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PUB-WOOD

Preparation for Construction

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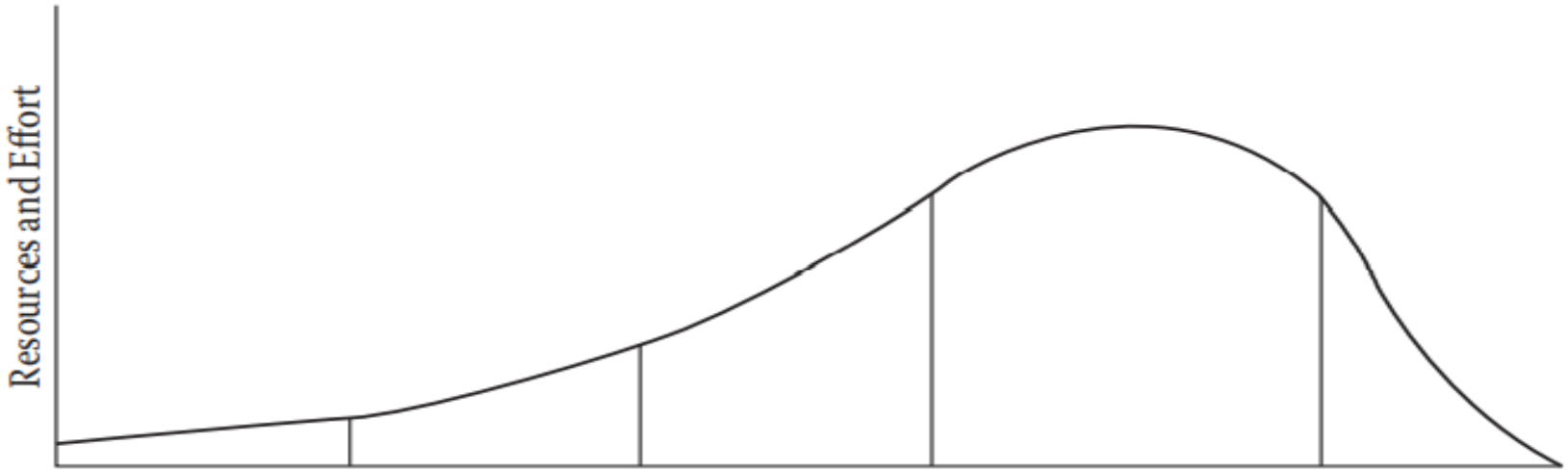
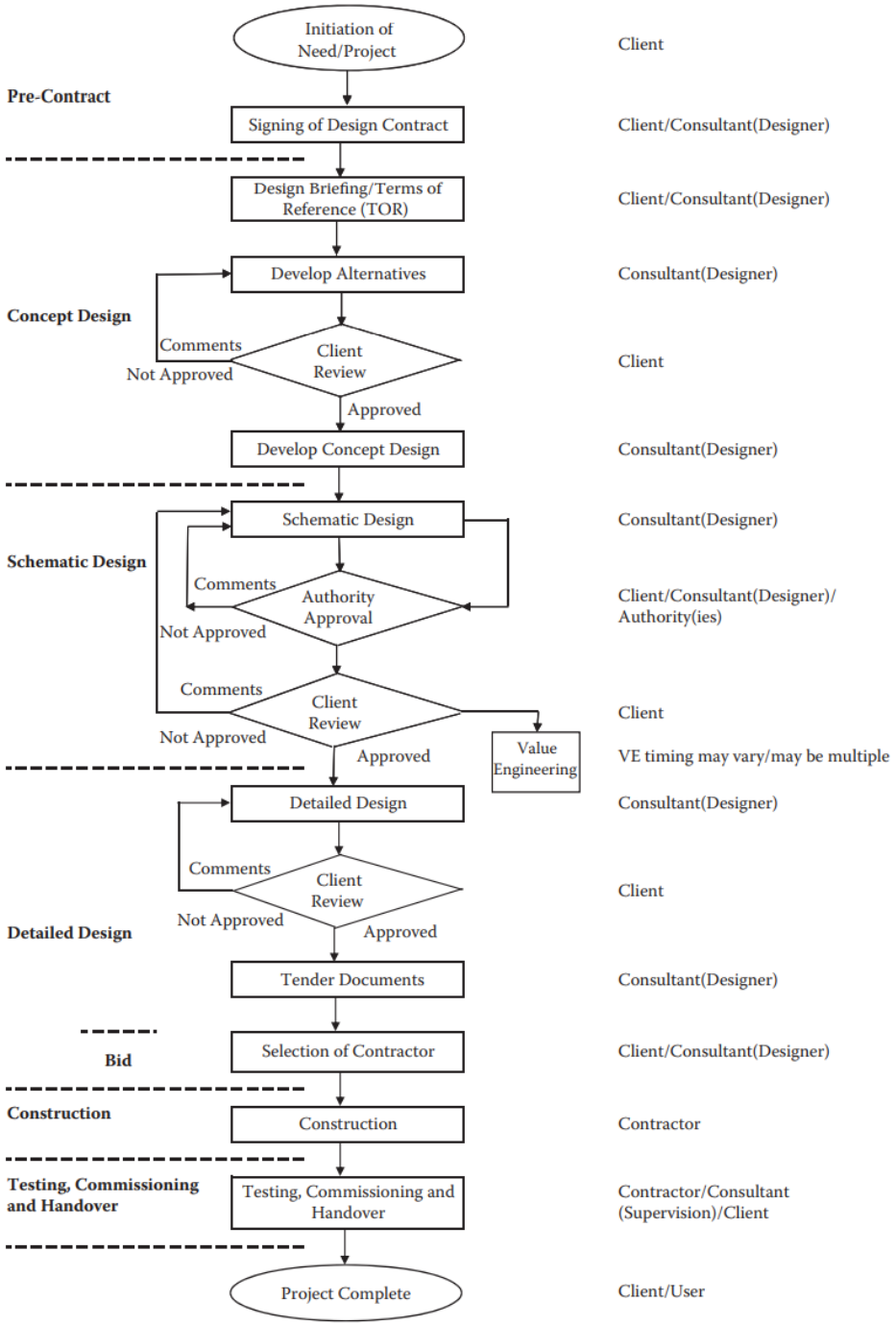
Project life cycle



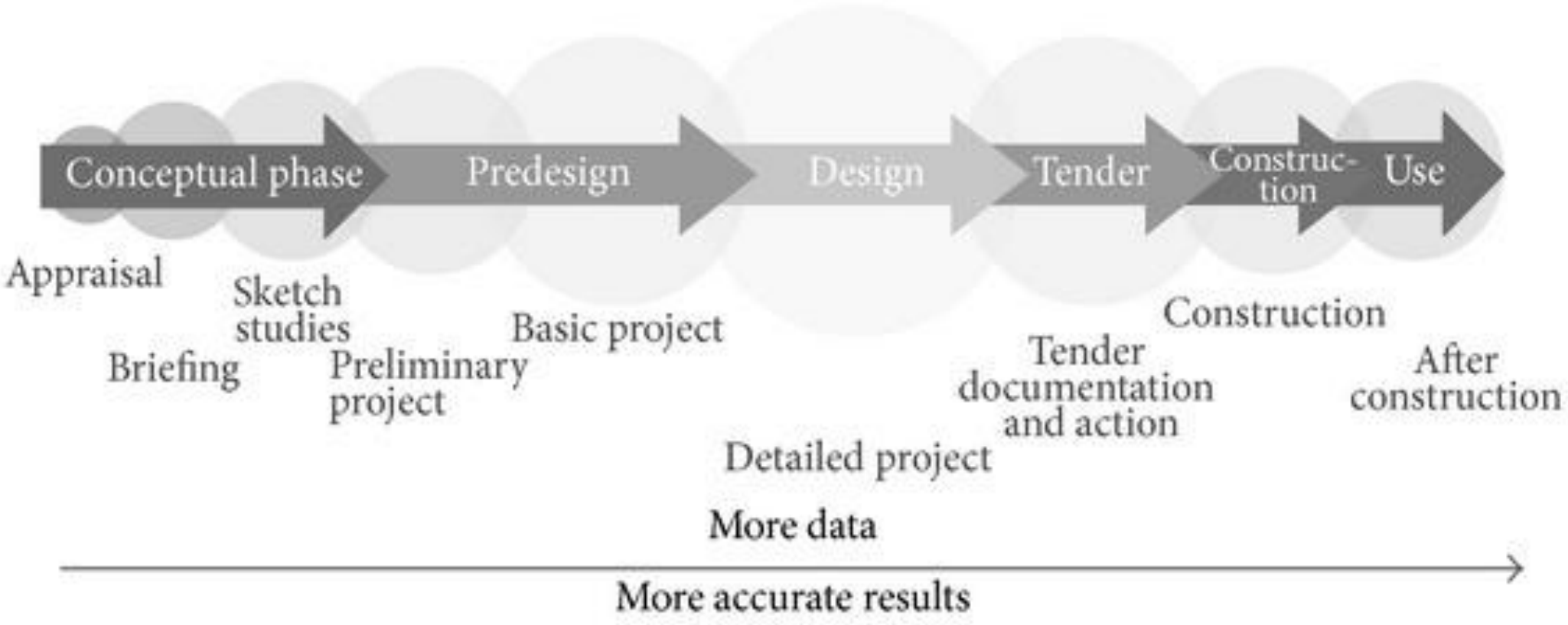
Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Conceptual design	Advanced development	Detailed design	Production	Termination
• Goals • Scope • Baseline • Requirements • Feasibility • Desirability	• Plan • Budget • Schedule • Bid proposal • Management commitment	• Responsibility definition • Team • Organizational structure • Detailed plan • Kickoff	• Manage • Measure • Control • Update and replan • Problem solving	• Closeout • Document • Suggest improvement • Transit • Reassign • Dissolve team

Source: Shtlub et al. (1994)



Source: Rumane (2011)

Main Stages

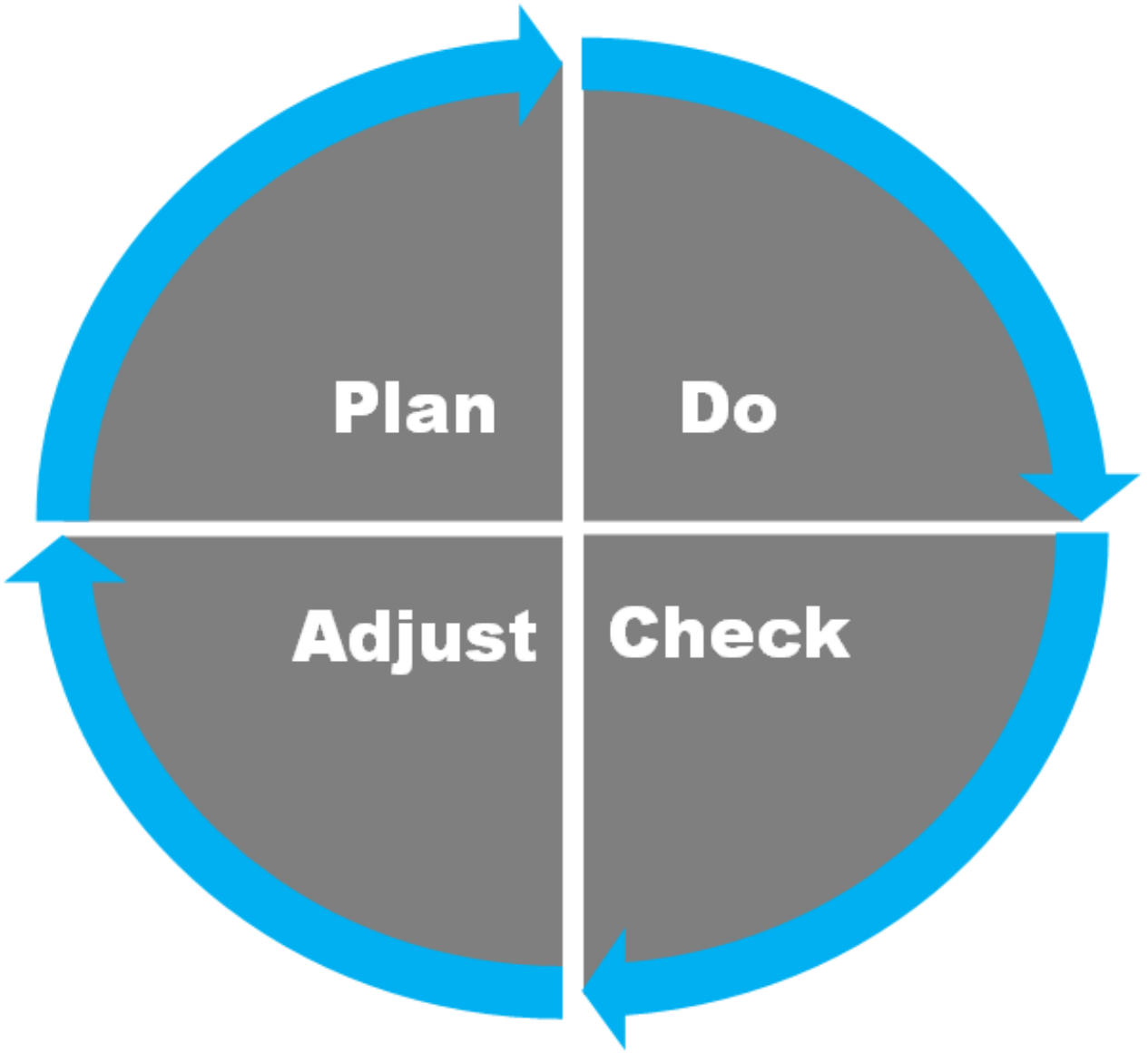


Source: Bragança et al. (2014)

Conceptual Design

- The conceptual design is initiated once **the need is recognized**.
- In this phase, the idea is conceived and given an initial assessment.
- **Conceptual design is often viewed as most critical to achieving outstanding project performance**.

Source: Rumane (2011)

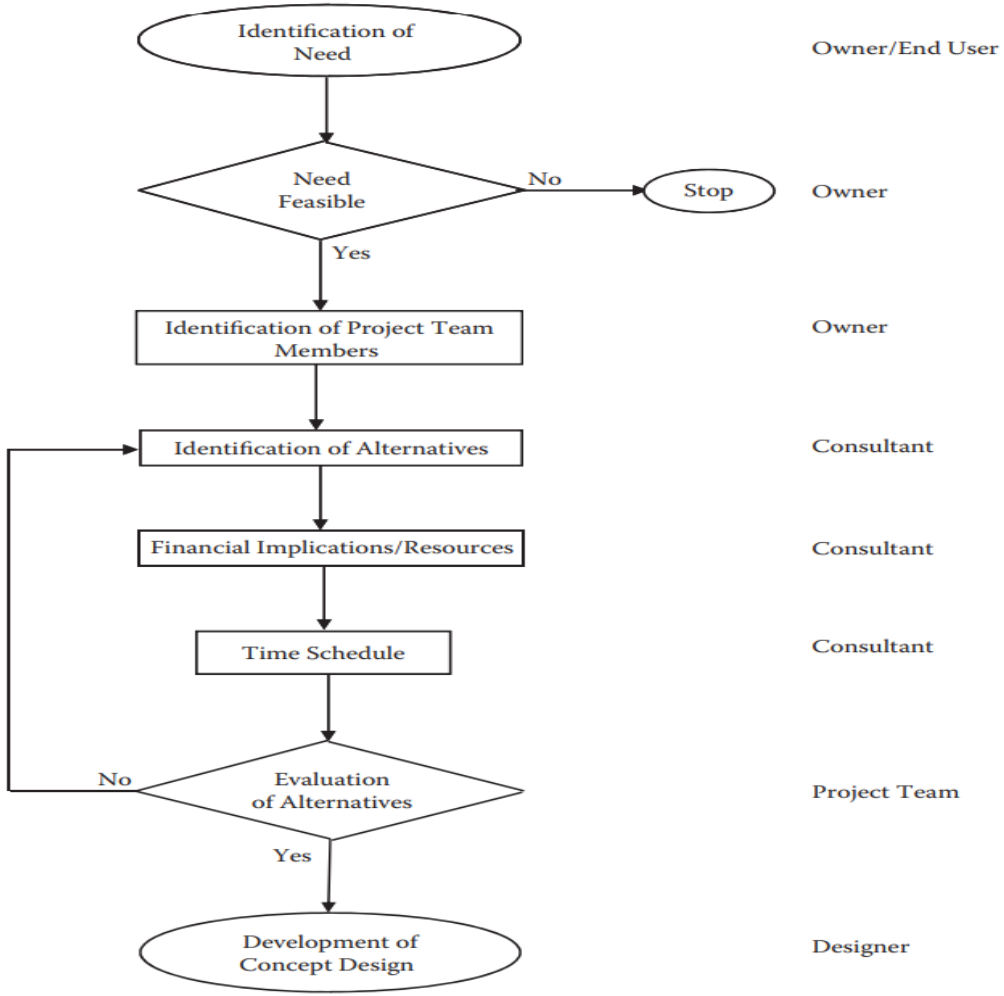


Source: https://leanconstructionblog.com/First-Run-Video-Studies-Plan-Do-Check-Adjust.html

- The most significant **impacts on the quality** in a project occur during the **conceptual phase**.
- This is the time when specifications, statement of work, contractual agreements, and initial design are developed.
- Initial planning has the **greatest impact on a project** because it requires the commitment of processes, resources schedules, and budgets.

Source: Rumane (2011)

Major activities in the conceptual design phase



Source: Rumane (2011)

Step 1. Identification of Need

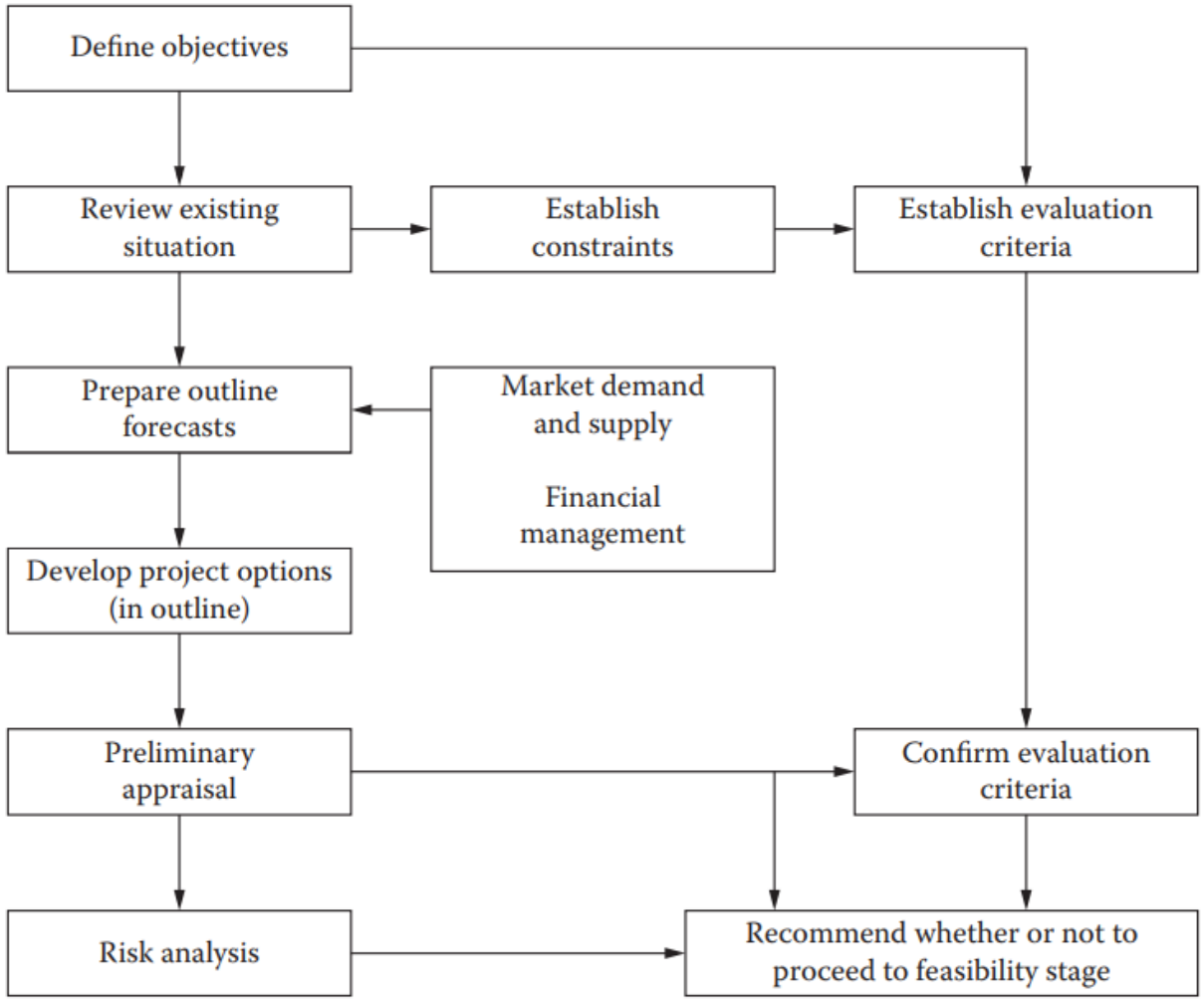
- The need for the project is created by the owner/client and is linked to the financial resources available to develop the facility.

Typical needs

- To have **best use of the money** - to have maximum profit or services at a reasonable cost.
- **On time completion** - to meet the owner's/user's schedule.
- **Completion within budget** - to meet the investment plan for the facility.

Source: Rumane (2011)

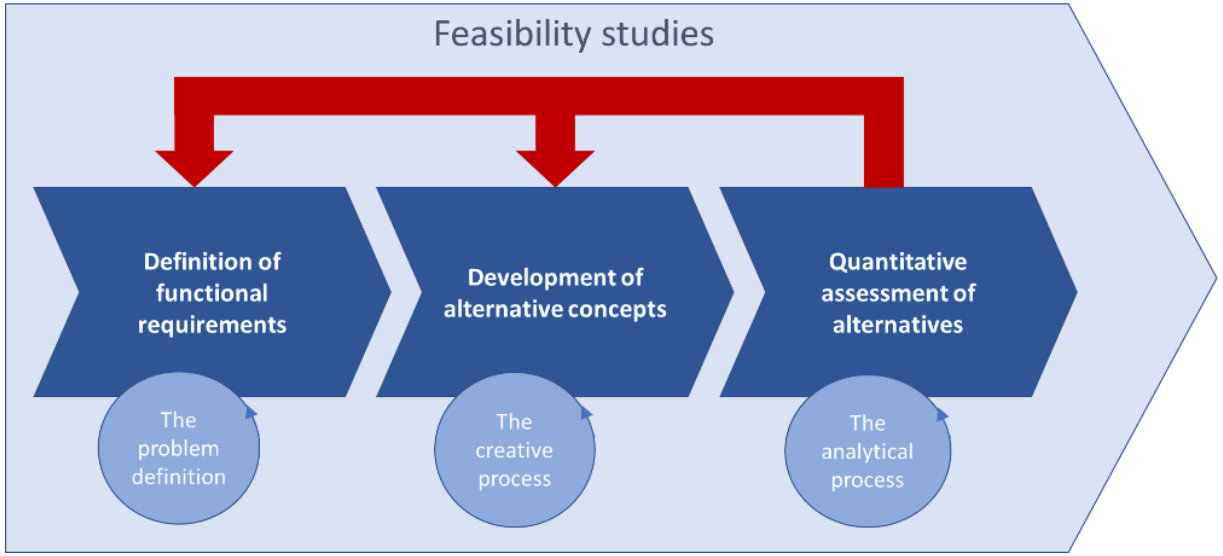
Steps in project identification



Source: Rumane (2011)

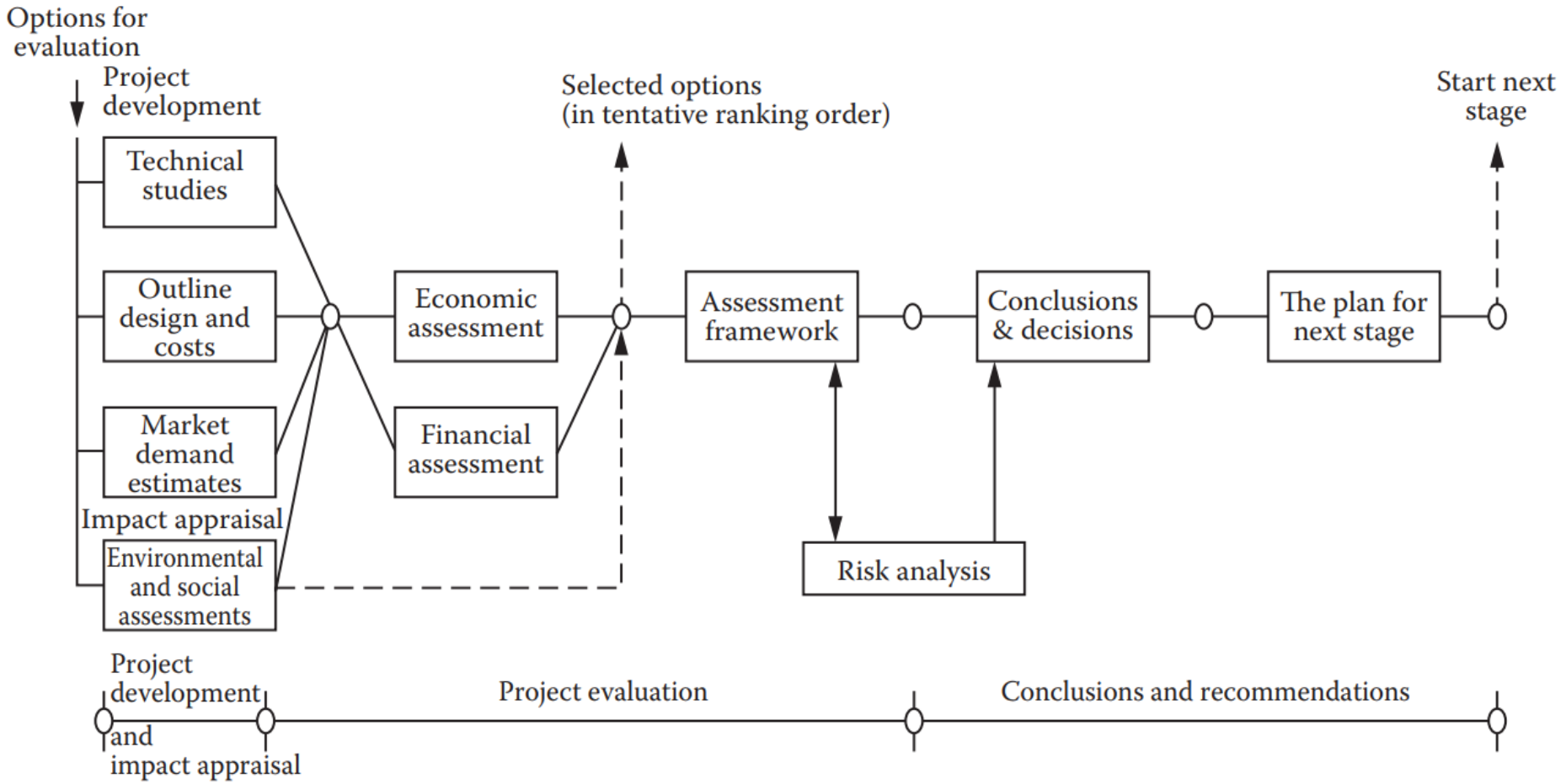
Step 2. Feasibility

- **Feasibility study** – an economical appraisal of owner needs or benefits, also taking into account the many relevant moral, social, environmental, and technical constraints.



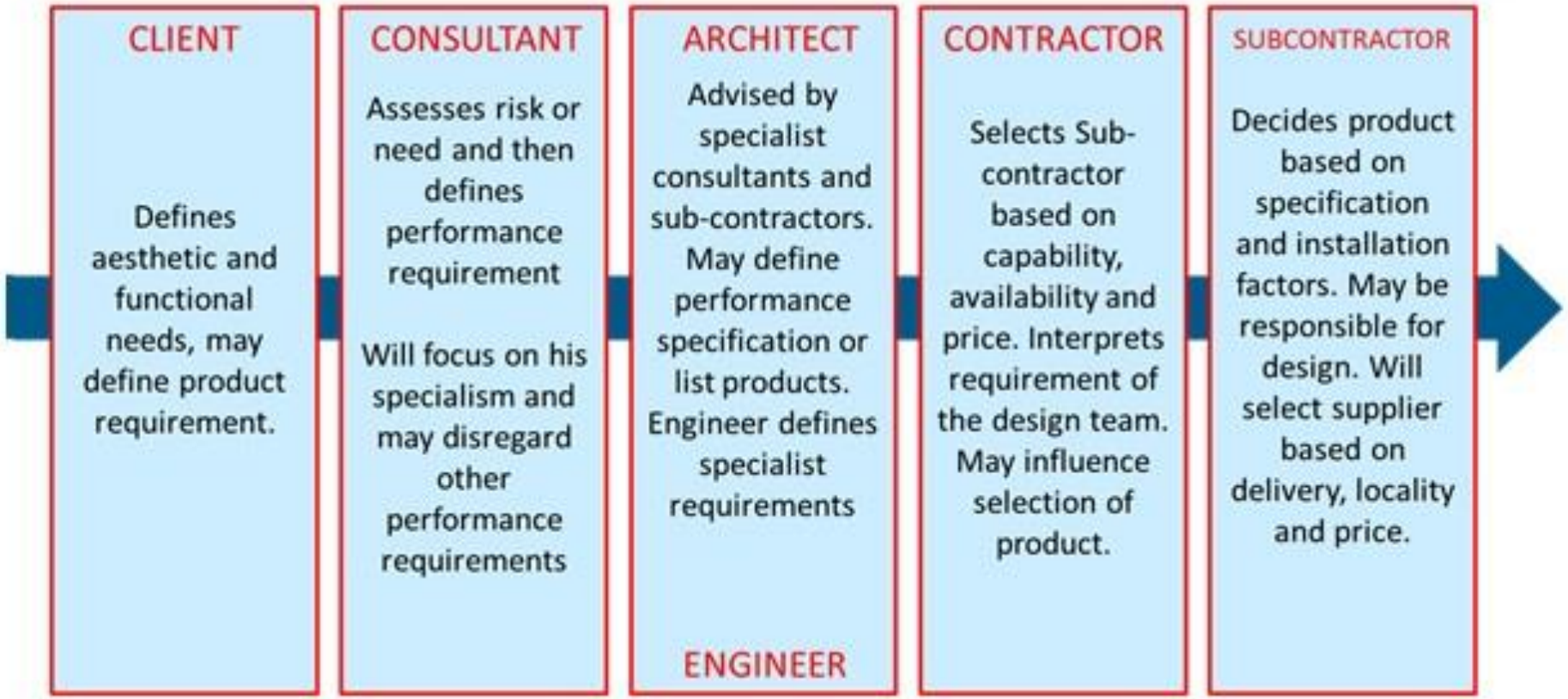
Source: https://exposedaquaculture.no/en/feasibility-studies-methodology/

Project feasibility stages



Source: Rumane (2011)

Step 3. Identification of Project Team



Source: https://cadvantage-knowledge.co.uk/product/news-articles/articles/construction-project-team-roles-and-responsibilities/

Typical Requirements of Project Team Members

Owner/Client/Project Manager	Design Professional or A&E	Contractor
Adequate function and appearance of the new facility	An adequate project scope definition	A well-defined set of contract documents
Project completion on time and within budget	A reasonable schedule Timely decisions from the owner	Timely decisions from the owner and design professional
Desirable balance of life cycle and initial capital costs	Realistic and fair sharing of project risks	Realistic and fair sharing of project risks
Addressing of environmental, health, permitting, safety, user impacts, and sustainable development considerations	Adequate communication with the owner regarding performance A fair and reasonable process for resolving disputes	Adequate communication with the owner regarding performance A fair and reasonable process for resolving disputes
A fair and reasonable process for resolving disputes	Timely payment and a reasonable profit	Timely payment and a reasonable profit

Source: Rumane (2011)

Step 4. Identification of Alternatives

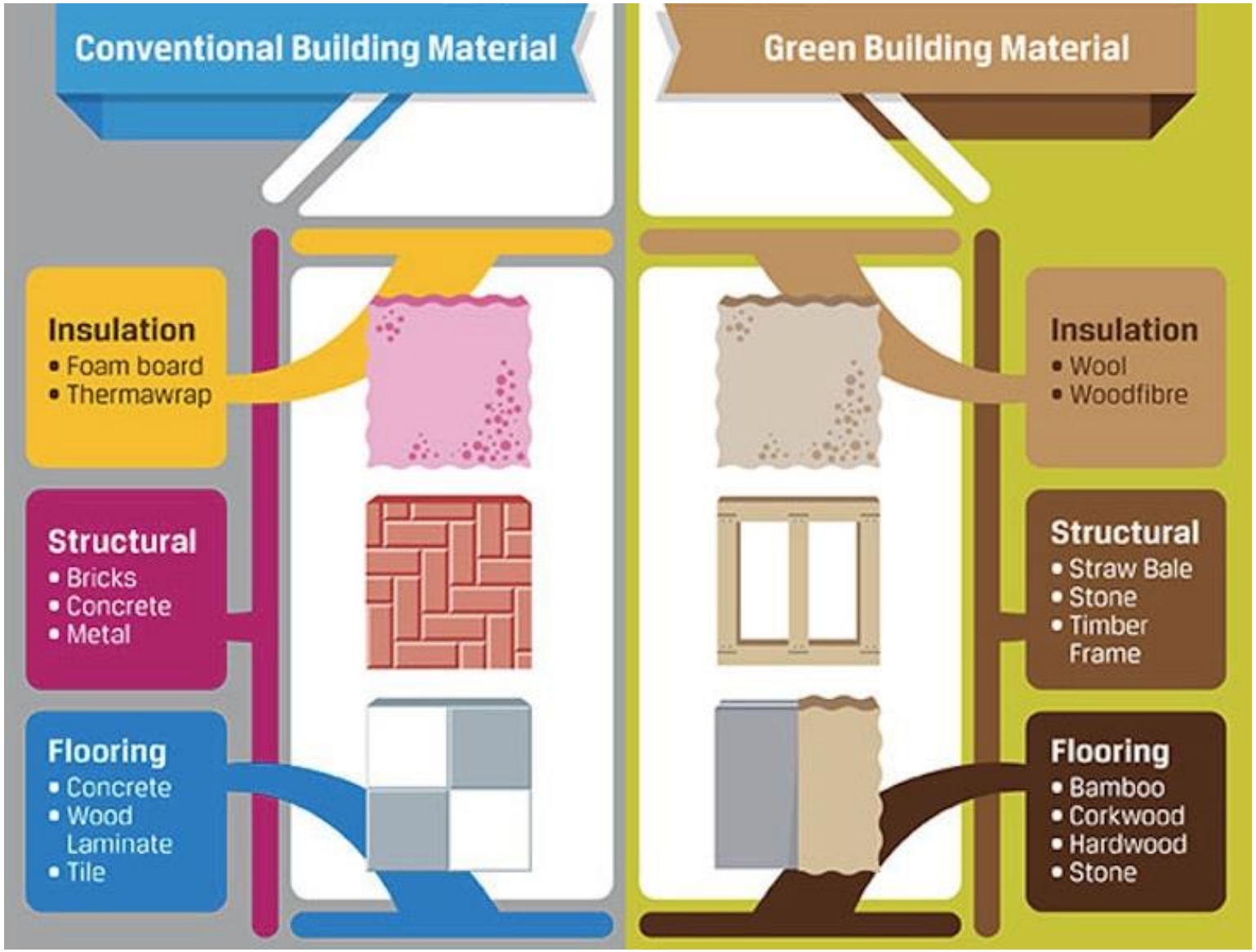
- Each alternative is based on a predetermined set of performance measures to meet the owner's requirements.
- Development options are discussed between the owner/client and the designer/consultant.

Source: Rumane (2011)

Conceptual Alternatives

Functional Alternatives	Cost Alternatives
Materials-handling methods, technologies	Design cost
Space allocations	Capital cost of construction
Clear-span requirements in buildings	Life expectancy or design-life periods
Public/private (joint development) options	Return on investment
Methods to avoid or minimize impacts to the natural environment	Extra cost for aesthetics Cost/benefit ratios

Source: Rumane (2011)



Source: https://inhabitat.com/infographic-build-your-green-dream-home-with-these-eco-friendly-alternatives-to-conventional-building-materials/

Step 5. Time Schedule

- The duration of a construction project is finite and has a **definite beginning** and a **definite end.**
- During the conceptual phase the expected time schedule for the completion of the project/facility is worked out.

Source: Rumane (2011)

Typical time schedule

	First Year	Second Year	Third Year	Fourth Year
Conceptual Design				
Preliminary Design				
Detailed Engineering				
Construction				
Commissioning & Handover				

Source: Rumane (2011)

Step 6. Development of the Concept Design

- The selected preferred alternative is the base for development of the concept design.
- The designer can use techniques such as **quality function deployment (QFD)** to translate the owner's need into technical specifications.

Source: Rumane (2011)

Concept design: designer

- Project goals
- Usage
- Technical and functional capability
- Aesthetics
- Constructability
- Sustainability (environmental, social, and economical)
- Health and safety
- Reliability
- Environmental compatibility
- Fire protection measures
- Supportability during maintenance/maintainability
- Cost-effectiveness over the entire life cycle (economy)

Source: Rumane (2011)

Concept design: owner

The owner on his part should ensure that the project objectives are:

- Specific
- Realistic
- Measurable
- Agreed upon by all the team members
- Possible to complete within the stipulated time
- Within the budget

Source: Rumane (2011)

Components of Concept Design

1. Site Plan
- a. Civil
- b. Services
- c. Landscaping
- d. Irrigation

2. Architectural Design

3. Building and Engineering Systems
- a. Structural
- b. Mechanical (HVAC)
- c. Public Health
- d. Fire Suppression Systems
- e. Electrical
- f. Low Voltage Systems
- g. Others

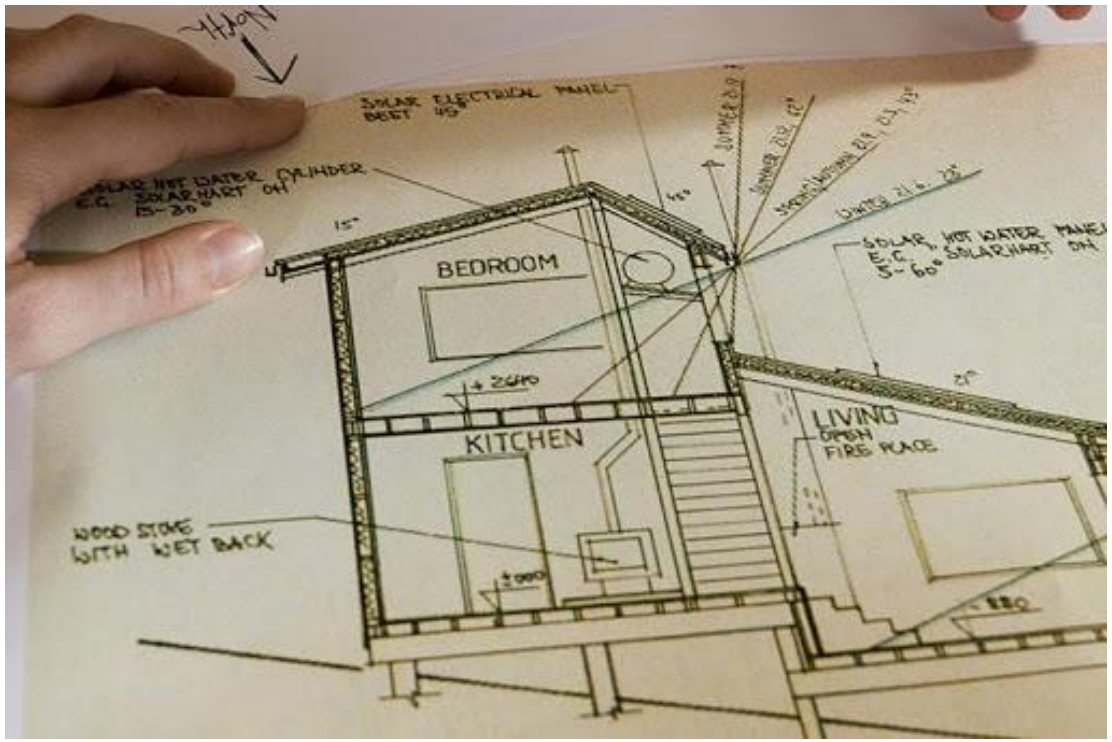
4. Cost Estimates

5. Schedules

Source: Rumane (2011)

Preliminary Design

- Preliminary design (schematic design) is mainly a **refinement** of the elements in the conceptual design phase.



Source: Rumane (2011)

General Scope of Works/Basic Design

- **General scope of works** identifies the works to be performed.

Source: Rumane (2011)

Preliminary design covers

- General layout of the facility/building/project
- Required number of buildings/number of floors in each building/ area of each floor
- Different types of functional facilities required such as parking, etc.
- Type of construction such as reinforcement concrete or steel structure, precast, or cast in situ
- Type of electromechanical services required
- Type of infrastructure facilities
- Type of landscape

Source: Rumane (2011)

Regulatory Approval

- Once the preliminary design is approved, it should be submitted to regulatory bodies for their review and approval for compliance with the regulations, codes, and licensing procedure.

Source: Rumane (2011)

Budget

- Based on the preliminary design, **the budget** is prepared by estimating the cost of activities and resources.
- **The budget for a construction project** is the maximum amount the owner is willing to spend for design and construction of the facility that meets the owner's need.

Source: Rumane (2011)

- The budget is determined by estimating **the cost of activities and resources** and is related to the schedule of the project.

Project Estimate Sheet

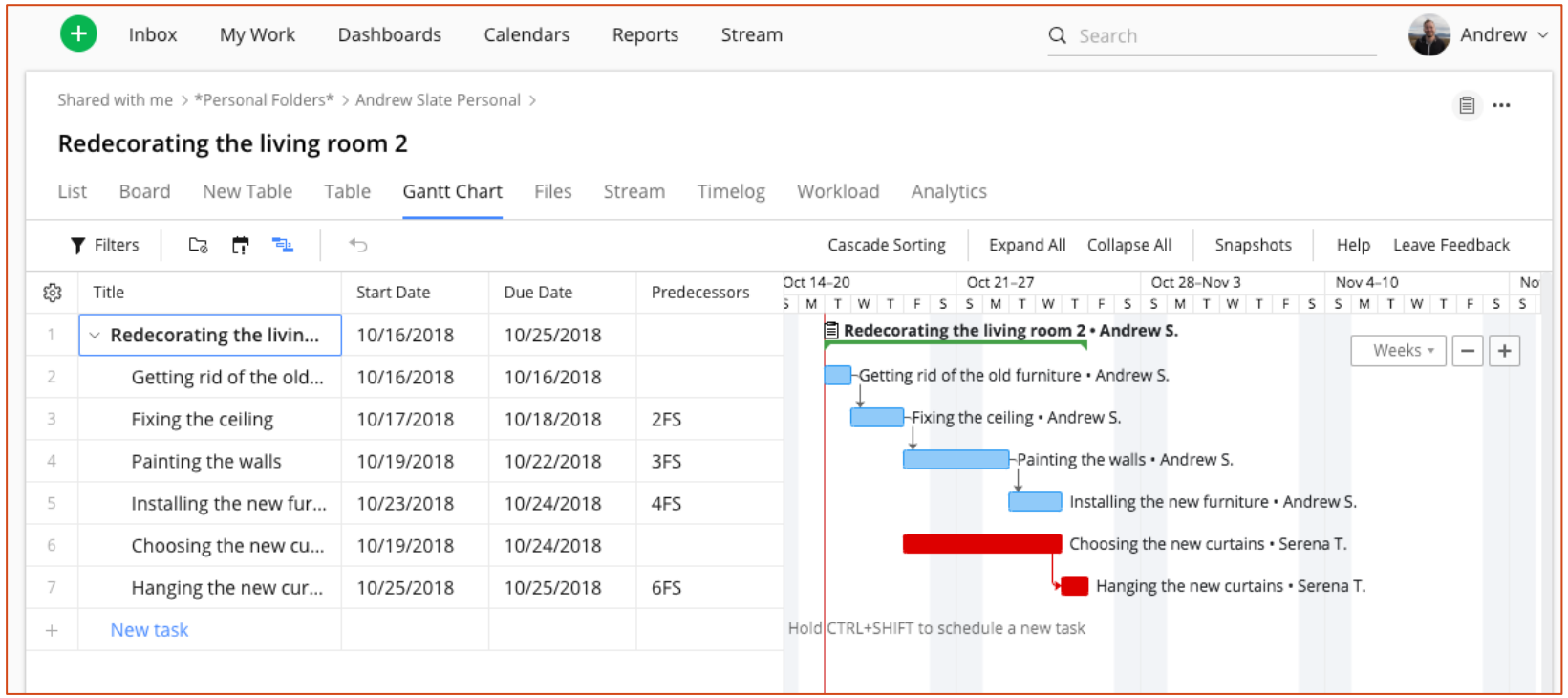
Contractor	
Client Name	
Client Address	
Client Phone	

Phase	Budget Costs			Actual Costs		
	Labour	Materials	Total	Labour	Materials	Total
Land Purchase						
Design Costs						
Preliminaries						
Service Connections						
Groundworks						
Masonry Work						
Floor Structure						
Roof Structure						
Roof Covering						
Doors and Windows						
Plumbing						
Heating						
Electrical						
Plaster						
Joinery						
Decoration						
Floor Coverings						
Garage						
Externals Works						
Landscaping						
Total	0	0	0	0	0	0
Contingency (10%)	0	0	0	0	0	0

Source: https://www.fohlio.com/blog/which-design-construction-cost-estimation-method-works-best/

Schedule

- After the preliminary scope of works, the preliminary design and budget for the facility/project are finalized; the logic of the construction program is set.



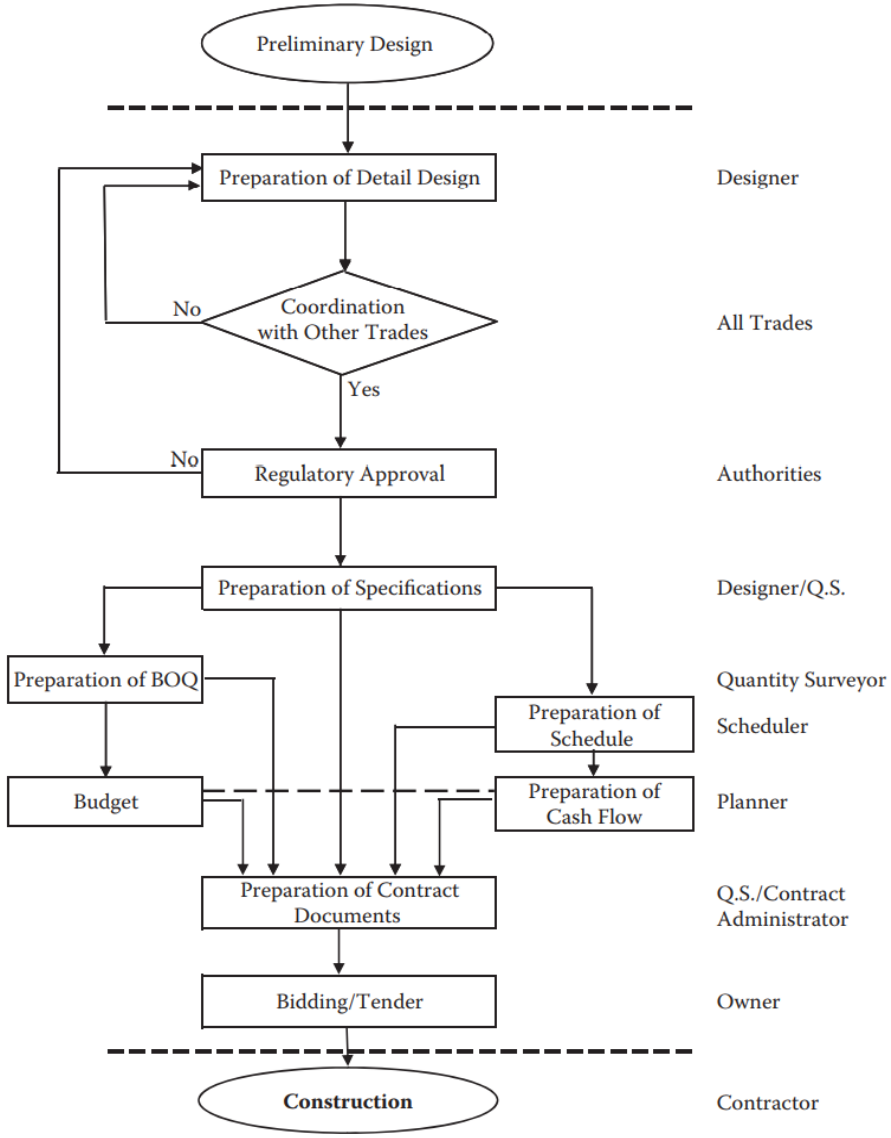
Source: Rumane (2011)

Detailed Design

- Detailed design is also known as **design development/detailed engineering**.
- The detail design phase defines the complete specification of the geometry, materials, and tolerances of all the parts through the provision of **detail drawings**, **assembly drawings**, and **general assembly drawings**.

Source: https://www.sciencedirect.com/topics/engineering/detail-design-phase

Major activities in the detailed design phase



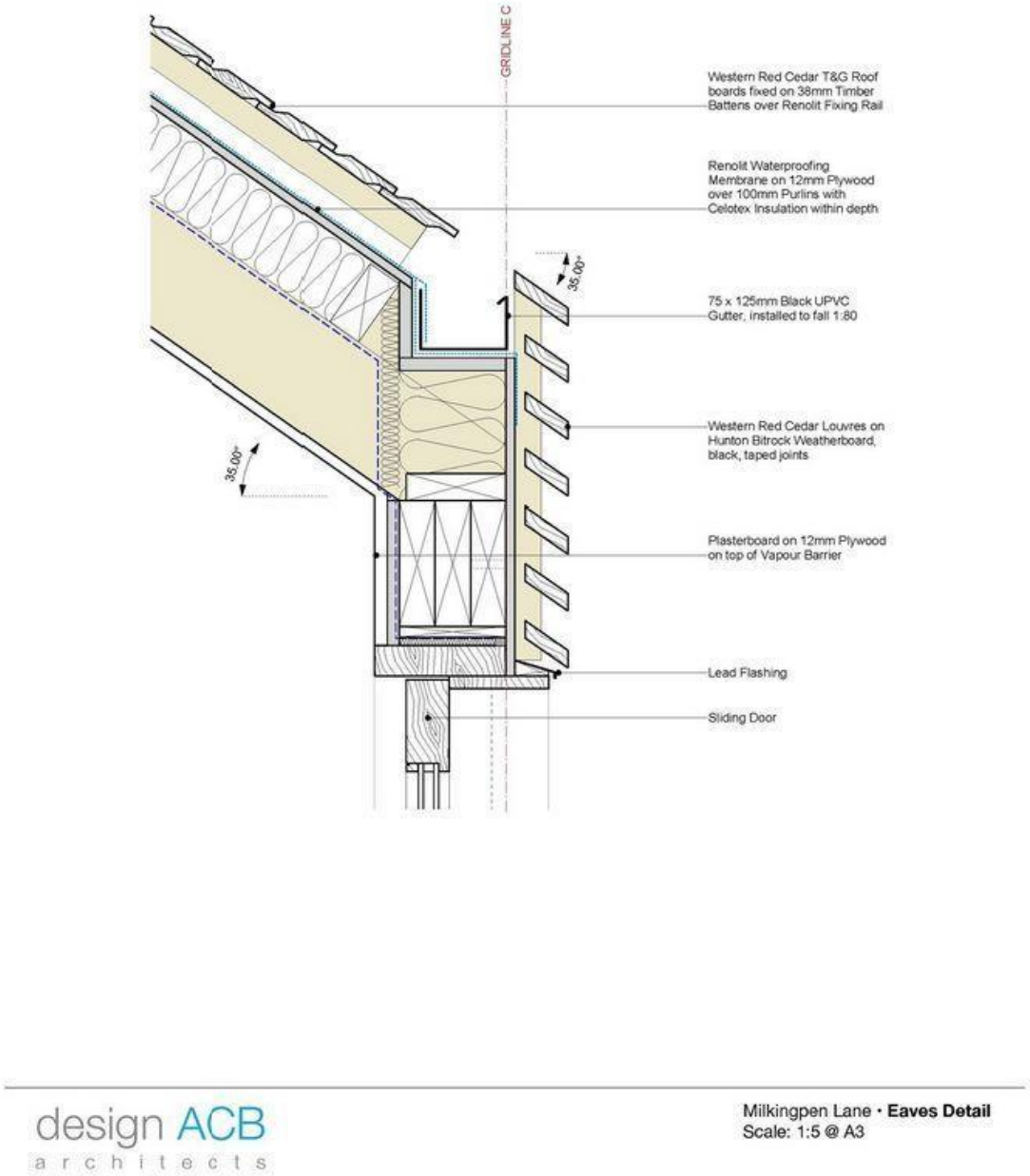
Source: Rumane (2011)

Detailed design covers

- Architectural Design
- Foundations
- Elevator Works
- HVAC Works
- Fire Protection System
- Plumbing Works
- Drainage System
- Electrical System
- Telephone/Communication System
- Security System
- Landscape
- Furnishings, etc.

Source: Rumane (2011)

Example

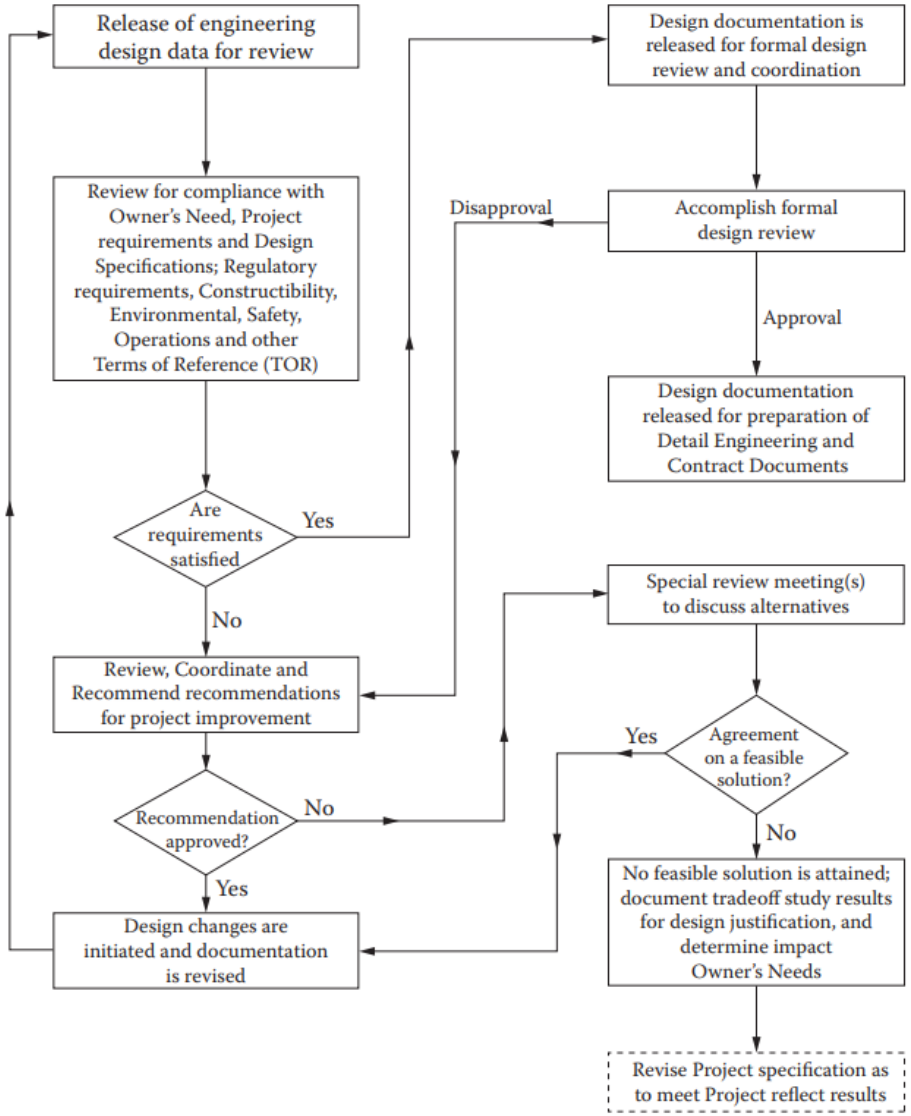


Source: https://i.pinimg.com/originals/08/ba/28/08ba287d854619a7e6a9bed6be025324.jpg

- It is unlikely that the design of a construction project will be right in every detail the first time.
- The design **should be reviewed** taking into consideration requirements of all the disciplines before release of design drawings for a construction contract.
- **Engineering design** has significant importance to the construction projects and must meet the customer's requirement at the start of project implementation.

Source: Rumane (2011)

Design data review cycle



Source: Rumane (2011)

Regulatory/Authorities' Approval

- Government agency regulatory requirements have considerable impact on precontract planning.
- Some agencies require that the design drawings be submitted for their preliminary review and approval to ensure that the designs are compatible with local codes and regulations.

Source: Rumane (2011)

Contract Documents and Specifications

- The contract documents must specify the scope of works, location, quality, and duration for completion of the facility.
- As regards the technical specifications of the construction project, master format specifications are included in the contract documents.

Source: Rumane (2011)

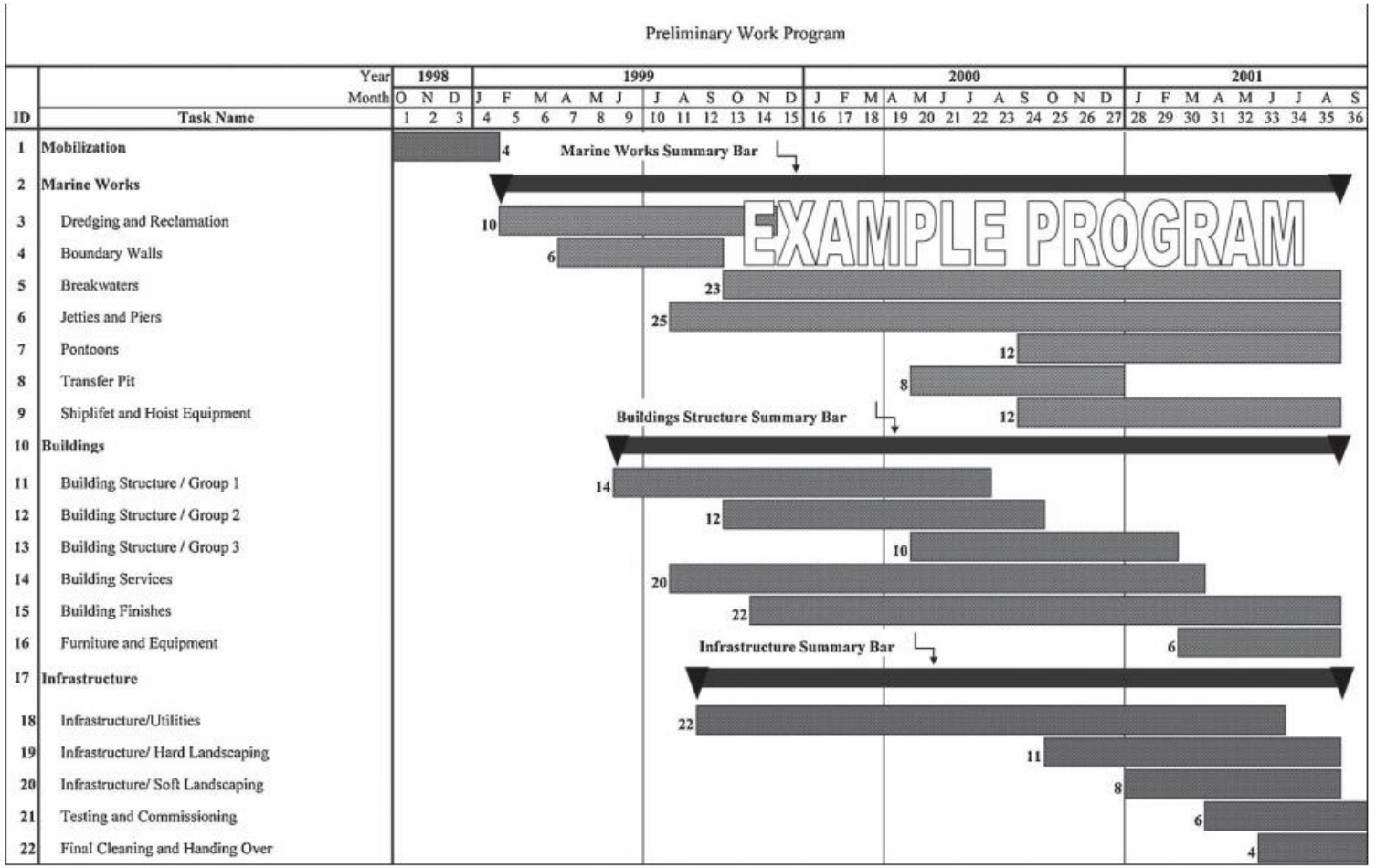
Detail Plan

Project plan is used to:

- Guide project execution
- Document project planning assumptions
- Document project planning decisions regarding alternatives chosen
- Define key management views regarding content, scope, and timing
- Provide a baseline for progress measurement and project control

Source: Rumane (2011)

Work program



Source: Rumane (2011)

Summary

- Responsibilities for quality depend on the type of the construction contract.
- The most common construction contracts are design/bid/build and design/build.
- Design phase consists of conceptual design, preliminary design and detailed design stages.
- Design phase has critical importance for performance of construction phase.

Thank you for your attention!

Questions?