GOVERNMENTPOLYTECHNICKENDRA

PARA

DEPARTMENT

OF

CIVILENGINEERING

LECTURENOTES

Year & Semester: 3rd Year, 6th Semester

Subjectcode/Name-Th-2,Constructionmanagement

By

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CHAPTER-1

INTRODUCTIONTOCONSTRUCTIONMANAGEMENT

CONSTRUCTIONMANAGEMENT

Theprocessofimplementationofmanagementprinciplesinconstructionproceduresandmethodsiscalledconstructionmanagement.

Aimsandobjectivesofconstructionmanagement

FollowingarethevariousAimsandObjectivesofconstructionmanagement:

a) Completingtheworkwithinestimatedbudgetandspecifiedtime.
b) Evolvingareputationforhighqualityworkmanship.
c) Providingsafeandsatisfactoryworkingconditionforallpersonnelandworkers.
d) Takingproperdecisionsatthemostpracticallevelthroughdelegationofauthority.
e) Motivatingpeopletoputtheirbesteffort.
f) Createanenvironmentofencouragementtoworkasateam.

FunctionsofConstructionManagement

1. **PlanningandScheduling-**

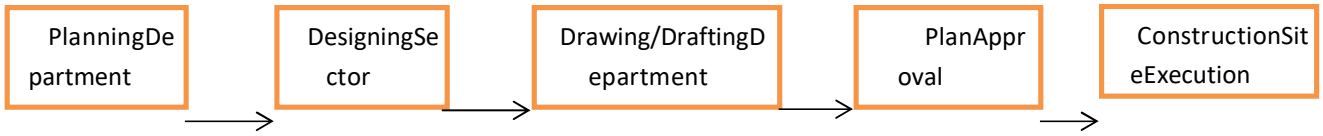
   Planning-

   Thismethodincludesfindingvariousalternatives,evaluatingallthealternatives,andfindingoutthebestalternative foranyparticularconstructionworkormethod.

   Scheduling-

   Schedulingistheprocessoffittingthebestalternativetoatimescale.Inshortly,schedulingmeanswhentoperformwhatconstructionwork.

2. **Organising**-Organisingistheprocessofdivisionofconstructionworkintovariousmanageabledepartments.



3. **Staffing**-Staffingistheprocessofrecruitmentofpropercandidatetoproperdepartment.
4. **Directing**-Directingistheprocessofassigningvarioustasktotheindividualsoremployeesanddirecting themwithproperguidancetoperformthespecifiedtask.
5. **Controlling**- Controlling is the process in which the performance of doing a task is checked, evaluated,assessedproperlyforefficiencyandanychangeorprobleminthetaskisidentified,correctedandimplemented.Thisincreasestheefficiencyoftheorganisation.

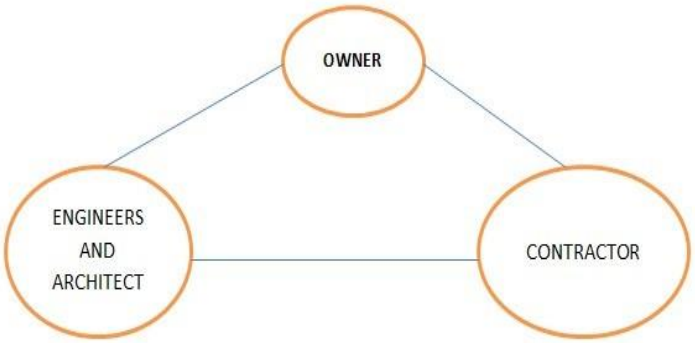
6. **Co-ordinating**- Co-ordinating is the process in which the members of the organisation co-ordinate witheachotherforcompletionofatask.Itcanbeintra-departmentorinter-departmentcoordination.

CONSTRUCTIONTEAM

TheConstructionteamconsistsofaOwner,Engineers,andContractors.

1. **Owner**- Owner isaperson/agroup ofpersonwho takethe final decision ofany construction activity.The owner holds the authority of financing the construction work. Any change in the scope, plan orscheduleofanyconstructionactivityisapprovedbytheowner.
2. **Engineers/Architects**-Engineersarethetechnicalemployeeswhotakecareofallthetechnicalworksof a project. The Engineers includes all core branches like Civil, Mechanical, Electrical Engineers thatexecute their individual roles at the project site. The Architects beautifies the building and increases itsaestheticaspect.
3. **Contractor**-
   Thecontractorofanyconstructionprojecttakescareofallaspectlikeprovidingconstructionmaterials,arranginglabourandequipmentforconstructionwork.

RelationshipswithinaconstructionTeam



RESOURCESFORCONSTRUCTIONINDUSTRY

1. Materials-Bricks,Stones,Cement,aggregates,steel,shuttering,scaffolding,timber,water-supplyarrangements,plumbingmaterials,etc.

2. HumanResource-TechnicalManpower(Engineers,Architects,Surveyors)andLabours(Skilled,Semi-Skilled,Unskilled)

3. Machinery-Constructionequipmentlikerollers,vibrators,mixers,towercranes,transitormillertrucks,dumpers,etc.

4. Space- Space is of utmost importance for construction activitieslike storing material, site office,forplacingof equipments,forcarpentryworks.

5. Funds-

   Themostimportantresourceforanyconstructionindustryisfund.Withoutproperfundstheconstructionwork cannotprogressat all.

CHAPTER-2CONSTRUCTIONPLANNING

CONSTRUCTIONPLANNING

ConstructionPlanningistheprocessoffindingoutvariousalternativesofperformingaparticularconstructionprojectandfindingoutthebestalternativeforimplementation.

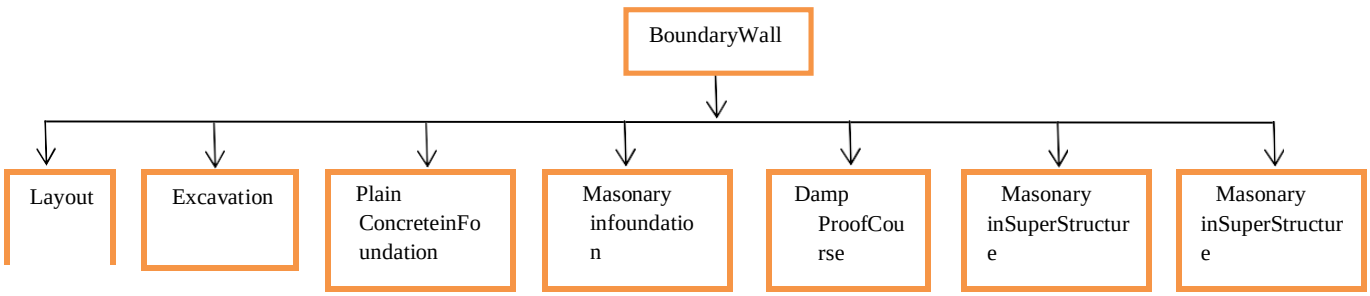
IMPORTANCEOFCONSTRUCTIONPLANNING

1. Constructionplanningisthestartingphaseofallmanagementfunctionsinaconstructionproject.
2. Aconstructionprojectcanbewellmanagedifitiswell-planned.
3. PlanningofaconstructionworkincludesWBS(WorkBreakdownStructure)whichincludesdividingalargeworkintosimplemanageablecomponents.
4. Constructionplanningisimportantforcontrollingtheprogressofconstructionworkbybasingitonaplannedschedulesand plannedstrategiesforbackupprovisions.
5. Planninginconstructionforecaststheresourcerequirementfortheconstructionprocess(machinery,funds,materials,etc.)
6. Constructionplanningisatoolusedinplanningdepartmentstoidentifyproblemsthatarelikelytooccurduringconstructionandplanstrategiesbefore-handtotacklesuchconstructionproblems.

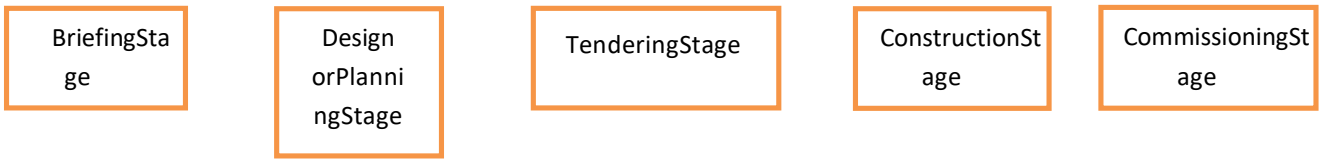
WorkBreak-downStructure(WBS)

TheWorkBreak-downStructureisatechniqueinwhichaconstructionworkisseparatedintoseparaterecognisableactivitywhichcanbemanagedproperly.

[ExampleofaWBSofaBoundaryWallConstructionisgivenbelow]



I. StagesinConstruction


BriefingStage
DesignorPlanningStage
TenderingStage
ConstructionStage
CommissioningStage

1. **BriefingStage**
   i. Understandingthepurposeoftheprojectfromtheclient.(**Conceptualisation**ofConstructionProject)
   ii. AppointmentofprojectmanagertotheClient
   iii. FormationofaProjectdirectingcommittee
   iv. Assessthefeasibilityoftheproject
   v. DetailTechnicalandNon-TechnicalInvestigationoftheconstructionsite,material,equipmentandlabouravailability
   vi. Preparationofabriefreportdescribingthepurposeoftheconstructionproject,theinvestigationdetails,their possible alternatives and theirfeasibility.

2. **Planning/DesigningStage:**
   i. Todeterminethemethodofconstruction
   ii. Topreparedetaildesign,workingdrawings,specifications,billofquantities,costestimatesandpreliminaryconstructionstepsorprogrammeplanincludingtimeschedule
   iii. ConductofPre-TenderingandPosttenderingactivitiesforthecontractortoinvestigatethefeasibilityofperformingconstructionactivitiesatthesite,economyofengaginglabourandequipmentperformance.
   iv. Summarizationofthewholeconstructionprojectincludingproperdesignandestimateaspertheconvenienceoftheclientforapproval.

3. **TenderingStage:**
   i. Quotationformationwithdetailsoftheconstructionwork,theitemsofworkalongwiththerates.
   ii. PublishofNoticeinvitingtendersfromvariouscontractors.(e.g.ClassAtoClassFcontractors)
   iii. Evaluationofterms,conditions,workspecificationsandcompletionofvariousbidsfromindividualcontractors.
   iv. Choosingofbidderwithbesttermandconditionmatchingtherequirementsoftheprojectandapprovalofowner.
   v. Awardingofthecontracttothe**BestBidder**(henceforthcalledasthe**Contractor**)
   vi. **Contract**documentsarepreparedwhichincludesallinformationoftheprojecttothelastdetailthat **binds**theClientandContractorin**legal**termsuntilthecompletionoftheproject.

4. **ConstructionStage:**
   i. Thisistheactual**Realisation**oftheproject.

ii. Thisstageincludesconstructionworkstartingfromsurveying,layout,excavation,concreting,masonaryworks,plastering,flooring,wiring,plumbing,etc.

iii. Theexecutionofconstructionworkisproperlysupervisedbyengineers-at-siteasperttheplannedschedule asdesignedduringtheplanningstage.

iv. Coordinationbetweencontractorandengineersisimportantatthisstage

v. Qualityofmaterialandworkmanshipiscloselymonitoredtomaintainthequalityofconstructionwork.

5. CommissioningStage:

i. Performanceoftheconstructionworkisevaluatedandnatureofmaintenanceworkisdetermined

ii. Qualitycheckofvariousconstructionworksisconductedbynon-destructivetechniques.

iii. Finallyafterallevaluationsareassessedtobeperfecttheprojectishandedovertotheclientdenotingtheendofconstruction workandendofcontract.

II. StagesinConstructionPlanning

ThePlanningStageconsistsoffollowingtwostages:

1. Pre-tenderStage:

Pre-tender stage is the stage in which the contractors are allowed to visit the location of construction forevaluating the feasibility of the construction project for proper bidding. A pre-tender project report isdocumentedwhichincludesalldetailsaboutthesiteinvestigation,localweatherreport,labouravailability,andtheworkingenvironmentof theconstructionsite.

a) Thebidderisallowedtocarryoutinvestigationslikesurveyofland,labour,materials,localweatherconditionandequipment functionality.

b) TheContractorcanexaminethedrawingsandspecificationofconstructionworktoidentifyvariousitemsofwork.

c) TheContractorcanproperlyestimatevariousalternativesformostsuitableandeconomicalmethodofconstruction.

d) Prepareatentativescheduleofconstructionworksandestimatethecompletiontimeoftheproject.(**FinalWorkPlan**)

e) Finally,thecontractorfixestheoverheadsandtheprofitmargin andfinalizethetenderingprice forcompletingtheworkwithinstipulatedtime.

2. Post-tenderStage/ContractStage:

i. Contractstageoccursaftertheawardofthecontracttothecontractoranditextendstilltheendoftheconstructionproject.

ii. Inthisstagethecontractorevaluatesthebestalternativestoexecutetheconstructionworkeffectivelyandmosteconomicalway.

iii. Coordinateforexecutionoftheprojectasperttheplannedschedule.

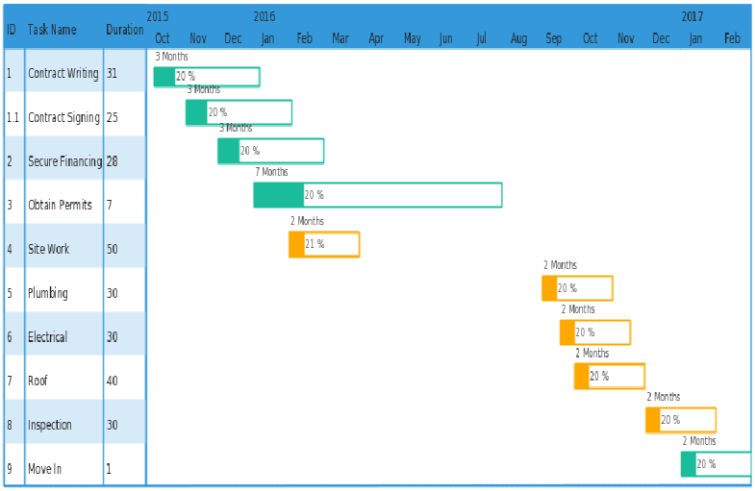
iv. Varioustechniques/methodsareusedtoassesstheprogressofaparticularproject(GanttChart,CPM,PERT)

III. ConstructionScheduling

Constructionschedulingorsimply**Scheduling**inconstructionmeanstheprocessoffittingfinalworkplanintoatimescaleindicatingstartandcompletiontimeofeachandeveryconstructionactivity.

1. **GanttChartScheduling:**

GanttChartisachartthatisusedforscheduling of construction activities. TheGanttchartconsistsoftheConstructionActivityontheY-axisandtheTimedurationontheX-axis.Also,calledBarChart.



Theactivitiesareshownseparatelybybarswherethelengthofbarshowsthedurationthattheparticularconstructionactivitytakestocomplete.

Theprogressoftheconstructionactivityisshownbyshadingthebarwithcolourorhatching.

*Note:*ThedisadvantagesofGanttChartare:

* Itdoesnotshowinter-dependencybetweenactivities.(Doesnotshowiftheprogressisdelayedornot)
* Criticalactivitiescannotbeknown.

2. **NetworkAnalysisandScheduling:**

Networkanalysisconsistsofmethodstoassessthevariousconstruction activities,theirinter-dependencywitheachother,andfindouttheactivitiesthatneedmostattentionduringtheprogressofaconstructionproject.

NetworkAnalysisconsistsoffollowingmethods:

A. **CriticalPathMethod(CPM)**
B. **ProgrammeEvaluationandReviewTechnique(PERT)**

<u>FeaturesofNetworkPlanning:</u>

2. Thenetworkshowsthecriticalactivitiesandeventswhichneedspecialattentionduringprogressoftheproject.
3. Thenetworkcanbeusedfortime-costoptimisation.

(Optimisingmeansnotusingtoomuchortoolessoftheresourcesavailable,i.e.optimisedutilisation)

4. Resourcescanbeallocatedordivertedfromoneactivitytootherforoptimising.(ResourceAllocation)

FollowingarethetermsassociatedwithNetworkAnalysis:

a) **Activity**-Progressofaspecifictaskorconstructionactivitywhichhasadefinitebeginningorendiscalledactivity.

b) **Event**-Thebeginningorendofanactivityiscalledanevent

c) **Network**-Networkistheinter-connectionofmultipleeventsandactivitiesshowingtheirinter-dependencyamongthem.

d) **Dummy**-

Dummyrepresentsadummyactivitywhichdoesnotconsumeanytimeorresourcebutshowstheimportanceofcompletionofanactivitybeforestartofanother.Dummyservestwopurpose:

a)Logicalpurpose b) Grammaticalpurpose

A. CRITICALPATHMETHOD(CPM)

CriticalPathMethodisanetworkanalysistechniqueusedforschedulingofconstructionactivities.

FeaturesofCPM:

1. CPMisactivityorientedmethod.(i.e.itdependsonactivity)
2. CPMisusedforprojectsthatarerepetitiveinnatureordeterministicinnature.(Allactivities andtheirtimedurationsarewellknownbeforehand)
3. CPMisusedforConstructionprojects.

TerminologyforCriticalPathMethod:

1. Activityduration-Thetimedurationthatanactivitytakestocomplete.($\mathbf{T_{ij}}$)
2. EarliestStartTime-Earliesttimeatwhichanactivitycanstart(EST)
3. EarliestFinishTime-EarliestTimeatwhichanactivitycanfinish(EFT)

$$EFT=EST+T_{ij}$$

4. LatestStartTime-Latesttimeatwhichanactivitycanstartwithoutdelayingtheproject(LST)
5. LatestFinishTime-Latesttimeatwhichanactivitycanfinishwithoutdelayingtheproject(LFT)

$$LFT=LST+T_{ij}$$

Floats:

i. TotalFloat(F_T)-TotalFloatisthetimebywhichthestartorfinishofanactivitycanbedelayedwithoutdelaying thecompletionoftheproject.

OR (rememberanyone)

ii. FreeFloat(F_F)-FreeFloatistheportionoftotalfloat(F_T)thatcanbeusedwithoutdelayingthesucceedingactivity.

$$F_F = F_T - S_j$$

iii. IndependentFloat(F_I)-

IndependentFloatistheexcesstimethatexistsiftheprecedingactivityendsaslateaspossibleandthesucceedingactivitystarts asearlyaspossible.

$$F_{ID} = E_j - L_i - t_{ij}$$

iv. Independenceofactivity-

Itisthetimedurationbywhichanactivityisindependentofthecompletionofitsprecedingactivity andthestartofitssucceedingactivity

v. Slack(S)-Slackisthetimedurationdifferencebetweenthe(LST~EST)or(LFT~EFT)afanyparticularactivity.

HeadEventSlack= $S_i = (LST - EST)$

TailEventSlack= $S_j = (LFT - EFT)$

vi. Interferencefloatistheheadeventslack $F_{IN} = F_T - F_F$

CriticalPath

CriticalPathisthepathinthenetworkthatconnectscriticalactivitieshavingTotalFloatvalueequaltozero(i.e.where$\mathbf{F_T = 0}$).

CriticalActivityandEventsarethoseactivitiesandeventsrespectivelywhichlieoncriticalpath

AdvantagesofCPM:

1. Makesthewholeprojectfinanciallyeconomical.
2. TheCPMNetworkanalysisidentifiescriticalactivitiesandevents.
3. Properattentioncanbegiventothecriticalactivitiesandevents.
4. Resourceallocationcanbedoneeconomicallybasingontheanetworkanalysis.
5. TheCPMnalysisshowsthedependencyofactivitiesandtheactivitiesthatcanbedelayedwithoutdelayingprojectcompletion.(ItisdonebyutilisingFloatValues)

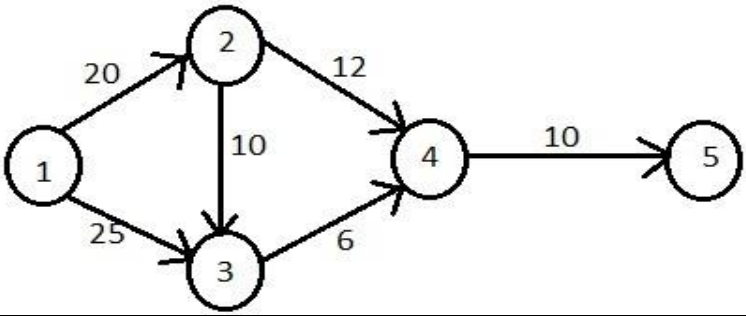
Example2.1

Forthefollowingdatadrawthenetwork,findtheEST,EFT,LST,LFT,F_T,F_F,F_{ID}.Findthecriticalpathandtheprojectcompletionperiod.

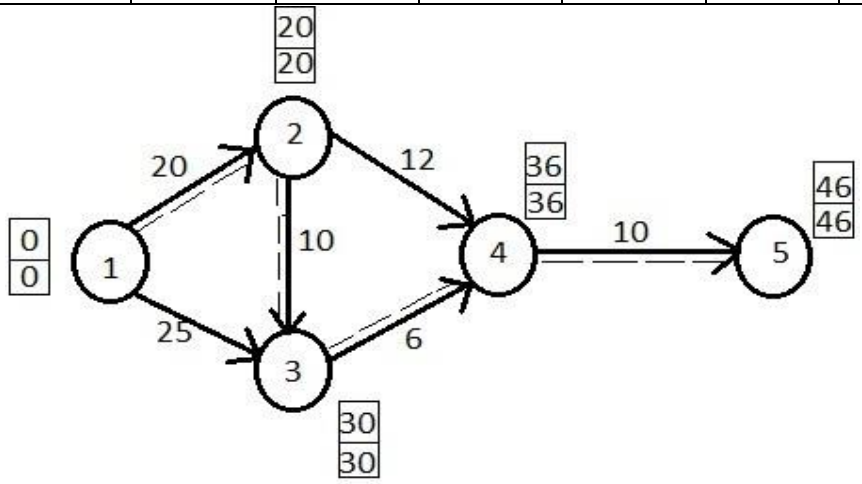
Activity	Duration
1-2	20
1-3	25
2-3	10
2-4	12

3-4	6
4-5	10

Solution:



Activity	Duration indays	EST	EFT	LST	LFT	F_T	F_F	F_{ID}
1-2	20	0	20	0	20	[0]	0	0
1-3	25	0	25	5	30	5	5	5
2-3	10	20	30	20	30	[0]	0	0
2-4	12	20	32	24	36	4	4	4
3-4	6	30	36	30	36	[0]	0	0
4-5	10	36	46	36	46	[0]	0	0



The Activity**1-**inthediagramabove(dashedarrow)ThePro jectcompletiontimeis**46days**.

CriticalPathis: **2-3-4-5**asshown

B. <u>PERTNetworkAnalysis</u>

a. PERTisProgrammeEvaluationandReviewTechnique.

b. Thismethodisaprobabilisticapproach.

c. Thecompletiondurationofanyactivitycannotbedetermined(itmeansitisgenerallyvariable)

d. ThismethodofschedulingisusedforResearchorganisation.(Notsuitableforconstructionorganisation)

e. Thecompletiontimeperiodforanyactivityisexpectedtime(T_E).

f. Therearethreetimeperiodsinexpectedtime:

1. Pessimistictime(t_P)-

Themaximumtimeperiodthatanactivityisexpectedtobecompletedifeverythinggoeswrong.

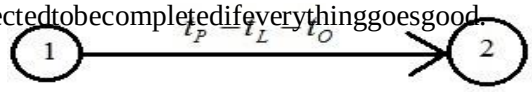
2. MostLikelytime(t_L)-

   Thetimeperiodthatanactivityisexpectedtobecompletedifeverythinggoesundernormalcondition.

3. Optimistictime(t_O)–

   Theminimumtimeperiodthatanactivityisexpectedtobecompletedifeverythinggoesgood.

g. AnactivityinPERTanalysisisrepresentedas:



h. ExpressionforExpectedtime(T_E)isshownbelow:

$$T_E = \frac{t_P + 4t_L + t_O}{6}$$

DifferentiateBetweenCPMandPERT

Sl. No.	**CPM**	**PERT**
1	ItiscalledCriticalPathMethod	It called Programme Evaluation and ReviewTechnique
2	ItisActivityOriented	ItisEventOriented
3	ItisDeterministicApproach	ItisProbabilisticApproach
4	This Method is suitable for Construction Organisation	Thismethod is suitable for Research Organisation
5	Thismethodisutilisedforrepetitiveprojects	Thismethodisusedforcompletelynew project.

CHAPTER-3MATERIALMANAGEMENT

CONSTRUCTIONMATERIALS

Constructionmaterialsarethematerialsthatareutilisedforconstructionpurposes.

ConstructionmaterialsconsistofCement,sand,aggregates,brick,timber,steel,scaffoldings,glasspanels,PVCPipes,wires,plumbingaccessories,colourpaints,etc.

STORAGEOFCONSTRUCTIONMATERIALS

Schemesofstorageofmaterialsdependonthefollowingfactors:

a. **Typeofmaterial:**
   Thestorageofmaterialsdependsonthetypeofmaterialtobestored.Materialslikesand,aggregatescanbestoredoutsidebutcementhastobestoredinadamp-proofstore.
b. **Accessofmaterials:**
   Thestorageofmaterialsdependsonthematerialaccessibility.Ifthematerialslikescaffoldingsarestoredthenitshouldbeplacedsuchthatitcanbeplacedandremovedeasily(i.e.accessibility)
c. **Locationofmaterials:**
   Thematerialsshouldbestoredatsuchplacesthatitisnotdamageddue toclimaticconditionsandavoidcatchingoffireduetoincreasedtemperature.(Inflammablematerialsarestoredsecurely)
d. **Amountofmaterials:**
   TheStoreroomsizeshouldbesufficienttoaccommodatematerialssecurelywithinit.Itdependsontheamountofmaterialstobeutilisedduringconstructionactivity.

ImportantGuidelinesforstorageofdifferentconstructionmaterials

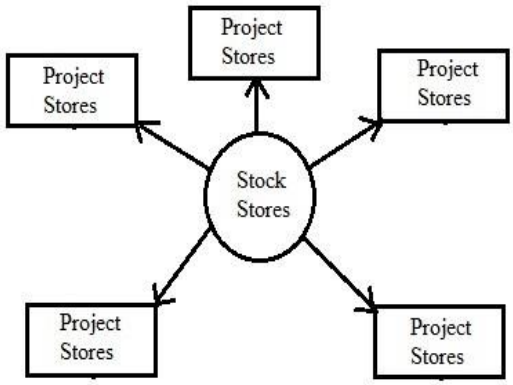
1. Cement-Itshouldbeplacedindrystoragearea.Cementshouldnotbestoredforlongduration.
2. Form-works-
   Formworksshouldbeplacedatstoresfreefromwhiteantsandplacedsuchthatcountingofformwork ispossibleandcan beaccessedeasily.
3. EquipmentandMachineries-Equipmentmustbestoredatplacesofminimumcorrosionordust.
4. SteelBars-Steelbarsshouldbestoredinlotsandpaintedtoavoidcorrosion.
5. ReadyFittings-Plumbingandtimberfootingsmustbestoredsecurelyinstoresindrycondition.

Stores

Astoreisaplacewherematerialsofconstructionareproperlyplacedinarrangedmannerandstoredforvariousconstructionactivities.

Therearetwotypesofstores:

a) ProjectStores b)StockStores



a) Projectstores-
Thesestoresarearrangedatconstructionsites.Oncetheprojectatsiteiscomplete the on- site stores are dismantled or utilisedforotherpurposes.

b) StockStores-
StockStoresarestorageplacesforcommonbuildingmaterials.Bigconstructioncompanieshaveaseparatestockstoresfromwherematerialsareissuedforconstructionworksatvariousnumberof constructionsites.

VariousPrincipleofMaterialManagement

a. Planningofstoragespaceandminimisationofmovementofmenandmaterials.
b. Handlingofmaterialslikereceiving,storage,in-processhandling,inspection,packaging,shippingandtransportationshouldbecoordinated
c. Materialflowpatternmustbebasedonoperationsequenceandequipmentmanagement.
d. Optimumutilisationofspaceformaterialhandling.
e. Safehandlingconditionstoavoidbreakageofmaterials.
f. Reductionofunproductivetime.

Theobjectivesofmaterialmanagementare:

1. Efficientmaterialplanning
2. Procurementofmaterials
3. Buying/Purchasingofmaterials
4. StoringandInventoryControl
5. Supplyanddistributionofmaterialstoconstructionsite
6. Safeguardthequalityofmaterials

TERMINOLOGY:

1. Stock:

Stockofmaterialsmeansvariousconstructionmaterialsthataregroupedintoseparatesub-headsandstoredinstores.

2. Inventory:

Theamountofmaterialsstoredinstockiscalledinventory.Theinventoryinstockisalwaysmonitoredsoastoavoidshortageofconstructionmaterialduringtheprogressofconstructionproject.

3. Issueofmaterials:

When materials are need in construction they are issued from the stores so as to keep record of materials, itsamount consumed and remaining, time of issue, etc. to keep track of materials utilised in the constructionprocess.

4. Indent:

Indent is a document generated by the user for the procurement of materials. It consists of a UIN (UniqueIdentificationNumber)anddetailsofthematerial.

5. Invoice:

Invoice is a document that lists the type of material purchased, its amount or number, rate of each itempurchased,billofquantitiesandthetotalcostincurredduringthepurchase.

6. BinCard:

Bin Card is adocument used to record thestatus of amaterialin stock.It consists thedetailsofthe amountofmaterialinstock,amountofmaterialreceivedandtheproblemattached tothegoods(material).

7. StockTaking:

Stocktakingisthecheckingofthequantityandconditionofinventorystored.Itistheinvestigationteamthat takes the responsibility for stock taking. This is useful for writing-off losses after the end of a particulartask.

8. StockControl:

InventoryorStockcontrolarethetwoprocessesinmaterialmanagementthatutilizethescientificprocedures to divide stocks into various categories and handle important materials. There are two types ofinventorycontrol:a)ABCAnalysisb)VEDAnalysis

9. ReserveStocklimit:

Itisthemaximumamountofmaterialsthatcanbestockedinstores.

10. Minimumholdinglimit:

Minimum holding limit of stock is that amount of materials at which it must be ensured that theprocurementforpurchaseofthat materialisinitiated.

Differencebetweenvariousterms:

1. BinCardandStoresLedger:

BinCard	StoresLedger
a) BinCardconsistsofquantityofmaterialreceived,issuedandremaininginstock. b) BinCardContainsquantitydetailsonly.	a) Store's Ledger keeps record of each andeverytransactionofmaterialfromthestores. b) StoresLedgercontainsbothquantitiesof materialandmonetarydetails.

c) Bincardisstoredinstoreroomsonly. d) Bincardsarefirstrecordedandthenmaterials areissued.	c) StoresLedgeriskeptinaccountingdepartments. d) Enteringin stores ledger occurs after transaction.

2. OrderingandIssuing

Ordering	Issuing
a) Requirements ofvariousdepartments arenotedandforwardedtopurchasingdepartments. b) Materialsare not available at stores duringordering	a) Various materials are issued to respectivedepartmentswhenmaterialsaredemanded. b) Materialsare available at the stores duringissuing.

3. StockControlandInventoryControl

StockControl	InventoryControl
a) Stockcontrolisthemethodtomanagematerialsdirectlyatthestores. b) ABCandVEDanalysisareutilisedinmanagingmaterialsatstoresproperly. c) Stockcontrolisdoneatstoresdirectlybyhandlingmaterials. d) StockControlcannotdirectlyevaluatewhentoprocurematerials. e) Categorisation/Divisionofmaterialsintodifferentcategoriesisdonetostore materialsproperlyandsecurely.	a) Inventory control uses procedures to managematerialsindirectly. b) Inventory Control uses the tools like reservestock,minimumandmaximumstocklimit, stockremaining,etc. c) Inventorycontrolisdoneataccountingdepartments. d) InventoryControlcansensetheneedofprocurementatpropertime. e) Inventory control avoids theexcess blockageoffundsinstoresandfurtheravoidsfunds shortagewhiletheprojectisprogressing.

4. AccountingofStocksandAccountingofTools&Plants:

AccountingofStocks	AccountingofToolsandPlants

a) Quality and quantity of stocks arerecorded. b) Whenstocksareinshortage,thevaluesaredeductedinaccounts. c) Thisaccountregisterisclosedhalf-yearly.	a) Onlyquantitydetailsarerecorded. b) Toolsand Plant items are recordedhereeven ifthey are inshortageand writtenlater. c) Thisaccountregisterisclosedyearly.

MATERIALMANAGEMENTPROCEDURES

StagesofMaterialManagement:

1. **RegisterofSuppliers:**

Aregisterofsuppliersismaintainedcontainingcostofmaterialssuppliedbythem.Itisupdatedatregularintervals.

2. **Calculatethequantitiesofmaterials:**

Quantitiesofmaterialsarecalculated/estimatedfromdrawingsandspecifications.

3. **SupplySchedule:**

Accordingtoplanofwork,supplyofmaterials,mustbefitintoatimeframe(timeduration).Asupplyscheduleispreparedsothatmaterialreachessiteofworkbeforethestartofplannedwork.

4. **Purchasing:**

Dependingonsupplyschedulematerialsarepurchasedbeforetimetokeepmaterialsreadybeforeconstructionofparticularwork.

5. **Orderingofmaterials:**

Orderingofmaterialisdonebasingonthequantitiesrequiredatatimeorinphases.

6. **Inspection:**

Before thematerial is brought on tosite,inspection shouldbedone.Ifany rejection is needed,can bedonebeforesendingittosite.Thiswillavoidfurtherdisputeatlaterstage.

7. **Acceptanceandissueofmaterials:**

Thematerialsafterbeingbroughttothesitearepropertlystored.Bincardsaregeneratedandotheraccounting registers are prepared to keep details of the materials purchased and stores in stores and thematerialsusedinconstruction site(transactionof materials).

8. **UseofNetworkAnalysis:**

Network technique like CPM can also be used to manage the schedule of materials and the critical eventslikepurchaseandorderofvitalitems canbetakencareof.

9. **Tool&Plants(T&P):**

ToolsandPlantsareprocuredinaprojectworkforaspecifiedpurpose.Toolsandplantsincludeconstructionmachinery(Compactors,vibrators,Rollers),vehicles(Trucks,jeeps,dumpers),

tools(Hammers,rammers,shovels),surveyinginstruments(compass,theodolites,dumpylevels,staff),engineeringinstruments(Compressiontestingmachine,CBRapparatus,pycnometer),etc.

- Theaccountregisterisspeciallymaintainedtoenterthereceiptandissuedetailsoftoolsandplants. Thatregisteriscalledas**T&Paccountregister**.

METHODOFSTOCKANDINVENTORYCONTROL

a)StockControl:

The materials stored at stores are controlled by stock controlling procedures. There are two stock controllingprocedures:a)ABCanalysis b)VEDAnalysis

a) ABCAnalysis

InABCanalysisthewholestockisseparatedintothreecategories:

1) CategoryA 2)CategoryB 3)CategoryC

CategoryAMaterialsarestoredinstoresandmanagedinseniormanagementlevel.Withouttheconsentofthesenior managementtheCategoryAmaterialscannotbeutilisedintheproject.

CategoryBMaterialsarethosematerialswhicharecontrolledatmediummanagementlevel.

CategoryCMaterialsarethosematerialswhichareundercontrolofthejuniormanagementlevel.

b) VEDAnalysis

InVEDanalysisthestockisdividedintothreecategories:

a) Vital b)Essential c)Desirable

Vital- These materials are of vital importance. Without these materials any construction task cannotproceedatall.Thismaterialismanagedatseniormanagementlevel.Evenifvitalmaterialsarelessinquanti ty thenalsoitis controlledatsenior management.

Essential-Thesematerialsareimportantforconstruction(essentialbutnotvital)

Desirable-Materialswhicharedesirableforanyconstructionworkbutarenotessential.Thesematerials are managed atjuniormanagementlevel.

b) InventoryControl:

InventoryControlistheproceduresusedforthecontrolledmanagementofmaterialsataccountingdepartments.

Inventory control also uses the ABC analysis for material management. The main objectives ofinventorycontrolare:

1. **Toavoidtheexcessblockageoffundsoftheorganisation**:
   Fundsareimportant for constructionprojectto proceed.But ifunnecessary utilisation of funds isdonefor thepurchaseofmaterials,thefundsmay getblocked and maynotbeavailableatotherstagesofconstructionproject.
2. **Toseethattheprojectisnotstarvedofmaterialswhenneeded**:

Theinventorycontrolutilisestheconceptofmaximum/minimumstocklimit,reservestock(inventory), etc. This allows the organisation to take timely action for procurement of Vital orCategoryAmaterials,shortageofwhichtheprojectwouldstarveanddelayprogress.

AccountingProceduresofStores:(ShortNote)

Theaccountsof stores are basedon the fundamentalprinciplethat cost ofevery article isultimately debitedto the**final head**ofthe account created foreach**particularwork** (as simplified inthe**WBS structure**).Incase of materials, tools & plants, road metal when required for a specific work can be immediately bookedunderfinalhead.

Butin certain cases likepurchaseofcement&steelimmediately purchased dueto requirementatsite,cannotbebookedinthefinalheadoftheworkdirectly.Itisbecausethequantityofmaterialtobeusedatsite is uncertain. So these materials are booked under a separate head temporarily called as **suspense head**.Afterthecompletionoftheparticularwork,thesuspenseheadsare**putuptothefinalhead**andthesuspenseheadofthatparticularworkis cleared.

DisposalofSurplusMaterial:

Materialsinconstructionprojectaresometimesinexcessdueto:

1. Reductioninconstructionwork.
2. Changeindesign&specification.
3. Excessorderingofmaterials.

Thisresultsinsurplusofmaterialsattheendofconstructionproject.Thesematerialsaredisposedofbyfollowingtwoways:

1. Theyaredivertedtootherconstructionsitesforuse.
2. Ifthesecannotbeusedfurtherinconstruction,itisauctionedinpublicafternecessarypermissionsfromresponsibleauthority.

I. Writing–offLosses:

Ifitisfoundthatthelossofmaterialshaveoccurredinspiteoftakingallthepre-cautionsandno-bodycanbe blamed, then a loss statement is reported along with the attachment of the stock-taking officer's findingsandinvestigationreport.Thelossisfinallywrittenoffundertheorderofthesenior authority.