In-situ 2015). the process involves batching, mixing,

Design

IN-SITUCONCRETE FRAME METHODINTRODUCTIONIn-situ concrete frame isgenerally used as a structure for both single and multi-storey buildings suchas residential buildings and commercial spaces. Since several years, in-situconcrete is raised from an experimental material to the widest form of buildingconstruction.

This method is used as a structural material for buildings as aframe with a combination of beams, columns, concrete roofs and floors. Portlandcement is easily manufactured by burning shale and limestone; aggregates suchas sand and crushed limestone are easily attained. Steel minimills use scrapiron to feed their furnaces inturn producing reinforcing bars for localoperation (Hartman 2014).

In-situ concrete is used for foundations and forstructural skeleton frames. PROCESSIn-situ concrete frameinvolves pouring liquid concrete into removable forms and dismantling the formsonce the concrete has been hardened to leave a solid wall behind (Din 2016). The pouring liquid concrete includes cement type, aggregate size and type, amount of water, mineral and chemical admixtures (Din 2016). In the mix, theaggregates are graded in size, the water combines chemically with the cementpaste to form a strong bond gel structure (The Structural Frame 2015). Theprocess involves batching, mixing, placing, consolidation, finishing and curing(Hartman 2014). BATCHINGThe concrete is usuallybatched in the ready mix central plants where varieties of cement, aggregatesand equipments are available and operated under controlled conditions. Theprocess is completed inside the plant and loaded to a truck or it can be mixedin the truck while transporting to the site. The quality is high and consistentdue to exact weighing of

materials and is often suitable for small jobsdepending upon the travel distance.

Fig1(Left): Ready mix plant. Right: – Freshmixed concrete being filled in the truck (Hartman 2014)MIXINGMixing of concrete is animportant process to achieve good quality of concrete with the right equipment. Good mixing removes all the air voids between the aggregates and clustersformed with cement giving a high strength to concrete.

Bad mix design alwaysleads to bad quality of concrete hence most of the times ready mix concrete isused. Fig2: Mixing of concrete (Hartman 2014)PLACINGThe concrete must always bedeposited as near as possible into the formwork on the site. The rebar is to beprovided before the placing of concrete into the formwork. Concrete can be transportedusing special concrete pumps by hoses or by buckets using cranes if thedeposition place is not accessible.

Fig3: Placing of wet concrete into the rebar produced formwork (The Structural Frame2015)CONSOLIDATIONIn this process, the concreteis compacted after placing through a rolling compactor or vibrator. Thevibrator is an equipment that transfers shear energy into the concrete througha certain depth to remove excess air voids. The roller is used only inconstruction of roads, dams with a heavy roll in front and is driven on theconcrete. While concrete should be placed in many layers, each layer iscompacted first and then the next layer is placed over it.

Fig4: Compaction of fresh placed concrete (Din 2016)FINISHINGThe concrete floors andpavements are finished using a wide blade after consolidation to

bring out thesmooth surface and attractive. However, the finishing depends on the type offloor or pavement and for what purpose it is used for. The finishing is carriedout before the concrete is hardened. Fig5: Finishing of concrete using wide blade (The Structural Frame 2015)CURINGThe concrete must be curedafter its hardened using damped bags, filling the roof with water or byspraying water periodically. This process is important as it avoids cracks, strength loss, durability of concrete. If the curing is not carried outproperly there might be cracks developed or sometimes the collapse of thebuilding takes place.

Fig6: Curing of concrete by storing water without drying (Hartman 2014)ADVANTAGESOF IN-SITU CONCRETE FRAMEü Buildingdesign and architectural interest is feasible because of today's technology. ü Itprovides thermal insulation resisting from earthquakes, insects penetratingwalls, explosion and collision. ü It canbe moulded into numerous geometrical shapes with less maintenance cost. ü Nocranes and skilled labours are required for the erection.

ü Beforeor during the construction, any adjustments or alterations is flexible. ü Durableand stable for long time because of minimal deflection and less movement. ü Doesn'trequire any storage place and the whole process can be carried onsite. ü Preferredfor basement walls and foundations because of its high strength. ü It canwithstand any climatic conditions because of its high compressive and tensilestrength. ü In-situconcrete is the most economical material for construction of foundations, piers, dams and columns.

ü Thetotal construction time in in-situ concrete frame is relatively short. DISADVANTAGESOF IN-SITU CONCRETE FRAME· It is tough to make the alterations once theconcrete is hardened.· It requires more number of labours whichincreases the wages.· The improper process of mixing, placing andcuring affects its final strength which causes shrinkage, cracks and collapseof the building.· It is a complicated process with many inputsand flows which takes 28days for attaining the concrete final strength hence, speed of construction is relatively low.· It need to be carried out under certainclimatic conditions to maintain the hydration of concrete.

· The cost is increased due to more temporaryworks and falsework of labours.· The formwork costs more and its erection istime consuming.· Crushed concrete cannot be used for a newbuilding hence, its scrap value is nil.· Maintaining the quality of concrete isdifficult due to poor mix design.· The surrounding environment of the site isaffected as the process is carried out in an unprotected environment.

· Concrete can harden even before placing andsurface finishing is not assured due to variable workmanship.· Climate, large areas can be problematic duringconstruction and curing. REFERENCES1) Din, R. (2016)" Advantages and Disadvantages of Reinforced Concrete". RezaDin2) Hartman, D. (2014)" The Advantages and Disadvantages of Cast-In-Place Concrete".

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