International Journal of Engineering Research in Mechanical and Civil Engineering (IJERMCE)

Inference and Interpretation with Classification, and Comparison Of Construction Equipments Prevailing to Site Conditions

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Abstract- — **In the present days with globalization of Indian economy & introduction of multinationals in India for construction activities, it has become foremost to have speedy construction using new technologies & trends in construction equipments. Construction equipments play a vital role in making the project successful with respect to cost & duration required to complete it. Conventional methods viz. adopting manual handling of materials, excavation, hauling, loading & unloading cannot cope up with demand of infrastructural facilities with high degree of quality control & assurance thus extending the duration of project. Though conventional method proves to be economical but fails in providing required number of dwellings in time. Thus latest construction equipments with new technologies have eliminated these drawbacks thereby permitting speedy excavation, loading, unloading & hauling with reduction in time & labor cost. Thus it has become an important task to develop the automated services in this sector too whereby it will be covered by studying, classifying & detailing the construction equipments.**

Keywords: **- Construction Equipments, Equipment selection.**

I. INTRODUCTION

Construction of any projects include basic operations such as Excavation, Digging of large quantities of earth, Moving them to fairly long distances, Placement, Compacting, Leveling, Dozing, Grading, Hauling, Construction equipments play an important role in construction sector. Proper selection and allocation of equipments at site enhance time management activity at site. Construction equipments are important focus centers at site for proper cash flow at project & maintain quality of work at site. The need for Mechanization arises due to the following reasons:

1) Material handling in large quantities at high rise building & major projects.
2) Optimum use of Material, Manpower and Finance.
3) High grade materials increasing complexity of Projects

Construction equipment is an important part of any construction process. It is not always desirable or possible for the Contractor to own each and every type of Construction Equipment required for the Project. Considering the various aspects of the utility of particular Equipment, the Contractor has to economically justify whether to purchase the Equipment or to hire it.

II. BRIEF DESCRIPTION OF FACTORS TO BE CONSIDERED WHILE SELECTING EQUIPMENTS-

Typically, construction equipment is used to perform essentially repetitive operations, and can be broadly classified according to two basic functions:

1. Operators such as cranes, graders, etc. which stay within the confines of the construction site.

2. Haulers such as dump trucks, ready mixed concrete truck, etc. which transport materials to and from the site. In both cases, the cycle of a piece of equipment is a sequence of tasks which is repeated to produce a unit of output.

III. CLASSIFICATION OF EQUIPMENTS

The basic operations involved in the construction of any Project are Excavation, Digging of large quantities of earth, Moving them to fairly long distances, Placement,

Compacting, Leveling, Dozing, Grading, Hauling, etc. Construction Equipment can be classified as under:

1. Excavating Equipment a. Power Shovel b. Dragline c. Hoe 2. Earthmoving Equipment 3. Hauling Equipment 4. Hoisting Equipment a. Tower Cranes b. Mobile Cranes c. Crawler Mounted Cranes d. Builders Hoist e. Passenger Hoist	5. Conveying Equipment 6. Dredging Equipment 7. Pumping Equipment 8. Compacting Equipment 9. Pile Driving Equipment 10. Drilling Equipment 11. Equipment used for the Production of Aggregate 12. Equipments used in Hot Mix Batch Plant 13. Equipments used for Concrete Works 14. Material Testing Equipments

IV. NEED TO FOCUS ON CONSTRUCTION EQUIPMENT ISSUES ON SITE-

Construction equipments though an important part of construction projects are ever ignored by owner & engineers thus leading to following problems as below-

i) Expenditure of more amount of finance by contractors.

ii) Increased duration of project as a result of unavailability of skilled labors for equipment operation.

iii) Risk in construction projects as a result of unavailability of equipments spare parts & maintenance.

iv) Unnecessary inculcated cost in improper equipment selection leading to extra labor & equipment cost.

Thus it has become a foremost need to avoid these risks in project & extra cost by detail studying & making available all required specifications to common people.

V. METHOD OF ANALYSIS

1) Classification& study of construction equipments according to their work & family classes.

- The construction equipments focus centre of work is primary stage classified & studied in detail so as provide a datum to project.
- Various equipments have been considered for detail view of all classes of equipments use in construction from primary stage of planning of project till concreting phase.

2) Select sites & consultancies to gather construction equipment details.

3) Collection of data from site& office.

- After the selection of sites & consultancies further the approach towards these locations is carried out for collection of details such as Cost of equipments, Duration of work & the working efficiency.

4) Preparing excel sheet giving all details of cost, duration & efficiency of equipments.

- After the overall data collection, the collected data is plotted in MS Excel sheet.

VI. DATA COLLECTION

1. Material Handling Equipments :

- The details of material handling equipments are collected from various sites & consultancies.
- The data with respect to rates, work duration & load carriying capacity is collected.
- Further various cost & working capacity range will be considered as input.

Table No.1

SR NO	CLASS	TYPE OF EQUIPMENT	COMPONENT	EQUIPMENTS	BASIC PURCHASE COST EXCLUDING ED AND GST/VAT	WORK DURATION (HRS)	LOAD CARRYING CAPACITY
1	MATERIAL HANDLING EQUIP	PASSENGER CUM MATERIAL LIFT	PASSENGER CUM MATERIAL LIFT CABIN	Speedo 101-delux (5HPx2Nos) (Suitable for maximum 60 mtr	8,32,000	8 hrs	800 Kg
2				Speedo 101 (12.5HPx2Nos)	10,10,000		1000 Kg
3				Speedo 101.2 (12.5HPx2Nos)	10,50,000		1200 Kg
4				Speedo 101.5 (12.5HPx2Nos)	11,25,000		1500 Kg
5				Speedo 102 Ton (12.5HPx3Nos)	15,25,000		2000 Kg
6				Speedo 201.5 (12.5HPx2Nosx2)	22,10,000		3000 Kg
7				Speedo 202(12.5HPx3Nosx2)	25,90,000		4000 Kg
8				Speedo Urja(7.5 HPx2Nos)	13,50,000		400 Kg
9				Speedo MPMH 101	9,15,000		1000 Kg
10				Speedo MPMH 102	12,40,000		2000 Kg
11			COLUMN	Column SMR 0.8T-Delux	15,500		88 Kg
12				Column TMD 1 T	18,500		90 Kg
13				Column SMR 1.2 T	21,000		120 Kg
14				Column SMR 1.5 T	21,500		130 Kg
15				Column SMD 2 T	23,000		140 Kg
16				Column SMR 1.2 T twin cage	25,000		148 Kg
17				Column SMR 2 T twin cage	26,000		155 Kg
18				H-Frame	12,000		—

(Details of Material Handling Equipments)

2. Concreting Equipments :

- The collected details of materials are classified into two types depending on the working condition & features as follows.
  - a) Concrete mixers
  - b) Batching plant
  - c) Concrete pump
  - d) Boom placer
- Concreting solution-

Table No.2
(Concreting Equipments)

SR NO	CLASS	TYPE OF EQUIPMENT	COMPONENT	EQUIPMENTS	LOAD CARRYING CAPACITY
1	CONCRETING SOLUTIONS	CONCRETE MIXER	100 LTR MIXER	5/3 Concrete Mixer (Hand/Electrical)	5 Cu. Ft. / 3 Cu. Ft.
2			200 LTR MIXER	10/7 GEN X Model	10 Cu. Ft. / 7 Cu. Ft.
3				10/7 Concrete mixer self start	10 Cu. Ft. / 7 Cu. Ft.
4				10/7 concrete mixer hydraulic hopper	10 Cu. Ft. / 7 Cu. Ft.
5				10/7 concrete mixer mechanical hopper	10 Cu. Ft. / 7 Cu. Ft.
6				10/7 Super 09 VH without hopper	10 Cu. Ft. / 7 Cu. Ft.
7				10/7 Concrete mixer cum hoist	10 Cu. Ft. / 7 Cu. Ft.
8		BATCHING PLANT	MOBILE BATCHING PLANT	Pan type plant	22/30 Cu. Mtr/Hr.
9				Reversible type plant	15/20 Cu. Mtr/Hr.
10			STATIONARY BATCHING PLANT	Boom Scraper	20-30/30 Cu.Mtr/Hr.
11				Bin Feeding System	12/15/20 Cu.Mtr/Hr.
12		CONCRETE PUMP	CONCRETE PUMP	Concrete Pump	48/30 and 75/45 Cu. Mtr/Hr.
13		BOOM PLACER	BOOM PLACER	Boom Placer	120/70 and 100 Cu.Mtr/Hr.

3. ***Mechanization Equipments***

- The details of material handling equipments are collected from various sites & consultancies.

Table No.3
(Mechanization Equipments)

SR NO	CLASS	TYPE OF EQUIPMENT	COMPONENT	EQUIPMENTS	WORK DURATION (HRS)	LOAD CARRYING CAPACITY
1	MECHANIZATION SOLUTIONS	COMPACTING SOLUTIONS	CONCRETE COMPACTION	Concrete Compactor	8 hrs	600 kr batch capacity
2			SOIL COMPACTION	Floater		30cm/20 cm compaction & 5 cm jumping stroke
3				Earth Compactor		
4		BAR PROCESSING SOLUTIONS	BAR CUTTING MACHINE	Tamping Rammer		28 mm
5				Bar Cutting UTS 55		42mm/52 mm
6			BAR BENDING MACHINE	Bar Cutting UTS 55		42mm/52mm
7				Bar Bending UTS 65		36 mm
8			BAR CUTTING AND	Bar Cutting and Straightening		50- 65mm/min, xtie traction
9		SAND PURIFYING MACHINES	SAND SCREENING	Rotary Sand Screening		2 Cu. m/hr or 4 Cu.m/hr
10				Vibratory Sand Screening		6 Cu. m/hr
11			SAND WASHING	Portable Sand Washing		6 Cu.m/hr
12				Stationary Sand Washing		15 Cu m. Input Capacity
13		BLOCK MAKING MACHINES	MANUAL	Manual Block Making Machine		400 Blocks/shift
14			VIBRATORY	Vibratory Block Making Machine		640 Blocks/shift
15			AUTORAMMING	Autoramming Block Making Machine		800 Blocks/shift
16			HYDRAULIC	Hydraulic Block Making Machine		400/hr

4. *Excavation Equipment -*

- The collected details of materials are classified into two types depending on the working condition & features as follows.

Table No.4
(JCB Excavators)

SR NO	CLASS	TYPE OF EQUIPMENT	COMPONENT	EQUIPMENTS	BASIC PURCHASE COST (RS)	MAX DIG DEPTH (M)	MAX WORK HEIGHT (M)	MAX DUMP HEIGHT(M)	LOAD OVER HEIGHT (M)	BELOW GROUND DIG DEPTH(M)	DUMP ANGLE (DEGREE)
1	EXCAVATORS	JCB	BACKHOE LOADER & FRONT EXCAVATOR	JCB 2DX	1450000	3.02	3.88	2.2	2.81	0.1	48
2				JCB 3DX	1950000	4.77	5.97	2.74	3.23	0.07	43
3				JCB 3DX XTRA	2350000	5.05	6.01	2.93	3.37	0.12	41
4				JCB 430 ZX	2486000	0.086	1.22	2.806	3.453		45

Table No.5
(Drilling & Balsting Equipments)

SR NO	CLASS	TYPE OF EQUIPMENT	COMPONENT	BASIC PURCHASE COST (RS)	CAPACITY
1	EXCAVATORS	DRILLING	TRACTOR + COMPRESSOR + JACK HAMMER	750000	2.5 ft - 12 ft
2		BLASTING	JELLETIN	5000/BOX (200 JELLETIN EACH BOX)	2.5 ft - 12 ft

5. *Compaction Equipment*

- The details of compaction equipments are collected from various sites & consultancies.The data with respect to rates, working speed & load carriying capacity is collected.

SR NO	CLASS	TYPE OF EQUIPMENT	COMPONENT	EQUIPMENTS	BASIC PURCHASE COST (RS)	CAPACITY (Centrifugal force)KN	WORKING SPEED KM/HR	TRAVEL SPEED KM/HR
1	COMPACTION	COMPACTORS	ROLLERS	MINI TANDEM ROLLER VMT 330	1000000	261	6	11.8
2				SOIL COMPACTOR VM115/D	1000000	282	4.5	10
3				SOIL COMPACTOR VM115PD	1000000	45	5	10.2
4				TANDEM ROLLERR VMT860	1000000	71	5.5	11.5

6. *Hauling Equipments*

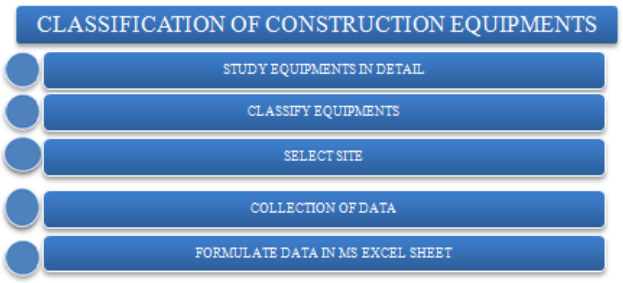
- Various hauling equipments details are collected as explained further such as Dump trucks ,Hauling trucks etc.

Table No.3

(Hauling Equipments)

SR NO	NAME OF EQUIP	MATERIAL	CAPACITY	RATE
1	TRUCK	Cement	10 Tonne	10 Lakh - 15 Lakh
2	Hyva Truck	Sand	3 Brass- 4 Brass	25 Lakhs
3	Hyva Dumper	Sand	6 Brass	30 Lakhs
4	Tractor with Trolley	1 Brass	7 Brass	Lakhs
5	Trailor	Cement	20 Tonne - 25 Tonne	25 Lakhs

VIIFLOW CHART FOR PROCESS:



VIII. CONCLUSION

In the present work all the details of construction equipments regarding their Costs, Rates & Efficiency have been gathered which has been further formulated in excel sheet in such a format that it becomes easy to all class workers to read it study & conclude about proper equipment selection.Thereby by it reduces & prevent any of the risks approaching the construction project regarding construction equipments.

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