Analysis of A Dam Structure Using Analysis Tool: A Review

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Abstract- *Dams are constructed to store water in large capacity for future use. Due to large storage the loads acting over the upstream side of the dam are heavy and, during earthquakes, in addition to these load a huge loads act on it because of ground motions. It may results in the failing of structure and thereby resulting in loss of life, social, economic and environmental crisis. The seismic vibration created at the time of earthquake must be minimized by proper application of engineering principles and so it is necessary to determine the behaviour of concrete gravity dam in the same basis. In this paper we are presenting literature review of publications related to analysis of dam.*

Keywords- Gravity dam, Dynamic Analysis, STAAD-PRO., review, water pressure.

I. INTRODUCTION

Concrete gravity dam is coined as a structure designed in such a manner thatit is capable to resists the external forces using its own weight. It is the weight of a gravity dam which encrypts it from being overturned when exposed to the thrush of appropriated water. Such kind of structure is solid and requires next to no support. Gravity dams normally comprise of a non-flood section(s) and a flood area or spillway. The two general solid development techniques for solid gravity dams are customarily positioned mass cement and RCC. Gravity dams, developed in stone brickwork, were assembled even decades back, frequently in Egypt, Greece, and the Roman Empire.

Concrete gravity dams are on the favoured end in a current period and for the most part, built. They can be developed effortlessly on any dam site, where there exists a characteristic establishment sufficiently able to tolerate the tremendous load of the dam. Such a dam is commonly square in plan, albeit at times, it might be somewhat bent. The line of the upstream substance of the dam or the line of the crown of the dam if the upstream face in inclining is taken as the reference line for design purposes, and so on and is known as the "Pattern of the Dam" or the "Pivot of the Dam". At the point when appropriate conditions are accessible, such dams can be developed up to extraordinary statures. The proportion of base width to the stature of high gravity dams is commonly under 1:1. Be that as it may, the previous dams are built with a proportion of 1.5 to 3. This is due to the low grade of concrete and low density of compaction achieved.

we are presenting review of literatures related to analysis and design of structures considering lateral load resisting techniques, considering analysis tools, soil interaction, hydraulic loading and analysis of dam. This review will shows the present state of condition of structures and technique to resist displacement and heavy cost.

Deepika M et al (2017) This paper presented time history method for presenting the seismic behavior and firmness of a gravity dam. The designing and analysis of the model was done using the application Staad.Pro v8. As per the Indian standard code of training, the dynamic examination was done for a dam with various statures as 70m, 80m and 120m have been dissected and the outcomes acquired were analyzed, to decide the basic execution of solid gravity dam. The impact of certain parameters which impacts the seismic presentation, height of dam and loading designs were researched.

From the outcomes, it was inferred that the most extreme total pressure esteems (14.5N/mm2)for 120mdam was sensible in contrast with other considered dam models. Be that as it may, there was no huge gigantic contrast between 90mdam's qualities (14.2N/mm2). The creator considered most extreme and least chief burdens (6.97N/mm2, 0.893N/mm2)90m dam was productive when contrasted with the other two dams. The shear pressure values (0.259N/mm2, 0.372N/mm2) for 80m dam was better as look at 90m and 120m dams. At long last, the dynamic qualities for various statures of the dam the 90m dam recurrence, period, mass interest was sensible than another dam.

The principle advantage was pressure variety through the dam body and the inclines could be structured by the pressure design. Thusly, while contrasting these three distinct statures of the dam, the 90m dam was discovered more proficient than others.

Shou-yan JIANG and Cheng-bin DU (2015) the research paper examined considering parameters such as Geometric nonlinearity and large deformations along with the contact condition at the crack site. The area of infiltrated splits was first recognized utilizing the solid plastic-harm model dependent on the nonlinear limited component technique (FEM). At that point, the hard contact calculation was utilized to reproduce the break connection the typical way, and the Columb grinding model was utilized to recreate the split association in the distracting bearing. After evaluating numerical models through contextual analysis, the seismic soundness of the Koyna Dam with penetrated cracks was further described with different seismic peak accelerations, and the breakdown procedures of the broke dam were even displayed. The outcomes exhibited that the solidness of the dam with two kinds of entered splits can be guaranteed in a quake with a greatness of the first Koyna seismic tremor, and the broke dam has a huge seismic tremor safe edge. The disappointment procedures of the broke dam in solid seismic tremors could are isolated into two phases: the sliding stage and the toppling stage. The sliding stage finishes close to the pinnacle speeding up, and the top square slides a long separation along with the split before the breakdown happens. The most extreme sliding removal of the top square will diminish with an expanded grinding coefficient at the split site.

The outcomes showcased, the steadiness of the dam could be improved with an expanding interlayer erosion coefficient, since a higher grating coefficient can forestall the slide of the top square. The peak sliding removal of the conceivable slide square abatements with the expansion of the erosion coefficient at the split site. Because of seriously nonlinear properties at the crack site, the pinnacle joint opening increments with the split erosion coefficient just when the grinding coefficient was under 0.8. At the point when the grating coefficient was more noteworthy than or equivalent to 0.8, the opening marginally shifts.

ManojNallanathel et al (2018) The research paper described the analysis of concrete stability with the use of analytical application STAAD.pro and compared the results against conventional methods. STAAD.pro was for the stability and stress analysis of the structure. The stability analysis was done in absence of seismic forces.

The results demonstrated that various aspects such the dead load, water/hydrostatic weight, elevated pressure, combined estimations of the positive moment and negative moment, the summation of level and vertical forces were answerable for dam steadiness. The investigation further expressed that moment derived about because of self-weight go about as a resistive moment against moment delivered because of water, inspire pressure and so forth. Such implied that dependability against moment was accomplished when the positive moment was more prominent than negative moment. Dependability against sliding relies on the coefficient of contact, the entirety of every vertical forces and every single even force. Consequently sliding was represented by elevated pressure. If flat forces builds soundness against sliding reductions if vertical forces remain around the equivalent. Third soundness of dam was on-premise of sheer erosion factor, which relies on the coefficient of grinding, the summation of every single vertical forces, the summation of every single flat forces, thegeometry of dam and materials shear quality. For same issue material shear quality, geometry grinding stays unaltered, consequently strength ought to rely on whole of every single vertical forces and every level forces.

Khalid Dawlatzai and Manju Dominic (2018) the research paper introduced a 2-dimensional strength investigation of a non-overflow segment of the Koyna dam having a tallness of 103 m and base width of 70 m was finished utilizing the Gravity strategy for the examination which was a judicious examination technique. Different forces following up on the dam structure incorporates vertical and flat tremor forces worked out and the burdens were physically determined at various focuses, for example at heel and toe. Considering a similar cross-sectional measurements and material properties a 2D limited component model of the dam was mimicked utilizing ANSYS APDL R.18.2. The pressure results found through the two methodologies was classified and analyzed for the exactness of manual counts. Dam-establishment repository cooperation was ignored and the dam was thought to be fixed at the base. Seismic forces were the dormancy force initiated because of speeding up brought about by a tremor, and this increased speed was considered as a small amount of Peak Ground Acceleration (PGA) applied to the dam. The dam material was thought to be versatile and isotropic. The worst conditions for earthquake forces was considered and two cases i.e. reservoir empty and reservoir full conditions were considered.

The results demonstrated the heading of vertical seismic tremor forces doesn't have a critical principle in the pressure circulation results yet the most extreme uprooting at the peak was marginally less if these force demonstrations upward. In reservoir empty condition the bearing of the level quake forces was basic on the off chance that it demonstrations towards upstream face since it will cause the upsetting of the dam all in all. In reservoir full condition compressive stress creates at the toe and tractable stress at the heel, it likewise has been seen that pressure conveyance design was marginally unique for manual and FEM results

Kai Zhu et al (2016) the research paper displayed an investigation of the observing arrangement of the establishment elevate pressure expecting the persuasive procedure of forerunner reservoir water level and precipitation as a procedure of typical circulation and acquainted the change factor with mirror the uprush highlight of inspiring pressure under the capacity of the high-influential tropical storm. Also, the relating hysteresis days and persuasive days of the model were upgraded with quantum hereditary algorithm(QGA) to raise the fitting and expectation exactness. It was confirmed that the new factual model for fitting can acquire higher various relationship coefficient (0.972) contrasted and the customary measurable model (0.925) and could likewise consummately the uprush highlight of the weight during the storm, which was of purely theoretical and practical application value in the future.

As the research paper proposed the novel factual model of the establishment uplift pressure about the nonlinear impacts of the forerunner natural factors and acquaints the change factor with reenacting the uprush highlight of the pressure under the capacity of the storm. While comparing it with a traditional model the conclusion stated to the extent the estimation point A6-UP-01 was considered, the new measurable model demonstrated to have better fitting precision and precisely anticipate the uprush highlight of the establishment elevate pressure during the tropical storm contrasted and the conventional factual model. The streamlining procedure of the QGA has the great property of quick convergence speed and worldwide improvement capacity which can adequately abstain from falling into nearby extremum of GA.

Yoshikazu YAMAGUCHI et al (2004) this research paper presented the role of nonlinear dynamic analyses in seismic evaluation problems in United States and Japan and examined the application on linear examinations to give subjective appraisals of the potential degree of damage under decently extreme excitations. A contextual investigation was viewed as utilizing a two-dimensional segment of a solid gravity dam was assessed utilizing different direct and nonlinear techniques.

The conclusion stated thorough seismic assessment of solid dams requires an exact evaluation of the damages that can happen under tremor excitations. Nonlinear examination techniques can distinguish a definitive limit of existing solid dams taking into account the most basic nonlinear marvels controlling the reaction. Be that as it may, the intricacy of these methods and the shortage of proper adjustment techniques much of the time force the investigator to decipher the relating results utilizing the best building judgment. The impact of the information parameters and ground excitation on the nonlinear unique reaction ought to be researched by affectability considers that intend to distinguish the most basic conditions. Techniques for subjective damage estimation dependent on results from straight investigations could be utilized to build up a methodical appraisal device, and this could give the analyst a valuable reference structure for the satisfactory understanding of results.

Meghna S. Bhalodkar (2014) the aim of the research paper was analysis of stability of dam under seismic forces. The dam is one of the megastructures it gets prime imperative to plan and dissect such structure with sharp perception considering different components influencing them. As it is one of the lifesaving structures, it was again essential to investigate such structure for significant forces like a quake. The essential target of the paper was discovering the outcome that makes the dam stable against forces following up on it with and without thinking about seismic forces. The examination was finished considering the mesmerizingly dam exposed to pre-chosen land factors like the sort of soil, its thickness, seismic zone and so forth further the research work was accomplished for dam full (with and without considering elevate weight) and void condition. This structuring was finished using IS code criteria.

The results showcased that dam was stable against overturning, sliding and shearing in absence of seismic forces but with introduction of seismic forces dam turned unstable against overturning and sliding.

T Subramani and D.Ponnuvel (2012) the research paper presented static and seismic stability evaluations of concrete gravity dams with the use of analytical application STAAD.Pro.

The calculations were found complex to perform because of the coupling between the inspire pressure and break length. Parametric investigations were regularly performed to cover vulnerabilities in quality and loading parameters to take a fitting choice concerning a specific structure. The author has effectively utilized STAADPRO as a computational research centre in courses, to engineers from training, associated with dam wellbeing assessment STAADPRO which was likewise utilized for modern applications and R&D in dam building and has been widely approved during the previous years. The association of the program and the specific highlights that have been displayed thus are valuable for those inspired by the advancement and utilization of PC supported solidness examination of gravity dams.

UrmilaSarde and A.P.Jaiswal (2017) the research paper presented the dynamic time history analysis of a concrete gravity dam with the use of analytical application STAAD.pro and the analysis was carried with Finite Element Analysis. The assigned model was designed using STAAD.Pro so as to perform time history analysis and further on comparisons were made in between dam with gallery(openings) and dam without gallery. Seismic valuation was done for both the models and the load combinations were used in the analysis governed under IS 6512 :1984.

The conclusion derived from the results stated compressive and tensile strength at toe of dam with openings was less in comparison to other model. Variation in Stress was found because of construction of gallery. STAAD-PRO is the most advantageous for dynamic examinations and it gives a figuring situation to explore demonstrating suppositions and computational procedures identified with the static and seismic basic security of gravity dams.

R. Esmaili et al (2012) the research paper presented the performance assessment of concrete gravity dams with a methodology based on stress demand capacity ratio (DCR). The presentation evaluation technique was applied on Pine Flat Dam in California as a contextual analysis. Likely seismic harms of the contextual analysis at three particular ground movement risk levels were quantitatively evaluated utilizing reaction history examination by EAGD PC code. It was presumed that the plan rules used to extend the dam measurements were sufficient; the dam displayed no harm at Operating Basis Earthquake (OBE) level. At Maximum Design Earthquake (MDE) and Maximum Credible Earthquake (MCE) levels some tractable splitting happened, however, the degree of breaking was regarded adequate with no probability of failure.

BaoTeng-fei et al (2012) the research paper used a catastrophe model of plastic strain vitality dependent on the quality decrease coefficient was utilized to investigate hostile to sliding strength security of the solid gravity dam. It ought to be called attention to that quality decrease coefficient and even uprooting could be utilized to set up a level dislodging calamitous model to break down the counter sliding security of gravity dam establishment. Simultaneously, the technique which utilized the catastrophic model to decide the counter-sliding strength wellbeing coefficient of the dam establishment could be applied to a comparative examination of against sliding security and security.

Shaowei Wang et al (2013) this research paper provided a case study so as to describe the process involved in the establishment of safety monitory index for a high concrete gravity dams based on failure mechanism of instability and this led to establishment of three grades of monitory index in relation to different safety conditions.

Focusing on the potential disappointment methods of material quality debasement and outrageous outer natural burdens during the administration time frame, in light of the FEM basic examination strategy, disappointment components and the dynamic disappointment procedure of high solid gravity dams are considered in this paper by techniques for quality decrease and over-loading. Common stages in the failure procedure were distinguished by assessment markers of dam dislodging, the availability of yield zones, and the yield volume proportion of dam solid; at that point shakiness security observing record of high solid gravity dams was resolved by these run of the mill side effects. Finally, failure component of a high solid gravity dam is considered, and as per distinctive dam security circumstances, three evaluations of dam precariousness wellbeing observing record of dam removal are progressively settled, which are, individually, at the phases of the availability of yield zones along the forces interlayer by strategies for quality decrease and over-burdening, and the fiasco of dam overloading by the over-burdening strategy.

II. CONCLUSION

Staad.pro is advance tool for structural analysis.

1. Researchers determined that lateral stability in a structure minimizes the bending moment and forces generated due to loads and its age which results in increase in structure life with stability and safety.
2. It is observed that for seismic force resistivity lateral resisting members are necessary to provide safe design.

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