

25 July 2001

CHIEF, TECHNICAL SERVICES DIVISION POLICY MEMORANDUM #001

Subject: Technical Services Division Policy No.1, Independent Technical Reviews

1. Reference is made to Technical Services Division Design Guide, Chapter 18, dated 10 Nov 2000, and the Technical Services Division Quality Management Plan, Engineering Branch Sub-Plan, Appendix B, dated April 2001 (enclosed).
2. Recent events have caused me to ensure that we continue to improve our "Independent Technical Review (ITR)" process. As a result of this concern, I have modified our procedures in the Technical Services Division Quality Management Plan (QMP).
3. Attached is the process that Engineering Branch implemented to ensure the ownership and quality of our products that are produced by Technical Services Division. Engineering Branch will ensure that all projects be in compliance with Appendix B of Engineering Branch sub-plan for the TSD QMP and TSD Design Guide, Engineering Branch, Chapter 18, Quality Review Process. Those documents have certification requirements that shall be used. It is the responsibility of the Branch Chiefs to ensure that an Independent Technical Review is performed in a timely, and complete manner to ensure our customers are provided quality products. This requirement is part of your "Total Army Performance Evaluation System (TAPES)," effective immediately.
4. Branch Chiefs shall ensure that I am briefed at the completion of all ITRs to ensure that all significant issues have been addressed at the proper level and to the satisfaction of the ITR team.
5. My direction is non-discretionary and will be modified by me upon receipt of significant "Lessons Learned" documentation and as a minimum, reviewed annually by each Branch Chief.



WILLIAM A. SORRENTINO, JR., P.E.
Chief, Technical Services Division

2 Encls

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CHAPTER 18

QUALITY REVIEW PROCESS

1.0 APPLICABILITY: This Quality Review process applies to all products produced by Engineering Branch in-house forces, or others such as sister districts or Architect-Engineer (A-E) consultants. The purpose of the quality review process is to help ensure design quality of in-house and A-E designed HTRW, Civil, SFO, and Military projects.

2.0 POLICY: Each product prepared by Engineering Branch shall receive an Independent Technical Review (ITR) commensurate with its size, complexity, importance and utilization of innovative or unusual features. This review is normally the third step of the quality review process.

3.0 REFERENCES:

- a. ER 1110-1-12, QUALITY MANAGEMENT
- b. ER 1110-2-1200, PLANS AND SPECIFICATIONS FOR CIVIL WORKS
- c. ER 1110-345-100, DESIGN POLICY FOR MILITARY CONSTRUCTION
- d. ER 5-1-11, PROGRAMS AND PROJECT MANAGEMENT
- e. ER 415-1-11, BIDDABILITY, CONSTRUCTABILITY, OPERABILITY

4.0 DEFINITIONS:

4.1 Product means the assembled item to be delivered to a customer outside Engineering Branch such as studies, reports, programming documents, and the final design of a project, which includes drawings, specification, design analysis and cost estimate.

4.2 Design Check Review is the first step of the review process and is the evaluation of the analysis and the product documents performed by each functional discipline as an extension of the design process. Design checks shall be performed internal to the product development team (PDT) member's section. All checked drawings, computations and analyses shall be annotated to show the initials of the designer/originator and the checker. Each PDT member shall sign a certification verifying the Design Check Review(s) was accomplished. Design checklists should be used by each functional discipline to strengthen the design check process. Experience level of checker shall be commensurate with the level of complexity and risk. A design check should include an evaluation of:

- a. Correct application of methods;

- b. Adequacy of basic data;
- c. Correctness of calculations;
- d. Completeness of documentation;
- e. Compliance with guidance and standards;

4.3 Interdisciplinary Review is normally the second step of the review process and encompasses the day-to-day coordination between PDT members throughout the product development process. The interdisciplinary check ensures the portion of the product developed by one discipline does not conflict or interfere with the portion developed by another discipline. Although an on-going process, it shall be formally documented in a meeting(s) prior to completion of each predetermined milestone. This is also an opportunity for each member of the PDT to review the product as a whole. Each PDT member shall sign a certification verifying that all significant conflicts between their portion of the product and that of other team members have been satisfactorily resolved.

4.4 Independent Technical Review (ITR) is normally the third step in the review process and provides verification that a quality product is being provided in accordance with applicable references. ITR does not include detailed checks of each designer's work, which are performed during the earlier steps of the review process. The ITR shall normally be performed by functional section chiefs. However, if the functional section chief is involved in the design of the product, or cannot meet the ITR schedule, then the ITR may be delegated to other senior engineers within the functional discipline or a contract A-E firm or sister district, as applicable, who are not significantly involved in preparation of the product under review. Each ITR reviewer shall sign a certification verifying that the ITR was accomplished. The ITR shall ensure, as appropriate, that:

- a. The concepts, features, methods, analysis, and details are appropriate, fully coordinated and correct;
- b. The concepts, features, methods, analysis, and details of an appropriate range of feasible alternatives are evaluated;
- c. The problems/opportunities/issues are properly defined and scoped;
- d. The analytical methods used are appropriate and yield reliable results;
- e. The product is consistent with the Army's environmental policy of compliance, restoration, prevention, and conservation.
- f. The results and recommendations are reasonable, within policy guidelines, and supported by the presentation;
- g. Any deviations from policy, guidance, and standards are appropriately identified and have been approved;
- h. The product is cost effective.

4.5 Quality product means that the product complies with applicable criteria, the authorized scope of work and funds, the end-users' functional and other specific requirements and that environmental and aesthetic features commensurate with the function and importance of the project have been incorporated, as applicable.

4.6 Significant involvement means: Direct personal selection of a prominent system, project feature, or result; personal performance of analyses, comparisons or formulation of recommendations; selection of alternatives, methods, parameters, or judgmental factors to an extent which confers control.

5.0 RESPONSIBILITIES:

5.1 The Project Engineer or Project Architect (PA/PE) shall:

5.1.1 Ensure that the schedule, budget and deliverable items for each product are adequate for review. Items to consider include:

- a. Concurrent activities will most likely be under way.
- b. Provide adequate copies of products to avoid delay.
- c. Conformance with technical and project criteria and other specified guidance to minimize cost and duration of review.
- d. Review at early stages, including criteria preparation, can be the most effective use of review budget.

5.1.2 Provide advance notice to applicable Section Chiefs when the normal review duration of 15 working days is not available so alternate means of obtaining independent review can be developed if necessary.

5.1.3 Ensure that comments with cost implications are copied to Cost Engineering Section.

5.1.4 Ensure that the Project Manager (PM) is notified in a timely manner when conflicts are identified between the authorized scope of work, the authorized funding, and/or other criteria which could effect the quality of the end prevent.

5.1.5 Notify applicable branch or section chief(s) of any repetitive deficiencies or problems.

5.1.6 Arrange for mandatory reviews by centers of expertise, and/or review by others when specialized expertise is not available from Engineering Branch sources.

5.1.7 Establish the project in the Dr. Checks Review System, as applicable, and route reviews to PDT members.

5.1.8 Manage review comments to minimize conflicting comments and provide comments, which lead to a quality product.

5.1.9 Promptly provide responses to reviewers allowing time for resolution of all comments without affecting project schedule.

5.1.10 Place a copy of review comments with responses in the project file.

5.1.11 Provide written notice to A-E coordinator of poor A-E firm performance with a synopsis suitable for transmittal to contract A-E firms as the basis for BELOW AVERAGE or POOR performance evaluations. Include a copy to Chief, Engineering Branch.

5.2 Section Chiefs shall:

5.2.1 Assign designers and reviewers to projects.

5.2.2 Participate in the ITR process, to the extent practicable, or delegate ITR to experienced senior engineers within the functional discipline, or others, as applicable, who are not significantly involved in preparation of the product under review.

5.2.3 Ensure the detailed check of individual designers' work, in the Design Check step of the review process, as otherwise required but not included in the ITR of the assembled product.

5.2.4 Develop methods of preventing repetitive deficiencies, incorporate appropriate guidance in a design guide, or elevate consistently unrealistic expectations for resolution.

5.2.5 Determine technical adequacy of work within their area of responsibility.

5.3 Reviewers shall:

5.3.1 Make objective and relevant comments in a professional tone. Statements of personal preferences will be avoided. Comments will be structured to indicate:

- a. Reviewer identity
- b. The document reviewed
- c. Subject feature of the comment and its location in the document
- d. The criteria violated, error, unfulfilled user need, or suggested improvement.

5.3.2 Evaluate responses and, if necessary, participate in resolution of comments they have made or comments by others, which impinge upon their comments.

5.3.3 Present repetitive deficiencies to the applicable branch or section chief.

5.4 Designers shall:

5.4.1 Develop quality products as defined previously.

5.4.2 Notify the PA/PE when changes are discovered which may prevent delivery of a quality product and/or affect budget and/or schedule.

5.4.3 Participate in resolution of comments applicable to their work.

5.4.4 Respond to comments or suggestions. Responses will be relevant and in a professional in tone, and where the response is negative, cite applicable criteria, user functional needs, or elements of good engineering practice, as applicable.

5.4.5 Notify applicable branch or section chief(s) of any repetitive deficiencies or problems requiring or incorporation into a Design Guide.

5.5 Chief, Engineering Branch shall:

5.5.1 Ensure that repetitive deficiencies, and repetitive unrealistic expectations are addressed and dealt with in an effective manner.

5.5.2 Review the ITR process at least once a year and make appropriate changes, if required.

5.5.3 Resolve issues that cannot be resolved at lower levels.

5.6 Documentation:

5.6.1 Design Check Reviews: All calculations will be initialed and dated by the design team member and the checker. At the completion of this review, the Design Checker will sign a Certificate of Completion – Design Check and send it to the appropriate PA/PE. The PA/PE will compile all required forms and forward them to the PM for inclusion in the project file.

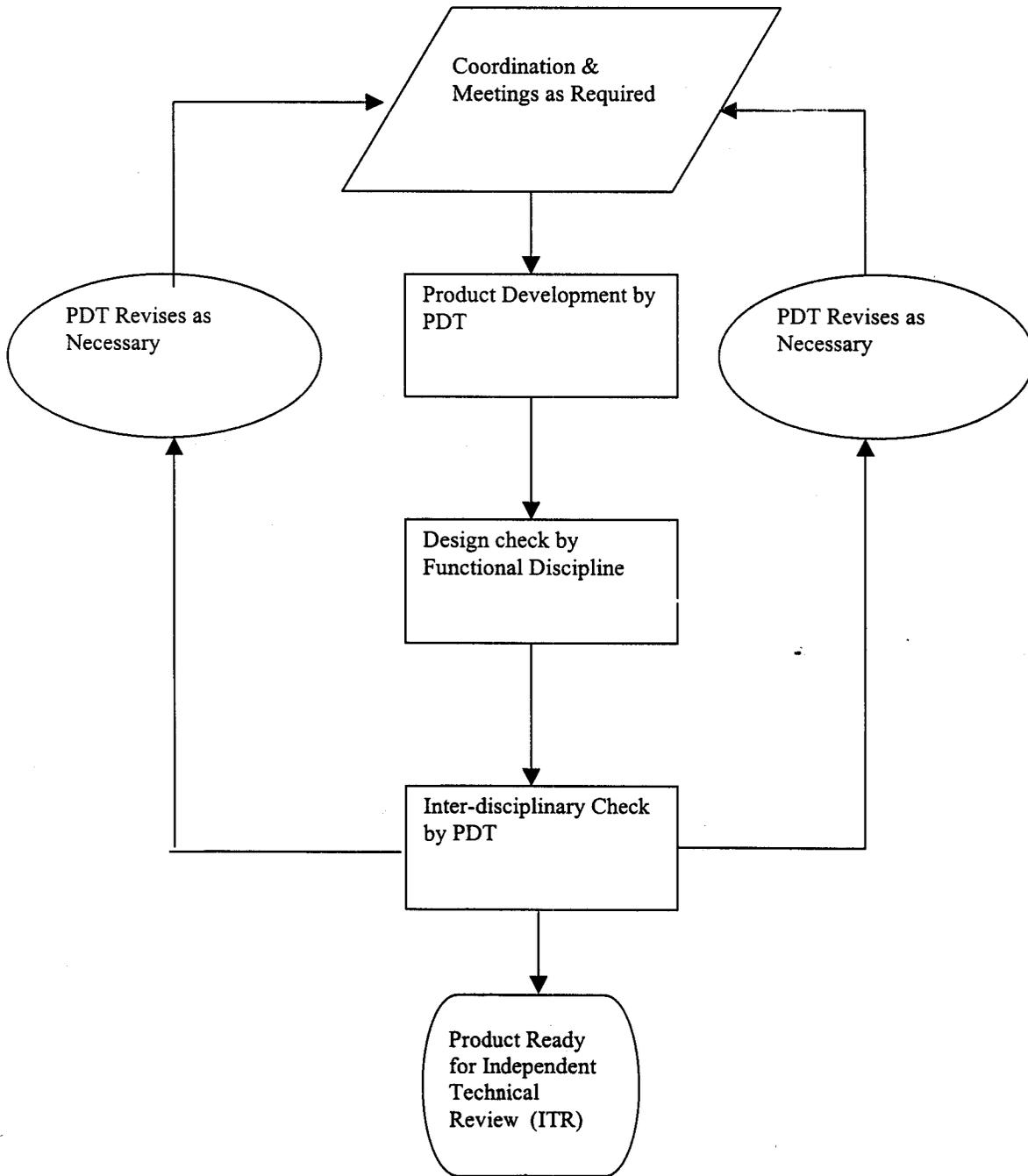
5.6.2 Interdisciplinary Reviews: Each designer will be responsible to review their own design and those portions of other disciplines' designs that interface with theirs to make sure the designs are coordinated. Designers will incorporate all necessary revisions from the

Interdisciplinary Check. At the completion of this review, the reviewer will sign and date the Certificate of Completion - Interdisciplinary Check and send it to appropriate PA/PE. The PA/PE will compile the required forms and forward them to the PM for inclusion in the Project File.

5.6.3 Independent Technical Review (ITR): When all revisions from the Interdisciplinary Check are completed, the PA/PE will ensure that the appropriate numbers of copies of the design documents are reproduced for the ITR. The Section Chief of the lead section will assemble the Quality Reviewers of each discipline (Review Team) in a conference room, as applicable, with copies of the design documents for the ITR. Each ITR reviewer will review their disciplines' design plus those portions of other discipline's designs that interface with their discipline. Reviewers will document required changes by showing the design changes or writing notes on the drawings/specs/DA. At the completion of this ITR review, each reviewer will initial and date their discipline's drawings. The Section Chief of the lead section will have the ITR team members sign and date the Certificate of Completion - ITR and send it to appropriate PA/PE. The PA/PE will consolidate the required information and forward it to the PM for inclusion in the Project File.

APPENDIX A

IN-HOUSE PRODUCT DEVELOPMENT PROCESS



APPENDIX B**EXAMPLE MILITARY CHECKLIST**

The enclosed example Military Checklist is taken from the ER 1110-1-12. Checklists for HTRW and Civil Works projects are included in ER 1110-1-12, but are not reiterated here. This checklist is intended to serve only as a guide in checking or reviewing design documents for errors and omissions. It cannot substitute for the exercise of sound engineering judgement by reviewers. Professionals must maintain control of their decisions, understand the technical basis for those decisions, and independently evaluate significant data upon which the design decisions are based. The main usefulness of a checklist such as this is to provide a "minimum" check of consistency between disciplines, and compatibility of drawings to specifications. It is expected that it will be modified by each USACE command to fit specific requirements. Each item in the checklist should be checked off to indicate that the item has been reviewed, or marked "NA" to indicate it is not applicable.

Verify:

A. GENERAL:

- 1. That all documents have been logically ordered and a table of contents provided.
- 2. That all documents have been signed and dated.
- 3. That the scale and orientation of the drawings are consistent throughout the complete set of drawings.
- 4. That SOW shown in the design submission has been checked against the official 1391 and current design directive.
- 5. That all real estate planning reports have been reviewed to identify real estate constraints.
- 6. That appropriate elements have been notified of any additional real estate requirements.
- 7. Schedules and budgets are in accordance with PMP.

B. CIVIL:

- _____ 1. Existing and proposed grades.
- _____ 2. That haul routes, disposal/borrow sites, construction contractor's storage area, construction limits, and construction staging area are shown.
- _____ 3. Existing utilities.
- _____ 4. That new underground utilities have been checked for conflicts against the site plans.
- _____ 5. That utility tie-in locations agree with mechanical stub out plan.
- _____ 6. That profile sheets show underground utilities and avoid conflicts.
- _____ 7. That property lines and limits of clearing, grading, turfing, or mulch have been shown and are consistent with architectural and/or landscaping plans.
- _____ 8. That fire hydrant and power/telephone pole locations correspond with electrical and architectural drawings.
- _____ 9. That basis of horizontal and vertical control is given and the control points are located properly with pertinent data shown: i.e., elevations, coordinates, stationing, and/or start of construction.
- _____ 10. That valve boxes and manholes match final finished grades or pavement, swales, or sidewalks.
- _____ 11. That boring locations, soil classifications, water table, and depth of rock are shown on the plans.
- _____ 12. That rigid pavement joint plans are shown with reasonable spacing.
- _____ 13. That foundation coordinates are shown on the foundation plan and coordinated with architectural drawings.
- _____ 14. That finished floor elevations match on architectural and structural drawings.
- _____ 15. That civil specifications are coordinated with plans.
- _____ 16. That storm and sewage drains from the facility have adequate capacity.

- _____ 2. That building location meets all setback requirements, zoning codes, and deed restrictions.
- _____ 3. That building limits match with civil, plumbing, and electrical on-site plans.
- _____ 4. That locations of columns, bearing walls, grid lines, and overall building dimensions match structural.
- _____ 5. That locations of expansion joints, at all floors, roof and walls, match with structural drawings, and that locations of masonry control joints are shown on plans and elevations and coordinated with structural drawings.
- _____ 6. That demolition instructions are clear on what to remove and what is to remain, and are coordinated with design documents.
- _____ 7. That building elevations match floor plans and have the same scale.
- _____ 8. That building sections match elevations, plans, and structural drawings.
- _____ 9. Building plan match lines are consistent on structural, mechanical, plumbing, and electrical drawings.
- _____ 10. Structural member locations are commensurate architecturally.
- _____ 11. That elevation points match with structural drawings.
- _____ 12. That chases match on structural, mechanical, plumbing, and electrical drawings.
- _____ 13. That section and detail call outs are proper and cross-referenced.
- _____ 14. That large-scale plans and sections match small scale plans and sections.
- _____ 15. Reflected architectural ceiling plans are coordinated with mechanical, and electrical plans.
- _____ 16. That columns, beams, and slabs are listed on elevations and sections.
- _____ 17. That door schedule information matches plans, elevations, fire rating, and project manual.
- _____ 18. That cabinets or millwork will fit in available space.

- _____ 19. That flashing through the wall and weep holes are provided where moisture may penetrate the outer material.
- _____ 20. Flashing materials and gauges.
- _____ 21. Fire ratings of walls, ceilings, fire and smoke dampers.
- _____ 22. That miscellaneous metals are detailed, noted, and coordinated with the Project Manual.
- _____ 23. That equipment rooms or areas are commensurate with mechanical, electrical, and plumbing needs.
- _____ 24. The limits, types, and details of waterproofing are coordinated with design documents
- _____ 25. The limits, types, and details of insulation are coordinated with design documents and insulation R values are shown on the drawings.
- _____ 26. The limits, types, and details of roofing and coordination with design documents.
- _____ 27. Skylight structures compatibility with structural design.
- _____ 28. That piping loads hang from the roof or floors, are coordinated with mechanical and structural drawings, and proper inserts are called for on the drawings.
- _____ 29. That all mechanical and electrical equipment is properly supported and that all architectural features are adequately framed and connected, and, that sleeves are noted on foundation plans for mechanical/electrical/communication work.
- _____ 30. That all drawings showing monorails, hoists, and similar items have support details, notes, and that the locations are coordinated with the architectural, structural, mechanical, and electrical drawings.
- _____ 31. That walls, partitions, and window walls are not inadvertently loaded through deflection.
- _____ 32. That all window walls, expansions, and weeps are provided.
- _____ 33. That all handicapped requirements are coordinated with plumbing and electrical.

_____ 34. That architectural space requirements are commensurate with duct work, conduit, piping, light fixtures, and other recesses.

_____ 35. That architectural space requirements are commensurate with elevators, escalators, and other equipment.

_____ 36. Dew point in walls, roof, and terraces are satisfactory, and that a vapor barrier has been provided as required.

_____ 37. That concealed gutters are properly detailed, drained, waterproofed, with expansion provided for, and, that downspouts/rain leaders fit in designated spaces and that splash blocks are located and detailed.

_____ 38. Compatibility of grading around perimeter of building with civil drawings.

_____ 39. That color finish schedules are included in documents.

_____ 40. That interior valleys for buildings having large flat roofs are provided with saddles or crickets to eliminate formation of bird baths.

_____ 41. That all shelving, hang rods, casework and bath accessories are identified and specified.

_____ 42. That stairs, corridors and landings provide code required width and length and structure, handrails and stringers do not interfere with required clearance.

F. MECHANICAL:

_____ 1. That mechanical plans match electrical plans, architectural plans, and reflected ceiling plans.

_____ 2. That HVAC ducts are commensurate with architectural space and are not in conflict with conduit, piping, structures, etc.

_____ 3. That mechanical equipment fits architectural space with room for access, safety, and maintenance and that access clearance is shown on the mechanical plans.

_____ 4. That mechanical openings match architectural and structural drawings.

_____ 5. That mechanical motor sizes match electrical schedules.

_____ 6. That thermostat locations are not placed over dimmer controls.

_____ 7. That equipment schedules correspond to manufacturer's specifications and design documents.

_____ 8. Mechanical requirements are shown for special equipment; i.e., kitchen, elevator, telephone, transformers, etc.

_____ 9. Fire damper location in ceiling and fire walls.

_____ 10. That all structural supports required for mechanical equipment are indicated on structural drawings.

_____ 11. That all roof penetrations are shown on roof plans.

_____ 12. That seismic bracing details are provided for all platforms which support overhead equipment and that seismic flexible coupling locations and details are shown.

G. FIRE PROTECTION:

_____ 1. Conduct waterflow testing for all new sprinkler systems. Indicate waterflow test data on drawings or in specifications.

_____ 2. Provide detailed hydraulic calculations that verifies that the water supply is sufficient to meet the fire protection system demand.

_____ 3. Ensure that a complete riser diagram is shown, and coordinate clearance from other equipment.

_____ 4. Ensure that all piping from the point of connection to the existing, to the top of the sprinkler riser(s) is shown on the drawings.

_____ 5. Ensure that all valves, fire department connections, and inspector's test connections are indicated on drawings.

_____ 6. Ensure that sprinkler main drain piping and discharge point are shown and detailed. Main drains should discharge directly to the outside.

_____ 7. Ensure that the extent of limit of each type of sprinkler system, each design density, each type and temperature rating of sprinkler heads, and location of concealed piping is clearly specified or shown.

_____ 8. Ensure that water-filled sprinkle piping is not subject to freezing.

- _____ 9. Provide detail of the sprinkler piping entry into the building, and include details of anchoring and restraints.
- _____ 10. Ensure that aesthetics considerations are incorporated in the design of the sprinkler system, e.g., sprinkler piping is concealed in finished areas and recessed chrome-plated pendent sprinkler heads are used in finished area.
- _____ 11. Ensure that paddle-type waterflow switches are only used in wet-pipe sprinkler systems. The other sprinkler systems shall use pressure-type flow switches.
- _____ 12. Ensure that the main sprinkler control valves are accessible from the outside.
- _____ 13. Ensure that fire rating of fire-rated walls, partitions, floors, shafts, and doors are indicated.
- _____ 14. Ensure that if spray-applied fire proofing is specified that the fire rating of the steel structural members are indicated.
- _____ 15. Ensure that the location of required fire dampers are shown.
- _____ 16. Ensure that the location of all fire alarm indicating devices, pull stations, waterflow switches, detectors, annunciation panel, and other fire alarm and supervisory devices are indicated on the drawings.
- _____ 17. Ensure that the connection of the fire alarm and detection system to the base-wide fire alarm system is clearly shown and detailed and coordinated with electrical drawings.
- _____ 18. Coordinate with civil and landscape any requirements for 'detector-check'.

H. PLUMBING:

- _____ 1. That the plumbing plans match architectural, mechanical, and structural drawings.
- _____ 2. That plumbing fixtures match plumbing schedules and architectural locations.
- _____ 3. Compatibility of site piping limits interfaces with building piping.
- _____ 4. Roof drain locations with roof plan.
- _____ 5. That subsurface drains are located and detailed.
- _____ 6. That roof drain overflows are provided.

- _____ 7. That piping chase locations matches architectural and structural drawings.
- _____ 8. That all hot and cold water piping is insulated in accordance with the contractor's approved piping insulation display sample.
- _____ 9. That piping is commensurate with architectural space and not in conflict with conduit, duct, and structure.
- _____ 10. That piping openings match architectural and structural drawings.
- _____ 11. That structural design is compatible with plumbing equipment and piping requirements.
- _____ 12. That plumbing equipment schedules correspond to manufacturers' specifications and design documents.
- _____ 13. That floor drains match architectural and kitchen equipment plans.
- _____ 14. That site utilities have been accurately verified, and that site water and gas service requirements are met by supply utilities.
- _____ 15. That floor openings, i.e., drains, water closets, etc., do not conflict with structural beams, joists, or trusses.
- _____ 16. Limits and confines where piping may be run.
- _____ 17. That seismic bracing details are provided and that seismic flexible coupling locations are shown.
- _____ 18. That roof drain details are coordinated with other trades to show the installation of sump pans in ribbed sheet metal decks, and the placement of roof insulation in and around the drainage fitting.
- _____ 19. That sump pumps are provided for elevator pits.
- _____ 20. That oil/water separators are coordinated with civil.

I. ELECTRICAL:

- _____ 1. That electrical plans match architectural, mechanical, plumbing and structural.

- _____ 2. That location of light fixtures, speakers, etc., match with reflected ceiling plans.
- _____ 3. That electrical connections are shown for equipment, i.e., mechanical motors, heatstrips, etc., architectural, overhead doors, stoves, dishwashers, etc.
- _____ 4. That locations of panel boards, transformers, are shown on architectural, mechanical, and plumbing plans.
- _____ 5. That conduit chase locations match with architectural and structural drawings.
- _____ 6. Compatibility of conduit and light fixtures with architectural space and that no conflicts exist with duct, piping, or structure.
- _____ 7. That electrical equipment structural requirements are met.
- _____ 8. That electrical equipment room fits architectural space, with clearance for safety and maintenance.
- _____ 9. That electrical horsepower, voltage, phasing for all motors match on mechanical and architectural designs.
- _____ 10. That fixtures, speakers, clocks, etc., schedules correspond to a manufacturer's description and design documents.
- _____ 11. Light fixture spacing and location to eliminate dark spots.
- _____ 12. Location of duplex outlets, telephone, fire alarms clock outlets, etc., with architectural millwork and finishes.
- _____ 13. The limits and confines where conduits may be run.
- _____ 14. Site electrical and telephone service requirements with supply utility.
- _____ 15. That seismic bracing details are provided and that seismic flexible coupling locations are shown.

J. SPECIFICATIONS:

- _____ 1. That bid and additive items are coordinated with drawings.
- _____ 2. That the measurement and payment section is present, when appropriate.

- _____ 3. That construction phasing is clear.
- _____ 4. That cross-referenced specifications and drawing are numbered correctly.
- _____ 5. That all finish materials listed in architectural finish schedule are specified.
- _____ 6. That thicknesses and quantities of materials shown on plans agree with specifications.
- _____ 7. That all items of material or equipment are covered by adequate specifications, including those not covered by CEGS.
- _____ 8. That all shop drawings and material certifications to be submitted are listed in the submittal register.
- _____ 9. That provider of utilities during construction is indicated in specifications.
- _____ 10. That asbestos abatement and quantities are included in specs and on bid schedule.
- _____ 11. That Government-furnished materials are identified.
- _____ 12. That security requirements for employees are included.
- _____ 13. That references to test methods, material specs, or other manuals are consistent with civil or military designations, as applicable.
- _____ 14. That traffic control during construction is indicated.
- _____ 15. That temporary dust control measures are outlined.
- _____ 16. That proper warranties are called for in the specifications.

APPENDIX D

**EXAMPLE SIGN-OFF SHEETS
DESIGN CHECK REVIEW VERIFICATION**

PROJECT:
PRODUCT:
PRODUCT PHASE:
PA/PE/DTL:

Check One:

_____ Input provided in this submittal

_____ No input required for this submittal

Description of Assignment:

I hereby certify that the input provided by this section for the above project has undergone a DESIGN CHECK REVIEW and is of adequate quality and detail for this phase of the product.

Signature:

Name:

Date:

Section:

INTERDISCIPLINARY REVIEW VERIFICATION

PROJECT:
PRODUCT:
PRODUCT PHASE:
PA/PE/DTL:

Check One:

_____ Input provided in this submittal

_____ No input required for this submittal

Description of Assignment:

I hereby certify that the input provided by this section for the above project has undergone an INTERDISCIPLINARY REVIEW and is of adequate quality and detail for this phase of the product.

Signature:

Name:

Date:

Section:

INDEPENDENT TECHNICAL REVIEW (ITR) VERIFICATION

PROJECT:
PRODUCT:
PRODUCT PHASE:
PA/PE/DTL:

Check One:

Input provided in this submittal

No input required for this submittal

Description of Assignment:

I hereby certify that an Independent Technical Review (ITR) was conducted on the above project, appropriate to the complexity and level of risk inherent in the project. This product complies with applicable criteria, the authorized scope of work, and meets the customer's needs.

Section Chief or ITR Designee Signature: _____

Name:

Date: _____

QUALITY MANAGEMENT PLAN

DESIGN MEMORANDUM



PROJECT TITLE
Project Location

Norfolk District

Technical Services Division
Engineering Branch
803 Front Street
Norfolk VA 23510-1096

Project Title
Project Location

PROJECT OVERVIEW

1. **PURPOSE:** The purpose of this Design Quality Management Plan is to ensure that all elements of the Design Memorandum for the *?PROJECT TITLE?* are thorough, technically excellent, and meet the needs of the non-Federal sponsor and the Federal Government.

2. **REFERENCES:** ER 1110-1-12, 1 June 1991, subject: Quality Management SOP

3. **BACKGROUND:** *INSERT PROJECT INFORMATION*

4. **CONTENT:** This Design Quality Management Plan consists of several parts. These parts are outlined below:

a. **Quality Management Assignment Rosters:** These rosters list the design professionals who will work together as a team to produce a quality product within budget and within schedule.

Description of the work and identification of in-house and A/E staffs selected to perform these functions.

b. **Review Sheets:** Single and Multi-Discipline Review Sheets

c. **Comments and Responses:**

d. **Signature Certification Sheets**

Quality Management Assignment Rosters

QUALITY MANAGEMENT ASSIGNMENT ROSTER

EXECUTION AND QUALITY CONTROL

PROJECT: *Project Title*

LOCATION: *Location*

Project Engineer: *Name*

Professional Discipline

Designer

Quality Control Reviewers

Primary

Alternate

HTRW
Cost Engineering
Architectural
Structural
Mechanical
Electrical
Civil
H & H

Geotechnical

Single Discipline Review Sheets

CERTIFICATION OF DESIGN QUALITY SINGLE DISCIPLINE REVIEW

CENAO-TS-EC

PROJECT: _____

LOCATION: _____

DOCUMENT: _____

Brief description of the work completed: *Enter Information*

John P. Professional, Designer
CENAO-TS-EC

Date: -----

ITEM	N/A	STATUS	INITIALS	DATE
Narrative				
Readability and Terminology				
Compatibility with Plates				
Technical Adequacy for DM Level				
Quantity Estimates				
Completeness All construction features				
Spot Check Quantities for Accuracy				
Appropriate Quantity Units				
Drawings				
Vertical and Horizontal geometry/control				
Compatibility with all Design Elements				

ITEM	N/A	STATUS	INITIALS	DATE
(Civil, Structural, Geotechnical)				
Adequacy of Information for DM Level				
Utility Relocations				
Symbols and Legends				
Terminology				
References				
Line Definition and Weight				
Environmental Features				
Mitigation Features				
HTRW Features				
Recreation Features				
Build ability of Features				
Specifications				
Completeness of Table of Contents				
Appropriate Edits				
Submittal Requirement Validation				

Additional Comments:

This is to certify that the above documents have been independently reviewed. Drawings, specifications, and calculations were reviewed by *Insert Name*. The signature below verifies that the documents have been reviewed, comments appropriately addressed and the documents are complete and accurate as presented.

John J. Professional Sr.
Title
CENAO-TS-EC

Date: _____

**CERTIFICATION OF DESIGN QUALITY
SINGLE DISCIPLINE REVIEW**

CENAO-TS-EG

PROJECT: _____

LOCATION: _____

DOCUMENT: _____

Brief description of the work completed: *Enter Information*

John P. Professional, Designer
CENAO-TS-EG

Date: -----

ITEM	N/A	STATUS	INITIALS	DATE
Boring Logs Included				
Laboratory Test Results Included				
Geologic Profiles Included				
Design Concerns Addressed Relative To: STABILITY, SEEPAGE, SETTLEMENT				
Assumptions and Design Parameters are Appropriate				
Calculations				
Seepage				
Settlement				
Stability				
Construction Materials Addressed				

Additional Comments:

This is to certify that the above documents have been independently reviewed. Drawings, specifications, and calculations were reviewed by *Insert Name*. The signature below verifies that the documents have been reviewed, comments appropriately addressed and the documents are complete and accurate as presented.

_____ Date: _____
John J. Professional Sr.
Title
CENAO-TS-EG

**CERTIFICATION OF DESIGN QUALITY
SINGLE DISCIPLINE REVIEW**

CENAO-TS-ES

PROJECT: _____

LOCATION: _____

DOCUMENT: _____

Brief description of the work completed: *Enter Information*

John P. Professional, Designer
CENAO-TS-ES

Date: _____

ITEM	N/A	STATUS	INITIALS	DATE
Narrative				
Closure Structure Calculations				
Design Methodology and Approach				
Appropriate Use and Interpretation of Numerical Models				
Check of Model Input/Output				
Quantities for Cost Estimating				
Floodwall Calculations:				
Quantities for Cost Estimating				
Drainage Structure Calculations				
Quantities for Cost Estimating				

Additional Comments:

This is to certify that the above documents have been independently reviewed. Drawings, specifications, and calculations were reviewed by *Insert Name*. The signature below verifies that the documents have been reviewed, comments appropriately addressed and the documents are complete and accurate as presented.

_____ Date: _____
John J. Professional Sr.
Title
CENAO-TS-ES

**CERTIFICATION OF DESIGN QUALITY
SINGLE DISCIPLINE REVIEW**

CENAO-TS-EW

PROJECT: _____

LOCATION: _____

DOCUMENT: _____

Brief description of the work completed: *Enter Information*

John P. Professional, Designer
CENAO-TS-EW

Date: -----

ITEM	N/A	STATUS	INITIALS	DATE
GENERAL:				
Does H&H analysis address customer requirements?				
Hydraulic design approach/assumptions correct?				
Does design comply with accepted standards?				
Have computer models been used appropriately?				
HYDROLOGY:				
Check mapping for changes/improvements				
Is delineation of basin correct?				
Check drainage area calculations				
Review of theoretical and historical rainfall records				

ITEM	N/A	STATUS	INITIALS	DATE
Verify routing times/frequency				
INTERIOR FLOODING:				
Check mapping for changes/improvements				
Calculation of drainage area				
Analysis and delineation of subareas				
Calculation of drainage structures and size				
Interior drainage routing analysis				
Have computer models been used properly?				
Accuracy of input/output of computer models checked?				
Were appropriate storm events used?				
Were residual flooding elevations verified and redelineated if necessary?				
Accuracy of frequency curves				
HYDRAULICS:				
Have computer models been used appropriately?				
Calibration/verification of HEC-2 model				
Topography changes accounted for in the model?				
Blockages, including debris were addressed?				
Design and overtopping profiles were finalized				
Uncertainties in Manning's n value addressed				
Superiority was addressed				
Channel modifications were addressed.				
RIPRAP DESIGN:				
Design approach and methodology				

ITEM	N/A	STATUS	INITIALS	DATE
Applicability of variables in analysis (toe elevations and velocities)				
Appropriate riprap size				
Verification of Calculations				
NARRATIVE				
Main report write-up is clear and concise				
Assumptions in H&H Appendix clearly stated				
Figures and plates clearly display analysis results				

Additional Comments:

This is to certify that the above documents have been independently reviewed. Drawings, specifications, and calculations were reviewed by *Insert Name*. The signature below verifies that the documents have been reviewed, comments appropriately addressed and the documents are complete and accurate as presented.

_____ Date: _____
John J. Professional Sr.

Title

CENAO-TS-EW

**CERTIFICATION OF DESIGN QUALITY
SINGLE DISCIPLINE REVIEW**

CENAO-TS-EG

PROJECT: _____

LOCATION: _____

DOCUMENT: _____

Brief description of the work completed: *Enter Information*

John P. Professional, Designer
CENAO-TS-EG

Date: _____

ITEM	N/A	STATUS	INITIALS	DATE
NARRATIVE				
HTRW REPORT				
Statement of Purpose included				
Objectives identified				
Program or authority defined				
Physical characteristics (project area, vicinity map, planned construction activities)				
Existing data identified and assessed				
ARAR's identified				
Sampling locations described				
Sampling technique and hazards identified.				
Construction type in sampling area described				
Well construction methods and materials				

ITEM	N/A	STATUS	INITIALS	DATE
defined.				
Field screening results included				
Deviations from the work plan documented				
Equipment decontamination and handling of investigative derived waste described				
Summary of analytical results				
Regulatory requirements data				
Potential exposed populations and exposure pathways of contaminants of concern				
QA/QC sampling plan				
Construction areas requiring special handling identified.				
Construction requirements including handling during excavation, stock-pile, reuse, & disposal identified.				
Chemicals of concern identified				
Health effects of chemicals of concern				
Worker protection and engineering controls specified				
Boring Logs				
Well construction details.				
Development records				
Purging and Sampling Records				
Soil gas survey results				
Geophysical survey report				
Geotechnical test results				
Chemical Test Results/Analytical Methods				
Slug/Pumping test results				
Pertinent correspondence				
Data quality/usability				

ITEM	N/A	STATUS	INITIALS	DATE

Additional Comments:

This is to certify that the above documents have been independently reviewed. Drawings, specifications, and calculations were reviewed by *Insert Name*. The signature below verifies that the documents have been reviewed, comments appropriately addressed and the documents are complete and accurate as presented.

_____ Date: _____
 John J. Professional Sr.
 Title
 CENAO-TS-EG

**CERTIFICATION OF DESIGN QUALITY
SINGLE DISCIPLINE REVIEW**

CENAO-TS-EM

PROJECT: _____

LOCATION: _____

DOCUMENT: _____

Brief description of the work completed: *Enter Information*

John P. Professional, Designer
CENAO-TS-EM

Date: _____

ITEM	N/A	STATUS	INITIALS	DATE
CALCULATIONS:				
Site Distribution Calculations Complete				
Panel board and transformer sizing complete				
Wire sizing appears correct				
DRAWINGS:				
Existing site infrastructure accurately shown.				
Proposed modification to site accurately shown				
Details for installations and connections included?				
Proper coordination between all utilities?				
Identification of television/telephone services				
SPECIFICATIONS:				
Proper sections have been edited				

ITEM	N/A	STATUS	INITIALS	DATE
Sections are complete with submittals identified				
Sections are coordinated with other disciplines.				

Additional Comments:

This is to certify that the above documents have been independently reviewed. Drawings, specifications, and calculations were reviewed by *Insert Name*. The signature below verifies that the documents have been reviewed, comments appropriately addressed and the documents are complete and accurate as presented.

_____ Date: _____
 John J. Professional Sr.
 Title
 CENAO-TS-EM

**CERTIFICATION OF DESIGN QUALITY
SINGLE DISCIPLINE REVIEW**

CENAO-TS-EM

PROJECT: _____

LOCATION: _____

DOCUMENT: _____

Brief description of the work completed: *Enter Information*

John P. Professional, Designer
CENAO-TS-EM

Date: _____

ITEM	N/A	STATUS	INITIALS	DATE
CALCULATIONS:				
Ventilation calculations complete				
Heating calculations complete				
Equipment sizing appears correct				
DRAWINGS:				
Mechanical work shown clearly				
Coordination with other disciplines				
SPECIFICATIONS:				
Proper sections have been edited				
Sections are complete with submittals identified				
Sections are coordinated with other				

ITEM	N/A	STATUS	INITIALS	DATE
disciplines.				

Additional Comments:

This is to certify that the above documents have been independently reviewed. Drawings, specifications, and calculations were reviewed by *Insert Name*. The signature below verifies that the documents have been reviewed, comments appropriately addressed and the documents are complete and accurate as presented.

_____ Date: _____
 John J. Professional Sr.
 Title
 CENAO-TS-EM

**CERTIFICATION OF DESIGN QUALITY
SINGLE DISCIPLINE REVIEW**

CENAO-TS-EA

PROJECT: _____

LOCATION: _____

DOCUMENT: _____

Brief description of the work completed: *Enter Information*

John P. Professional, Designer
CENAO-TS-EA

Date: _____

ITEM	N/A	STATUS	INITIALS	DATE
Architectural Features Addressed				
Coordination with other disciplines				

Additional Comments:

This is to certify that the above documents have been independently reviewed. Drawings, specifications, and calculations were reviewed by *Insert Name*. The signature below verifies that the documents have been reviewed, comments appropriately addressed and the documents are complete and accurate as presented.

John J. Professional Sr.
Title
CENAO-TS-EA

Date: _____

Multiple Discipline Review Sheets

CERTIFICATION OF DESIGN QUALITY INTER-DISCIPLINE REVIEW

CENAO-TS-EG

PROJECT: _____

LOCATION: _____

DOCUMENT: _____

The following signature certifies that John Q. Professional, Geotechnical Branch, has completed the inter-discipline review of the solicitation package. General review guidelines are outlined below:

John Q. Professional, Designer
CENAO-TS-EG

Date: _____

ITEM	N/A	STATUS	INITIALS	DATE
ENVIRONMENTAL ASSESSMENT				
Project description is accurate				
HTRW ISSUES ADDRESSED				
HTRW identified on plans and in specifications				
HTRW descriptions are accurate				
COST ESTIMATE				
Project description is accurate				
Quantities are consistent with plates and quantity take-offs provided.				
HYDROLOGY AND HYDRAULICS				
Design accurately reflects hydraulics				

ITEM	N/A	STATUS	INITIALS	DATE
analysis				
Design accurately reflects interior drainage recommendations.				
Rip/Rap protection recommendations are accurately addressed in the drawings and specifications.				
SPECIFICATIONS:				
Specifications are complete and coordinated.				
DRAWINGS				
Details and plans are clear				
Adequate detail has been included to allow installation in accordance with design information				

Additional Comments:

**CERTIFICATION OF DESIGN QUALITY
INTER-DISCIPLINE REVIEW**

CENAO-TS-ES

PROJECT: _____

LOCATION: _____

DOCUMENT: _____

The following signature certifies that John Q. Professional, Design Branch, Structural Engineering Section, has completed the inter-discipline review of the solicitation package. General review guidelines are outlined below:

John Q. Professional, Designer
CENAO-TS-ES

Date: _____

ITEM	N/A	STATUS	INITIALS	DATE
COST ESTIMATE				
Project description is accurate				
Quantities are consistent with plates and quantity take-offs provided.				
SPECIFICATIONS:				
Specifications are complete and coordinated.				
Submittals are clearly identified				
DRAWINGS				
Details and plans are clear				
Adequate detail has been included to allow installation in accordance with design information				
Drawings reflect the conditions exhibited in the Design Analysis and Design Requirements of the customer.				

ITEM	N/A	STATUS	INITIALS	DATE

Additional Comments:

**CERTIFICATION OF DESIGN QUALITY
INTER-DISCIPLINE REVIEW**

CENAO-TS-EW

PROJECT: _____

LOCATION: _____

DOCUMENT: _____

The following signature certifies that John Q. Professional, Engineering Services Branch, Civil Works Section, has completed the inter-discipline review of the solicitation package. General review guidelines are outlined below:

John Q. Professional, Designer
CENAO-TS-EW

Date: _____

ITEM	N/A	STATUS	INITIALS	DATE
COST ESTIMATE				
Project description is accurate				
Special Features are Included				
SPECIFICATIONS:				
Specifications are complete and coordinated.				
Submittals are clearly identified				
DRAWINGS				
Details and plans are clear				
Adequate detail has been included to allow installation in accordance with design information				
Drawings reflect the conditions exhibited in the Design Analysis and Design Requirements of the customer.				
ENVIRONMENTAL ASSESSMENT				

ITEM	N/A	STATUS	INITIALS	DATE
H&H Information has been included correctly				
HYDROLOGY AND HYDRAULICS				
Top of protection conforms with hydraulics analysis				
Design accurately reflects interior drainage recommendations				
Riprap/toe protection recommendations are accurately addressed on the plans.				

Additional Comments:

**CERTIFICATION OF DESIGN QUALITY
INTER-DISCIPLINE REVIEW**

CENAO-TS-EC

PROJECT: _____

LOCATION: _____

DOCUMENT: _____

The following signature certifies that John Q. Professional, Design Branch, Civil Engineering Section, has completed the inter-discipline review of the solicitation package. General review guidelines are outlined below:

John Q. Professional, Designer
CENAO-TS-EC

Date: _____

ITEM	N/A	STATUS	INITIALS	DATE
COST ESTIMATE				
Project description is accurate				
Quantities are consistent with plates and quantity take-offs provided.				
SPECIFICATIONS:				
Specifications are complete and coordinated.				
Submittals are clearly identified				
DRAWINGS				
Details and plans are clear				
Adequate detail has been included to allow installation in accordance with design information				
Drawings reflect the conditions exhibited in the Design Analysis and Design Requirements of the customer.				

ITEM	N/A	STATUS	INITIALS	DATE

Additional Comments:

Responses to Design Review Comments

Certification Review Signature Sheets

Linda E. Records
Chief Structural Section

Date

John J. Doe, P.E.
Chief Engineering Branch

Date

ENGINEERING BRANCH QUALITY MANAGEMENT PLAN

Purpose.

This appendix provides the general policies and procedures for the execution of quality management activities conducted for engineering products.

1. Applicability.

1.1 This appendix applies to all activities of the Engineering Branch involved in the preparation, review, and approval of engineering products.

2. References

2.1 See TSD Quality Management Plan

2.2 Engineering Branch Design Guide

2.3 Enclosure #1 – Quality Management Guidelines for HTRW work.

2.4 Enclosure #2 – Sample Quality Control Plan

3. Definitions.

See paragraph 4 of the Norfolk District Quality Management Plan.

4. General.

4.1 The policy of the Engineering Branch is to deliver quality engineering products, on time and within budget to our customers. The policies, requirements, and directions contained in the Engineering Branch Design Guide are considered mandatory parts of the Quality Management Plan and the Quality Control Plan for all projects.

4.2 *Quality Management Plans* The engineering quality management plan is a part of the overall District Quality Management Plan and shall provide the general guidance for work produced by the Engineering Branch, including the input provided by other functional organizations which support the development of the engineering products. Engineering Branch management shall evaluate and approve the engineering portions of the district Quality Management Plans.

4.3 *Quality Control Plans* All engineering and design services shall be prepared using a product specific, generic or programmatic quality control plan. Quality Control Plans shall present a focus area within the Project Management Plan (PMP) for a project. The responsible PM shall review and approve the quality control plan for their respective projects.

4.4 *Quality Assurance* Engineering Branch is responsible for quality assurance of quality control activities for engineering products prepared by the in-house professional staff as well as products designed wholly by a consultant or a combination of consultant and in house forces. For

that portion of work conducted by consultants, the Engineering Branch shall be responsible for quality assurance of the consultant's quality control activities and shall maintain a general oversight of this process.

4.5 *Programmatic/Generic Quality Control Plans* Product specific quality control plans shall be prepared for all products except those of a routine, recurring nature. Cost, complexity, risk and visibility shall be the criteria used to determine if a product specific or programmatic/generic QCP is required.

4.6 *Funding* Quality control activities shall be funded by the appropriate project.

5. Quality Control Responsibilities

5.1 Engineering shall prepare Quality Control Plans for each engineering product.

5.2 The Quality Control Plan shall be a document supplementing the general quality control activities outlined in TSD's Quality Management Plan and describing unique quality control activities for a specific product. As such the length and level of detail should be commensurate with the risk and complexity of the product. The Quality Control Plan shall address (at a minimum) the following:

- Name of Project
- Description of Product
- Name and location of customer
- A statement of the quality control plan objective.
- A statement of the quality guidelines that will be followed for the technical review.
- Members of the product development team.
- Members of the Independent Technical Review Team with a statement of the technical qualifications of each member in their respective areas of expertise. (Including Mandatory Centers of Expertise and Centers of Standardization.)
- Major Milestones
- Unique, sensitive or high visibility items requiring special attention. Include items, which require technical or policy clarification, and environmental constraints such as complying with records of decision.
- A list of documents to be reviewed by the independent technical review team, and dates of scheduled reviews.
- Special interest items such as value engineering, cost controls, contractor evaluation procedures, acquisition strategy, etc.

The quality control plans for all engineering documents that are supported by NEPA or other environmental documentation shall include an independent technical review to ensure consistency between the environmental documentation and the engineering documents.

5.3 *Approval of Quality Control Plans* The Chief of Engineering Branch shall certify (i.e. review and approve) that the plan meets the customer's needs and conforms to Corps of Engineers requirements by reviewing and approving the QCP.

5.4 *Use of Checklists* Checklists shall be used to guide the independent technical review and insure that critical items are not overlooked. Checklists may also be used to simplify the

documentation of the independent technical review. The use of checklists in the documentation would not, however, eliminate the requirement to document specific comments.

5.5 Quality Control of Consultant's Work The consultant shall prepare a quality control plan which discusses the quality control and its relationship to the entire project. For design-build contracts, the Contractor shall develop and follow a QCP for their product including independent quality control of the design product and construction quality control activities. The level of detail for this plan will be commensurate with the size and complexity of the project. Government review of submittals shall be to assure compliance with the request for proposal (RFP), the accepted proposal, and for QA of the contractor's quality control activities. The contractor's quality control plan shall be approved by the Resident Engineer of the applicable Area or Resident Office.

5.6 QC Certification and Final Documentation Proper documentation is a key component of an effective independent technical review process, and is a significant resource for lessons learned in the quality control process. Significant decisions must be recorded and the entire process must leave a clear audit trail. The Chief of Engineering shall certify to the Chief Technical Services Division that the quality control process for that product has been completed and that all identified technical issues have been resolved. This certification and accompanying documentation shall be made a part of the official District project files.

5.7 General Requirements. The following requirements apply to all engineering products except as noted:

Independent Technical Review Process: In addition to supervisory review, quality control procedures shall include independent technical and seamless review.

Formation of Independent Technical Review Team (ITRT): The ITRT shall be assigned representatives from disciplines involved in product development, such as plan formulation, economics, environmental, hydrology and hydraulics and coastal engineering, water quality, HTRW, civil design, structural design, geotechnical, real estate, project management and other disciplines, as required. Since careful coordination between these disciplines is required, the ITRT must include senior staff with broad expertise. The members of the ITRT must be independent from those who perform the work. Supervisors and work leaders of product development team members shall not normally be included on the ITRT. If sufficient staff is not available in a district, or if specialized review expertise is required, the PM shall supplement the review team with personnel from other NAD Districts, other USACE Divisions, headquarters, centers of expertise, laboratories, the customer's organization or by contract. Project funds shall be used to pay for the cost of conducting technical reviews.

For Water Control Products. Districts shall consult with MSC Water Control Center staff when selecting a water control ITR Team member.

Review Systems: The use of a review management system, Dr. Checks, shall be encouraged for use in all projects and is required for all MILCON products. Reviews must be completed prior to major decision points in the process so that the technical results can be relied upon in setting the course for further activities.

Product Review. The QCP shall identify products to be reviewed by the ITRT, a schedule as well as cost for these reviews. These products shall be essentially complete before review is undertaken and the section chiefs shall be responsible for accuracy of the computations through design checks and other internal procedures, prior to conducting of an independent technical

review. The products shall be reviewed using an interdisciplinary team approach. The products shall be reviewed for scope, adequate level of detail, compliance with guidelines and policy and customer needs, consistency, accuracy, and comprehensiveness as outlined in the QCP.

Interdisciplinary Review: All members of the ITRT shall be expected to raise concerns in other functional areas. These concerns shall be addressed to the ITRT as a whole. The ITRT shall then work through the appropriate ITRT counterparts to resolve the issues/concerns. ITRT meetings shall be open.

Responses to ITRT Comments: The ITRT shall meet with the study/product development team to resolve the raised issues. Along with a description of the scope of the review, all review comments shall be documented in a comment, response, action required, action taken and backcheck format. In those cases where unresolved disputes between the design team and the ITRT are decided by a functional chief, the review documentation shall provide the basis for the functional chief's decision.

5.8 Civil Works Products

Civil Works Milestones. As part of the Quality Control process, Districts shall follow a milestone system for development of civil works engineering products in the design (post feasibility) phase. Although a formal milestone system is a difficult mandate, guidance is provided below for minimum requirements. Specific milestone objectives shall be tailored to the engineering product and included in the product's Quality Control Plan.

Milestones for Civil Works projects are significant or important events in the execution of the project. Milestones are important tools for measuring progress along a pre-defined path to the completion of the project. The milestones that are defined below are not a complete list of all activities that must be performed to complete a project. These milestones are considered to be the major accomplishments that must be completed on schedule to help ensure that the overall final product is technically correct and satisfactory to the local sponsor. The numbers shown in parentheses indicate milestones tracked by Programs and Project Management Division and included in the Project Executive Summary Report. Milestones tracked by headquarters as Command Management and Review (CMR) dates are identified by "(CMR)".

Design Documentation Report Milestones:

- D1 Design Documentation Report Initiated (400)
- D2 General Design Conference (270)
- D3 Technical Review Strategy Session
- D4 Quality Control Plan Approval
- D5 Value Engineering Study Completed
- D6 Submit Intermediate Design Documentation Report for Independent Technical Review
- D7 Submit Near-Final Design Documentation Report for Independent Technical Review
- D8 Local Sponsor Review Completed
- D9 Quality Control Certification
- D10 Design Documentation Report Approval (480)

Plans and Specifications Milestones:

- P1 Plans and Specifications (P&S) Initiated (500)
- P2 Design Coordination Meeting
- P3 Technical Review Strategy Session
- P4 Quality Control Plan Approval
- P5 Submit Intermediate P&S for Independent Technical Review
- P6 Submit Near-Final P&S for Independent Technical Review
- P7 Biddability, Constructability, Operability and Environmental (BCOE) Review Conference
- P8 Final Local Sponsor Review Meeting
- P9 BCOE Certification
- P10 Quality Control Certification
- P11 Plans and Specifications Approval (290)(590) (CMR)

Engineering During Construction Milestones:

- C1 Pre-Advertise Contract in Commerce Business Daily
- C2 Construction Contract Advertised (950)
- C3 Government Estimate
- C4 Bid Opening (951)
- C5 Engineering Considerations and Instructions to Field Personnel Report
- C6 Construction Contract Awarded (960) (CMR)
- C7 Final O&M Manual Transferred to Local Sponsor (981)
- C8 As-Built Drawings Transferred to Local Sponsor (982)

Hydraulic, Hydrologic and Related Products.

Activities associated with the development of hydraulic, hydrologic, water quality, water control, sediment, groundwater and related products shall be outlined in the format of a Hydrologic Engineering Management Plan (HEMP), as required by EP 1110-2-9. The HEMP is a quality control measure for ensuring the complete outline of required H&H related activities and their interrelationship with other product development activities that are required in the development of engineering products, and their costs, and is consistent with guidelines set forth in ER 1110-2-1150. The HEMP format shall be utilized in the H&H related scoping contained in a study's/project's PSP or PMP, respectively.

Certification of the Without-Project Hydrology - Civil Works GI Studies. Because of the critical need to establish the without-project hydrology early in a flood control planning study, the Chief of the Civil Works Support Section will certify the hydrology prior to the first milestone conference in the feasibility phase. This certification will be included in the review documentation.

Engineering Appendices for Decision Documents.

Submittal of Engineering Appendices. An engineering appendix is an essential part of a feasibility report or post-authorization decision document for a Civil Works project. And, for any decision document that is not approved at the district, the policy compliance review of the engineering appendix will be completed by CENAD. Either a printed copy or an electronic copy of the engineering appendix will be transmitted to CENAD with the draft decision document for policy compliance review. A printed copy of the engineering appendix will be included with the submission of the final report since the appendix will be published with the final decision document that supports authorization or the signing of a PCA.

Section 1202 of WRDA 1986 Section 1202 of WRDA 1986 (PL 99-622) requires that any report submitted to Congress for the purpose of authorizing or funding the "construction of a water impoundment facility, shall include information on the consequences of failure and geologic or design factors which could contribute to the possible failure of such facility." This requirement can be met by including the analysis in the Engineering Appendix and a summary of the consequences in the recommendation section of the main body of the report. The independent technical review of the decision document should identify and confirm that the requirements of Section 1202 have been met

5.9 Military Construction, HTRW, WFO and SFO programs. The following special requirements apply to these programs.

Design review shall be in accordance with ER 1110-345-100 paragraph 9 and ER 1110-1-12 paragraph 6h(3) except that design by private A-E firms shall be reviewed by the A-E with a quality assurance review by the district. Requirements include but are not limited to the following:

A QCP should be prepared for every engineering product or service whether obtained using in-house forces, an A-E or an A-E product in a design-build contract. While the QCP should be complete, it need not duplicate items in the QMP.

For contract work, the A-E shall be required to submit a QCP. The nature of the QCP shall be determined with the A-E in pre-proposal meetings. The QCP should be provided to the project manager for incorporation into the project management plan (PMP) prior to initiation of the technical work on the project. For large or complex projects the A-E may be allowed to initially submit a generic QCP, with a fully detailed QCP furnished in the first phase of the work. The extent of the independent review should be commensurate with the complexity of the project and is not intended to be a detailed check. All design reviews will be accomplished using the Dr Checks review management system. Designs prepared by private A-E firms will be given an independent technical review by the A-E, with a quality assurance review by the district office.

A QCP shall be submitted for A-E products in a design build contract. Designs prepared by A-E firms in design build contracts shall be reviewed by the A-E with a quality assurance review by Engineering Branch. In design build contracts, the Engineering Branch shall review design submittals to assure compliance with the RFP and the accepted proposal.

Review of in-house designs and quality assurance reviews of A-E products should be performed by a interdisciplinary team specifically selected based on project requirements. The use of Technical Centers of Expertise and Centers of Standardization for projects is strongly encouraged. Certain projects or portions of projects require special design procedures or review by the Mandatory Centers of Expertise (MCX). These MCX include the Utility Monitoring and Control System MCX; HTRW MCX; Intrusion Detection Systems MCX; Protective Design MCX; Army Range and Training Land Program MCX; and Transportation Systems MCX.

Engineering products for the Military, WFO, and SFO programs shall be reviewed in accordance with a QCP. The QCP shall be developed using the District QMP and Division QMP as guides. However due to the wide variety of products and the unique requirements imposed by various customers, the individual QCP may be adjusted to meet any special requirements.

Quality management guidelines for HTRW programs are provided in Enclosure #1.

5.10 Flood Recovery Efforts: Due to its special requirements, Natural Disaster Procedures are classified as a unique function of the Corps as prescribed in the North Atlantic Division organizational guidelines. Quality control of products resulting from flood recovery efforts is prescribed in the existing engineering regulations outlined in the above referenced subplan as well as below:

Code 200 Emergency Operations (Flood Response and Post Flood Response): Due to the emergency nature of the products developed under this authority, quality control of flood response products shall consist of peer or supervisory review, only, prior to implementation. Quality control of post-flood response products shall be accomplished by NAD until an approved QCP is developed and approved by the district.

Code 300 Rehabilitation Assistance: Quality control plans and independent technical review are required for products developed under this authority.

5.11 QA/QC of Laboratory Investigations and Testing: The responsibilities, policies, procedures for laboratory investigations, materials and chemistry testing and analytical services performed in support of design, construction and operation of Civil Works, Military and Support for Others programs.

ENCLOSURE 1

DESIGN QUALITY MANAGEMENT PLAN (QMP) HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW) PROGRAM

1. PURPOSE: The purpose of this document is to establish quality management procedures for assuring that HTRW work performed by Norfolk District achieves a consistent level of quality in conformance with regulatory requirements, and professional standards.

2. APPLICABILITY: This document is applicable to all HTRW work performed in support of Norfolk District including work performed by in-house staff, contract A-E firms, and sister districts, such as, NAD HTRW Design Centers (Baltimore and New England).

3. REFERENCES: The following source documents are incorporated by reference herein. These documents provide detailed documentation and requirements applicable to quality management for Norfolk District work products over and above those specified directly in this document.

- a) North Atlantic Division Quality Management Plan, Appendix D- Design Quality Management for Hazardous, Toxic, and Radioactive Waste (HTRW) Work in the North Atlantic Division, dated August 2000.
- b) ER 5-1-11, U.S. Army Corps of Engineers Business Process, dated 14 February 2001
- c) ER 415-1-11, Biddability, Constructibility, Operability, and Environmental Review, dated 01 September 1994
- d) ER 1110-1-12, Engineering and Design Quality Management, dated 1 June 1993
- e) ER 1110-1-263, Chemical Data Quality Management for Hazardous, Toxic, Radioactive Waste Remedial Activities, dated 30 April 1998
- f) EM 200-1-2, Technical Project Planning (TPP) Process, dated 31 August 1998
- g) EM 200-1-3, Requirements for the Preparation of Sampling and Analysis Plans, dated 01 February 2001
- h) EM 200-1-6, Chemical Quality Assurance for HTRW Projects, dated 10 October 1997
- i) Norfolk District Engineering Branch Design Guide, dated 11 November 2000
- j) Norfolk District Technical Services Division Quality Management Plan, dated April 2001

4. RESPONSIBILITIES:

- a. Project Manager: The Project Manager (PM) is responsible for leading the Product Delivery Team (PDT) and for ensuring that all work is performed in a quality manner consistent with customer expectations and in conformance with applicable regulatory requirements, and good business procedures. The PM leads the development of the Project Management Plan (PMP) and helps focus the PDT's efforts to accomplish the work in accordance with the agreed upon scope of work, schedule, and budget. The PM employs the expertise of the PDT members to determine the procedures necessary to achieve the targeted level of quality. The PM works closely with the customer to ensure that the customer's expectations are clearly understood and articulated to the PDT, and that the customer is aware of the applicable rules, regulations, codes, and professional standards governing execution of the HTRW work.
- b. Project Engineer: The Project Engineer (PE) provides technical leadership of the PDT during the development of engineering deliverables. The PE coordinates technical work execution in conformance with the Norfolk District Engineering Branch Design Guide, the project-specific PMP, the Norfolk District Design Quality Management Plan (QMP), and project specific QMPs and Quality Control Plans (QCPs).
- c. Chief, GeoEnvironmental Engineering Section (GeoE): The Chief, GeoE, is responsible for the delivery of accurate, timely, and cost-effective deliverables in support of PMs in Norfolk District, consistent with the project-specific PMP/QMP/QCP. The Chief, GeoE, is responsible for assuring that the PDT is staffed with personnel possessing the necessary technical capabilities to properly execute the work. The PDT can be staffed with in-house personnel, A-E Contractors, sister district personnel such as personnel from NAD HTRW Design Centers (NAB and NAE), or a combination thereof. In addition, the Chief, GeoE is responsible for assuring that appropriate quality control/quality assurance is provided for *all* HTRW work consistent with the Norfolk District Technical Services Division Design Quality Management Plan (QMP), and project specific QMPs/QCPs.
- d. Product Delivery Team (PDT) Members: PDT members are directly responsible for development and delivery of project-specific deliverables. PDTs consist of Norfolk District in-house personnel, A-E Contractors, sister district personnel such as personnel from NAD HTRW Design Centers (NAB and NAE), or a combination thereof. PDT members work with the PM in developing project scope and budget. Individual team members are responsible for the quality of their own work, and for keeping commitments for completion of their portion of the project as documented in the PMP. The Project Engineer (PE) provides technical leadership for in-house PDT members and serves as the technical Point of Contact (POC) for external PDT members. Initial QC review of PDT work efforts is accomplished internal to the PDT members' Section as outlined in the Norfolk District Engineering Branch Design Guide.
- e. HTRW and Ordnance and Explosives (OE) Centers of Expertise (CX) and NAD HTRW Design Centers: The HTRW Center of Expertise (Omaha, Nebraska), the OE Center of Expertise (Huntsville, Alabama) and the NAD HTRW Design Centers (Baltimore District and New England District) provide technical support and quality oversight.

5. QUALITY MANAGEMENT FRAMEWORK: Quality is a primary goal for all Norfolk District deliverables whether produced by in-house personnel, A-E Contractors, sister district

personnel, or a combination thereof. All work will be performed in accordance with the Norfolk District Technical Services Division Quality Management Plan, as well as the project-specific PMP, QMP, and QCP. Quality Control of work products produced by A-E Contractors and/or sister districts will be documented in the applicable project-specific Work Plan and QCP. In order to maintain A-E Contractor accountability, the A-E Contractor shall be responsible for his/her own quality control on their deliverables. Norfolk District will provide quality assurance oversight of A-E Contractor-produced deliverables through in-house resources, other A-E Contractors, sister district resources, or a combination thereof. Qualified Norfolk District personnel with the requisite knowledge and experience will be utilized to fulfill the Project Engineer (PE) role. The PE will help ensure that the PDT achieves the objectives of the QMP. The following sections provide more detailed discussion of required quality control provisions for project specific deliverables.

- a. Project Staffing: In accordance with the PMP, Chief, GeoE, will assign a Project Engineer (PE) to prepare the product/deliverable. The PE will work with the Chief, GeoE, and the PM to identify appropriate technical team members for the PDT. Chief, GeoE, will also identify appropriate Independent Technical Review (ITR) team members. Appropriate members of the PDT will work with the PM in performing the project-specific acquisition strategy review. The acquisition strategy review will be used to determine if in-house, sister district, or contract support (or some combination thereof) will be applied to execute the customer's desired work effort.
- b. Scope of Work (SOW) Development: The nature of this work necessitates detailed scopes of work (SOW). The PM and PDT will work with the customer early in the project scoping process to identify site-specific requirements and to refine those requirements in light of safety, regulatory, fiscal, schedule, and other constraints. The services of the NAD HTRW Design Centers and USACE guidance on HTRW Scope of Work preparation will be utilized, as applicable. PDT members are integrally involved in developing the technical aspects and approach to be specified in the SOW. The PM and PDT will hold periodic meetings to help focus the PDT on producing high quality deliverables on time, within budget, and in accordance with the PMP and customer expectations.
- c. Acquisition Planning: At the start of each individual aspect of the project, the PM and appropriate PDT members will perform project-specific acquisition planning. The objective of the project-specific acquisition planning is to determine the most appropriate approach and contract vehicle for executing the defined project scope. Acquisition planning participants include the PM and PE as well as representatives from Construction and Contracting Divisions. Acquisition Plans consider existing in-house contracts, other USACE District in-house contracts, and small business and minority set-asides.
- d. Project Budgets.
 - 1.) In-House Project Budgets: Project budgets which provide the basis for work assignments are developed through direct input from appropriate technical personnel based upon the agreed upon Scope of Work (SOW). When the SOW is developed, the PE provides the SOW to Section Chiefs of the appropriate technical sections with a request to provide a detailed project budget. Standardized cost estimating spreadsheets are utilized to facilitate uniformity of cost estimates and to help ensure all applicable costs are captured. In the event that the estimated project budget exceeds the PM's expectations and/or budget, the PM and the PDT will work together to better define project-specific

expectations. The SOW and/or project budget may be modified to reflect the better understanding of the project-specific expectations. The PDT and PM must agree on a project budget, schedule, and SOW before proceeding with any execution of project activities.

2.) A-E Contractor Project Budgets: When the decision is made to access an A-E Contractor for project support, the PE provides the SOW to the Engineering Branch A-E Coordinator. The Engineering Branch A-E Coordinator provides the SOW to the selected A-E Contractor through a letter signed by the Contracting Officer's Representative (COR). The PE (with support from the PDT) prepares an Independent Government Estimate (IGE), based on the pre-established rates outlined in the A-E Contractor's specific contract, prior to requesting a proposal from the A-E Contractor. To facilitate negotiations, bid schedules are established for each SOW and provided to the A-E Contractor's for inclusion in their proposal submissions. The A-E Coordinator, with support from the PE, will ensure each A-E Contractor understands the SOW, the expectations for each deliverable or phase of work, and the requirements for the QCP. The A-E Coordinator, with support from the PE, assesses each A-E Contractor's proposal for the appropriate level of effort and applicable contract rates. Negotiations and documentation procedures for A-E Contractor proposals and subsequent delivery orders and modifications are in accordance with Norfolk District Contracting Branch requirements.

- e. Technical Project Planning (TPP): TPP is a comprehensive and systematic process focused on effective planning to identify project objectives and design data collection programs. TPP seeks to involve all project stakeholders (including regulatory authorities) to achieve consensus on project objectives and approach prior to starting project activities. Requirements for TPP are specified in EM 200-1-2, *Technical Project Planning (TPP) Process*. The use of TPP is preferred for all projects as it can save considerable money over the long-run. The *general* TPP approach is utilized to help minimize conflicts, facilitate communication/decision making, provide buy-in from regulators and stakeholders, and to help ensure that project objectives are clearly defined and that the data collection program meets data quality objectives/project objectives in a timely and cost effective manner.
- f. Chemical Data Quality Management: Chemical data quality management is governed by ER 1110-1-263, *Chemical Data Quality Management for Hazardous Waste Remedial Activities*. This document addresses the full range of chemical data quality considerations, including, but not limited to:
- Laboratory validation;
 - Methods and materials;
 - Reporting requirements;
 - Containers and preservatives;
 - Field sampling protocols;
 - QC checks and documentation;
 - QA analysis; and
 - Data validation

Project-specific information is presented in the Quality Assurance Project Plans (QAPP) prepared for each project. Requirements for QAPP are established by EPA and summarized in EM 200-1-3, *Requirements for the Preparation of Sampling and Analysis Plans*.

g. Technical Review Process: All A-E Contractor and in-house deliverables are subject to a detailed technical review, as appropriate. The following is a description of the overall review process.

1) Design Check Review: The Design Check Review is the first step of the review process and is the evaluation of the analysis and the product documents performed by each functional discipline as an extension of the design process. Design checks shall be performed internal to the product development team (PDT) member's section. All checked drawings, computations and analyses shall be annotated to show the initials of the designer/originator and the checker. Each PDT member shall sign a certification verifying the Design Check Review(s) was accomplished. Design checklists should be used by each functional discipline to strengthen the design check process. Experience level of checker shall be commensurate with the level of complexity and risk. A design check should include an evaluation of:

- Technical Adequacy;
- Appropriateness;
- Adequacy of data;
- Completeness of documentation;
- Compliance with Federal, State, Local, and Army guidance and standards; and
- Whether any deviations from policy, guidance, and standards are appropriately identified and have the requisite approvals.

2) Interdisciplinary Review: The Interdisciplinary Review is normally the second step of the review process and encompasses the day-to-day coordination between PDT members throughout the product development process. The interdisciplinary check ensures the portion of the product developed by one discipline does not conflict or interfere with the portion developed by another discipline. Although an on-going process, it shall be formally documented in a meeting(s) prior to completion of each predetermined milestone. This is also an opportunity for each member of the PDT to review the product as a whole. Each PDT member shall sign a certification verifying that all significant conflicts between their portion of the product and that of other team members have been satisfactorily resolved.

3) Independent Technical Review (ITR): The ITR is normally the third step in the review process and provides verification that a quality product is being provided in accordance with applicable references. ITR does not include detailed checks of each PDT member's work, which is performed during the earlier steps of the review process. The ITR shall normally be performed by functional section chiefs. However, if the functional section chief is involved in the design of the product, or cannot meet the ITR schedule, then the ITR may be delegated to other senior engineers within the functional discipline, or performed by A-E Contractors, sister districts, or a combination thereof, as applicable. Each ITR reviewer shall sign a certification verifying that the ITR was accomplished. The ITR shall

ensure, as applicable:

- Technical Adequacy;
 - Appropriateness;
 - Adequacy of data;
 - Completeness of documentation;
 - Compliance with Federal, State, Local, and Army guidance and standards; and
 - Whether any deviations from policy, guidance, and standards are appropriately identified and have the requisite approvals.
- 4) Biddability, Constructibility, Operability, and Environmental (BCOE) Review: Project deliverables that will be used as a scope for a removal action (including full designs and performance specifications) are subject to a biddability, constructibility, operability, and environmental (BCOE) review. The BCOE review process is specified in ER 415-1-11, *Biddability, Constructibility, Operability, and Environmental Review*. BCOE reviews may be performed by appropriate members of the ITR Team, i.e. Construction Branch Team Members.
- 5) Reviews by Centers of Expertise and HTRW Design Centers: Reviews by the HTRW Center of Expertise (Omaha), the Ordnance and Explosive (OE) Center of Expertise (Huntsville), and the NAD HTRW Design Centers (Baltimore and New England) will be conducted, as applicable.
- h. Technical Guidance: The HTRW program is subject to many programmatic documents. Norfolk District maintains a library of documents/regulations for use by in-house personnel and others. Also, the Internet (<http://www.hnd.usace.army.mil/techinfo/> and <http://www.usace.army.mil/publications/>) is utilized to access documents/regulations (ERs, EMs, ETLs, ECs, EPs, etc.) and to check for new or updated documents/regulations.
- 6. QUALITY ASSURANCE:** Quality Assurance reviews will be provided as an independent check that the QC process has been effectively implemented. QA reviews for both in-house, sister district, and A-E Contractor work are performed during the ITR. Federal and State regulators also participate in the QA review, as applicable. Project-specific procedures for QA review will be defined in the project-specific Work Plans and QCPs. Quality Assurance Review of Norfolk District QC/QA procedures, processes, and documentation is provided by North Atlantic Division.
- 7. LESSONS LEARNED:** Norfolk District is in the process of implementing the following process. At the completion of each aspect of the project, the PE shall be responsible for preparing a "Lessons Learned" summary for the project. The "Lessons Learned" summary should address issues associated with:
- Project scope, schedule, or budget;
 - Communications with team members, customer, and regulators;

- Coordination with other USACE entities and stakeholders;
- AE/ in-house team technical performance;
- Regulatory issues;
- Acquisition planning decisions; and
- Other issues associated with technical project execution.

The "Lessons Learned" will be compiled into a shared directory to maximize access by PDT members.

**ENCLOSURE #2
ENGINEERING QUALITY MANAGEMENT SUBPLAN**

Mission: Provide our customers with excellent engineering products with allotted execution periods and within approved budgets.

ENGINEERING QUALITY MANAGEMENT PLAN COMPONENTS

1. Quality Management Assignment Rosters:

Assigns Designer, Reviewer, and Alternate reviewer for both single- and multiple-discipline reviews. Identifies key professionals involved in the process.

2. Quality Management Coordination Sheets:

Single Discipline Review Sheets: Peer review to ensure completeness and accuracy of design criteria, assumptions, calculations, analysis, drawings, and specifications.

Multi-Discipline Review Sheets: Ensures that all work is adequately addressed and incorporated into other disciplines work. This is a cross discipline and cross Divisional review as applicable.

3. Quality Assurance Report:

- a. Narrative describing project scope, number and types of reviews.
- b. Project Assignment Rosters
- c. Review Lists

d. Review Comments and Written Responses by the Designers

4. Signature Certification Sheets

Management assurance that quality reviews have been executed and the importance of quality management stressed.