Q&A Session and Discussion on APC Related Competencies

15th March 2023

by

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PROFESSIONAL PROFILE
Presently I work as a Senior Quantity Surveyor for Khansaheb Civil Engineering . Dubai, the United Arab Emirates. Currently assigned to Mall of The Emirates expansion project, Dubai. With the Academic and Professional Qualifications and Experience gained in my overall 24 years of post- graduate working experience in different built environment professionals and organizations in Sri Lanka and the United Arab Emirates.

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INTRODUCTION

The following will be covered

- Design Economics and Cost planning by Mr. Dhammika T. Gamage
- construction Technology by Mr. Kingsley Devendra

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AGENDA

Sl. Nr.	Heading	Minutes	Conducted by
	Introduction		AJ
1	Design Economics and Cost Planning	60	DTG
2	Construction Technology	60	KD
	Q&A		
	Total (Minutes)	120	
	Total (Hours)	2 Hours	

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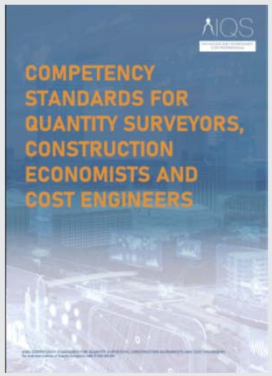
Introduction

AIQS Competency Standards



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Introduction

AIQS Competency Standards – Definitions

Basic Skills	**Skills which need to be acquired during tertiary education and are part of the Core Competencies.**
Core Competencies	**Required skills of a competent Quantity Surveyor.**
Specialist Competencies	**Skills gained in areas akin to Quantity Surveying, which may become primary business functions.**

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COMPETENCY STANDARDS FOR QUANTITY SURVEYORS OCTOBER 2005

GENERAL
BASIC SKILLS
PROJECT COST MANAGEMENT COMPETENCIES
- DESIGN COST MANAGEMENT, COST PLANNING & COST ENGINEERING
- CONTRACT DOCUMENTATION
- POST CONTRACT SERVICES

SUPPORT SYSTEM COMPETENCIES
ASSET FINANCIAL MANAGEMENT COMPETENCIES
SPECIALISED MANAGEMENT COMPETENCIES

GENERAL	BASIC SKILLS	PROJECT COST MANAGEMENT COMPETENCIES			SUPPORT COMPETENCIES	ASSET FINANCIAL MANAGEMENT COMPETENCIES	SPECIALISED MANAGEMENT COMPETENCIES
		DESIGN COST ADVICE, COST PLANNING & COST ENGINEERING	CONTRACT DOCUMENTATION & PROCUREMENT	CONTRACT ADMINISTRATION	CORE UNITS	SPECIALIST UNITS	SPECIALIST UNITS
		CORE UNITS	CORE UNITS	CORE UNITS	13. COMPUTER SERVICES 14. CONSTRUCTION TECHNOLOGY 15. GOVERNMENT REGULATION & LAW	21. FEASIBILITY STUDIES 22. LIFE CYCLE COST ANALYSES 23. TAX DEPRECIATION 24. SPECIAL ASSESSMENTS 25. AUDITS 26. TECHNICAL DUE DILIGENCE 27. COMPLIANCE ISSUES	28. PROJECT VALUE MANAGEMENT 29. PROJECT MANAGEMENT 30. PROJECT RISK MANAGEMENT 31. QUALITY ASSURANCE
		1. STRATEGIC PLANNING 2. BUDGETARY PROCESS 3. COST ESTIMATING 4. COST PLANNING	5. GENERAL PROCUREMENT ADVICE 6. QUANTIFICATION, MEASUREMENT & DOCUMENTATION 7. TENDER PROCESS	8. ACCOUNT MANAGEMENT 9. CONSTRUCTION CHANGE MANAGEMENT	SPECIALIST UNITS 16. ARBITRATION 17. EXPERT WITNESS / EVIDENCE 18. BUSINESS MANAGEMENT 19. RESEARCH & DEVELOPMENT 20. COST INFORMATION DATABASE		
				SPECIALIST UNITS 10. CLAIMS & DISPUTE RESOLUTION 11. FINANCIAL AUDIT 12. RESOURCE ANALYSIS			

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COST PLANNING AND COST MANAGEMENT IN CONSTRUCTION PROJECTS

Presented by :

Dhammika T. Gamage

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Contracts and Procurement Director at National Investments Company (NIC)

AGENDA

01 AIQS COMPETENCIES INTRODUCTION
02 PROJECT BRIEF AND DEVELOPMENT
03 PRECONTRACT COST MANAGEMENT
04 DESIGN COST ADVICE & COST PLANNING
05 PRETENDER ESTIMATE
06 CASE STUDY – COST PLAN
07 POST CONTRACT COST MANAGEMENT
08 COST REPORTS
09 CHANGE MANAGEMENT
CONCLUSION

Cost Management

- Cost management is a living process in the construction industry. It is born at the inception of a project as a concept cost plan, matures into an elemental cost plan, with the assistance of value engineering and risk apportioning, then converts into the engineer's pre-tender estimate. Upon award of the construction contract, post-contract cost management begins.
- This process can never be treated as a post-mortem procedure.

PROJECT COST MANAGEMENT COMPETENCIES

Project cost management involves various cost management and procurement procedures to ensure that **the Client's budget is properly established and maintained.**

DESIGN COST ADVICE, COST PLANNING AND COST ENGINEERING COMPETENCIES

Cost management of a project includes establishing the budget and then effectively monitoring and reporting against that budget on a regular basis, cost planning the evolving design, preparing appropriate contract documentation and advising on variations and claims during the progress of the project.

Additional Range Indicators

Strategies for gathering data and carrying out research on current construction costs and future predictions	Analysis of data relating to costing, budgeting and cashflows including financial implications of various options	Use of appropriate analysis and evaluation techniques in reporting to the Client	Application of principles of cost management and elemental cost analysis

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PROFESSIONAL CQS SERVICES

- Client Brief
- Development appraisal
- Viability of Project
- Project evaluation
- Procurement Strategy
- Cost Planning
- Pretender Estimate
- Tendering process

- Contract formation
- Contract documentation
- Conttact Administration
- Commercial Management
- Change Mangement
- Post Contract issues
- Vartaitions
- Valuations
- Final account

- Conflicts Avoidance in Pre-contract stage
- Conflicts to Dispute
- Contractual process
- Dispure resolution processes
- ADR (Alternate Dispute resolution) Methods
- Arbitration
- Litigation

- Contarctual provisions
- Claims procedures
- Claims submissions
- Review and analysis
- Evaluation
- Determination
- Negotiations
- Consultations
- Conclusion

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01. PROJECT BRIEF AND DEVELOPMENT ?

Preparation of the project brief is likely to be coordinated by the lead consultant.

"The project brief is the final stage in the process of **defining the client's requirements for the development of a built asset**".

Development appraisal involves research into constraints and opportunities evolving from the location, legal and planning aspects of potential sites as well as their physical characteristics.

"A development appraisal is a financial assessment to enable a developer to establish the viability of a project."

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2. Client's requirements ?

Time : Time and timing, which are of the essence, with costs and project processes inextricably linked.

Quality : Quality goals, which have to be properly defined if they are to be achieved.

Flexibility : The need to adapt to changing circumstances and keep projects on track whatever happens.

Costs : Effective financial planning and cost management are essential throughout.

Risks : Risks, which have to be identified, quantified and managed – and avoided wherever possible.

Client's wants and needs

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3.Contents of Project brief ?

Preparation of the project brief is likely to be coordinated by the lead consultant. As well as gathering information about physical requirements, the briefing process should:

1. Verify the objectives and priorities of the project.
2. Ensure space, time and budget parameters are aligned with the client's vision and needs.
3. Ensure expectations are reasonable and attainable.
4. Clarify client roles and the project structure.
5. Establish how much the client knows already and their level of experience; do they already have a clear brief?
6. Gather contextual information.
7. Gather user information.
8. Establish the building life span and flexibility requirements.

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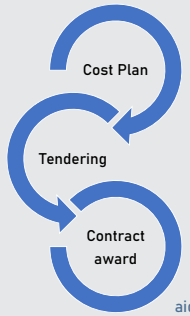
04. PRE-CONTRACT COST MANAGEMENT?

- Project brief and development appraisal
- Design Economics
- Cost Advice
- Cost Planning Process
- Pre-tender estimate
- Tendering process and evaluation
- Finalization of the Contract award



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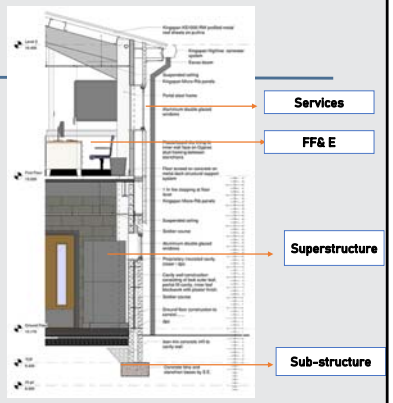
05. Elemental Cost planning ? Element ?

Few Definitions

An **element** (for cost analysis/planning purposes) is a major physical part of a building that fulfils a specific function or functions irrespective of its design, specification or construction.

"Elemental cost planning is a system of Cost planning and Cost control, typically for buildings, which enables the cost of a scheme to be monitored during design development."



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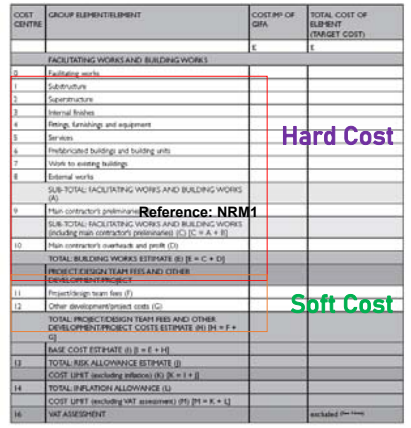
06. What do you include in Elemental Cost planning ?



Cost Plan Format Elements breakdown

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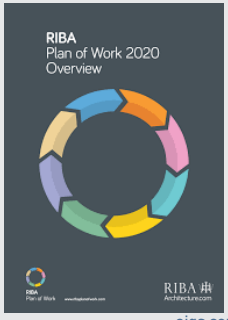
07. RIBA- 2020 PLAN OF WORK ?

- Agree appointments with the professional team
- Develop a brief with the client
- Create concept designs options
- Coordinate the design
- Prepare a planning application
- Apply for planning consent
- Develop a set of construction information
- Prepare a tender
- Obtain consents required prior to construction
- Award a Building Contract
- Construct the building
- Inspect the construction as it progresses
- Hand over the building.



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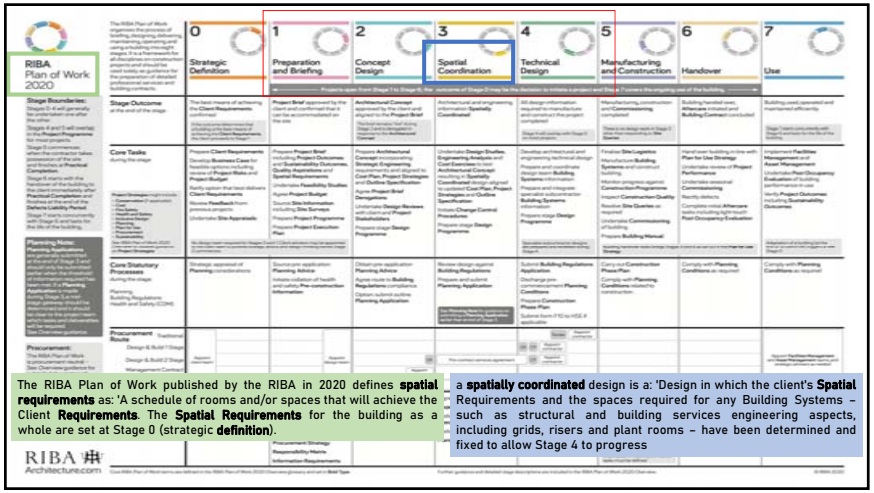

The RIBA Plan of Work published by the RIBA in 2020 defines **spatial requirements** as: 'A schedule of rooms and/or spaces that will achieve the Client **Requirements**. The **Spatial Requirements** for the building as a whole are set at Stage 0 (strategic **definition**).

a **spatially coordinated** design is a: 'Design in which the client's **Spatial** Requirements and the spaces required for any Building Systems – such as structural and building services engineering aspects, including grids, risers and plant rooms – have been determined and fixed to allow Stage 4 to progress

Cost Plan Strategy

The **Cost Plan** represents the anticipated construction cost of the building and, as such, it represents only a portion of the **Project Budget**. The **Cost Plan** used to be prepared at the end of Stage 2 or Stage 3. At the outset, the **Cost Plan** can be based on industry norms for similar building types adjusted to take account of market conditions, project abnormalities, Project Risks and contingencies. As design information is developed, an elemental **Cost Plan** is prepared. Essentially, this breaks down the cost for the building into the different **Building Systems**.

Figure 2: Example Project Programme for each stage of the RIBA Plan of Work 2020

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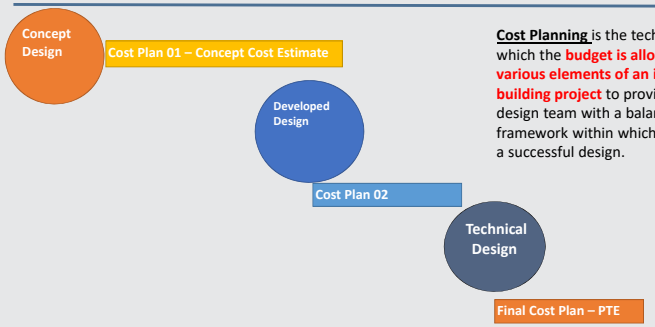
07. Design Economics ?

Design Vs Cost

Design economics is an understanding of the **economics** associated with the **design of** building.

Cost Planning is the technique by which the **budget is allocated** to the **various elements of an intended building project** to provide the design team with a balanced cost framework within which to produce a successful design.



08. Cost Planning process includes ?

Cost plans are generally prepared by cost consultants (often quantity surveyors). They evolve through the life of the project, developing in detail and accuracy based on the nature of the design, and then actual prices are provided by specialist contractors, contractors and suppliers. They range from very early initial cost appraisals through to tender pricing documents.

Cost Planning Process

- Client's requirements
- Quantification process
- Standard Method of measurements
- Pricing methods
- Rates database
- Assumptions
- Exclusions
- Inclusions
- Marked-up drawings /List
- Contingencies
- Risk Register
- Control of documents and distributions
- Revisions
- Value Engineering options
- Design Economics options
- Revised Cost Plans
- Comparative Cost Plan
- Bench Marking
- BCIS/NRM Cost Analysis.

09. Structure your Cost Plan ?

- Executive summary
- Outline of key risks
- Assumptions
- Exclusions
- Information Used / Cost datum
- Details
- Area schedule
- **TIP**: Include a set of Marked up drawings

Elemental **cost planning** is a system of **Cost planning** and **Cost control**, typically for buildings, which enables the **cost** of a scheme to be monitored during design development.

10. Preparation of BOQ in Cost Planning Process ?

- List of drawings
- Specifications
- Standard Method of measurements
- Exclusions
- Information Used
- Details
- Other schedules (BBS, Cost breakdown etc.,)
- Preambles

The Bill of Quantities (sometimes referred to as 'BoQ' or 'BQ') is a document prepared by the cost consultant (often a quantity surveyor) that provides project specific measured quantities of the items of work identified by the drawings and specifications in the tender documentation.

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11. What do you measure ?

Measurement

- Traditional measure / BIM
- Focus on areas with greatest value
- Focus on areas that take longest to measure
- **TIP:** Think about what is **not** on the drawings
  - Plant rooms
  - Building maintenance unit
- **TIP:** Think outside the box
  - If you were an auditor, where would you find gaps in a cost plan?
- Understand your building function
- Know your stuff!

Construction Areas

- GIA, GEA, NIA, NLA - when are they applicable?
- BCIS - all costs expressed against GIA(Definition as RICS Code)
- RICS Code of Measuring Practice - 6th Edition August 2007 *"The Code is for use in the UK only"*
- NRM (New Rules of Measurement)

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12. New Rules of Measurement (NRM) by RICS ?

The rules have been written to provide a standard set of measurement rules that are understandable by all those involved in a construction project.
They provide advice and best practice guidance to RICS members involved in the cost management of construction projects worldwide.

13. Pricing principles ?

Pricing

- Procurement
- Location
- Size of project
- New build / refurbishment
- Market conditions
- Rates of construction
- Others

Know your market

- Key materials (steel, rebar etc)
- Procurement from overseas
- Timing of procurement
- Workload of Contractors
- Check Quarterly Market Reviews

14. Risks?

- **Employer risks**
  - Cash flow restrictions
  - Employer variations
  - Funding
- **Design team risks**
  - Design co-ordination
  - Investigations
  - Lack of design
  - Inappropriate design
- **Procurement risks**
  - Currency fluctuations
  - Design responsibility

15. PRETENDER ESTIMATE (PTE)?

The pre-tender estimate (PTE) is the final estimate of the likely cost of the works that are described in completed tender documents prepared to seek tenders (offers) from prospective contractors.

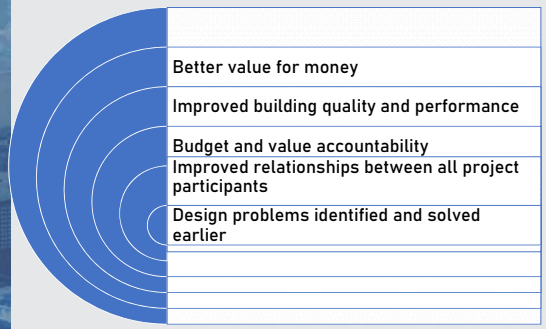
1. PTE provides a final comparison with the budget, and along with the cash flow estimate enables the client to confirm that sufficient funds are available before committing to seeking tenders.

2. PTE also gives a basis for assessing and comparing tenders when they are returned. If the pre-tender estimate exceeds the approved budget, an explanation should be provided for the client to consider and issue instructions.

3. PTE ensures that the tenders are easily compared with one another and with the pre-tender estimate, and any anomalies or potential savings identified.

The pre-tender estimate should be prepared following a standard approach to estimating such as that defined by the new rules of measurement (NRM).

16. BENEFITS OF COST PLANNING ?



17. COST REPORT

Cost Report – Contents

- Contract Reference
- Package name and reference
- Budget associated with each contract / package
- Contract Price
- Instructed variations (agreed / not agreed)
- Anticipated variations (forecast)
- Claims / EOT
- Forecast Out-turn Cost or Cost At Completion
- Expenditure summary
- Financial Status -Cumulative and for this month

18. CHANGE MANAGEMENT ?

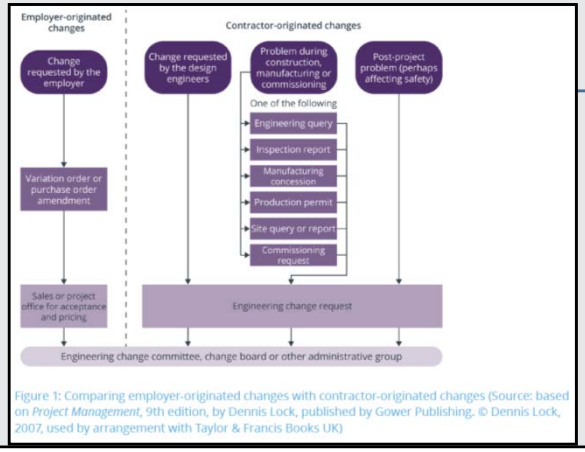


Figure 1: Comparing employer-originated changes with contractor-originated changes (Source: based on *Project Management*, 9th edition, by Dennis Lock, published by Gower Publishing, © Dennis Lock, 2007, used by arrangement with Taylor & Francis Books UK)

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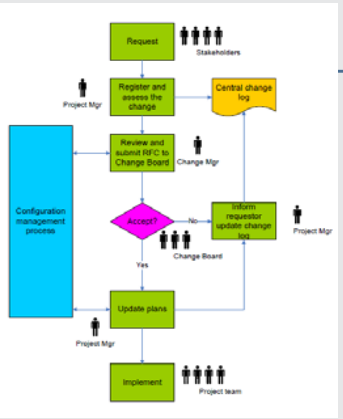
CHANGE MANAGEMENT



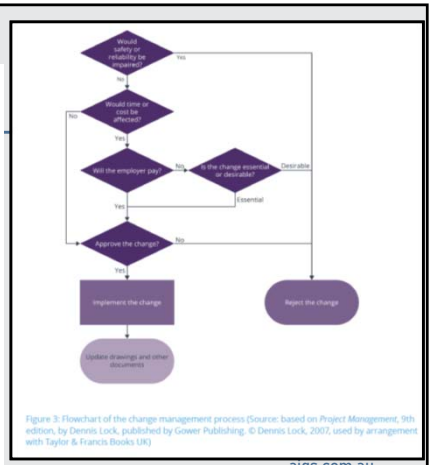


Figure 3: Flowchart of the change management process (Source: based on *Project Management*, 9th edition, by Dennis Lock, published by Gower Publishing, © Dennis Lock, 2007, used by arrangement with Taylor & Francis Books UK)

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20. Cost Manager skills ?

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Executive summary of a consultant's monthly cost report

minimum requirements

1. Contract Sum dated xx yyy zzzz
2. Variations by Engineer's Instructions
3. Variations committed but not covered by Engineer's Instructions
4. Forecast of variations which have arisen from Employer's / Engineer's comments
5. Provisional Sum Adjustment
6. Contingency Sum Adjustment
7. Day Works Adjustment
8. Contractual Claims

- **ANTICIPATED AMOUNT OF STATEMENT AT COMPLETION As at**

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Components built within the contract for project cost management

- Project construction programme
- Project cash flow
- Contract notices
- Project progress reports
- Cost proposals and valuation of variations
- Payment application and certification procedure, including release of retention
- Bonds and guarantees, insurances
- Final account procedure
- Contract termination Procedure

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Any Questions? Please contact

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THANK YOU

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ADVANCING BUILT ENVIRONMENT COST PROFESSIONALS

CONSTRUCTION TECHNOLOGY

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COMPETENCY STANDARD UNIT 14 – CONSTRUCTION TECHNOLOGY (CORE UNIT)

ELEMENT		PERFORMANCE CRITERIA	
14.1	Acquire knowledge of construction processes, technologies and associated building materials	14.1.1	Knowledge of construction processes and technologies as applied to construction activities and sequencing of activities acquired
		14.1.2	Knowledge of source and use of building materials applied in construction activities acquired include testing and assessing techniques
		14.1.3	Knowledge of design and installation of building services acquired
14.2	Acquire knowledge of the principals of the science of construction	14.2.1	Knowledge of principles of building science demonstrated, in respect of heat, light and sound
		14.2.2	Knowledge of principles of building science in relation to structures demonstrated including analysis, design and stability
14.3	Acquire knowledge of the principles of construction	14.3.1	Knowledge of principles of construction demonstrated including demolition methods, formwork design, erection techniques, plant and equipment and site surveys
14.4	Interpret building documentation	14.4.1	Building plans, specifications, construction codes and regulations interpreted

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Q1- Explain the Purpose of foundation

The followings are the purpose of foundation.

- Foundation Provide the support to the Structure
- Transferring the structure load to the ground to avoid any excessive settlement
- Foundation should bear the Load of the Superstructure

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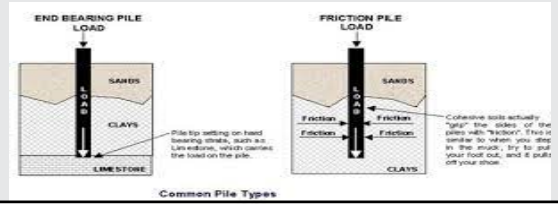
Q2-Can you explain how end bearing and friction piles transfer the load of the building?

- **End Bearing Piles** – The Bottom of the pile rests on a layer of strong rock or Soil . the load of the building is transferred through the Pile into the strong layer
- **Friction Piles -** The Friction flies works in difference principal ; friction piles develop most of the pile bearing capacity by shear stresses along the side of the piles . the forces are transferred to the soil



Common Pile Types

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Q3. What are the typical consideration when selecting the type and size of the foundation

- The following are the key constrain to be considered for selection of the foundations

- The total load of the building
- Nature of the load bearing capacity of the ground
- Type of Structure
- Cost
- Construction Constrain (for example their proximity to adjacent buildings/ structure)
- Program

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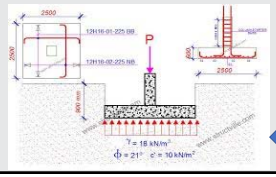
Q4 – Explain the Key difference in Pad and Raft foundation ?

The Following are the key difference in both foundation

- A Raft Foundation is essentially a continues slab that extended over the entire footprint of the building . The load of the building spreads large area than other foundation

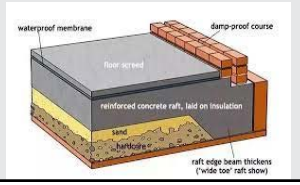
- Pad foundation are mainly used to support the individual or multiple Colum spreading the load to the ground below

They are usually square or rectangular on plan and can be reinforced or non reinforced



Raft Foundation

Pad foundation



Q5. Explain the key considerations when design the external walls

The Following elements to be considered for design the external walls

- Weather Protection
- Fire Resistance
- Acoustic and Thermal Performance
- Structural Performance
- Appearance and Aesthetics View
- Expected Life Span
- Future Maintenance cost

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Q6. What are the key factors should be considered when selecting the type of structural Frame ?

The following are the main factors to be considered for select the structural frames

- Fire Resistance
- Structural Performance
- Expected Life Span
- Future Maintenance
- Erections
- Cost
- Availability of the steel section
- Corrosions

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Q7- What is the raised access flooring?

➢ A floor system sitting on the mechanical / pedestals above the structural slab the system allowed services to be located within the void (usually power and data cable). The abortive work could be avoided when office is re arranging

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Q8- Explain the typical survey might be required for Building Construction

- Topographic Survey
- Site Investigation
- Asbestos Survey
- Utility Survey
- Ecology survey
- CBR Test
- Existing condition Survey

Utility Survey

Asbestos Survey

Topographic Survey

CBR Test

Ecology survey

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Q09- What are the key factors should be considered when design the Internal partitions?

- The Following Elements need to be considered for Design The Internal Partition
- Fire rating and Acoustic requirement
- Requirement of the Doors and internal windows
- Height of the partition
- Material
- Strength and Structural requirement including fixing details
- Cost

Q10-Explain the Objective of Site Investigation.

- The Determine the Suitability of the Site suitability of the Site for the proposed work and determine adequate economical foundation design

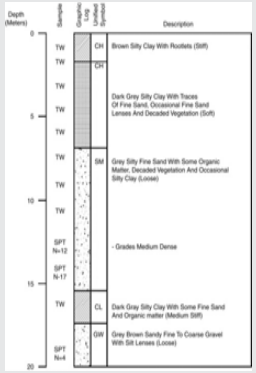
- To determine the potential construction difficulties
- To Determine any soil improvement is required
- To mitigate the impact to the environment
- To determine the any drainage improvement is required

Q11 – Explain the Key Advantages in timber frame.

- Construction on site Faster (Compared to In situ concrete Frames)
- Structure is relatively light weight
- Given good aesthetically View

Q12-What are the outcome of soil investigation

- Type of Soil, rock , made ground , Organic
- Proportion of the sand clay and Silt
- Water table ,
- CBR – California Bearing Ratio which indicates the load bearing capacity of the strata



Q13- What are the factor to be considered for HVAC system building?

- The following are the main factors to be considered for selecting suitable HVAC System for building.

- Type of the Building
- Cost
- Time
- Available Budget
- Lifetime
- Requirement
- Maintenance and Replacement cost

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Q14-Explain the Advantages in Busbar system in Highrise building compare to conventional cable system.

The Following are the main Advantages in busbar system

- Speed construction
- Reduce the space for shafts
- Remove the cable tray and ladders
- Any new installation easy and less cost
- Good Asthmatic View
- Voltage Drop is minimum

Busbar System

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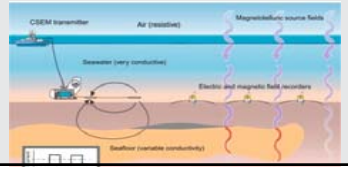
Q15 – What are the soil investigation methods?

- Direct method – Test pits , Trial Pits and Trenches

Test Pit

- Semi Direct – Drilling and deep boring
- Indirect – Sounding or Penetration tests electromagnetic



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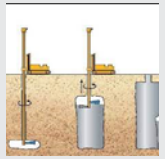
Q16 – How does soil can be improved?

- The following are the method for Soil Can be improved
- Vibration
- Dynamic compaction
- Jet Grouting
- Soil washing
- Vapor extraction

Dynamic compaction



Jet Grouting

Soil washing

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Q17-Explain the type of slabs

The Following are the slabs commonly use in construction industry

- Flat slabs – reinforced slab supported by the columns and load distribution to throughout the span
- Solid slab – Supported by the beams and columns and load of each spans distributed separately (one way or two ways)
- Waffle slab
- Post-tensioned slab
- Precast slab

Flat slabs

Waffle slab

Post-tensioned slab

Precast slab

Q18-What are the common type of the ventilation system?

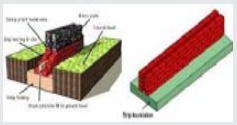
- Natural – Doors, Windows, Louvers and Grills
- Mechanical ventilation system – Split AC , Window AC , VRF system , Central air conditioning and Package units

Q19-Explian the main components of substation?

- Transformers
- Switchgears
- LV distribution
- Protection system

Q20- Explain the type of foundations?

- Strip foundation
- Trench foundation
- Pad Foundation
- Raft Foundation
- Pile foundation



Q21- What's need to be considered for deep basement excavation in city centre area?

The following work items need to be considered in deep basement excavation

- Method of excavation
- Shoring system
- Disposal of the excavated material
- Authority approval
- Deviation of the existing services

Q22-When advising difference materials what other factors than cost need to be considered?

- It depend on the material , however commonly included strength , Quality , suitability , Aesthetics , Life Cycle including operation and Maintenance cost

Q23-How do you apply the construction Technology Knowledge for preparation of the new rates ?

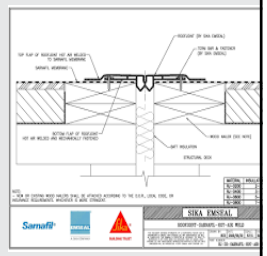
- If you have in depth knowledge in Construction Technology it will help to build up the accurate unit rat5e in first principal and help to ;
- Identify the scope of work
- Changes in design
- Understand the change in specification/ Scope
- Method statement
- Calculate the labor productivity
- Sequency of the work and prepare the break down for the material and labour

24. How do you differentiate the window wall system and Curtain wall system

- There Key difference in both the system and following are key elements
- Window wall system support the floor to floor but Curtain wall system will be supported by the external structure
- Curtain wall system is strong, but window wall system is weaker
- Window wall system is cost effective
- Window wall installation is easy and it can be done from inside the building but heavy machinery is required for install the curtain wall with a structure
- High Possibility to water penetrating through window wall system because gap between slab and window wall
- Maintenance cost is high in curtain wall system
- Curtain wall system has good Asthmatic and Architectural view to building

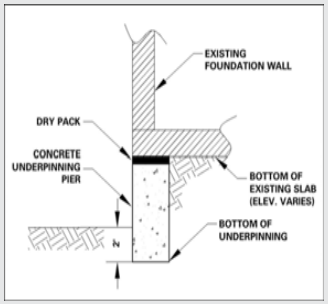
25. Can you explain Difference in Expansion Joint and Construction Joint

- There are significant difference in Expansion Joint and Construction joint
- The Expansion joint in shown in the Contract Drawing , Specified in Specification and it is part of the Contract its measured in Contract BOQ as a line item
- The Expansion joint provided for keep tph gap between long span building to avoid the cracks in structure due to movement of the structure
- However the Construction joint is not shown in the drawing and does not specify in the specification . Its specify in the method statement in Concreating works . Concreate is required to stop as emergency situation , heavy rain and problems in concreate supply . In this situation slab casting is stopped and provide the construction joint . No additional cost for it , the contractor may allowed allowance with in the tender price.



26. What do you understanding about underpinning

- Underpinning is strengthening and reinforcing an existing foundation of a structure, typically by extending the depth and breadth of the foundation.
- Why it is required
- The original foundation isn't strong/stable enough to support the existing structure
- The initial use of the structure has changed, requiring foundational reinforcement
- The soil is not competent to withstand the weight of the structure
- Another story is being added to the structure, requiring deeper foundational footings to help support greater load-bearing capacity
- It is cheaper to repair/reinforce than buy new
- Seismic activity, drought, flood, or other acts of God have compromised the structure's structural security



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Thank you for your valuable contribution
and
We wish you a very successful APC session
AIQS UAE Team

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