



# The modern use of ancient theatres related to acoustic and lighting requirements: Stage design guidelines for the Greek theatre of Syracuse



Elena Bo<sup>a,\*</sup>, Arianna Astolfi<sup>a</sup>, Anna Pellegrino<sup>a</sup>, David Pelegrin-Garcia<sup>b</sup>,  
Giuseppina Emma Puglisi<sup>a</sup>, Louena Shtrepi<sup>a</sup>, Monika Rychtarikova<sup>b,c</sup>

<sup>a</sup> Department of Energy, Politecnico di Torino, Turin, Italy

<sup>b</sup> Laboratory of Acoustics, Division Soft Matter & Biophysics, Department of Physics & Astronomy, KU Leuven, Belgium

<sup>c</sup> Department of Building Structures, STU Bratislava, Slovakia

## ARTICLE INFO

### Article history:

Available online 27 December 2014

### Keywords:

Scenery  
Guidelines  
Retrofitting  
Acoustic design  
Lighting design  
Conservation

## ABSTRACT

The ancient theatres present today two sides: an architectural one, as archaeological site, and an artistic one, as an entertainment place. This double cultural heritage generates conflicts in the manner of use, so in ancient theatres conservation rules sometimes collide with the intense (and often inappropriate) use during the theatrical summer season.

This article presents a research conducted on the Greek theatre of Syracuse related to acoustic and lighting comfort. A parametric study through the prediction software Odeon 10.1 and Relux 2012.1 has been carried out by adding different scenic elements in the theatre to evaluate their influence on acoustic quality and solar radiation.

For the acoustic part, the comparison between the conditions with and without the scenery allowed to establish guidelines for scenic design, to preserve and improve the original acoustic apparatus. The computer model was calibrated according to in situ measurements performed in non-occupied conditions. For the lighting part, the natural light analysis during the hours of daytime use of the theatre defined potential elements of discomfort for the viewers, due to glare or high contrasts of luminance between scenery and sky. Through an integrated approach of acoustic and lighting design it has been possible to solve those problems.

© 2014 Elsevier B.V. All rights reserved.

## 1. Introduction

The Syracuse theatre is an ancient open-air theatre in the Sicily, the South of Italy, intensively used for the cycle of classical representations organized every year during the summer season by the Italian association INDA (Istituto Nazionale Damma Antico), which subjects the theatre area to substantial changes for almost four months per year. A protection material – wooden panels – covers the *cavea*'s steps to allow the public to sit, whereas the *orchestra* and the stage receive the temporary scenery, usually conceived on the idea of the classical geometry. Fig. 1a and b show respectively the empty condition of the theatre and the scenery inserted in 2013.

The use of contemporary sceneries in ancient theatres is necessary for plays and other performing arts genres: scenery is useful to lead the viewer into the imaginary world represented by the play. Previous research aimed at investigation of the positive acoustical effects of the insertion of specific sceneries in the Syracuse and other ancient theatres, through computer simulations and scale modelling, in ancient and modern times [1–3]. On the contrary, the visual comfort of viewers due to the presence or the absence of a scenery has never been analyzed.

Some indications on the conservation and the modern use of the ancient theatrical structures have been indicated in 2004 with the *Syracuse Charter, for the conservation, the fruition and management of the ancient theatrical architecture* [4]: it contains also few considerations related to acoustical and lighting fields. From the acoustic point of view, the ancient acoustical apparatus may be preserved and improved through temporary structures. From the lighting point of view, the correct installation of the lighting system can help to understand and increase the value of the spatial and cultural

\* Corresponding author at: Politecnico di Torino, Department of Energy, Corso Duca degli Abruzzi 24, 10129 Torino, Italy. Tel.: +390110904551  
E-mail address: [elena.bo@polito.it](mailto:elena.bo@polito.it) (E. Bo).



Fig. 1. (a) The theatre of Syracuse, empty and (b) The theatre of Syracuse, scenery 2013.

### General guidelines

Multi-purpose intent

No strict limitations to design process

Respect of the antiquity of the theatre

Temporary structures and light materials

#### Acoustic proposals

Reinforce the sound propagation

Execution of other kinds of performance

Control of the Background Noise

#### Lighting proposals

Limitation of glare conditions

#### Simple elements analysed

1. Scenic front

2. Stage floor

3. Back panels

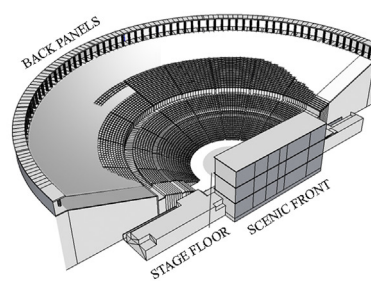


Fig. 2. Diagram of the intentions for design guidelines in the theatre.

qualities of the monument and its environments. But there is still a lack of guidelines for the scenery design.

On the basis of a previous analysis [5], this article indicates the basic scenery elements that can be inserted into the theatre in order to improve the acoustic environment, verifying also the lighting comfort for the audience in the Syracuse theatre. The exploration of the different variants was performed by means of computer-based simulations. These were necessary for discussion and definition of guidelines for scenery design, which could be helpful in exploring shapes and materials that enhance acoustics and avoid annoying lighting contrasts.

This research would provide useful information not only for scenographers, but also for directors, architects, acousticians and lighting designers. Improvement of the experience for the attendants of the theatre, by taking into account the not-limiting inspiration to the scenery designers and following a multi-purpose intent, with the respect of the antiquity of the theatre was one of the aims of this research. The main focus was oriented to 3 classical geometries of the ancient theatre: I. Scenic Front (*Scaenae Frons*); II. Stage Floor (*Orchestra*); III. Back Panels (*Porticus*). A summary of the intentions is shown in Fig. 2.

## 2. The ancient theatre of Syracuse

The ancient theatre of Syracuse dates to the fifth century B.C. The structure as it appears today is similar to the Roman type, even though the theatre was conceived in the Greek period,

changing over time. The part that survived until today shows the *cavea* (where the audience sits) with a diameter of around 105 m (from the original 143 m at its maximum extension) that extends radially around the *orchestra* in a plane semi-circle of 29 m diameter located in front of the building stage (or *scaenae frons*) that is not anymore preserved. Horizontally, it is still possible to recognize nine sectors (*kerkides*) in the *cavea*, separated by eight stairs (*klimakes*) of 0.6 m of length. Vertically can be distinguished three zones: *ima*, *media* and *summa cavea*. Each part is divided from the other by a specific boundary element. Starting from the orchestra, the *ima cavea* corresponds to the first twelve steps and it has a slope of  $22.5^\circ$ . After a higher step of 0.86 m, it becomes *media cavea* and the slope changes to  $20.8^\circ$ . A large passage, called *diàzoma*, bounds this part and suddenly the *summa cavea* begins, keeping the same average slope. It developed until the *porticus*, a gallery that constituted the upper boundary element of the whole theatre. Today, this does not exist anymore and the *summa cavea* is strongly damaged, partly covered by earth and grass.

### 2.1. Acoustical measurements on-site and model calibration

Two types of acoustical measurement have been carried out in the empty theatre: background noise level (BNL) and reverberation time (RT). The instruments used for the analyses, provided by the Politecnico di Torino, Department of Energy (DENERG), were a calibrated sound level metre used as a receiver (XL2 Handheld Audio and Acoustic Analyser produced by NTi Audio) and a sound source

Download English Version:

<https://daneshyari.com/en/article/262585>

Download Persian Version:

<https://daneshyari.com/article/262585>

[Daneshyari.com](https://daneshyari.com)