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Reinforced Concrete Foundation for Turbine Generators

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Abstract : Steam Turbine-Generators (STG) and Combustion Turbine-Generator (CTG) are used in almost all modern petrochemical, LNG plants and power plant facilities. The reinforced concrete table top foundations are required to support these high speed rotating heavy machineries and is one of the most critical and challenging structures on any industrial project. The paper illustrates through a practical example, the step by step procedure adopted in designing a table top foundation supported on piles for a steam turbine generator with operating speed of 60 Hz. Finite element model of a table top foundation is generated in ANSYS. Piles are modeled as springs-damper elements (COMBIN14). Basic loads are adopted in analysis and design of the foundation based on the vendor requirements, industry standards, and relevant ASCE & ACI codal provisions. Static serviceability checks are performed with the help of Misalignment Tolerance Matrix (MTM) method in which the percentage of misalignment at a given bearing due to displacement at another bearing is calculated and kept within the stipulated criteria by the vendor so that the machine rotor can sustain the stresses developed due to this misalignment. Dynamic serviceability checks are performed through modal and forced vibration analysis where the foundation is checked for resonance and allowable amplitudes, as stipulated by the machine manufacturer. Reinforced concrete design of the foundation is performed by calculating the axial force, bending moment and shear at each of the critical sections. These values are calculated through area integral of the element stresses at these critical locations. Design is done as per ACI 318-05.

Keywords : steam turbine generator foundation, finite element, static analysis, dynamic analysis
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