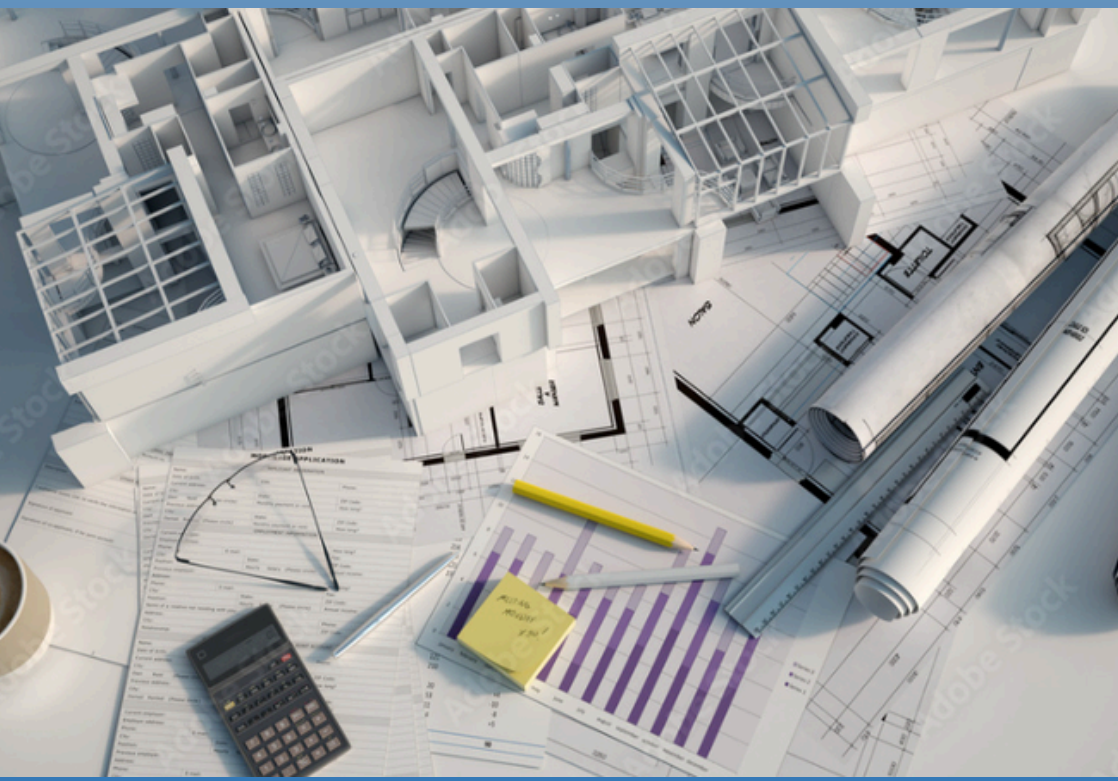
BUILDING COSTS MADE SIMPLE :

BUILD-UP RATE METHOD



S. A. MUZAFAR

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PREFACE

The build-up rate method is widely used in various industries for accurate project costing and estimation. It provides a systematic way to compile detailed costs, enabling more precise budgeting and financial planning. This eBook aims to demystify the build-up rate method, offering theoretical insights and practical guidance to professionals and students alike.

The purpose of this eBook is to serve as a comprehensive guide to understanding and applying the build-up rate method. Whether you are a project manager, cost estimator, engineer, or student, mastering this method will enhance your ability to develop robust cost estimates and manage projects more effectively. By the end of this eBook, you will have a solid grasp of how to use the build-up rate method to achieve greater accuracy and control over project costs.

This eBook will be a valuable resource for you and it will contribute to your professional growth and success. Your feedback is welcome and will help in improving future editions.

Thank you for choosing this eBook. Happy reading and successful project estimating!

S. A. MUZAFAR

CONTENT

“IF YOU THINK EDUCATION IS EXPENSIVE, TRY ESTIMATING THE COST OF IGNORANCE”

HOWARD GARDNER

GENERAL LEARNING OUTCOME

Explain the build-up rate methods

Calculate the construction price rate by using build-up rate method

SPECIFIC LEARNING OUTCOME

Describe requirement and uses of the price rates and schedule of rates

Explain basic criteria of price rate calculation; materials, labour, plants, overheads and profits

Distinguish the built-up rate calculation for:

- Concrete works mixed manually and mixed by using machine
- Excavation work done manually and by using machine
- Brickwork
- Reinforcement work

INTRODUCTION

Price rate or build-up rate is the price of a unit of work or material

The price rate needs to consider all the costs involved such as materials, plant, and equipment as well as labour

These direct costs will be added together with overhead and profit to get a complete price rate

The cost of materials, labor, and plant or equipment should be combined to form a unit price rate but depending on the type of work

Source: Noor Khazanah et. al. (2022), 125

WHAT IS BUILD-UP RATE?

Price per unit of measurement

+

Price rate for 1m^3

→

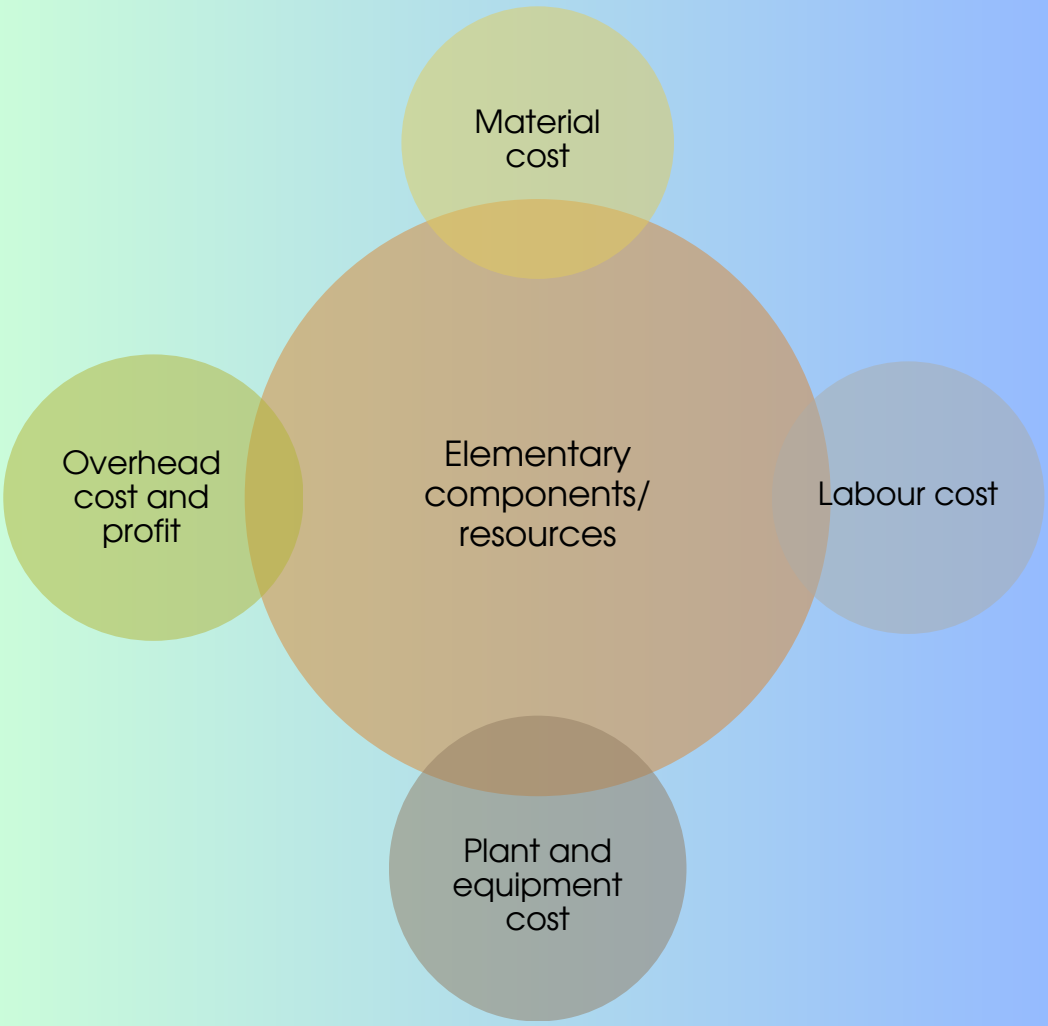
RM5.00/m^3

WHY BUILD-UP RATE?

Specific work description is not available in the schedule of rates

Build-up rate is needed by identifying the elementary resources as components of the analysed rate

ELEMENTARY COMPONENTS



WHAT TYPE OF BUILD-UP WORK?

Excavation work

Concreting work

Brickwork

Reinforcement work

PURPOSE OF BUILD-UP RATE METHOD

Financial

- Allocation of employer financial

Design

- Suitability of design based financial limit allocation

Reference

- Information as reference for future project estimation

TYPE OF COST

Material cost

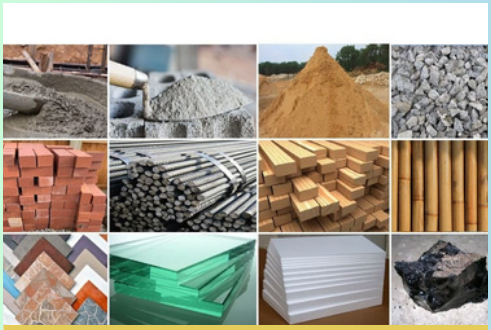
Labour cost

Plant and equipment cost

Overhead cost and profit

Source: Noor Khazanah et. al. (2022), 128

MATERIAL COST



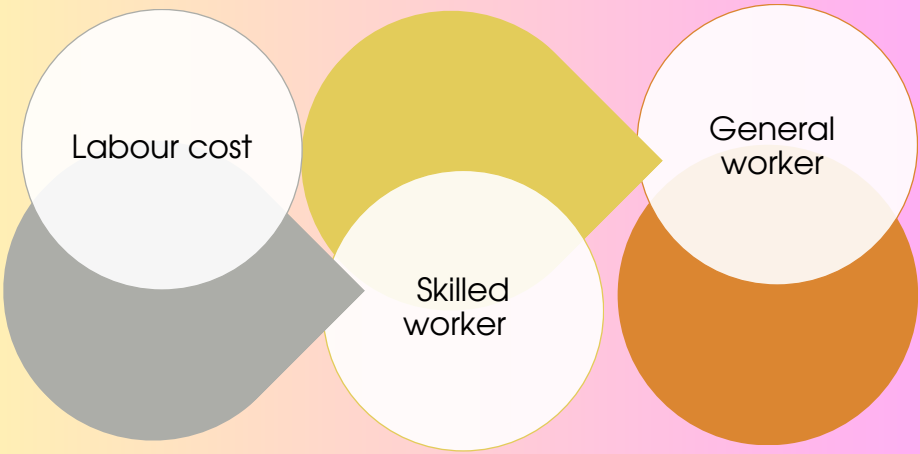
Brick, glass, metal, cement, sand

Transportation cost

Storage cost

Wastage cost

LABOUR COST



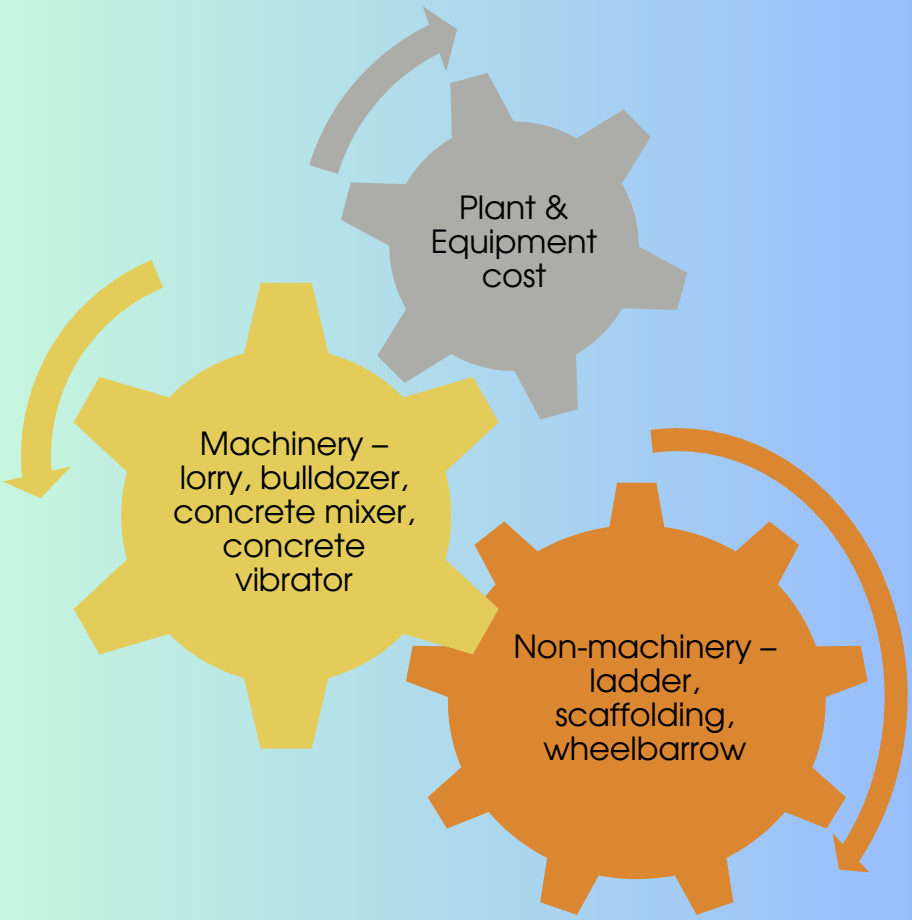
- Fee or wages to the workers

- Bar bender
- Carpenter
- Bricklayer

- Transporting
- Dumping
- Site clearing
- Wages per day around RM60.00-RM100.00

Source: Noor Khazanah et. al. (2022), 126

PLANT AND EQUIPMENT COST



OVERHEAD COST AND PROFIT

Overhead cost

Salary

Electricity, water, telephone bills (utility bills)

Office and workshop furniture

Percentage of materials, labour, plant and equipment cost

Office rental

CHAPTER 1
EXCAVATION WORK

INTRODUCTION

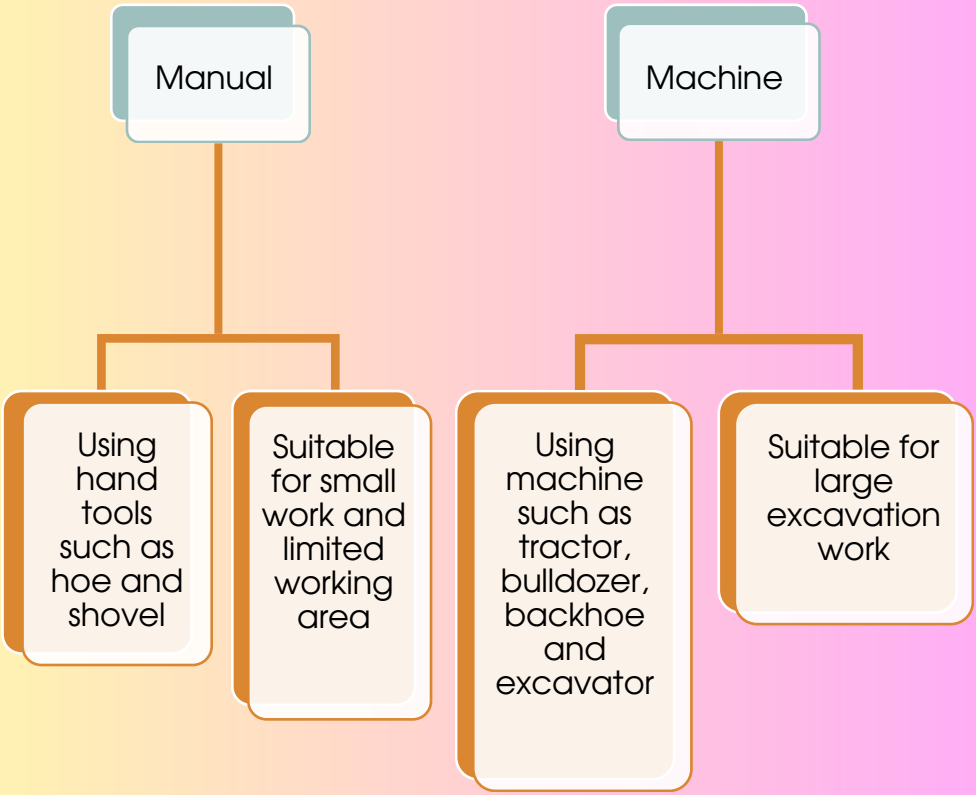
Excavation work is work that is usually carried out at the beginning of construction

This excavation work includes site preparation, excavation and disposal of the excavated soil and backfilling of the soil into the excavated space if necessary

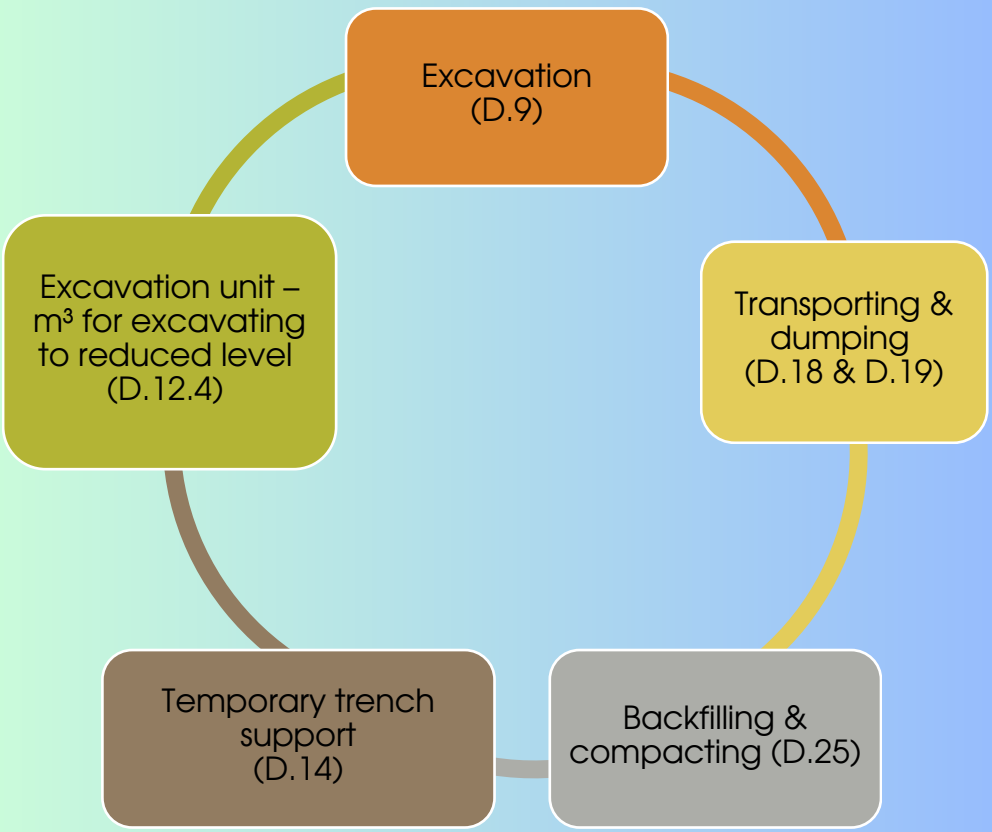
The cost of this work depends a lot on the scope and amount of work, the condition of the land and how the work is carried out

Source: Ahamad Abdullah (2006), 113

BUILT-UP COST FOR EXCAVATION WORK



STANDARD METHOD OF MEASUREMENT



Source: SMM2 (2000), 17-20

INCREASING VOLUME

TYPES	INCREASE (%)
Sand	10
Clay	20
Natural soil	25
Gravel	50

Source: Ahamad Abdullah (2005) page 123

LABOUR CONSTANT

NO	DESCRIPTION	UNIT	LABOUR CONSTANT
1	Excavation	m^3	1.20 hour
2	Excavation trench not exceeding 1.50m deep	m^3	1.74 hour
3	Excavation trench exceeding 1.50m but not exceeding 3.00m deep	m^3	2.61 hour
4	Dumping away from site not exceeding 100m away	m^3	1.20 hour
5	Loading on the lorry	m^3	1.00 hour

Labour constant is duration needed by the labour to execute the works.

EXCAVATION BY HAND CALCULATION

Calculate 1m³ manual excavation of trench not exceeding 1.50 m deep and dumping to an average distance 100m away from site.	
Excavating trench/ditch not exceeding 1.5m deep	1.74 hour/m³
Dumping of soil 100m away from site	1.20 hour/m³
Increased volume of soil after excavation	25%
Overhead cost and profit	5%
Labour cost for excavating and dumping per day (8 hours)	RM55.00

SOLUTION

1.	Labour cost		
	Excavating trench not exceeding 1.50m deep		1.74hour/m^3
	Dumping of soil 100m away from site		1.20hour/m^3
	Increased volume of soil after excavation	25/100 x 1.20hour/m^3	0.30hour/m^3
	Total labour constant		3.24hour/m^3
	Labour rate for excavate, remove and disposal of 1m^3		
	$\frac{\text{3.24hour x RM55.00}}{8}$		RM22.28
2.	Overhead cost and profit (10%)	10/100 x RM22.28	RM2.23
Total excavation trench cost for every 1m^3			**RM24.51**

TUTORIAL 1
EXCAVATION BY HAND

Calculate 1m³ manual excavation of trench not exceeding 1.50 m deep and dumping to an average distance 100m away from site.	
Excavating trench/ditch not exceeding 1.5m deep	1.74 hour/m³
Dumping of soil 100m away from site	1.20 hour/m³
Increased volume of soil after excavation	25%
Overhead cost and profit	10%
Labour cost for excavating and dumping per day (8 hours)	RM40.00

TUTORIAL 1 ANSWER

Scan me

EXCAVATION BY MACHINE CALCULATION

Calculate 1m³ excavation work starting from ground level exceeding 1.50 m deep and not exceeding 3.00m deep.	
Rental rate	RM80.00/hour
Machine operator	2 persons
Labour	2 persons
Machine operator cost	RM6.00/hour
Labour cost	RM3.00/hour
Diesel consumed	5.00liter/hour
Lubricant oil consumed	2.50liter/hour
Cost of diesel	RM3.15/litre
Cost of lubricant oil	RM25.00/litre
Production capability	25.25m³/hour
Overhead cost and profit	10%
Product capability is capability of mixer to mix the concrete within 1 hour	

SOLUTION

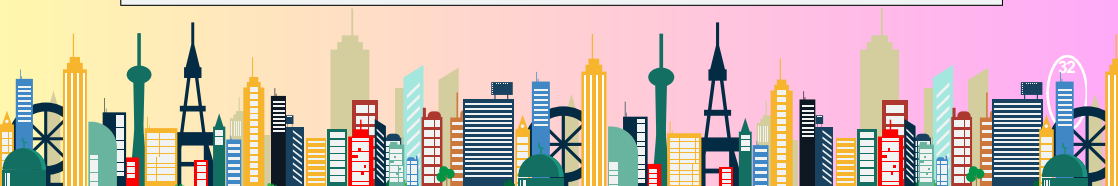
1.	Machinery cost		
	Rental rate per hour		**RM80.00**
2.	Labour cost		
	Machine operator	2 persons x RM6.00	RM12.00
	Labour	2 persons x RM3.00	RM6.00
	Total labour cost		**RM18.00**
3.	Oil cost		
	Diesel	5litre x RM 3.15	RM15.75
	Lubricant oil	2.5litre x RM25.00	RM62.50
Total oil cost			**RM78.25**

SOLUTION (CONT'D)

	Total material + labour + oil		
	RM80.00+RM18.00+RM78.25		RM176.25
4.	Production capability		
	Production capability	25.25m^3/hour	
	Machinery cost	25.25m^3 soil	
		25.25m^3/hour	RM176.25
		1m^3 = RM176.25/25.25	
	Excavation cost for 1m^3		RM6.98
5.	Overhead cost and profit	10/100 x RM6.98	RM0.70
Price rate for 1 m^3			**RM7.68**

TUTORIAL 2
EXCAVATION BY MACHINE

Calculate 1m³ excavation work starting from ground level exceeding 1.50 m deep and not exceeding 3.00m deep.	
Rental rate	RM80.00/hour
Machine operator	1 person
Labour	2 persons
Machine operator cost	RM6.00/hour
Labour cost	RM3.00/hour
Diesel consumed	5.00liter/hour
Lubricant oil consumed	2.50liter/hour
Cost of diesel	RM3.50/litre
Cost of lubricant oil	RM30.00/litre
Production capability	19.22m³/hour
Overhead cost and profit	15%
Product capability is capability of mixer to mix the concrete within 1 hour	



TUTORIAL 2 ANSWER

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CHAPTER 2
CONCRETE WORK

INTRODUCTION

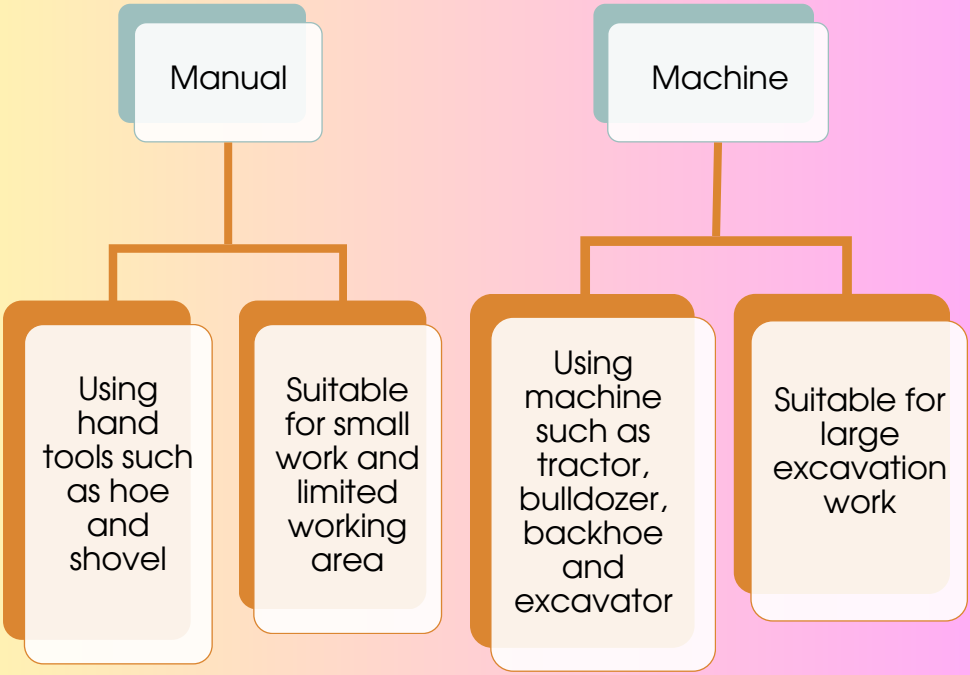
Concrete work is one of the main construction works of a building

The way this work is handled depends a lot on the quantity and conditions of the work

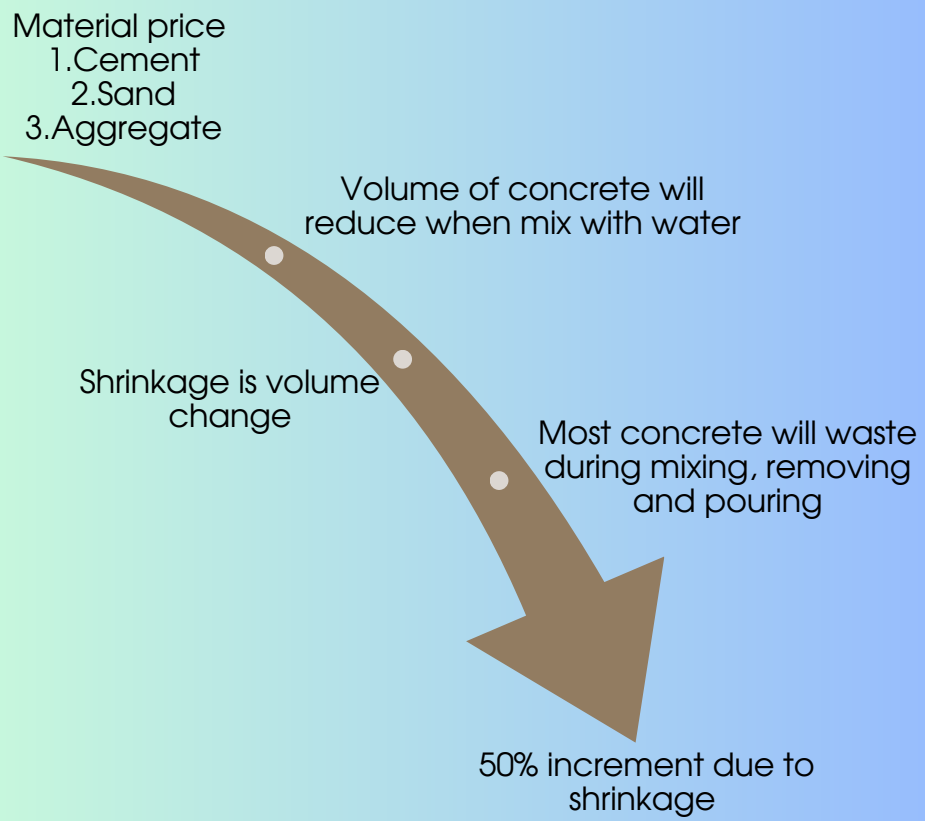
The contractor can prepare concrete by mixing it by hand or using a concrete mixer or with ready-mixed concrete

Source: Ahamad Abdullah (2006) page 151

BUILT-UP COST FOR CONCRETE WORK



CALCULATION



TUTORIAL 1

CONCRETE WORK BY HAND

Calculate build up cost of mixing concrete manually: concrete (1:2:4-20mm aggregates) for ground beam; transport and cast into formwork.	
1m³ cement	28.7 bags
Price of cement bag	RM15.00
Price of 1m³ sand	RM25.00
Price of 1 m³ aggregate	RM35.00
Increase in volume due to shrinkage, wastage and compaction of concrete	50%
Overhead cost and profit	15%
Labour cost for 1 worker per day (8 hours)	RM80.00
Labour constant for mixing, transporting, casting and compacting concrete into formwork per day (8 hours)	8.75hour/m³

CONCRETE WORK BY HAND CALCULATION

Calculate build up cost of mixing concrete manually: concrete (1:2:4-20mm aggregates) for ground beam; transport and cast into formwork.	
1m³ cement	28.7 bags
Price of cement bag	RM20.00
Price of 1m³ sand	RM25.00
Price of 1 m³ aggregate	RM35.00
Increase in volume due to shrinkage, wastage and compaction of concrete	50%
Overhead cost and profit	5%
Labour cost for 1 worker per day (8 hours)	RM75.00
Labour constant for mixing, transporting, casting and compacting concrete into formwork per day (8 hours)	7.75hour/m³

SOLUTION

1.	Material cost		
	1m³ of cement x 28.7 bags x RM20.00		RM574.00
	2m³ of sand x RM25.00		RM50.00
	4m³ of aggregate x RM35.00		RM140.00
	7m³ concrete material		RM764.00
	50% increment due to shrinkage, wastage and compaction		
	50/100 x RM764.00		RM382.00
	Total cost of materials for 7m³ of concrete		
	RM764.00 + RM382.00		RM1,146.00
	1 m³ of concrete	$\frac{\text{RM1,146.00}}{7}$	**RM163.71**

SOLUTION (CONT'D)

2.	Labour cost		
	Labour constant for mixing, transporting, casting and compacting 1m³ of concrete	7.75hour/ m³	
	7.75 X RM75.00 / 8		RM72.66
3.	Total material cost + labour cost	RM163.71 + RM72.66	**RM236.37**
4.	Overhead cost and profit (5%)		
	5/100 x RM236.37		**RM11.82**
5.	Manual cost rate for 1m³ concrete	RM236.37 + RM11.82	**RM248.19**

TUTORIAL 3

CONCRETE WORK BY HAND

Calculate build up cost of mixing concrete manually: concrete (1:2:4-20mm aggregates) for ground beam; transport and cast into formwork.	
1m³ cement	28.7 bags
Price of cement bag	RM15.00
Price of 1m³ sand	RM25.00
Price of 1 m³ aggregate	RM35.00
Increase in volume due to shrinkage, wastage and compaction of concrete	50%
Overhead cost and profit	15%
Labour cost for 1 worker per day (8 hours)	RM80.00
Labour constant for mixing, transporting, casting and compacting concrete into formwork per day (8 hours)	8.75hour/ m³

TUTORIAL 3 ANSWER

Scan me

CONCRETE WORK BY MACHINE CALCULATION

Calculate built-up rate cost of mixing concrete using concrete mixer using (1:2:4-20mm aggregates).	
Material cost refer example before	RM163.71
Concrete mixer price	RM8,000.00
Production capability of concrete mixer	5.50m³/hour
Rate of transport machinery to the construction site for 5 years	5% of the original price
Bank interest cost per year	8%
Cost of repairing machines for 5 years	10%
No. of days using the machine for a year	200
Diesel consumed per hour	3.00litre/hour
Lubricant oil consumed per day	0.75litre/day
Operator	1 person
Assistants	4 persons

CONCRETE WORK BY MACHINE CALCULATION (CONT'D)

Overhead cost and profit	10%
Working period	8hours/day
Duration of cleaning and maintenance machines	2hours/day
Cost of diesel	RM3.15/litre
Cost of lubricant oil	RM5.00/litre
Labour cost per hour	RM5.00/hour

SOLUTION

1.	Material cost		RM163.71
2.	Capital cost		
	Price of concrete mixer		RM8,000.00
	Interest of capital	8/100 x 5 years x RM8,000.00	RM3,200.00
	Repairing cost	10/100 x RM8,000.00	RM800.00
	Transport cost	5% x RM8,000.00	RM400.00
	Total capital cost for 5 years		
	RM8,000.00 + RM3,200.00 + RM800.00 + RM400.00		RM12,400.00
	Total capital cost per year	$\frac{\text{RM12,400.00}}{5}$	RM2,480.00
	Total capital cost per day	$\frac{\text{RM2,480.00}}{200}$	RM12.40

SOLUTION (CONT'D)

3.	Operating cost		
	Labour cost		
	Labour operator	1 person x 10 hours x RM5.00	RM50.00
	Labour assistants	4 persons x 8 hours x RM5.00	RM160.00
4.	Fuel cost		
	Diesel	3.00 x RM3.15 x 8	RM75.60
	Lubricant oil	0.75 x RM5.00	RM3.75
5.	Daily operating cost	RM50.00 + RM160.00 + RM75.60 + RM3.75	RM289.35
6.	Daily machine cost	RM12.40 + RM289.35	RM301.75

SOLUTION (CONT'D)

7.	Production cost		
	Production capability	5.50m³/hour	
	Daily production capability	8 hours	
		5.50 x 8 hours	44.00m³/day
	Mixing cost for44.00 m³/day concrete	RM301.75	
	Mixing cost for 1m³ concrete	RM301.75 / 44.00	RM6.86
	Total mixing cost for 1m³ concrete	RM163.71 + RM6.86	RM170.57
8.	Overhead cost and profit	10/100 x RM170.57	RM17.06
9.	Cost for 1m³ concrete	RM170.57 + RM17.06	**RM187.63**

TUTORIAL 4
CONCRETE WORK BY MACHINE

Calculate built-up rate cost of mixing concrete using concrete mixer using (1:2:4-20mm aggregates).	
Material cost refer example before	RM132.96
Concrete mixer price	RM6,000.00
Production capability of concrete mixer	4.25m³/hour
Rate of transport machinery to the construction site for 5 years	5% of the original price
Bank interest cost per year	8%
Cost of repairing machines for 5 years	10%
No. of days using the machine for a year	250
Diesel consumed per hour	2.50litre/hour
Lubricant oil consumed per day	0.25litre/day
Operator	1 person
Assistants	4 persons

TUTORIAL 4

CONCRETING WORK BY MACHINE (CONT'D)

Overhead cost and profit	15%
Working period	8hours/day
Duration of cleaning and maintenance machines	1hour/day
Cost of diesel	RM1.50/litre
Cost of lubricant oil	RM5.00/litre
Labour cost per hour	RM4.00/hour

TUTORIAL 4 ANSWER

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CHAPTER 3
BRICKWORK

INTRODUCTION

Brick wall construction is one of the most important parts of construction and often contributes to a large part of the construction cost of a building

This work is done entirely on the construction site requiring lot of types of materials and involving many workers

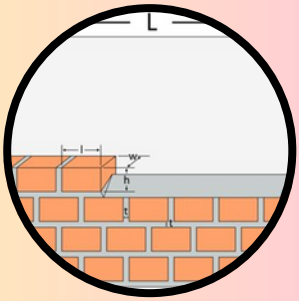
Mortar is needed to bind the bricks and the damp proof course if necessary

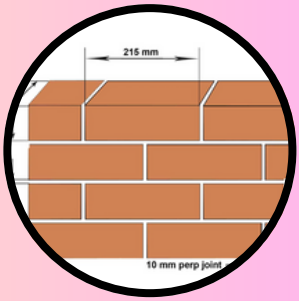
Source: Ahamad Abdullah (2006) page 172

BUILT-UP COST FOR BRICKWORK

Measured in square metre (m^2)

- Material cost Brick and mortar
- Labour cost
- Overhead cost and profit





TIPS OF CALCULATION

How to calculate number of brick

Step 1: measure area of wall

Step 2: measure area of 1 brick

Step 3: measure area of wall/area of 1 brick

Step 4: add 5% wastage

BRICKWORK CALCULATION

Calculate built-up rate cost of 230mm thickness brickwork wall. The price of 1 unit brick is RM1.50 including operating and transporting cost.			
No.	Description	Calculation	Total
1.	Area of wall	2,000mm x 3,000mm	6,000,000mm^2
2.	Area of 1 brick	75 (65 + 10)mm x 225 (215 + 10)mm	16,875mm^2
3.	No. of brick	$\frac{6,000,000}{16,875}$	355.56
4.	Wastage	5/100 x 355.56	17.78
5.	Total	355.56 + 17.78	373.34 = 373 nos

BRICKWORK CALCULATION

1.	Number of bricks required	150 nos (RM1.50/brick)
2.	Mortar required for 1 m^2 brickwork	0.05m^3
3.	Cost of mortar 1:3 per m^2	RM150.00
4.	Labour constant for general worker	1.5hour/m^2
5.	Labour constant for bricklayer	3.0hour/m^2
6.	Labour cost of general worker per hour	RM5.00
7.	Labour cost of bricklayer per hour	RM6.00
8.	Overhead cost and profit	10%
9.	1m^3 cement	28.7 bags
10.	Price of cement bag	RM25.00
11.	Price of 1m^3 sand	RM35.00
12.	Wastage	50%

SOLUTION

1.	Material cost (mortar 1:3)		
	1m³ cement	1 x 28.7 bags x RM25.00	RM717.50
	3m³ sand	3 x RM35.00	RM105.00
	4m³ material	RM717.50 + RM105.00	RM822.50
	50% increment due to shrinkage and wastage	50/100 x RM822.50	RM411.25
	Total cost of material for 4m³ mortar	RM822.50 + RM411.25	RM1,233.75
	1m³ mortar	RM1,233.75/4	RM308.44
	Mortar cost for 1m²		
	1m² = 0.05m³	RM308.44 x 0.05m³	RM15.42

SOLUTION (CONT'D)

2.	Material cost (brick)		
		RM1.50 x 150	RM225.00
	Total material cost (mortar + brick)	RM15.42 + RM225.00	RM240.42
3.	Labour cost		
	Bricklayer	3.0hour x RM6.00	RM18.00
	General worker	1.5hour x RM5.00	RM7.50
	Total labour cost	RM18.00 + RM7.50	RM25.50
	Total cost (material + labour)	RM240.42 + RM25.50	RM265.92
4.	Overhead cost and profit	10/100 x RM265.92	RM26.59
5.	Cost of 1m² brick	RM265.92 + RM26.59	RM292.51

TUTORIAL 5
BRICKWORK

Calculate 1m³ excavation work starting from ground level exceeding 1.50 m deep and not exceeding 3.00m deep.	
Rental rate	RM80.00/hour
Machine operator	1 person
Labour	2 persons
Machine operator cost	RM6.00/hour
Labour cost	RM3.00/hour
Diesel consumed	5.00liter/hour
Lubricant oil consumed	2.50liter/hour
Cost of diesel	RM3.50/litre
Cost of lubricant oil	RM30.00/litre
Production capability	19.22m³/hour
Overhead cost and profit	15%
Product capability is capability of mixer to mix the concrete within 1 hour	

TUTORIAL 5 ANSWER

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CHAPTER 4
REINFORCEMENT WORK

INTRODUCTION

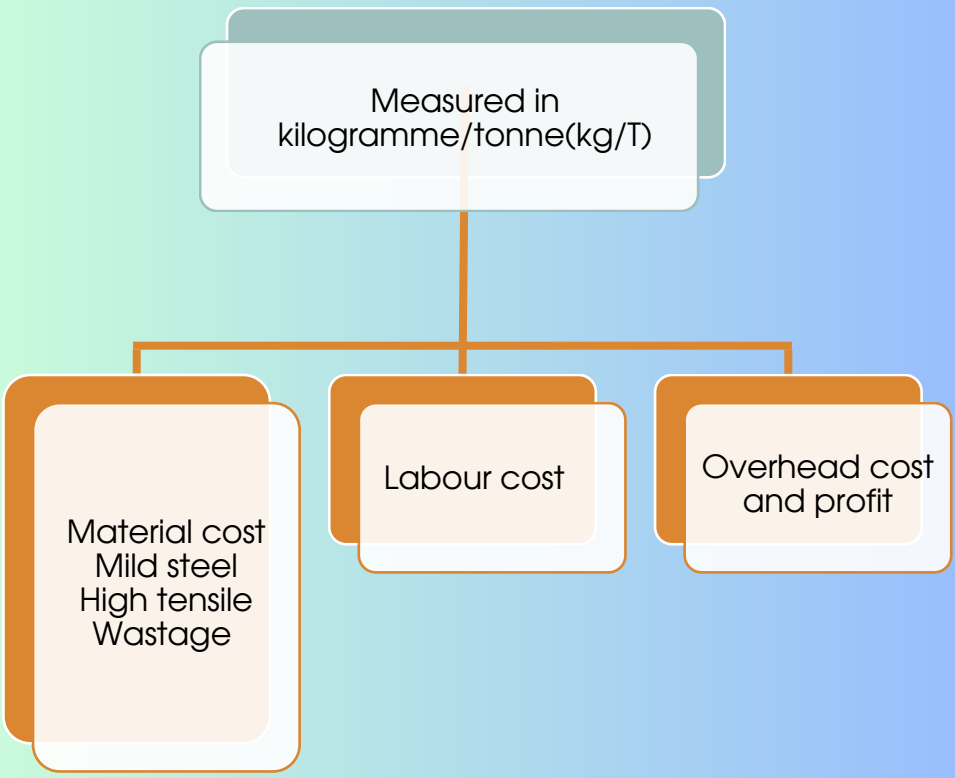
Reinforcement bar consists of medium steel reinforcement and high tensile steel

An addition of 5% on the cost of bar reinforcement is necessary to take into account the wastage

The labour constant for this job is 1.50 hours for 1 tonne of reinforcement bars

Source: Ahamad Abdullah (2006) page 161&162

BUILT-UP COST FOR REINFORCEMENT WORK



REINFORCEMENT WORK

Calculate built-up rate cost of reinforcement work including cutting, bending and placing.

Calculate the price of 1kg reinforcement work.

REINFORCEMENT WORK CALCULATION

Calculate built-up rate cost of 1kg reinforcement work including cutting, bending and placing.		
1.	Cost of 1 tonne bar reinforcement with 10mm dia.	RM5,570.00
2.	Labour cost of skilled worker per day	RM75.00
3.	Labour cost of general worker per day	RM60.00
4.	Labour constant for cutting and bending of 50kg	3.5hour
5.	Labour constant for removing and placing of 50kg	3.5hour
6.	Overhead cost and profit	10%
7.	Wastage	5%

SOLUTION

1.	Material cost		
	1tonne (1000kg) reinforcement bar		RM5,570.00
	50kg	$\frac{5,570 \times 50}{1000}$	RM278.50
	5% increment due to wastage	5/100 x RM278.50	RM13.93
	Total material cost (50kg)	RM278.50 + RM13.93	**RM292.43**
2.	Labour cost		
	Skilled worker per hour	RM75.00/8	RM9.38
	General worker per hour	RM65.00/8	RM8.13

SOLUTION (CONT'D)

	Skilled worker	4.00 x RM9.38	RM37.52
	General worker	4.00 x RM8.13	RM32.25
	Total labour cost (50kg)		
	RM37.52 + RM32.25		RM69.77
	Total cost (material + labour)		
	RM292.43 + RM69.77		**RM362.20**
	Total cost of 1 kg	$\frac{\text{RM362.20}}{50}$	**RM7.24**
3.	Overhead cost and profit	$\frac{10 \times \text{RM7.24}}{100}$	RM0.72
4.	Total cost of 1kg reinforcement work		
	RM7.24 + RM0.72		**RM7.96**

TUTORIAL 6
REINFORCEMENT WORK

Calculate built-up rate cost of 1kg reinforcement work including cutting, bending and placing.		
1.	Cost of 1 tonne bar reinforcement with 10mm dia.	RM3,570.00
2.	Labour cost of skilled worker per day	RM80.00
3.	Labour cost of general worker per day	RM60.00
4.	Labour constant for cutting and bending of 50kg	3.5hour
5.	Labour constant for removing and placing of 50kg	3.5hour
6.	Overhead cost and profit	15%
7.	Wastage	5%

TUTORIAL 6 ANSWER

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SUMMARY

SUMMARY

BUILD-UP RATE METHOD

EXCAVATION WORK

CONCRETE WORK

BRICKWORK

REINFORCEMENT WORK

“IF YOU DO NOT LIKE TO READ,
YOU HAVE NOT FOUND THE RIGHT BOOK”

<J.K. ROWLING>

ASSESSMENT

EXERCISE 1
CONCRETE WORK BY MACHINE

Based on the data below, calculate the build-up rate of 1m³ concrete work using machinery mixer.	
Concrete ratio	1:3:6 – 20mm aggregate
1m³ cement	28.7 bags
1 bag of cement	RM20.50
1m³ sand	RM25.50
1m³ coarse aggregate	RM35.50
Increase in volume due to shrinkage, wastage and compaction	50%
Original price of machine	RM25,000.00
Investment return of capital rate	10% per annual for 5 years
Repairing cost for 5 years	10%
Transportation cost for 5 years	8%
Machine working	265 days
Rate machine capability	4m³ /hour
Labour cost	RM60.00/day
Operator	1 person
Labour	3 persons
Labour constant: mixing, transport, casting and compacting per day	8hours/m3
Diesel	RM3.35 litre@20 litre/day
Lubricant	RM6.00/litre@4 litre/day
Overhead cost and profit	15%

TIPS OF CALCULATION

1. Calculate the material cost

2. Calculate the labour cost

3. Total up the material cost and labour cost

4. Calculate the overhead cost and profit

5. Total up the cost for 1m^3 concrete work manually

EXERCISE 2

CONCRETE WORK BY MANUAL

Based on the data below, calculate the build-up cost 1m³ concrete of pad footing work manually.	
Concrete ratio	1:2:4 – 20mm aggregate
1m³ cement	28.7 bags
1 bag of cement	RM19.00
1m³ sand	RM25.00
1m³ coarse aggregate	RM35.00
Labour cost	RM60.00/day
Labour	2 persons
Increase in volume due to shrinkage, wastage and compaction	50%
Labour constant: mixing, transport, casting and compacting per day	8hours/m3

TIPS OF CALCULATION

1. Calculate the material cost

2. Calculate the labour cost

3. Calculate the capital cost (purchase/ rental)

4.Calculate the fuel cost

5. Total up the labour + fuel + capital cost

6. Total up the cost for 1m³ concrete work manually

7. Calculate the production cost

8. Calculate the overhead cost and profit

9. Cost for 1m³ concrete work by machine

EXERCISE 3

EXCAVATION WORK

Based on the data below, calculate the build-up cost for manual excavation of ditch work not exceeding 1.50m depth and dumping to average distance 100m away from the site.	
Excavating ditch not exceeding 1.50m deep	1.74hour/m^3
Dumping of soil 100m away	1.20 hour/m^3
Increase volume of soil after excavation	25%
Labour cost	RM60.00
Working hour	8hours/day
Overhead cost and profit	10%

EXERCISE 4

EXCAVATION WORK

Based on the data below, calculate the build-up rate of 1m³ excavation starting from the ground level more than 1.50m but not exceeding 3.00m depth.	
Rental rate	RM8,500.00
Machine operator	1 person
Labour	1 person
Machine operator cost	RM10.00/hour
Labour cost	RM8.00/hour
Diesel	4.50 litre/hour
Lubricant	0.50 litre/hour
Cost of diesel	RM3.35/litre
Cost of lubricant	RM30.00/litre
Production capability	18.50m³/hour
Overhead cost and profit	15%

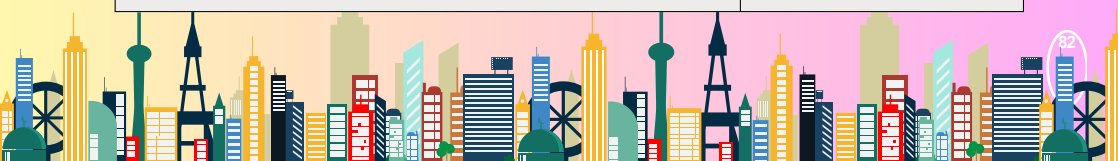
EXERCISE 5
BRICKWORK

Calculate the cost of brickwork, given the price of 1 unit of brick is RM1.10 including operating and transporting costs.	
Area of wall	3500mm x 3200mm
Cost of mortar 1:3 for $1m^3$	RM80.00
Labour constant for general worker	1.5 hour/m^2
Labour constant for bricklayer	2.5 hour/m^2
Labour cost of general worker per hour	RM4.00
Labour cost of bricklayer per hour	RM6.00
Overhead cost and profit	10%
Wastage	5%

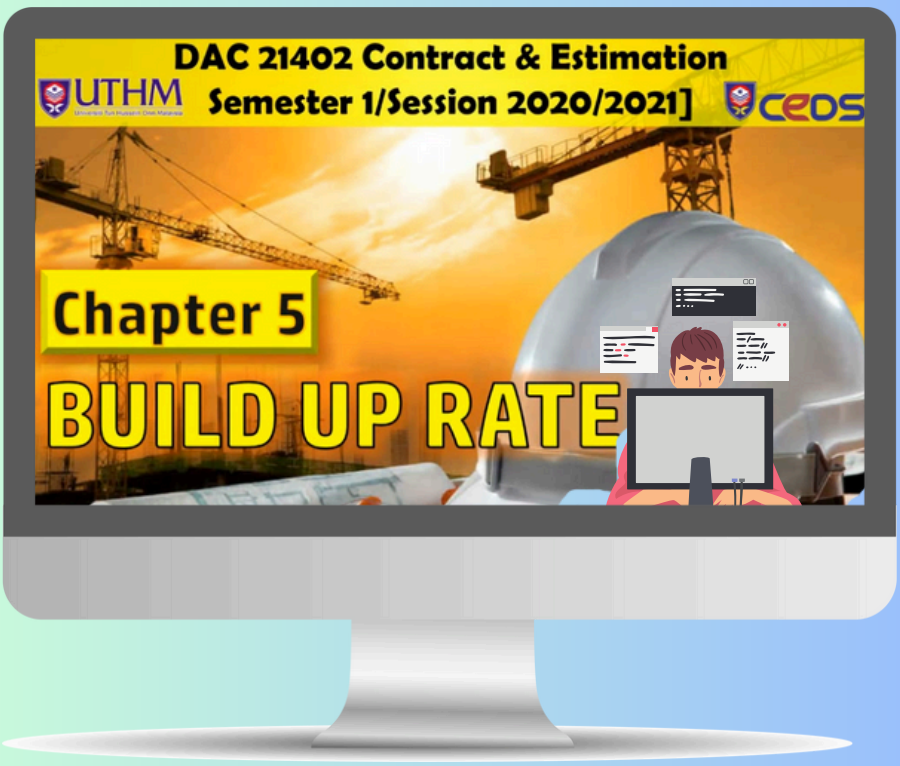
EXERCISE 6

REINFORCEMENT WORK

Calculate the price rate of 1kg reinforcement works by using the data given.	
Reinforcement (R12)/tonne	RM4,350.00
Skilled labour/day	RM80.00
General labour/day	RM60.00
Cutting and bending 50kg bar	2.30 hour
Lifting and fixing 50kg bar	2.15 hour
Wastage	5%
Working hours per day	8 hours
Overhead cost and profit	15%



ADDITIONAL INFORMATION



https://www.youtube.com/watch?v=C78XzP0okeA&t=132s

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MIND TEST

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https://create.kahoot.it/share/build-up-rate-method/d7ec6358-5fb1-4939-a44e-7f3e584059c6

FEEDBACK

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“KNOWING IS NOT ENOUGH; WE MUST APPLY.
WILLING IS NOT ENOUGH; WE MUST DO.”

JOHANN WOLFGANG VON GOETHE

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