GEEM 445

Engineering Ethics and Professional Practices



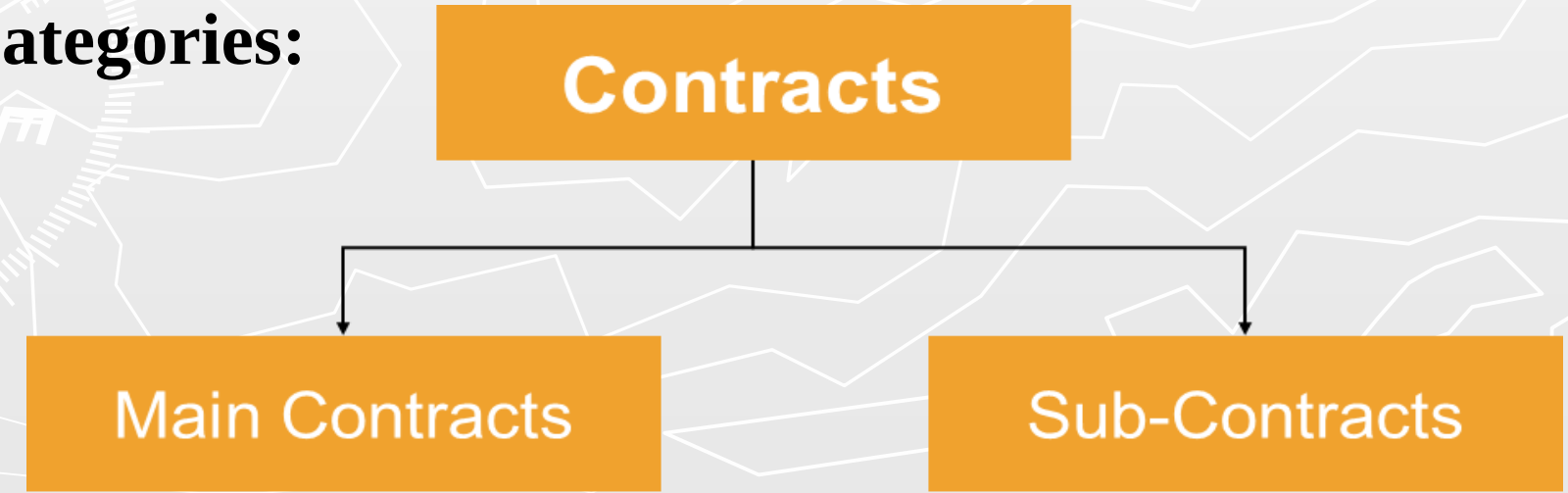
What we are going to learn today?

- **What is a Contract?**
- **Classification of contract.**

Definition of Contract:

- A contract is an **agreement** between two or more than two parties (individuals or organizations) **to perform or not to perform** certain acts.
- This agreement ie. contract **must also be enforceable by law.**

Major Categories:



Main Contracts:

- Refer to the **primary legal agreements** between a client (or employer) and a contractor (or engineer) that **outline** the scope of work, **payment terms**, **timelines**, and **other essential obligations** for a specific engineering project.

- **Define** the fundamental relationship and responsibilities for the execution of the engineering project.

Subcontract

- An agreement where a main contractor, having secured a larger project, **delegates specific tasks** or portions of the work to another company or individual, known as a subcontractor.

- Subcontractor then **performs these tasks according** to the terms outlined in their subcontract agreement with the main

Classification of Contract :

- **Admeasurement Contract**
- **Cost Reimbursement contract**
- **Fixed Price or Lump-Sum Contract**
- **Turn key Contract**
- **Design Build Contract**
- **Design Build Operate Contract (Public Private Partnership Contract)**

Question: Briefly describe the different classification of contract.

What is admeasurement of contract? Describe the types of admeasurement contract.

Admeasurement contract:

- In this type of contracting, **items of work are specified in Bills of Quantities or Schedule of Rates.**
- Contractor then **specifies rates** against each item.
- Rates **include risk contingency**.
- Contract **offers a facility for the client to introduce changes** in the work defined in the tender documents.
- Contractor **can claim additional payment** for any changes in the work content of the contract.
- **Tender price is usually increased** by variations and claims.

S.N.	Description	Unit	Quantity	Rate per unit		Total Amount	Remarks
				In Figure	In words		
1	E/w Excavation of soft clay & silty soil including disposal upto 10m lead & 1.5 m lift	cum	414.00	72.29	Seventy two and twinty nine paisa only	29,928.06	
3	Structure back filling works 15 cm layer ways compaction two third of quantity	cum	136.17	118.75	One hundred eighteen and seventy Five paisa	16,170.19	
5	Boulder solling works with supplying of materials	cum	1.20	1446.12	One thausand four hundred fourty six and	1,735.34	
6	P.C.C. 1:3:6 work with materials all complete	cum	0.96	10438.95	Ten thausand four hundre	10,021.39	
7	P.C.C. 1:2:4 work with materials all complete	cum	12.00	11935.64	Eleven thausand nine hundred thirty five and	143,227.68	
8	Supply of form work with shuttering, staging etc. and erecting, fitting, fixing, centering etc all complete including dismantling as per drawing and specification	sq.m	121.00	715.82	Seven hundred fifteen and eight two paisa only	86,614.22	
9	Renforcment steel work for curtoff wall with supllying ,cutting , bending , binding , placing all comlete	kg	594.33	91.77	Ninety one and Seventy seven paisa only	54,541.66	
					Total = NRs.	**342,238.54**	
					Payle Amount	**285,000.00**	
					Contribution	57,238.54	

How to prepare BILL OF QUANTITY (BOQ) of any construction work

S.N.	Description	Unit	Quantity	Rate per unit		Total Amount	Remarks
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Two forms of admeasurement contract are usually used:

-bill of quantities and

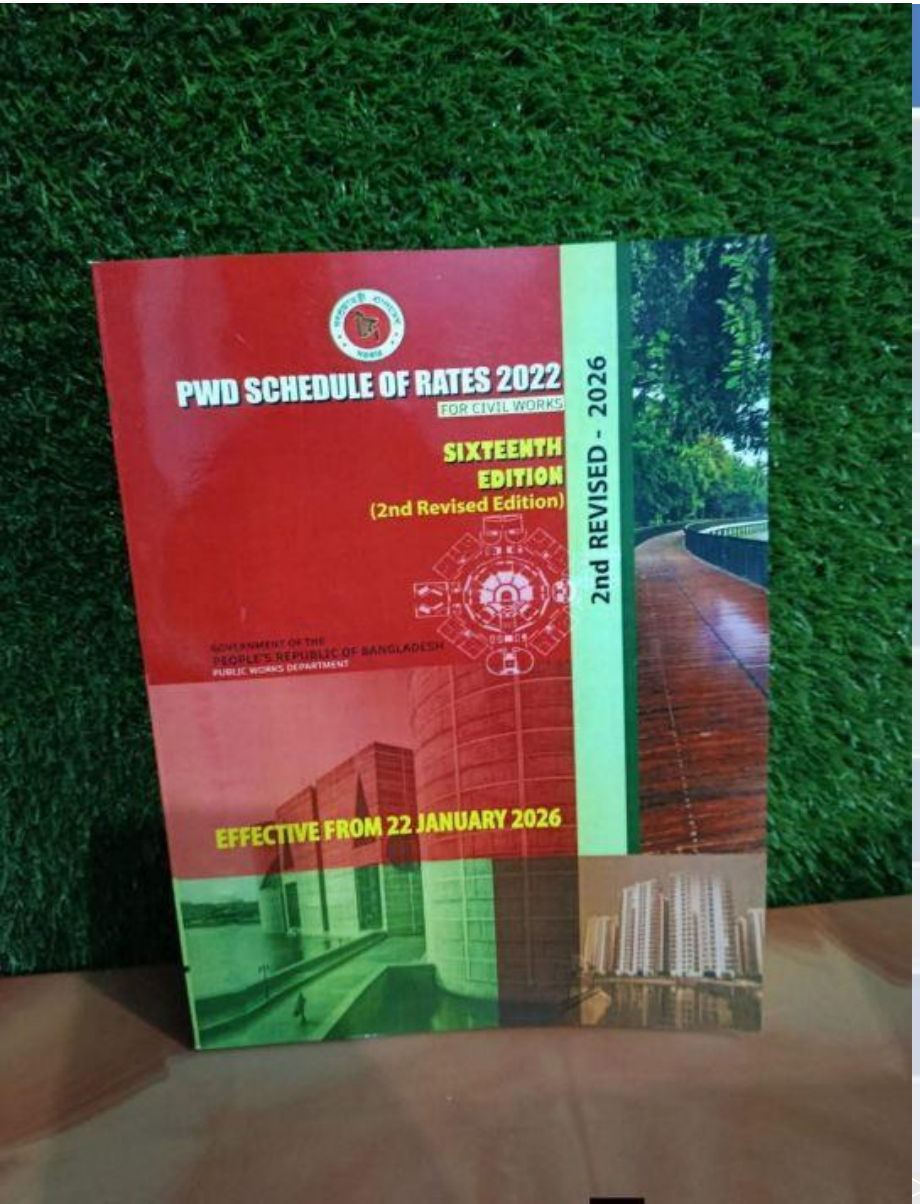
-schedule of rates

Bill of Quantities Contract:

- Tenderers **enter rates against each item** of the estimated quantities of work.

- Quantities are **re-measured during the course of the contract**, **valued at the tendered rates** and the contract **price adjusted** accordingly.

Section 6. Schedule of Works including Technical Specifications



Sr no.	Type of labors	Rates (per day)
1	Mistry	400
2	Mason	300
3	Male labor	200
4	Female labor	180
5	Carpenter	300
6	Blacksmith	300
7	Painter	250
8	White Washer	200
9	Plumber	300
10	Watch Man	200

Schedule of Rates Contract (SOR):

- Schedule of Rates (SOR)is an **agreed upon list** of what services, materials, or **prices are expected to be for a specific period**.

- Contains **inaccurate quantities of work**, possibly with upper and lower probable limits.

- It is common for **separate rates to be quoted for labor, plant, and materials.**

- **Contract price is derived** by measuring the **man-hours**, **plant-hours** and the **quantities of materials** actually consumed, and then **pricing them** at the tendered price.

- Contract is best **suitable for repetitive works**.

Analysis of Schedule or rate items – Example

Schedule Item : 1-1

Unit : Per Cubic metre

Excavation in any soil upto 1.5 M depth in Foundation soil pipe trenches upto 1.5 m side in Shafts wells and in dependent holes upto 30 Sqm within 10 Metre all as spd.

Analysis for 1 Cum Soil

A.	Cost of Labour	
I.	Skilled Labour = 0.18 Nos @ Tk. 400/Nos	Tk. 72.00
II.	Labour Un-skilled = 0.35 @ Tk. 300/Nos	Tk. 105.00
III.	Rent/Hire charge for hand tools 0.5 Hrs @ Tk. 5.00/Hour	Tk. 2.50
		Tk. 179.50
	Add 10% Contractor profit	Tk. 17.95
	Add 3.50% over head expenses	Tk. 6.28
		Tk.203.73
	Add 5.50% Vat	Tk. 11.20
		Tk.214.93

Say Tk=215.00

Analysis for per Cum

A.	**Materials supplied by the Dept**			
	1.	Cement	97.11 kg @ Tk. 7.50/Kg	Tk. 728.32
B.	**Materials supplied by the Contractor**			
	i.	1st class Bricks	406 Nos @ Tk. 8000/M.Nos	Tk. 3,248.00
	ii.	Sand (FM 1.00)	0.277 CUM @ Tk. 650/CUM	Tk. 180.05
	iii.	T&P rent	0.25 Hour @ Tk. 25/hour	Tk. 6.25
	iv.	Hire/rent for scapholding (Bamboo & planks) 2 Sqm @ Tk. 4.00/Sqm		Tk. 8.00
C.	**Labour & Carrying**			
	i.	Unskilled labour for carrying of cement	= 0.54 Nos @ Tk. 300/Each	Tk. 16.20
	ii.	Head Mason	= 0.10 No @ Tk 525/Each	Tk. 52.50
	iii.	Mason	= 0.25 No @ Tk. 500/Each	Tk. 125.00
	iv.	Labour skilled	= 0.5 No @ Tk. 400/Each	Tk. 200.00
	v.	Labour Unskilled	= 0.04 Nos @ Tk. 300/Each	Tk. 12.00
	vi.	Labour (Unskilled) for curing	= 0.17 Nos @ Tk. 300/Each	Tk. 51.00
			Total of A+B+C =	Tk.4,627.32
			Add 10% Contractor profit except cement	Tk. 389.90
			Add 3.50% over head expenditure except cement	Tk. 136.46
				Tk. 5153.68
			Add 5.50% Vat	Tk. 283.45
				Tk. 5437.13

Say Tk= 5437.00

Write down the advantages of admeasurement contract.

Advantages of Admeasurement contract:

- Contractor is **paid for the amount of actual work** he does.
- There is a **freedom for the alteration of work**.
- **Adjudication of tenderer** is relatively easy in that **all tenders are priced on a comparable basis**
- Tenderer is **given a clear conception of the work involved by the way of bills.**

What is cost-reimbursable contract?

Cost-Reimbursable Contracts:

- All the **costs that the seller/contractors incurs during the project are charged back** by the buyer/Procuring Entity(PE).
- **Costs** which are allowable will be **defined** in the contract.
- **More risk is carried by the buyer/PE** as the **final cost is uncertain**.
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- Advantage to the buyer/PE is that obviously **scope changes can be easily made** to the work being done.
- One **problem** is that the **seller/contractor has very little incentive** to be efficient and productive and complete the work quickly**.**
- Most often used when **there is a lot of uncertainty associated with the final deliverable.**

Briefly describe the different types of cost reimbursement contract.

Types of cost-reimbursable contracts : Three kinds of cost-reimbursable contracts :

- **Cost plus fixed fee (CPFF)**
- **Cost plus percentage fee (CPPF)**
- **Cost plus fluctuating fee (CPFF)**

Cost plus fixed fee (CPFF) Contract

- Here the **contractor's fee is fixed** and **does not fluctuate with actual cost of work**.

Cost plus percentage of fee (CPPF) Contract:

- Contract is given **on certain percentage** over the actual cost of construction.

- **Example**: Total cost plus 15% of the cost as a fee to the **contractor**.

Cost plus fluctuating fee (CPFF):

- Construction company has their actual **costs** covered and the **fee** is based on **some form of sliding scale**.

- **Example:** More **costs** and time the **company saves**, the **higher the lump sum fee** (payment) will be in the end.

Fixed Price or Lump Sum Contracts

- **Contractor offers to do the whole work** as shown in drawings and described by specifications, **for a total stipulated sum of money.**
- Upon the completion of work, a **fixed lump sum amount is paid to the contractor.**
- In large projects, **part payments** are made to the contractor at different stages of work on money agreed terms.
- In case the **contractor stops the work in between** he is not entitled for any further payment

Design Build Contract

- **A single organization** is responsible for **performing both design and construction** and, in some cases, providing certain "**know-how**" for the project.

- **Cost may not be known** until end of the construction.

Turn key Contract:

- Approach is **similar to the design-build approach** but with the organization being responsible for **performing both design, construction**, **know-how** (if any), and **project financing**.

- **Owner payment is made at the completion** (when the contractor **turns over** the "key").

Turn Over - start or continue to run properly

Partial Turnkey Contract:

- **Employer** is given the **responsibility of contracting separately** and probably more cheaply for the **ancillary works.**

- **Employer** has the **responsibility of coordinating his work** with that of the turnkey contractor.

- If the **ancillary work is delayed** implementation of whole project is delayed and the **employer have to pay for delay** to the turnkey contractor.

Design Build Operate Contract (PPP Contract)

- Developed since 1992 to **reduce the financial burden on the public purse**.
- **Process is known** as Private Public Partnership (PPP).
- A **subset of PPP** is Private Finance Initiative (PFI).
- Contracts have a number of variations but their **main purpose is for the private sector to take most if not all the financial risk** and **employ their** specialized knowledge and commercial experience, not always available in the **public sector**.

A private finance initiative is **a way** for the public sector to finance big public works projects through the private sector.

Important Features of PPP Contract:

- **Contractor finances the whole project** from his own resources and **recoups the cost and profit** from the **operating revenues** or from **levies** charged on the public sector organization that awarded the contract.

- Contractor is **not chosen on the basis of the cheapest price**, but **on**
  - **the viability** of his **business case**,
  - **design concept**,
  - **experience**,
  - **technical expertise**,
  - **track record** and
  - **financial backing**.

- In many cases the **contractor leads a consortium** of
  - **specialist** contractors,
  - design **consultants** and
  - financial **institutions**.

Types – Public Private Partnership

Free standing

- A typical example of this type of PPP contract is:

  -where the **public authority drafts a performance specification** for a **new bridge** and

  -asks a number of large contractors to **submit costed schemes**.

- **Successful contractor** then

  -designs,

  -builds,

  -maintains and

  -operate the bridge for a specified period.

- **During this operating period**, the cost and profit are **recovered by the contractor/operator from tolls** charged for the crossing.

- **Contractor carries the risk** that the volume of traffic **will not reach the anticipated levels to yield** the required revenues, possibly because the **end user**, the general public, considers the tolls to be too high.

Levies on the public sector

- An example of such a contract is where the Government requires **a new prison**.

- **Successful contractor designs and builds the prison** to the client's specification and **operates it** in accordance with the standards laid down by the prison service.

- As the end, the prisoners can hardly be expected to pay rent, **an operating levy is charged on the prison service** to cover building, financing and operating costs plus profit

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Joint Ventures

- Joint venture Public Private Partnership (PPP) projects are often **used for road construction** where there are **no toll** charges on the road users.

- Here the **design and construction costs are shared by an agreed amount by the public and private sector** and the **contractor recovers his costs by a fee based on a benefit/revenue formula** agreed in advance.

Advantages of PPP Project

- Investment decisions tend to be **based on a long term view rather than short-term concerns.**

- **Risk and work are transferred to the party/Firms** which is **best able to manage it** at the least cost, achieving best value.

- **Projects go through a competitive pricing process**, meaning that the cost of public services is benchmarked against market standards

Disadvantages of PPP Project

- Number of parties involved and the long-term nature of their relationships often **result in complicated contracts and complex negotiations**, and therefore **high transaction and legal costs.**
- PPP projects can **take years to complete**
- Sometimes a **public sector entity could borrow more cheaply alone** than it could via the private sector.
- There is a **risk that the private sector party will become insolvent or make large profits** during the course of the project – this **can cause political problems** for the public entity

What we have learned today?

- What is a Contract?
- Classification of contract.
  - -Admeasurement Contract
  - -Cost/Reimbursement contract
  - -Fixed Price or Lump-Sum Contract
  - -Design Build Contract
  - -Turn key Contract
  - -Design Build Operate Contract (PPP).

Thanks