

**POST FIRE REFURBISHMENT OF APPAREL
MANUFACTURING BUILDINGS FOR ENHANCED
BUILDING PERFORMANCE**

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ABSTRACT

Post Fire Refurbishment of Apparel Manufacturing Buildings for Enhanced Building Performance

The essence of buildings in apparel sector is highly influenced on the efficiency and effectiveness of occupants' performance and comfort. Creation of user satisfaction can be reached through the involvement of building performance mandates (BPMs) within the interplay of total building performance (TBP). TBP is affected by numerous reasons. Among those, fire incidents may cause direct or indirect impacts to the present building or even in old age. Consequences of these fire incidents in apparel buildings lead to building refurbishments which intended to reinstate the building condition as well as to improve the quality of life. Nevertheless, evaluation of post-fire refurbishment projects mainly focused on building integrity in terms of mechanical and physical properties. However, there are no evidence of any building evaluation especially focusing to the other performance mandates in post fire building refurbishment. Therefore, equal importance should be given to other five BPMs (spatial performance [SP], thermal, acoustic [TP], indoor air quality performance [IAQP], visual performance [VP] and acoustic performance [AP]) in order to achieve building functionality and comfort of the building occupants.

The study was conducted by involving the concurrent nested mixed design under mixed research approach. An extensive literature review and case studies of three fire affected apparel buildings were involved as data collection methods. Literature review was conducted in order to review the behaviour of building fires, factors contribute to building fire incidents, hardware and software measures of fire safety and models for building fire impact evaluation. Moreover, refurbishment of fire damaged buildings and its impact on building performance were recognised through the literature review. Data collection were supported by eighteen semi structured interviews and a questionnaire survey among thirty-six respondents. Collected qualitative data analysed using manual content analysis and quantitative data analysed by relative importance index (RII).

The results revealed that due to the business nature of apparel sector holds high risk for fire incidents. To fight against high fire risk in apparel sector, better symbiosis between elements of fire detection, notification and suppression emphasised by the current research. On the other hand, lack of practice on passive fire protection and unavailability of apparel sector specific fire regulation in Sri Lanka asserted as a practice which hinder the effective building protection against fire. To safeguard the building from critical fire incidents, forty-nine factors highlighted and strategies to overcome the identified loopholes elaborated in the current study. Accordingly, 'faulty wiring' was ranked with highest relevance followed by 'welding work with electrical sparks'. Importance of BPMs for apparel manufacturing buildings was analysed to enhance building performance in post-fire situation. Then existing best practices of BPMs in the apparel sector were discussed. Even though these BPMs essential to apparel manufacturing sector, the better application of BPMs have been limited by many challenges in the business operation. The research identified forty-five (45) challenges encountered in maintaining BPMs of post fire refurbished apparel manufacturing buildings and provided strategies to overcome the identified challenges. Finally, a framework was developed by incorporating main three themes, push factors and pull factors identified in the study to enhance the performance of post-fire apparel buildings beyond restoration.

Keywords: Building Performance, Fire, Apparel Buildings, Refurbishment

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EQUATIONS

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ABBREVIATION

| | |
|--------|--|
| AP | Acoustic Performance |
| ASHRAE | American Society of Heating Refrigerating and Air Conditioning Engineers |
| BAW | Berkeley Architectural Walkthrough |
| BOI | Board of Investment's |
| BPMs | Building Performance Mandates |
| CIDA | Construction Industry Development Authority |
| CMFST | Consolidated Model of Fire and Smoke Transport |
| FDS | Fire Dynamics Simulator |
| FPEs | Fire Protection Engineers |
| FSCT | Fire Safety Concept Tree |
| FSES | Fire Safety Evaluation System |
| FBFSEM | Fitzgerald's Building Fire Safety Evaluation Model |
| FD | Fluctuation of thermal discomfort |
| GFR | Generic Fire Response |
| IAQ | indoor air quality |
| IAQP | Indoor Air Quality Performance |
| ICI | Integrated Characteristic Interaction |
| ITD | Intensity of thermal discomfort |
| NFPA | National Fire Protection Association |
| RII | Relative Importance Index |
| SP | Spatial Performance |
| TP | Thermal Performance |
| TBP | Total Building Performance |
| UDA | Urban Development Authority |
| VP | Visual Performance |