



## Increasing safety in construction methods using failure modes and effects analysis (FMEA) in Tehran's towers

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### ABSTRACT

The construction industry is a fundamental industrial asset of national construction, which plays an important role in the economic development of developing and developed countries. Because there is a lot of compaction and complexity in the field of work in this industry. Damage in this industry leads to death, serious occupational injuries and lost time due to its unique nature. FMEA is a structured way to begin designing or reviewing and developing a product or process plan in an organization. This method can be used to link many key organizational issues and their specific documentation. The purpose of this study is to provide a method for assessing the safety risks of construction projects using the FMEA method, to help them to investigate the root and real risks and causes of their occurrence, and provide appropriate solutions to reduce these risks. According to the results of the comparison, the RPN index for various variables affecting safety has been observed in the building projects. In sum, the most significant variables including the lack of workers' consciousness with a probability of 24.9%, poor planning with a potential of 23.7%, were exposed. The unsafe situation was identified with a 22.2% probability and a lack of coordination among members with a probability of 22.2%. Also, based on the comparison of the RPN coefficient for the main safety indicators in the building projects, it has been observed that the impact on the safety of Tehran's building projects has been due to personal factors. Second-order adverse conditions are also important. Insecure acts in this category have had the least impact.

**Keywords:** Failure Mode and Effect Analysis, Tower Building Projects, Safety

### 1. INTRODUCTION

Failure mode and effects analysis (FMEA)—also "failure modes", plural, in many publications—was one of the first highly structured, systematic techniques for failure analysis. It was developed by reliability engineers in the late 1950s to study problems that might arise from malfunctions of military systems. An FMEA is often the first step of a system reliability study. It involves reviewing as many components, assemblies, and subsystems as possible to identify failure modes, and their causes and effects. For each component, the failure modes and their resulting effects on the rest of the system are recorded in a specific FMEA worksheet. There are numerous variations of such worksheets. An FMEA can be a qualitative analysis,[1] but may be put on a quantitative basis when mathematical failure rate models[2] are combined with a statistical failure mode ratio database .

A few different types of FMEA analyses exist, such as :

- Functional
- Design
- Process