



# Structural retrofitting in historic buildings – the case of Hearst Greek theatre, California

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## Abstract

A modification process after manufacturing or constructing is called Retrofitting. Within the existing built forms it refers to the transitions made to the systems in the building or the structure after it is constructed or put to its defined use. Within the present day context, there are many historic buildings that are still in use or have the potential for future use. These may not be sometimes used to their full potential, despite their historic character and environmental features as most of them do not satisfy the contemporary needs of the present day user. They may also have been built for a purpose that no longer exists or has changed and often lag behind today's performance standards and codes. Therefore, for contemporary use of such historic buildings, Retrofitting for Rehabilitation is an opportunity for alterations and additions to suit it to the present day context. The most significant aspect of retrofitting is associated with structural refurbishment which aids for added strength, stability and safety of the historic buildings. Retrofitting measures in a historical building aims to improve the overall performance of the building, facilitate techniques to alter, repair or add to make the historic building fit for contemporary use without jeopardizing their historic qualities. Through case examples, the paper aims to bring out the trends in retrofitting and the retrofitting techniques that are being adopted in contributing to a sustainable future of historic buildings. The structural retrofitting techniques adopted at the Hearst Greek Theatre, California exemplify how historic buildings can be structurally rehabilitated to become a sustainable resource for future generations.

**Keywords:** Historic Building; Rehabilitation; Retrofitting; Sustainability

## 1. Introduction

Rehabilitation is a process of giving a compatible use of an existing property through the means of repairing the damages, appropriate alterations, and required additions yet preserving the characteristics features representing the various values associated with it. Rehabilitation is most commonly used level of intervention which allows for contemporary alterations and additions. Retrofitting<sup>1</sup> is a process that transforms an object after its manufacture or construction. Within the existing built forms it refers to the transitions made to the systems in the building or the structure after it is constructed or put to its defined use. The intention of retrofitting is improving on the existing facilities for its occupants and/or the overall performance of the building as a whole. Retrofitting for Rehabilitation is a process of makes changes within an existing historic building in order to adapt it for new uses satisfying the used needs without intervening with the property's historic integrity. (De Almeida, 2014 [1]). In recent years there has been increasing activity in "retrofit"-where new services and fittings have been installed to historic buildings. Retrofitting historic buildings are sometimes also seen as a risk mitigation measure against earthquake hazard impact on the historic structure as well.

<sup>1</sup> The word 'Retrofit' means to "to install or fit" with parts, devices, or equipments not in existence or available at the time of original construction. In Historic buildings it provides for installing a device or a system, for example air conditioning, disaster safety devices etc., for a use-in or on an existing structure.

## 2. Need for retrofitting in Historic Buildings

The basic aim of retrofitting a historical building is to improve the overall performance of the building adding to its long term usage and benefit. The retrofitting measures adopted for any historical structure may be adopted for one or more of the following:

### 2.1. Updating Building Systems Appropriately

It has become imperative to provide many contemporary Interior Systems, such as Heating Ventilation and Air Conditioning, plumbing, electrical and other technologies within the buildings that add to the user comfort and improve the life of the building fabric. Retrofitting helps to update the existing building systems in historic structures. It retains original significant historic features and thus accommodating new technologies and equipment. However, while updating the systems a conscious effort of minimizing the impact as far as possible should be made to retain much of the original building fabric and thereby maintain the building's integrity.

### 2.2. Improved Environmental Performance

The safeguarding and preserving processes adopted for heritage buildings contribute towards the sustainability. It aims to reduce the energy wasted during the process of demolishing, disposing the produced waste and followed on construction as well as conserve the embodied energy within the existing built fabric