a community fine arts center

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FOREWORD

IN RECENT DECADES THE ARTS HAVE BEEN NEGLECTED. WE ARE ONLY NOW BEGINNING TO RE-INSTATE THEM, AND GIVE THEM THE IMPORTANCE THEY DE¬SERVE, THE IMPORTANCE THEY HAVE HAD IN SOME OF THE PAST GREAT AGES OF MANKIND. IN THE LAST 100 YEARS ESPECIALLY, WE HAVE BEEN SO DAZZLED BY THE SPECTACULAR ACHIEVEMENTS OF SCIENCE, SO ABSORBED IN ITS COMPLEXITY AND RAMIFICATIONS, THAT WE HAVE SLIGHTED THE ARTS, LEAVING THEM TO THE FEW PEOPLE WHO HAD SOME SPECIAL DRIVE OR TALENT. IN EDUCATION THEY HAVE BEEN TREATED TOO OFTEN AS MINOR FRILLS. EDUCATION HAS CONCENTRATED ON THE SCIENCES, AND ON THE PRACTICAL-SOUNDING SUBJECTS REQUIRING ONLY VERBAL LITERACY. LITERACY IN MUSIC AND IN THE VISUAL ARTS HAS BEEN ALLOWED TO DECAY, TO OUR VERY GREAT LOSS. TOO MANY OF US DON'T KNOW HOW TO HEAR, HOW TO SEE. IN¬DEED, TOO MANY OF US HARDLY KNOW HOW TO FEEL. WE HAVE OVER-EMPHASIZED THE MORE ABSTRACT, RATIONAL PROCESSES OF THE MIND, AT THE EXPENSE OF THE CREATIVE IMAGINATION, THE INSIGHTS AND PERCEPTIONS WHICH THE ARTS PROVIDE. WE HAVE DEVELOPED THE HEAD AND STARVED THE HEART. WE SEE AND ADMIRE ALL AROUND US THE ACHIEVEMENTS OF SCIENCE. BUT WE ARE UNEASILY AWARE THAT SCIENCE IS A NEUTRAL FORCE - IT CAN DESTROY AS WELL AS BUILD. ITS VAST POTENTIALITIES DEPEND UPON THE WISDOM WITH WHICH IT IS USED; AND WISDOM IS NOT THE PRODUCT OF A MATHEMATICAL FORMULA.


OUR OWN AGE IS ONE OF CRISIS, WHEN THE INDIVIDUAL FEELS HIMSELF THREATENED BY UNCONTROLLABLE SOCIAL FORCES. IN LARGE AREAS, THE INDIVIDUAL HAS BEEN POLITICALLY CRUSHED AND SUBORDINATED TO AN ALL-PowerFUL STATE. HE HAS BECOME ONLY A STATISTICAL UNIT, A PAWN IN POWER POLITICS. IT IS SIGNIFICANT THAT THE TOTALITARIAN STATES CANNOT ALLOW ANY FREEDOM FOR THE ARTS. DICTATORS ARE RIGHTLY AFRAID OF ARTISTS, BECAUSE THEY INSIST ON DEALING, NOT WITH A STATISTICAL UNIT, BUT WITH A WHOLE MAN; NOT WITH PAWNS, BUT WITH HUMAN SOULS. THE ARTS ARE A BASTION OF INDIVIDUAL FREEDOM; AND A SOCIETY WHICH ENCOURAGES THE ARTS, AND WHICH EXPOSES ITSELF TO THE DISCIPLINE, INSIGHT, AND SPONTANEITY THEY PROVIDE, IS MAKING AN AFFIRMATIVE STATEMENT ABOUT THE CONTINUING VALUE OF THE FREE HUMAN SPIRIT.

THE SITE FOR A FINE ARTS CENTER SHOULD NOT BE OVERRIDDEN BY THE DISTRACTIONS OF COMMERCIAL ENTERPRISES OR THE CONFUSION OF MAIN TRAFFIC ARTERIES. IT SHOULD BE ADEQUATE IN THE MOST GENEROUS SENSE OF THE WORD. A THEATRE OR MUSIC HALL SHOULD NOT HAVE TO COMPETE WITH THE NOISE FROM SCREECHING BRAKES, HONKING HORNS, SCREAMING SIRENS, OR THE BLARE AND FANFARE OF AN OCCASIONAL CELEBRATION. A QUIET SECTION OF A LARGE PARK IS ONE LOGICAL ANSWER.

GIVEN ENOUGH SPACE THE ARCHITECT CAN INTELLIGENTLY WORK OUT THE PLACEMENT OF BUILDINGS, GARDENS, WALKS, DRIVES, AND PARKING AREAS. THE INTELLIGENTLY SELECTED SITE BECOMES ARTICULATED SPACE THROUGH PROPER PLANNING.
Painting and Sculpture can play an important and dramatic part if given a chance in the initial planning. They should not be an afterthought, purchased and applied or placed haphazardly, and without relation to the meaning of the living space. Painting, sculpture, and architecture must meet on common terms if they are to fulfill their potentialities in the art of space articulation. The ideal would be for the architect to execute his own paintings and sculpture, but for numerous reasons this will seldom be possible. However, a true correlation of painting, sculpture, and architecture can succeed if the painter and sculptor plan with the architect from the first sketch on, and if the collaborators have a common understanding of purpose and share similar viewpoints about how their art forms can complement each other.
THE THEATRE IS AN IMPORTANT FORM OF ENTERTAINMENT AND A SOCIAL FORCE TO BE RECKONED WITH ... ITS IMPACT BEING BOTH CULTURAL AND SPIRITUAL.

THE SCHEME PRESENTED IS A THEATRE THAT FITS THE CONDITIONS OF THE PROPOSED ARTS CENTER AND IS OFFERED ONLY AS ONE PARTICULAR SOLUTION. IT DOES NOT PROPOSE TO SET STANDARDS BUT POINTS TOWARD IDEALS. MOST OF THE THEATRE REFERENCE MATERIAL IS MUCH TOO STANDARDIZED. MOST ARCHITECTS TODAY SEEM CONTENT TO COPY THE MISTAKES OF OTHERS AND ALLOW EQUIPMENT COMPANIES TO DETERMINE MANY OF THE IMPORTANT ELEMENTS OF THE THEATRE.

THE DESIGNING AND PLANNING OF A THEATRE AS A WORK OF ART IN ARCHITECTURE, AND AS A WORKSHOP FOR THE CREATION OF ART IN THE THEATRICAL REALM MUST BE ACCEPTED AS A DOUBLE RESPONSIBILITY ... A RESPONSIBILITY THAT MUST BE ACCEPTED AND SHARED BY THEATRE ARTISTS AND ARCHITECTS. ALL OF THE KNOWLEDGE, SKILL, AND IMAGINATION OF BOTH MUST BE POOLED IN ORDER TO ARRIVE AT A CREATIVE SOLUTION. THE HISTORY OF THEATRE ARCHITECTURE IN AMERICA IS THE REPEATED STORY OF THE ARCHITECT RELYING ON A SEVENTEENTH CENTURY THEATRE PLAN AS THE PROTOTYPE FOR HIS DESIGNING, AND OF THE THEATRE ARTISTS' ACCEPTANCE OF THIS BUILDING OF LIMITED SERVICE.

DESPITE MANY STRONG CRITICISMS THAT THE THEATRE HAS RECEIVED IN THE PAST FEW YEARS VERY FEW NEW DESIGNS HAVE APPEARED AND FEWER STILL HAVE BEEN EXECUTED. MOST OF OUR THEATRES TODAY ARE NOT GOOD. THEY ARE NEITHER TRUE NOR BEAUTIFUL. NEW METHODS OF STAGING, SUCH SCIENTIFIC DEVELOPMENTS AS AIR CONDITIONING, SOUND PROJECTION, A CERTAIN DEGREE OF ACOUSTICAL ASSURANCE, AND NEW METHODS OF LIGHTING, ARE BUT A FEW OF THE FACTORS WHICH MUST BE GIVEN PROPER CONSIDERATION IN OUR NEW DESIGNS.
THERE ARE THREE BASIC STAGE FORMS:

THE PRIMARY ONE IS THE CENTRAL ARENA ON WHICH THE ATTRACTION UNFOLDS ITSELF THREE-DIMENSIONALLY WHILE THE SPECTATORS CROWD AROUND CONCENTRICALLY. TODAY WE FIND THIS FORM IN THE CIRCUS, SPORTS-AREA, AND "THEATRE IN THE ROUND".

THE SECOND CLASSIC STAGE FORM IS THE GREEK PROSCENIUM THEATRE WITH ITS PROTRUDING PLATFORM AROUND WHICH THE AUDIENCE IS SEATED IN CONCENTRIC HALF CIRCLES. HERE THE PLAY IS SET UP AGAINST A FIXED BACKGROUND.

EVENTUALLY THE OPEN PROSCENIUM RECEDED MORE AND MORE FROM THE SPECTATOR TO BE FINALLY PULLED BACK ALTOGETHER BEHIND A CURTAIN TO FORM TODAY'S DEEP STAGE WHICH DOMINATES OUR PRESENT THEATRE.
"FRONT" OR PUBLIC AREAS, AND "BACKSTAGE" OR WORK AREAS, ARE THE TWO MAJOR ELEMENTS OF THE THEATRE. THE FIRST CONSTITUTES THE AUDIENCE IN TERMS OF RECEPTION, TRAFFIC, SEEING, HEARING, COMFORT, AND SAFETY; THE SECOND CONSTITUTES ACCOMMODATION OF THE PERFORMANCE IN TERMS OF RECEPTION, PREPARATION, ASSEMBLY, REHEARSAL, PERFORMANCE, REMOVAL, AND SHIPPING OR STORAGE.

TO PLAN A THEATRE INTELLIGENTLY AN ARCHITECT MUST KNOW THE PURPOSE OF EACH ELEMENT AND HAVE A CLEAR AND COMPLETE UNDERSTANDING OF HOW THESE ELEMENTS FUNCTION, BOTH WITHIN THEMSELVES AND WITH EACH OTHER.
AUDIENCE TRAFFIC

The audience comes to the theatre to enjoy a good show. The quality of the entertainment is dependent upon a number of factors, but it is the architect's responsibility to provide the audience with a maximum of comfort, a minimum of distraction, and complete safety.

From the moment the theatre-goer comes in sight of the theatre until he is on his way home, his every action and reaction is the architect's, as well as the showman's, concern. The easier and more pleasant the patron's progress from home to theatre seat and back again, the better the chance of having a repeat customer.

APPROACHES

Architectural planning for clear paths of movement must not be confined to the theatre proper. Pedestrian approaches, motor transportation, unloading space, parking areas, etc., should be studied for the specific site and community habits.

FOYER

The architect's concern here is to provide a comfortable foyer with a box office so located and arranged as to make possible as speedy a sale of tickets as the management may find efficient. In addition to accommodating ticket lines, the foyer must provide space for people waiting to meet friends. The foyer should be so arranged that the patron who has purchased his ticket can pass through without getting tangled in the ticket lines or being obstructed by those patrons awaiting the arrival of friends.

The box office should command the entrance to the lobby and at the same time permit the ticket lines to form without obstructing it.

Fire regulations provide that all theatre doors must open out. For the
SAKE OF FULFILLING THEIR FUNCTION THERE MUST BE ENOUGH DOORS TO HANDLE THE WHOLE AUDIENCE IN A FEW MINUTES WITHOUT CONGESTION. THE DOORS SHOULD BE SELF-CLOSING. IF CHANGES IN LEVEL ARE NECESSARY BETWEEN THE OUTSIDE FRONT AREA AND THE FOYER AND LOBBY, THEY ARE BEST MADE BY RAMPS. STEPS AT DOORS AND ISOLATED STEPS ARE TO BE AVOIDED. WHEN STEPS ARE NECESSARY THEY SHOULD BE ADEQUATELY LIGHTED. THERE IS MORE TRAFFIC THROUGH THE FOYER THAN THROUGH ANY OTHER AREA IN THE THEATRE. THE FLOOR SURFACES, THEREFORE, SHOULD BE DURABLE AND EASILY CLEANED. CONCRETE, STONE, AND TILE ARE VERY GOOD BUT ARE BEST COVERED BY PERFORATED OR LINKED RUBBER MATTING IN WET WEATHER AS THEY TEND TO BECOME SLIPPERY. WALL SURFACES SHOULD RESIST DEFACING, AT LEAST TO A REASONABLE HEIGHT, AND BE EASY TO CLEAN. WITH HARD SURFACE MATERIALS FORMING THE FLOOR AND WALLS THE FOYER WILL TEND TO BE NOISY; IT IS, THEREFORE, DESIRABLE TO SURFACE THE CEILING, AND POSSIBLY THE UPPER WALLS, WITH A MATERIAL THAT IS AS SOUND ABSORBENT AS POSSIBLE.

LIGHTING IN THE FOYER AREA SHOULD BE QUITE BRILLIANT. HOWEVER, BRIGHT LIGHT SOURCES WITHIN THE NORMAL VISUAL ANGLE ARE A SOURCE OF ANNOYANCE WHICH RULES OUT STANDLIGHTS AND USUALLY CHANDELIERS. IT GOES WITHOUT SAYING THAT THE OVERALL TREATMENT OF THE FOYER SHOULD MAKE IT A MOST PLEASANT AND ATTRACTIVE AREA. A DARK, UNATTRACTIVE FOYER GIVES A BAD FIRST IMPRESSION OF THE THEATRE AND DISCOURAGES ATTENDANCE.

BOX OFFICE

THE BOX OFFICE SHOULD HAVE FOR CURRENT TICKET SALES, AT LEAST ONE WINDOW PER 1,000 SEATS, AND ONE WINDOW FOR RESERVATIONS. THE FARTHER THESE WINDOWS ARE APART THE EASIER THE TRAFFIC PROBLEM WILL BE. IF THE BOX OFFICE IS AT A CORNER, A WINDOW CAN BE ON EACH SIDE OF IT. THE ISLAND BOX OFFICE CAN HAVE LINES FORM ON EITHER SIDE OF IT. SIZE AND SHAPE OF THE BOX OFFICE IS DETERMINED BY THE NUMBER OF WINDOWS WITH THEIR AUTOMATIC CHANGE MACHINES, OR CHANGE DRAWERS, AND THE NECESSARY SPACE FOR THE TICKET RACKS, TELEPHONE, AND MOVEMENT OF THE CASHIERS. A SAFE MIGHT BE INCLUDED BUT IS USUALLY IN THE BUSINESS OFFICE. ACCESS TO THE BOX OFFICE SHOULD BE BY A SINGLE DOOR INSIDE THE THEATRE.

LIGHTING IN THE BOX OFFICE IS BEST CONCENTRATED ON WORKING AREAS. VENTILATION SHOULD NOT BE OVERLOOKED AND ENOUGH HEAT SHOULD BE PROVIDED TO COUNTERACT THE WAVES OF COLD AIR FROM THE FOYER IN WINTER.

LOBBY

THE THEATRE-GOER PRESENTS HIS TICKET AS HE ENTERS THE LOBBY. HIS ENTRANCE SHOULD BE PLANNED TO AFFORD SHORT, STRAIGHT PATHS TO CHECKROOM, AISLES, AND STAIRCASES. BUILDING CODES REQUIRE ENTRANCE-EXIT DOORS AT THE RATE OF APPROXIMATELY FIVE FEET OF OPENING PER 300 PERSONS OF AUDIENCE; HOWEVER, THE TRAFFIC IS NOT USUALLY SLOWED BY THE AMOUNT OF ENTRANCE SPACE BUT RATHER BY THE NUMBER OF TICKET TAKERS.

OBVIOUSLY, THE CHECKROOM IS MOST EFFICIENTLY LOCATED WHERE THE ENTERING LINES WILL PASS IT BEFORE DIVIDING. WHILE THE DOWN-TOWN THEATRE IN THE LARGE CITY HAS NO PARTICULAR USE FOR OVERSIZE LOBBIES, IN THE COMMUNITY THE PERFORMANCE IS CONSIDERED A SOCIAL OCCASION, AS WELL AS DRAMATIC ENTERTAINMENT. A COMBINATION OF EXHIBITION SPACE, LOUNGE, AND LOBBY IS EASY TO ACHIEVE AND IS GENERALLY DESIRABLE IN THIS TYPE OF THEATRE. IT IS HOPED THAT THE COMMUNITY WILL TAKE AN INTEREST IN THE PRODUCTION OF A PLAY AS WELL AS ITS PRESENTATION; THEREFORE, EXHIBITION SPACE IS DESIRABLE TO SHOW THE VARIOUS ELEMENTS OF PRODUCTION: COSTUME DESIGNS, SKETCHES AND MODELS OF STAGE SETS, ETC. THE REQUIREMENTS FOR LOBBY SIZE AND SHAPE ARE DERIVED FROM TRAFFIC STUDIES. IF THE LOBBY IS MADE LARGE ENOUGH, PRACTICALLY 100% OF THE AUDIENCE WILL USE IT DURING THE INTERMISSIONS. AS THE SPECTATORS COME OUT OF THE AUDITORIUM THEY LOOK FOR REFRESHMENTS, TOILETS, OR A PLACE TO STRETCH, SMOKE, AND TALK WITHOUT BEING PUSHED AROUND. EASY MOVEMENT TO SUCH AREAS IS OF PRIME IMPORTANCE.
Furniture and exhibition set-ups should be so planned as not to impede the audience traffic; they should be located in space over and above the clear widths or areas required by codes.

Sound from the lobby must not leak into the auditorium. For this reason the acoustical treatment of floors, walls, and ceilings should be made as absorbent as possible. Lighting in the lobby should be warm and flattering and so directed as not to be annoying, or spill into the auditorium. The general illumination of the lobby should be at a lower intensity than that of the foyer in order to facilitate dark adaptation for the entering audience. These requirements can be met by carefully planned direct and indirect illumination.

Refreshment Bar

A refreshment bar in the lobby is an additional source of pleasure for the theatre-goer and an additional item of income for the theatre management. A play may run at no profit to the box office or even at a slight loss, and the theatre may still operate on the profits from the bar.

Toilets

Both men's and women's toilets should have anterooms; a smoking room for men and a powder room, with several dressing tables, for women. Five urinals, three lavatories, and two water closets per 1,000 seats are minima for the men's toilet; five lavatories and five water closets for the women's toilet are minima. If performances are unusually long the traffic to these facilities increases greatly; for this reason it is wise to exceed the minima as much as seems practical.

Check Room

The checkroom should either be adequate or omitted entirely. With adequate facilities, the efficiency of checking is governed by the number of attendants. Five attendants per 1,000 seats in the house is a workable ratio. Check rooms in balcony lobbies can reduce main lobby congestion.

Business Office

A suite of rooms large enough to accommodate the executive staff of the theatre should be provided. The size of this area depends, of course, upon the management set-up. Usually it will include (1) treasurer's office with appropriate office equipment for receipt and expenditure of money and keeping of records: chairs, desks, files, business machines, safe. (2) press agent's office with a large table for laying out publicity material. A generous amount of storage for this material and files for pictures and typescript. (3) office or area for general typing and stenography. Equipment: typewriter, desks, chairs, files, and supply cabinets according to the needs of the organization.

Reserve facilities are desirable for typing and duplicating of scripts under pressure of time limitation. (4) director's office might be placed in this group, if he can have easy access to the stage area. Desk, small conference table, and chairs are the items of furniture needed here.

Auxiliary Areas

The feasibility of originating radio and television programs in the theatre should be considered. If radio and television studios can possibly be afforded they should be included. They can also serve as rooms for rehearsals, classes, and conferences.

An adjoining restaurant, if properly designed and managed, can become an asset to any community theatre, but as a general rule most commercial enterprises are best kept away.
I AUDITORIUM ACCESS

If possible the principal entrances to the auditorium from the lobby should be arranged so that doors are not necessary. In order to achieve this a careful analysis of acoustics and lighting should be made.

AUDITORIUM

Successful design of the auditorium depends upon the following factors:

■ Good Visibility and Good Acoustics

The audience comes to the theatre primarily to see and hear the show. This fact is the primary consideration governing all planning on the audience side of the footlights. As far as possible the audience should be made to feel itself a part of the show from the earliest possible moment until it leaves the theatre.

If the patron is to see satisfactorily, all seats in plan and section should be oriented toward the acting area. Although a steep floor slope is somewhat hazardous, a fair amount of slope can greatly contribute to uninterrupted vision.

There are many formulas to determine auditorium depth. Many diagrams and ratios give the relationship between depth of house, width of house, and proscenium opening. They vary considerably and are all empirically derived on the basis of existing theatres, with little consideration of whether these theatres are good or not. An average of averages is seldom a good criterion. Here are some typical formulas:

- Depth equals 1.25 to 2.35 times the house width when the house width is 2.5 to 3.5 times the screen width. Optimum depth equals 4 times the screen width. Maximum depth equals 6 times the screen width.

Layout of orchestra and balcony can be a simple matter. Once the size of the acting area is determined, sight lines can easily be checked in trial plans and sections. When balconies are used the front of the balcony is preferably within 50 feet of the stage. Visibility limitations and seating capacity determine the house depth. Normal human vision can perceive a minimum dimension or separation equal to one minute of visual arc. Translated into space measurement this means that at 10 feet a normal eye can perceive a dimension of .035 inch at 50 feet, .175 inch at 100 feet, .35 inch. Details of actors’ facial expressions and make-up are not clearly recognizable at distances of more than about 60 feet. 75 feet is generally accepted as maximum house depth, although many theatres exceed this considerably. Any auditorium planning that stays within the limits determined by good visibility and where shape is carefully considered from the beginning should not be confronted with serious acoustical problems. Acoustical planning in detail is considered in another section of this thesis.

■ Comfort of Individual Seats and Seat Spacing

Acoustical requirements, as well as those of comfort, must be considered in the selection of seats. Upholstery variations include spring-edge seats (most luxurious and expensive); box-spring seats; spring-back and padded-back. Veneer-back seating does not allow very good acoustical control of the empty house. Seats with springs which raise them automatically or which slide back are considered hazardous by some theatre planners. However, this feature simplifies cleaning and saves many bumped shins.

Cramming seats close together in order to slightly increase the size of the house is a very short-sighted policy. They should be spaced far enough apart to permit passage of people without the occupant rising. The marginal spacing, back to back, is 34". 45" permits easy passage past seated patrons.

■ Position and Width of Aisles

Building codes in most localities set the requirements for aisle widths and number of seats per aisle, but leave the seating and aisle arrange-
VENTS UP TO THE DESIGNER. A NUMBER OF LAYOUTS ARE SHOWN AND DISCUSSED IN TIME-SAVER STANDARDS.

- VENTILATION, TEMPERATURE, AND HUMIDITY
  
  THE IMPORTANCE OF MECHANICAL EQUIPMENT FOR PROPER CONDITIONING OF THE AIR CANNOT BE STRESSED TOO MUCH.

- AUDITORIUM LIGHTING
  
  SEEING REQUISITES NOT ONLY DETERMINE THE SHAPE AND, TO SOME EXTENT THE SIZE OF THE AUDITORIUM, BUT THEY ALSO DETERMINE THE PROVISIONS FOR AUDITORIUM ILLUMINATION. AUDITORIUM LIGHTING DOES NOT HAVE TO COME FROM "FIXTURES". THE ARCHITECT SHOULD CONSIDER THE LIGHTING SCHEME AS FLOOR, CEILING, AND WALL SHAPES ARE BEING DETERMINED.

  LIGHT FOR VISIBILITY IN THE AUDITORIUM BY WHICH THE THEATRE-GOERS MAY FIND THEIR SEATS, READ THEIR PROGRAMS, AND RECOGNIZE FRIENDS SHOULD BE GENERAL AND, MORE OR LESS, EQUALLY DISTRIBUTED WITH A MINIMUM OF SHADOWS (A MODERATE INTENSITY OF ABOUT 15 FOOT CANDLES IS DESIRABLE). CONCEALED OR LOW-BRIGHTNESS SOURCES INSTALLED IN THE CEILING ARE A GOOD ANSWER TO THIS PROBLEM AND THE LIGHT SOURCE WILL NOT BE SEEN UNLESS THE PATRON LOOKS DIRECTLY UPWARD.

  SPECIAL VISIBILITY LIGHTS ARE REQUIRED FOR SAFETY. AISLE LIGHTS SHOULD BE PROVIDED NEAR THE FLOOR ABOUT EVERY THREE ROWS. THEY SHOULD ALSO BE PLACED ON BOTH SIDES OF THE AISLE WHEREVER THERE IS A STEP OR CHANGE IN FLOOR PITCH, AND AT INTERSECTIONS AND ENDS OF AISLES AND CROSSOVERS. LUMINOUS GUIDE LINES IN THE AISLES, ACTIVATED FROM ULTRAVIOLET SOURCES, PROMOTE SAFETY WITH MINIMUM DISTRACTION.

  ALL EXITS MUST BE MARKED BY A LIGHT. MOST FIRE REGULATIONS REQUIRE RED LIGHTS ABOVE THE DOORS. IF ORDINANCES WILL ALLOW THE USE OF BLUE LIGHTS, THEY WILL PROVE LESS DISTRACTING, YET WILL BE PERFECTLY VISIBLE.

  DECORATIVE LIGHTING CAN BE AN IMPORTANT FACTOR IN ESTABLISHING THE CHARACTER AND QUALITY OF THE AUDITORIUM.

COLOR CONTROL ON HOUSE LIGHTING CAN DO MUCH TO SET THE MOOD CALLED FOR BY THE PLAY IN ADVANCE OF THE CURTAIN. IT IS ALWAYS USEFUL FOR SPECTACLE PRODUCTIONS. TO ACHIEVE COLOR TWO THINGS ARE NECESSARY; CONCEALED LIGHTS IN PRIMARY COLORS CONTROLLED AS ARE THE FOOTLIGHTS, AND NEUTRAL TINTED WALLS AND CEILING SURFACES WHICH ARE TO BE ILLUMINATED BY THESE LIGHTS.

MUSIC STAND LIGHTS ARE OFTEN DISTRACTING TO THE AUDIENCE. WHILE IT IS EASY TO MASK THE MUSIC STAND LIGHTS, IT IS HARD TO STOP REFLECTION FROM SCORES AND THUS A RELATIVELY BRIGHT AREA WILL BE IN THE AUDIENCE LINE OF VISION WHENEVER MUSICIANS ARE VISIBLE. THIS IS NO PROBLEM IF THE THEATRE IS PROVIDED WITH A DEEP, OR BETTER STILL, ADJUSTABLE ORCHESTRA PIT; OR A LOUVERED ORCHESTRA PIT COVER. SCORES WITH WHITE NOTES ON BLACK PAPER MIGHT BE ANOTHER SOLUTION.

- FLEXIBILITY
  
  EMPTY SEATS VISIBLE TO THE ACTORS ARE A DETRIMENT TO GOOD PERFORMANCES. WITH A THEATRE THAT PRESENTS A VARIETY OF PRODUCTIONS, THE SIZE OF THE AUDIENCE IS BOUND TO VARY. THE POSSIBILITY OF VARYING THE HOUSE CAPACITY SHOULD BE CONSIDERED.

  THE MOST OUTSTANDING EXAMPLE OF A FLEXIBLE AUDITORIUM IS SWEDEN'S MALMÖ ENTERTAINMENT CENTER BY ERIC LALLERSTEDT, SIGURD LEWERTZ, AND DAVID HELDEN. FOUR ALTERNATE SCHEMES FOR DIVIDING THE AUDITORIUM PROVIDE FLEXIBLE CAPACITY CORRESPONDING WITH THE SIZE AND APPEAL OF THE PRODUCTION (SEE FOLLOWING SHEET). THIS IS ACCOMPLISHED WITH MOBILE PARTITIONS WHICH BISECT EITHER THE DEPTH OR THE WIDTH OF THE HALL. OPERATING ON CEILING TRACKS, THE PARTITIONS ARE CUT AWAY AT THE BOTTOM TO FIT THE SLOPE OF THE AUDITORIUM FLOOR. CIRCULATION WAS STUDIED FOR MAXIMUM EFFICIENCY WHETHER THE HOUSE IS FULL OR IN PARTIAL USE, SEVERAL COMBINATIONS OF REAR AND CENTER EXITS BEING POSSIBLE. THIS GRAND ENTERTAINMENT CENTER, WHICH WAS FINANCED BY PUBLIC SUBSCRIPTION, COMBINES THE FUNCTIONS OF THEATRE, OPERA HOUSE, AND CONCERT HALL IN A SIN-
GLE, ELABORATELY EQUIPPED STRUCTURE.

Another valuable aid to flexibility is to have part or all of the forestage adjustable in a vertical direction. It can serve as an elevator orchestra pit, or when raised to floor level, extra seats can be added to the normal seating capacity of the house. When raised to stage level, it can increase the forestage to an area large enough to give many types of performances in front of the proscenium curtain.
The deep stage on which the audience views the action through a prosценium opening has dominated the theatre for over 300 years. Many plays could not be presented as effectively any other way, but this is not true of all existing dramatic productions, nor should those of the future be limited to a rigid form. The contemporary theatre architect should set himself the aim of creating a great keyboard for light and space, so objective and adaptable in character that it would respond to any imaginable vision of a stage director; a flexible area, capable of being transformed to meet the challenge of new dramatic interpretations, and releasing the future writers of stage productions from the limitations of most of today's stages.

The stage is the heart-center of the theatre. In only a few designs during our present century has this important element been fundamentally altered. There have been modifications and slight changes within the old plan in the interest of new scene-changing machinery, but the stage has undergone practically no change that has come from a direct concern about the actor and the drama. In designing the stage of a producing theatre for a community there are several factors that need be more thoughtfully and imaginatively considered by the architects and theatre artists as they design. They are:

- Give the drama and its actors first place in all considerations.
- Realize the variety of uses of the stage in producing theatre (both from hour to hour within a given day and from day to day, as well as the complete change of demands from production to production).
- The economic limit for stage size is the stage which will accommodate as elaborate a show as the house capacity can support.
- Examine the purpose and functions of the "experimental stage".
- Recognize light as the most potent force in stagecraft today.
IN DESIGNING THE STAGE AREA, SPACE IS THE MOST VITAL CONSIDERATION. THE ACTING AREA SHOULD BE TRAPPED THROUGHOUT ITS EXTENT, WITH UNIMPEDED SPACE BELOW. IT IS DESIRABLE THAT THE STAGE BE SO ARRANGED THAT SEVERAL SETS CAN BE SET UP AND STACKED IN SUCCESSION, WITHOUT INTERFERING WITH NORMAL BACKSTAGE ACTIVITY. A HIGH STAGE LOFT AND AN EXPANSE OF WALL SPACE ARE DESIRABLE FOR STORING CURRENT SETS. TO PROVIDE MORE FLEXIBILITY A GREATER AMOUNT OF STAGE AREA AND CUBAGE MAY BE ADDED TO THE WINGS. WITH CERTAIN EXCEPTIONS, IT IS OBVIOUS THAT A GIVEN AMOUNT OF CUBAGE UP IN THE AIR DOES NOT HAVE THE MULTIPlicity OF USE THAT IT WILL HAVE AT STAGE LEVEL. HOWEVER, THE GRIDIRON SHOULD NOT BE ELIMINATED IF FUNDS CAN PERMIT BOTH GRIDIRON AND ADDITIONAL SPACE AT THE SIDES OF THE STAGE PROPER.

IT IS NECESSARY THAT THE STAGE HAVE A "CROSSOVER", THAT IS, A PASSAGE FOR ACTORS AND STAGE PERSONNEL, EITHER BEHIND THE STAGE THROUGH A CORRIDOR, OR BEHIND THE CYCLORAMA.

THE STAGE MANAGER IS BEST LOCATED WHERE HE WILL HAVE DIRECT ACCESS TO THE STAGE AND TO THE DRESSING ROOMS. SINCE HE IS RESPONSIBLE FOR ALL ACTIVITY BACKSTAGE DURING A PERFORMANCE, AN INTERCOMMUNICATION SYSTEM SHOULD CONNECT HIS DESK WITH THE LIGHT AND SOUND CONTROL STATIONS, DRESSING ROOMS, AND GREEN ROOM.

THE PROMPTER NEEDS A SMALL SPACE FROM WHICH HE CAN SEE AND HEAR THE ACTION ONSTAGE WITHOUT BEING SEEN.

STAGE MACHINERY

KIND AND AMOUNT OF SCENERY VARIES FROM ONE PRODUCTION TO ANOTHER, BUT THE TIME ELEMENT IN SCENE CHANGING IS A MOST IMPORTANT FACTOR IN ANY CASE. THE FOLLOWING FACTS REGARDING THE SCENE SHIFT SHOULD BE CONSIDERED BY THE THEATRE PLANNER:

- SCENERY SPACE MUST BE CLEARED OF ONE SET BEFORE ANOTHER CAN BE BROUGHT INTO IT.

- THERE MUST BE STORAGE SPACE TO ACCOMMODATE ALL THE SETS.

- PATHS OF MOVEMENT OF SCENERY MUST BE DIRECT AND CLEAR OF OBSTACLES.


- SCENERY OCCUPIES SPACE WHEN STORED.

IT IS BEYOND THE SCOPE OF THIS PAPER TO ELABORATE ON THE MANY TYPES OF SCENE CHANGING MECHANISMS. ONLY A BRIEF COMMENT ON A FEW TYPES WILL BE INCLUDED.

- SCENE WAGONS - A STUDY OF SEVERAL THEATRES BUILT IN THE LAST FEW YEARS FOR COLLEGE DRAMATIC DEPARTMENTS WILL SHOW THAT THE WAGON SYSTEM, EVEN WITHOUT A GRID, CAN BE PRACTICAL.

- REVOLVING AND ELEVATOR STAGES - OFFER GREAT FLEXIBILITY AND RAPID SCENE CHANGES, BUT ARE VERY COSTLY TO INSTALL AND MAINTAIN.

- OVERSTAGE EQUIPMENT - THE GRIDIRON IS A HORIZONTAL LAYOUT OF STRUCTURAL STEEL SHAPES LOCATED JUST UNDER THE STAGE ROOF. FROM THIS GRID PULLEYS MAY BE FASTENED THROUGH WHICH ROPES OR CABLES MAY BE DROPPED FOR THE SUSPENSION OF SCENERY, LIGHTING EQUIPMENT, ACTORS, AND ANY NUMBER OF THINGS WHICH THE PERFORMANCE MAY REQUIRE SUSPENDED. THIS GRID SHOULD BE ABOUT 2½ TO 2½ TIMES AS HIGH AS THE PROSCENIUM OPENING HEIGHT. OF COURSE, ALL OF THIS CUBAGE SO HIGH IN THE AIR IS EXPENSIVE, BUT IN MANY TYPES OF PRODUCTIONS IT IS INVALUABLE. A FLY GALLERY IS BRACKETED OR CANTILEVERED OUT FROM THE WALL ON ONE OR BOTH SIDES OF THE STAGE FOR OPERATION OF THE FLYING SYSTEMS. IT IS IMPORTANT TO HAVE GOOD VISIBILITY FROM THE GALLERY INTO THE FLIES FOR PROPER OPERATION OF THE HUNG SCENERY AND CLEARANCE UNDERNEATH FOR THE HIGHEST USED STAND-
ING SCENERY. THE FLY GALLERY IS USUALLY 15 TO 30 FEET ABOVE THE STAGE FLOOR.

A LIFT SHOULD BE PROVIDED, IN A CONVENIENT PLACE BACKSTAGE, FOR MOVING SCENERY AND HEAVY EQUIPMENT BETWEEN STAGE LEVEL AND THE STORAGE SPACE BELOW STAGE OR SHOP.

SCENERY PRODUCTION

MOST OF THE SCENERY USED IN THIS TYPE THEATRE WOULD BE DESIGNED, CONSTRUCTED, PAINTED, AND THEN BROKEN DOWN OR STORED WITHIN THE BACKSTAGE AREA.

DESIGN STUDIO - SHOULD BE EQUIPPED WITH:
- DRAFTING TABLES
- MODEL BUILDING BENCH
- CABINETS FOR SUPPLIES
- BOOKSHELVES
- FILES FOR DRAWINGS AND SKETCHES

SCENE SHOP - SHOULD BE EQUIPPED WITH:
- LUMBER RACKS
- RACKS FOR ROLLS OF CLOTH AND CHICKEN WIRE
- STORAGE CABINETS FOR HAND TOOLS
- WOODWORKING POWER TOOLS: RIP-SAW, BAND-SAW, MORTISER, JOINTER, DRILL PRESS
- WOODWORKING ASSEMBLY BENCHES, EACH 6' X 16'
- MINIMUM WITH 3' CLEARANCE ALL AROUND
- METAL WORKING: LATHE, BREAK, DRILL PRESS, SAW, SHEET METAL SHEARS, WELDING TORCH, HAND TOOLS

PAINT SHOP - SCENERY IS USUALLY PAINTED ON A PAINT FRAME OR PAINT FLOOR. THE PAINT SHOP SHOULD BE EQUIPPED WITH:
- FIREPROOF LOCKERS FOR FLAMMABLE PAINTS
- BINS AND SHELF STORAGE FOR DRY COLORS, GLUE, WHITING, AND FLAMEPROOFING
- VENTILATED CABINETS WITH SHELVES OF WIRE MESH FOR STORING BRUSHES

MANY OF THE INGREDIENTS OF SCENE PAINT CAUSE METAL TO CORRODE. MUCH WATER IS USED IN THE MIXING OF PAINTS AND IS OFTEN SPILLED. THEREFORE, THE WALLS AND FLOOR OF THE PAINT SHOP SHOULD BE EITHER OF REPLACEABLE WOOD, OR OF CONCRETE, TILE, OR NON-CORRODING METALS.

PROPERTIES - THE CATEGORY OF PROPERTIES IS BROAD ENOUGH TO INCLUDE ALMOST ANY CONCEIVABLE OBJECT. IT IS, THEREFORE, IMPOSSIBLE TO ELABORATE ON THE NECESSARY SIZE OF A PROPERTY SHOP OR STORAGE AREA. IN THE OTHER SHOPS THERE WILL BE EQUIPMENT FOR THE FABRICATION OF PROPERTIES IN WOOD, METAL, PLASTICS, FABRICS, AND OTHER MATERIALS. A LARGE FLEXIBLE STORAGE AREA BELOW THE STAGE OR SHOPS SHOULD TAKE CARE OF THE STORAGE OF MOST PROPERTIES AS WELL AS SCENERY.

STAGE LIGHTING AND SOUND CONTROL

THE ART OF STAGE LIGHTING HAS MADE TREMENDOUS ADVANCEMENTS IN THE LAST FEW YEARS, AND FURTHER PROGRESS IS EXPECTED TO BE MADE. IT IS BEYOND THE SCOPE OF THIS WORK TO DEAL WITH THE COMPLEXITY OF AN IDEAL THEATRICAL LIGHTING SET-UP. CERTAINLY IF THERE IS ANY PLACE IN THE DESIGNING OF A THEATRE WHERE A SPECIALIZED TECHNICAL EXPERT SHOULD BE CONSULTED, IT IS HERE. THE LIGHTING EXPERT SHOULD BE IN ON THE PLANNING FROM ITS BEGINNING STAGES, BECAUSE THE STAGE LIGHTING SYSTEM NOT ONLY AFFECTS THE GENERAL CONCEPTION OF A FLEXIBLE THEATRE, BUT THE PHYSICAL FEATURES AS WELL. FOR INSTANCE, THE CYCLORAMA LIGHTING TROUGH AND FOOTLIGHTS AFFECT THE STRUCTURE OF THE STAGE FLOOR AND THE APRON; BEAM LIGHTS AFFECT THE CEILING SHAPE; AND FOLLOW SPOTS OR OTHER LIGHTING EQUIPMENT MIGHT REQUIRE WALL OPENINGS. TO HAVE A GOOD FLEXIBLE SYSTEM OF LIGHT-
ING IS OF THE UTMOST IMPORTANCE TO ANY THEATRE. THE LIGHTING CONTROL SHOULD NOT BE PLACED BACKSTAGE; AND IF IT IS PLACED IN A PROJECTION BOOTH AT THE BACK OF A BALCONY, THE CONTROLLER OCCUPIES A POSITION WHICH IS INFERIOR TO THE WORST SEAT IN THE HOUSE. TO LOCATE THE SWITCHBOARD IN THE ORCHESTRA PIT, SHIELDED FROM THE AUDIENCE BY A HOOD, IS ONE ACCEPTABLE SOLUTION. HOWEVER, THE IDEAL POSITION FOR LIGHTING AND SOUND CONTROL WOULD BE AT HOUSE-CENTER.

Adequate storage for a full complement of lighting instruments should be provided. The electrical or lighting shop should be accessible to the stage and to all of the areas where stage lighting is placed. It should be equipped with the necessary tools to repair, modify, and maintain the lighting equipment.

The sound control room should be equipped with the necessary turntables and storage for sound effects records.

Projection booths are quite standardized as to operating equipment, fire protective measures, and ventilation. Excellent recommended specifications may be obtained from the Society of Motion Picture Engineers.

COSTUME SHOP

The costume shop should be located close to the dressing rooms and preferably on the same level. This shop should be equipped to fabricate any imaginable costume - theatrical production knows no limitation of style, material, or color.

The shop should have ample work space with both natural and adequate artificial lighting. There should be storage space, not only for costumes, but for large bolts of cloth, patterns, sewing materials, and small supplies. A flexible arrangement of electrical outlets is necessary because of the equipment used: sewing machines, irons, curlers, etc. A steam presser should be included if possible. Large tables are required for the laying out and cutting of patterns.

The dye room should be equipped with dye vats, drying racks, and storage for dye stuffs and demijohns of acid. The air circulation system here should be separate from the main system because of the odors associated with the dye process. The separate system should be designed to speed the drying of cloth.

DRESSING ROOMS

Provision for 20 to 30 actors in a combination of stars and chorus dressing rooms should prove satisfactory. All dressing rooms should have lavatory and toilet facilities. One lavatory per four people and one shower and water closet per six people is ample in the chorus rooms. Each actor should have dressing table space at least 18" deep by 36" wide, with a well lighted mirror above. There should be at least one full length mirror in each dressing room. Closets are not required; but plenty of hanging space (at least 2 linear feet per person) and shoe rack space is necessary, as an actor may have several costume changes.

Dressing rooms should be near the stage and preferably on the same level. In determining the size of dressing rooms, 50 square feet per person should be considered minimum.

ReHEARSAL ROOMS

The number of rehearsal rooms is determined by how much use is made of the theatre and how often the stage is available for rehearsal. A
VERY ACTIVE THEATRE SHOULD HAVE AT LEAST ONE LARGE REHEARSAL ROOM THAT
DUP LICATES STAGE SIZE AND ACOUSTICS AS CLOSELY AS POSSIBLE. DURING
VERY ACTIVE PERIODS WHEN MUSICIANS, DANCERS, AND ACTORS ARE ALL RE¬
HEARSING AT THE SAME TIME THE PUBLIC LOUNGE AND GREEN ROOM MAY BE
USED.

THE GREEN ROOM IS PRIMARILY A LOUNGE AND SOCIAL ROOM FOR THE ACTORS.
HERE THE ACTORS CAN A WaIT THEIR CUES, AND THE STAGE MANAGER CAN CHECK
THE CAST AND ASSEMBLE CHORUSES. THE GREEN ROOM SHOULD BE AT THE SAME
LEVEL AND NEAR THE DRESSING ROOMS, COSTUME SHOP, AND STAGE. IF POSS¬
IBLE IT SHOULD BE ACCESSIBLE FROM THE “FRONT” OF THE HOUSE, BECAUSE
ON OCCASIONS SOME MEMBERS OF THE AUDIENCE ARE INVITED BY MEMBERS OF
THE CAST TO MEET WITH THEM AFTER THE PERFORMANCE, FOR A CLOSER LOOK
AT THE COSTUMES AND TO MEET OTHER PERFORMERS. THE ROOM SHOULD BE
FURNISHED AS A COMFORTABLE LOUNGE WITH AT LEAST PART OF ONE WALL
MIRRORED FULL-LENGTH FOR THE LAST MINUTE CHECKING OF MAKE-UP AND
COSTUME. A SMALL KITCHENETTE OR SERVING PANTRY IS DESIRABLE.
theatre design
1 FOYER
2 TICKET OFFICE
3 LOBBY, LOUNGE, EXHIBITION SPACE
4 CHECK ROOM
5 AUDITORIUM
6 STAGE
7 TELEPHONES
8 WOMEN'S POWDER ROOM & TOILET
9 MEN'S SMOKING ROOM & TOILET
10 REFRESHMENT BAR
11 BUSINESS OFFICE
12 TREASURER
13 PUBLICITY
14 DIRECTOR
15 GREEN ROOM
16 COSTUME SHOP
17 DYEING
18 STORAGE
19 FITTING
20 MEN'S CHORUS
21 TOILET
22 WOMEN'S CHORUS
23 STAGE ENTRANCE
24 BACKSTAGE CONTROL; SHIPPING & RECEIVING
25 STAGE MANAGER
26 CROSSOVER; HANGING STORAGE
27 PAINT FRAME
28 LIFT
29 BACKSTAGE WORK AREA
30 SCENE SHOP
31 ELECTRICAL SHOP
32 PAINT SHOP
33 METALWORKING SHOP
34 WOODWORKING SHOP
35 REHEARSAL ROOM
36 STAR'S DRESSING OR REHEARSAL
37 HYDRAULIC FORESTAGE (3 SECTIONS)
When the house capacity is reduced, by curtaining off the rear section, the theatre-goer will use the side entrances and not have to pass through the dark, empty rear section of the auditorium.
The stage area can be enlarged or reduced to meet different production requirements by the use of folding panels which reveal or conceal side stages and the elevator forestage which is divided into three sections.
concert hall

OUR FUTURE CONCERT HALLS SHOULD NOT BE DESIGNED AS MULTI-PURPOSE BUILDINGS USED FOR CONVENTIONS, PUBLIC MEETINGS, THEATRICALS, AND DOG SHOWS; AND USED LASTLY FOR MUSICAL PERFORMANCE. THEY SHOULD BE DESIGNED PRIMARILY FOR MUSICAL TONE, AND SHOULD BE RETAINED FOR MUSIC. THIS IS IMPORTANT BECAUSE WE NOW MUST PROVIDE FOR THE REQUIREMENTS OF RADIO BROADCAST AND TELEVISION. THE CONCERT STAGE TODAY COMMANDS A WIDER AUDIENCE THAN THAT ACCOMMODATED IN THE HALL. MUSIC IS AN ART - OUR CONCERT HALL SHOULD BE A HOME FOR THAT ART.
A study has been made of many of the outstanding concert halls in Europe and this country. Because of the great variance in functional requirements, size, shape, location, etc., it is doubtful that a valid set of standards, or fixed requirements, for concert hall design can be formulated. There is probably no building type about which so little has been written. Nevertheless, acoustics, which is the most important consideration in any concert hall design, can be treated in such a way as to apply to concert halls in general.

The next section of this thesis will cover the fundamentals of acoustic design.

Then against the background of the concert hall study, and the desirable requirements of the concert hall that would be a most important element of the proposed community fine arts center, a design is submitted which attempts to fulfill, not only the acoustical, but the functional, engineering, and aesthetic requirements.
ACOUSTIC DESIGN

The acoustic design of concert halls is still an art as much as a science. Science can help but the theory of acoustic behavior of large halls is still very approximate. The need for greater scientific knowledge about the desirable acoustical properties and treatments of concert halls cannot be emphasized too much.

The designer of today's large music hall should try to leave the vital acoustical surfaces as flexible as possible in order that a certain amount of adjustment can take place as the hall nears completion. Certain areas of the hall can be left free of treatment until measurements can be made, and tests conducted experimentally. Wall and ceiling splays can be designed for slight adjustment. The imagination of the architect and acoustical engineer can make the difference between an excellent and a mediocre, or poor, concert hall.

FLOOR PLAN

When the architect is developing a floor plan to meet the requirements of capacity, circulation, sight lines, building codes, etc., he must keep in mind the importance of a good acoustical shape. Circular and elliptically shaped plans nearly always produce focusing defects, echoes, and non-uniform distribution of sound. The focusing defect is very pronounced in elliptical plans. In both circular and elliptical plans, the acoustical conditions can be improved by the addition of convex diffusing surfaces or other special treatment.

To bring a large audience as close as possible to the stage of an auditorium, it is advantageous to design a floor plan with diverging walls. Reflections from these walls can aid in the establishment of a higher sound level at the rear of the auditorium, if these reflections are carefully controlled. Path-length differences of 65 feet or more between direct and reflected sound give rise to echoes. Path-length differences from about 50 feet to 65 feet produce a blurring quality which may result in a lack of "intimacy," especially for people seated near the stage. Intimacy is a term used to describe the extent to which sound appears to come from its source. If the included angle of the sound received by a person is small, he will judge the auditorium to have intimacy. In this respect, reflections from the side walls are more critical than those of the ceiling, for one's ability to localize sounds in the horizontal direction is somewhat greater than it is in the vertical direction.

CEILING

The ceiling and walls should provide favorable reflections of sound, especially for the seats far removed from the stage. In some instances, the ceiling should also aid in the diffusion of sound. However, if adequate means of diffusion are furnished by the floor and wall surfaces,
AND NO ADDITIONAL DIFFUSION IS NEEDED BY THE CEILING, IT MAY BE UTILIZED TO THE UTMOST FOR THE ADVANTAGEOUS REFLECTION OF SOUND.

THERE IS NO FORMULA FOR CALCULATING THE OPTIMUM CEILING HEIGHT OF A ROOM. CONSIDERATION MUST BE GIVEN TO THE OPTIMUM VOLUME. IN GENERAL, THE CEILING HEIGHT OF A ROOM TO BE USED FOR SPEECH AND MUSIC SHOULD BE ABOUT ONE-THIRD TO TWO-THIRDS OF THE WIDTH OF THE ROOM - THE LOWER RATIO FOR VERY LARGE ROOMS, AND THE HIGHER FOR SMALL ROOMS. IF THE CEILING OF AN AUDITORIUM IS TOO HIGH, NOT ONLY WILL THE VOLUME-PER-SEAT BE EXCESSIVE, BUT LONG DELAYED REFLECTIONS FROM THIS SURFACE CAN BE THE SOURCE OF ECHOES.


SIDE WALLS

THE SIDE WALLS SHOULD REINFORCE THE SOUND THAT REACHES THE REAR PARTS OF A LARGE AUDITORIUM. WHILE THE LOCATION OF THE WALLS IS DETERMINED LARGELY BY THE GENERAL CONTOUR OF THE FLOOR PLAN, THE ANGLE THAT ANY PORTION OF THE SURFACE OF THESE WALLS MAKES WITH THE CENTER-LINE NEED NOT BE, IF SPLAYS ARE EMPLOYED. THE LAW OF REFLECTION CAN BE USED TO DETERMINE THE PROPER ANGLE FOR THE WALL SURFACES SO THAT THEY WILL GUIDE SOUND TO THOSE SEATS WHERE THE SOUND LEVEL IS NOT ADEQUATE. THE SIDE WALLS SHOULD BE DESIGNED SO THAT THE SOUNDS THEY REFLECT TO THE AUDIENCE WILL NOT BE TOO LONG DELAYED. SOME PARTS OF THE SIDE WALLS MAY BE SUSPECTED OF CAUSING ECHOES OR UNDULY DELAYED REFLECTIONS; THIS MAY HAPPEN IN VERY LARGE AUDITORIUMS. IN SUCH INSTANCES THE SUSPECTED SURFACES SHOULD NOT BE SMOOTH AND REFLECTIVE. INSTEAD THEY SHOULD EITHER BE MADE "ACOUSTICALLY ROUGH" TO DIFFUSE THE SOUND, OR THEY SHOULD BE COVERED WITH HIGHLY ABSORPTIVE MATERIAL.

FLUTTER ECHOES FREQUENTLY OCCUR BETWEEN THE SIDE WALLS. THEY CAN BE AVOIDED BY A NUMBER OF MEANS; BY DIVERGING, NON-PARALLEL, OR TILTED WALLS; BY SPLAYED, OR V\^0, WALLS. SPLAYS NOT ONLY SERVE TO PREVENT FLUTTER, BUT THEY CAN CONTRIBUTE BOTH TO DESIRABLY DIRECTED REFLECTIONS AND TO THE DIFFUSION OF SOUND WITHIN THE ROOM. AS LITTLE AS 1" SPLAY TO THE RUNNINC FOOT WILL PREVENT FLUTTER.

IN SOME DESIGNS, SPLAYS BETWEEN THE CEILING AND SIDE WALLS ARE USEFUL IN PREVENTING LONG-DELAYED REFLECTIONS AND IN DIRECTING ADVANTAGEOUS REFLECTIONS TO THE AUDIENCE.

REAR WALL

IN THE DESIGN OF ALL ROOMS, LARGE CONCAVE REAR WALLS PRESENT A PROBLEM TO THE ACOUSTICAL DESIGNER. UNFORTUNATELY, THEY ARE OF COMMON OCCURRENCE BECAUSE IT SEEMS SO SIMPLE AND ECONOMICAL TO MOST ARCHITECTS TO HAVE THE REAR WALL FOLLOWING THE CURVATURE OF THE LAST ROW OF SEATS. WALLS HAVING THIS SHAPE ARE RESPONSIBLE FOR TROUBLESOME ECHOES AND DELAYED REFLECTIONS IN MANY AUDITORIUMS. OFTEN THESE REFLECTIONS FROM CONCAVE REAR WALLS ARE CONCENTRATED IN REGIONS NEAR THE MICROPHONES OF THE SOUND-AUGMENTATION SYSTEM, CAUSING FEEDBACK TROUBLE AND HOWLING. THESE DETRIMENTAL REFLECTIONS CAN BE CONVERTED INTO BENEFICIAL ONES BY INTRODUCING A CEILING SPLAY BETWEEN THE CEILING AND THE REAR WALL. CONCAVE SURFACES IN CERTAIN SITUATIONS CAN BE MADE AS EFFECTIVE AS SPLAYS, AND THEY ARE SOMETIMES BETTER ADAPTED THAN SPLAYS TO THE GENERAL APPEARANCE OF THE ROOM. HOWEVER, UNLESS PROPERLY DESIGNED, THEY CAN LEAD TO FOCUSING EFFECTS.
IF REFLECTIONS FROM EITHER A VERTICAL OR TILTED WALL ARE CAPABLE OF PRODUCING ECHOES, THE OFFENDING SURFACE SHOULD BE TREATED WITH ABSORPTIVE MATERIAL. THERE WILL STILL BE SOME REFLECTION FROM THIS SURFACE BUT THE SOUND LEVEL CAN BE REDUCED SO GREATLY THAT ITS DETERIMENTAL EFFECTS ARE NEGLIGIBLE.

**BALCONY RECESS**

GOOD DESIGN OF A BALCONY RECESS USUALLY REQUIRES A SHALLOW DEPTH AND A HIGH OPENING. THE DEPTH SHOULD NOT EXCEED TWICE THE HEIGHT OF THE OPENING. THIS PERMITS SOUND TO FLOW READILY INTO THE SPACE UNDER THE BALCONY. GOOD DESIGN ALSO REQUIRES THAT THE REVERBERATION TIME IN THE BALCONY RECESS APPROXIMATE THAT OF THE MAIN PART OF THE AUDITORIUM.

BY APPLYING THE ABOVE RULES, IT IS POSSIBLE TO DESIGN THE RECESS SO THAT THE SOUND LEVEL IN THIS SPACE IS ABOUT THE SAME AS IT IS IN OTHER EQUALLY DISTANT PARTS OF THE AUDITORIUM. HOWEVER, IF THE OPENING IS LOW AND THE RECESS RELATIVELY DEEP, THE SOUND LEVEL WILL BE CONSIDERABLY LOWER IN THIS AREA, ESPECIALLY AT THE REAR OF THE RECESS. IN LARGE AUDITORIUMS AND THEATERS IT IS ADVISABLE TO "BREAK UP" THE REAR WALL IN ORDER TO PROVIDE PROPER DIFFUSION OF SOUND THROUGHOUT THE BALCONY RECESS. A LARGE UNBROKEN CONCAVE REAR WALL SHOULD BE AVOIDED, IF POSSIBLE, SINCE IT INEVITABLY GIVES RISE TO A NON-UNIFORM DISTRIBUTION OF SOUND. TROUBLE OF THIS KIND ALSO MAY ARISE FROM LARGE VERTICAL SURFACES OF GLASS IN FRONT OF STANDEE RAILS. IF THE CHAIRS ARE HIGHLY ABSORPTIVE, AS THEY SHOULD BE, IT USUALLY WILL NOT BE NECESSARY TO ADD ANY ABSORPTIVE MATERIAL TO THE BALCONY RECESS OTHER THAN THE ABSORPTIVE MATERIAL ON THE REAR WALL. IF THE CHAIRS ARE NOT ABSORPTIVE, IT MAY BE NECESSARY TO ADD SOME ABSORPTIVE MATERIAL TO THE SOFFIT OR SIDE WALLS OF THE RECESS IN ORDER TO PROVIDE THE OPTIMUM REVERBERATION IN THIS SPACE.
The balcony rail (front) should not be overlooked in working out the acoustical design of an auditorium. Since it is frequently a large concave surface having a width that is large compared with the shorter wave-lengths of speech and music, the balcony front can give rise to an echo or "slap-back". By tilting this surface downward and making it convex it is sometimes possible to utilize the resulting reflections to increase the sound level at the rear of the auditorium. Otherwise, the front should be highly absorptive or have a contour such that reflections from it will be diffused and not concentrated in small areas.

**Control of Reverberation**

Sound which originates in, or enters, an enclosed space is repeatedly reflected by its boundaries. At each reflection, a fraction of the acoustical energy is absorbed. Nevertheless, the sound may persist for many seconds before it dies away to inaudibility. The greater the volume of the room, and the less absorption it contains, the longer will be the reverberation.

A limited amount of reverberation is desirable in most auditoriums. However, excessive reverberation is one of the most damaging and annoying defects that can be inflicted upon a theater or concert hall.

The reverberation characteristics of an auditorium can be controlled by the amount and placement of absorptive material within it. The total amount of absorption in a properly designed auditorium determines the rate at which sound will decay in it. Proper distribution of the absorption aids in controlling the diffusion of sound and also the nature of the time fluctuations of the sound during its decay.

The first step in planning the acoustical treatment of an auditorium.

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The inseparability of architectural form and acoustical engineering is cemented by a simple law governing the behavior of sound waves. They are bent back, or reflected, like light, at an angle equal, and opposite to the angle of incidence. Like many great simplicities this fact was long in discovery. It underscores the necessity for compatibility between architectural form and good acoustics. It also explains to a certain degree the poor hearing conditions in most large auditoriums of classic order. Study of the angle of reflection has proved the high domed ceiling to be about the worst possible form of overhead treatment from the standpoint of good hearing: since its acutely convex reflective surface concentrates all sound waves in one "spot", leaving the rest of the enclosure a confused jumble of conflicting sound waves.
IS TO DETERMINE THE OPTIMUM REVERBERATION TIME, AND TO FIND THE TOTAL NUMBER OF SQUARE-FOOT-UNITS (SABINS) OF ABSORPTION REQUIRED TO GIVE THIS TIME. A LARGE PART OF THIS ABSORPTION WILL BE FURNISHED BY AGENTS OTHER THAN ACoustICAL MATERIALS; FOR EXAMPLE, BY THE SEATS, AUDIENCE, WALLS, CEILING, ETC. IT IS CUSTOMARY TO ASSUME THAT THE SIZE OF THE AUDIENCE IN AN AUDITORIUM WILL BE EQUAL TO TWO-THIRDS OF THE SEATING CAPACITY. THEN THE AMOUNT OF ABSORPTION THAT MUST BE ADDED IS THE DIFFERENCE BETWEEN THE TOTAL REQUIRED UNITS AND THE NUMBER OF UNITS FURNISHED BY THE ABOVE-NAMED AGENTS.

THE QUESTIONS REMAIN: WHERE SHOULD THE MATERIAL BE PLACED, AND WHAT MATERIALS SHOULD BE USED?


IT IS IMPORTANT TO CHOOSE MATERIALS THAT WILL PROVIDE THE OPTIMUM REVERBERATION TIME THROUGHOUT THE ENTIRE RELEVANT RANGE OF FREQUENCIES NOT AT JUST ONE FREQUENCY.

**RESONANCE**

RESONANCE, OR NATURAL AMPLIFICATION, IS PRODUCED BY MATERIALS VIBRATING AT THE SAME FREQUENCY AS THE SOUND WAVE IN THE MANNER OF PERCUSSION INSTRUMENTS. ALL MATERIALS VIBRATE TO ONE OR MORE FREQUENCIES. HARD, RIGID MATERIALS, SUCH AS STONE OR CONCRETE, VIBRATE TO LOW FREQUENCY TONES. WOOD IS THE NATURAL MATERIAL THAT VIBRATES TO THE WIDEST RANGE OF FREQUENCIES. IN ALMOST EVERY INSTANCE A CERTAIN AMOUNT OF RESONANCE IS DESIRABLE. IT IS ESSENTIAL TO THE ENJOYMENT OF MUSIC.

GOOD ACOUSTIC DESIGN PROVIDES THE PROPER PROPORTIONS OF REFLECTIVE, ABSORPTIVE, AND RESONANT MATERIALS SCIENTIFICALLY SHAPED AND LOCATED. THE CHARACTERISTICS OF SOUND ABSORBENT MATERIALS ARE FUNDAMENTALLY THE SAME AS THOSE OF RESONANT MATERIALS. BOTH REACT TO FREQUENCY. DRAPE, POROUS FABRICS TEND TO ABSORB HIGH FREQUENCIES; RESILIENT MATERIALS SUCH AS CARPETING OR UPHOLSTERY ABSORB THE MIDDLE FREQUENCIES; STRETCHED MEMBRANES ABSORB THE LOWER FREQUENCIES. ENGINEERED SOUND ABSORBENT MATERIALS REACT OVER A WIDE RANGE.
RECOGNIZING THE PLACE OF ACOUSTICS IN THE DESIGN OF A CONCERT HALL, THE ARCHITECTS ACCEPTED THE SPECIFICATIONS WRITTEN BY ACoustical ENGINEERS AS THE BASIS OF THEIR DESIGN.

CONCERT ARTISTS AND MUSIC CRITICS ACCLAIM ITS EXCELLENCE.

SECTION

Avoids excessive space-volume.
Utilizes broken planes near the source to direct sound waves along the shortest path to the balcony and rear of the hall.

PLAN

Plan illustrates how similarly broken wall surfaces direct sound waves toward the center and rear of the hall. This treatment is designed for two main sources of sound, one of the stage, the other in the orchestra pit.
concert hall design
1. ENTRANCE
2. LOBBY
3. COAT CHECK
4. PASSAGE TO AUDITORIUM
5. AUDITORIUM
6. REFRESHMENT BAR
7. MEN'S TOILET
8. WOMEN'S TOILET
9. STAIRWAY
10. POOL
11. EXHIBITION SPACE
12. EXIT
13. JANITOR & STORAGE
14. RADIO BROADCAST, TELEVISION, LIGHTING CONTROL
15. GENERAL BACKSTAGE & SHOP AREA
16. LIBRARY
17. STUDIO
18. STUDIO
19. BACKSTAGE CONTROL, SHIPPING & RECEIVING
20. BACKSTAGE ENTRANCE
21. MEN'S DRESSING
22. WOMEN'S DRESSING
23. INSTRUMENT STORAGE
24. STAR'S DRESSING OR MUSIC PRACTICE
25. GREEN ROOM
26. DIRECTOR'S OFFICE
27. AGENT'S OFFICE
28. TICKET SALES & BUSINESS SECTION
29. COVERED WALK
30. UPPER LOBBY
31. MECHANICAL EQUIPMENT
32. ORCHESTRA PIT
33. STAGE
ROTATING PANELS MAKE WIDE ACCESS TO THE STAGE POSSIBLE. SCENERY, SET WAGONS, OR STAGE EQUIPMENT CAN BE MOVED FROM THE BACKSTAGE WORK AREAS INTO POSITION ON STAGE QUICKLY AND DIRECTLY.

THE FRAMES FOR THESE PANELS CAN BE COVERED WITH PROPER MATERIAL (WOOD OR PLASTIC) FOR BEST ACOUSTICAL REFLECTION AND CAN BE MADE FIREPROOF IN ORDER TO FORM A BARRIER BETWEEN THE BACKSTAGE AREA AND THE AUDITORIUM.

A COMPARISON OF SEATING ARRANGEMENTS

THERE ARE MANY POSSIBILITIES FOR THE ARRANGEMENT OF AISLES AND SEATING. IN STUDYING THE VARIOUS PRELIMINARY PLAN LAYOUTS, THE DESIGNER SHOULD KEEP FOREMOST IN HIS MIND THAT HE WANTS TO GIVE AS MANY DESIRABLE SEATS AS POSSIBLE.

THESE DIAGRAMS SHOW A COMPARISON OF THE AMOUNT OF DESIRABLE SEATING BETWEEN THE MOST COMMON STAGE FORM (NO. 3) AND THE ONE DEVELOPED FOR THIS PROPOSED CONCERT HALL, WHICH IS A MODIFICATION OF STAGE FORM NO. 2. NOTICE THAT THE BACK ROWS CONTAIN FEWER SEATS THAN ANY OF THE OTHER ROWS IN THE AUDITORIUM EXCEPT THE VERY FRONT ROWS. BOTH AREAS ARE LESS DESIRABLE THAN THE MIDDLE AREA.
COMPARE PATH LENGTH OF B AND C (LESS THAN 5 FEET DIFFERENCE). ALTHOUGH THE CEILING IS THE MOST IMPORTANT REFLECTOR FOR AMPLIFYING THE SOUND RECEIVED AT THE REAR OF THE HALL, THE WALLS ARE DESIGNED TO DO THEIR PART.
Attention should be called to a new kind of concert hall established in prototype by the South American architect, Amancio Williams. The conception, in spite of certain evident difficulties, seems to open a new door in concert hall design, though its very novelty will be sure to raise a great many objections, some of fact and some of fancy; but these can be left for time to evaluate.

Mr. Williams, recognizing the ever-multiplying difficulties occasioned by the attempt to stretch the fan-shaped hall beyond its natural limits, reconsidered the whole question of balanced distribution of sound in an enclosure from first principles, and arrived at his conception of an annular hall, that is, "concert-in-the-round". The orchestra is centrally located, surrounded by a clear 25 ft. circular band of polished wood on a slight slope, from the outer edge of which the audience seating sweeps up in a relatively steep curve to meet the curving roof. In section the ceiling is designed to give a balanced and blended reflected sound to all levels of the audience from all positions of the orchestra. In addition, the radial increase of reflection surface is calculated to give an increase in the volume of reflected sound, thus allowing seats to be placed at an increased radius from the central stage.

If the seating capacity of a hall of this type is taken at 6,000, then the furthest seat from the orchestra will be about 108 ft. A fan-shaped hall with the rear seats at this distance would seat less than 2,500.
THERE ARE SEVERAL THEORETICAL OBJECTIONS TO AN ANNULAR TYPE HALL. IT MIGHT BE SUGGESTED THAT THE ORCHESTRAL SOUND WOULD BE REFOCUSED ON THE ORCHESTRA, BUT IT IS CLEAR THAT THIS WOULD DEPEND UPON REFLECTION FROM THE PLANE OF SEATING BACK ALONG THE SAME ANGLE OF INCIDENCE FROM WHICH IT ARRIVED FROM THE DIFFUSING CEILING REFLECTOR. BRIEF CONSIDERATION WILL SHOW, FIRST, THAT THE PRINCIPAL COMPONENT OF ALL SOUND RE-REFLECTED FROM THE SEATING PLANE MUST BE IN THE OUTWARD DIRECTION, THAT IS, AWAY FROM THE ORCHESTRA; SECOND, THAT WITH RESPECT TO OUTWARD MOVING SOUND, THE PLANE OF SEATING PLUS AUDITORS WOULD BE VERY HIGHLY ABSORBENT. BECAUSE OF THESE TWO REASONS, THE SOUND REFLECTED FROM THE FLOOR OF THE HALL WOULD BE BOTH WEAK AND HIGHLY RANDOMIZED, SO THAT THE PROPORTION WHICH COULD RETURN TO THE ORCHESTRA WOULD BE NEGLIGIBLE IN RELATION TO THE STRENGTH OF THE DIRECT SOUND AT THE SOURCE. THE DANGER OF "SLAP-BACK" WHICH PRESENTS A PROBLEM IN FAN-SHAPED HALLS, COULD BE HANDLED IN THE ANNULAR TYPE HALL BY ELIMINATING THE REAR WALL.

ONE OBJECTION THAT DEMANDS SERIOUS CONSIDERATION CONCERNS THE DIRECTIONALITY OF INSTRUMENTAL SOUND. AS SOUND APPROACHES THE UPPER FREQUENCY RANGE, IT BECOMES MORE SUSCEPTIBLE TO DIRECTIONAL EFFECTS. THE SOUND REDUCTION IN THE 10,000 CYCLES PER SECOND RANGE FROM A TRUMPET IS VERY SUBSTANTIAL BEHIND THE INSTRUMENT. HOWEVER, AGAINST THIS MUST BE SET THE FACT THAT THE SAME SOUND DECAYS RAPIDLY IN ITS PASSAGE THROUGH THE AIR, AND IT IS QUESTIONABLE WHETHER IT WOULD EXIST IN PERCEPTIBLE STRENGTH OVER THE REAR THIRD OF A FAN-SHAPED HALL FOR 4,000 (ABOUT HALF THE AUDITORS). DUE TO THE RELATIVE PROXIMITY OF THE AUDITORS IN THE ANNULAR HALL, SOMETHING LIKE HALF THE AUDITORS COULD BE EXPECTED TO RECEIVE THESE TOP TRANSIENT NOTES IN PERCEPTIBLE STRENGTH; THAT IS, 3,000 AUDITORS IN AN ANNULAR HALL FOR 6,000 SHOULD HEAR AS MUCH OF THE TOP TRANSIENTS AS 2,000 IN A FAN-SHAPED HALL FOR 4,000. SO THIS OBJECTION IS NOT SO REAL AS IT MIGHT APPEAR AT FIRST.

ALL OF THE FOREGOING FACTORS ADD UP TO A VERY POWERFUL CASE FOR THE ANNULAR TYPE OF CONCERT HALL AS A FUTURE POSSIBILITY.


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