

AGCE Amphitheatre

Prof. Ajay B.
Kolekar

Anupsinh V.
Shinde

Abhishek V.
Shinde

Suraj N.
Yadav

Tanveer H.
Aatar

Abhijeet S.
Nikam

Department of Civil Engineering
Arvind Gavali College of Engineering
Satara, India

ajaykolekar1311@gmail.com, anup.shinde611@gmail.com, abhishekshinde128@gmail.com,
yadavs5882@gmail.com, aatartanveer8@gmail.com & abhinikam111197@gmail.com

Abstract – This project deals with the analysis and design of the Amphitheatre. Planning and designing with cost estimation are enclosed in this report. Area and other specifications are taken from IS 2526:1963 (Code of practice for acoustical design of Auditorium and conference halls) and NBC (National Building Code). Design and analysis is done manually and the results are verified using Autodesk REVIT Architecture. We have used the AUTO CAD for planning.

Keywords – Acoustic, Analysis, Slab, AutoCAD , Revit ,etc.

I. INTRODUCTION

Amphitheatres are structures that have been used for entertainment and performances since the ancient Greek and Roman times. In order to develop the design of an amphitheatre, there are many factors that must be accounted for. Some of the considerations for the amphitheatre include the size, orientation, acoustics, stage, seating, and lighting. The goal of this project named design of amphitheatre is to develop design solutions for the development of an amphitheatre, stage and seating arena for Arvind Gavali College of Engineering, Satara.

This project represents layouts of amphitheatre, stage and designs as well as cost estimates. An amphitheatre is a space built to enable an audience to hear and watch performances such as theatres. Amphitheatre, Conference hall, Library is necessary for an Engineering college. In Arvind Gavali College of Engineering, Library, Conference hall are located at different locations and also there is no special arrangements for Amphitheatre. This project reports on the design of Amphitheatre in one separate block. All structural components for the building such as retaining walls, steps, seating space, stage etc are analyzed and designed.

1.1 Acoustical Requirements

- Halls Used for Speech -The clarity of speech is most important in this case. Optimum clarity depends on:
 - Correct reverberation time,
 - Absence of echo,
 - Correct loudness level at all parts of hall.
- Halls for music - Adequate reverberation is important to lend proper blending and fullness of music. The reverberation time is required to be higher than for

- Halls meant for speech only.
- Open-Air Auditoriums and Conference halls- While the general acoustical requirements are similar to those specified for halls additional requirements which arise are dealt with in 10.

1.2 General Principles of Design

1.2.1 Seats

Seats should be staggered sideways in relation to those in front so that a listener in any row is not looking directly over the head of- the person in front of him .This is particularly important for halls where the audience provides the major part of the required sound absorption.

1.2.2 Sitting Arrangements

Seating arrangements in an auditorium seating layout (or assembly space) will either be identified as “multiple-aisle” or “continental.

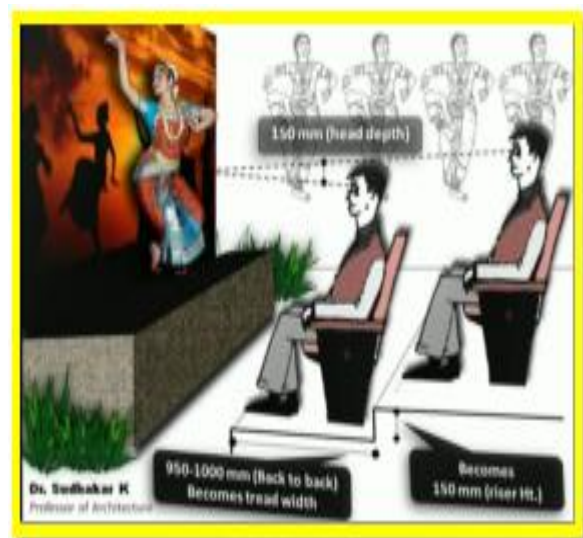


Fig. 1. Seating Arrangements in an Auditorium.

1.2.3 Sitting Dimensions

The average seat width has grown from 450 mm to 650 mm, a grow of 12.7% that is related to a growing human size as “Theatre Projects Consultants”

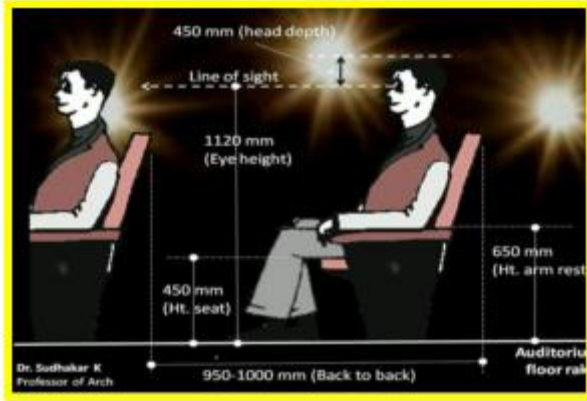


Fig. 2 .Seating Dimensions.

II. LITERATURE SURVEY

Howard G. Latham, The signal to noise ratio for speech intelligibility – An Auditorium Acoustics design index
The Signal-to-Noise Ratio devised by Lochner and Burger contributed an objective design index for predicting speech intelligibility. Their index provided a measure of useful and detrimental reflected speech energy according to the integration and masking characteristics of hearing, and enabled predictions to be made from impulse measurements in models. However, it was necessary to extend the Signal-to-Noise Ratio theory to account for the effect of fluctuating ambient background noise on speech intelligibility.

Howard G. Latham, The Measurement of Quality in Auditorium Acoustics by Subjective Scaling Methods - A Review of Developments in Theory and Practice

The effects of reflections: The terms 'reflection' and 'echo' have sometimes been confused, in that any perceptible reflection was called an 'echo'. It could be useful to identify three types of reflection by their subjective effects in complex sound fields:

- Imperceptible but contributing towards sound impression.
- Perceptible but not disturbing, and not perceived as an echo or new source.
- Perceptible and disturbing.

The threshold of perceptibility has been defined as the level at which 50 per cent of subjects noticed a difference in the sound field. The critical level of a reflection was determined when 50 per cent of listeners were disturbed.

III. COMPARATIVE STUDY

As we compared the existing conference hall with the proposed AGCE Amphitheatre we have got the following main advantages of AGCE Amphitheatre:

- To provide student with a leisure seating area for studying and socializing.
- To provide the college with an open-air venue for outdoor lectures, such as evening stargazing lectures and daytime reading and auditions, etc.
- To visually connect the library and imaginarium with an attractive transition in lawn space.
- To reduce the steep slope that presents a safety hazard to students
- To provide ample space for any kind of event such as annual gathering, alumni meet, day’s celebration etc.

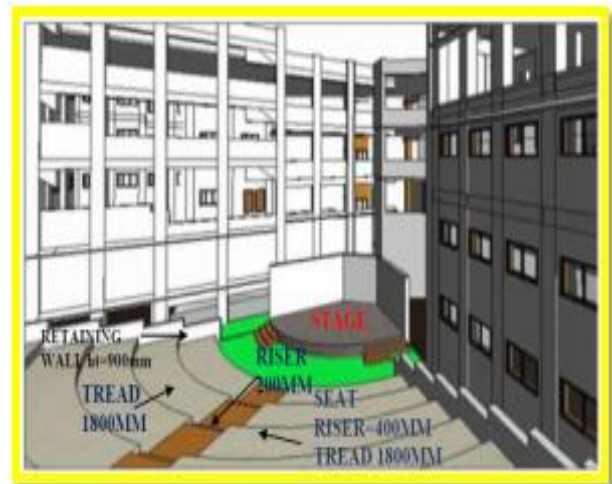


Fig. 3. Components of AGCE Amphitheatre.



Fig. 4. 3D Side View of Seating Arena.

The design and execution of Amphitheatre for AGCE, Satara includes following:

1. Surveying of the site
2. Design & estimate of amphitheatre
3. Execution work of amphitheatre

With above literature it is found that the design of amphitheatre can be developed with the qualitative and quantitative approach for the project under consideration. This project mainly aims to explore the economic benefit

of amphitheatre and the methodology has been demonstrated through application to the Arvind Gavali College of Engineering, Satara in the state of Maharashtra, India.



Fig. 5. 3D View of Retaining Wall.

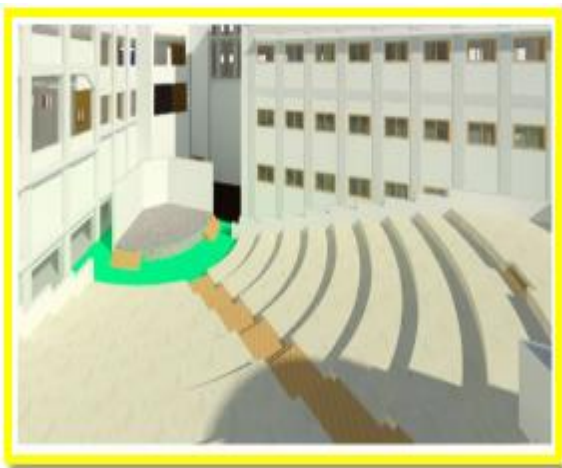


Fig.6. 3D View of Seating Arena & Stage.

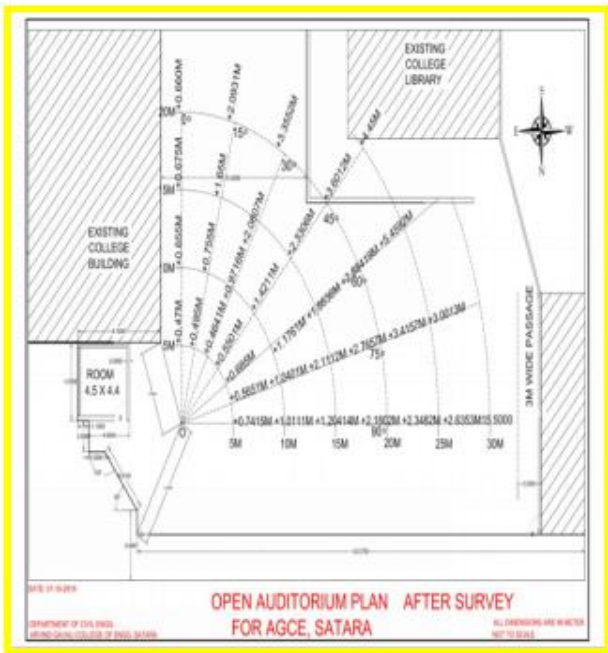


Fig. 7. Contour Points - AGCE Amphitheatre.

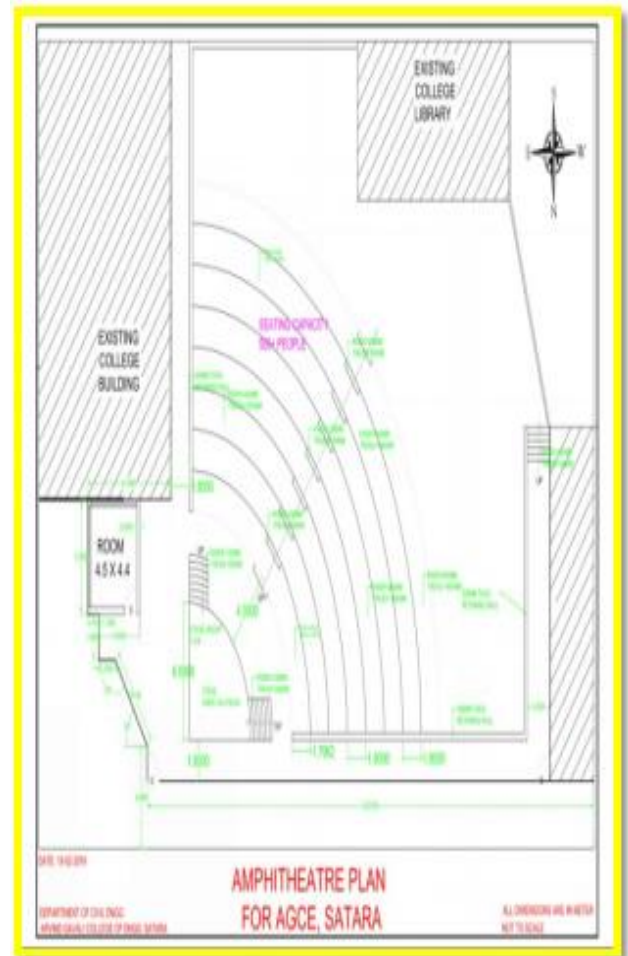


Fig. 8. Plan - AGCE Amphitheatre.

IV. COST ESTIMATION

Providing Staircase 13m x 0.9m x 0.6m 7.02Cu.m x Rs.2000 14040
 Providing Plaster Area=14.04 14.04Sq.m x Rs.3004212
 Providing Colour Area=14.04 14.04Sq.m x Rs.2102948.4
 Providing Electrification & Other facilities 7% of Total Cost 324075 x 7% 22685
 Total Cost In Rupees 346760

V. FUTURE SCOPE

1. Prior to any design, price is a heavy factor in consideration for a final design, which the group will decide upon following the completion of the designs.
2. Cost analysis can be performed for each alternative to ensure that the budget cannot be surpassed.
3. To aid in the decision of picking a design, the strengths and weaknesses of each design can be weighed.
4. Constraints, other than cost, that will be considered include feasibility of construction, sustainability, environmental impact, as well as the other considerations if any.

SL. NO	PARTICULARS	SPECIFICATIONS	QUANTITY	PRICE IN Rs
1	Excavation For Foundation in Earth	20m x 0.3m x 0.6m 14m x 0.3m x 0.6m	10.620Cu m	3186
			= Rs.300	
	Grade		2.520Cu m	756
			= Rs. 300	
2	Providing Stone Masonry for Foundation	20m x 0.3m x 0.6m 14m x 0.3m x 0.6m	10.620Cu m	30262
			= Rs.2850	
	Grade		2.520Cu m	7182
			= Rs. 2850	
3	Providing Stone Masonry for Foundation	20m x 0.3m x 1.5m 14m x 0.3m x 0.6m	26.550Cu m	80977.5
			= Rs.3050	
	Grade		2.520Cu m	7686
			= Rs. 3050	
4	Providing PCC Layer	23.3m x 21.02m 10m x 8m	4905q m	147000
			= Rs. 300	
	Grade		805q m	24000
			= Rs. 300	
5	Providing	13m x 0.9m x 0.6m	7.020Cu m	14040

- [6]. IS 2526:1963, Code Of Practice For Acoustical Design Of Auditorium And Conference Halls
- [7]. Chan Haan & Fergus Fricke, Statistical Investigation of Geometrical Parameters for the Acoustic Design of Auditoria, 1992

REFERENCES

- [1]. Mojgan, Ghorbanzadeh. "Landscape Design in Bojnourd Besh Ghardash Ecopark". Submitted to Department of Landscape Architecture for degree of master in landscape architecture, Faculty of Architecture and Urbanism, Shahid Beheshti University. (January, 2011).
- [2]. Josep Ignasi de Llorens. "Fabric Structures in Architecture". Woodhead Publishing Limited in association with The Textile Institute, Number 165, (2015). ISBN 978-1-78242-233-4.
- [3]. "Encyclopaedia Iranica Foundation". Center for Iranian Studies Columbia University (January, 2010) ISSN 2330-4804.
- [4]. Paolo, Beccarelli. "Chapter 2The Design,Analysis and Construction of Tensile Fabric Structures" Biaxial Testing for Fabrics and Foils, PoliMI SpringerBriefs, (2015). Doi: 10.1007/978-3-319-02228-4_2.
- [5]. Luís São Joãoa, Raquel Carvalhob and Raul Figueiroa. "A study on the durability properties of textile membranes for architectural purposes".