Change size of basement

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QUANTITY SURVEYING DIVISION
ASSESSMENT OF PROFESSIONAL COMPETENCE
FINAL ASSESSMENT – 23rd & 24th SEPTEMBER 2020
PRACTICE PROBLEMS
NOTES TO ASSESSORS

Question No. 1 – Feasibility Study (Cont'd)

Attachment A

ELS
- pile pipe wall to the outer sides of basement
- depth = basement depth + 5m embed
- no need ELS if direct excavation into rock

left to 10+10 same

10+10 left area same

10+10 right area adjust
- add shorter at A-A x 2
- deduct at B-B

Section A-A

B-B section

Excavation
- open cut excavation if no ELS
- open cut at 45 degree

Raft foundation footing
- footing no change as given
- raft slab assume 500mm thick, to footprint area
- w concrete binding
- w waterproof tanking at 1500/m2

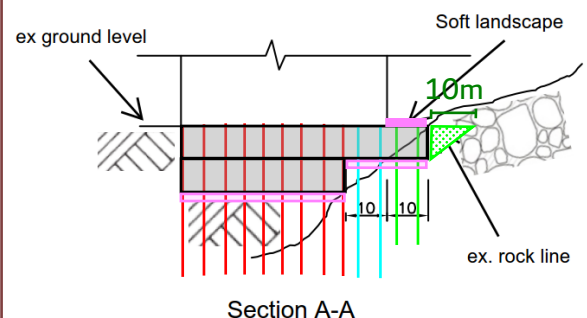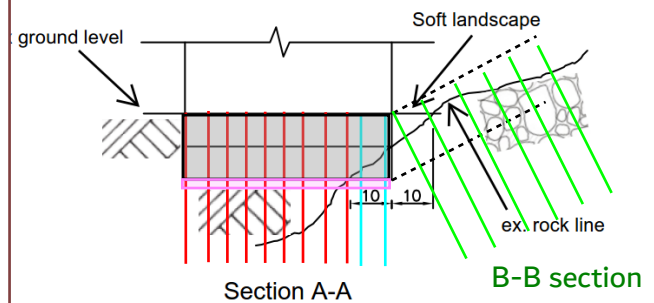raft slab change

Section A-A

Basement sides
- no change

Basement suspended floor, IFO, E&M
- no change in CFA
- minor cost effects due to changed layout

Exposed top of basement
- waterproofing and drainage

exposed top of basement

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Objective

This objective of this question is to test Candidates' ability to identify and cost the differences between the two options.

Cost Estimation

The Candidate should focus on items of differences. Although only ballpark estimate is required, reasonable build-up with assumptions, approximate quantities and/or sums based on $/m2 are expected. Estimates made up of guesstimated sums without any explanation should be marked down.

Option B Vs Option A

Description of Difference		Cost Effect HK$
Basement CFA of Option A B1: 50m x 30m = 1,500m2 B2: 50m x 30m = 1,500m2	Basement CFA of Option B B1: 60m x 30m = 1,800m2 B2: 40m x 30m = 1,200m2	

Pile pipe walls - reduced
• Overall length of basement increased from 50m to 60m.
• Pipe pile walls to the left of the 10+10m zone of rock slope not affected.
• Pipe pile walls within the left 10m zone of rock slope not affected because of the same excavation depth above rock slope though Basement B2 not requiring rock slope excavation any more.
• Pipe pile walls within the right 10m zone of rock slope are now required:
   ○ Length = 10m x 2 sides = 20m
   ○ Average depth = (4m + 0m)/2 + say 5m rock socket = 7m
   ○ Area = 20m x 7m = 140m2.
• Pipe pile walls on the right end of the basement in Option A are no longer required for Option B because of direct excavation into rock slope:
   ○ Length = 30m + 2 x say 0.15m offset = 30.30m
   ○ Depth = 4m + say 5m rock socket = 9m
   ○ Area = 30.30m x 9m = 272.70m2.
• Cost = 140m – 272.70m = omit 132.70m2 @ $8,000/m2 = omit $1,061,600.
		(1,060,000)

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Option A Vs Option B (Cont'd)

Description of Difference	Cost Effect HK$
Excavation and disposal – increased • Excavation to the left of the 10+10m zone of rock slope not affected. • Rock slope excavation location within the 10+10m zone of rock slope moved from Basement B2 in Option A to Basement B1 in Option B. No significant change in cost. • For the left 10m zone, open cut excavation above rock slope to be adopted for Option B to avoid the use of costly lateral support against Basement B2. Volume of excavation remains the same as Option A. • For the right 10m zone, Option A uses pipe pile walls with no basement excavation. Open cut to be adopted for Option B with cross-section = 10 m wide x (4+0)/2 m deep. • Cost = 30 long x 10 wide x 2 deep = 600 m3 @ $300/m3 = add $180,000.	180,000

Basement bottom raft - increased
• Increase in footprint = 30m x 10m = 300m2
• Cost per m2 (say) 500mm thick raft slab:
  Concrete 0.5m3/m2 x $1,400/m3   = $700/m2
  Rebar 0.5m3/m2 x 200kg/m3 x $9/kg = $900/m2
  Fwk is minimal, say 0.1m2/m2 x $500/m2 = $50/m2
  Concrete blinding 0.01m3/m2 x $1,300/m3 = $13/m2
  Waterproof tanking 1m2/m2 x $1,500/m2 = $1,500/m2
  Total   = $3,163/m2
  say   = $3,200/m2
• Cost = add 300m2 x $3,200/m2.
	960,000

Basement sides – minor • Option A length of two basement = 50 x 2 = 100 m • Option B length of two basement = 40 + 60 = 100 m • No change to basement side areas.	minor

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Option A Vs Option B (Cont'd)

Description of Difference	Cost Effect HK$
Basement suspended floors, interiors and M&E services - minor • No change in CFA. Assuming minor cost effects due to changed layout.	minor
Exposed top of basement – added • Waterproofing and drainage to extended and exposed basement top. Area 30 x 10 m. • Cost = 300m2 x $1,000/m2.	300,000
Subtotal	380,000
Add for preliminaries (15%) and contingencies (10%)	1.10 x 1.15
Total	480,700
Say	**500,000**

It is assumed that the site area, hoardings and covered walkways would not be affected.

As estimated above, Option B is more expensive than Option A. The volume of rock excavation remains unchanged. Pipe pile walls can be significantly reduced, but this has been outweighed by the increase in the basement bottom raft and the addition of waterproofing and drainage to the extended and exposed basement top.

Bonus:

To Candidates who consider the following:
• Greater uncertainty in site conditions with a larger footprint.
• "Stepped" basement may cause design of structure slightly less efficient.
• Repositioned fire escape routes, plant rooms, longer services routes etc.
• Soil for planting especially trees may increase loading on Basement B1 top slab and hence increase its structural cost.
• Construction periods may be different.

[12 marks]