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# Analysis and Design of Gravity Dam by Using STAAD Pro Software.

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**Abstract:** *Gravity dams are massive hydraulic structures that resist external forces primarily through their self-weight and are widely used for water storage, irrigation, flood control, and power generation. This project presents the analysis and design of a concrete gravity dam using both manual analytical methods and STAAD.Pro software to evaluate its structural safety and stability. The study considers all major forces acting on the dam, including self-weight, hydrostatic pressure, uplift pressure, silt pressure, wave pressure, and seismic forces. Stability checks were carried out for critical loading conditions such as reservoir empty, reservoir full with uplift, and reservoir full without uplift.*

*Manual calculations were performed to determine base width, stress distribution, and factors of safety against sliding, overturning, compression, and tension, in accordance with standard design principles and IS codes. The dam was then modeled and analyzed using STAAD.Pro, and the results were compared with manual computations for validation. The analysis showed that the resultant forces lie within the middle third of the base in all cases, indicating no tension at the foundation. The factors of safety obtained were within permissible limits, and the stress and displacement values were found to be acceptable.*

*The study concludes that the proposed gravity dam section is structurally stable, safe, and economical, and that STAAD.Pro is an effective tool for validating manual design and improving accuracy in gravity dam analysis.*

**Keywords**: Gravity Dam, STAAD.Pro, Structural Analysis, Stability Analysis, Uplift Pressure, Sliding, Overturning, Stress Distribution, Finite Element Method, Dam Safety



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