1105-2-412 does not cover engineering models used in planning. The responsible use of well-known and proven USACE-developed and commercially available engineering software will continue and the professional practice of documenting the application of the software and modeling results will be followed. As part of the USACE Scientific and Engineering Technology (SET) Initiative, many engineering models have been identified as preferred or acceptable for use on Corps studies and these models should be used whenever appropriate. 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, and IEPR reviews. All appropriate reviews were conducted in accordance with policy during the completed phases of the project.

a. Model Certification/Approval Schedule and Cost

- (1) For implementation documents prepared under the model National Programmatic Review Plan, use of existing certified or approved planning models is encouraged. Where uncertified or unapproved models are used, approval of the model for use will be accomplished through the ATR process. The ATR team will apply the principles of EC 1105-2-412 during the ATR to ensure the model is theoretically and computationally sound, consistent with USACE policies, and adequately documented. If specific uncertified models are identified for repetitive use within a specific district or region, the appropriate PCX, MSC(s), and home District(s) will identify a unified approach to seek certification of these models.
- (2) The models listed below were used in the design of the project. Any models required for new work packages will be identified in the package-specific QCP. This may include engineering and cost models. Certifications for those models will be addressed at that time.

| Model Name | Model description | Model Type |
|-------------------|--|-------------------|
| MCACES or MII | These are cost estimating models. This is a cost estimating model that was developed by Building System Design Inc. Crystal Ball risk analyses software will also be used. | Cost Engineering |
| Microsoft Excel | Computational Analysis | Engineering |
| STAAD.Pro V8i | Structural analysis and design | Engineering |

9. SCHEDULE AND COST OF REVIEWS

- a. **DQC Schedule and Cost.** The cost for DQC is included in the costs for PDT activities and is only broken out separately for the ITR and BCOES reviews. DQC will occur seamlessly throughout the DDR and the P&S development. Quality checks and reviews occur during the development process and are carried out as a routine management practice.

(1) **ITR Schedule and Cost:** The ITR is scheduled to occur on June 7, 2013 . The ITR is budgeted at \$13,000.

(2) **BCOES Schedule and Cost:** The 95% BCOES is scheduled to begin on February 17,2014. The total for all BCOES reviews is budgeted at \$8,000.

- b. **ATR Schedule and Cost.** The estimated cost for ATR is \$7,500. ATR is scheduled to be conducted during the 95% Review stage to review the DDR and associated plans. This review is planned to begin December 2, 2013.

10. MSC APPROVAL

The Great Lakes and Ohio River Division is responsible for approving the review plan. Approval is provided by the MSC Commander. The commander's approval should reflect vertical team input (involving district, MSC, and HQUSACE members) as to the appropriate scope and level of review for the project. Like the PMP, the review plan is a living document and may change as the study progresses. The review plan must be updated and approved by the MSC throughout the PED phase (and the construction Phase, as applicable) .Changes to the review plan should be approved by following the process used for initially approving the plan. In all cases the MSCs will review the decision on the level of review and any changes made in updates to the project.

11. REVIEW PLAN POINTS OF CONTACT / VERTICAL TEAM CONTACTS

Questions and/or comments on this review plan can be directed to the following points of contact:

ATTACHMENT A

Completion of Agency Technical Review (ATR)

The Agency Technical Review (ATR) has been completed for **MACARTHUR LOCK - REPLACEMENT OF CULVERT BULKHEADS**. The ATR was conducted as defined in the project's Review Plan (see QMP) to comply with the requirements of EC 1165-2-209. During the ATR, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of assumptions, methods, procedures and material used in analyses, alternatives evaluated, the appropriateness of data used and level obtained, and reasonableness of the results, including whether the product meets the customer's need consistent with law and existing US Army Corps of Engineers policy. All comments resulting from the ATR have been resolved and the comments have been closed in DrChecks. DrChecks comments are attached.

Signature _____

ATR Team Leader
CEMVP-EC-D

Date

Signature _____

ATR Structural Lead
CELRH-EC-DS

Date

Signature _____

Project Manager
CELRE-OT

Date

CERTIFICATION OF AGENCY TECHNICAL REVIEW

As noted above, all concerns resulting from ATR of the project have been fully resolved.

Signature _____

Date

Acting Chief, Geotech and Structures Branch
CELRE-EC-G

Signature _____

Date

Acting Chief, Engineering and Construction Office