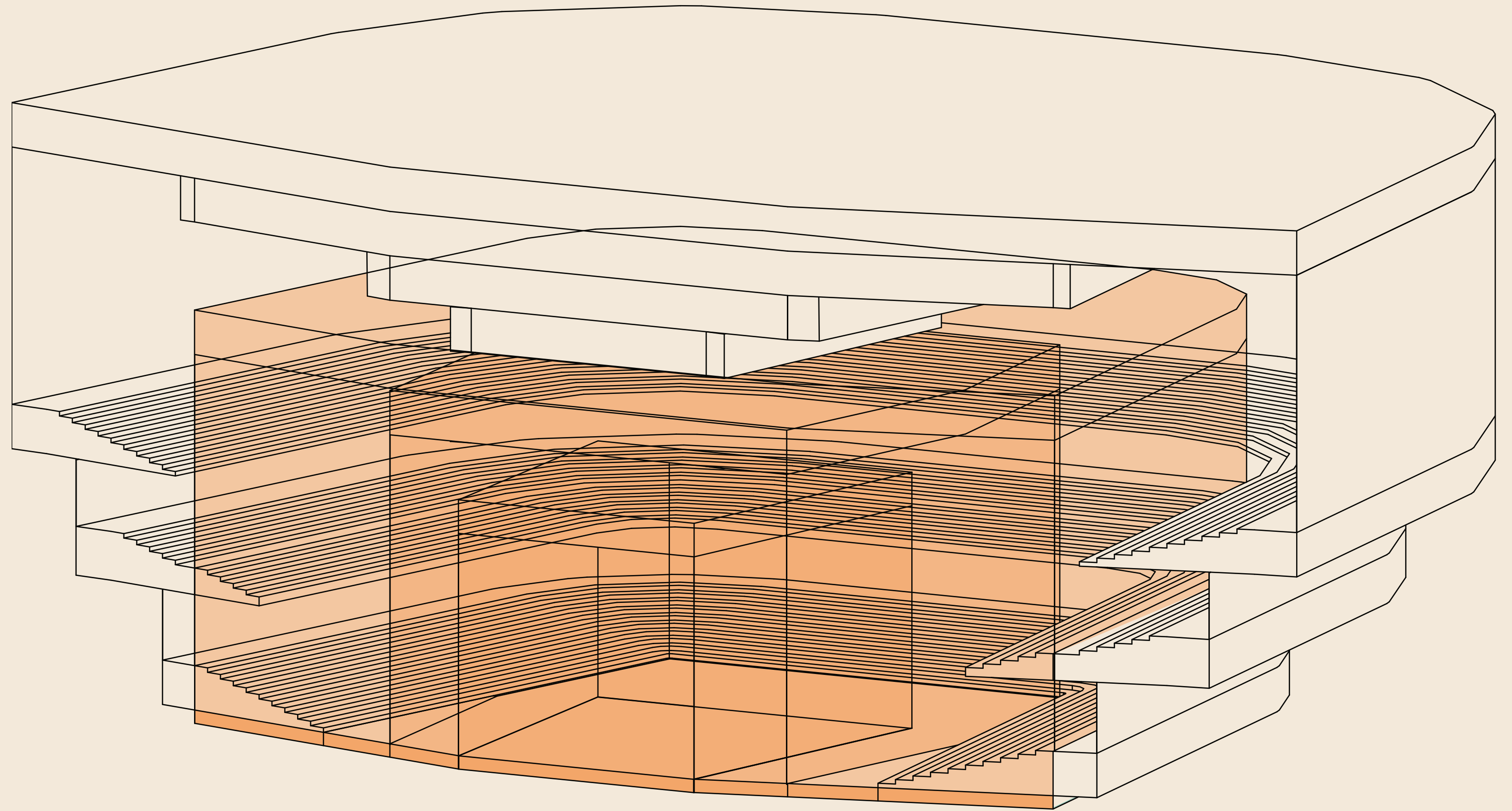


VERSATILE VENUE:
HOW CAN THE
ACOUSTICS OF
A SPACE BE
OPTIMIZED
FOR VARIED
PERFORMANCES?



RESEARCH AIM

What's the ideal configuration for a performance venue for specific performance types?

How can architecture be used to form the way sounds move and are heard?

What can kinetic architecture provide in terms of spatial configuration flexibility?

How can a venue be designed to maximize its use and acoustic capability?

METHODOLOGY

LITERATURE



Architectural Acoustics
Christopher N. Brooks

Acoustics of Multi-use Performing Arts
Centers
Mark Holden

Concert and Opera Halls: How They Sound
Leo Beranek

The Acoustics of Performance Halls
J. Christopher Jaffe

CASE STUDIES

Concertgebouw
Amsterdam, Netherlands

Boston Symphony Hall
Boston, United States

Musikverein
Vienna, Austria

Elbphilharmonie
Hamburg, Germany

Bridgewater Hall
Manchester, United Kingdom

Royal Albert Hall
London, United Kingdom

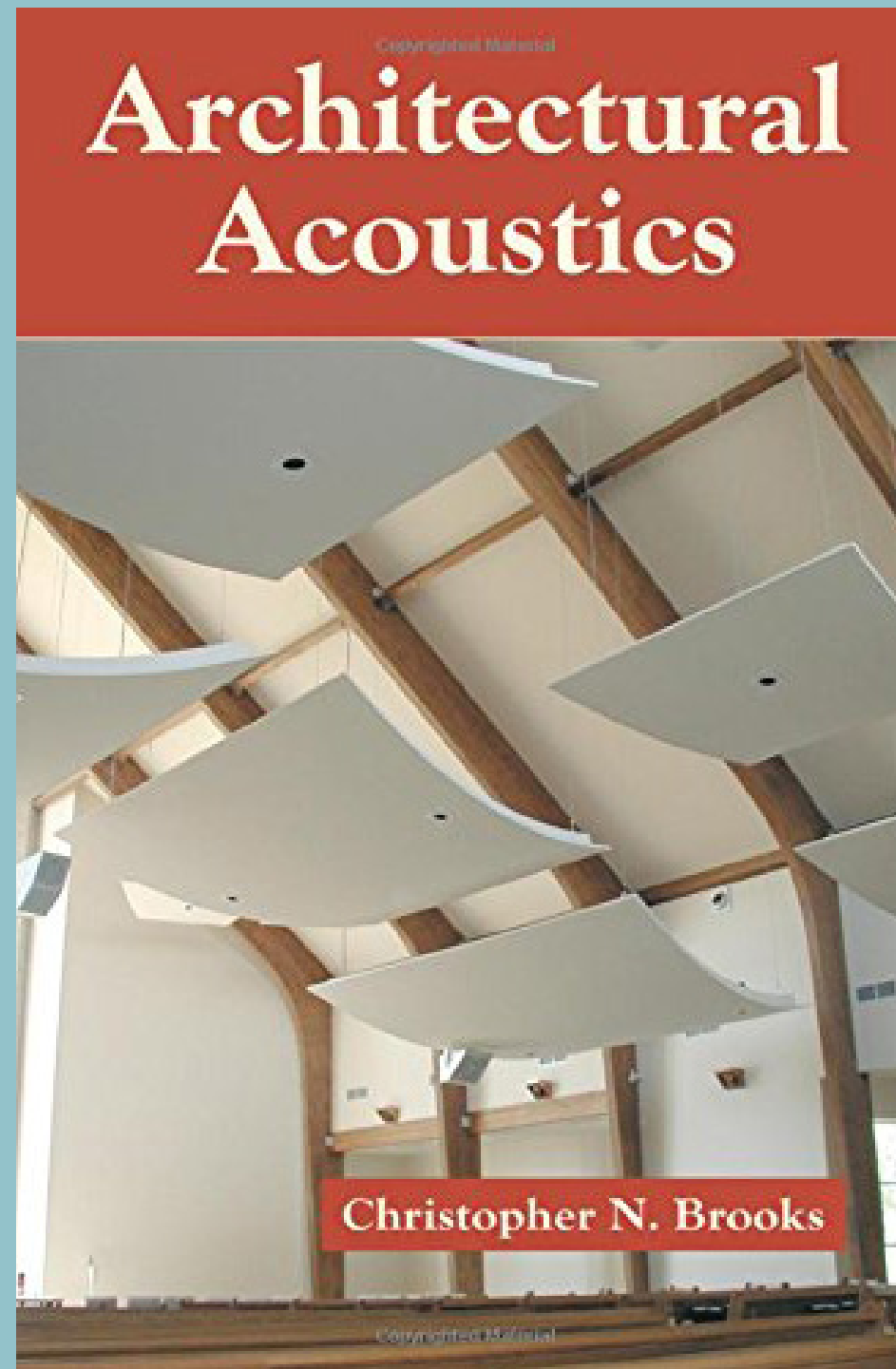
SIMULATION



form·Z⁹

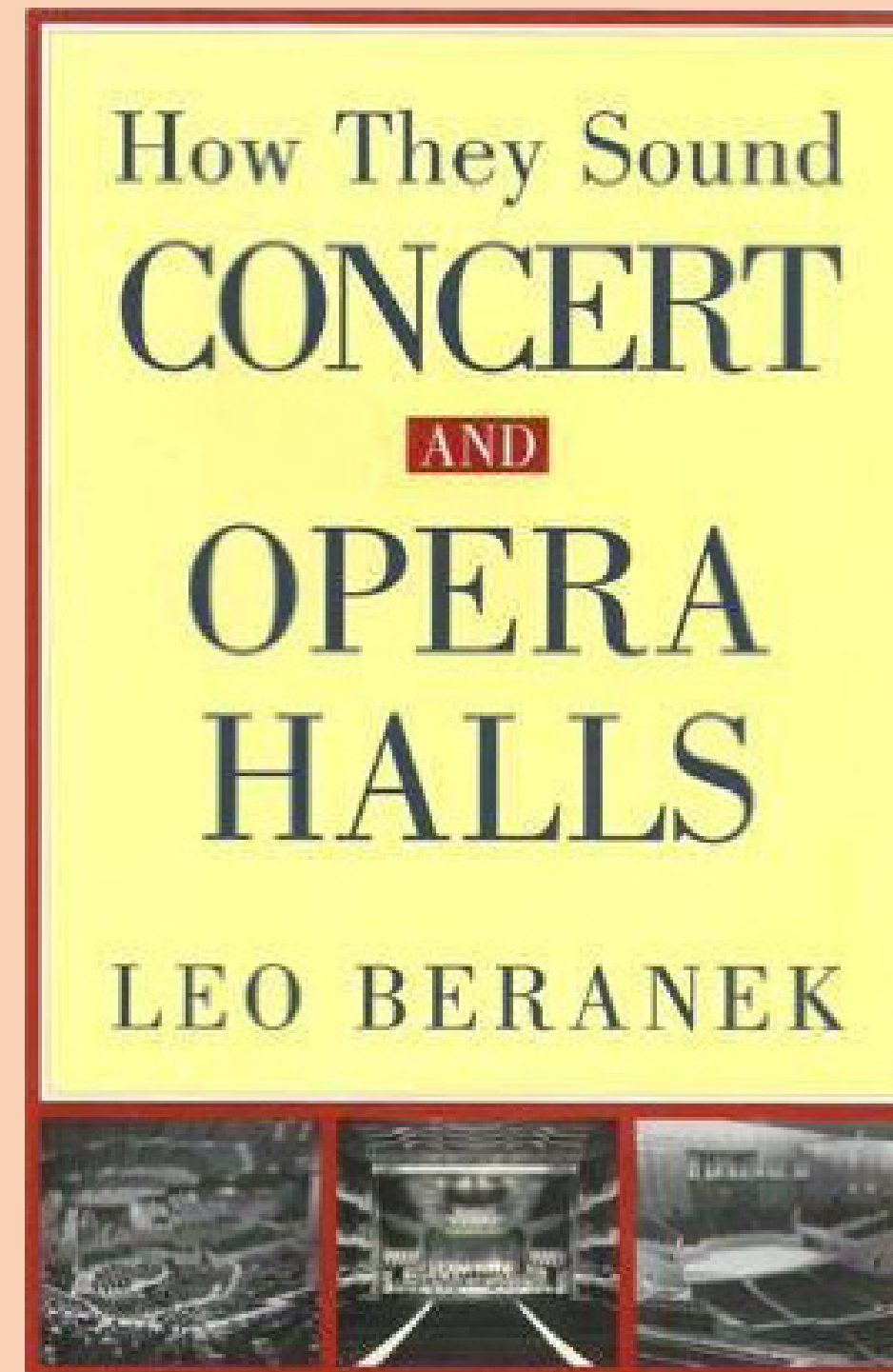


KEY LITERATURE RESOURCES



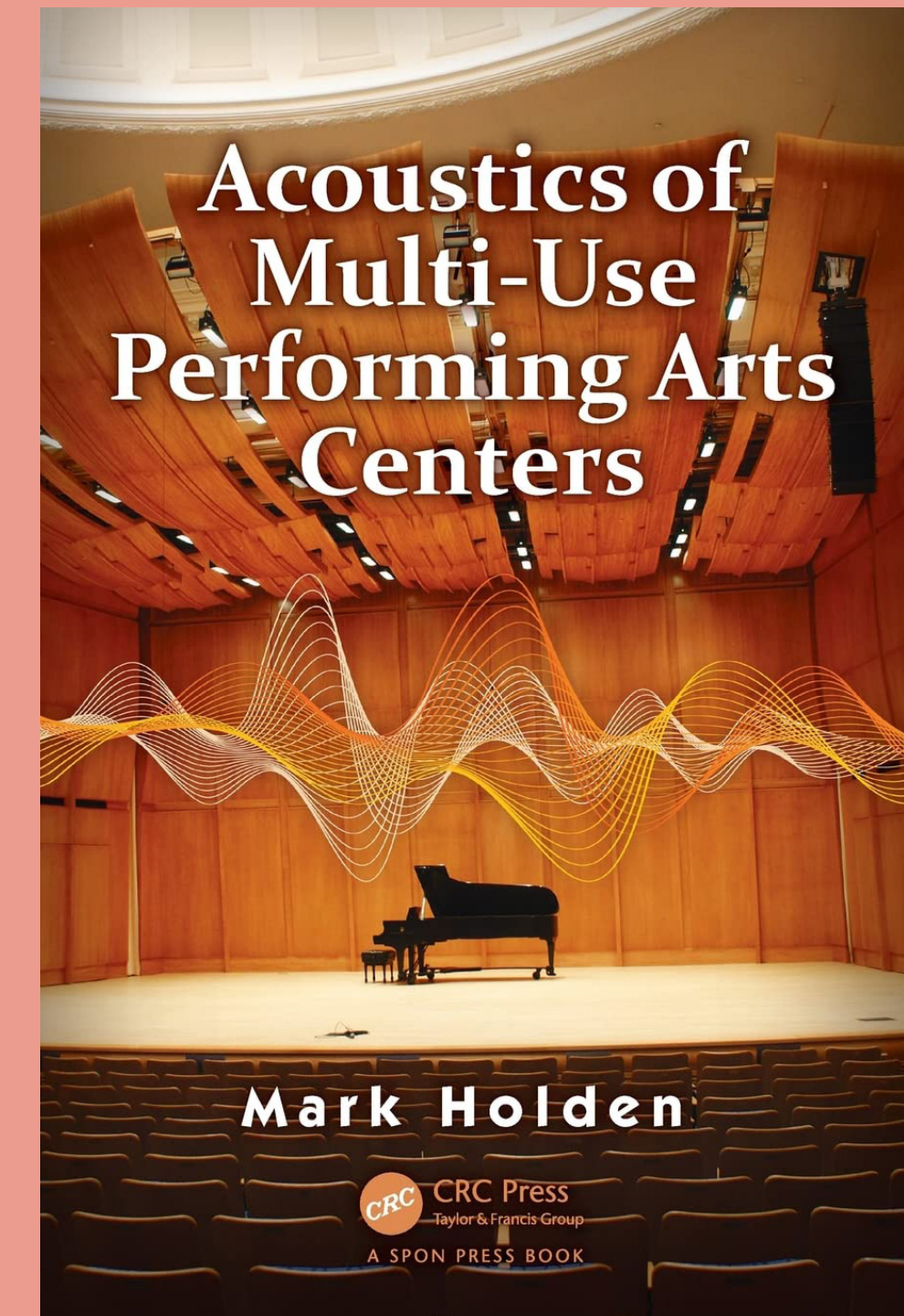
Christopher N. Brooks
2003
Architectural Acoustics

Focuses on Acoustics
Provides insight to design



Leo Beranek
1996
Concert and Opera Halls: How They Sound

A focus on acoustic measures
Includes specifications on over 50
halls



Mark Holden
2016
Acoustics of Multi-use Performing Arts
Centers

Describes the process of designing a
multi use hall in detail

ACOUSTIC FOCUS

Reverberation Time
(RT)

Echoes

Initial Time Delay Gap
(ITDG)

Early Decay Time
(EDT)

Texture

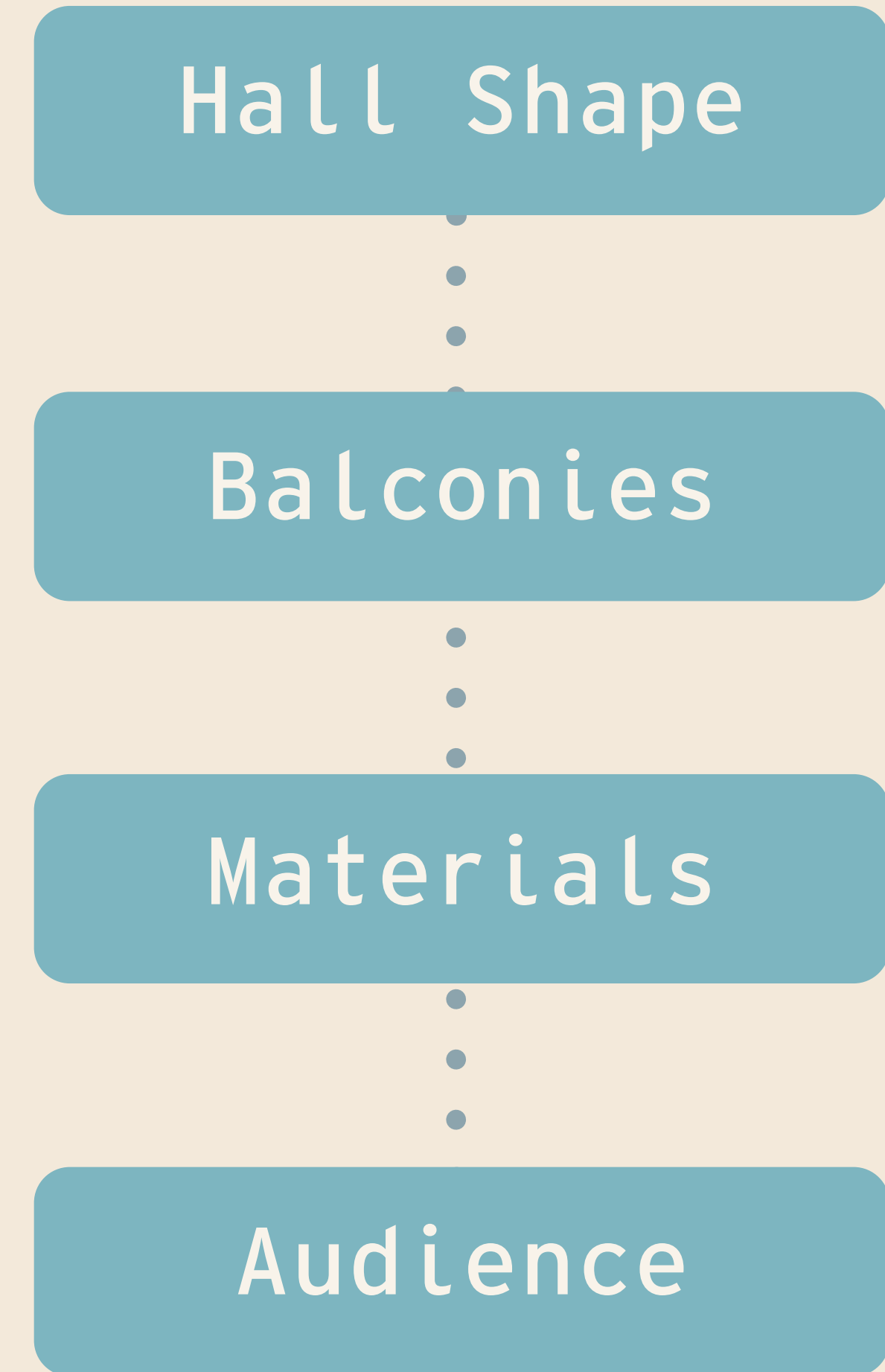
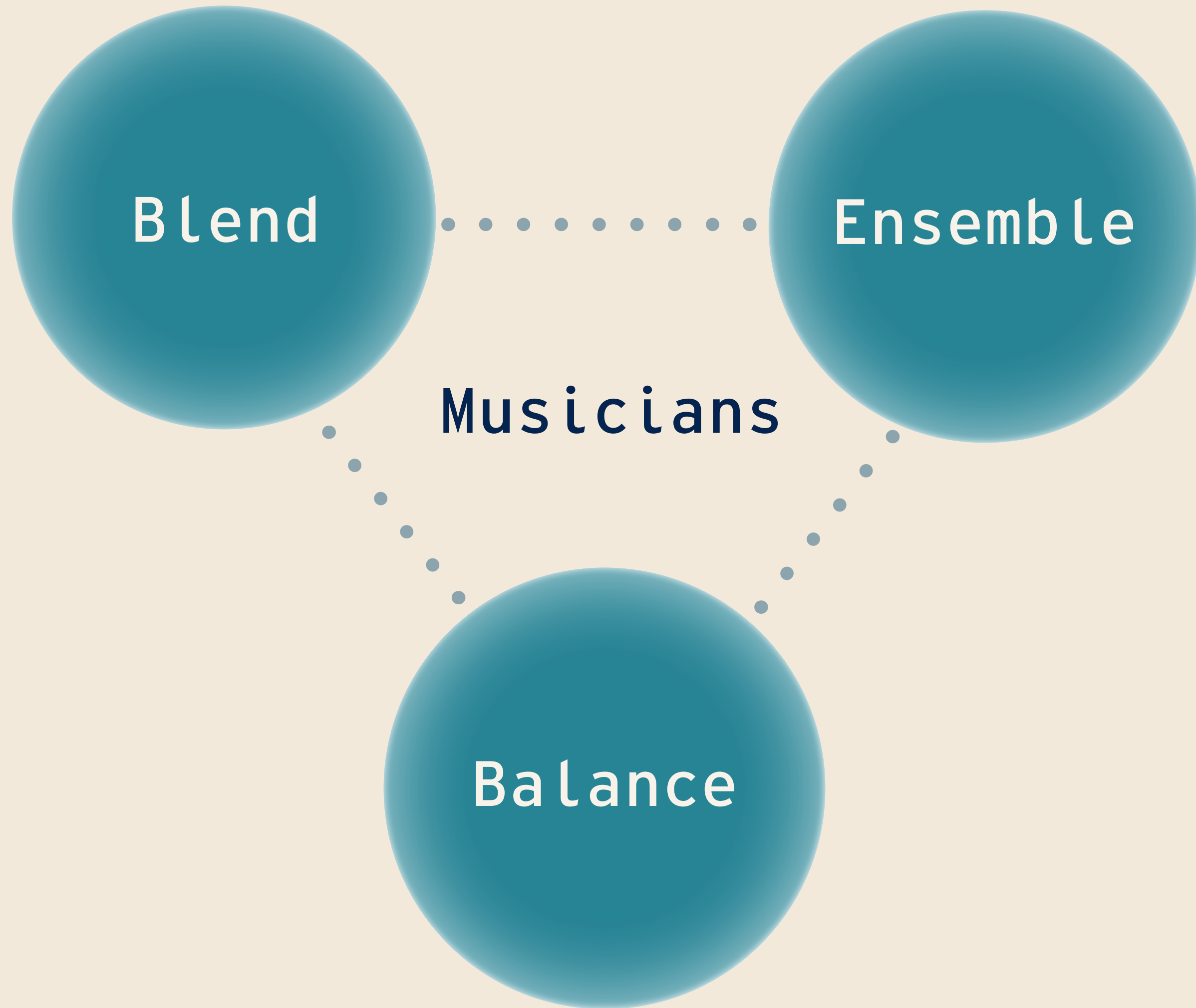
Dynamic Range

Resonance

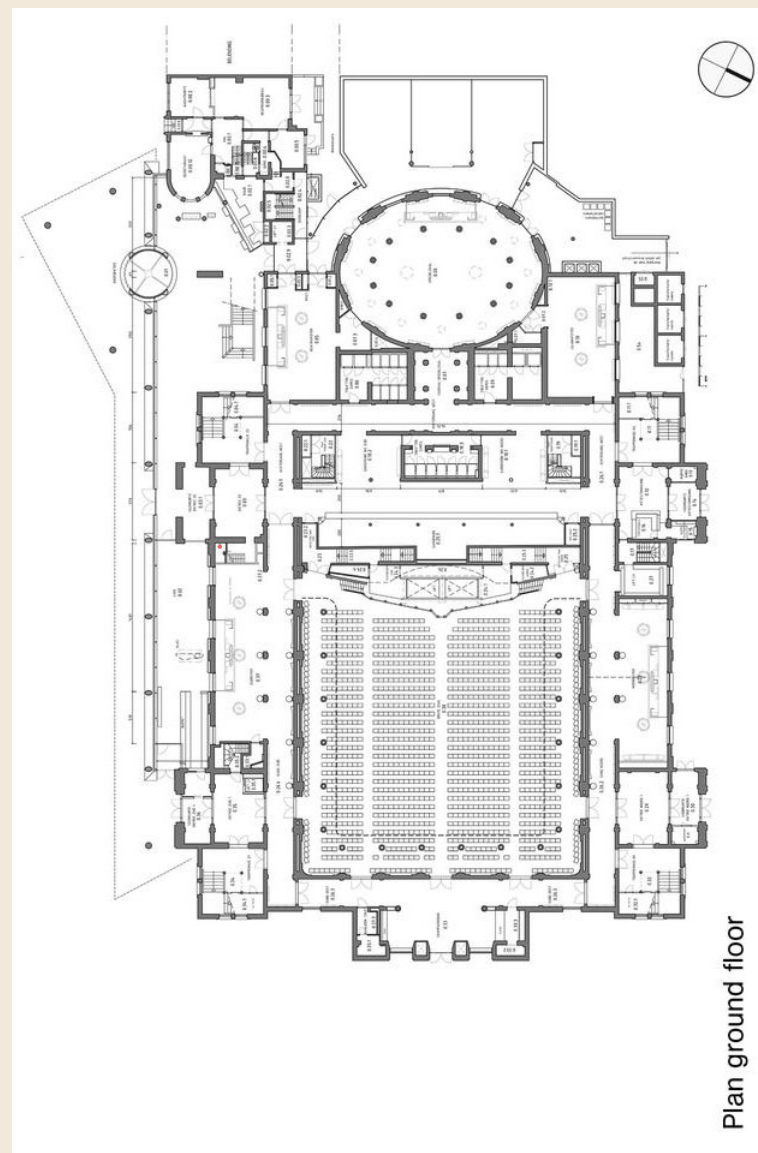
Spaciousness

PERFORMANCE FACTORS

DESIGN CONSIDERATIONS



CASE STUDIES



Year Built: 1888
Capacity: 2,037
Shape: Shoe Box

RT: 2.0

Materials

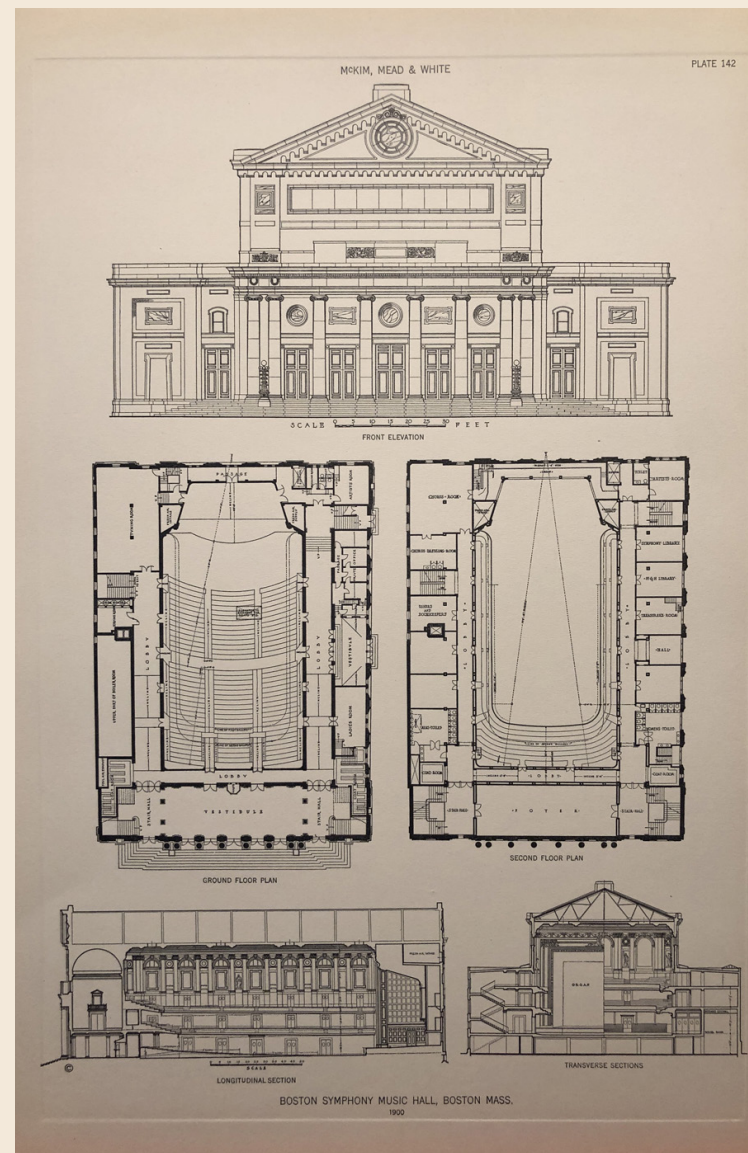
Ceiling: Plaster on reeds

Walls: Plaster on brick, plaster on reeds

Floors: 5 inch concrete on top of hardwood boards

Stage: Heavy wood over deep airspace

Seating: Upholstered



Year Built: 1900
Capacity: 2,625
Shape: Shoe Box

RT: 1.9

Materials

Ceiling: Plaster on a metal screen

Walls: Plaster on metal lath, Plaster on masonry, wood paneling

Stage: Wooden planks over airspace

Seating: Wood base with leather upholstery



Year Built: 1870
Capacity: 1,680
Shape: Shoe Box

RT: 2.0

Materials

Ceiling: Plaster on spruce wood

Walls: Plaster on Brick

Balcony fronts: Plaster on wood
Floors: Wood

Stage: Wood risers

Seating: Wood base with upholstery

CASE STUDIES



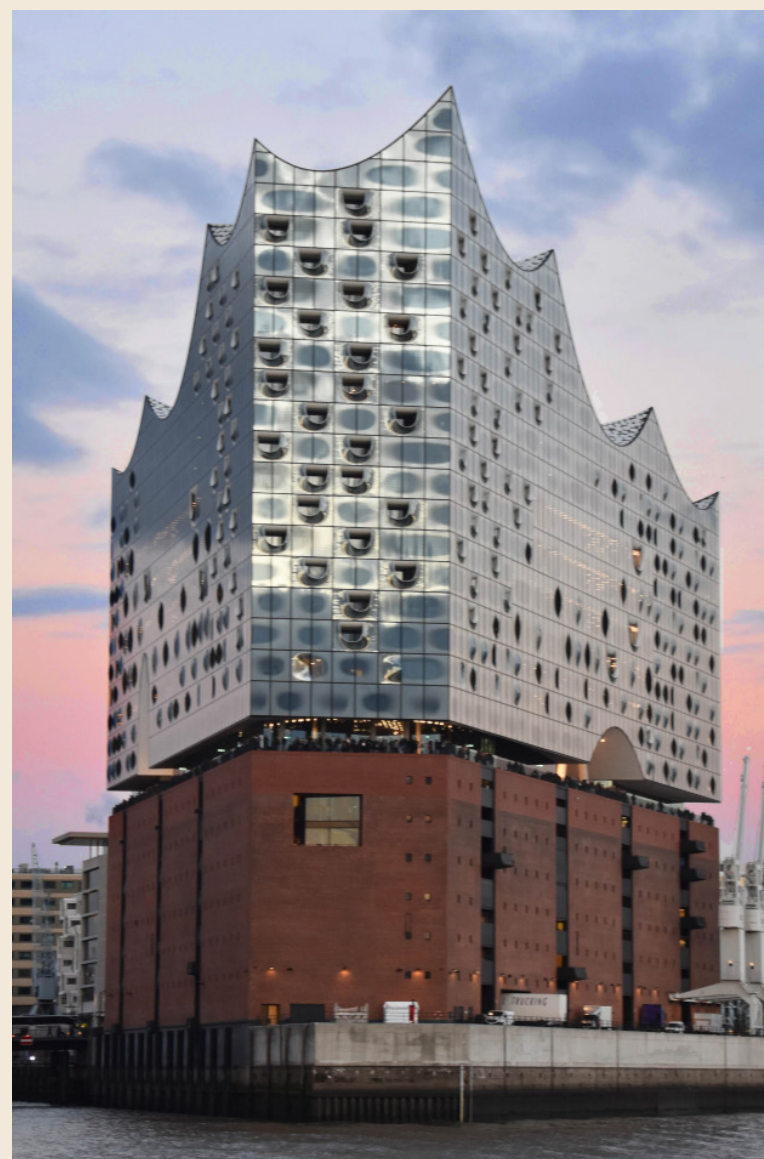
Elbphilharmonie
Hamburg, Germany



Bridgewater Hall
Manchester, United Kingdom



Royal Albert Hall
London, United Kingdom



Year Built: 2016
Capacity: 2,100
Shape: Vineyard

RT: 2.3

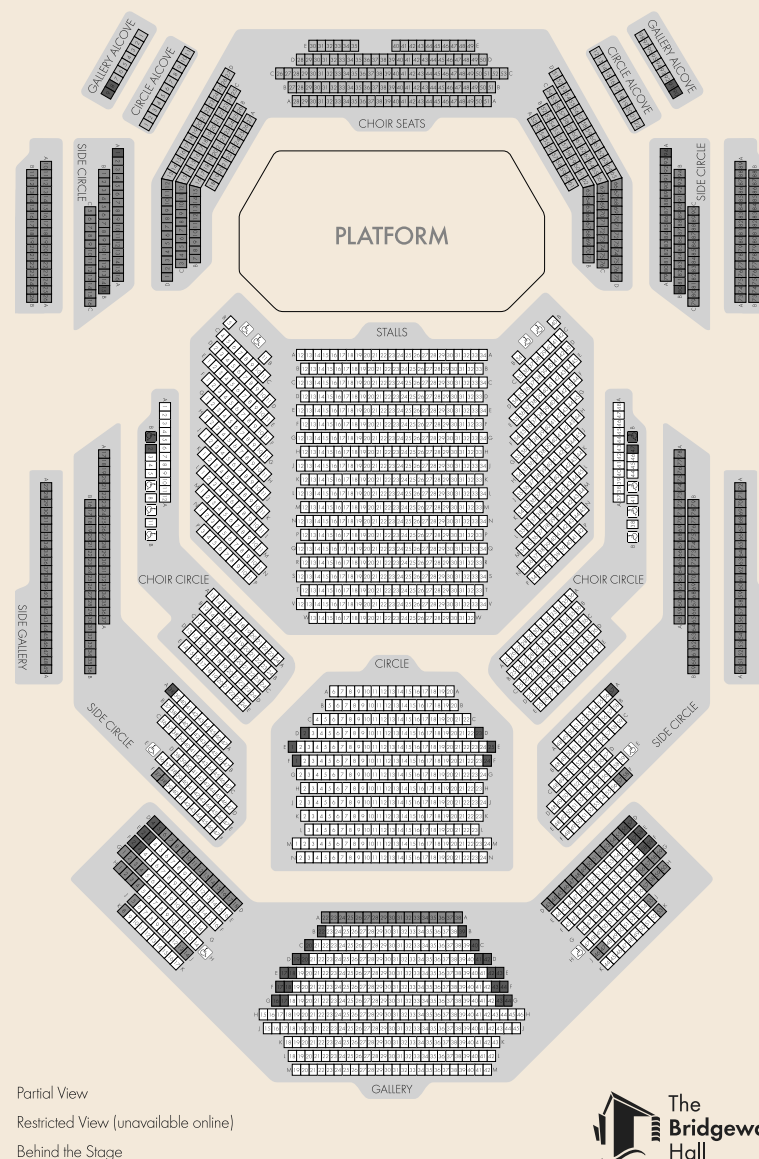
Materials

Ceiling & Walls: HGF, milled MS

Floor: Wood Flooring on HGF

Stage: Oregon pine supported with wooden joists

Seats: Upholstered



Year Built: 1996
Capacity: 2,357
Shape: Rectangular-Vineyard

RT: 2.0

Materials

Ceiling: Concrete panels

Walls: Inner wall plaster

Floors: Oak wood embedded in concrete

Stage: Wood boards over airspace

Seats: Wooden, with upholstery



Year Built: 1871
Capacity: 5,222
Shape: Ellipse

RT: 2.41

Materials

Ceiling: Plaster Finish

Walls: Plaster, and Thin Wood

Auditorium floor: Wood and Concrete

Stage Floor: Thick wood over airspace

Seats: Upholstered

SIMULATION SETUP



form · Z⁹

Walls	30mm Plaster on metal lath	
Floor	Wooden Floor on Joists	
Stage Enclosure	Thin Plywood Paneling	
Audience	Audience, medium upholstered seats	
Roof	30mm Plaster on metal lath	
Stage Floor	Floating Wooden Floor	

Sound Source:	Receiver 1:	Receiver 2:
On Stage	Located Near the front of the hall	Located Near the rear of the hall

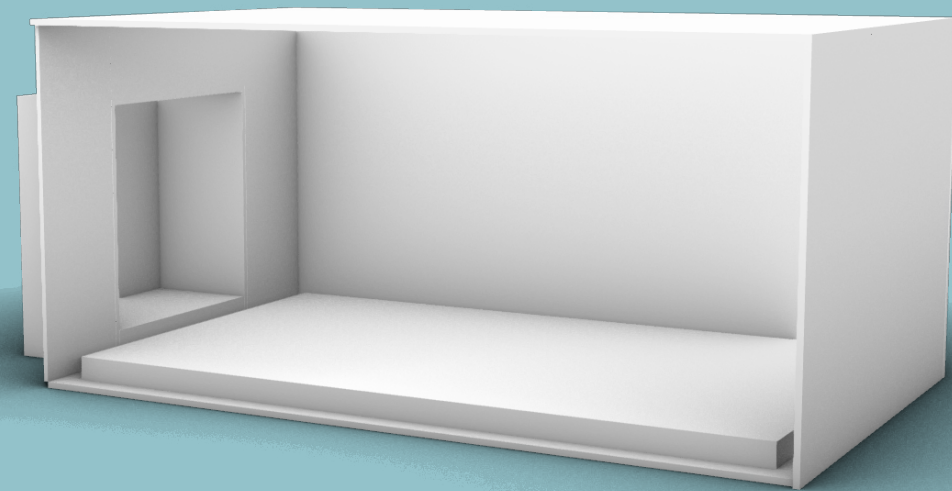
Simulation 1



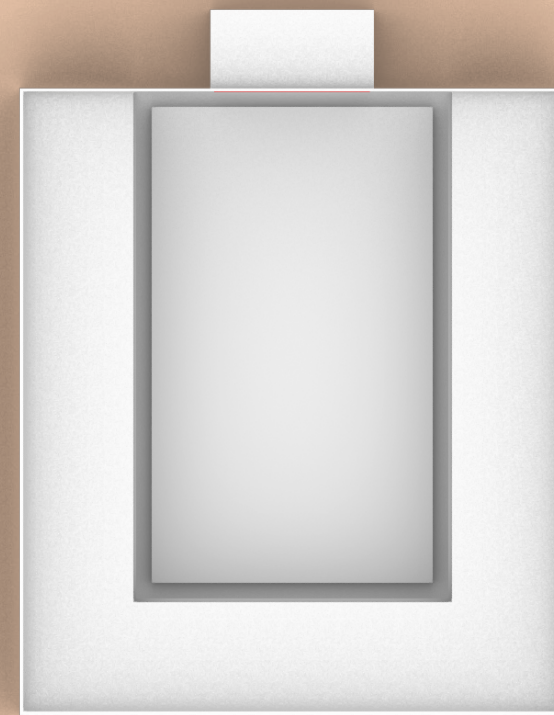
Dimensions
Length: 130'
Width: 80'
Height: 60'

Estimated Size
1,000 Seats

RT Average	EDT Average:
R1: 4.04s	R1: 3.60s
R2: 4.20s	R2: 4.50s



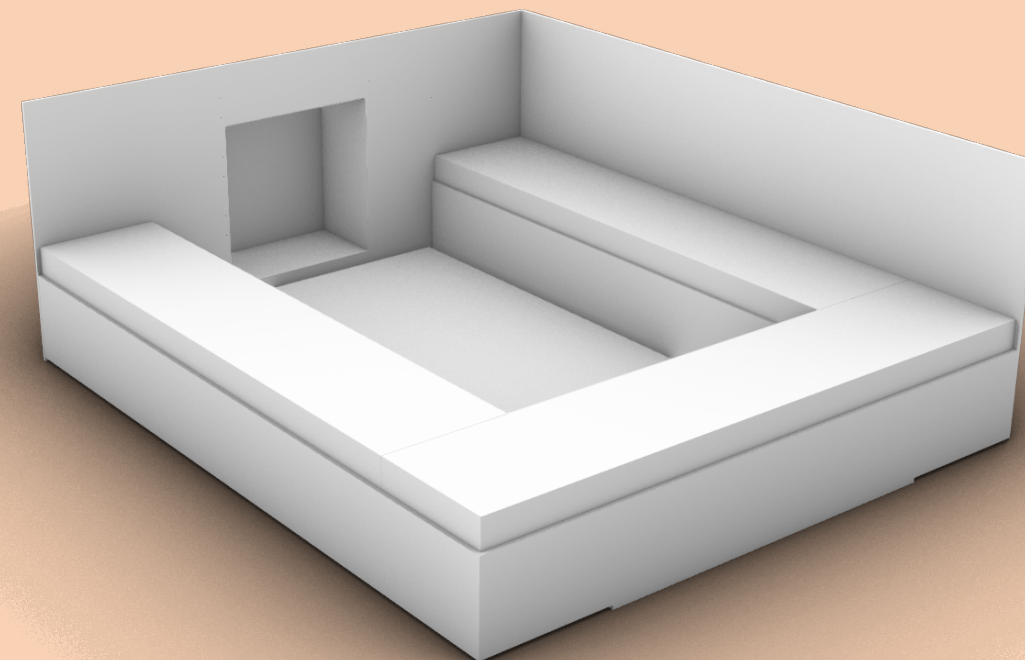
Simulation 2



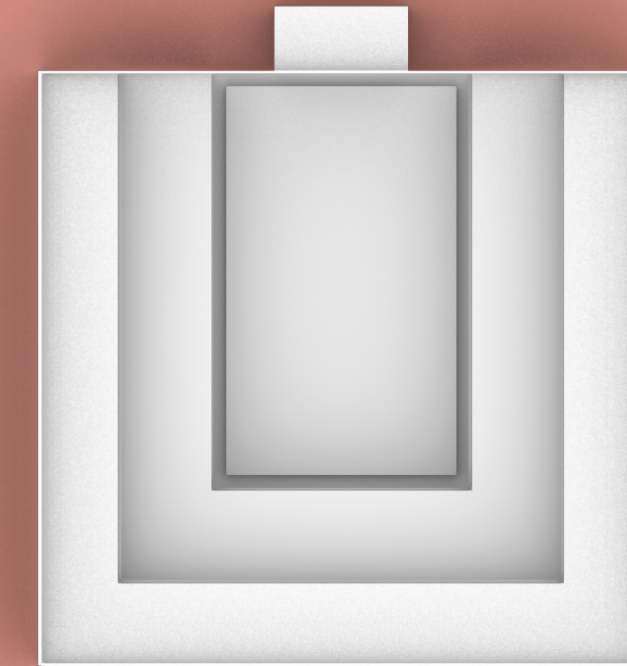
Dimensions
Length: 160'
Width: 140'
Height: 60'

Estimated Size
2,200 Seats

RT Average	EDT Average:
R1: 4.15s	R1: 2.78s
R2: 3.43s	R2: 2.31s



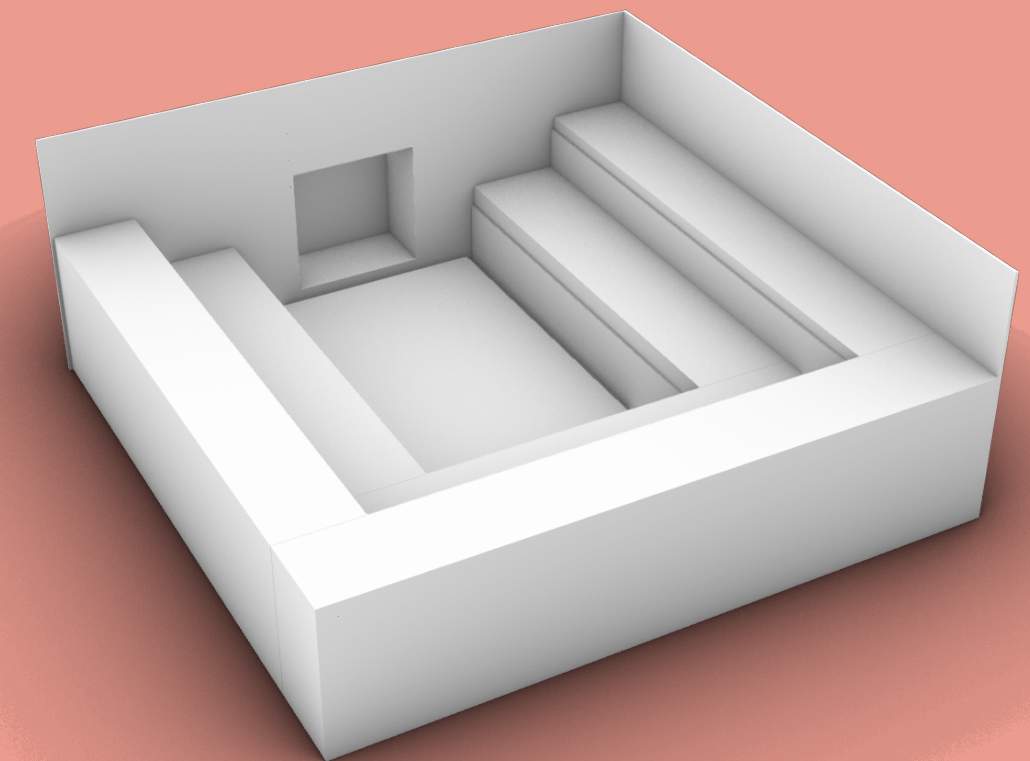
Simulation 3



Dimensions
Length: 180'
Width: 190'
Height: 70'

Estimated Size
3,400 Seats

RT Average	EDT Average:
R1: 3.09s	R1: 3.02s
R2: 2.88s	R2: 3.14s



Simulation 4



Dimensions

Length: 140'
Width: 100'
Height: 60'

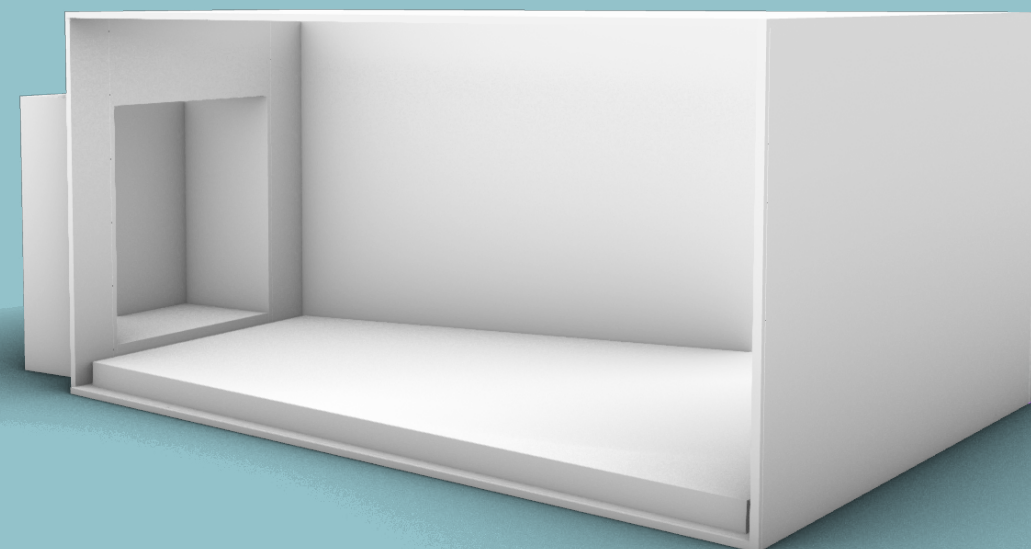
Estimated Size
1,200 Seats

RT Average

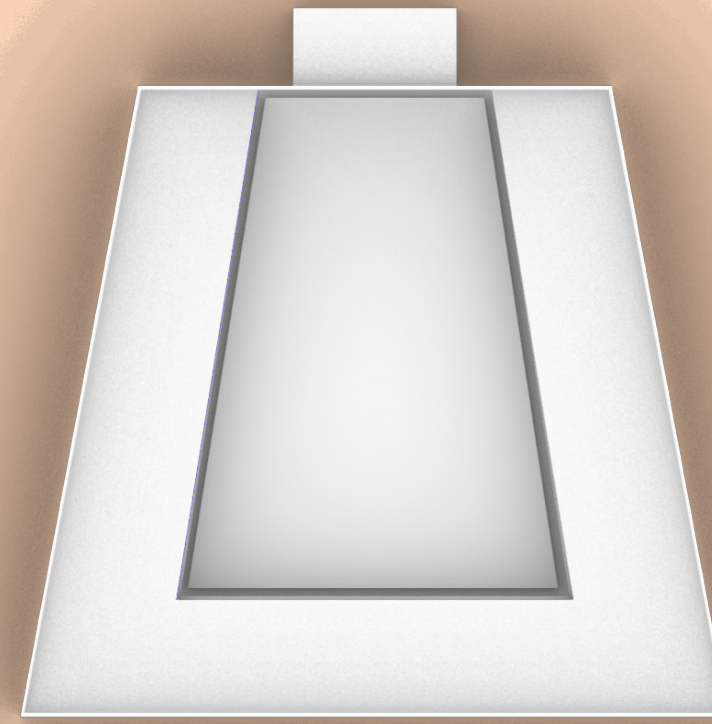
R1: 3.95s
R2: 4.38s

EDT Average:

R1: 4.07s
R2: 4.26s



Simulation 5



Dimensions

Length: 170'
Width: 160'
Height: 60'

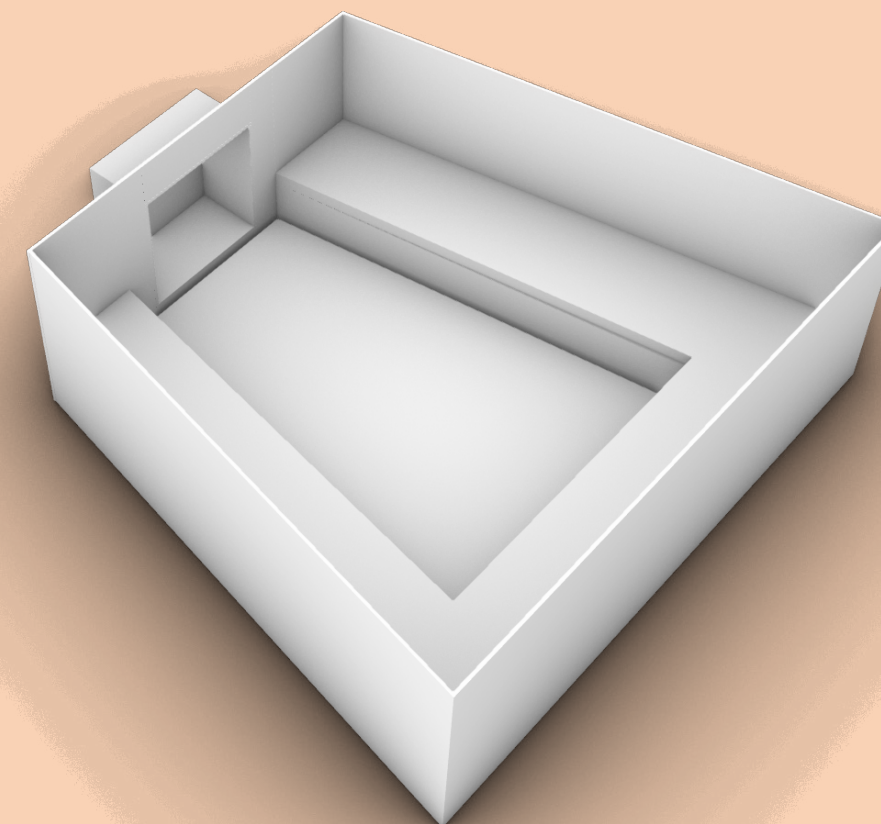
Estimated Size
2,500 Seats

RT Average

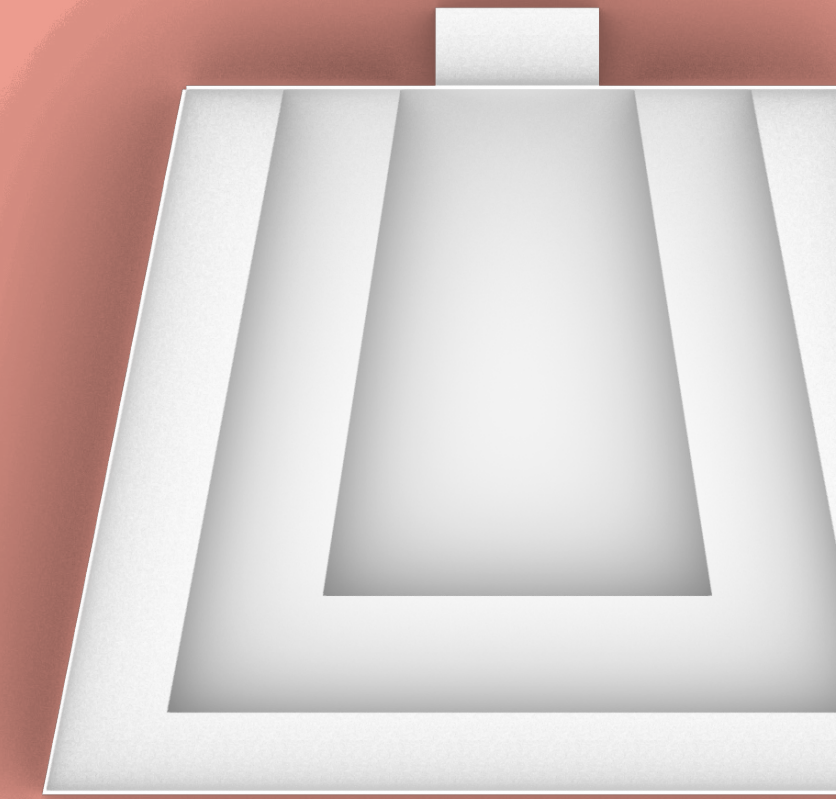
R1: 4.08s
R2: 3.90s

EDT Average:

R1: 2.65s
R2: 2.71s



Simulation 6



Dimensions

Length: 195'
Width: 210'
Height: 70'

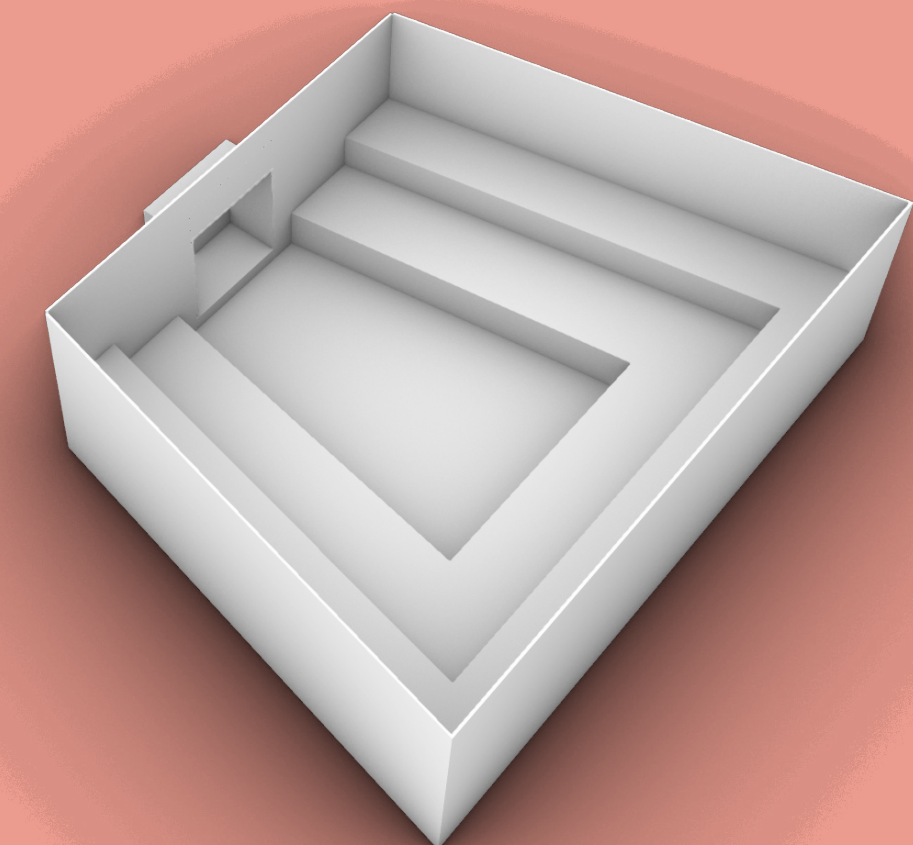
Estimated Size
3,600 Seats

RT Average

R1: 4.39s
R2: 3.99s

EDT Average:

R1: 9.72s
R2: 9.37s



PROJECT LOCATION - NASHVILLE, TN



Population - 683,622

Walk ability Score: 98

Bike ability Score: 72

Transit Score: 73

14.4 million tourist in
2022



Ryman Auditorium

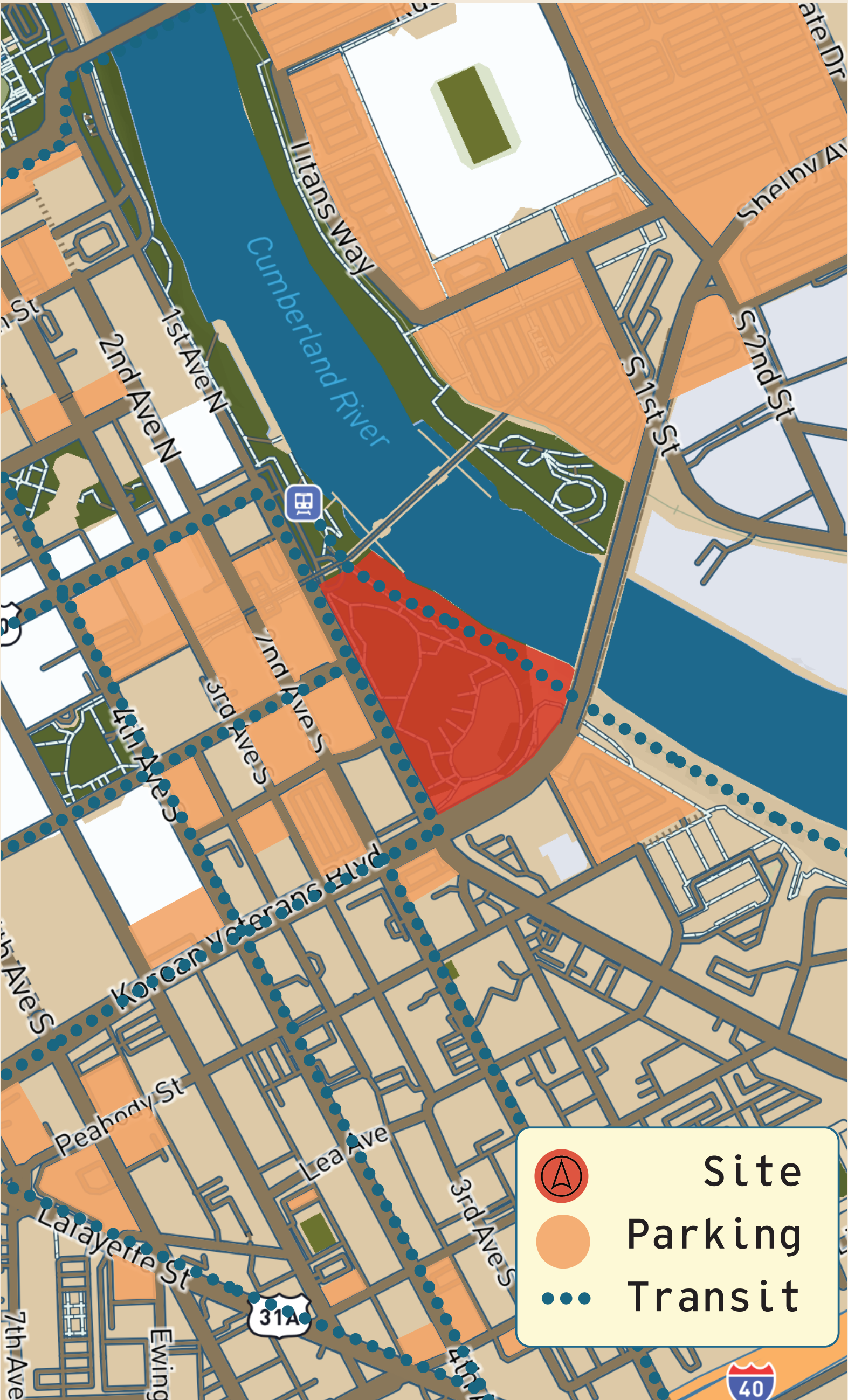


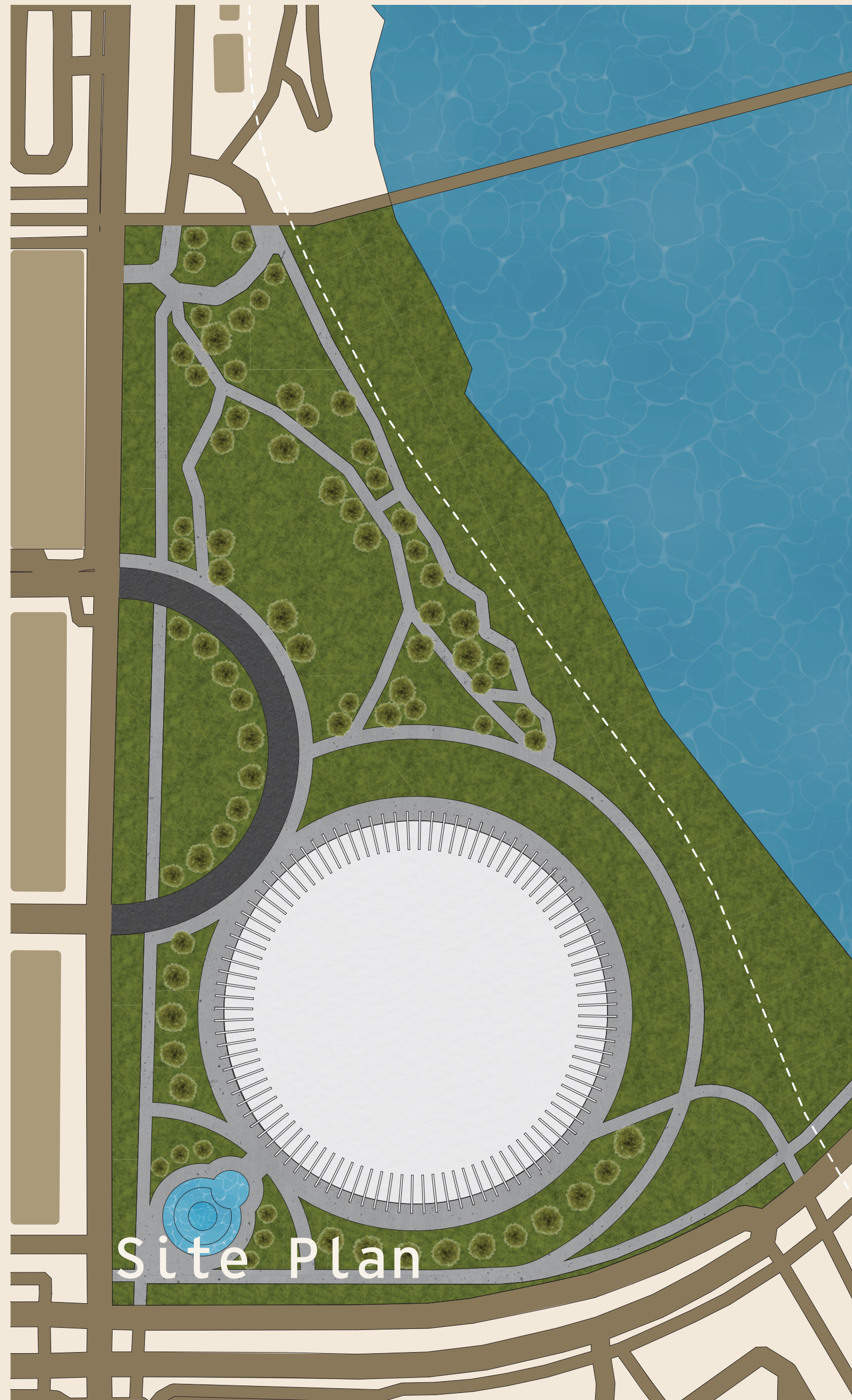
Country Music Hall of Fame



Grand Ole Opry

PROPOSED SITE

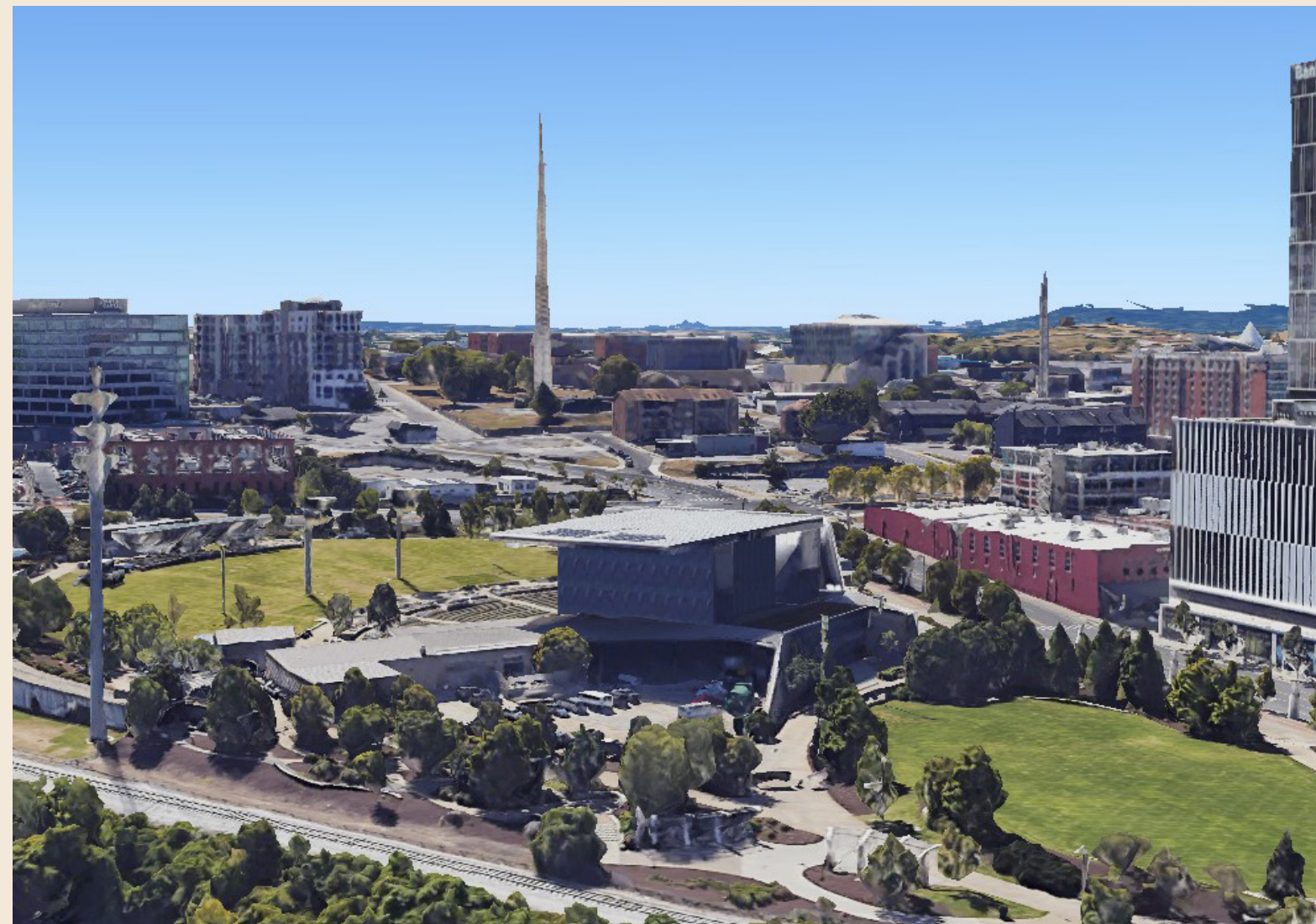




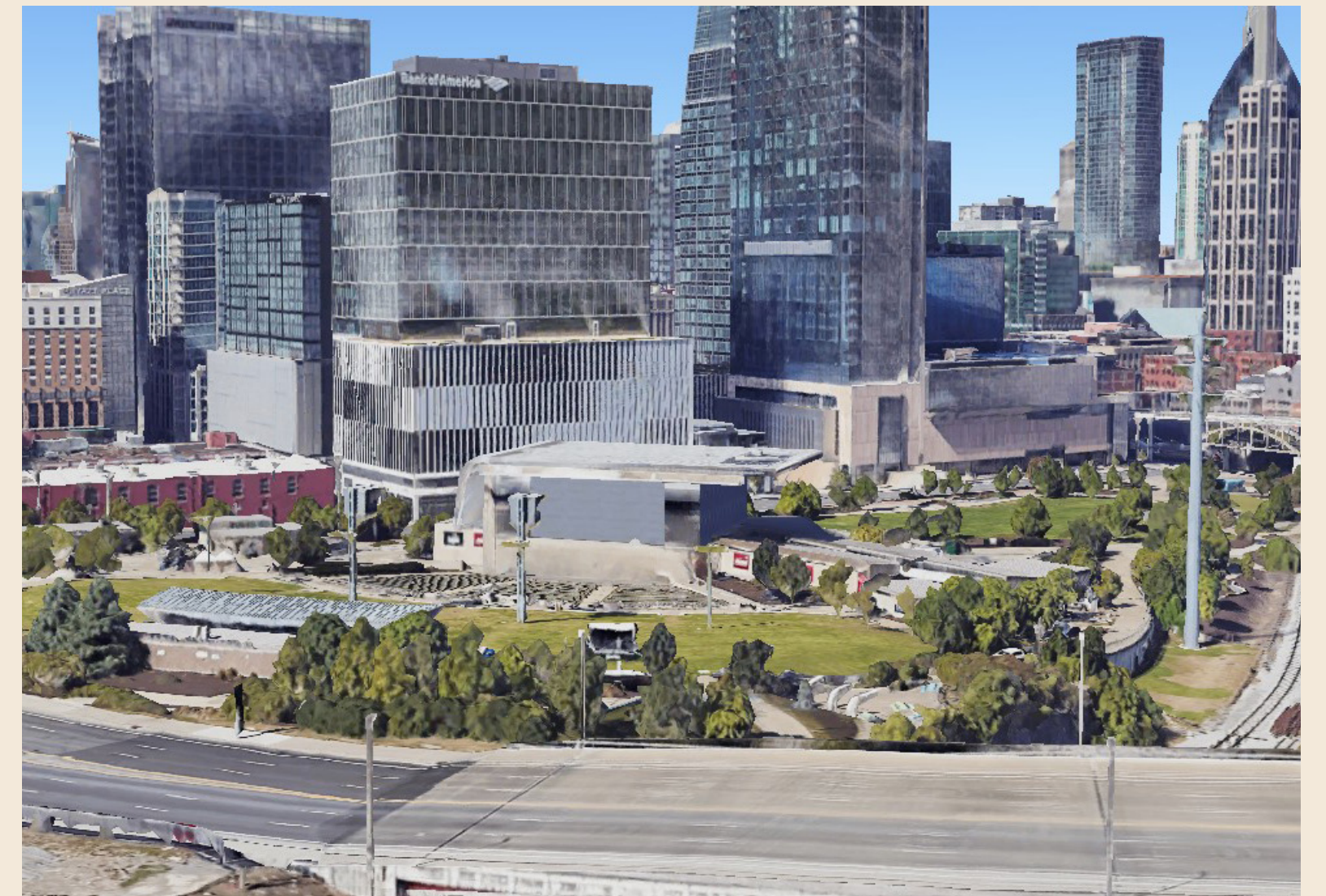
North View



East View

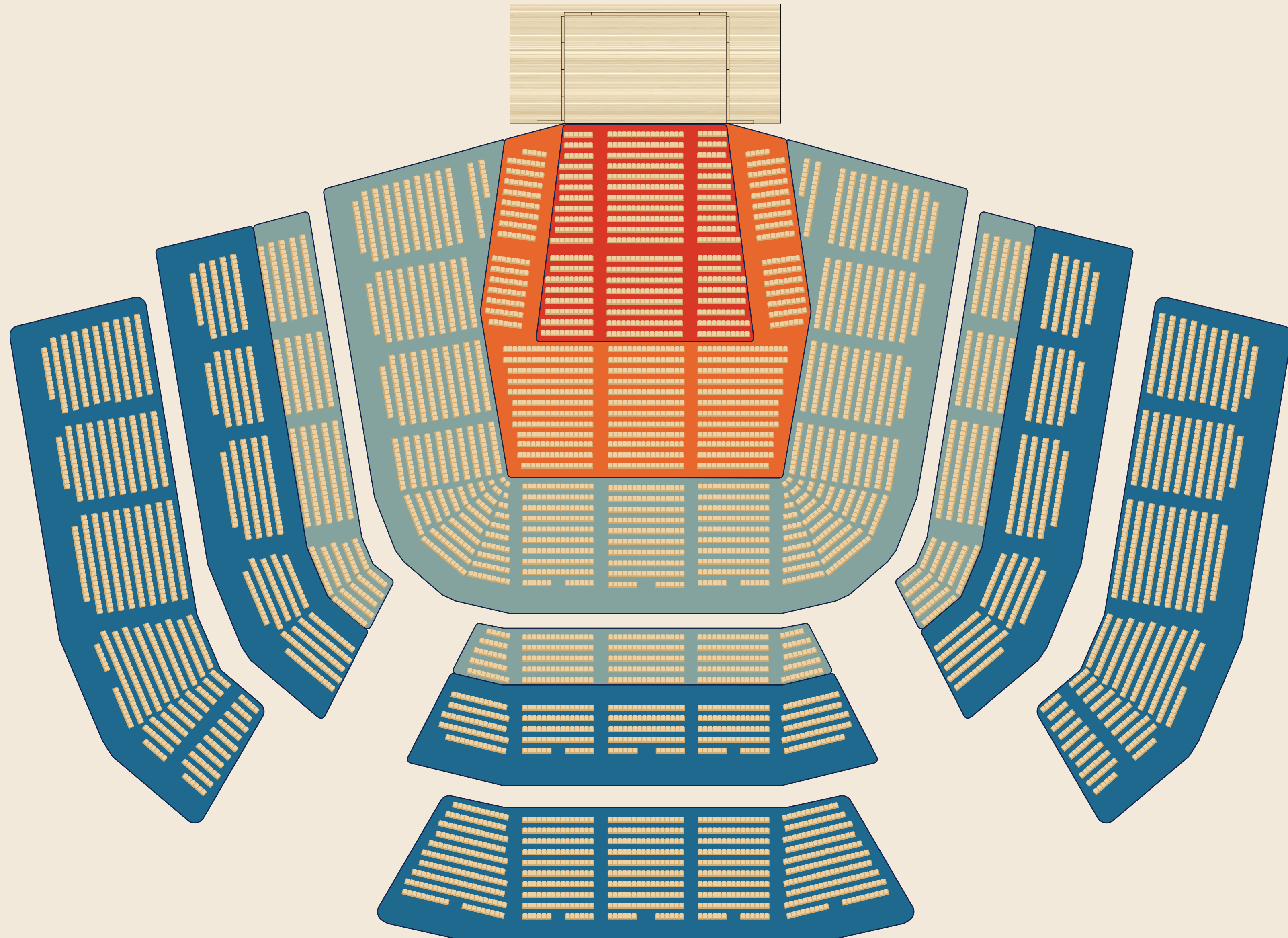
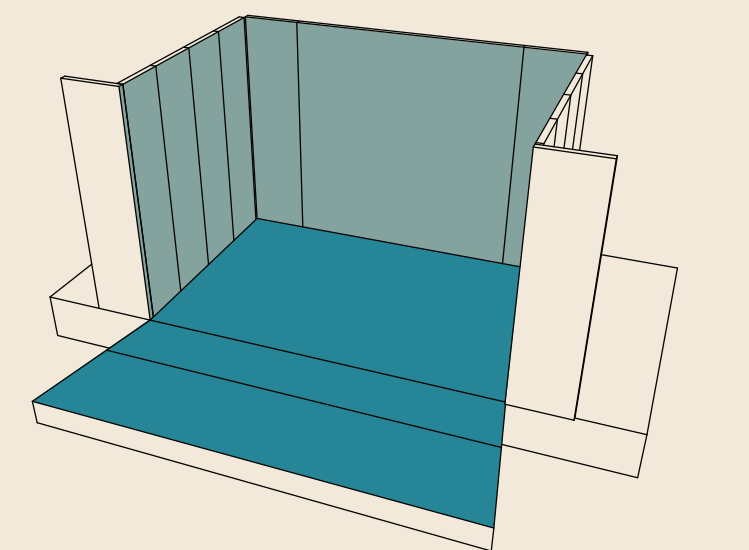
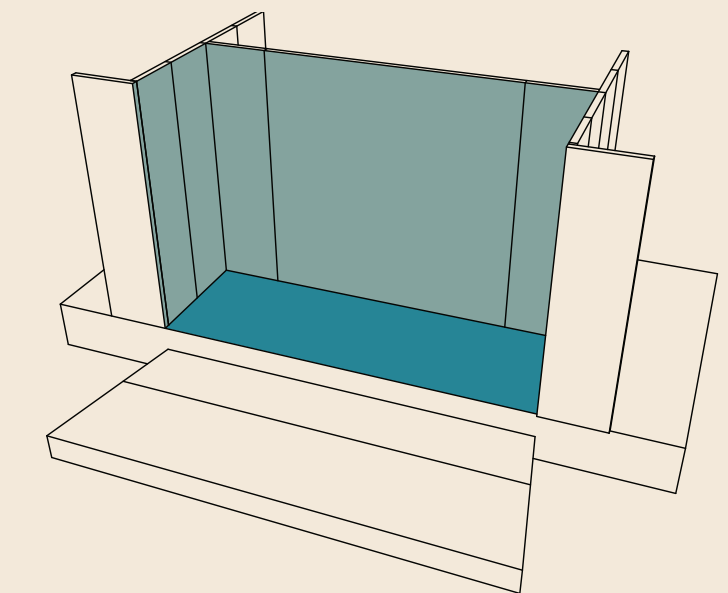
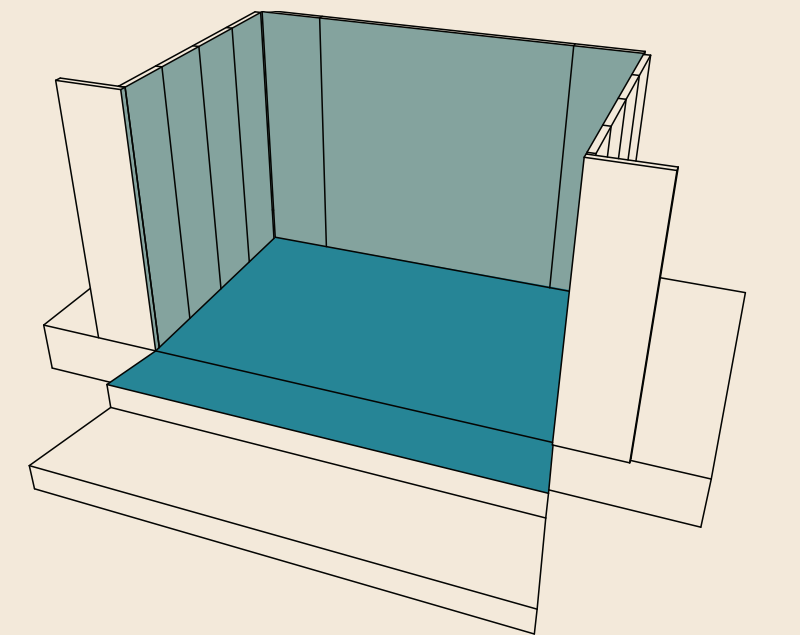
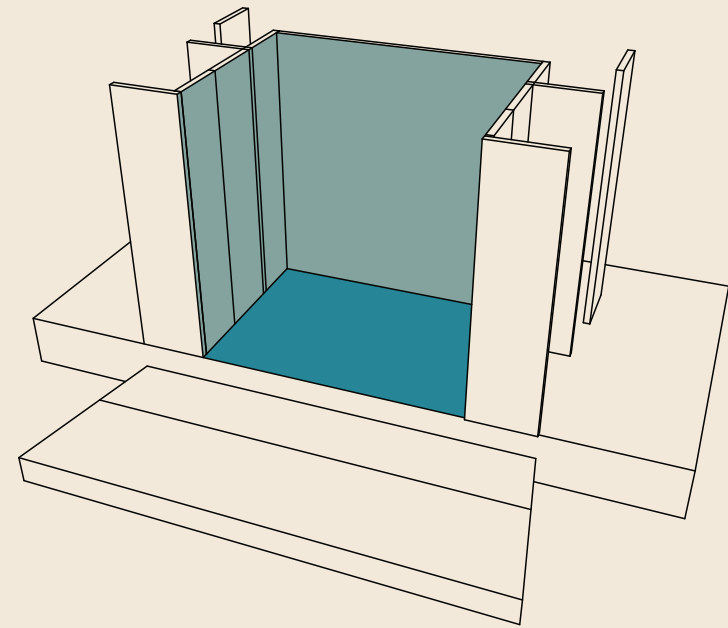
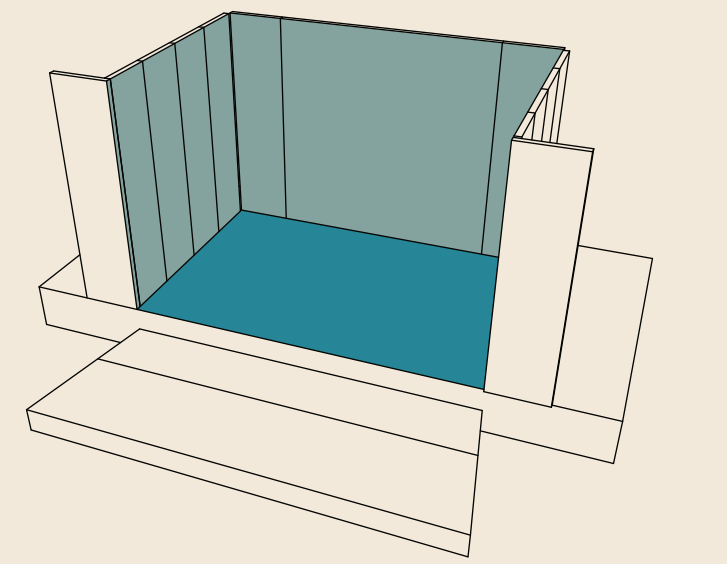
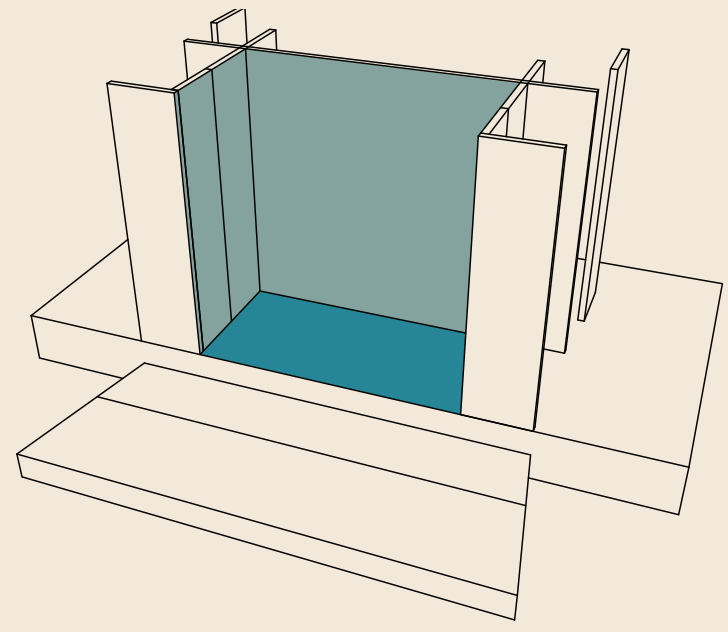


South View



West View

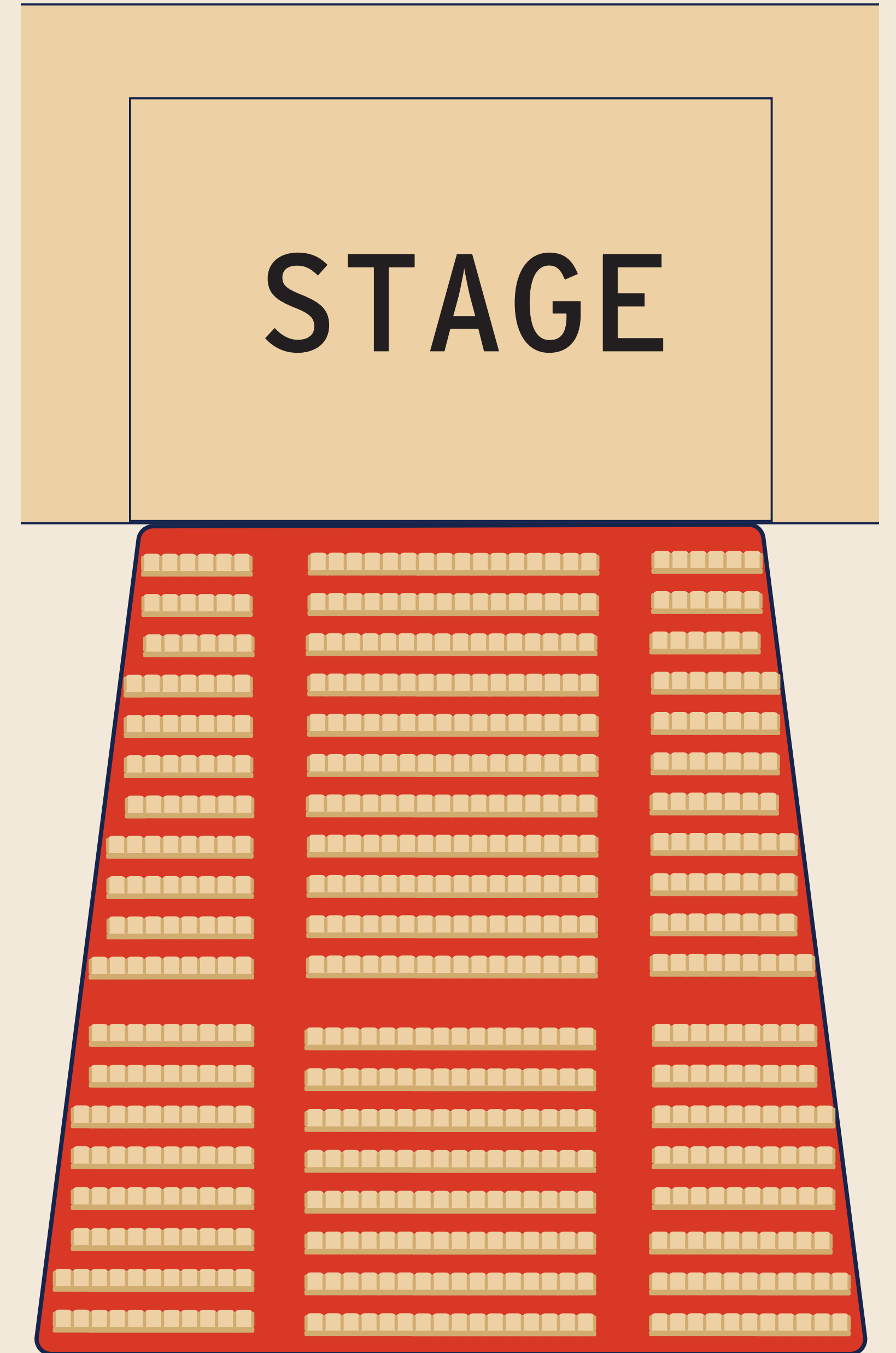
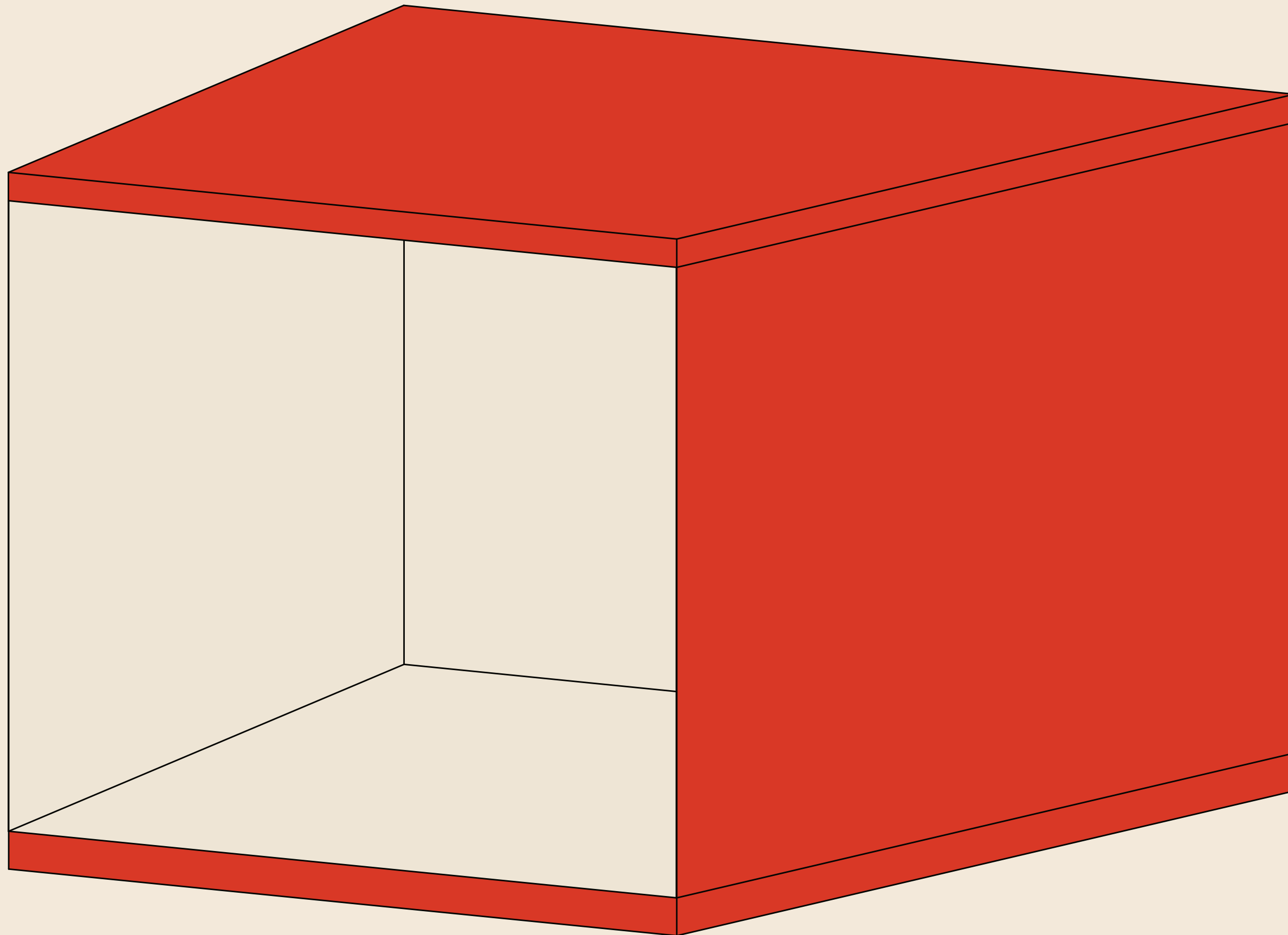
SCHEMATIC LAYOUT



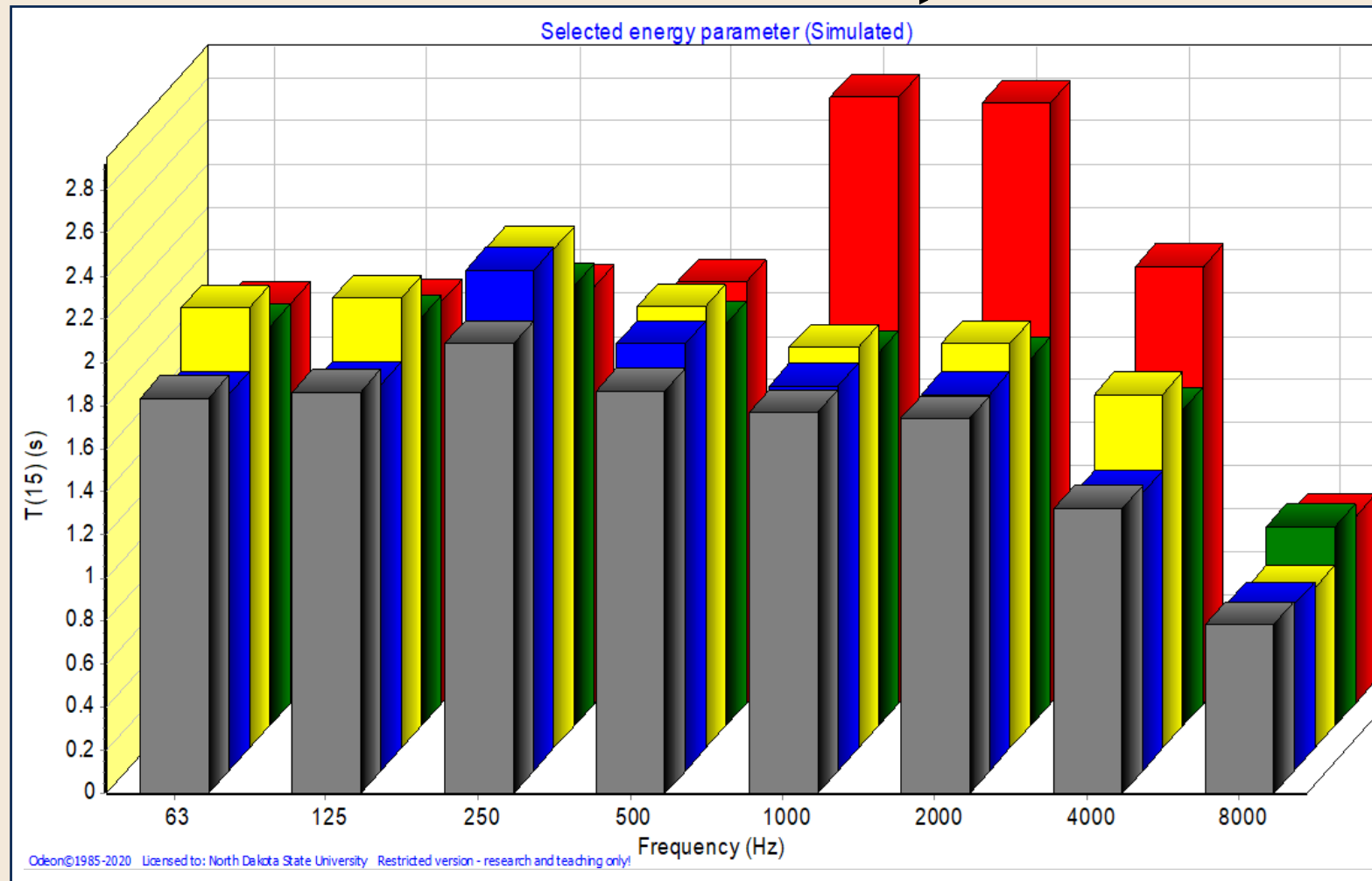
CONFIGURATION 1

Capacity: 480 to 620

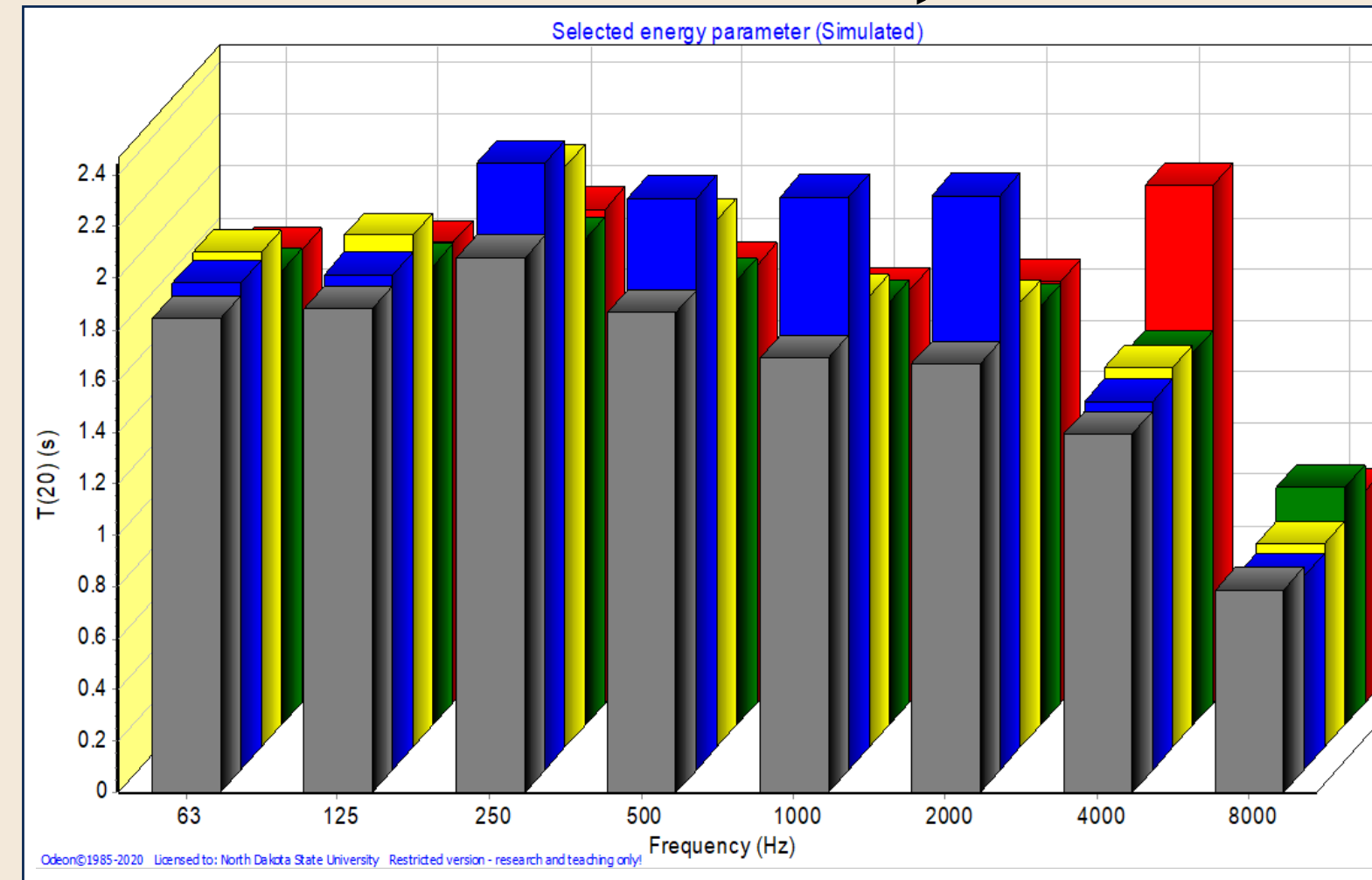
Uses: Opera, Ballet, Speaking, Theatre,
Soloist Performances



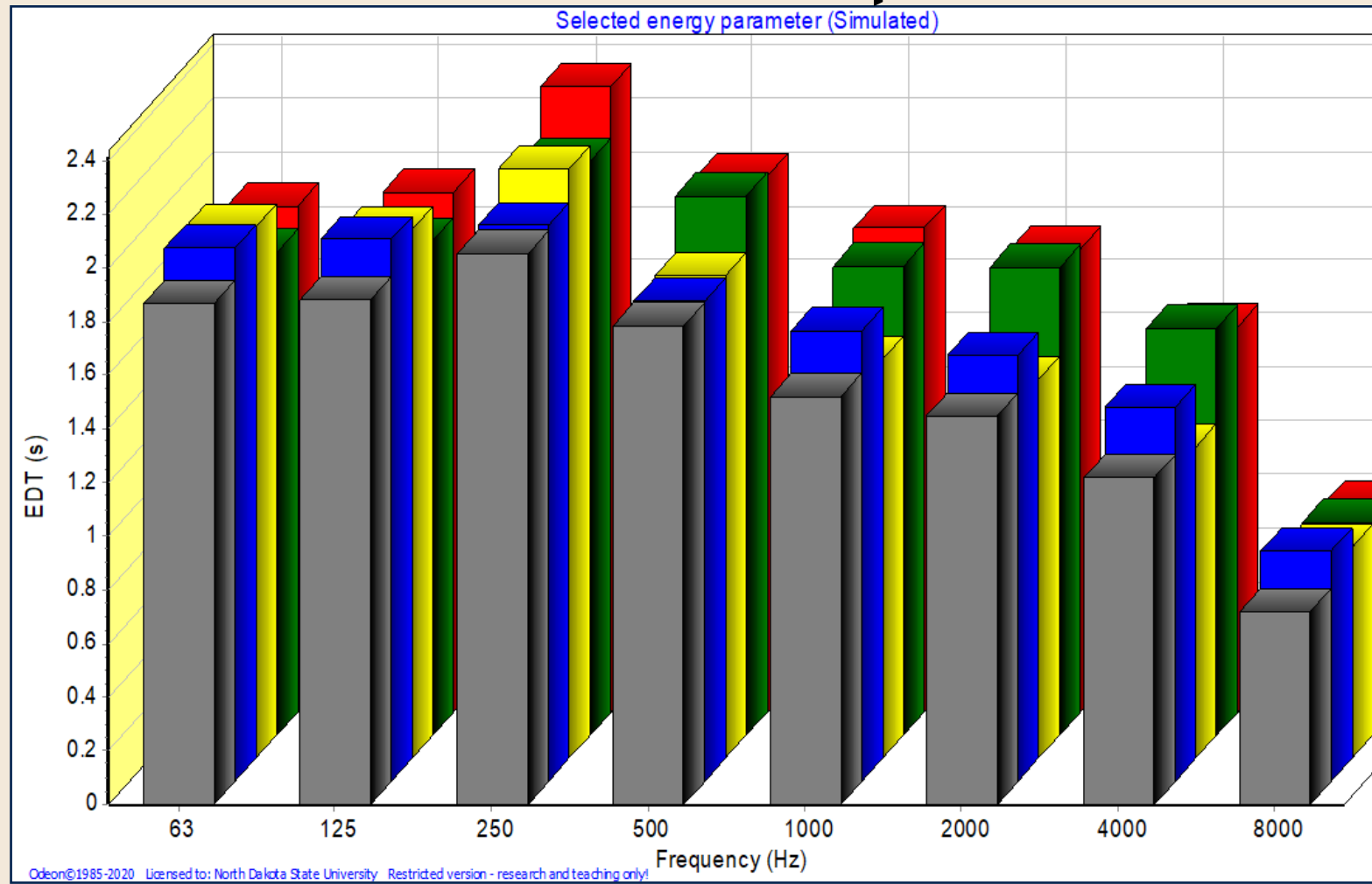
T15 Bar Graph



T20 Bar Graph

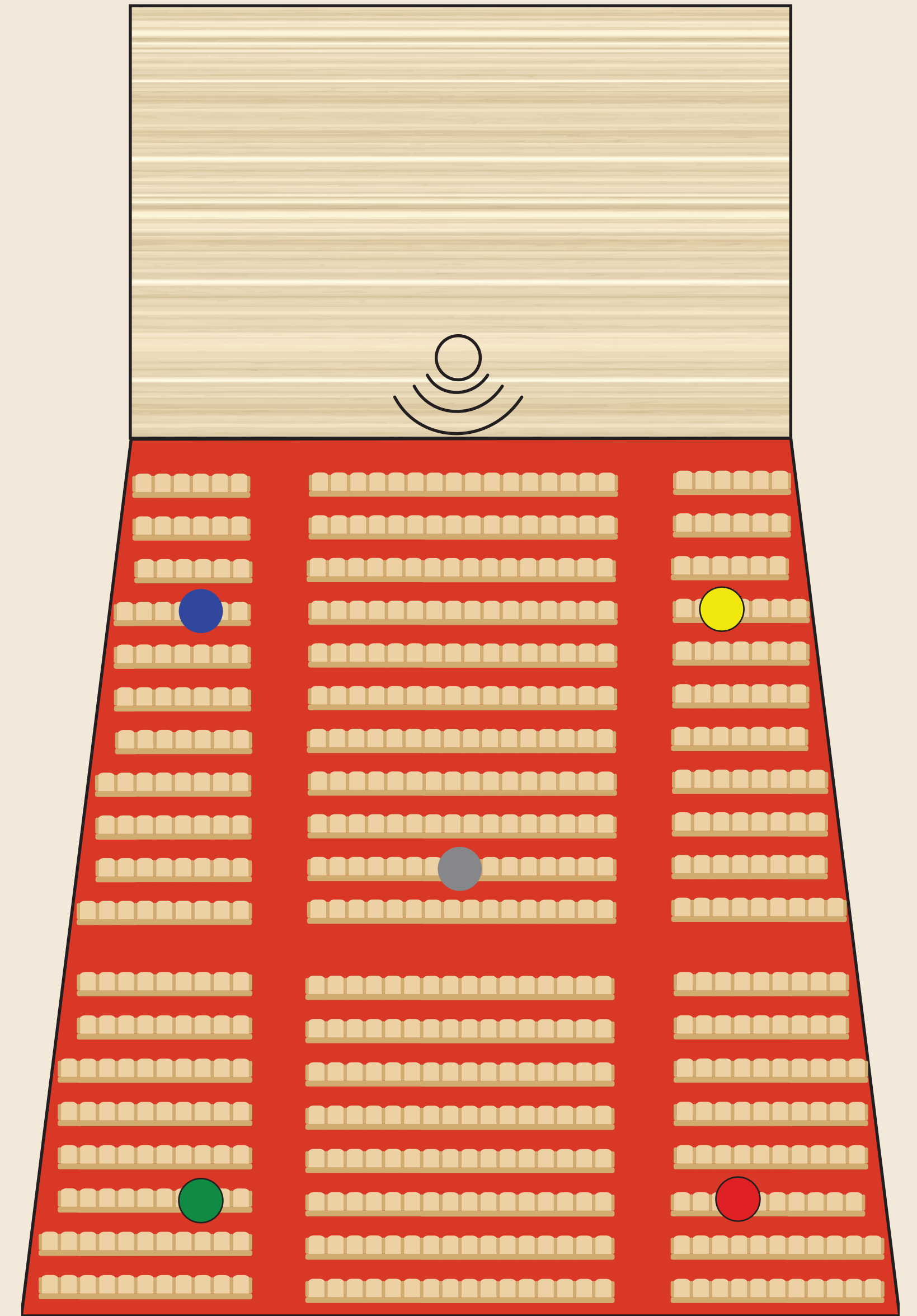


EDT Bar Graph



Odeon Setup

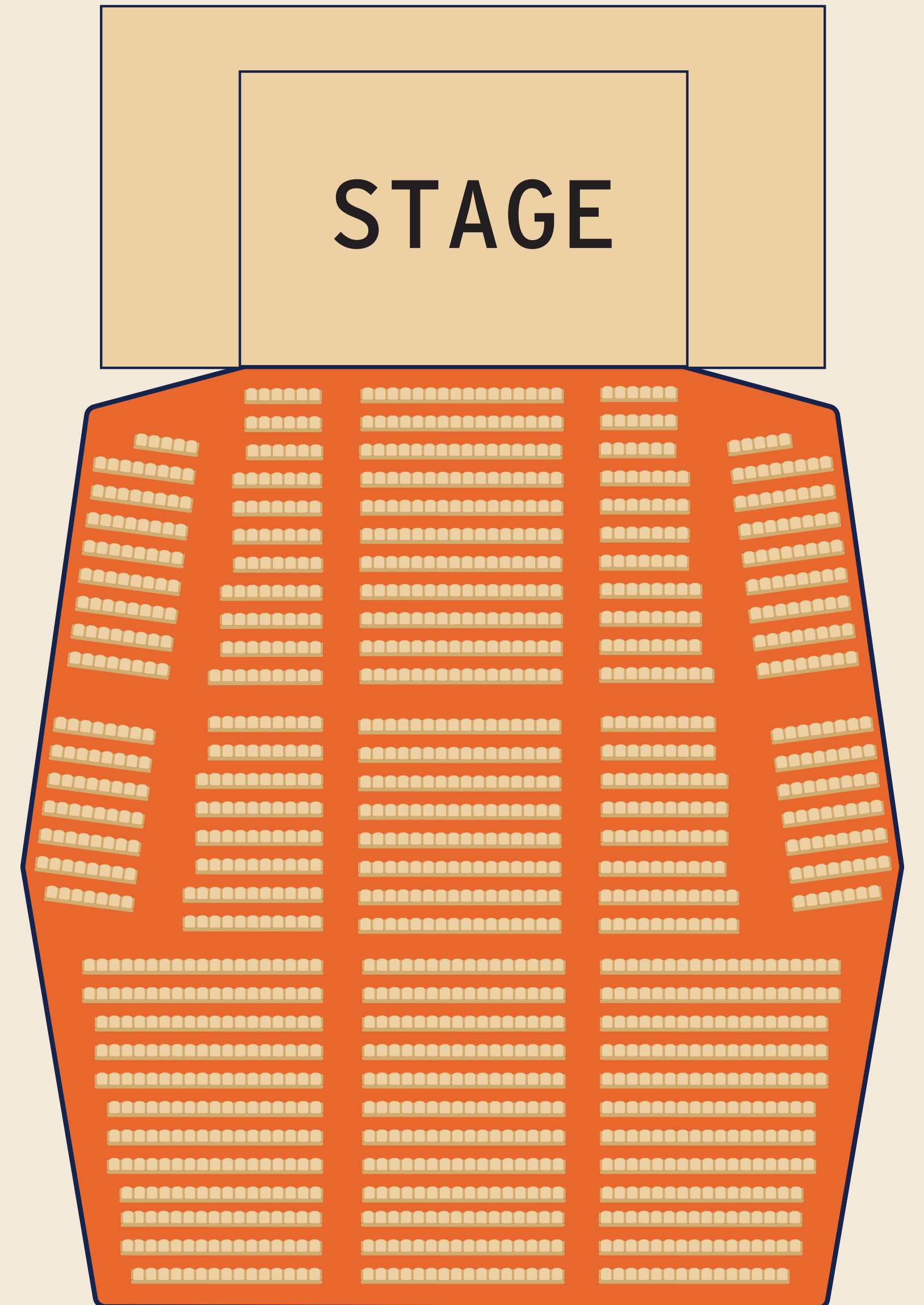
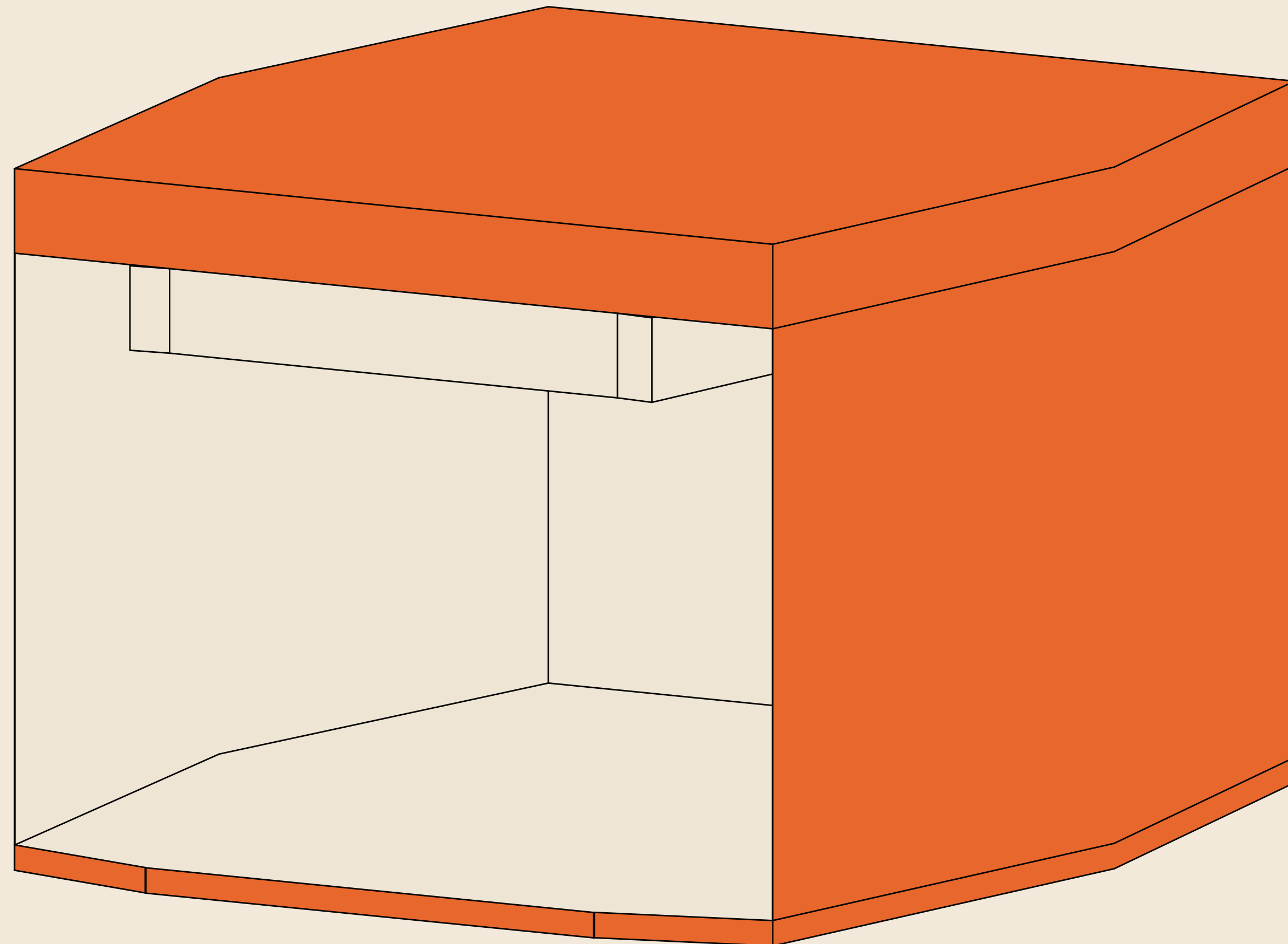
Walls 30mm Plaster on metal lath
 Floor Wooden Floor on Joists
 Stage Enclosure Thin Plywood Paneling
 Audience Audience, medium upholstered seats
 Roof 30mm Plaster on metal lath
 Stage Floor Floating Wooden Floor



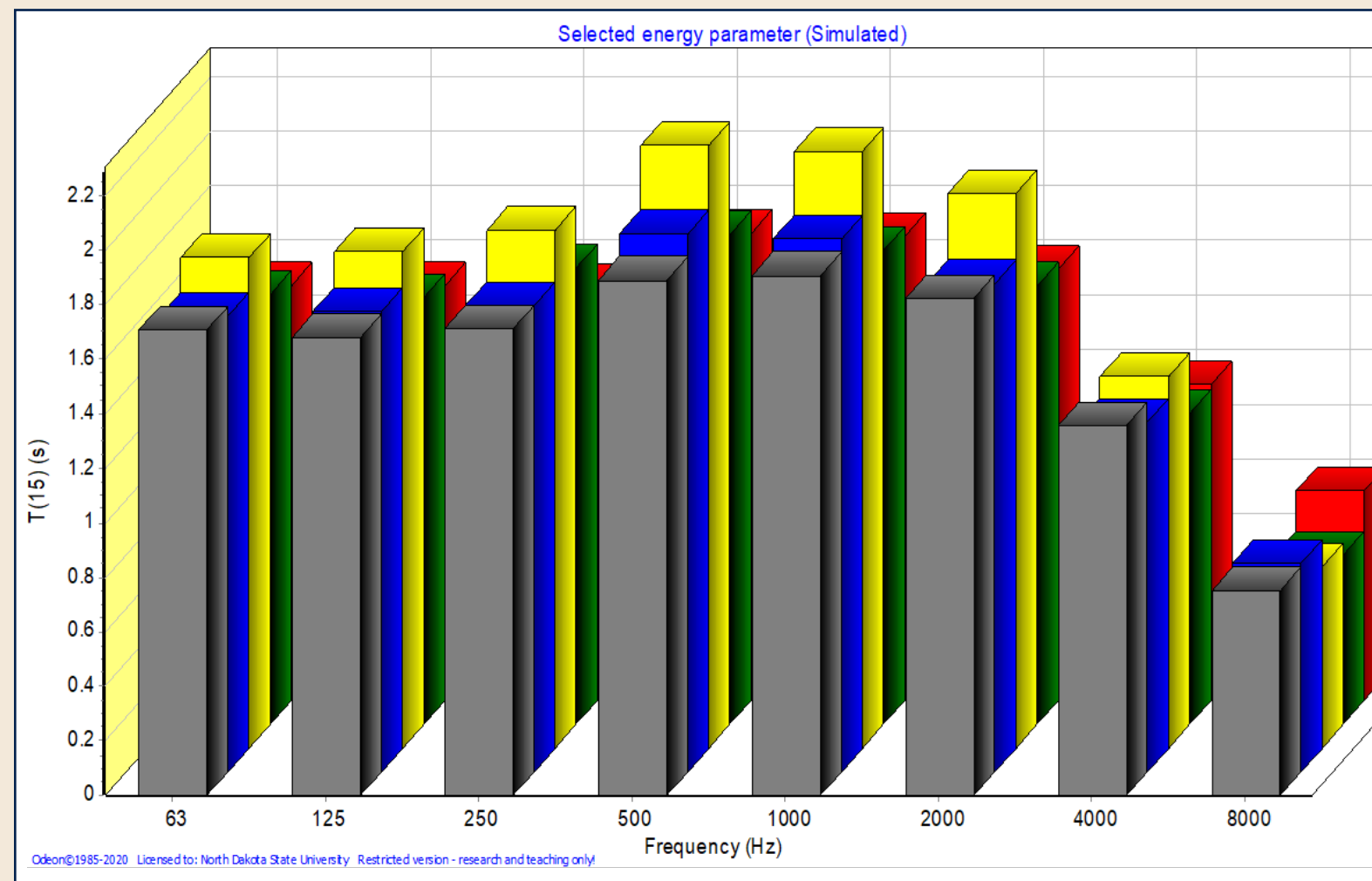
CONFIGURATION 2

Capacity: 1300 to 1450

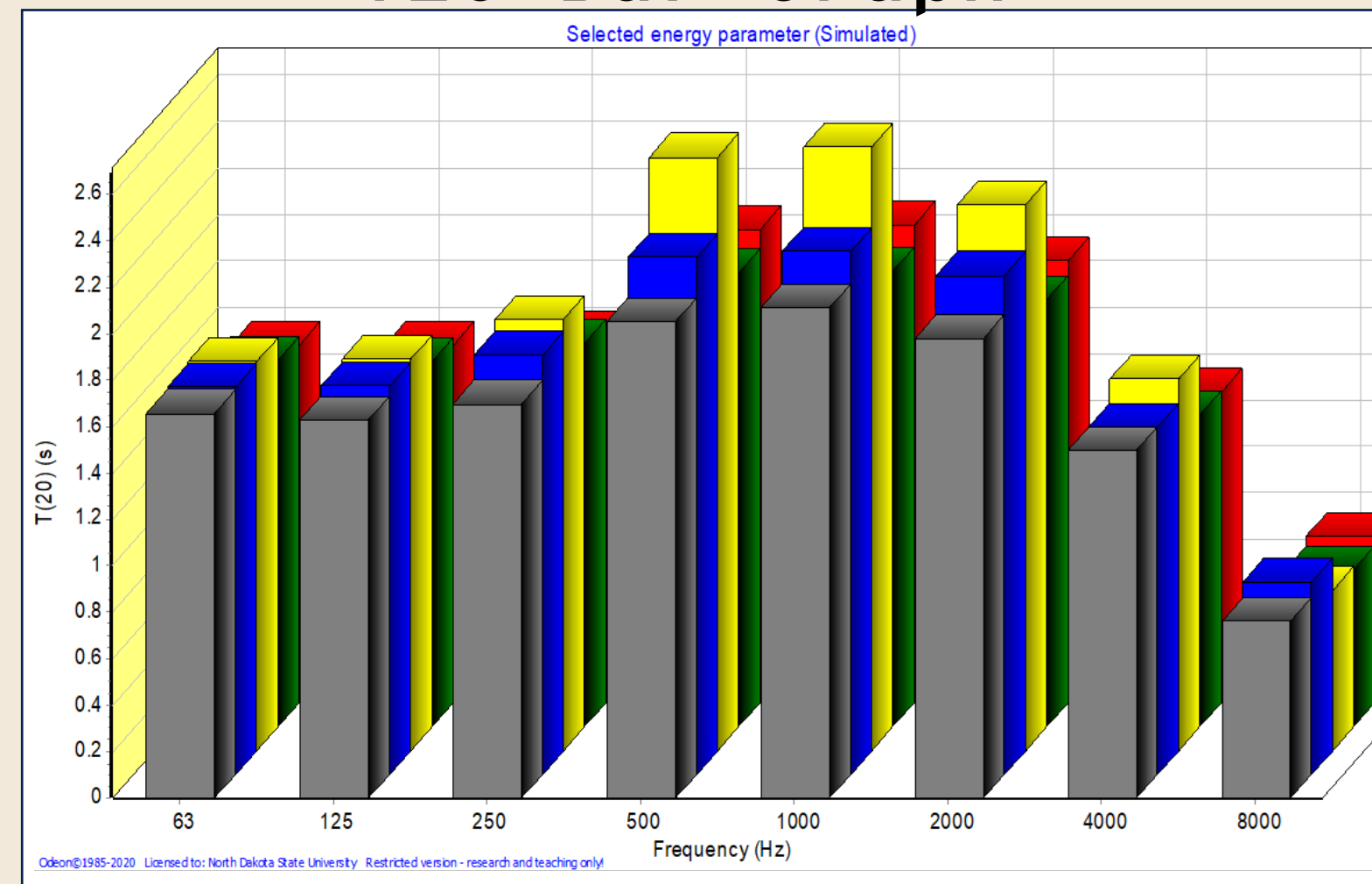
Uses: Opera, Ballet, Speaking, Theatre, Soloist Performances, Symphony, Orchestra



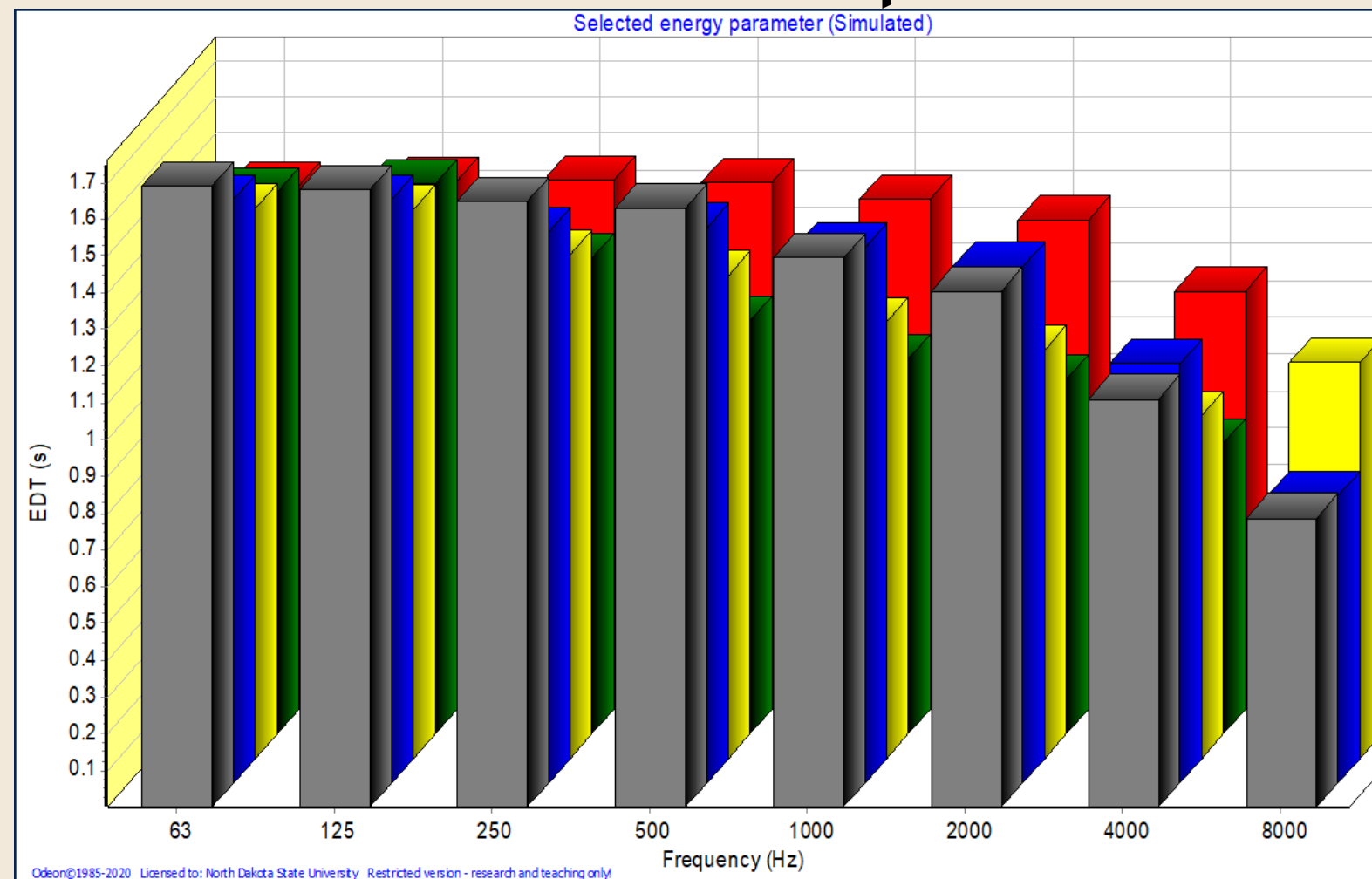
T15 Bar Graph



T20 Bar Graph

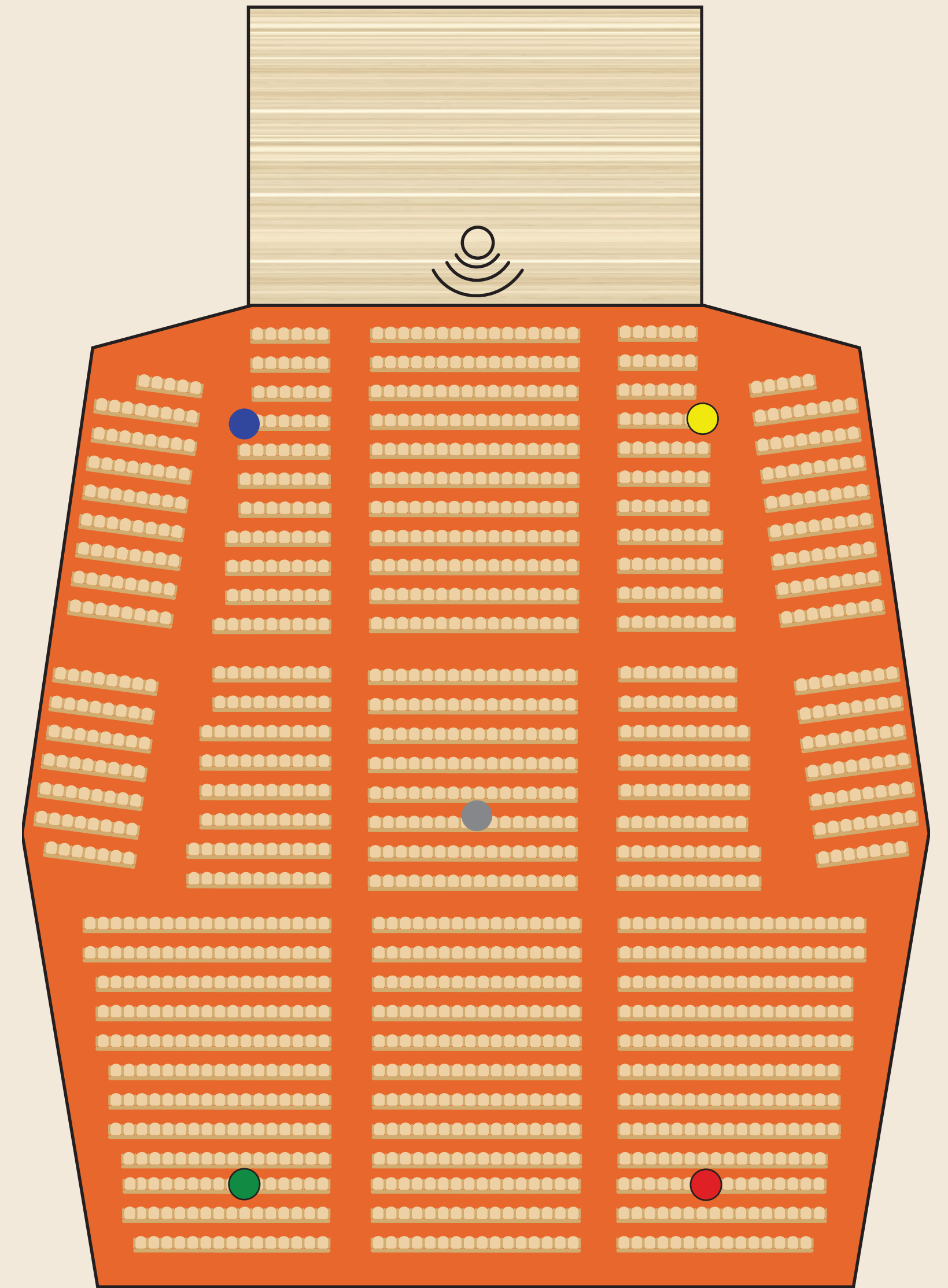
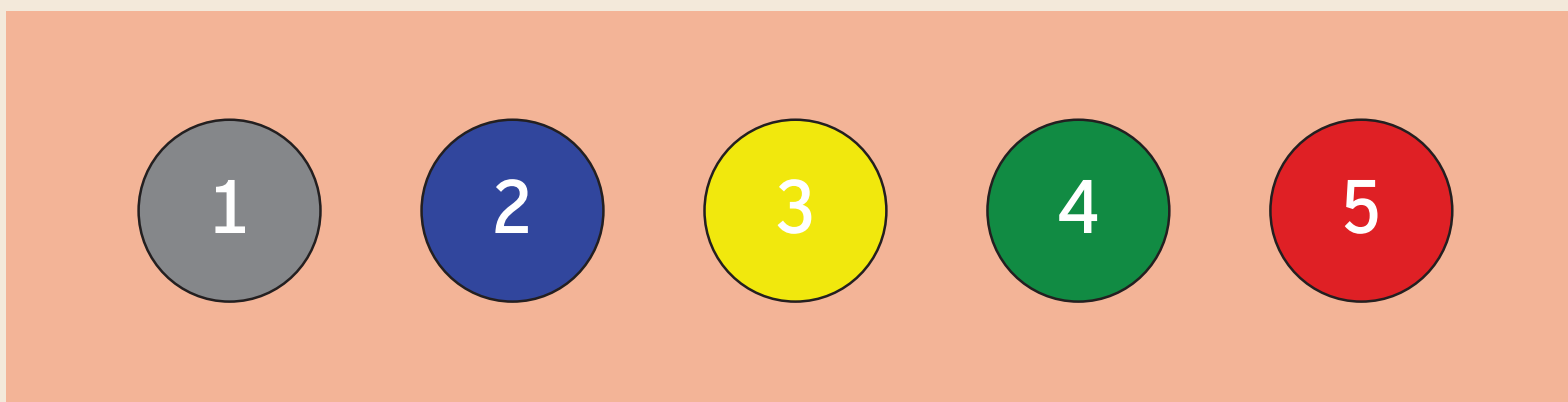


EDT Bar Graph



Odeon Setup

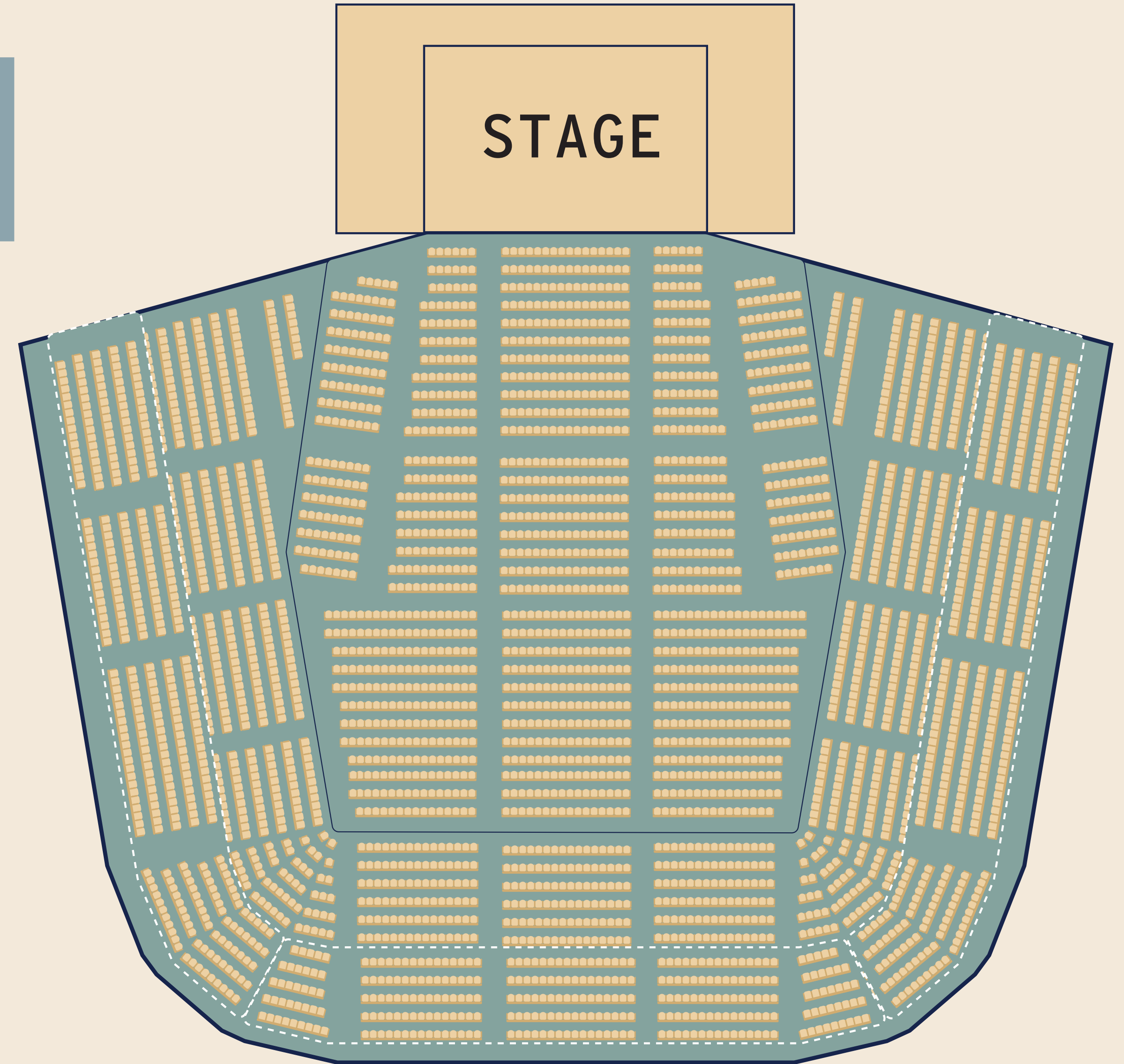
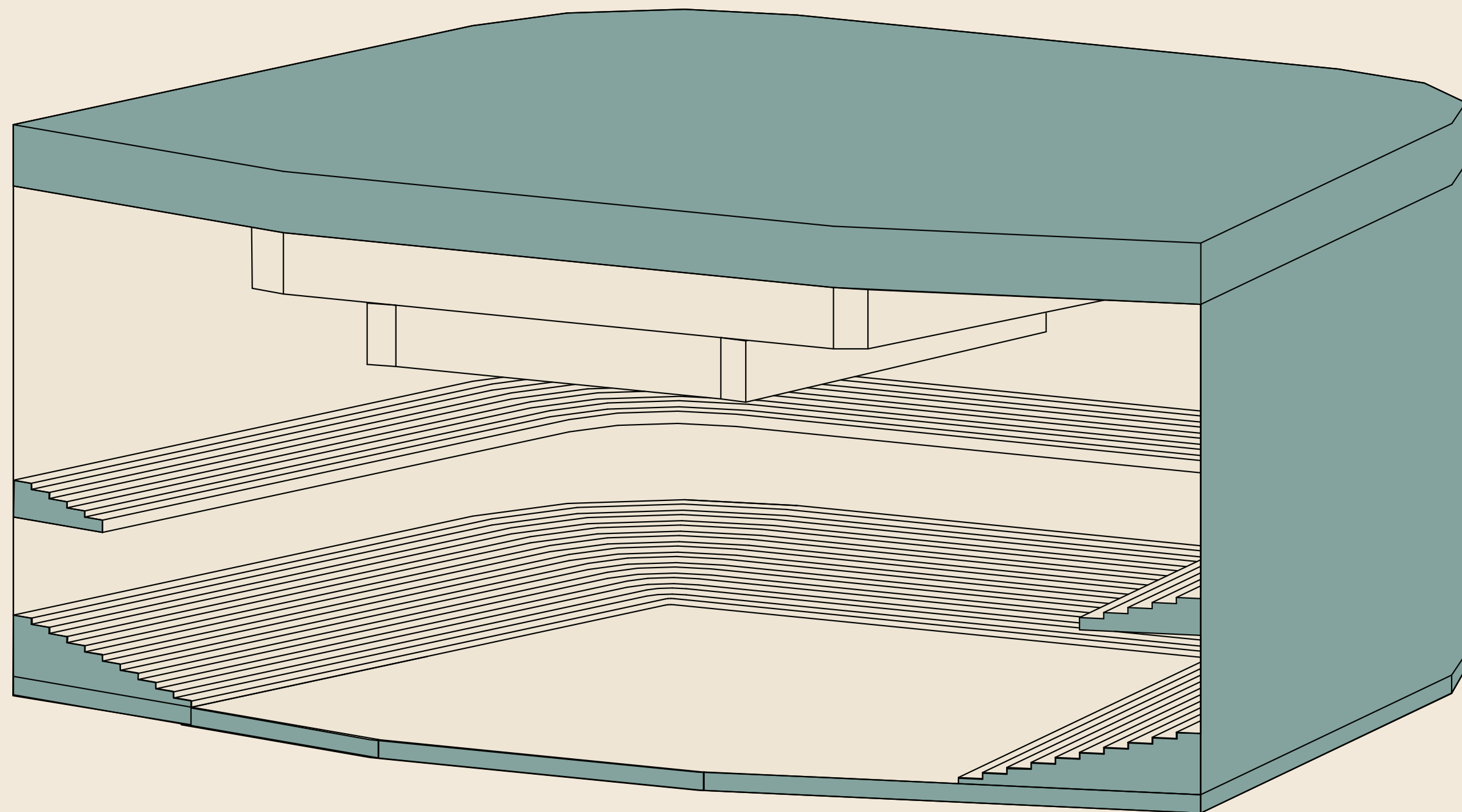
Walls 30mm Plaster on metal lath
 Floor Wooden Floor on Joists
 Stage Enclosure Thin Plywood Paneling
 Audience Audience, medium upholstered seats
 Roof 30mm Plaster on metal lath
 Stage Floor Floating Wooden Floor



CONFIGURATION 3

Capacity: 2350 to 2500

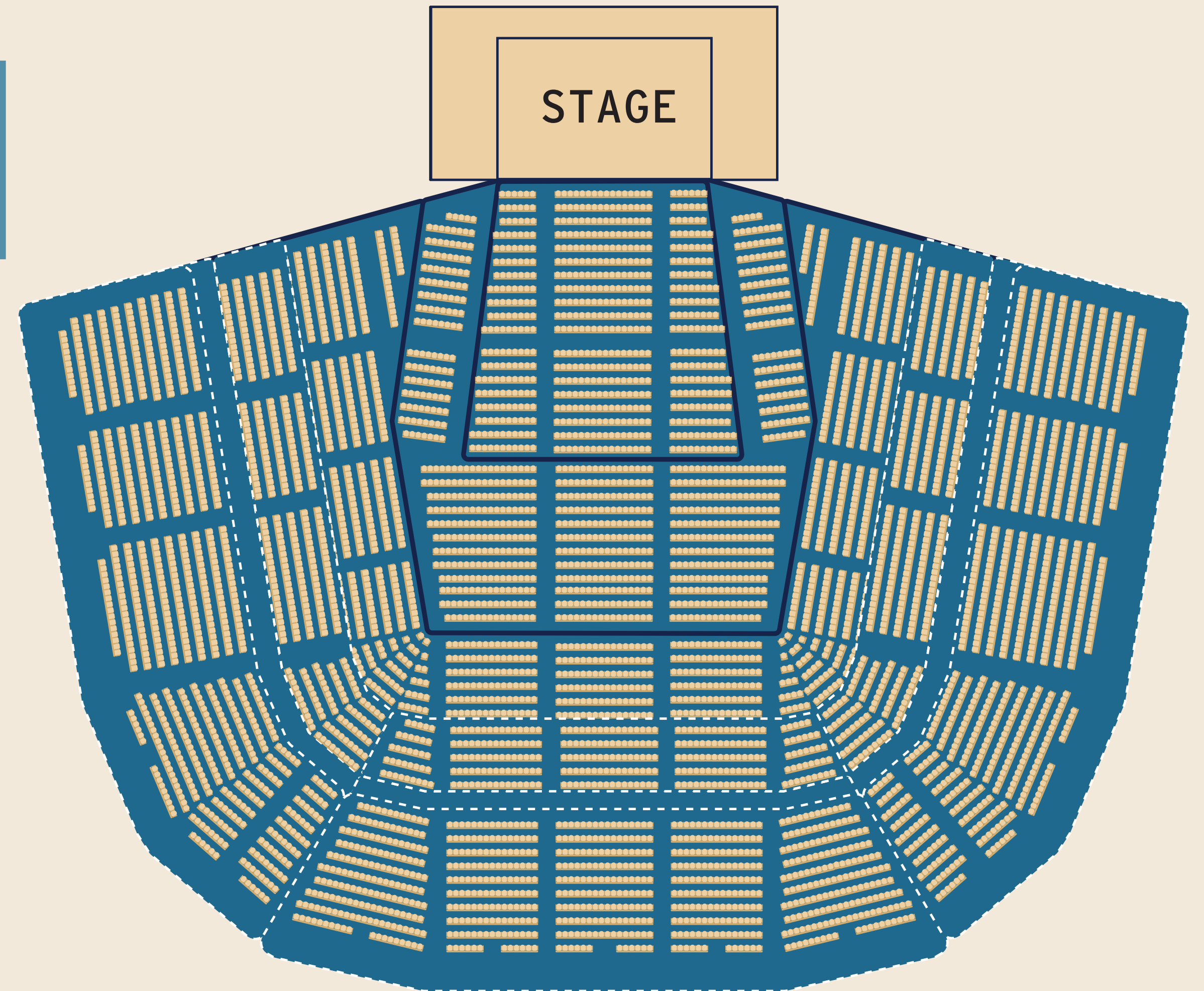
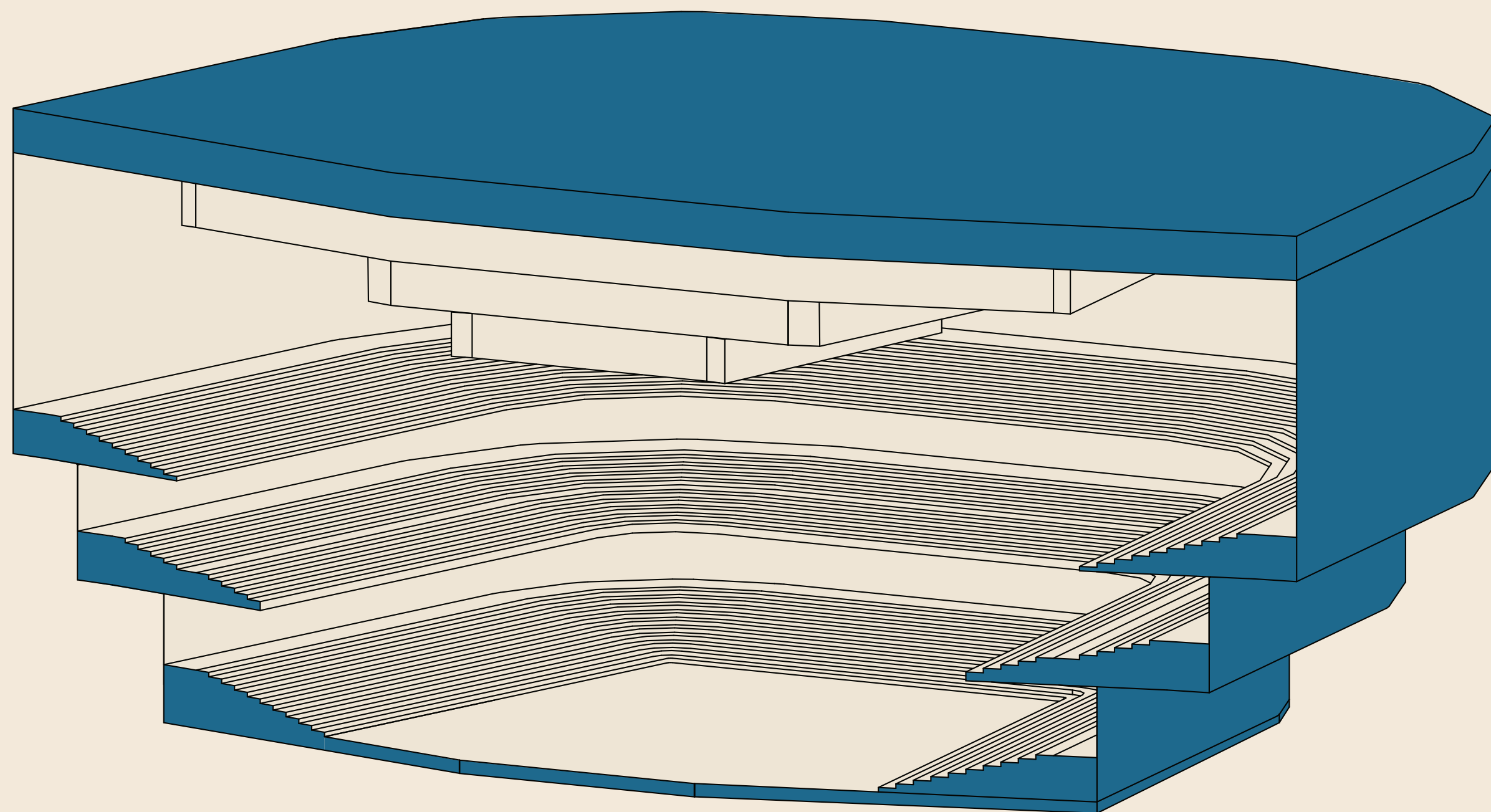
Uses: Theatre, Soloist Performances
Classical Music, Symphony, Orchestra



CONFIGURATION 4

Capacity: 4700 to 4850

Uses: Pop/Rock Concerts, Theatrical Performances, Soloist Performances, Speaking



The logo features a central sun with a gradient from yellow to orange, partially obscured by stylized, layered orange clouds. The background consists of concentric, semi-transparent circles in shades of light yellow and teal. The text 'RENAISSANCE' is written in a bold, dark teal, serif font across the middle of the clouds.

RENAISSANCE

Performance Hall