

# **Title: Dynamics of metallic structures submitted to strong time-dependent thermal and mechanical loads**

## **Abstract:**

This thesis focuses on the dynamics of metallic structures submitted to strong thermal and mechanical loads temporally variable. The modelling of steel beams and plates subjected to fire is carried out and the numerical simulation is used to find the beam and plate deflection with respect to time. The main results are the following:

- Establishment of modeling equations governing the dynamic behaviour of steel beams and plates under simultaneous actions of fire and mechanical loads.
- Dynamic responses of steel structures mean deflection and bending moment histories in presence of fire and mechanical actions.
- Collapse investigations in presence of fire are also made for steel beams and plates supporting various mechanical loads. Results have been presented in terms of collapse diagrams giving for any mechanical load intensity the corresponding time to collapse of the carrying structure in presence of fire.
- Comparisons of those responses mean deflection and bending moment histories in fire as well as collapse diagrams in fire have been made with respect to different boundaries conditions representing surroundings structures but also with respect to various mechanical load configurations.

**Keywords:** Metallic structures, steel, fire, mechanical loads, dynamic responses, collapse diagrams.

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