

ENGINEER REGULATION 1165-2-217 CIVIL WORKS REVIEW POLICY

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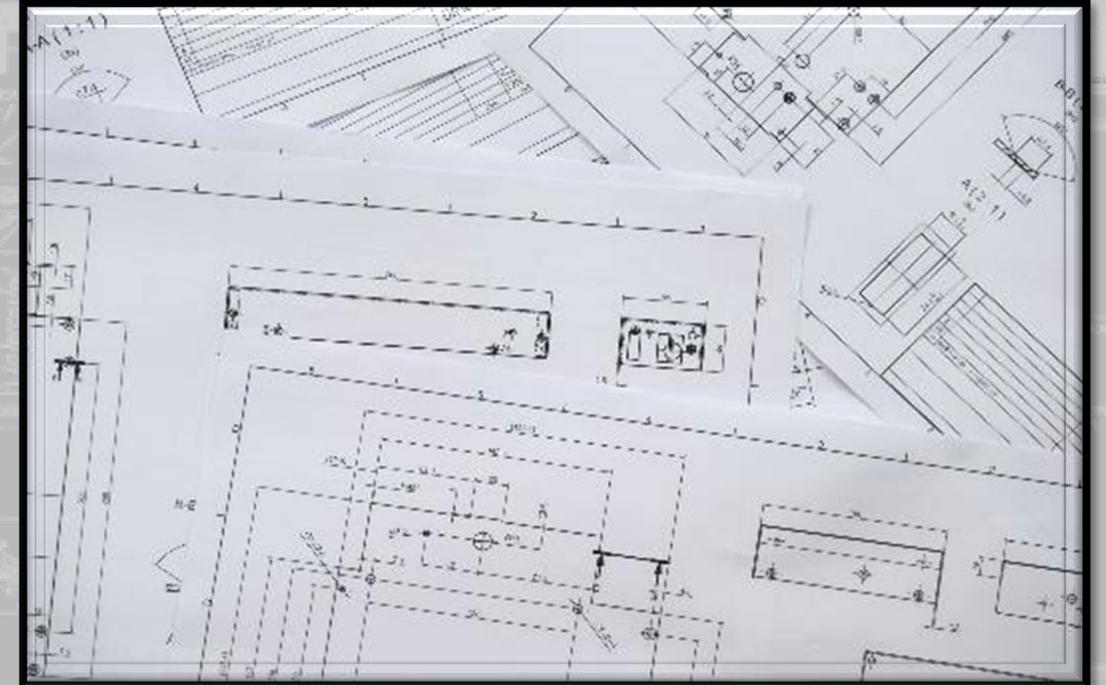
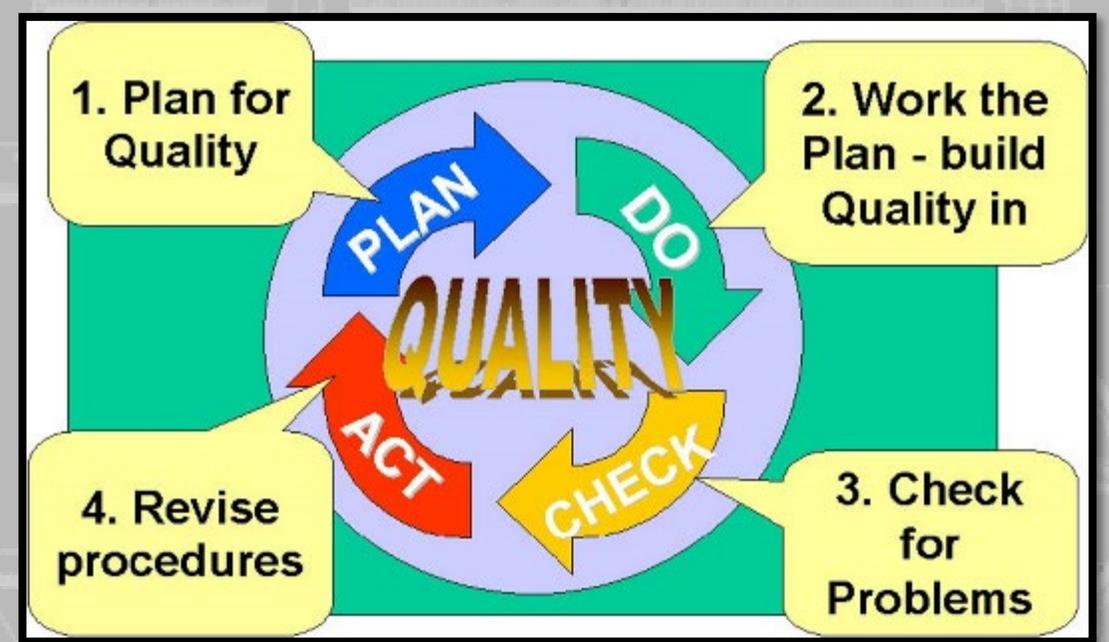
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Date: 10 June 2021



US Army Corps
of Engineers®





TO ENGINEER IS HUMAN BY HENRY PETROSKI



***“Engineers ... are not superhuman. They make mistakes in their assumptions, in their calculations, in their conclusions. That they make mistakes is forgivable; that they catch them is imperative.*”**

Thus, it is the essence of modern engineering not only to be able to check one’s own work, but also to have one’s work checked and to be able to check the work of others.”



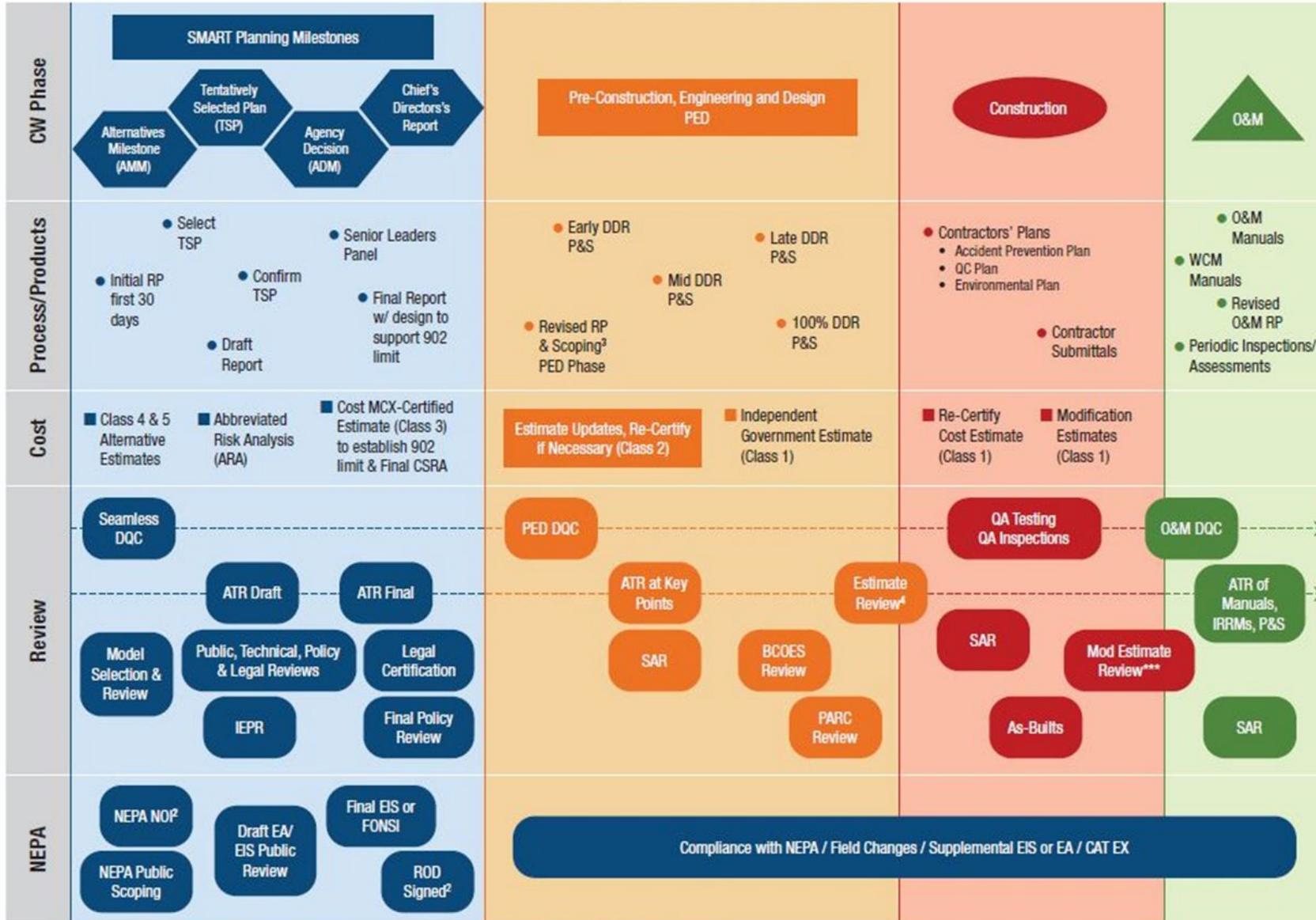


INTRODUCTION

CHAPTER 1



Civil Works Project Stages of Development and Review¹

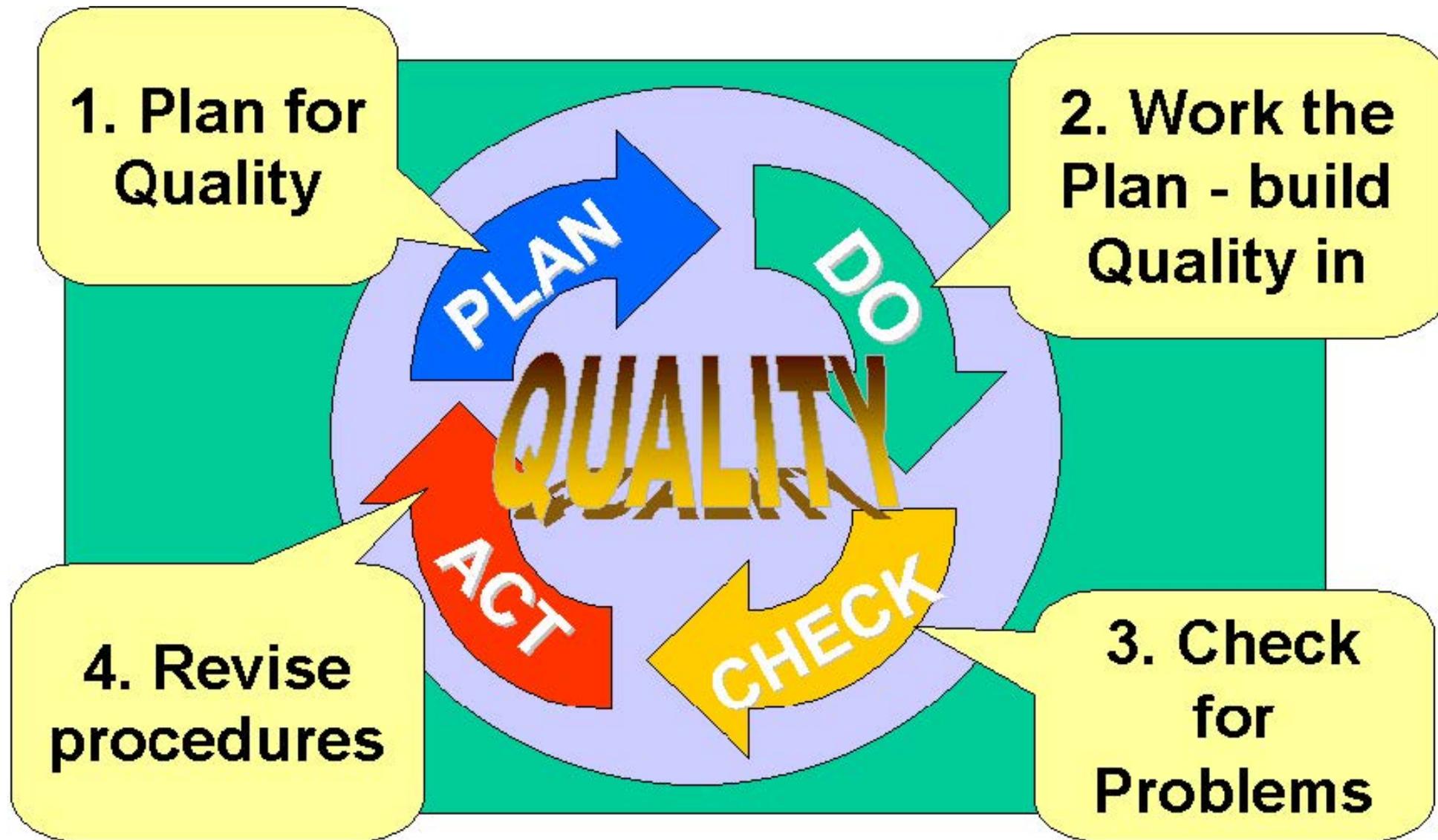


Reviews occur throughout product development

¹ Graphic not to time scale and projects can begin in any of the stages
² If environmental impact statement is required
³ Includes review of feasibility level design & commitments
⁴ Per USACE Acquisition Instruction (UA)



PLAN-DO-CHECK-ACT (PDCA) CYCLE





MAJOR QUALITY COMPONENTS (TABLE 1.1)



COMPONENT	DEFINITION	MEANS & METHODS	EXAMPLES
Quality Management	Governance structure establishes quality requirements & provides ability to achieve those requirements.	RMO	ER 1165-2-217
Quality Assurance	Processes show QC activities are accomplished as planned and are effective in producing a product that meets the desired end quality. Provides confidence quality requirements of a project, product, service, or process are fulfilled.	Processes	Review Plan
Quality Control	Ensuring performance meets customer requirements consistent with law, regulations, policies, sound technical criteria, schedules, and budget. Focus on fulfilling quality requirements of a project, product, service, or process.	ATRs	Reviewing



OVERALL GUIDING PRINCIPLES



- **Independent review is essential.**
- **Consistent review policy must be applied across all Civil Works phases.**
- **The PDT self-checks its work with the goal that subsequent reviews produce minimal comments.**
- **Peer review contributes to improved quality of work and ultimately saves time and additional cost by lessening rework and other undesired outcomes.**
- **Reviews must be risk-informed, scaled, and deliberate, occur throughout the lifecycle of the project, and be concurrent with normal business processes.**
- **Robust DQC is the foundation for quality.**
- **Ultimate responsibility for the quality of a work product resides with the District, including when the District uses Architect-Engineers (A-Es), other USACE entities, other government agencies, or sponsors to provide services or produce deliverables.**
- **Reviews must ensure transparency of the analysis so that the methods used to develop analyses and conclusions are clearly and fully presented.**



ER 1165-2-217 – A CULTURAL CHANGE



place a mark where you see our current state of practice!

One Size Fits All

Right Sized & Scalable



Unexpected requirements, costs, schedule delays

RP formulated early and approved by MSC Leader



What must be done to get the QC box checked?

PDT sees value in seamless and periodic review



Find anyone available

Team selected from certified lists by RMO



Reactive at end of project

Proactive at beginning of project



I don't need my work reviewed

I deserve to have my work reviewed



Reviews COST time & money

Reviews SAVE time & money





REVIEW MANAGEMENT ORGANIZATION (RMO) CHAPTER 2



RMO – OVERVIEW



USACE organization
overseeing quality reviews

Manages



Reviews and endorses the
Review Plan



Ensures review teams are
independent experts



RMO – DESIGNATION



- Based on *phase of work* and *type of project*
- PDTs determine prospective RMO and confirm with the prospective RMO and MSC
- A project may have *different RMOs for different phases*
- Only a *single RMO for each phase*

PCXIN-RED is the prospective RMO for an inland navigation decision document

Work Product	Project Purpose	RMO
Decision Documents	FRM and CSRMs projects requiring specific project authorization	FRM Planning Center of Expertise (FRM-PCX) or CSRMs Center of Expertise (CSRMs-PCX)
	Modification of a dam or levee that does not require specific project authorization	Risk Management Center (RMC)
	Inland navigation	Planning Center of Expertise for Inland Navigation (PCXIN-RED)
	Deep draft navigation	Deep Draft Navigation Planning Center of Expertise (DDN-PCX)
	Small boat harbor	Small Boat Harbor Planning Center of Expertise (SBH-PCX)
	Water supply/reallocation	Planning Center of Expertise for Water Management and Reallocation Studies (WMRS-PCX)
	Ecosystem restoration	Ecosystem Restoration Planning Center of Expertise (ECO-PCX)
	Multiple project purposes	MSC designates the Lead PCX
	Continuing Authorities Program (CAP) expected to require a SAR during the implementation phase	RMC
	CAP not expected to require an IEPR or SAR during the implementation phase	MSC unless delegated to District
Implementation Documents or Other Work Products	All other including planning assistance to states, watershed plans, CAP requiring an IEPR	MSC unless the MSC requests a PCX or RMC to act as RMO
	FRM or coastal storm management requiring a SAR	RMC
	FRM or coastal storm management not requiring a SAR	MSC
	Inland navigation	Inland Navigation Design Center (INDC)
	CAP requiring a SAR	RMC
	CAP not requiring a SAR	MSC unless delegated to a District
	All other not specified, including O&M, Interagency and International Services (IIS), work for others, additional projects requiring a SAR (e.g., public bridge, school relocation)	MSC



REVIEW PLAN (RP) CHAPTER 3



REVIEW PLANS (RP)



- **MSCs/Districts will develop a QMS** that documents regional requirements.
- **Streamlining** - RP meets the project specific requirements for the QMP, QCP, QAP, RMP, and CMP; therefore, separate plans for each project are not required.
- **All Review Plans expire after 3 years.**
- In general **RPs should be submitted 30 days after receiving funds**, see 3.5.1.
- The **RMO has 14 days** to endorse or provide comments, **MSC has 30 days** to approve or provide comments.
- RPs should be **approved prior to the start of any reviews.**
- Only **decision document RPs need to be posted to the internet** (statutory requirement).



REVIEW PLANS (RP)



What is a RP?

- **A component of the PMP** or Program Management Plan (PgMP).
- **Describes the scope of review** for the phase of work (feasibility, PED, construction).
- **RIDM is used to scale reviews** appropriate to project size, level of complexity, and level of uncertainty and risk.
- **Describes all reviews to be performed** for a given project phase.
- **Establishes RMO** for a project.
- **Late or outdated RPs will trigger Quality Audits.**



RP CONTENT



- **Overview.**
- Basic background information.
- The **objective** of the reviews.
- **Actions**, schedules, and estimated cost.
- (For **Studies/Reports** only) A brief description of the **future with and without project conditions.**
- Discuss **risks** and related issues, including **key assumptions, constraints, and information uncertainty.**
- The **District Chief of Engineering's assessment** if there is a **significant threat to human life.**



RP CONTENT, CONTINUED



- Discuss of the **life safety risks to construct/operate** the project.
- List anticipated **deliverables/work products**.
- List **reviewer disciplines** along with a succinct **description of the expertise needed**.
- The anticipated **review milestones and schedule**.
- List the **models** used.
- List of expected **in-kind contributions/services** to be provided by the sponsor.
- Whether a **site visit** will be required.



PROGRAMMATIC RPS



- MSCs may develop regional programmatic RPs for the **CAP and other low risk programs.**
- **Not allowed** for projects that require a **SAR.**
- Care must be taken to ensure the programmatic RP is only applied **within the intended scope.**
- Approval of **regional** programmatic RPs by the **MSC** Commander; approval of **national** programmatic RPs by the **DCW**, HQUSACE.



REVIEW PLANS ARE LIVING DOCUMENTS



- **Update** Review Plans as needed.
- **All Review Plans expire after 3 years.**
- Changes Requiring **Re-Approval** – see Chapter 3 of ER 217 but generally...
 - the **level of review** (i.e., **if IEPR or SAR is added or deleted** from the RP.
- Changes **Not** Requiring **Re-Approval**.
 - Updating **dates or** reviewer **names**.



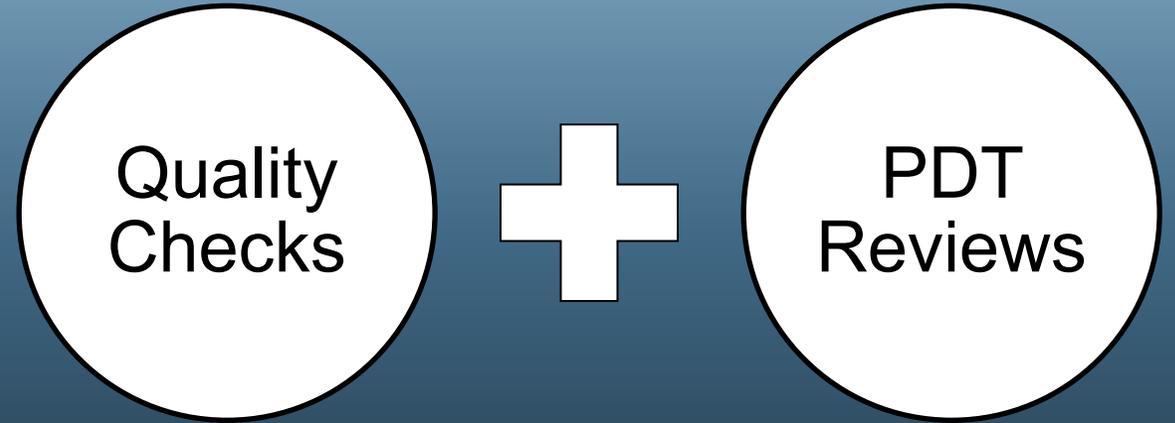
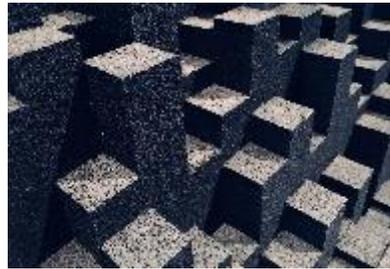
DISTRICT QUALITY CONTROL (DQC) CHAPTER 4



DQC – OVERVIEW



Foundation of the USACE Quality Process



- ✓ Review everything
- ✓ Check math (e.g., models)
- ✓ Scrutinize decisions

Mechanism to identify key ***risk-informed decisions***



DQC – GUIDING PRINCIPLES



- 1 The PDT is responsible for ***project success*** and for delivering ***quality products***
- 2 DQC is an integrated review approach providing for ***seamless review***
- 3 The PDT should consider a work product that has completed DQC a ***final document acceptable for release***
- 4 Each Commander is responsible for ensuring work products ***comply with requirements*** and have been ***read/reviewed***



DQC – REVIEW TEAM



- May include staff responsible for the work product (e.g., supervisors, work leaders, team leaders, etc.)
- May not include the same people that produced the work product or who managed/reviewed the work for contracted or brokered work



- Requires a ***DQC Review Lead*** to
 - Ensure a formal DQC is performed and certified
 - Serve as a reviewer for the DQC Review Team
 - Assist the PDT in other areas per District practices



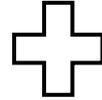
DQC – PROCESS



Divisions/Districts must develop and document robust DQC processes

Quality Checks

- **Detailed peer review/check** of documents, computations, and graphics (e.g., “red dot” check)
- **Complete reading** of any reports and accompanying appendices
- **Comprehensive evaluation** of correct application of methods, validity of assumptions, adequacy of basic data, correctness of calculations, completeness of documentation, compliance with guidance and standards, and BCOES



PDT Reviews

- **In addition to traditional DQC**
- **Cross check** of documents, computations, and graphics to ensure **consistency across disciplines**
- **Complete reading** of any reports and accompanying appendices to ensure **overall coherence** and integrity





DQC – “RED DOT” CHECK EXAMPLE



US ARMY CORPS OF ENGINEERS
GREAT LAKES AND OHIO RIVER
DIVISION (CELRH-EC-DS)

35% DESIGN COMPUTATIONS
Project: Isabella Dam, California (CESPK)
Subject: CA-155 Swing Gate Closure

Design By: CLC Date: 8/14/11
Checked By: *LOFF* Date: 8/15/11

SKIN PLATE

Assumptions for skin plate design

30 in • Intercostal Spacing
50 ksi • Fy (yield strength of skin plate)

Hydrostatic Pressure at bottom girder

P = 0.00694444 ksi •

Wu = 1.4xP

Wu = 0.00972222 ksi •

b = 30 in •

a = 192 in •

b/a = 0.15625 •

α = 1 Reliability Factor (EM 2105, App H) •

φ = 0.9 AISC •

F_{lim} = Ω*φ*Fy •

F_{lim} = 45 ksi •

t_{min} = 0.31180337 in •

< conservative, assumes full hydrostatic pressure allows 1/16" for corrosion •

note...some discrepancy here. Em 2105 •
appendix h says to design like miter gate, •
em 2705 example uses 'fixed beam' analogy. •

Per, EM 2105, H-2 d. (1)(b) •

$$t_{min} = \sqrt{\frac{0.5 W b^2}{F_{lim} \left[1 + 0.623 \left(\frac{b}{a} \right)^6 \right]}}$$

(B-5)

Note: Red Dots placed beside “checked” notes, calculations, and assumptions

- All computations, graphics, and plans **must undergo a “red dot” check**
- Digital or wet signatures are acceptable
- Typed initials are unacceptable



AGENCY TECHNICAL REVIEW (ATR) CHAPTER 5



AGENCY TECHNICAL REVIEW



- Added more on **ATR** during the phases of **planning, design, construction and O&M.**
- **An ATR Report is required for each formal ATR. ATR Certification is for the draft and final deliverable work products for studies and only for the final documents for implementation.**
- Added a requirement for **ATR reviewers to provide a “no comments” comment, at a minimum**, to provide traceability to the review.
- Added requirements for **PDT** comment **responses.**
- Added requirements **for ATR documentation and records.**



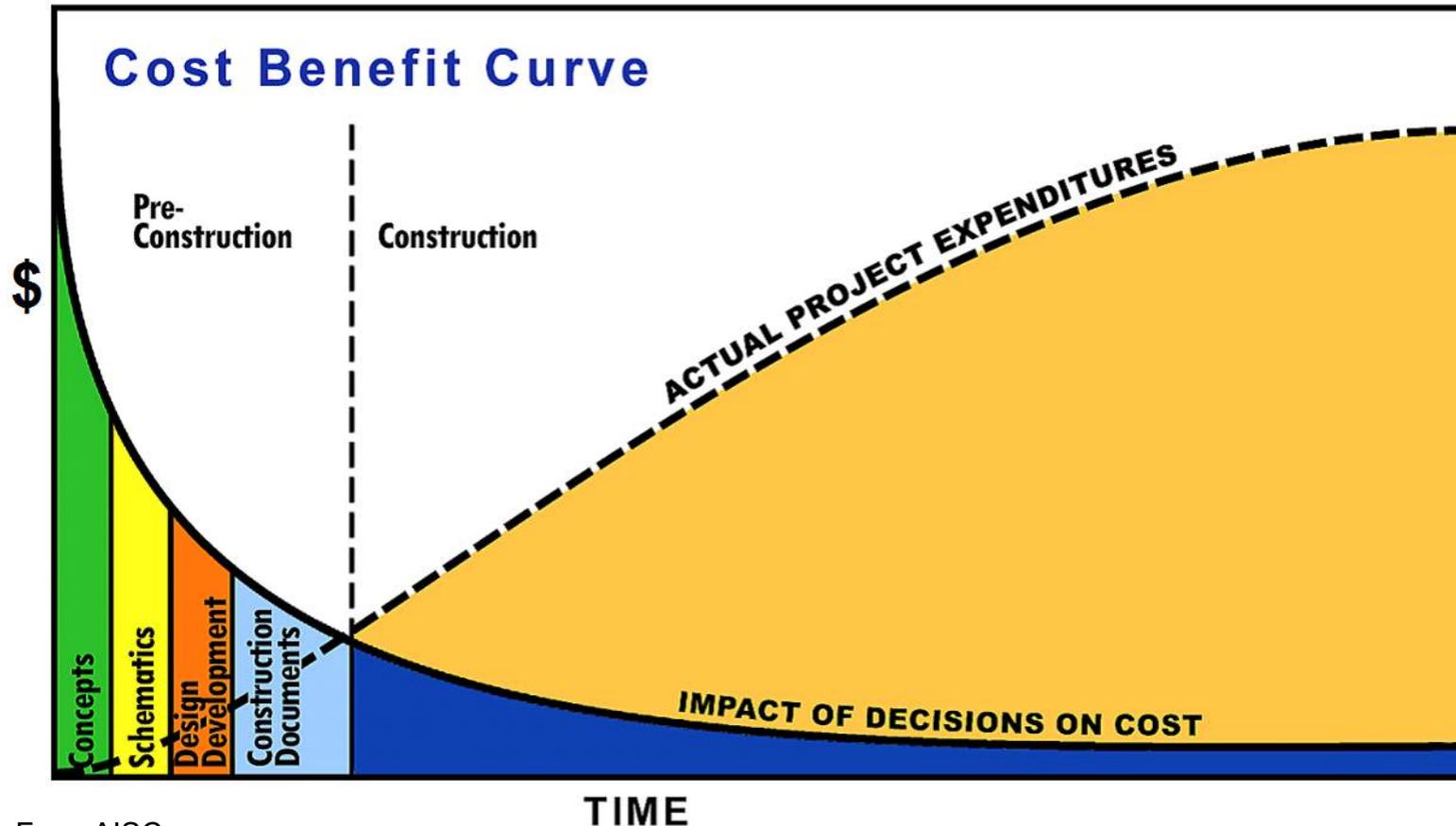
AGENCY TECHNICAL REVIEW (ATR)



- To help ensure the **quality and credibility** of USACE scientific and technical information.
- To **assess** adequacy of **DQC**, **validate key PDT decisions**, and **bring up important issues, concerns, and lessons learned**.
- **Work products** that are of poor quality or appear to have **inadequate DQC may be returned** with no action.
- To perform an **independent review** of the PDT work and is **not to make project decisions**. PDT is responsible for the work product/design.
- The PDT may also **engage the ATR Team as major issues arise**.



FROM AISC SHOWING IMPACT OF EARLY DECISIONS



- The early impact of decisions also applies to all **project goals** such as **quality, life safety risk reduction, meeting the customer needs, etc.**
- Common Theme - **PDTs** sometimes decide and develop **poorly formulated solutions without reaching out to the experienced personnel** throughout USACE.
- Key decisions are usually made **early in the project development, get those decisions validated by the ATR Team.**



ATR REVIEWS

- **Involved throughout** the project life cycle, especially early on **when key decisions are made.**
- **Scalable**, based on the complexity, size, and level of **risk** of the project.
- While ATR is traditionally done for planning and design phases; **construction and operation phases** are required.



ATRs help you from going down the wrong rabbit hole!





ATR COMMENTS SHOULD FOLLOW THE FOUR-PART COMMENT STRUCTURE



1

Clear statement of the concern.

2

Basis for the Concern.

3

The significance of the concern.

4

Recommended actions to resolve the concern.



PDT RESPONSES SHOULD FOLLOW THE THREE-PART STRUCTURE

1

Concur/Non-concur

2

How the comment will be resolved
OR why there is non-concurrence

3

Where the change was made in
the document



ATR COMMENT RESOLUTION



- Goal is to **resolve ATR concerns to mutual satisfaction** of the PDT and ATR team.
- **Engage the RMO** if issues arise that cannot be resolved.
- RMO will engage additional resources if necessary.
- Unresolved comments involving disagreement between the ATR Team and the PDT will be closed in DrCheckssm with the notation that **the comment has been elevated for resolution.**
- **Document discussions** and include highlights in the **ATR certification report.**



ATR STATEMENT OF TECHNICAL REVIEW



- **ATR Lead has primary responsibility.**
- **Each milestone of ATR**, including interim reviews, shall be documented in the report.
- Document **effectiveness of DQC**.
- Document top lessons learned & assess effectiveness of the review.
- Minimal documents required:
 - ATR team member information
 - Charge to Reviewers
 - Findings/conclusions
 - **Summary of each unresolved issue**, if any
 - DrChecks comments/responses/discussion/backcheck





INDEPENDENT EXTERNAL PEER REVIEW (IEPR) CHAPTER 6



IEPR

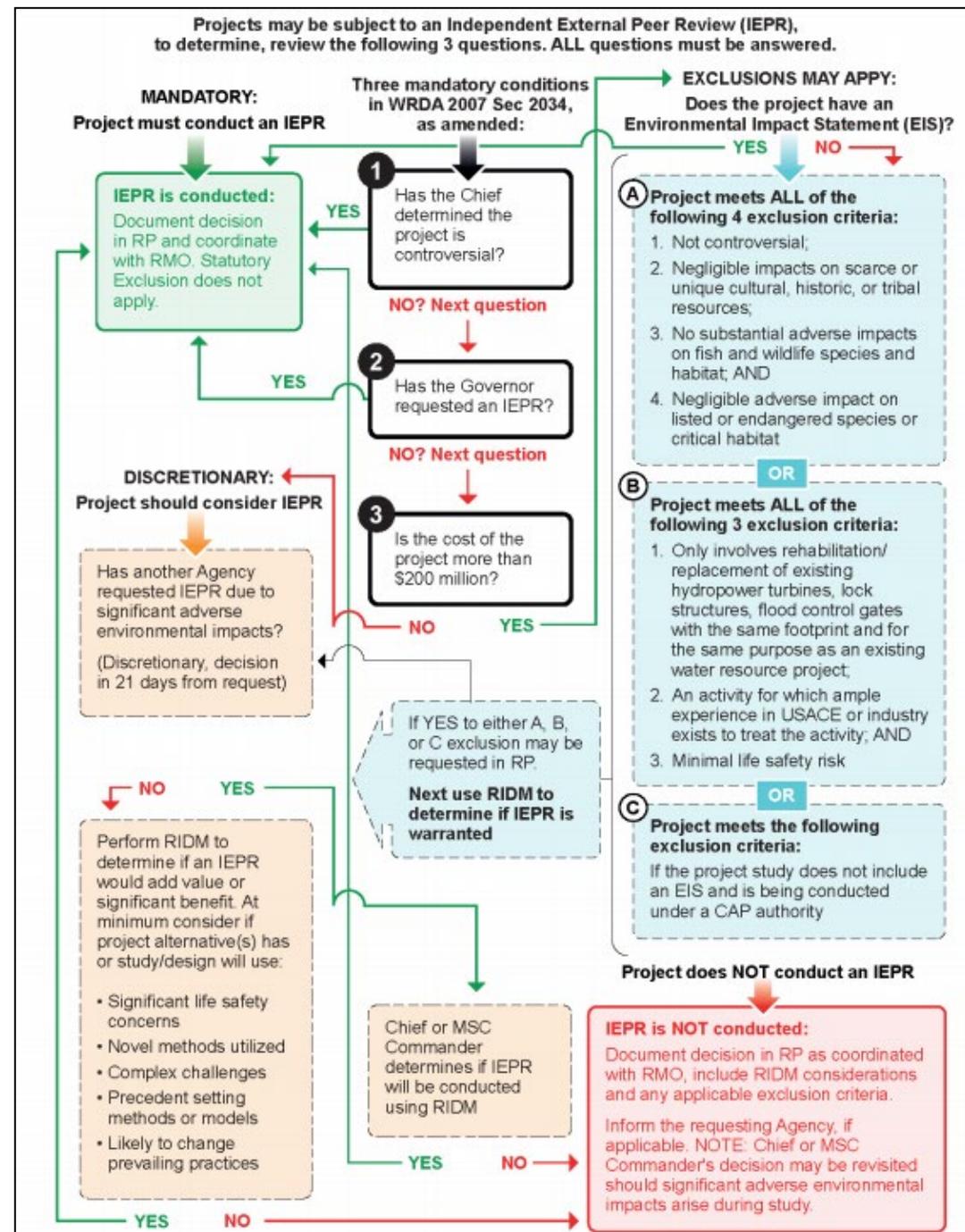


- IEPR emphasis placed on ***most complex studies*** or those with ***significant resources*** or ***public controversy***
 - Incorporated ***“CECW-CE Interim Guidance on Streamlining Independent External Peer Review (IEPR) for Improved Civil Works Product Delivery”*** dated 5 April 2019 to reflect only the statutory requirements for mandatory IEPR trigger
 - Incorporated ***all delegations*** associated with IEPR
- PDTs to consider IEPR through risk-informed decision making even if mandatory triggers aren't met



FLOWCHART

- Guides PDT through **mandatory**, **discretionary**, and **risk-informed decision making** paths
- PDTs Document the decision in RP, providing rationale for RIDM





SAFETY ASSURANCE REVIEW (SAR)

CHAPTER 7



SAFETY ASSURANCE REVIEW (SAR)



- Incorporated memorandum “CECW-CE Interim Guidance on Streamlining Independent External Peer Review (IEPR) for Improved Civil Works Product Delivery” dated 5 April 2019 to reflect that **SAR is required based on risk-informed decisions instead of statutory requirements.**
- **Removed the requirement to post SAR Reports** to the internet, since there is no statutory requirement to provide the report to the public.



SAR IS FOR THE IMPLEMENTATION PHASE



- **SARs help ensures probable failure modes were properly assessed and effectively mitigated.**
- SAR is conducted on PED and construction activities for projects where potential hazards pose a **significant threat to human life (public safety)**.
- The SAR Panel will **assess the critical decisions and criteria** of the PED or construction activities (e.g., investigations, design, analysis, assumptions, etc.)
- USACE **has extended SARs to all projects with life safety issues**, Districts/MSC's must consider life safety implications of the design of other **non-flood related projects** to determine if a SAR would be beneficial.
- SAR is a strategic level review and should **avoid having SAR duplicate ATR.**
- The cost of a SAR through completion of construction should be **reasonable, scalable, and a function of the risk, complexity, and duration of the project.**



DECISION ON CONDUCTING SAR



- The **District Chief of Engineering** will consider life safety implications to make a risk-informed decision whether the project would **benefit from a SAR and document the rationale to conduct or not conduct a SAR in the RP.**
- This decision is one of the first actions as it helps determine the RMO.
- Decisions concerning what is “significant” loss of life are a combination of the likelihood of failure and the consequences.
- **For dam and levee safety projects, Tolerable Risk Guidelines (TRG) will be used as the principle to judge if there is a significant threat to human life.**



OTHER SAR CONSIDERATIONS



- The **effectiveness of ATR during construction** should be considered and documented in the RP when assessing the **benefit to the project on the need and number of SAR milestones and number of panel members required during construction**. For routine construction procedures may use the ATR Team during construction.
- **Comments follow 4-Part structure and responses follow the 3-Part structure as described in ATR.**
- Conflict of Interest - **Whoever selected the panel should sign the NAS forms** or send a memo stating they independently selected the reviewers. See NAS Form: <https://www.nationalacademies.org/about/institutional-policies-and-procedures/conflict-of-interest-policies-and-procedures>, select Form 3.
- **All SARs will be coordinated through the RMC.**
 - Either by contract, most SARDS are contracted,
 - by another government agency,
 - or by a 408 Requester.
- The RMC has a step-by-step Standard Operating Procedure (**SOP**) for **SARS and Task Order, an optional 408 SAR Task Order, and a SAR Milestone Completion templates.**



MILESTONES TO CONSIDER



Milestone Reviews	Geotech	Mech	H&H	Structural	Construction	Site Visit or Conference Call Duration (days)	Review Start Date	Review End Date
35% Design	X		X	X	X	1.5		
65% Design	O		O	O		0.5		
95% Design	O	O	O	O		0.5		
P&S	O		O	O		0.5		
35% of Construction or Completion of Foundation Prep	X			X	X	1		
Cutoff Wall Critical Feature	X					1		
65% of Construction or 50% Embankment Placement	X			X	X	1		
Gate Testing		X		X		0.5		
End of Construction	X		O	X	X	1		

(X - Indicates attendance at the site visit. O - Indicates participation via conference call.)



QUALITY ASSURANCE (QA) AND OVERSIGHT

CHAPTER 8

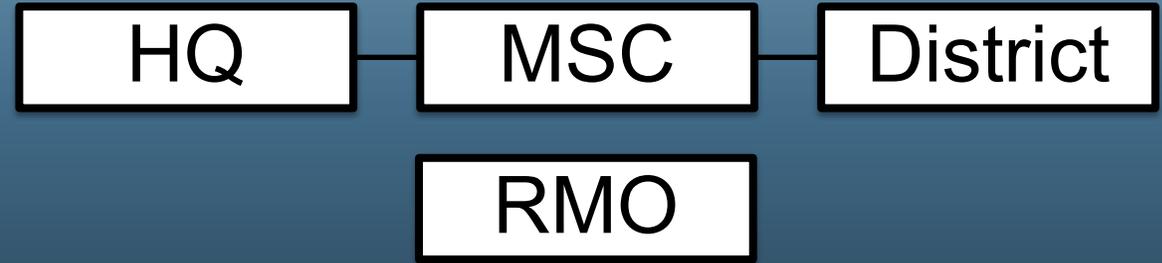


QA AND OVERSIGHT – OVERVIEW



Provides **confidence** that **quality requirements** of a project, product, service, or process **will be fulfilled**

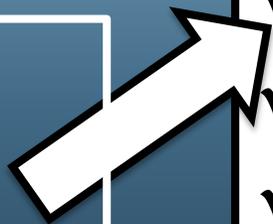
Occurs at



Audits occur at all levels



Sample areas such as



- ✓ Compliance with QMS
- ✓ Review Plans
- ✓ Review Teams
- ✓ DQC and certifications
- ✓ Etc.



QA AND OVERSIGHT – RESPONSIBILITIES



HQ designates a proponent to oversee and monitor ER execution

District

- Review work performed by *PDT and supervisors*
- Verify Quality Control from brokered USACE, A-E, and Sponsor work
- Conduct *internal audits*
- Maintain quality metrics
- Prior to sending documents for final BCOES, *the District Chief of Engineering is required to certify reviews*

MSC

- Review work performed by *District and MSC*
- Conduct *audits on all subordinate Districts every 3 years*
- Share lessons learned

RMO

- Review work performed by *District, ATR Team, and RMO*
- Conduct *audits on 2 supporting Districts every 3 years*

HQ may elect to conduct audits



QA AND OVERSIGHT – CONTINUAL IMPROVEMENT

Districts should conduct After Action Reviews for at least 3 challenging projects annually

After Action Reviews

PDTs should capture project lessons learned and review lessons learned repositories at project initiation

Lessons Learned

Continual Improvement

Quality Metrics



Districts will develop quality metrics to measure and track progress

Metric examples

- ✓ Controllable cost growth
- ✓ Number of scope revisions
- ✓ Number of significant review comments
- ✓ Etc.

Best Practices

Districts should implement a process to identify, document, and share best practices





SPECIAL CASES

CHAPTER 9



CHAPTER 9 SPECIAL CASES



- Covers *brokered*, *CAP (including recent delegations)*, and work performed by *non-Federal sponsors*
- Requires specific roles and responsibilities to be captured in a *formal agreement and attached to the RP* when a geographic District brokers work to another USACE entity
- Clarified *ATR* for brokered, A-E (including D-B), or sponsor work *will occur outside the “geographic” or brokered USACE entity* to ensure independence in the ATR process



NEVER HAVE I EVER... (MARK EACH QUAD THAT APPLIES!)



Performed work for another district...

Seen a formal agreement for brokered work...

Considered brokering instead of contracting out...

...but I have stayed in a Holiday Inn!



ADMINISTRATIVE CHAPTER 10



ADMINISTRATION



- Federal Advisory Committee Act (FACA)
- Does not apply to IEPR
- SARs are not specifically exempt from FACA requirements

Selected Requirements for Advisory Committees Covered under the Federal Advisory Committee Act (FACA)



Source: GAO analysis of FACA, GSA regulations, and OMB requirements. | GAO-20-575

- Includes a specific list of areas NOT covered by the ER



APPENDIXES



APPENDIXES – OVERVIEW



Appendix B	Appendix C
Summarizes <i>Roles and Responsibilities</i> for District, MSC, RMO, Policy/Legal Compliance, HQ, and “All”	Details recommended <i>Charge Guidelines and Considerations/Questions</i> for ATR, IEPR, and SAR
Appendix D	Appendix E
Provides <i>Templates</i> for Review Plan memos and DQC, ATR, and SAR certification and/or completion statements	Outlines best practices for <i>Transparency in Decision Documents</i> Transparency helps ensure that the methods used to develop analysis and conclusions are fully represented



QUESTIONS?