QA/QC in Construction Project (Design Phase)

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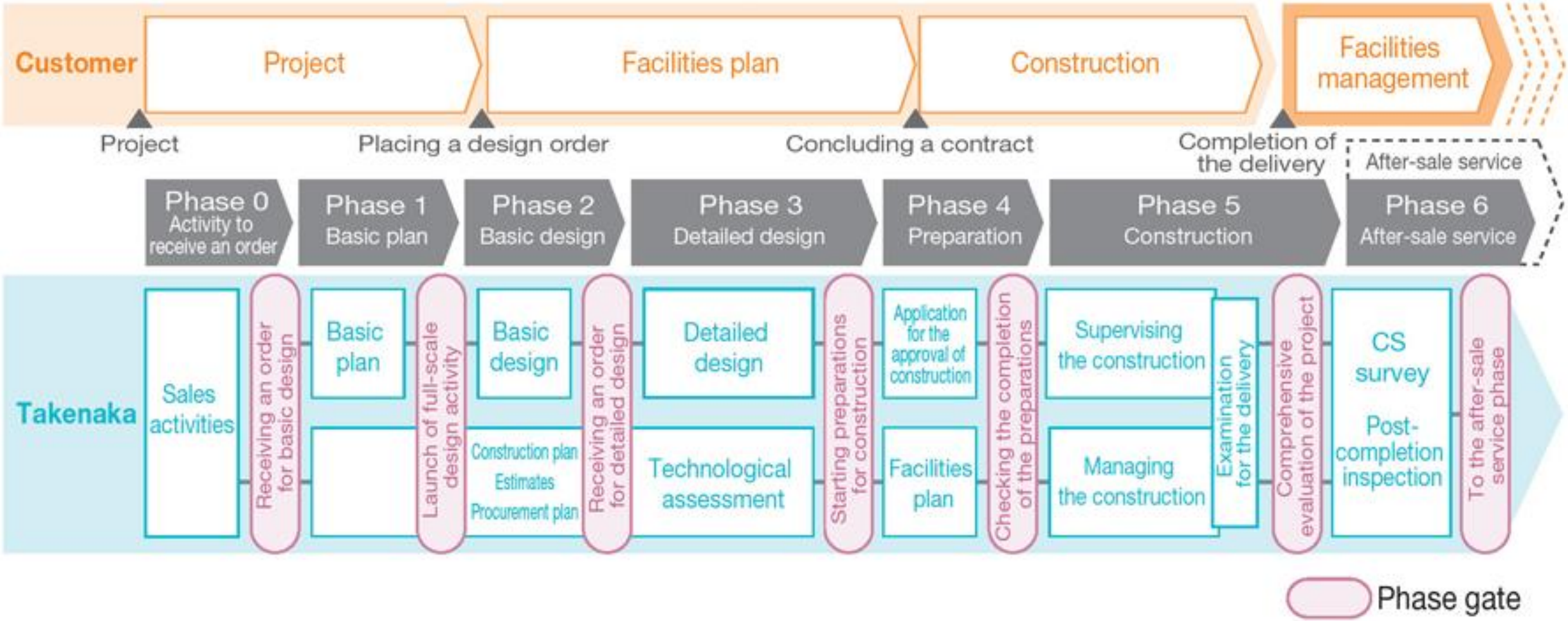
Figure 1. Quality assurance system for design and construction projects

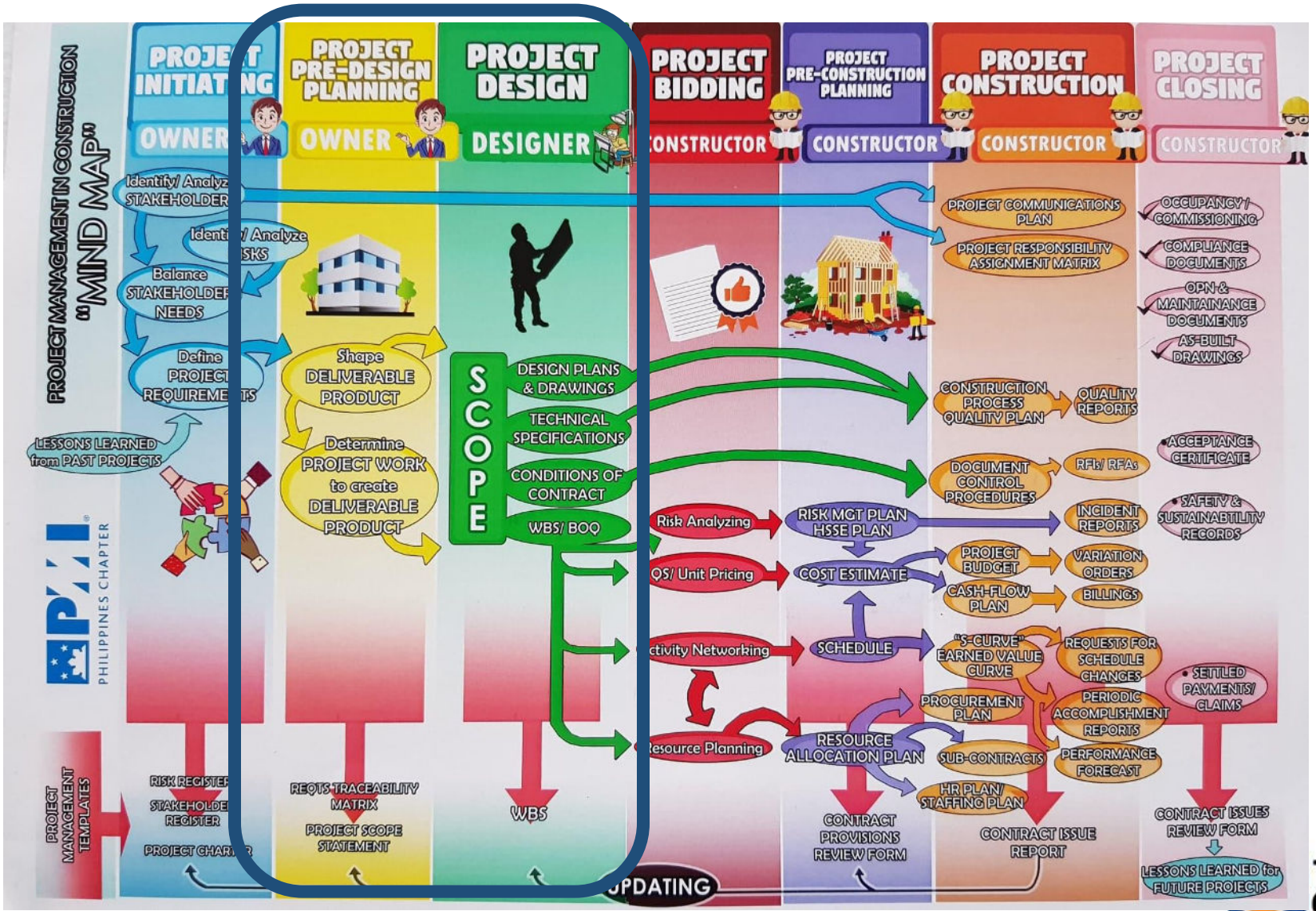


Quality *Management*

Quality Management plan Requirement , responsibility during project life phases

Project phase	Requirement	Responsibility
Feasibility Studies	To focus &Define Quality target	The Owner
Design	Specify Quality	The Designer
Planning	Quality Assurance	The Owner
Construction	Quality Control	The Contractor
Delivery	Verify of Quality	The Owner

QA/QC during Design Phase



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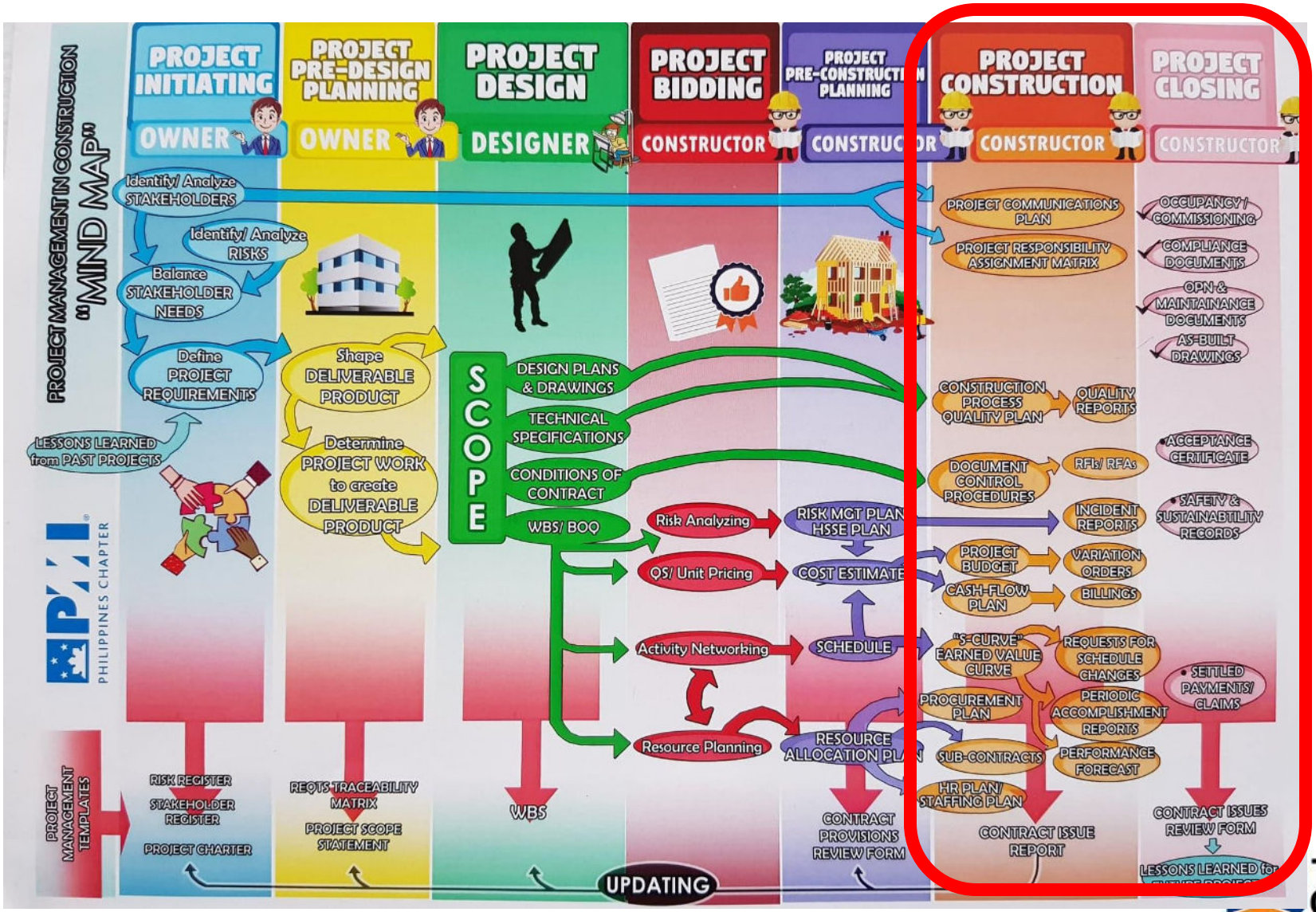
QA/QC during Construction Phase



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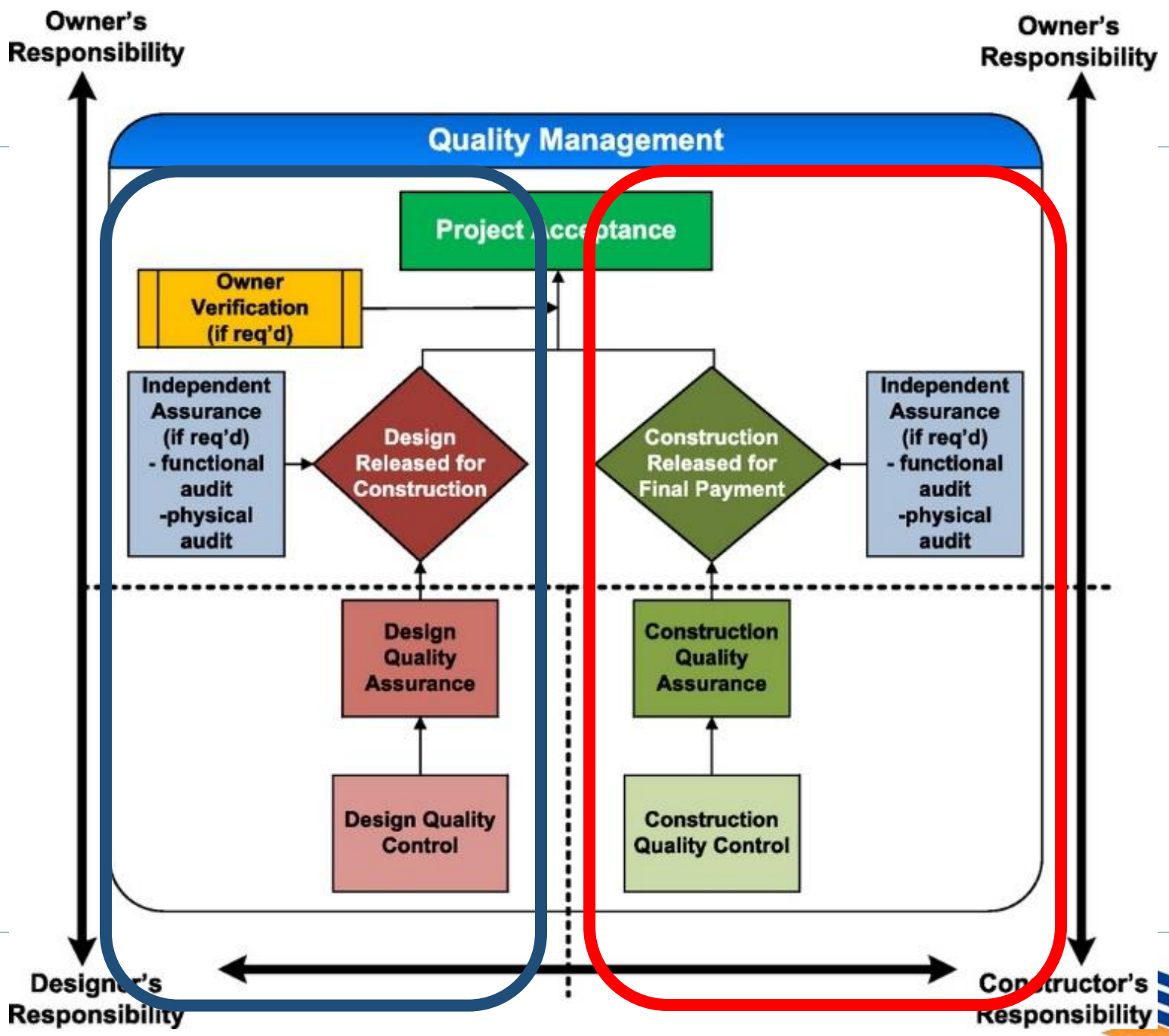

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Contribution of Various Participants (Design/Bid/Build Type of Contracts)

	Example of Contribution		
Phase	**Owner**	**Designer**	**Contractor**
Conceptual design	Identification of need Selection of alternative Selection of team members Approval of time schedule Approval of budget TOR	Feasibility Development of alternatives Cost estimates Schedule Development of concept design	
Preliminary design	Approval of preliminary (schematic) design	Develop general layout/scope of facility/project Regulatory approval Budget Schedule Contract terms and conditions	
Detailed design	Approval of budget Approval of time schedule Approval of design Contract negotiation Signing of contract	Development of detail design Authorities' approval Detail plan Budget Schedule BOQ Tender documents Evaluation of bids	Collection of tender documents Preparation of proposal Submission of bid

Conceptual Design

The following are the requirements to be prepared by the designer during the conceptual phase for submission to the owner:

1. **Site Dev't. Plan**
   - Civil Works
   - Utilities
   - Landscaping
2. **Architectural Design**
3. **Structural Design**
4. **Cost Estimates**
4. **Systems Engg**
   - Mechanical
   - Electrical
   - Plumbing
   - Fire Suppression
   - Low Voltage
5. **Schedules**

Preliminary Design

Preliminary Design

Preliminary design is mainly a refinement of the elements in the conceptual design phase. Preliminary design is also known as schematic design.

During this phase, the project is planned to a level where sufficient details are available for the initial cost and schedule.

Preliminary Design

Contract Terms and Conditions

Normally it is the consultant/designer team that is responsible for developing a set of contract documents that meets the owner's needs, and specifies the required level of quality, budget, and schedule.

At this stage, a contract exists between the consultant and the client for the development of the project, and any good management test will demand that the contract be clearly understood by all parties associated with it.

Detailed Design

Detailed design is also known as design development/detailed engineering. During this phase all suggested changes are reevaluated to ensure that the changes will not detract from meeting the project design goals/objectives.

The success of a project is highly correlated with the quality and depth of the engineering plans prepared during detailed design phase.

Design Review

Design Reviews

…… involve a formalized, structured approach to assure interdisciplinary coordination and compliance with design criteria and environmental, site, and operational constraints. Design reviews are conducted to assure quality of products in development.

Design Review

Design Reviews

…….is a detailed, analytical, and unbiased approach used to verify that the appropriate deliverables (e.g., studies, final drawings, technical specifications, and construction bid documents) are being prepared and that the designer is maintaining pace with the budget and project schedule.

Design Review

Design Reviews

……. generally occur at the following points in the design process:

- design criteria
- conceptual
- preliminary engineering (30%)
- final design phase reviews

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Design Review

For each design review, the design manager will ensure the ff key objectives are accomplished, as applicable to the particular review:

- Quality of the design
- Adherence to design criteria, environmental documents
- Identification of errors and omissions
- Building codes compliance

Design Review

For each design review, the design manager will ensure the ff key objectives are accomplished, as applicable to the particular review:

- Operational and functional objectives are met
- Coordination between engineering disciplines
- Adherence of cost estimates to the budget
- Designers' feedback before progressing further

Design Review

For each design review, the design manager will ensure the ff key objectives are accomplished, as applicable to the particular review:

- Design is biddable, constructible, and cost-effective
- Interface compatibility: adjacent project elements
- Final construction contract documents comply with the design criteria, environmental document, codes, and regulations.

REVIEW COMMENT REGISTER

PROJECT: _____ DATE: _____

REVIEWER: _____ DISCIPLINE: _____

DOCUMENT: ☐ DWGS. ☐ SPEC. ☐ ESTIMATE ☐ OTHER _____

REVIEW: ☐ PRELIM. ☐ INTER. ☐ PREFINAL ☐ FINAL ☐ OTHER _____

PURPOSE: ☐ GENERAL ☐ TECHNICAL

☐ COORDINATION ☐ QUALITY ASSURANCE ☐ OTHER _____

ITEM NUMBER	DWG/SECT/ PAGE NO.	COMMENT	ACTION BY	RESPONSE

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Design Review

The following two submittals/reviews should be accomplished during the preliminary engineering sub-phase of the project:

Design Review

1. In-Progress Preliminary Submittal

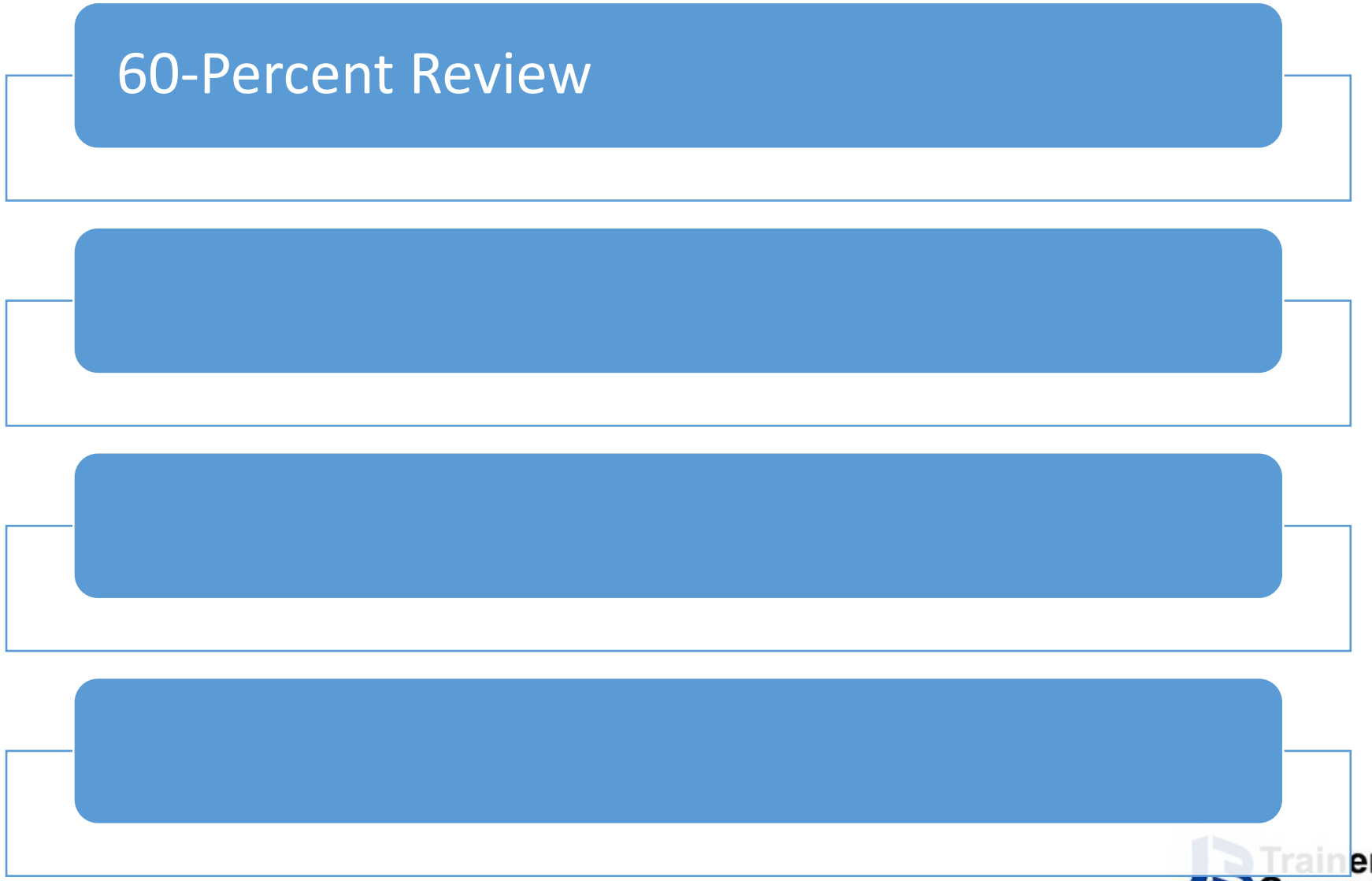
This preliminary submittal is intended to facilitate the review of the recommended approach, including evaluation of the rejected alternatives with the design team. It is recommended that Value Engineering be conducted at this point.

Design Review

2. Preliminary Engineering Submittal (30% Review)

The review is meant to demonstrate that the selected approach to all major design concepts and VE recommendations and other design features have been resolved and that final design can proceed without delay.

Major Reviews during Final Design Phase



Design Review

- 60-Percent Review
- 90-Percent Review
-
-

Design Review

- 60-Percent Review
- 90-Percent Review
- 100-Percent Review
-

Design Review

- 60-Percent Review
- 90-Percent Review
- 100-Percent Review
- Bid Document Verification

Design Review

Constructability Reviews

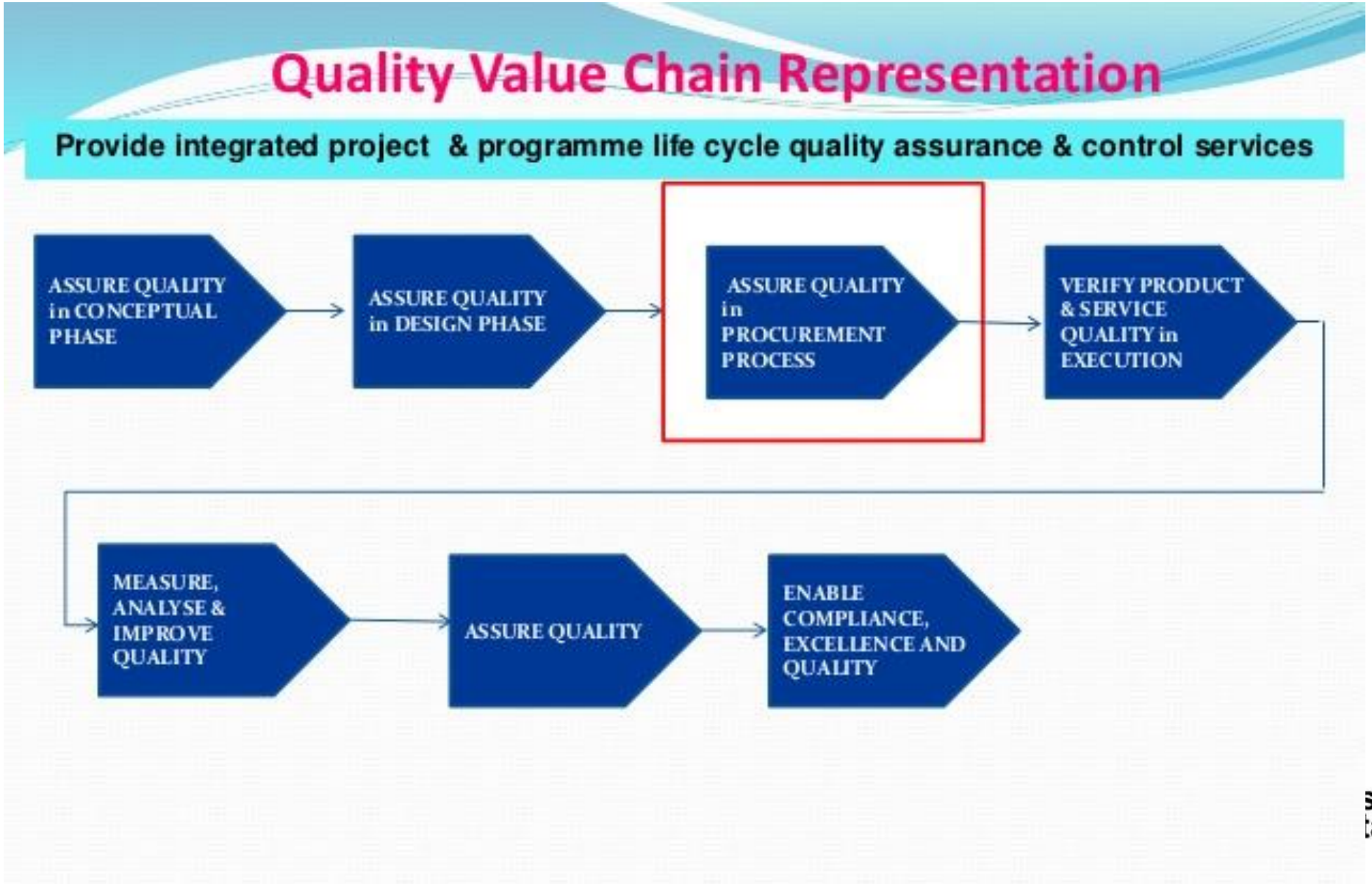
- Verify requirements for QA/QC during construction
- Determine appropriate construction durations and milestones.
- Determine requirements for Owner/Agency-furnished materials, OFE

Design Review

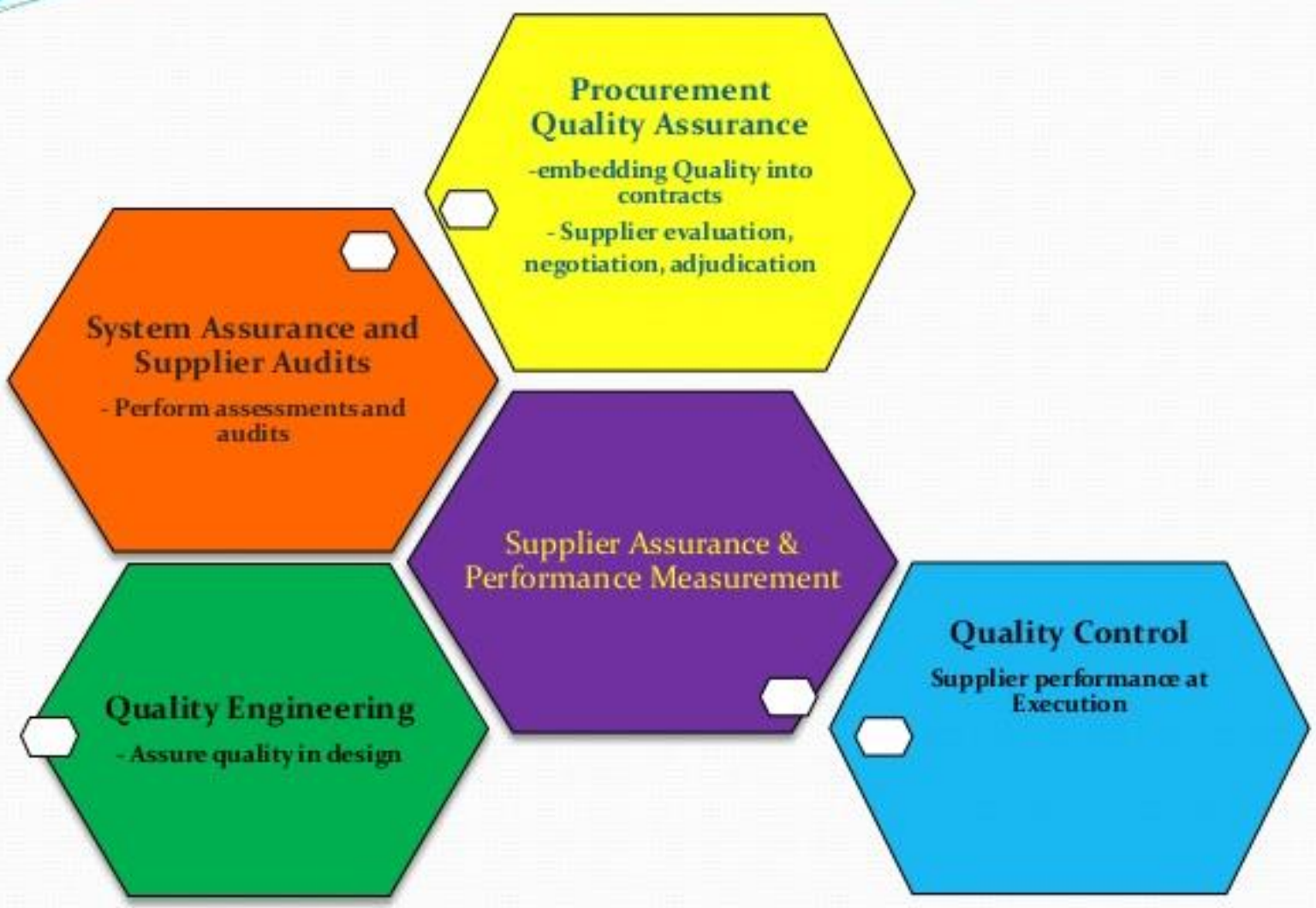
Constructability Reviews

- Eliminate construction requirements that are impossible or impractical to build.
- Make certain what is depicted on the final drawings, technical specifications, and construction bid documents can be built.

Interactions



Focused on Delivery Supplier Quality Assurance Excellence



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Any
Questions?