



Acoustical Design of Music Education Facilities

Edward McCue and
Richard H. Talaske, Editors



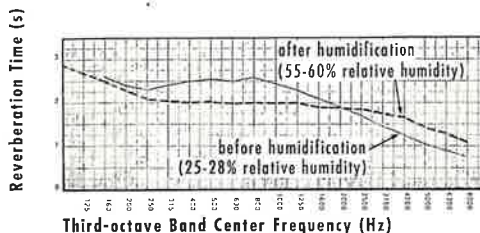
1 9 7 6

Llewellyn Hall

CANBERRA

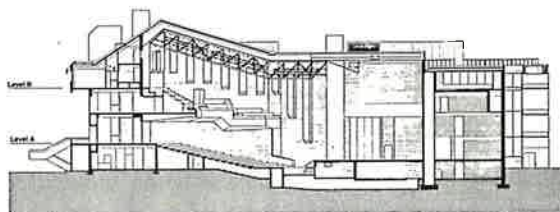
AUS

Concert Hall

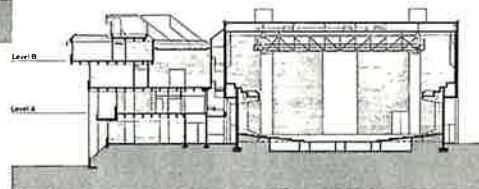


Reverberation

Sections



A - A



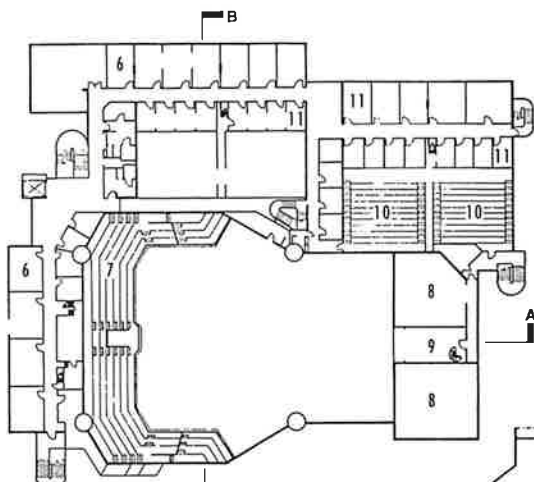
B - B

Physical Data

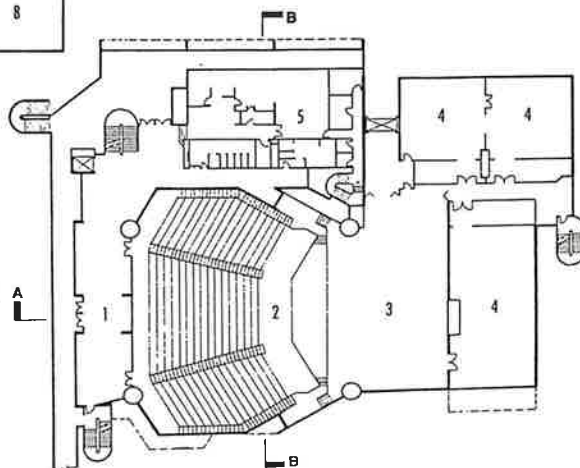
Total volume	450,000 ft ³ (12,750 m ³) (includes one-third of stage volume)
Seating capacity	1,500
Orchestra seating area	3,500 ft ² (324 m ²)
Volume-to-seat ratio	300 ft ³ (8.5 m ³)
Height:width:length ratio	15:32:24

Plans

- Foyer 1
- Concert Hall 2
- Stage 3
- Rehearsal Room 4
- Dressing Room 5
- Office 6
- Balcony 7
- Recording Studio 8
- Recording Control 9
- Lecture Theatre 10
- Practice Room 11



Level B



Level A

Red Deer Arts Centre

RED DEER

ALBERTA
CAN



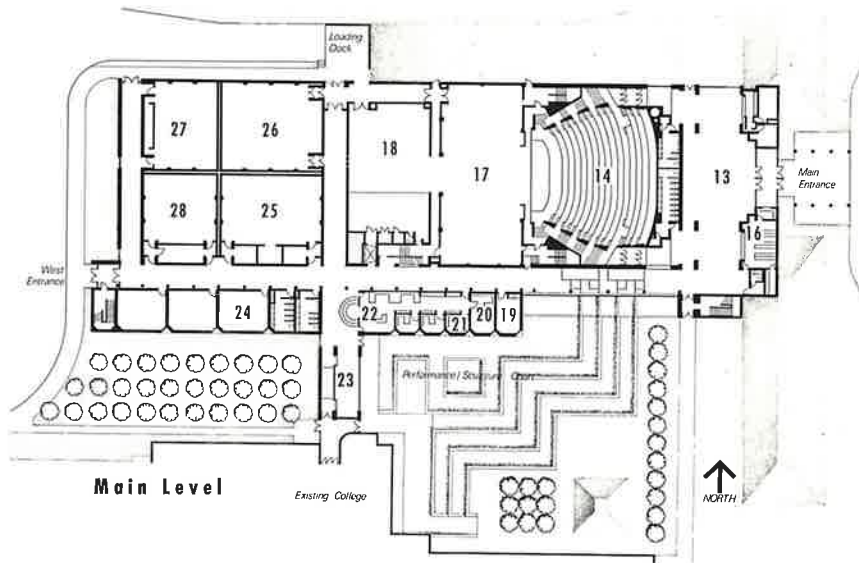
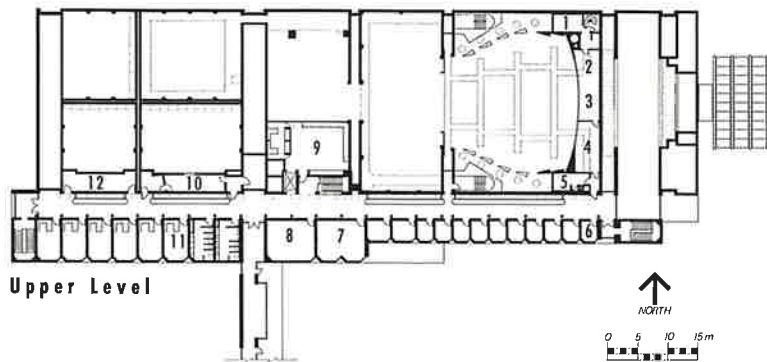
1 9 8 6

Entrance



Plans

- Dimmer Room 1
- Sound Room 2
- Control Room 3
- Instruction Room 4
- Electrical Shop 5
- Practice Room 6
- Music Library 7
- Seminar Room 8
- Costume Shop 9
- Recording Studio 10
- Office Studio 11
- Storage 12
- Lobby 13
- Auditorium 14
- Concession 15
- Coat Check 16
- Stage 17
- Scene Shop 18
- Drama Lounge 19
- Director's Office 20
- Office 21
- Administration 22
- Link 23
- Ensemble Rehearsal 24
- Instrumental Rehearsal 25
- Multipurpose Rehearsal 26
- Choral Rehearsal 27
- Community Rehearsal 28
- Dressing Room 29
- Trap Room 30
- Orchestra Pit 31
- Active Storage 32
- Mechanical 33



Red Deer Arts Centre



1 9 8 6

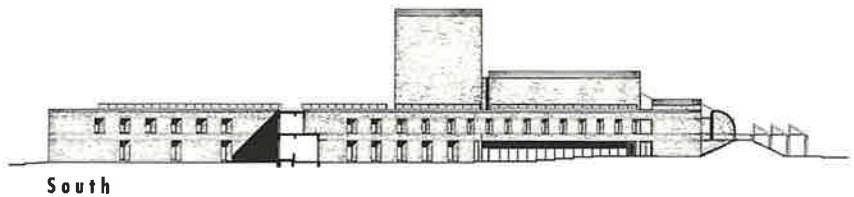
RED DEER

ALBERTA
CAN

Auditorium



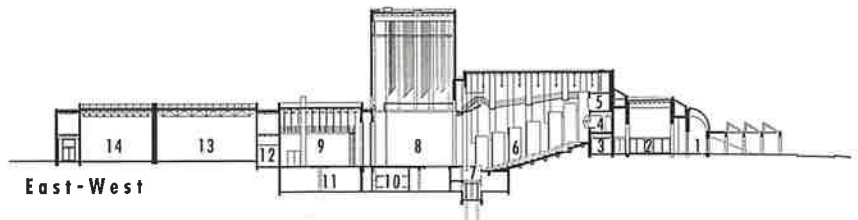
Elevation



South

Section

- Entry 1
- Lobby 2
- Washrooms 3
- Control Room 4
- Fellow Spot 5
- Auditorium 6
- Orchestra Lift 7
- Stage 8
- Scene Shop 9
- Dressing Room 10
- Mechanical 11
- Hall 12
- Ensemble Rehearsal 13
- Instrumental Rehearsal 14



East-West

Rehearsal Room



Practice Room

School of Music

ST. JOHN'S
NEWFOUNDLAND
CAN



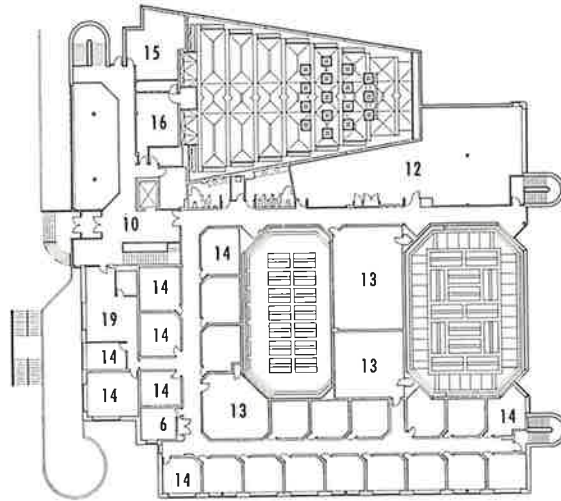
1 9 8 5

Exterior

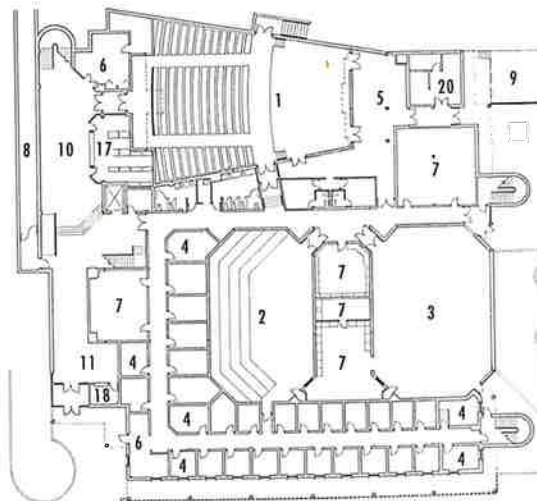


Plans

- Recital Hall 1
- Choral Rehearsal 2
- Instrumental Rehearsal 3
- Practice Room 4
- Backstage 5
- Lounge 6
- Storage 7
- Tunnel 8
- Loading 9
- Lobby 10
- Foyer 11
- Library 12
- Lecture Room 13
- Office/Studio 14
- Electronic Music 15
- Light/Sound Control 16
- Coat Check 17
- Box Office 18
- General Office 19
- Mechanical/Electrical 20



Second Floor



First Floor

Ensemble Musique et Danse aux Halles

PARIS

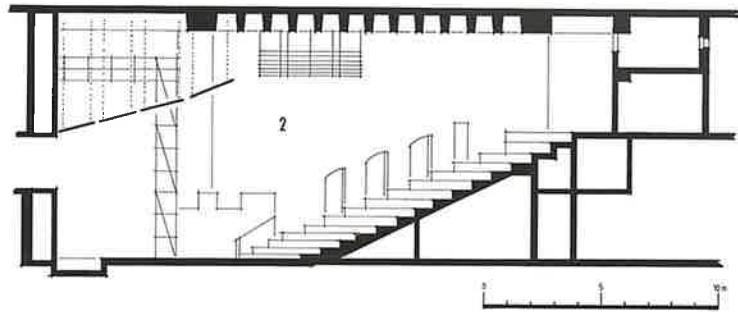
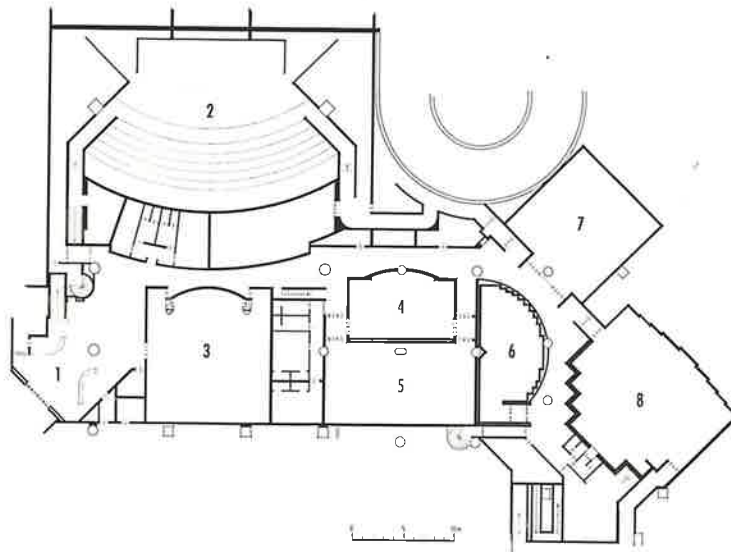
F



1 9 8 5

Legend

- Entrance 1
- Recital Hall 2
- Opera Rehearsal Hall 3
- Chamber Music 4
- Ballet 5
- Percussion 6
- Library 7
- Choir and Orchestra Rehearsal 8



Model



Avilac Music Community Center

TOKYO



1 9 8 4

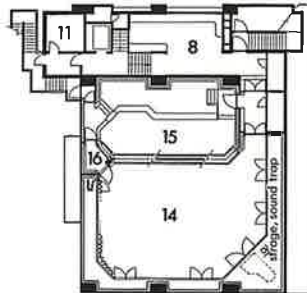
J

Recording Studio

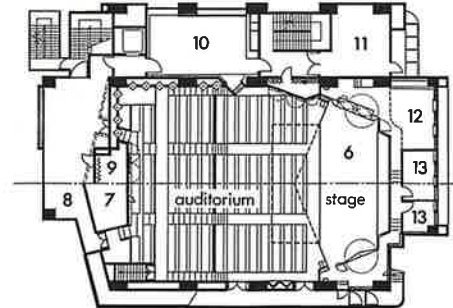


Legend

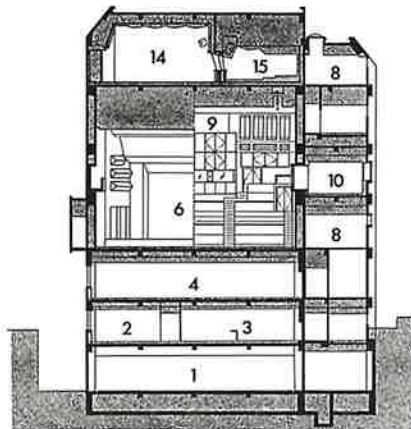
- Parking 1
- Office 2
- Stacks 3
- Library 4
- Information 5
- Recital Hall 6
- Control 7
- Lobby 8
- Lighting Balcony 9
- Work Studio 10
- Mechanical/Electrical 11
- Storage 12
- Green Room 13
- Recording Studio 14
- Recording Control 15
- Announce Booth 16



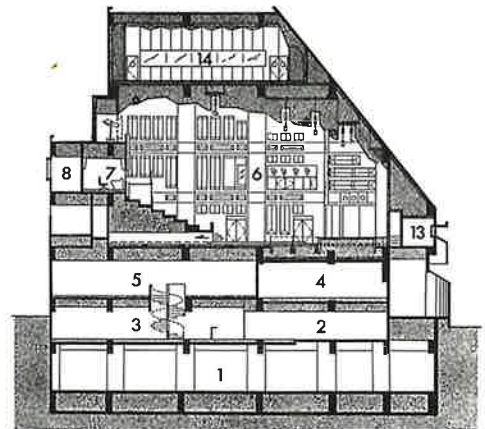
Sixth Floor



Third through Fifth Floors



Transverse Section



Longitudinal Section



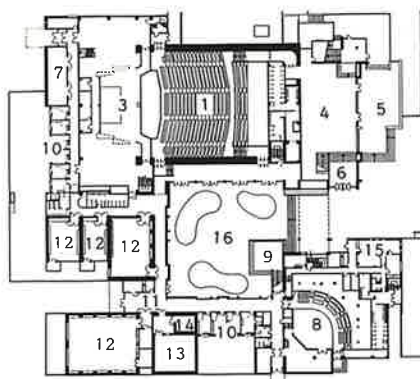
1 9 8 3

Exterior

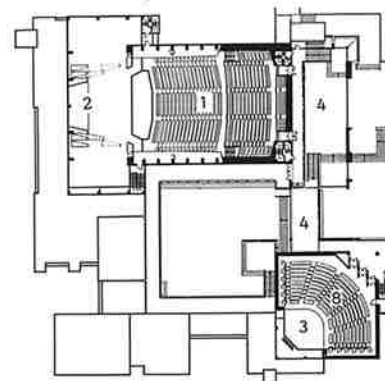


Legend

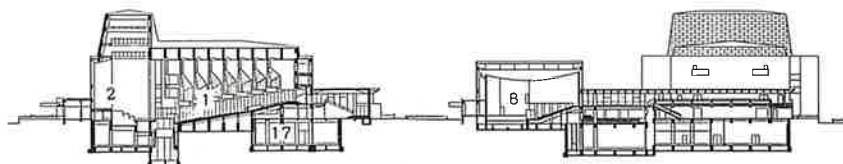
- Main Hall 1
- Grand Organ 2
- Stage 3
- Foyer 4
- Terrace 5
- Entrance Lobby 6
- Instrument Storage 7
- Recital Hall 8
- Outdoor Stage 9
- Dressing Room 10
- Green Room 11
- Rehearsal Hall 12
- Recording Studio 13
- Study 14
- Office 15
- Courtyard 16
- Mechanical/Electrical 17



Ground Floor

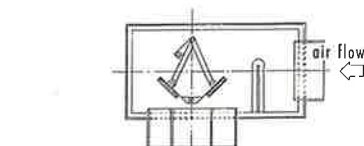


Second Floor

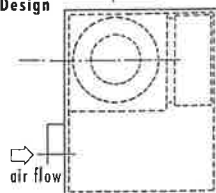


0 5 10 20 40m

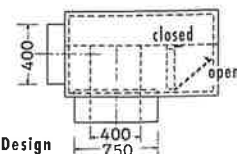
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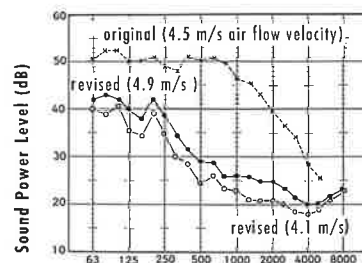
Original Design



Revised Design



Outlet Chamber Design



Third-octave Band Center Frequency (Hz)

Outlet Chamber Noise

Nanko Hall

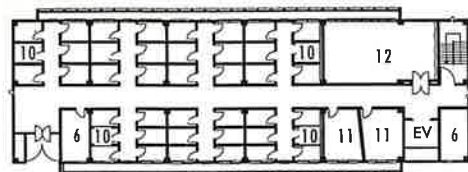
OSAKA

J



1 9 8 7

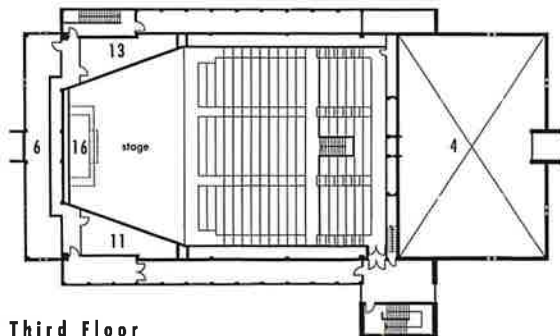
Exterior



Fourth Floor

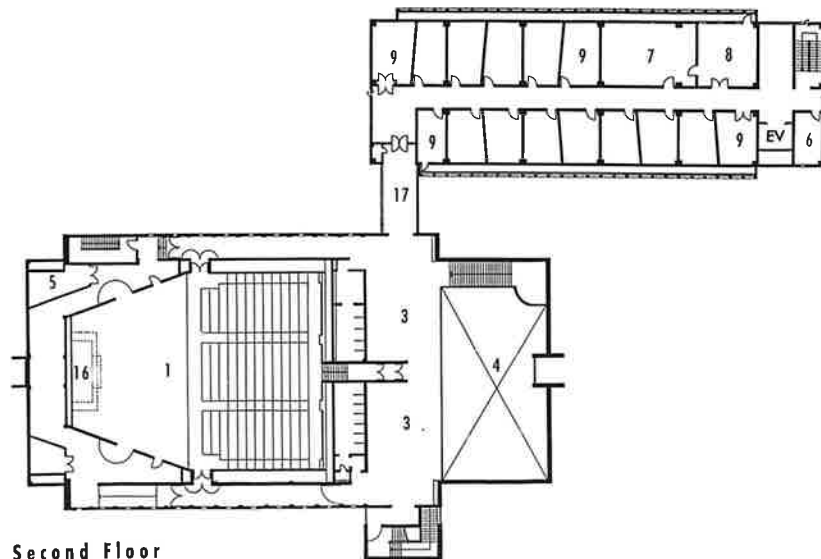
Legend

- Auditorium 1
- Control 2
- Lobby 3
- Entrance Hall 4
- Piano Storage 5
- Mechanical/Electrical 6
- Ensemble 7
- Instrument Storage 8
- Teaching Studio 9
- Practice Room 10
- Laboratory 11
- Organ Practice 12
- Retiring 13
- Student Lounge 14
- Air Conditioning 15
- Organ 16
- Connecting Corridor 17



Third Floor

0 1 2 3 4 5 (m)



Second Floor

School Building No. 3

TACHIKAWA

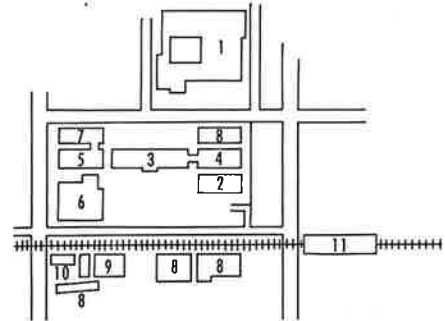
TOKYO

J



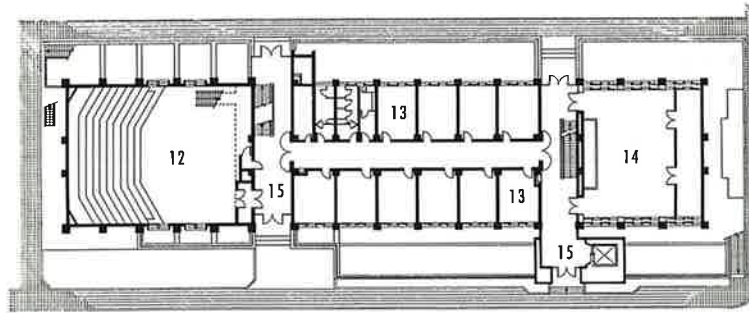
1 9 8 4

Site

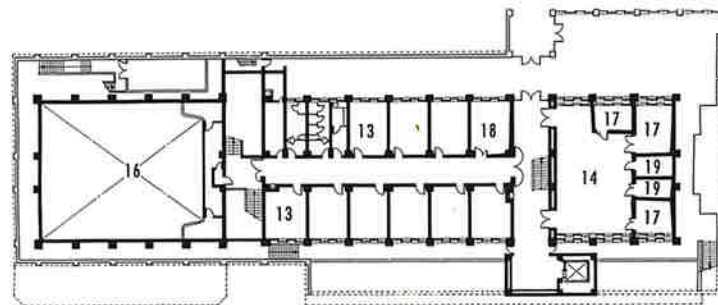


Plans

- Memorial Hall 1
- Head Office 2
- School Building No. 1 3
- School Building No. 2 4
- School Building No. 3 5
- School Building No. 4 6
- School Building No. 5 7
- Dormitory 8
- Gymnasium 9
- Technical Center for Tuning Practice
and Study of Instruments 10
- Sakurajousui Railroad Station 11
- Choral Rehearsal 12
- Teaching Studio 13
- Lecture Room 14
- Entrance Lobby 15
- Opera Rehearsal 16
- Percussion 17
- Percussion C 18
- Percussion Storage 19



Ground Floor



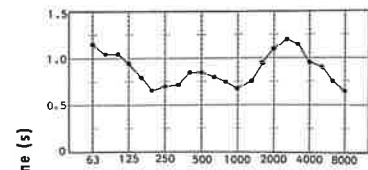
First Basement

0 2 4 8 16m

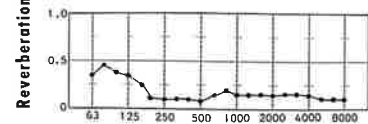
Exterior



Figure



Choral Rehearsal



Third-octave Band Center Frequency (Hz)

Percussion C

Reverberation

Suka Tomomasa Memorial Hall

UTSUNOMIYA

TOCHIGI

J



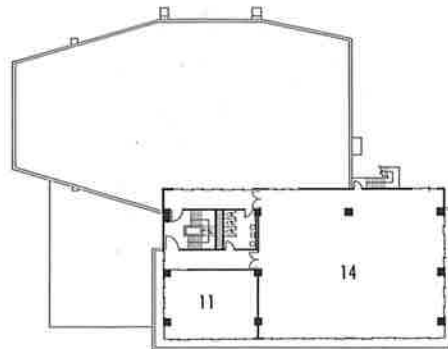
1 9 8 6

Exterior

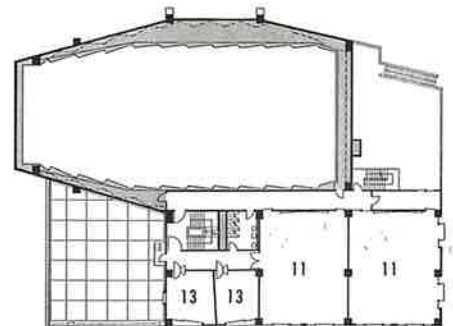


Plans

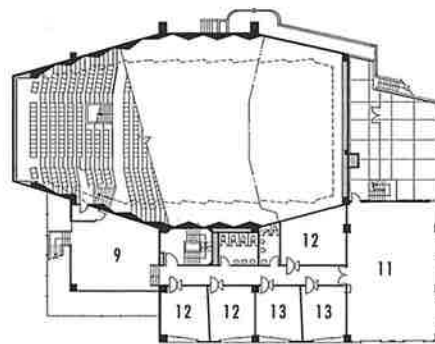
- Entrance 1
- Stage 2
- Auditorium 3
- Dressing Room 4
- Control Room 5
- President's Office 6
- Faculty Office 7
- Office 8
- Foyer 9
- Mechanical/Electrical 10
- Classroom 11
- Practice Room 12
- Teaching Studio 13
- Rehearsal Room 14



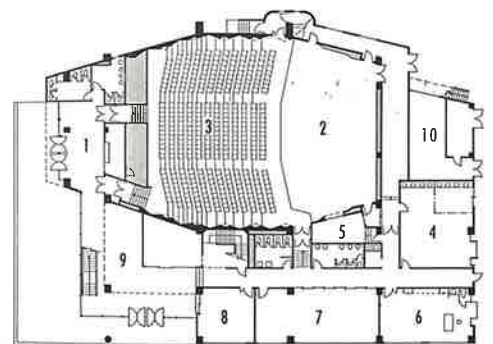
Fourth Floor



Third Floor



Second Floor



First Floor

0 2 5 10 20

Suka Tomomasa Memorial Hall

UTSUNOMIYA

TOCHIGI

J



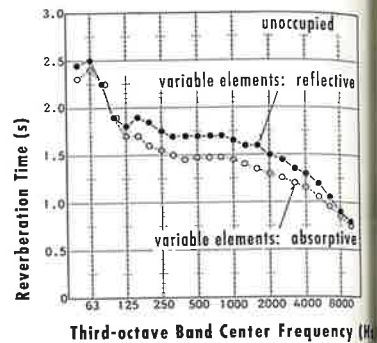
1 9 8 6

Recital Hall



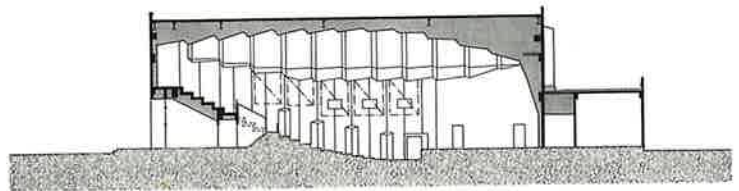
Physical Data

Total volume	3,900 m ³
Total area	1,829 m ²
Seating area	374 m ²
Volume-to-seat ratio	7.7 m ³ /seat
Volume-to-total-area ratio	2.13

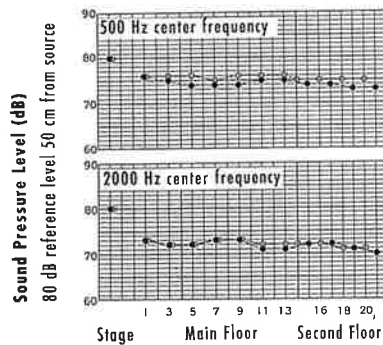


Reverberation

Section



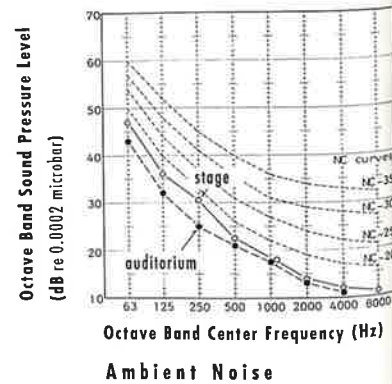
Figures



Measurement Points

- center audience block
- side audience block

Energy Distribution



La Sala de Carlos Chavez

MEXICO CITY

MEX



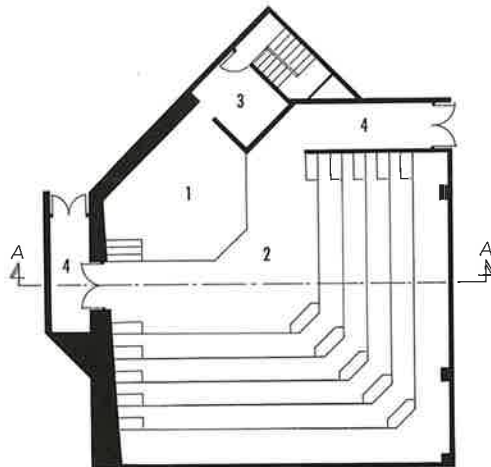
1 9 8 2

Exterior



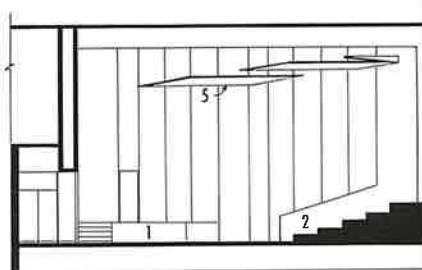
Legend

- Stage 1
- Seating 2
- Storage 3
- Vestibule 4
- Ceiling Reflectors 5



Physical Data

Total volume	58,000 ft ³
Seating capacity	200
Seating area	1,600 ft ² audience 300 ft ² orchestra
Area per audience seat	8 ft ² /seat
Volume-to-seating area ratio	36
Initial time delay gap	25 ms
Midfrequency reverberation time	1.5 s



Section A-A

Recital Hall



Algemene Muziekschool "Oost-Groningen"

WINSCHOTEN

NL



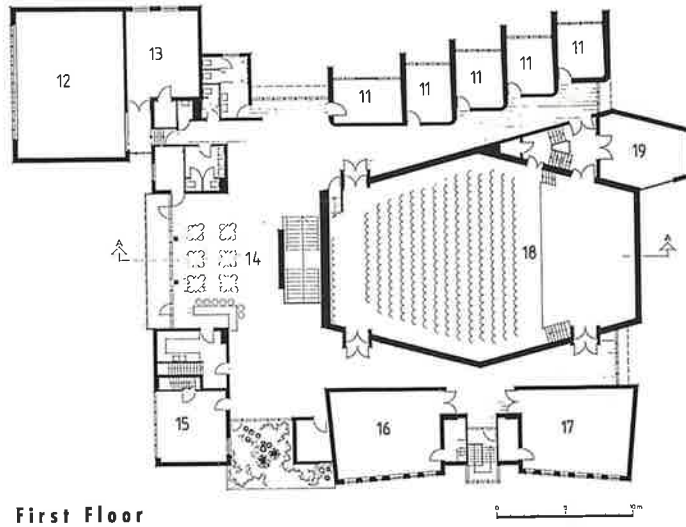
1 9 7 8

Elevation

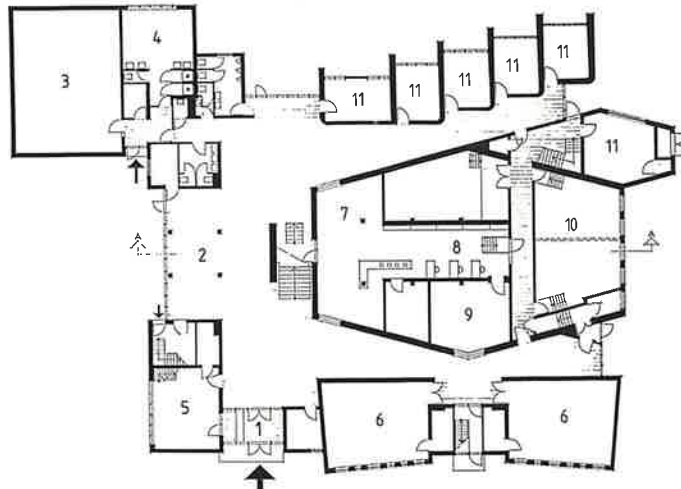


Plans

- Entrance 1
- Cloak Room 2
- Ballet 3
- Dressing Room 4
- Office 5
- Solfeggio 6
- Recordings Library 7
- Library 8
- Listening Room 9
- College Room 10
- Classroom 11
- Upper Ballet 12
- Storage 13
- Lounge 14
- Manager 15
- Staff 16
- Organ Studio 17
- Recital Hall 18
- Instrument Storage 19



First Floor



Ground Floor

Eindhoven School of Music

EINDHOVEN

NL



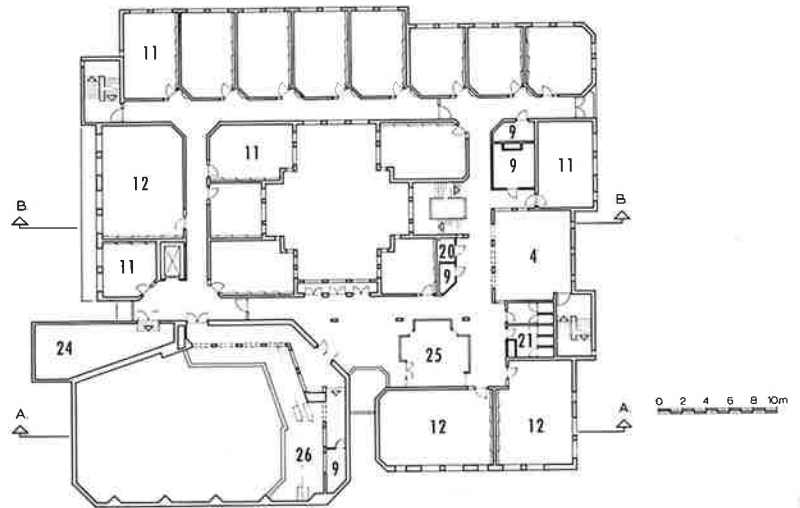
1 9 8 0

Corridor

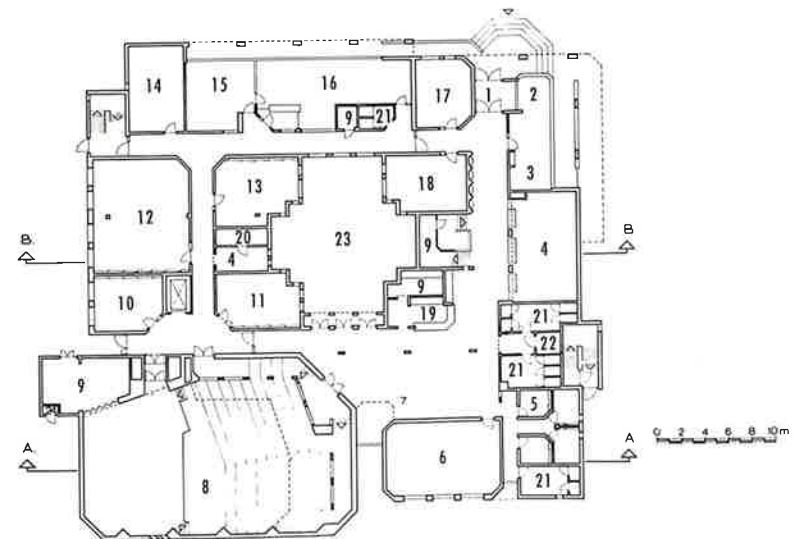


Plans

- Entrance 1
- Porter 2
- Reproduction 3
- Coat Check 4
- Practice Room 5
- Staff 6
- Foyer 7
- Recital Hall 8
- Storage 9
- Green Room 10
- Studio 11
- Classroom 12
- Conference 13
- Archives 14
- Bookeeping 15
- Office 16
- Deputy Principal 17
- Principal 18
- Kitchen 19
- Closet 20
- Restroom 21
- Janitor 22
- Patio 23
- Mechanical/Electrical 24
- Library 25
- Balcony 26



Second Floor



Ground Floor

Muziekcentrum Enschede

ENSCHEDÉ

NL



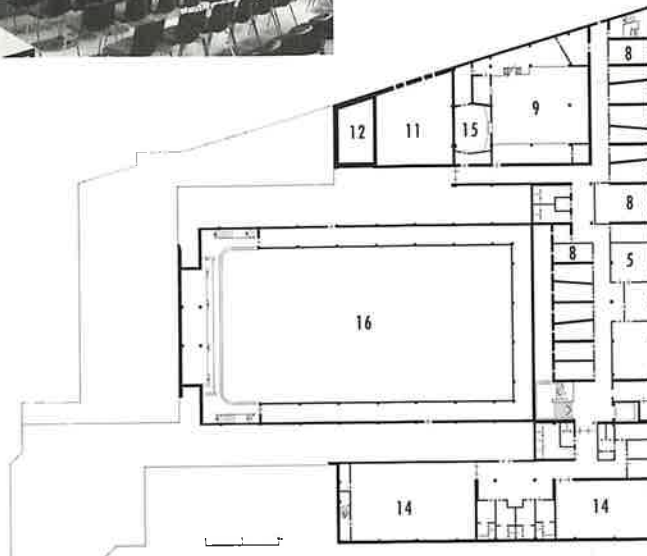
1 9 8 8

Organ Studio

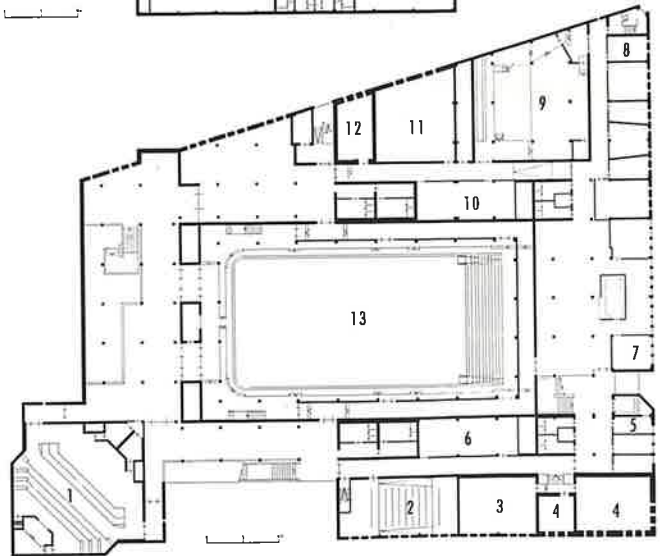


Legend

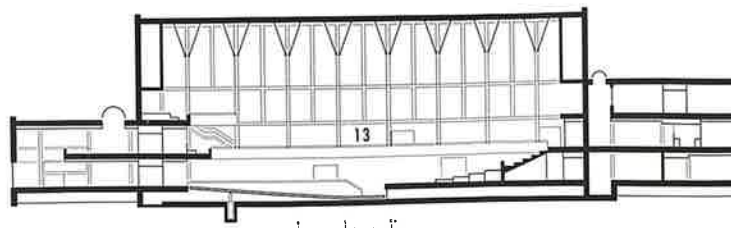
- Recital Hall 1
- Lecture Room 2
- Classroom 3
- Percussion 4
- Staff 5
- Expansion 6
- Conference 7
- Teaching Studio 8
- Opera Studio 9
- Computer 10
- Organ Studio 11
- Electronic Music 12
- Concert Hall 13
- Ballet 14
- Recording Control 15
- Upper Concert Hall 16



Second Floor



First Floor



Royal Conservatoire

THE HAGUE

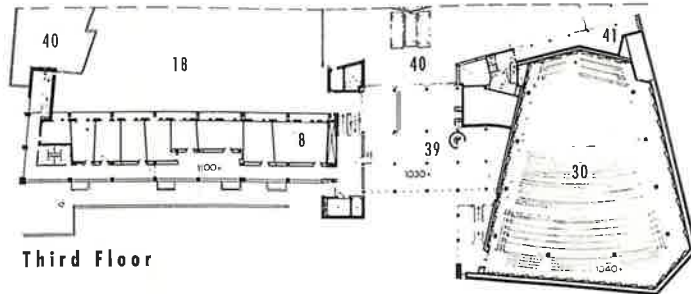
NL



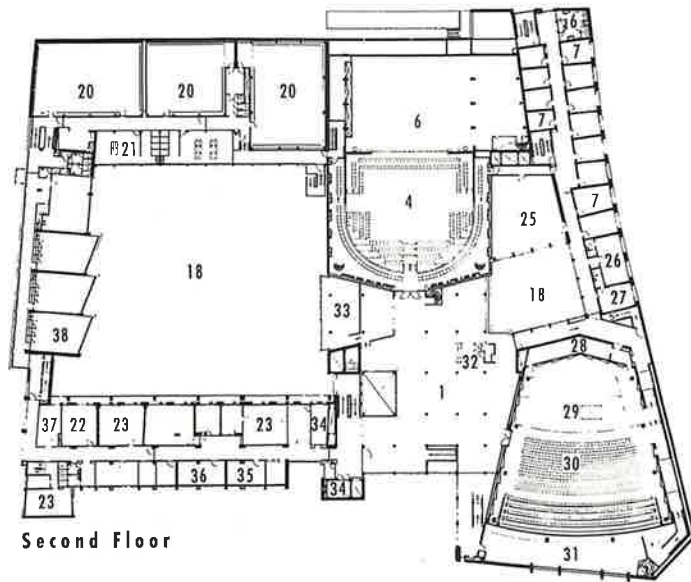
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Plans

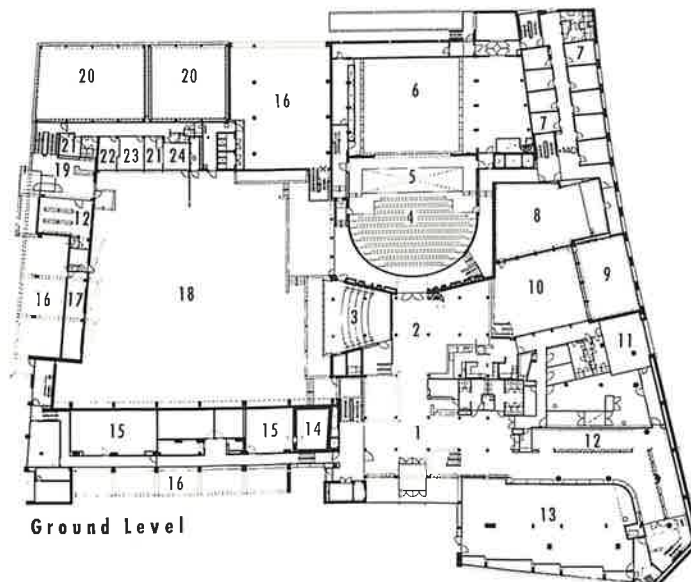
- Lobby 1
- Cafeteria 2
- Lecture Hall 3
- Opera House 4
- Orchestra Pit 5
- Stage 6
- Practice Room 7
- Studio 8
- Percussion Studio 9
- Courtyard 10
- Mechanical/Electrical 11
- Coat Check 12
- Retail 13
- Isolated Studio 14
- Electronic Music 15
- Parking 16
- Workshop 17
- Inner Court 18
- School Entrance 19
- Ballet 20
- Dressing Room 21
- Conference 22
- Office 23
- Work Room 24
- Green Room 25
- Conductor 26
- Soloist 27
- Choral Library 28
- Performance Platform 29
- Concert Hall 30
- Exhibition/Shop 31
- Concessions 32
- Lounge 33
- Archives 34
- Bookkeeping 35
- Reproduction 36
- Instrument Storage 37
- Classroom 38
- Library 39
- Roof 40
- Terrace 41



Third Floor



Second Floor



Ground Level

Herschel Theatre Complex

CLAREMONT
CAPE TOWN
ZA



1 9 8 8

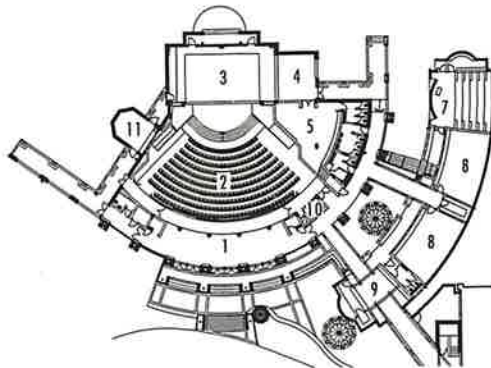
Auditorium



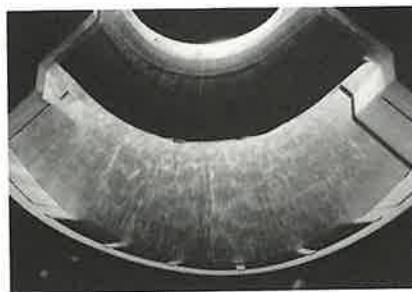
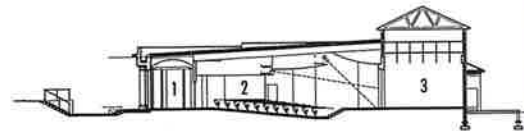
Legend

- Foyer 1
- Auditorium 2
- Stage 3
- Side Stage 4
- Dressing Room 5
- Restroom 6
- Lecture Theatre 7
- Classroom 8
- Servery 9
- Control Room 10
- Pavillion 11

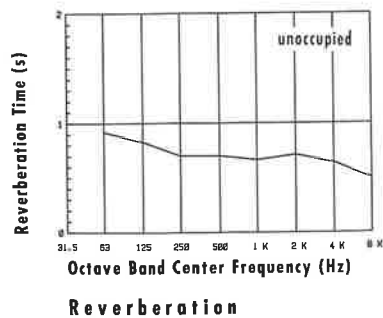
Model



Physical Data	
Auditorium volume	940 m ³
Stage volume	950 m ³
Total volume	1,890 m ³
Volume including foyer	2,246 m ³
Total area	701 m ²
Floor area	268 m ²
Seating area	153 m ²
Seating capacity	299
Volume-to-seat ratio	3.1 m ³ /seat
Volume-to-seating-area ratio	6.1
Volume-to-floor-area ratio	3.5
Height:width:length ratio	1:6.4:5
Viewer to curtain distance	10 m average 15 m maximum
Absorbent surfaces	fully upholstered seats 20% open wood lattice over 75 mm glass fiber rear wall carpet tile floor



Figure



Bennett Hall

HIGHLAND PARK
ILLINOIS
USA



1 9 8 8

Recital Hall

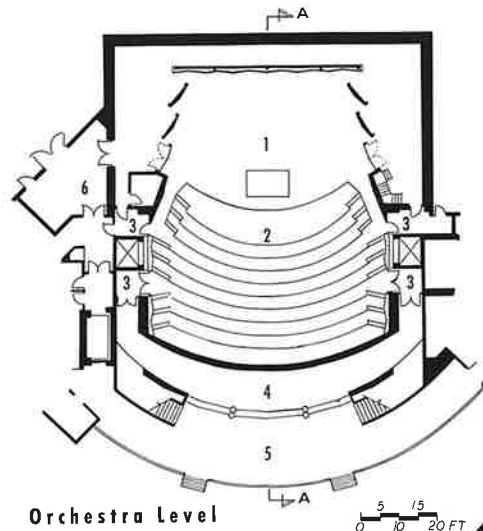


Physical Data

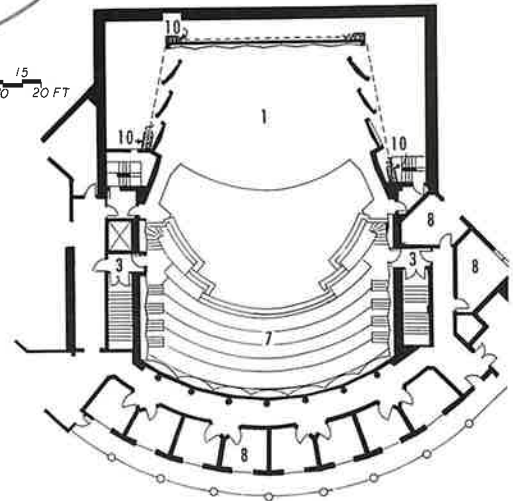
Total volume	220,600 ft ³
Seating capacity	450
Seating area	4,050 ft ² audience 1,850 ft ² orchestra
Area per audience seat	9 ft ² /seat
Volume-to-seating area ratio	55
Initial time delay gap	24 ms
Midfrequency reverberation time	1.8 s without draperies 1.5 s with draperies

Legend

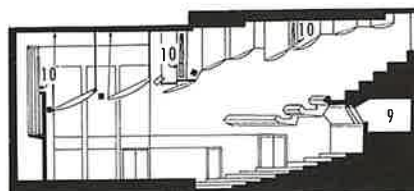
- Platform 1
- Main Floor 2
- Sound Lock 3
- Foyer 4
- Lobby 5
- Loading 6
- Balcony Level 7
- Practice Room 8
- Control Room 9
- Acoustic Drapery 10



Orchestra Level



Balcony Level



Section A-A

Berklee College of Music

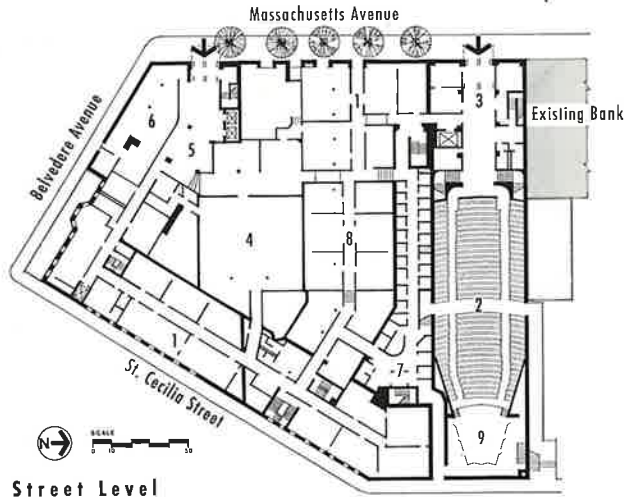
BOSTON
MASSACHUSETTS
USA



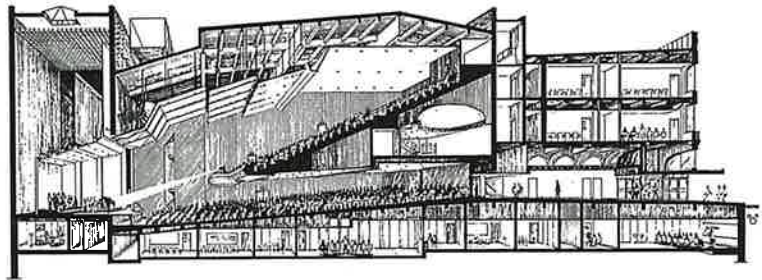
1 9 7 5

Plan

- Classrooms 1
- Concert Hall 2
- Foyer 3
- Library 4
- Lobby 5
- Offices 6
- Practice Rooms 7
- Rehearsal Rooms 8
- Stage 9



Section



Recording Studio



Braun Music Center

PALO ALTO

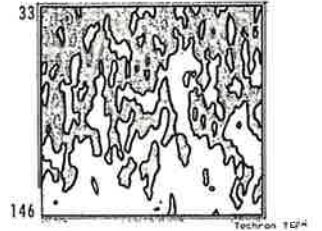
CALIFORNIA

USA

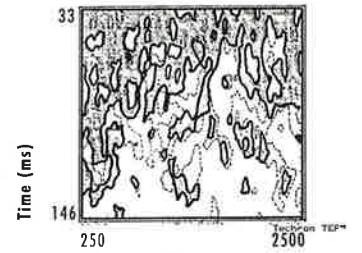


1 9 8 4

Recital Hall



Draperies Retracted



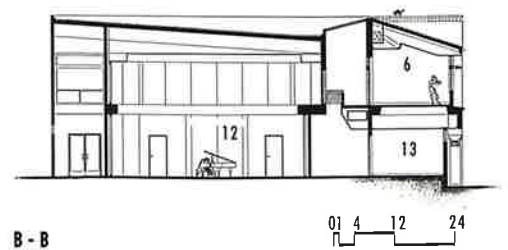
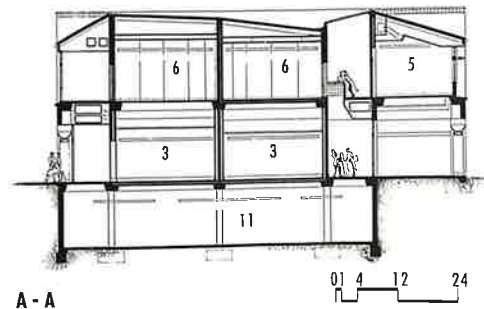
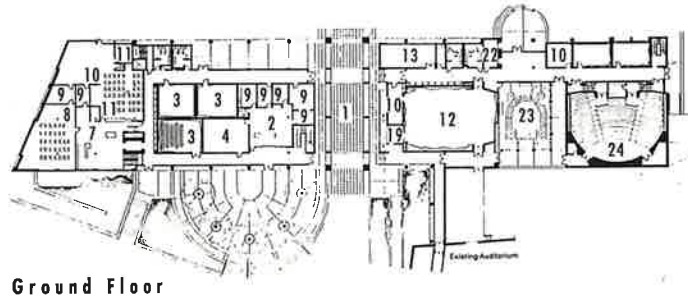
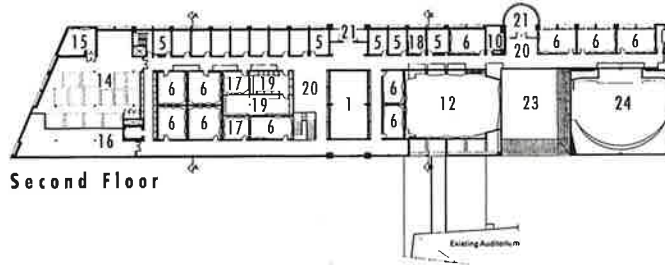
Frequency (Hz)

Draperies Extended

Variable Energy Loss

Legend

- Open Portal 1
- General Office 2
- Classroom 3
- Seminar 4
- Faculty Office 5
- Teaching Studio 6
- Library 7
- Reference Center 8
- Office 9
- Workroom 10
- Stacks 11
- Rehearsal Room 12
- Piano Teaching Lab. 13
- Piano Practice 14
- Organ Practice 15
- Expansion 16
- Chamber Music 17
- Harpsichord Practice 18
- Instrument Storage 19
- Lounge 20
- Terrace 21
- Ticket Booth 22
- Courtyard 23
- Recital Hall 24



Broyhill Music Center

BOONE
NORTH CAROLINA
USA



1 9 8 3

Exterior



Principal Volumes

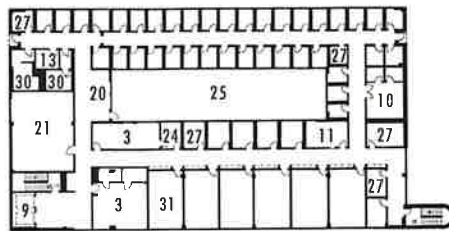
Concert Hall	201,000 ft ³ (5,700 m ³)
Choral Rehearsal	48,000 ft ³ (1,360 m ³)
Instrumental Rehearsal	67,000 ft ³ (1,900 m ³)

Floor Areas

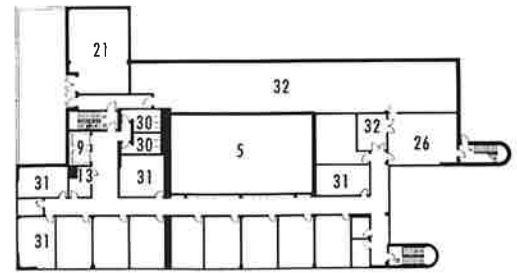
Concert Hall	4,900 ft ² (455 m ²)
Choral Rehearsal	2,000 ft ² (185 m ²)
Instrumental Rehearsal	2,600 ft ² (240 m ²) excluding a 500 ft ² (45 m ²) gallery

Plans

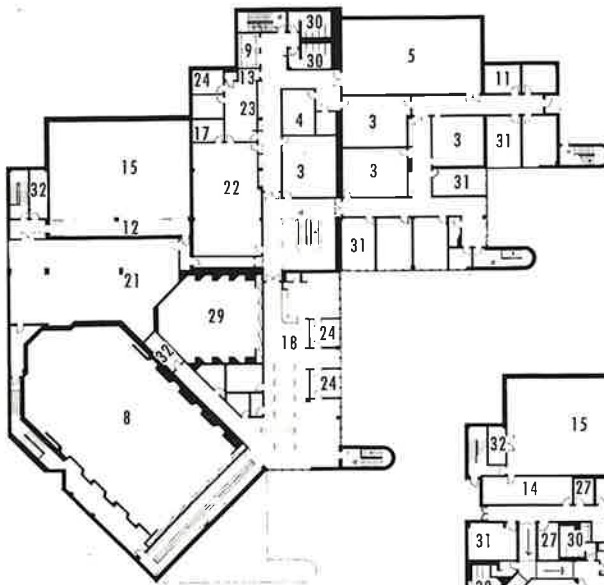
- Audiovisual 1
- Cannon Music Camp 2
- Classroom 3
- Choral Library 4
- Choral Rehearsal 5
- Coats 6
- Commons 7
- Concert Hall 8
- Elevator 9
- Electronic Laboratory 10
- Ensemble Rehearsal 11
- Gallery 12
- Housekeeping Supplies 13
- Instrumental Library 14
- Instrumental Rehearsal 15
- Instrument Repair 16
- Laboratory 17
- Library 18
- Lobby 19
- Lounge 20
- Mechanical/Electrical 21
- Music Education 22
- Music Education Resource 23
- Office 24
- Open Court 25
- Opera 26
- Practice Room 27
- Reception 28
- Recital Hall 29
- Restroom 30
- Studio/Office 31
- Storage 32



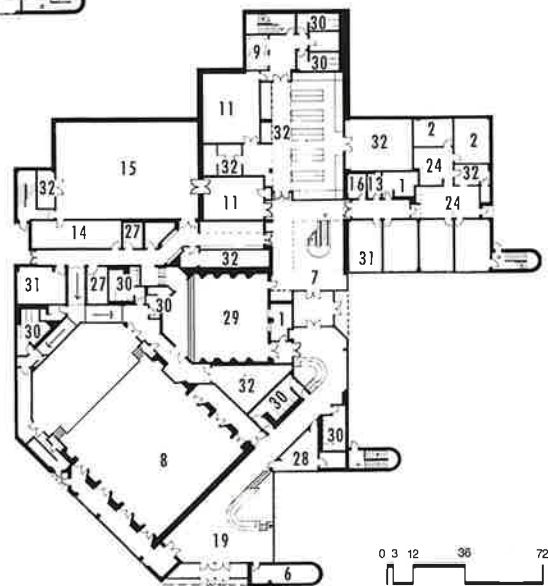
Fourth Floor



Third Floor



Second Floor



First Floor

0 3 12 36 72 ft

Broyhill Music Center

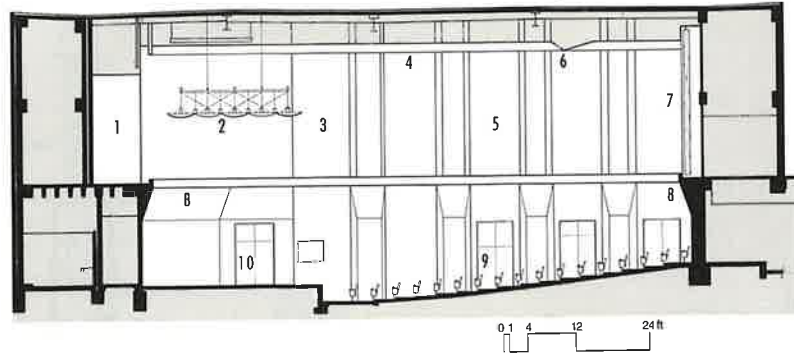
BOONE
NORTH CAROLINA
USA



1 9 8 3

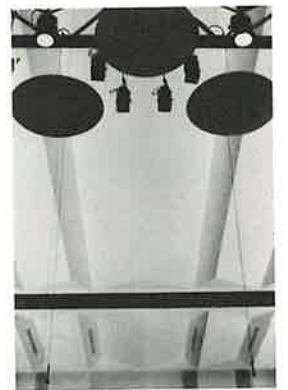
Concert Hall

- Organ loft 1
- Stage canopy 2
- Curtain pocket 3
- Plaster ceiling 4
- Brick sidewall 5
- Light slot 6
- Rear curtain 7
- Corbelled brick 8
- Upholstered seats 9
- Wood stage floor 10



Physical Data

Seating capacity	approximately 440
Seating area	2,640 ft ² (245 m ²)
Stage area	1,500 ft ² (140 m ²)
Volume-to-seat ratio	approx. 457 ft ³ (13 m ³)
Height:width:length ratio	approximately 3:4:7
Viewer to midstage distance	46 ft (14 m) average 76 ft (23 m) maximum
Variable absorption area	2,150 ft ² (200 m ²) (retractable curtains)
Stage ceiling height	38.5 ft (11.7 m)
Stage canopy height	28 ft (8.5 m)



Choral Auditorium

BERKELEY
CALIFORNIA
USA

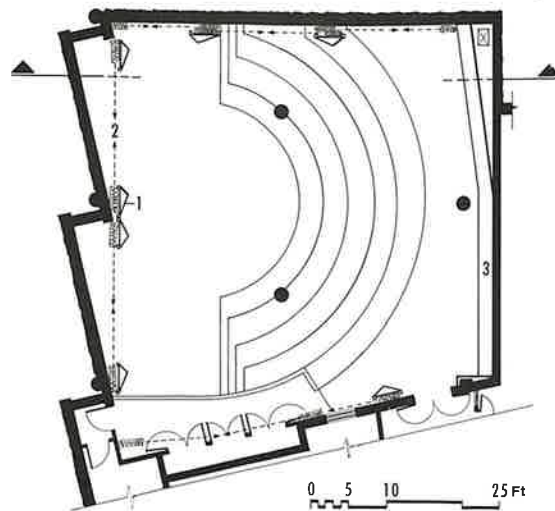


1 9 8 6

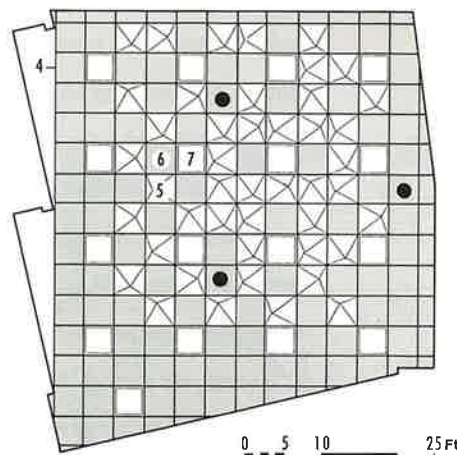
Choral Auditorium

Legend

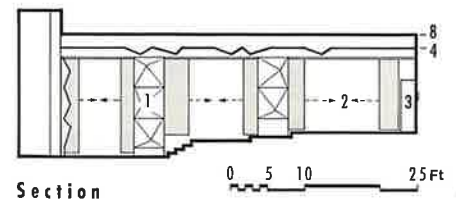
- 1 Sound-reflecting "tower"/ drapery storage pocket
- 2 Extent of movable draperies
- 3 Existing music storage cabinets
- 4 New suspended ceiling grid
- 5 Sound-reflecting panel
- 6 Sound-absorbing panel
- 7 Luminaire with flat acrylic lens
- 8 Original ceiling



Floor Plan

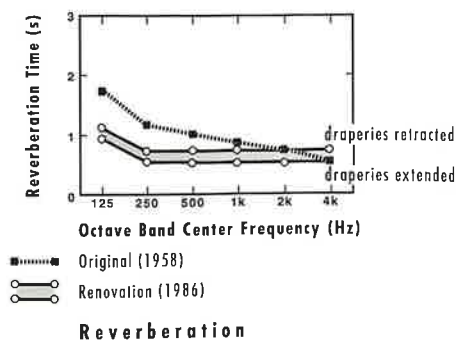


Reflected Ceiling Plan



Section

Figure



Creative Arts Center

SHEPHERDSTOWN
WEST VIRGINIA

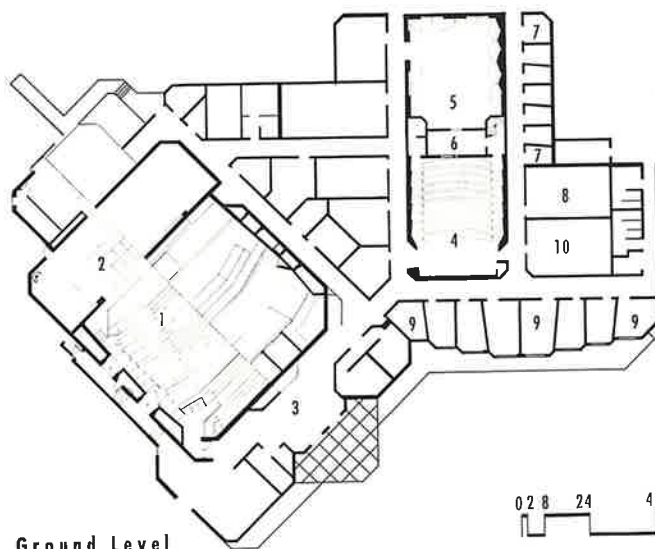
USA



1 9 7 8

Rehearsal Hall

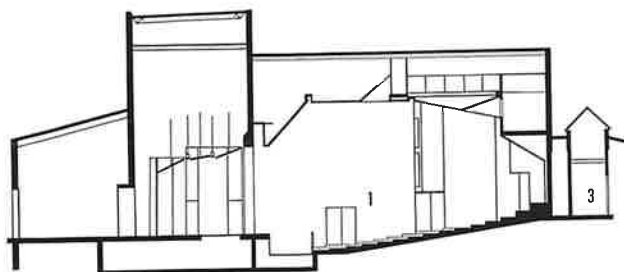
Auditorium



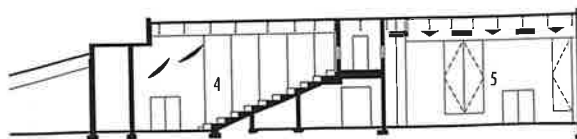
0 2 8 24 48

Legend

- Auditorium 1
- Stage 2
- Lobby 3
- Lecture/Recital Hall 4
- Instrumental Rehearsal 5
- Control Room 6
- Music Studio 7
- Classroom 8
- Teaching Studio 9
- Listening Room 10



Section through Auditorium



Section through Recital and Rehearsal Halls

Goodman House

NEW YORK

NEW YORK

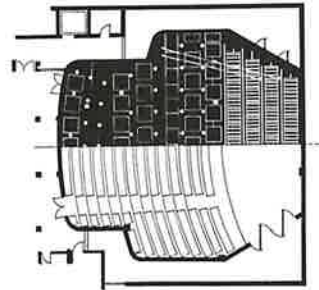
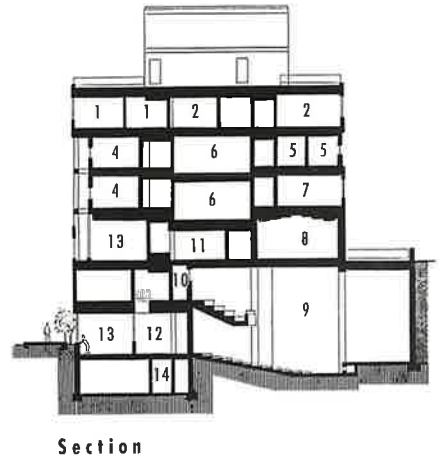
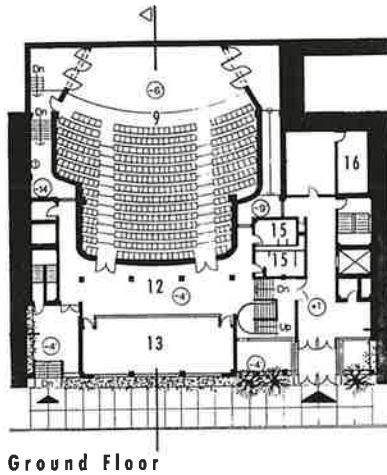
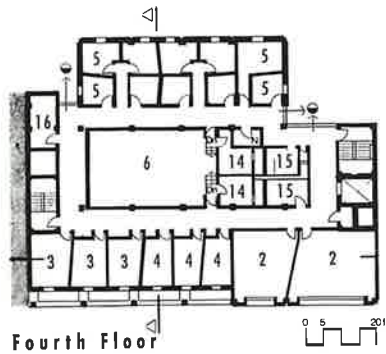
USA



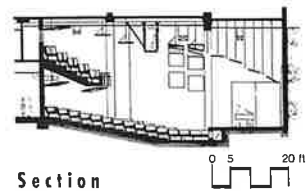
1 9 7 8

Legend

- Office 1
- Classroom 2
- Grand Piano Studio 3
- Piano Studio 4
- Instrumental Studio 5
- Dance Studio 6
- Art Studio 7
- Recital Hall 8
- Concert Hall 9
- Control 10
- Lounge Reception 11
- Lobby 12
- Library 13
- Dressing Room 14
- Restroom 15
- Mechanical/Electrical 16



Concert Hall



Practice Room

Gould Auditorium

NEW YORK

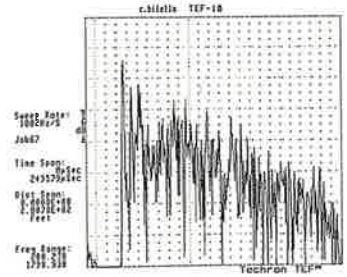
NEW YORK

USA



1 9 8 8

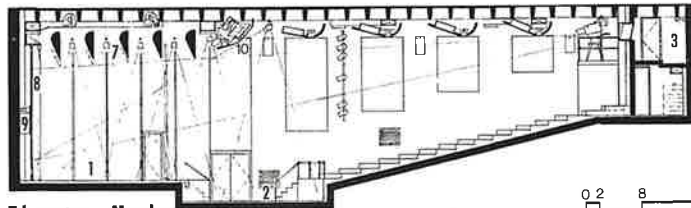
Auditorium



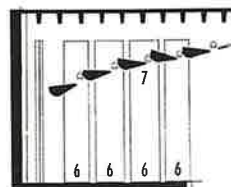
Energy Time Curve

Legend

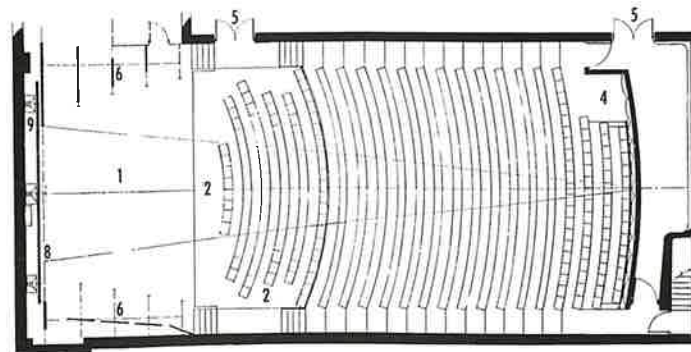
- Stage 1
- Orchestra Pit 2
- Projection 3
- Handicapped Seating 4
- Corridor 5
- Moveable Panel on Track 6
- Adjustable Overhead Panel 7
- Projection Screen 8
- Motion Picture Loudspeaker 9
- Central Loudspeaker Cluster 10



Theater Mode



Concert Mode



Hall of Music

WALLA WALLA
WASHINGTON
USA



1 9 8 6

Corridor

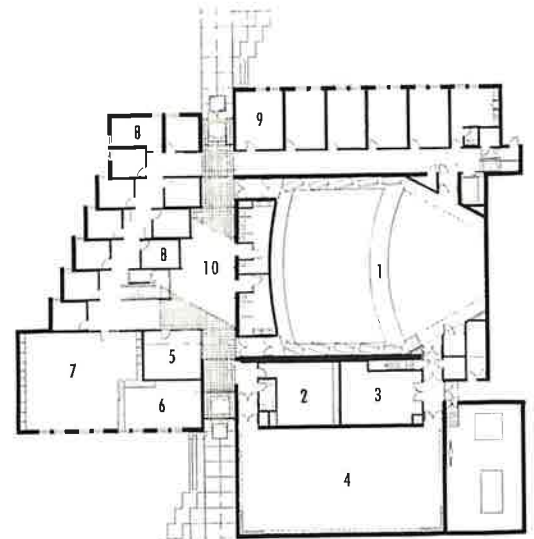


Legend

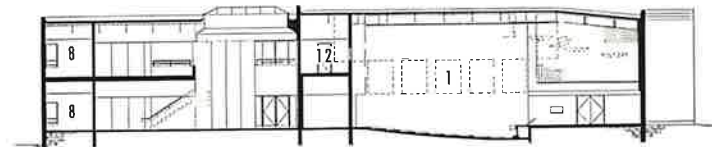
- Recital Hall 1
- Electronic Music 2
- Storage 3
- Rehearsal Hall 4
- Office 5
- Library Storage 6
- Library 7
- Practice Room 8
- Teaching Studio 9
- Lobby 10
- Control 11
- Classroom 12
- Mechanical/Electrical 13



Second Floor



Ground Floor



Miller Theatre

NEW YORK

NEW YORK

USA



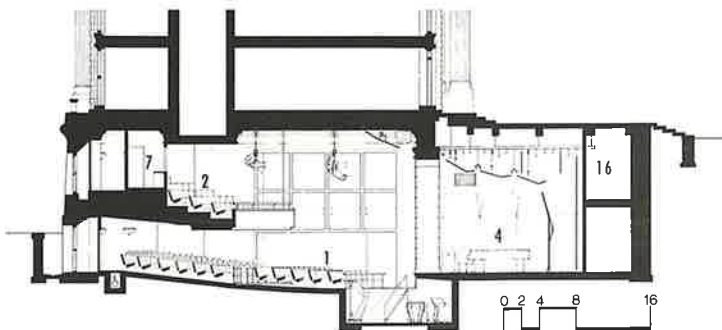
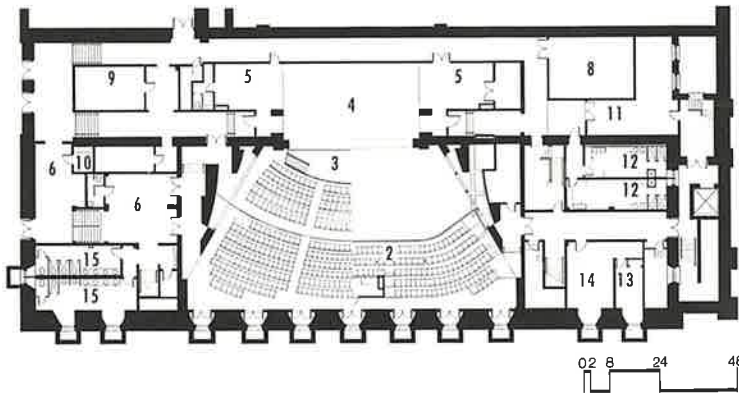
1 9 8 8

Theatre



Legend

- Theatre 1
- Balcony 2
- Orchestra Pit 3
- Stage 4
- Side Stage 5
- Lobby 6
- Control Booth 7
- Rehearsal Hall 8
- Electronic Music 9
- Tickets 10
- Instrument Storage 11
- Dressing Room 12
- Office 13
- Collegium Musicum 14
- Restroom 15
- Mechanical/Electrical 16



Moody Music Building

TUSCALOOSA

ALABAMA

USA



1 9 8 8

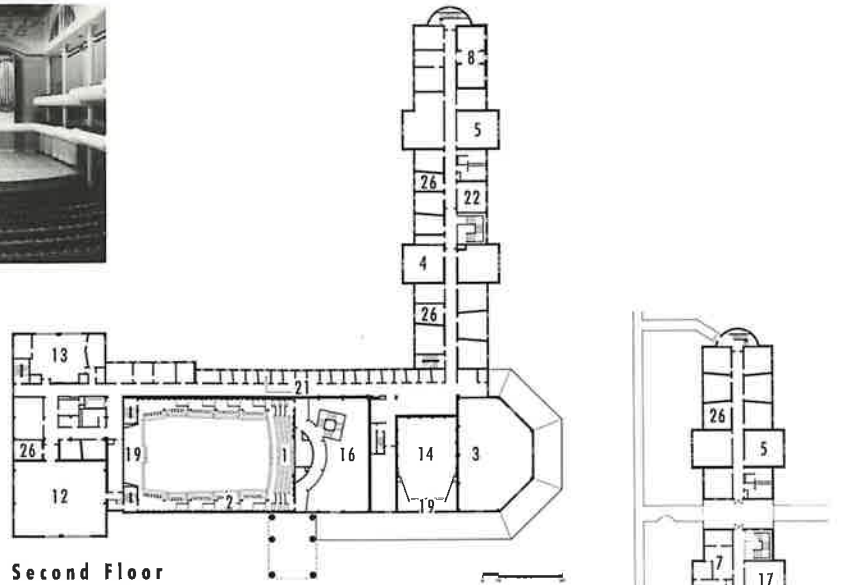
Concert Hall



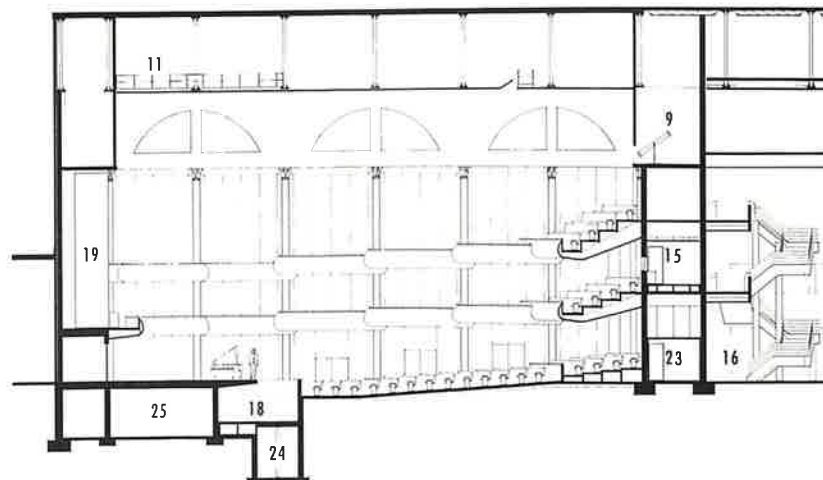
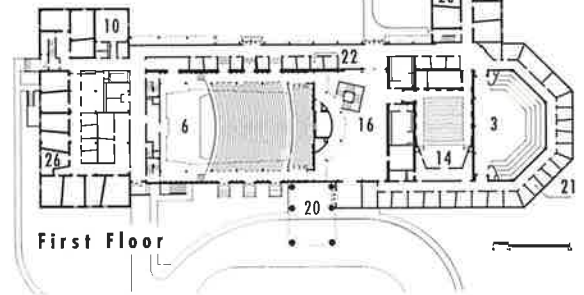
Legend

- Balcony 1
- Boxes 2
- Choral/Opera Rehearsal 3
- Class Piano 4
- Classroom 5
- Concert Hall 6
- Department Office 7
- Electronic Music 8
- Follow Spot 9
- Green Room 10
- Grid 11
- Instrumental Rehearsal 12
- Jazz Rehearsal 13
- Lecture/Recital 14
- Lighting 15
- Lobby 16
- Media 17
- Orchestra Pit 18
- Organ Loft 19
- Porte Cochere 20
- Practice Room 21
- Seminar 22
- Sound/Recording 23
- Stage Lift 24
- Storage 25
- Studio 26

Second Floor



First Floor



Music and Art Center

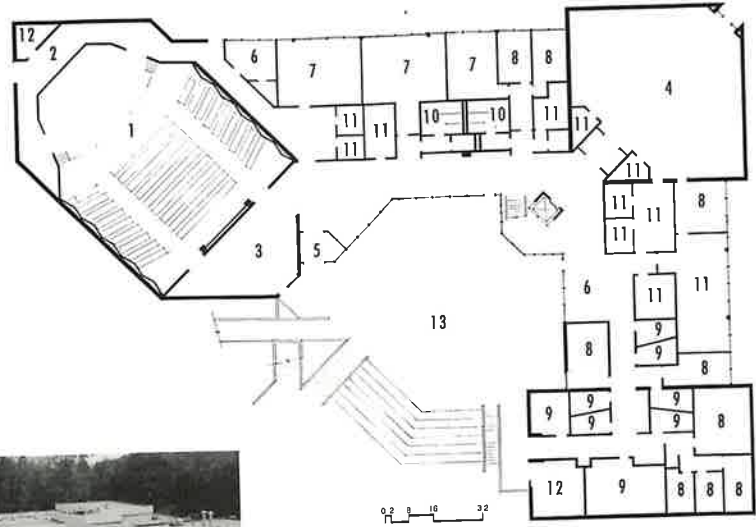
GRAND RAPIDS
MICHIGAN
USA



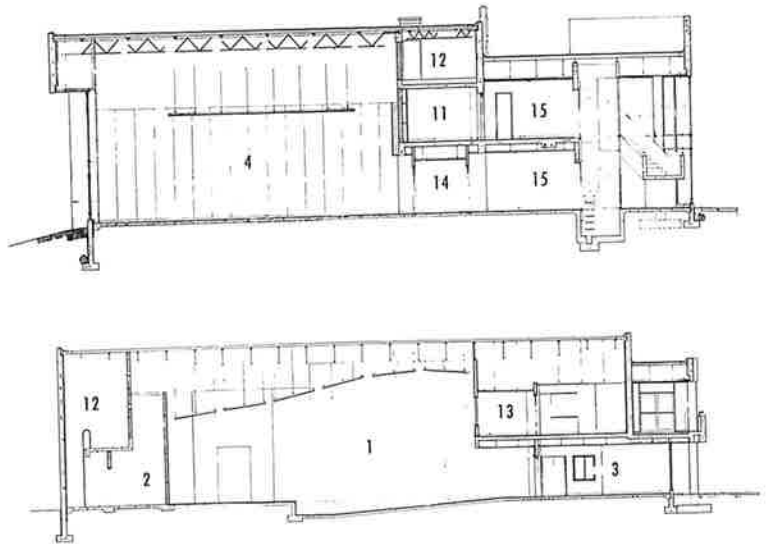
1 9 8 4

Legend

- Recital Hall 1
- Future Organ 2
- Lobby 3
- Rehearsal Hall 4
- Vestibule 5
- Launge 6
- Classroom 7
- Office/Studio 8
- Practice Room 9
- Restroom 10
- Storage 11
- Mechanical/Electrical 12
- Projection 13
- Vestibule 14
- Exhibit 15



Exterior



Recital Hall



Olin Humanities Building

ANNANDALE-ON-HUDSON
NEW YORK

USA



1 9 8 8

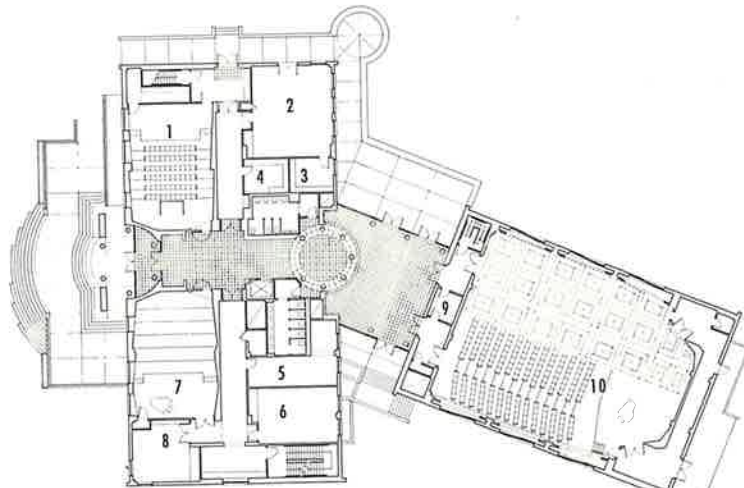
Recital Hall



Detail

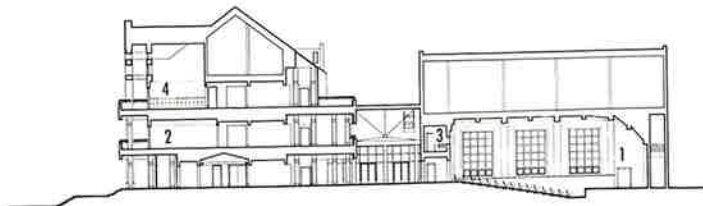
Legend

- Art History 1
- Poetry 2
- Storage 3
- Audiovisual 4
- Transparency Library 5
- Video Seminar 6
- Music Classroom 7
- Music Seminar 8
- Coal Room 9
- Recital Hall 10
- Lecture Room 11
- Projection 12
- Reading Room 13



Ground Level

0 10 25



0 5 15 25

Classroom



Recital and Rehearsal Center

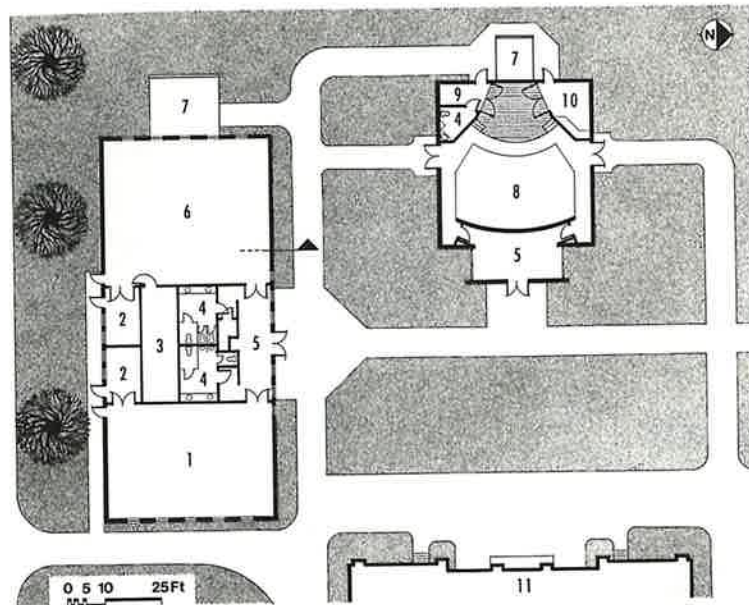
STOCKTON
CALIFORNIA
USA



1 9 8 5

Plan

- Choral Rehearsal 1
- Office 2
- Instrument Storage 3
- Restroom 4
- Lobby 5
- Instrumental Rehearsal 6
- Mechanical/Electrical 7
- Recital Hall 8
- Green Room 9
- Recording and Storage 10
- Existing Conservatory of Music 11



Principal Volumes

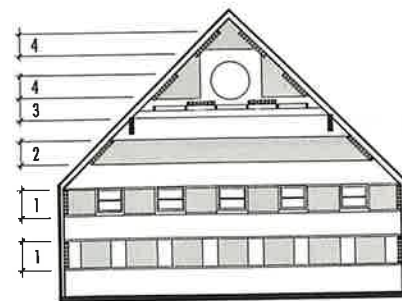
Recital Hall	37,000 ft ³
Instrumental Rehearsal	43,500 ft ³
Choral Rehearsal	32,500 ft ³

Rehearsal Hall



Section

- Movable sound-absorbing panels (side and end walls) 1
- Fixed sound-absorbing treatment (side and end walls) 2
- Ceiling grid on cross beams 3
- Fixed sound-absorbing treatment (side walls) 4



Instrumental Rehearsal

Recital Hall



Ross Fine Arts Center



1 9 8 2

NEWBERG

OREGON

USA

Recital Hall

