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FOREWORD

The Design Guide (DG) series is issued by the Engineering Division, Military Programs Directorate, Office of the Chief of Engineers, U.S. Army.

This Guide governs Design of Army Music and Drama Centers (MDC). The Army program for Music and Drama is contained in AR 28-1. Music and Drama Centers support the mission of Morale Support Activities by providing opportunities for community and skill development through cultural, social and creative activities that enrich life and stimulate personal development for the soldier and his family.

This Guide states basic planning and design considerations and criteria, and illustrates how the guidance can be applied to respond to the needs of differing communities. This Guide is applicable to all new construction projects for Army Music and Drama Centers and projects involving modernization of existing facilities.

Preparation of this Guide was under the direction of the Special Projects Section, Structures and Building Systems Branch, of the Engineering Division, and is based on the results of an architectural services contract with the firm of Hardy Holzman Pfeiffer Associates, New York, New York, under Contract No. DACA 73-78-C-0004, with the assistance of Jules Fisher & Paul Marantz, Inc., New York, New York, and Jaffe Acoustics, Inc., Norwalk, Connecticut. Material related to functional requirements has been developed in conjunction with, and approved by, the Morale Support Activities Division, Personnel and Community Activities Directorate of the U.S. Army Adjutant General Center.

Distribution of this Guide is limited. Additional essential copies are available from the OCE Publications Depot, 890 Pickett Street, Alexandria, Virginia 22304.

Users are invited to send comments and suggested improvements to HQDA (DAEN-MPE-B) WASH D.C. 20314.

FOR THE CHIEF OF ENGINEERS:

LEE S. GARRETT
Chief, Engineering Division
Military Programs Directorate

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1-1. PURPOSE

The central purpose of this Design Guide is to ensure good quality in planning, design and use of Army Music and Drama Centers (MDC). The Guide attempts to describe the relationship between the physical characteristics and functional qualities of performance facilities. It establishes flexible criteria along with information and recommendations on which to base design decisions and evaluations.

Thoughtful use of the Guide will help develop designs responsive to new and changing needs by improving early design decisions. It will aid in the evaluation of designs in conjunction with the Army regulations and DOD criteria referenced herein, and provide general guidance in planning facilities for inclusion in military construction programs. Finally, using service personnel will find this Guide helpful in developing improvements and in better utilizing existing facilities.

1-2. SCOPE AND APPLICATION

Guidance, criteria, and procedures explained in this publication are applicable to all new Music and Drama Center (MDC) construction projects and to the evaluation of Army Performing Arts facilities in general. Morale Support Activities personnel contemplating improvements to existing occupied or found space will also find this document necessary.

Permanent Music and Drama Center projects will in most cases be designed as non-repetitive facilities. Illustrative examples provided are based on realistic but hypothetical facility programs; they are not definitive prototypes. Each installation's program and context will necessarily reflect local conditions. The Design Guide is not intended to furnish all the information needed for successful preparation of project designs, but it will provide the procedural framework and basic criteria.

1-3. EMPHASIS

Design guidance stresses the unique characteristics of performance facilities over the general construction criteria developed in other technical manuals and reference material. Technical and functional quality is essential to a design at the outset, while attractiveness, economy and low maintenance are of long-range importance to operating a successful program. Technical and functional characteristics are rigorously defined by either procedural or prescriptive specification. A procedural description states required attributes and the means of ensuring their attainment. A prescriptive specification states vital dimensions, properties and materials in a way that completely defines acceptable products and assemblies. General and secondary criteria can often be best stated as performance requirements without rigidly specifying how they are to be achieved. Planning personnel will find these distinctions useful in organizing criteria statements.

The influence of pre-design deliberations will be improved by taking an inclusive approach to initial planning, followed by careful paring-down to balance desires with available resources. This process at once identifies larger goals and defines most important immediate needs without precluding future growth.

1-4. FORMAT

This Guide is structured to assist the reader through successive steps of MDC planning and design processes. Its format is designed to allow the participants in the overall design process to find and utilize the information applicable to their roles. However, a general reading is advised to gain understanding of the whole process.

A. CHAPTER CONTENT

Each of five chapters assembles information of like nature and application.

Chapter 1: Introduction
This chapter presents overall purposes and organization of this material, and explains how to use the Guide.

Chapter 2: Program and Planning
This chapter discusses the goals of the Army Performing Arts Program, procedures for determining activity programs for individual MDC's, project initiation, site selection and planning, and building planning. These are pre-design elements of the Project Development Process.

Chapter 3: Design
Presented in an integrated manner, this chapter relates the functional, architectural, dimensional and essential technical criteria to the significant concepts involved in defining and organizing performing arts spaces into a whole building. It stresses the translation of functional requirements and intended uses to the physical configuration of MDC facilities.

Chapter 3 is further divided corresponding to the major divisions of any MDC.

1. ***The Room:*** *The stage and audience seating*
2. ***Backstage:*** *Performer/production facilities*
3. ***Front End:*** *Lobby and audience facilities*

Chapter 4: Technical Packages
Special technical data and standards regarding theater lighting, sound, stage, mechanical and other equipment systems are presented. This chapter furnishes technical criteria and baseline recommended inventory for facilities of various sizes and uses.

Chapter 5: Illustrative Examples
This chapter presents examples of the application of programming, planning, and design guidelines developed in preceding chapters. Illustrations include existing operational facilities of a scope comparable to those anticipated.

B. ORGANIZATION

A major purpose of the Design Guide is to impart an understanding of how various design factors interact. The contents are organized to illustrate the nature and order of major decisions and most importantly their physical consequences. After distinguishing basic components of facility design, elaboration of each proceeds from general to specific.

1-5. USE OF REFERENCE MATERIAL

Information contained in this Guide is intentionally unique to the design of performance facilities, and is meant to be used with existing related references. As project development takes place, emphasis will shift from one group of reference material to the next, even as involvement and responsibility shifts among participants. It will be essential to have on hand appropriate regulations and manuals at any given stage. Table 1-5.1 lists applicable reference material and indicates the usefulness of its content for specific tasks in the project development process.

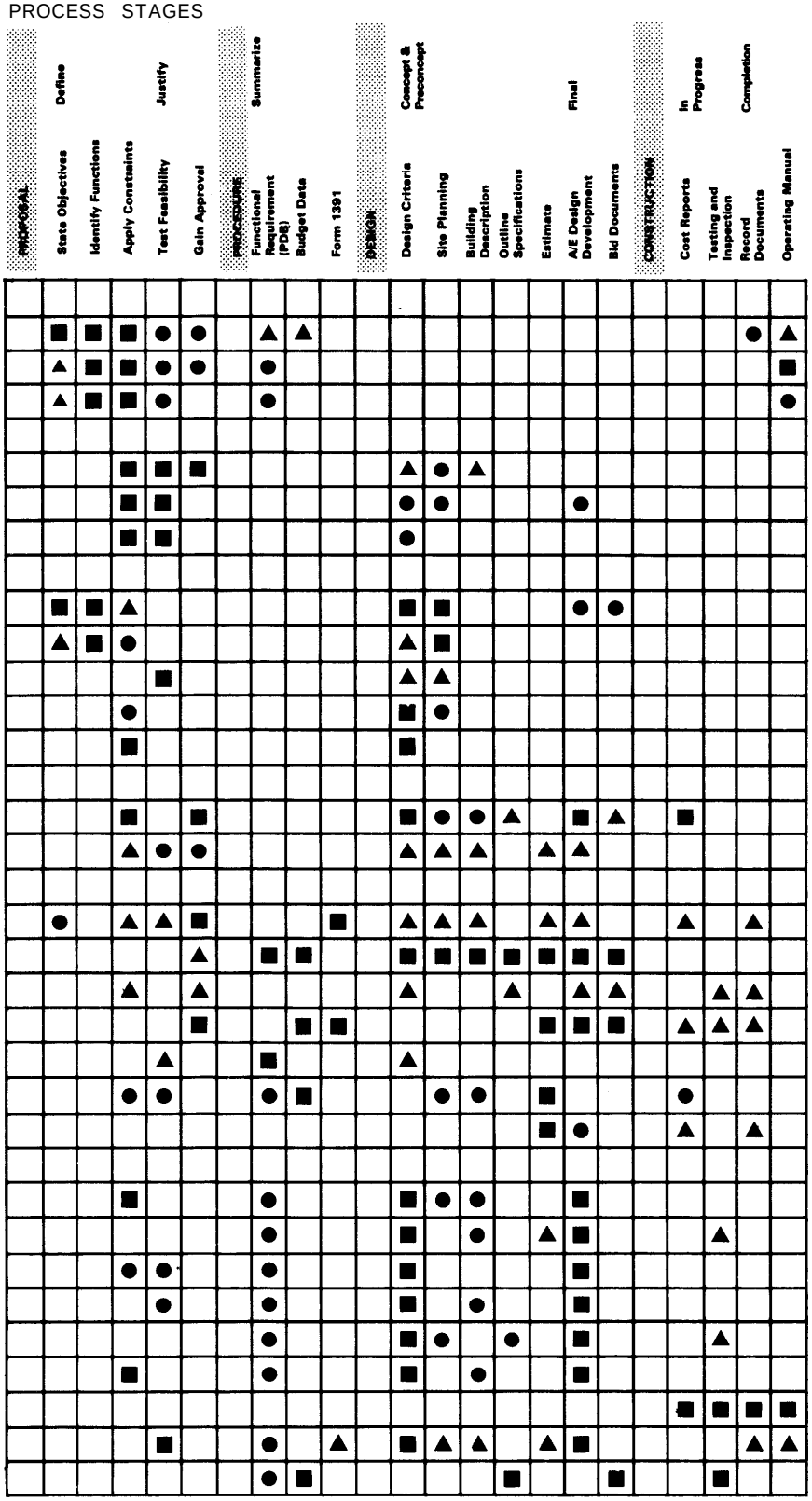
1-6. PROJECT DEVELOPMENT PROCEDURES

A clear understanding of the Military Construction, Army (MCA) Program is especially critical in the early planning stage, when the burden of effort rests with the using service. AR 415-15, MCA Program Development and AR 415-20, Project Development and Design Approval furnish detailed definition of required procedures, Chapter 2 of this Guide discusses step-by-step the process from recognition of the need for facility construction through preparation of a Project Development Brochure and data supporting DD Form 1391, which formally justifies project requirements. Several points about this sequential procedure deserve special emphasis.

A. DURATION

The time period required for development of final design documents is at least three years from installation level recognition of high priority status. One or two years will be added for bidding and construction.
The first year is devoted to developing sufficient data and rationale to justify the project's placement in the Short Range Construction Program. In the next six months, the project's functional requirements and budget data summary are codified and submitted for approval to begin design.

PROCESS STAGES



■ Primary References
● Useful References
▲ Supplemental Information

REFERENCES	
AR 28–1	Army Recreation Services
AR 28–8	Army Entertainment Program Operational Guide
AR 28–91	Army Musical and Theater Program
	MASTER PLANNING
AR 210–20	Master Planning for Permanent Army Installations
TM 5–803–1	Master Planning Principles and Procedures
AR 405–70	Utilization of Real Estate
	SITE CRITERIA
TM 5–803–3	Site Planning
TM 5–803–6	Site Planning of Community Centers
TM 5–822–1	Traffic Study Requirements
TM 5–822–3	Parking for Nonorganizational Vechicles
TM 5–822–2	Engineering & Design, Roads, Streets, Walks and Open Storage
	GENERAL CRITERIA
DOD 4270.1–M	Construction Criteria Manual
TM 5–800–1	Construction Criteria for Army Facilities
	PROCEDURES
AR 415–15	MCA Program Development
AR 415–20	Project Development and Design Approval
ER 1110–345–100	Design Policy for Military Construction
AR 415–35	Construction, Minor Construction
TM 5–800–3	Project Development Brochures Part I
AR 415–17	Empirical Cost Estimates for Military Construction
TM 5–800–2	Preparation of Cost Estimates
	TECHNICAL
EM 1110–1–103	Design for the Physically Handicapped
TM 5–809–1–11	Load Assumptions for Buildings
TM 5–810–1 /M 5–810–5	Mechanical Design - HVAC Plumbing
TM 5–811–1	Electrical Design - Power Supply
TM 5–811–2	Electrical Design - Interior System
TM 5–830–1–4	Planting Design
TM 5–812–1	Fire Prevention Manual
AR 415–10	General Provisions for Military Construction
ER 1110–345–700	Design Analysis
ER 1110–345–720M10	Specifications/Drawings

FIGURE 1-5.1 CORRELATED REFERENCES

This approval may take several more months. Actual design time will occupy as much as a year, after which the drawings are advertised and construction contract awarded. There may be further delays stemming from requirements for special equipment which must be ordered months in advance but installed integral with structure. In short, personnel initiating a project must be prepared to think ahead five years to projected needs when the building will be occupied.

It is likely initiating personnel will not be identical with using personnel. Moreover, the intervening process has built-in resistance to adjustment except as a result of significant changes in mission. It is therefore of utmost importance that early planning be well-informed, incisive, and carefully recorded for transmission through the process.

B. MANDATORY PROCEDURE

The MCA Process involves and coordinates among many levels of military organization. To be effective, its sequential procedure is mandatory and must be carefully observed. For example, failure to gain proper approvals for modification of the master plan (if required) will stop the process.

C. ATTENTION TO DETAIL

Firm, precise statement of requirements will not only expedite matters but ensure the quality of results. This is especially important with regard to technical and equipment elements, and for those elements for which standard criteria are inadequate or nonexistent.

D. COMPLETENESS

Nothing should be left to chance that can be specified. Military construction projects are expected to result in complete, fully functional facilities. It will be extremely difficult to add on elements neglected in the Project Development Brochure, especially as design progresses.

Figure 1-6.1 illustrates the MCA Process sequence in simplified form, from the viewpoint of principal participants. Using service personnel should request review opportunities for themselves and for their technical advisers at stages beyond concept design, if it will help them be thoroughly acquainted with the facility when it is completed.

1-7. KEY PARTICIPANTS

AR 415-10,15 and 20 define policies, procedures and responsibilities which govern the military construction program. AR 415-15 details the program development phase; AR 415-20 details the design phase; and AR 415-10 details the execution phase and the interrelationship among all three phases of the construction process. For a given Music and Drama Center project, the principal participants are broadly categorized as the using service and construction service. The using service is responsible for establishing facility requirements, while the construction service manages the design and execution phases.

The concept of team planning is inherent in the project development process. The participants in this process represent different viewpoints and disciplines. This Guide will help provide common language to improve translation of early planning goals to the completed facility.

A. USING SERVICE

At the installation level the using service representative is the installation commander, who will coordinate the efforts of MDC staff, facilities engineer, and any technical consultants retained during the pre-design phase. Using service responsibilities are as follows:

1. *Development of functional requirements in conjunction with criteria in this Guide.*
2. *Justification of functional requirements falling beyond the scope of criteria.*
3. *Preparation and submission of the Project Development Brochure required by AR 415-20.*
4. *Obtaining installation action to gain departmental site approval if the project is not sited according to HQDA approved master plan.*
5. *Preparation and submission of DD Form 1391 and supporting data in accordance with AR 415-15.*
6. *Approval of concept design to certify compliance with functional requirements.*

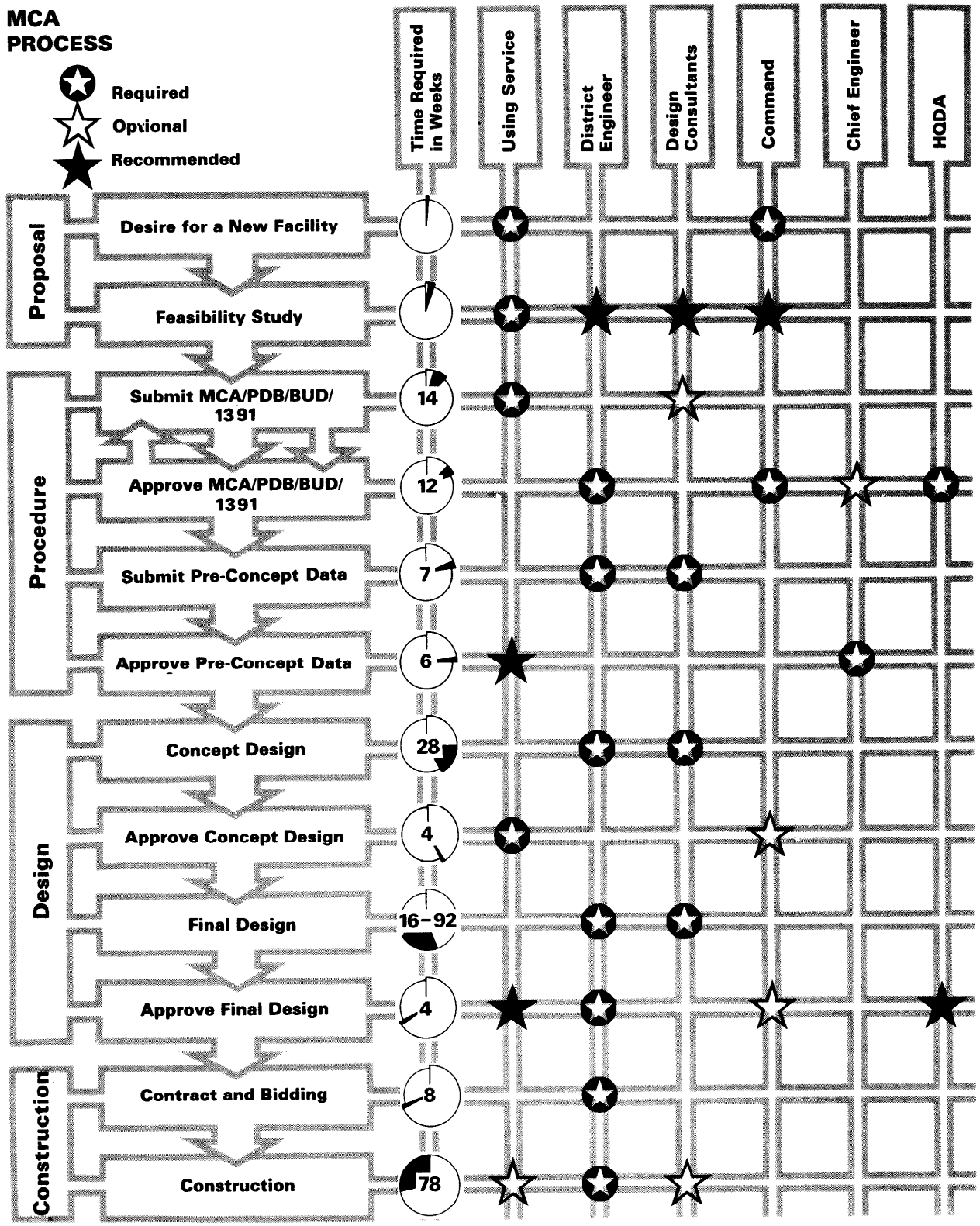


FIGURE 1.6-1 THE MCA PROCESS

B. CONSTRUCTION SERVICE

The Chief of Engineers will in most cases designate the district engineer responsible for construction service field office work. He will work closely with the using service and facilities engineer during the design phase. Design work will most often be accomplished by contract with a private architect-engineer firm, although minor construction and improvements may be effected by government forces. The district engineer will also assist the using service upon request during project development, and will manage construction activity. Construction service responsibilities are as follows:

1. *Ensure that the functional requirements of the using service are recognized and incorporated into the project design.*
2. *Ensure that the requirements of the using service fall within the criteria of this Guide and other DOD and DA standards.*
3. *Ensure that deviations from criteria requested by the using service are completely justified in project design analysis.*
4. *Ensure that the quality standards for overall design are emphasized as stated within this Guide.*
5. *Ensure that the assemblage of user information is coordinated upon completion of the project, and is furnished-together with the completion records required by AR 415-10, to the using service.*

C. DESIGN SERVICE

This term normally refers to the architect-engineer or other private design professional under contract to Corps of Engineers in the design phase. However, similar qualifications apply to technical consultants who may be retained by the construction service under separate contracts or by the A-E as subconsultants, and to technical advisers retained by the using service out of its own budget. The using service should not hesitate to use qualified consultants in the programming and development phase, since the information generated at that time is critical to facility quality. Such procurement shall be without prejudice to selection of the A-E, although in civilian practice they are often identical. If specialized technical consultants (acousticians, stage designers, theater lighting specialists) are involved early, it is desirable to continue periodic services for the duration of the project. Architects, engineers, and technical consultants should be selected on the basis of the following qualifications:

1. *Recognized experience in the design of music and drama facilities. This can be ascertained by requesting from prospective design firms written responses listing with brief descriptions, past and current projects in the performing arts to which they have contributed services. These responses should indicate the nature and extent of the designers' services and the client to whom they were rendered. It is customary to advertise for responses locally and through the offices of professional associations. However, it is also wise to solicit recommendations from using service personnel, national organizations and recognized experts in the design and operation of related facilities in order to address requests to the widest range of candidates.*
2. *A demonstrated imaginative approach to site and building design that integrates design quality, functional efficiency, and cost control.*
3. *Responsiveness to unique demands of individual use programs, project criteria and sites. Interviews with a limited number of selected candidates is the best means of evaluating how clearly a designer understands the particular set of requirements and constraints he will face, provided a summary statement is issued with the invitation to interview, with equal advance notice to all candidates.*
4. *Sensitive design capability extending from overall building design to detailed construction and interior design. Critical reviews published in regular columns of well-respected newspapers and professional journals, design awards and the acclaim of fellow-practitioners are good indicators. If the choice is still difficult, visits to current and completed projects are helpful, although selection teams should not expect to see the solution to* ***their*** *programs, nor expect the designer to replicate someone else's.*
5. *Efficient and well-managed project procedures and coordination with consultants. To some extent, investigation of past projects will help reveal organizational competence. Before final selection is made, candidates may be requested to submit a written proposal detailing procedures, consultants, anticipated work schedule and staff manpower to be made available.*

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2-1. INTRODUCTION

A. APPLICATION

This chapter deals with the first two stages (predesign) of MDC Development–dentifying program needs and translating them to statements of functional requirements. The final product will be in the form of a Project Development Brochure prepared by the using service. As many people should be involved as can meaningfully contribute to the question and answer process, each representing a segment of the community directly affected by the proposed facility. Coordination of the process shall be the responsibility of the installation MDC director, assisted by the facilities engineer. All deliberations and collected data should be carefully recorded for later reference.

Initial planning questions include:

1. *Identifying eligible population, its present and future needs in terms of the Morale Support Activities (MSA) mission.*
2. *How urgent are these needs?*
3. *What Performing Arts activities can answer them by building on the current program?*
4. *What opportunities and resources exist in the community and what may feasibly be developed?*
5. *What by-product benefits might be spun off Performing Arts activity?*
6. *Can existing physical plant and other assets contribute to the project?*
7. *To what extent can the civilian community share in the support and benefits of the center?*
8. *What are the unique aspects of the installation's mission?*

Having identified potential activities, consider:

1. *What are their implications for developing and reinforcing long term growth of program benefits?*
2. *What are the desirable characteristics of physical plant and building location?*
3. *How can program needs be economically satisfied without sacrifice of product quality?*
4. *What is the influence of operating costs, available staff, and staff skill emphases?*

Finally, these considerations must be coordinated with authorized funding, space allowances, master plan designations, construction criteria, and Army-wide regulations required to justify major command approval and Congressional appropriations.

B. ORIENTATION

The program and planning process is an exchange between a facility's users and its designers. The process enables the using service to make two kinds of statements: what it means to do with its new facility, and what characteristics it believes the facility must have to accomplish that end. While it is important to have clear priorities, restraint is urged in making critical judgments until all potential elements are accounted for. It is best to feel confident no useful contribution or idea has been overlooked. Statements of intent mean as much to an experienced designer as descriptions of finite dimensions and properties. Many of the characteristics sought by the user in the early planning stages will change as information and understanding grow. A part of the evaluation task consists of tracing the consequences of these changes so that the eventual design result is judged for approval in terms of the last best statement of requirements.

The primary task is to lay out characteristics in order of importance. Trial values can then be assigned using the contents of Chapters 3 and 4. It will be found that some criteria are in conflict, and a decision will have to be made to compromise or to eliminate the lesser value.

Desired characteristics must be stated in a language that can be translated to observable properties. Many requirements appear in every project for which no common standard exists. Qualities such as orderliness, liveliness, scale and beauty are not readily verified or measured, but it is nonetheless wise to include them in the program statement.

2-2. ARMY PERFORMING ARTS PROGRAM

A. SUBPROGRAMS

There are four categories into which Army Performing Arts programming falls. These are called subprograms since, at many installations, they are individually organized and operated as components of the overall Performing Arts Program, They frequently work together and share technical resources. However, in terms of programming each tends to appeal to a specific segment of the military community.

1. Music Subprogram
All forms of locally produced vocal and instrumental music, music listening/appreciation, and music-related technical activities are included.

2. Theater Subprogram
All forms of locally produced drama and musical theater auditing/appreciation, and theater technical activities are included.

3. Unit Level Entertainment Subprogram
This is composed of an organized set of music and theater activities programmed to fit the personnel in a specific unit (e.g., if the unit works at night the activities will be programmed for the day). The activities included will generally emphasize music, but may be a comprehensive mixture of music, theater and dance to suit the unique and often diverse needs of the unit.

4. Commercial Entertainment, In-coming Touring Show Subprogram.
Activities may be in any performing arts discipline. They may be either professional or amateur. However, the distinguishing characteristic is that these activities are not produced locally, but by another military installation, or commercially, or by a civilian community or school.

It is worth noting that dance is not presently identified as a separate subprogram. However, dance is one of the fastest growing performing arts activities in the United States. The historic absence of dance as an activity locally produced on military installations should be viewed carefully. The absence of suitable facilities has impeded commercially produced dance concerts as well as local development, but a growing number of Army dance enthusiasts has been discovered over the past twelve years.

Of the four subprograms, all but Unit Entertainment are immediate candidates for the MDC facility. The Unit Centers benefit indirectly from heightened community awareness and the use of the installation MDC for inter-unit and district competitions, showcase performances, and the like.

B. COMMUNITY AND SKILL DEVELOPMENT

Programs in this larger category include Performing Arts; Visual, Applied and Industrial Arts and Crafts; Dependent Youth Activities; and Social Recreation.

These programs reinforce each other in basic objectives but remain distinct in emphasis, with efforts directed toward experience in respective categories. In particular, Performing Arts addresses the objectives of life-enhancement and personal development through cultural and creative activity, and skill development supported by recognition and practical training opportunities. The discipline of the Arts is emphasized more than consumption of leisure time. Community and Skill Development Activities is one of the three core programs whose overall objectives reflect the mission of Morale Support. Other core programs are Physical Activities, which include athletics and outdoor recreation, and Library Activities and services.

C. MORALE SUPPORT ACTIVITIES

At the installation level, MSA is usually a divisional element of the Directorate of Personnel and Community Activities. MSA's mission is to increase Army effectiveness and combat readiness by assisting commanders in maintaining morale, mental and physical fitness.

2-3. ESTABLISHING PROGRAM GOALS

Policies governing MSA are found in AR 28-1, and require that programs adhere to several major objectives that have general implications for the direction of installation programs. These in turn have impact in the qualities and functional requirements of performing arts facilities.

A. RELATIONSHIP TO MSA MISSION

1. Maintain a high level of esprit de corps, job proficiency, military effectiveness, and educational attainment.

Implication:

Music and Drama Center programs will be designed to support diverse types of performing arts activities which may be conducted concurrently. The MDC design must also allow for diversity in the various skill levels of participants.

2. Promote and sustain the mental and physical fitness of military personnel.

Implication:

The program should provide opportunity for creative fulfillment-either actively or through spectator involvement-and for physical development activities such as dance.

3. Encourage the constructive and creative use of off-duty leisure time.

Implication:

Provide activities which help develop and maintain motivation, talent, and skills that enhance the soldier's ability to discharge his duties as service member and citizen. In order to encourage military personnel to participate on a voluntary basis, the facility must be inviting and visually appealing. Particular attention will be given to those production support areas which reinforce and enhance on-the-job soldier skills (e.g. scenic drafting, construction, and electrical work).

4. Aid in recruitment and retention.

Implication:

Make Army service an attractive career. Performing arts activities play a vital role in assuring military personnel of "life style" comparability between military and civilian life. The facility must visually and functionally support the same quantity and quality levels of performing arts programming found in civilian communities.

5. Assist Army personnel in adjusting from civilian life to a military environment.

Implication:

The performing arts activities undertaken must be contemporary, relevant, innovative; artistically, educationally and culturally sound; and must include new interests and trends in the performing arts.

6. Assist in building morale.

Implication:

Provide the same kinds of activities for military dependents and other eligible personnel within the military community. The MDC must have a non-military atmosphere.

B. PROGRAM EMPHASIS

The first three chapters of AR 28-8, *Program Operational Guide,* discuss at length many of the important emphases of the Performing Arts program; these are largely (and aptly) revealed in terms of the skills and dedication expected of directors and staff. The MDC must provide the tools and functional qualities equal to the task.

1. Performance

There is one prime, unequivocal emphasis to begin with: Performance is the most important activity and the main purpose of the MDC facility. Performance generates awareness, interest, appreciation, and demand for more. It inspires participation, skill development, recognition, and the motivation for excellence. The performance space with its technical support is top priority.

2. Quality vs. Quantity

Of great importance is the quality of activities and of the facility itself. Ultimately it is good staffing of a good facility that will assure high quality performance and participant/spectator involvement in the program. It is therefore imperative that technical/functional adequacy, capacity, and durability be initial considerations with respect to audio, stage lighting, musical, rigging and operating equipment.

While the number and variety of performances offered annually is often regarded as a measure of program effectiveness, this is true only to the extent that quality is maintained. Frequent productions are valuable if well done, and if they permit the attainment of increased quality, audience appreciation, and participant skills. Avoid downgrading technical and functional adequacy in order to simply achieve low average construction costs or the false operating economies sometimes perceived in a multi-purpose facility concept.

3. Diversity vs. Specialization

Programs and activities within the facility must be varied to provide freedom of choice to participants with a wide range of ages, abilities, preferences, skill levels and cultural needs. In the past there has been a tendency to assume that a facility that is not multi-purpose is too specialized. Inevitably, local interest would argue for the theater auditorium to double as a basketball court or training facility. A quick study of the requirements of these and similar uses reveals irresolvable technical conflicts which if placed within one facility would downgrade the quality of it for all uses.

In order to achieve diversity while maintaining quality within budgetary limits, the facility must be designed primarily for one use with other diversified activities subordinate to the primary use. There are, of course, limits to how diversified a facility may become without totally compromising the primary activity. This issue will be discussed more fully in Chapter 3, which demonstrates that even among performing arts activities, facility characteristics can be in conflict where performance types are mixed.

Program planners are advised to choose one primary performance space use (music or drama) to which the majority of supporting facilities are directed. Diversity is achieved by offering a variety of opportunities for active participation. Appropriate secondary activities can take place if they are adapted to the facility.

4. Active vs. Spectator Participation

These aspects are inseparable. However, it will often become apparent that the budgeted facility will not contain sufficient space for the largest desired audience capacity and necessary production facilities. The planners must resolve this dilemma in a manner which does not inhibit technical production quality.

The project initiators must take into account the existence of other permanent facilities on the installation or in the nearby civilian community that have ample capacity for major productions, or can make rehearsal and production support space available for MDC use. These factors will have bearing on the programming of a new facility. In the majority of instances the new facility will have to serve all aspects of the primary performance activity. The planning staff must be ready to eliminate other secondary activities or to determine which of these can be combined for economy.

Significantly, the choice of primary performance type has direct bearing on optimum audience capacity, but it should be recognized that this choice influences the proportion of allotted space available for secondary programming. Chapter 3 further develops this data.

5. Popular Interest vs. Special Motivation

Great care should be exercised in utilizing general opinion polls to establish program emphasis. Similarly, it is a mistake to ignore community needs in favor of known special interests like dinner theater and glee club. The Army Performing Arts Program is aimed at enriching the cultural life and varied experience of soldiers and their families. Polls typically reflect only common experiences which may be limited. However, properly conducted surveys can provide indicators of underlying interest and desire for varied choices. The Army Performing Arts Program can capitalize on this since commercial profit is not a significant motive.

Audience satisfaction promotes active participation. Participants in production activity (and the MDC staff) need the reward of community and leadership recognition, appreciation and support, and a sense of worthwhile accomplishment in developing valuable skills. The community image of the facility will help establish the effectiveness of program activities.

In order to produce any type of performance a great many non-performance skills are required (technical/administrative skills). A facility must be designed to encourage active participation and development of requisite skills. Moreover, the cost-effectiveness of each production season increases with the skill levels of participants and awareness of audiences. When soldiers are transferred to a new installation, their skills and the desire to apply them travel. The abiding support of the community then encourages newcomers to excel.

2-4. SELECTING ACTIVITIES

Unless the using service has already devoted considerable time and effort to devising a long-range program development strategy that can now be analyzed in terms of this Guide, program planners are advised to consider every potential activity for inclusion in the MDC. Since this Design Guide is concerned with securing adequate facilities, it will tend to emphasize activities that have special physical implications. However, the using service is first concerned with program values. The following sequence is recommended procedure.

First generate a list of as many activities as can possibly be undertaken by an installation Performing Arts program. AR 28-1 and AR 28-8 serve as the basic source of eligible activities, and a good many more will suggest themselves

1. PERFORMANCE ESSENTIALS

Music Performance - Vocal
Choral/Glee Club
Solo

Music Performance-Instrumental
Symphonic Orchestra
Recital/Solo
Popular/Dance Band
Chamber Ensemble

Drama Performance
Readings/Monologues
Comedies/Skits
Plays

Combined Performances
Musical Comedies
Dance Concerts
Musical Revues
Thematic Pageants
Operas/Operettas
Cabaret

Preparatory & Technical
Rehearsal
Theatrical Direction
Musical Direction
Choreography
Set & Costume Construction
Makeup/Stage Design
Lighting Design/Control
Recording/Sound Control
Bookings/House Management

2. DEVELOPMENT & SUPPORTING

Voice Coaching
Instrumental Instruction
Conducting Workshops
Composition Classes
Writing Lyrics
Recording Clinics
Electronic Equipment Workshops
Instrument Repair
Drama Workshops
Auditions & Try-outs
Playwriting Classes
Play Production
Scenic & Costume Design
Lighting & Design Workshops
Dance Workshops
Dance Production
Choreography
Telecommunications
Special Effects
Theater Management
Production Management
Publicity

3. RECREATIONAL & OTHER

Music Tape Club
Record Library
Script/Book Library
Video Library
Film Library
Drama Seminars
Demonstrations
Play-going
Movie-going
Concert-going
Social Dancing
Arts Festivals

TABLE 2-4.1 PERFORMING ARTS ACTIVITIES CATEGORIES

by induction. This process will provide input for decision making and dispel preconceived definitions everyone is likely to have.

Assemble activities into categories with one or more characteristics in common, even if the categories have little apparent relevance to present purposes. Are these activities otherwise related? For example, AR 28-1 lists typical activities by administrative assignment to each of the subprograms. It also enlarges and subclassifies this list according to the disciplines and participants involved and possible combined activities.

AR 28-8 uses these same activities to define necessary staff skills; the same could be done for skills developed through soldier participation. AR 28-8 also proceeds at length to characterize activities in terms of functional and technical facilities required. Each regrouping of activities yields a better understanding of fundamental characteristics, from equipment employed to eligible funding sources.

A. PRIORITIES

The key is to make useful distinctions in order of importance. For the purpose of facility definition, reference to Program Emphasis (2-3b above) suggests initial categories are:

1. *Every kind of performance and the production activities required to implement it.*
2. *Developmental activities that can lead to performance or to supporting resources.*
3. *Educational and recreational activities*

Some of these activities are shown in Table 2-4.1. The requirement of balanced programming (AR 28-1) means that some of each category shall be implemented at every installation. However, the order of selection and emphasis for the central facility (MDC) shall correspond to this categorization. Unit-level centers balance this by taking the reverse order.

B. APPLY GOALS

Examine each activity or cluster of activities in terms of the Program Emphasis issues (2-3b) and rearrange by priority within each category. It may be helpful to employ a score-keeping system, mapping activities against positive values by assigning a range score of 0 to 3, for example. This is simply a method for making cumulative notes of individual judgments, It recognizes that each analyst may have a different interpretation of activity names. A sample is shown in Figure 2-4.1.

C. ADJUST TO CONTEXT

Check this ordered list against MSA mission goals (AR 28-1 and 2-3a of this Chapter) to evaluate long-view justification and balance. It is here that unique local conditions come to the fore. An evaluation of current interest in various activities will be helpful. Also, determine if exposure to new performance types and public information campaigns would develop interest. A survey or interviews with operators of neighboring facilities, to assess their capabilities and plans for the future, will set baseline expectations.

Consult reputable opinion polls, such as the Harris Poll of Music and the Arts, as well as surveys conducted within the military community. Regard all such information realistically; published results are extrapolations of data that may have been taken in a context entirely different from that in which it is read. The thrust of this investigation is to estimate the level of activity that is implementable now and in the future.

D. REVIEW

At this point, certain activities will have emerged as strong candidates, perhaps as alternative development strategies. This is a good time to review preliminary findings with the installation command and planning board to gain initial support for the developing rationale.

Command feedback will indicate the influence of plans and priorities set at higher levels of authority. It may also include meaningful new considerations to be followed up, related to the installation's current and future mission. For example, a trend toward technical specialization will introduce increased numbers of personnel with higher educational levels, perhaps older with established families.

E. APPLY CONSTRAINTS

High value primary activities must be dimensioned in terms of physical and budgetary constraints. A firm resolve may be required at this critical point. Consult general criteria for space allowances (DOD 4270.1-M) and, using basic criteria developed in Chapter 3 of this Guide, estimate production and performance facilities needed to accomplish primary activities.

Also consider the staff available in comparison with the staff needed. AR 28-1 recommends minimum activity standards (Table 2-4.2) that can serve as an indicator of bottom line staff and operating budget for a functioning program. Consult installation records and HQDA for assistance in the realistic appraisal of various production costs. Compare these to anticipated attendance and participation levels projected from data assembled in 2-4d. above.

It is very likely the preliminary program will exceed constraints and require reduction in scope. In this case, the major guideline is to resist across-the-board reductions. It is most important that primary activities be accomplished well, with fully adequate technical facility support.

The requirement of balanced offerings cannot be ignored, but within that framework, development of at least one chosen performance activity as the primary use of an MDC is essential to ensure a high level of production quality, audience appreciation, and consequent interest in participation and skill development. Identify the primary program elements that can be main-

PROPOSED ACTIVITIES

SOLDIER PARTICIPATION (SAMPLE)

(Include Family, Civilian Community, Staff Participation)

"Instructions: please rate the following proposed program activities from 0 to 3, in terms of Morale Support, Community and Skill Development, and Army Performing Arts objectives. Also note (+ or −) special factors inherent in local conditions and available resources."

Publicity Work	House Management	Ensemble Performance	Recital Performance	Instrumental Instruction	Glee Club/Choral Performance	Stage Crew Work	Lighting Design	Set and Costume Construction	Set and Costume Design	Playwriting for Production	Skits and Variety Acts	Drama Performance, Full Length			
1	1	2	2	3	2	1		1			3	2		Provide Freedom of Choice, Initiative	MSA
2	1	3	3	2	2	1	2	1	2	2	3	3		Provide Alternatives to Duty Environment	MSA
2	1	2	3	3	1		3	1	3	3	3	2		Provide Sense of Personal Accomplishment	MSA
1		2	3		2				1	1	2	3		Recognition and Reward	MSA & CSDA
3	2	2	2	3	3	3	2	2	3	2	3	3		Wide Age Range Involvement	MSA & CSDA
3	1	2	1	3	3			3	2		3	3		Wide Ability Range Involvement	MSA & CSDA
1	2	1	3	3	1	1	3	2	3	3	2	1		Increase Individual Skills	MSA & CSDA
		3	2	2					2	1	1	3		Heighten Cultural Awareness	MSA & CSDA
2	2	3			3	3		3			2	3		Promote Team Work	MSA & CSDA
3		3	1		3	1		1			2	3		Increase Sense of Community	MSA & CSDA
1		3	2	3	2	1	3	1	3	3	2	3		Encourage Creative Use of Leisure Time	MSA & CSDA
2	2	3	3	3	1	1	2	1	2	3	1	3		Comparable Military/Civilian Opportunities	MSA & CSDA
2	3	3	2	1	2	2					1			Provide Quality Musical Productions	PROGRAM GOAL
2	3			1		2	3	1	3		1	3		Provide Quality Theatrical Productions	PROGRAM GOAL
		1	2		2						3	1		Program Diversity	PROGRAM GOAL
3		3	2		2						2	3		Develop Audiences	PROGRAM GOAL
		+		+	+						−	+		Existing Demand	LOCAL CONDITIONS
−	+	+	−	+	+	+	+		−	+	+			Available Budget	LOCAL CONDITIONS
+	+	+	+	+	−	+	+	+	+	+	+	+		Available Staff	LOCAL CONDITIONS
−	+	+	+	+	+	−	−	−	−	+	+	−		Existing Facilities	LOCAL CONDITIONS
−	+	+	−	+	+	+	−	−	−	−	+	−		Existing Activities	LOCAL CONDITIONS
+							+	+				+		Unique Installation Mission Factors	LOCAL CONDITIONS
+	+		−	+			+		+		+			By-Product Value	LOCAL CONDITIONS
28	18	36	31	26	29	16	20	17	24	18	34	39		Program Values	EVAL
0	+5	+5	−1	+6	+3	+2	+2	−1	−1	+2	+4	1		Practicality Factors	EVAL

Goals and Objectives

FIGURE 2-4.1 ANALYSIS OF ACTIVITY PRIORITIES

	Installation Military Strength (in thousands)				
	under 5,000		5,000–15,000	over 15,000	
Music or Drama Center	**Unit Entertainment Center**		**14,000 GSF**	**20,000 GSF Space Allowed**	
Drama Groups	1	1	1	1	
Choral Groups	1	1	1	1	
Concerts/Productions		3	6	9	
Instrumental Groups	1	1	1	1	
Stagecraft Training		3	6	6	
Clinics/Workshops			2	4	
Visiting Teachers, Lecturers, or AV Programs		6	9	12	
Touring Shows					
Amateur/Semi-Pro		2	4	6	
'Names'' Commercial		1	2	3	

	under 10,000		10,000–25,000	over 25,000	
Music-Drama Centers	**Single Facility Recommended**		**28,000 GSF**	**40,000 GSF Space Allowed**	
Concerts/Production		3	6	9	12
Stagecraft/Training		3	6	6	9
Clinics/Workshops		2	4	4	6
Visiting Teachers		6	9	12	12
Touring Shows		3	6	9	9

TABLE 2-4.2 MINIMUM ACTIVITY STANDARD PER QUARTER

Music Center Staff

Music Center Director GS-9 (1)
Vocal Music Specialist GS-7 (1)
Instrumental Music Specialist GS-7 (1)
Technical/Instrumental Repair GS-7 (1)
Instrument/Equipment Control GS-5 (2)

Drama Center Staff

Drama Center Director GS-7 (1)
Theater Publicist GS-6 (1)
Public Information Specialist GS-5 (1)
Lighting Technician GS-5 (1)
Design Technician GS-5 (1)

Music-Drama Center Staff

Area District Command Installation Director GS-11 (1)
Music Director GS-11 (1)
Theater Director GS-9 (1)
Lighting Technician GS-7 (1)
Sound Technician GS-7 (1)
Costume Technician GS-7 (1)
Instrumental Music Specialist GS-7 (1)

TABLE 2-4.3 STAFF GUIDELINES

tained within staff and budgetary limits, and then apply constraints of space allowances to a broad-scope estimate of needs.

F. EVALUATE PRODUCT

The adjusted list of program elements may still exceed general facility allowances. First be sure every essential activity component is noted and assigned a place in the general space estimate, even if its best functional relationship and exact requirements are undetermined.

At this stage, the estimate is based on very general assumptions that careful planning may subsequently bring into line with stated limits. However, if the divergence is great, do not assume that "something can be worked out" in detailed refinement. Chapter 3 of this Guide will help determine if estimates of smaller groups of activities are unrealistic in size or functionality. For instance, set storage and rehearsal cannot occupy the same space. However, this is not the time to eliminate essential functions. If unsure, it is entirely appropriate to retain professional consultants to advise on application of this Guide's criteria to the desired program.

Finally, the using service should have in hand a statement of activities to be accommodated as essential functions. If the program scope has been reduced significantly, compare it to original program goals. Although the realistic quantitative scope of activity may have been altered, qualitatively it should remain equal. If a major objective has been sacrificed, the reason for making that decision must be clear. The decision may have resulted from an error in choosing activities to eliminate or from a simple failure to transfer an important program goal characteristic to the activities remaining. For instance, basing the description of a single performance facility on the needs of incoming commercial shows may inadvertently limit opportunities for local participation. However, there may be justification for departure from general standard constraints. These must be thoroughly and firmly documented since the acceptable basis for altering project scope at a later date is very limited. An economic analysis of the program is advised, and a specifically designed "market survey" should be conducted to substantiate the need for the program and its projected goal-effectiveness. Of the possible variations, the first to be explored should be any deviation from the DA approved master plan that designates the MDC site. Approval of a changed master plan must precede the project's placement in the Short-Range Construction Program.

2-5. SELECTING THE SITE

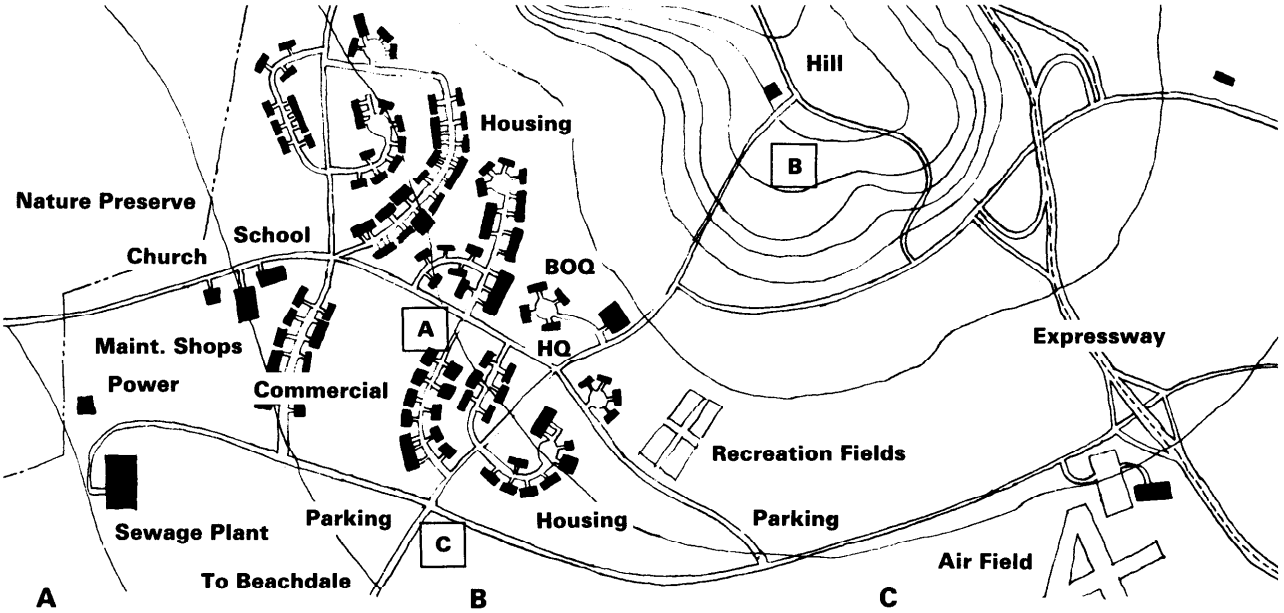
A. INSTALLATION MASTER PLAN

Location selection should be understood to be a process of reconsideration. Most installations will already have a DA approved master plan, with a Music and Drama Center site on it. This previous site selection will presumably have been based on a less thorough and up-to-date understanding of the MDC's program than this 'Guide sets forth, but the existing site may still be valid and master plan rationales should be understood before attempting any change. Depending on the site chosen, there may be required a request for approval of changes in the installation master plan, in accordance with AR 210-20, Master Planning for Permanent Army Installations.

The MDC site is usually assigned to the Community Facility Complex, but since the master plan is basically a land-use plan, this designation often covers a large area. Established installations have assigned a specific plot for the MDC in relationship to other existing facilities. Younger installations that have not physically developed the land may offer alternative MDC sites. While location in the community complex is correct for several reasons, the proximity of existing utility services and access roads may make the preselected site an economic necessity.

B. OTHER CONSIDERATIONS

If there is flexibility in site selection, or if analysis of the master plan warrants relocation, the site selection should be based upon the activity program and function understandings gained during Activity Selection (2-4 above). Useful information concerning procedures, methods, and criteria considerations is furnished by several sources in the Technical Manual series, including TM 5-803-1, Master Planning Principles and Procedures; TM 5-803-3, Site Planning; and TM 5-803-6, Site Planning of Community Centers.



A	B	C
+ Near Troops	+ Visible from Expressway	+ Ample Site Area
+ Near Community Facilities	+ Near Post Entry Gate	+ Easy Access from Local Town/ College
- Constricted Site	- Within Air Field Flight Path	- Poor Soil Condition
- Potential Traffic Generator through Preserve, Housing	- Distant from Support Facilities	- Heavy Transport Noise

FIGURE 2-5.1 LOCATION CONSIDERATIONS-INSTALLATION MASTER PLAN

The process of locating the MDC facility is carried out jointly by the MDC staff and the facilities engineer, for best understanding of the local situation and needs. Continuing dialogue will be required concerning the determinants of installation geography, available sites and fitness to the needs of Music and Drama Program. The most significant factors are noted here.

1. Proximity

Other military community facilities and housing areas for troops and their families should be nearby, preferably within walking distance. This places the activities in the participant's domain. Perhaps more important is proximity to related community facilities. This increases daily visibility and awareness of coming events. Moreover, theater has the best chance for success when it becomes part of a series of evening events. Many theatergoers enjoy dinner before the show or a social drink after. The nearness of post recreational activities or clubs can provide that sense of making a "whole evening" out of a visit to the theater.

2. Accessibility

In order to have a larger and diversified audience pool to draw from, it may be beneficial to include the surrounding civilian communities. In this case accessibility is both physical and visual. Not only is nearness to the main gate desirable to avoid lost civilians wandering around the post, but of equal importance is the prominence of the site (on a hill, for instance). The building becomes a reference point.

Vehicular access has several dimensions to consider. If transit systems are available, a good deal of congestion can be avoided at performance times. Otherwise, primary roads should connect town and troop areas to the MDC without invading quiet zones and housing areas.

Parking space will be needed, normally at a rate of one space per four seats full capacity, plus spaces for cast and crew. Since performance normally occurs in off-peak hours, location near daytime community facilities can make use of existing parking spaces.

Service access also becomes a site selection factor. Loading of bulk items and road shows requires that access to the stagehouse be negotiable by semi-trailers. There are also access/ proximity considerations where production fa-

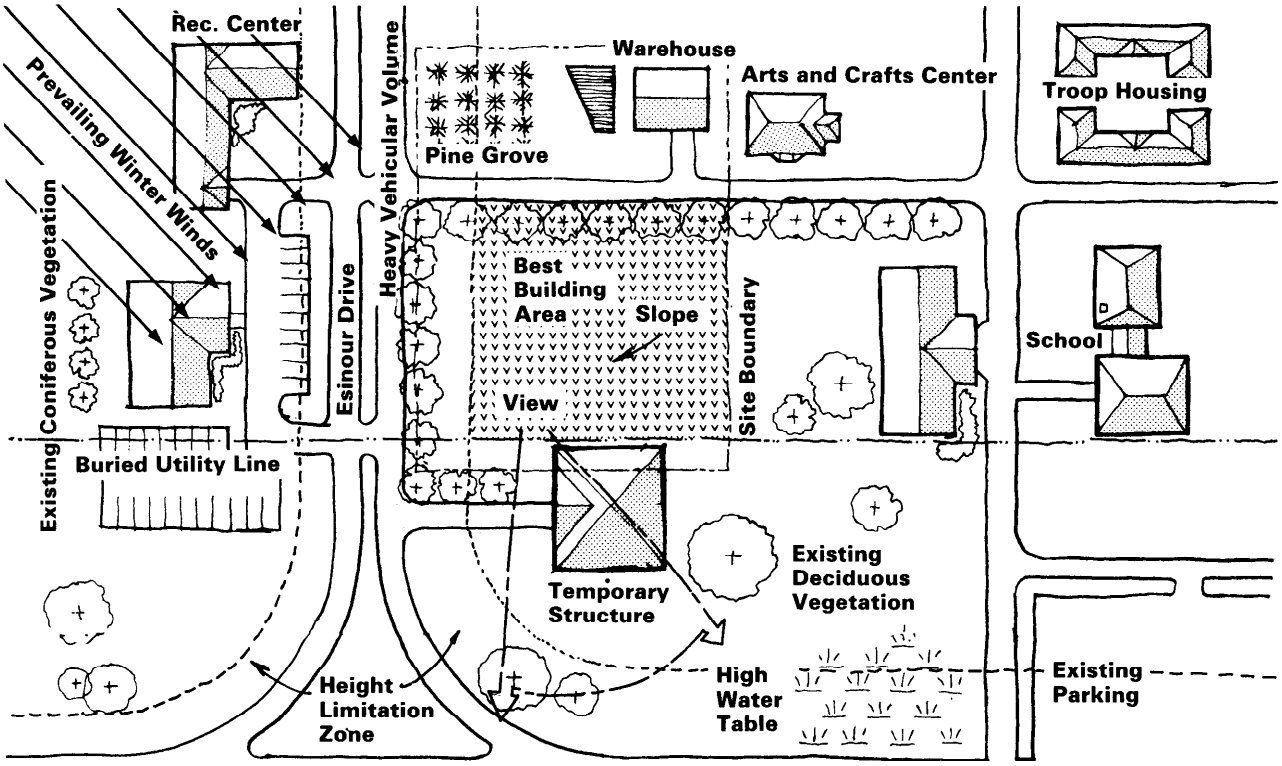


FIGURE 2-5.2 TYPICAL SITE ANALYSIS DIAGRAM

cilities (warehouses, workshops) are separate, although such arrangements should generally be avoided.

3. Site Area

Along with parking and service areas, future expansion of indoor or outdoor spaces are significant determinants of the site size. Space limitations require planners be prepared to take maximum advantage of outdoor waiting spaces for capacity crowds. Since site selection occurs before the MDC's exterior configuration is known, an ample margin for variation is needed. Also, proximity is a significant factor in noise reduction; don't overlook flight paths, machine shops, laundries, youth centers, target ranges, and other potential noise sources.

4. Identity

Prominence and community context have been mentioned. There are other considerations, such as familiarity with the location of an existing temporary facility, or relationship to a local landmark that gives special meaning to the site selection.

2–6. COMMAND APPROVAL

Program definition and site selection are the first major steps toward securing a Music and Drama Center. Continuing with the MCA process requires that the installation proposal receive authorization as short range construction program (SRCP) line item. Authorization takes the form of guidance from the appropriate major Army command to proceed with limited documentation of project requirements. This guidance is the product of a priority programming system that determines annual project initiations.

The installation master plan is in fact a list of facilities for ultimate development; each year the installation commander submits to HQDA a list of components in order of priority, separately identifying those funded from MCA. Other command levels add their own priorities, a summation is made, and a revised list is sent back down consisting of projects included in the Five Year Defense Program. From the top of this list, major commanders select the SRCP projects they desire to submit to Congress for funding.

Clearly, the using service objective is to achieve the highest priority status it can, beginning with the installation commander. It is wise to plan carefully a presentation to the commander and installation planning board, building on previously earned support (see 2-4e). Not only must they be convinced of the program's importance, they must also receive ample information to back up the request for high priority in dealing with major command. The main points for presentation are discussed below.

A. DESCRIPTION OF PROGRAM FUNCTIONS

Description is the key term. It need not be elaborate, and indeed should be concise and orderly, underlining primary activities, the kinds and frequency of performances anticipated, the people who will be involved, important developmental activities, and the general scope of facility requested, including its site. Create an overall understanding of how the pieces fit together and what the facility might look like. It is not recommended to design its appearance, but a careful selection of illustrative material speaks volumes. For example:

1. *One or two reference diagrams depicting primary and secondary space uses in relative scale and relationship. Use simple geometric shapes without labored, intricate organization. Basic logic should read at a glance.*
2. *Photographs of the site, preferably from the viewpoints most visitors would have. Include adjacent buildings and terrain. One photo may be overlaid with the outline of a rectangular volume approximating that of the facility. Remember to include a person in any photo to give it scale.*
3. *Photographs or clippings of comparable facilities or significant portions of them, to illustrate your verbal presentation as you make it. Similar illustrations will be found in Chapter 5.*
4. *A calendar or bar chart showing a hypothetical schedule of anticipated events, explaining overlaps and lead time needed for production, and the active participants involved at any given time.*
5. *Photographs of current staff and soldiers engaged in production activities like set-building, music practice, stage lighting, tryouts and rehearsals. Also show audience activities, cast parties and ceremonies related to discussion of these topics.*

Illustrations should be thought of as gestures. They help round out the substance of description, but they should not overwhelm it.

B. SUPPORTING DATA

A summary of the information collected during the programming process may be submitted prior to the presentation, especially if the commander has already had an opportunity to review preliminary findings. The quality of this data is an important factor in determining the project's status, but it must be accompanied by a brief interpretation explaining its relation to significant features of the proposal. The data consist of facts and figures: population analysis, survey results, basis for budgeting space, manpower and operating costs, traffic and parking counts, historical costs and activity rates and current inventory of applicable equipment. The summary should report the decision making process which led to the proposal and a description of long range objectives and temporary deferrals. Accurate recordkeeping during the program exploration will prove invaluable here.

C. PROGRAM JUSTIFICATION

An essential ingredient of the presentation is a brief, cogent statement of the need for this project in relation to installation mission and the soldiers' proficiency and preparedness. Specific reference is made to Morale Support Activities and skill development opportunities. Requests for unusual or nonstandard elements must be justified by demonstrated economic analyses (cost-effectiveness), their essential role in the overall program (negative effect of deletion), or special requirements not anticipated by existing criteria (local conditions). A detailed discussion should be appended to the supporting data summary. The district engineer can assist in the preparation of this material, much of which can be used to substantiate costs and needs when seeking Congressional funds.

2-7. ESTABLISHING PROJECT REQUIREMENTS

Receipt of Short Range Construction Program guidance is the signal to prepare formal submission material in accordance with regulations for MCA projects. This is a joint effort of the using service and facilities engineer, intended to specify functional requirements in a way that methodically defines the uses and performance criteria of the building by reference to existing standards and this Guide. A preliminary cost estimate is made at the same time and the entire package sent back to major command with DD Form 1391, an important summary of project data and justification of its requirement by the installation. The process is essentially a codification of the material prepared for installation command approval.

If the project is then placed in the SRCP and approved, a directive will be issued by OCE to the district engineer or construction service field office to proceed with concept design. The construction service compiles design criteria (a nuts-and-bolts parallel of functional requirements) and pre-concept control data, which include a project site plan, basic building plan, outline specifications, and refined cost estimate.

A. PROJECT DEVELOPMENT BROCHURE

The statement of functional requirements (PDB) is the principal project reference for planning, design, and evaluation. It is written in language comprehensible to the using service, major command, the construction service and design personnel. TM 5-800-3 contains complete instructions for its preparation, which parallels the content of this chapter of the Design Guide. AR 415-20 establishes procedures.

The using service must bear in mind that this is the last major opportunity to state its requirements in the most complete, specific form it can, including those requirements difficult to quantify. The statement of design criteria prepared by the district engineer is a further elaboration of PDB content. But the using service should not assume provision will be made for anything that is not called for. This is also the time to request any departure from the normal process of design development.

B. BUDGET DATA

The using service will furnish a budgetary estimate to accompany the DD Form 1391. The estimate is developed in accordance with AR 415-17, Empirical Cost Estimates, for the primary facility and supporting facilities defined by AR 415-20. Primary facilities will be in the code category 740-76 unless amended listing is issued.

In addition to this estimate, a general site plan will be furnished for a proposed facility sited in accordance with the DA approved master plan. If the facility is not so sited, both general site plan and a specially prepared detail site plan will be furnished in accordance with AR 415-15.

C. DD FORM 1391

This is a summary project description to be completed with the greatest care, following procedures detailed in AR 415-15. Every block should be completed with special attention given to the description of the requirement for the project. This is the only written summary justification that reaches OSD, OMB, and the Congress. More detailed justification is prepared only for the Army witness presenting program and budget requests at the DA level.

2-8. FUNCTIONAL PLANNING

Functional requirements and criteria cannot be developed without reference to subsequent chapters of this Guide. However, it is possible to outline the kinds of information involved, suggest an orderly approach to recording and presenting it, and remark on special considerations arising in military construction projects.

The basic PDB illustrated in TM 5-800-3 is inadequate for defining functional requirements of Music and Drama Centers. Although it is intended to furnish statements of special requirements, its topical procedure has been designed for relatively routine construction programs. It is at once too specific to guide overall thinking (“type of curb and gutter desired”) and too general to sensibly emphasize exceptional needs (“ceilings: height, finish, acoustical treatment, additional information”). In short, using service planners are urged to supplement the standard PDB extensively.

The using service's task of planning will be considerably facilitated by the detailed listing and consideration of activities generated from program definition. It is the MDC staff who best understand what takes place in the scene shop, the lighting control booth, the practice room, and the ticket office.

These and all other activities have direct implications for the architectural substance and environmental conditions required (functional requirements). As a starting point, it may be helpful to adopt an existing facility of similar scope and intended use, or pieces of several, for the purpose of analyzing what is and is not germane to the actual program activities; what adjustments, additions, deletions would make various spaces conform in use to the special needs of the project. Figure 2-8.1 categorizes (names) various activity centers for consideration. A much more extensive treatment is offered in subsequent chapters to be consulted.

Each activity center (or space use), can be described by several characteristics, some of which have quantitative factors (measurable attributes). The appropriate characteristic, measurable or not, is a criterion. In formulating functional requirements, address each space use with at least the characteristics discussed below.

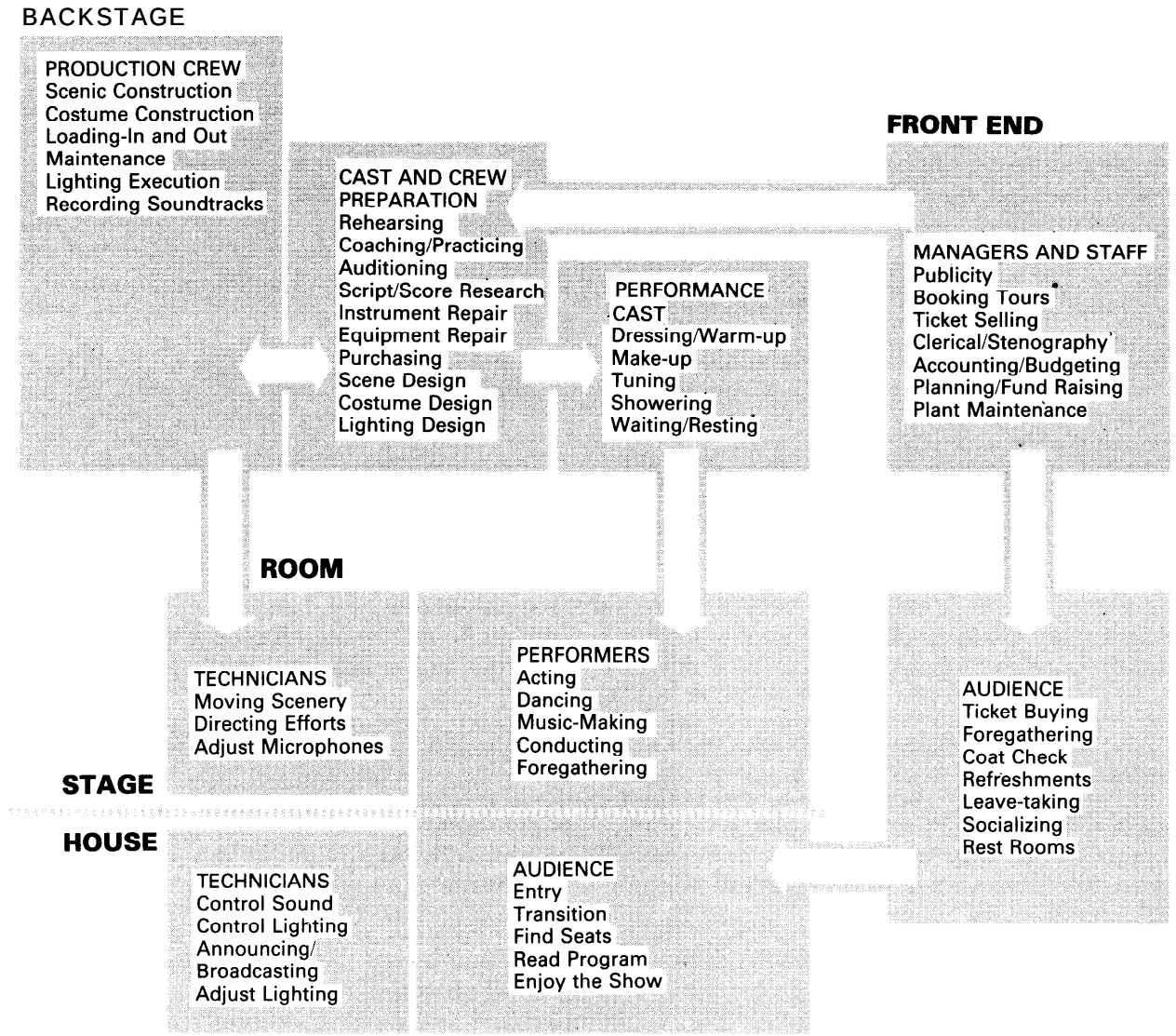


FIGURE 2-8.1 ACTIVITY CENTERS

A. RELATIONSHIPS

This characteristic governs relative positions within and among physical components and occupants. First distinguish conceptual from functional relationships.

Conceptual statements express the quality of a space, usually by analogy to common experience (the main entry should be like a front porch, the proscenium is a picture frame). Conceptual statements are important, useful information for the designer and should not be discarded or discounted. But the conceptual characteristics cannot be dimensioned or verified operationally, even though they may have a vital function (to make people welcome, to provide locational reference).

Statements of functional characteristics imply the measure of attainment (light switches within reach, a vestibule large enough for two wheelchairs before entering the auditorium). The using service should state special or unusual functional relationships clearly, and also express general requirements that affect groups of spaces. Adjacency, proximity, separation, connection, overlap, and sequence are relationships in three dimensions and time, preferably dimensioned by distance and degree (open, closed, partial; always, never, sometimes). These considerations may seem elementary except to the audio engineer who finds himself in a soundproof booth unable to hear what he is controlling, or to the actor who must leave the building and reenter by another door in order to cross the stage unseen.

In the MDC, functional groups that are particularly sensitive to physical relationship criteria are the Performance Room itself, technical accessories like theater lighting, stage dressing and acoustical supplements, access and circulation, and process-oriented activities like set and costume construction.

B. SIZE OR CAPACITY

Unit measure of floor area is employed extensively as a common denominator of many criteria, and is therefore especially important. The constraints of maximum facility scope and cost are unfortunately expressed this way, with little

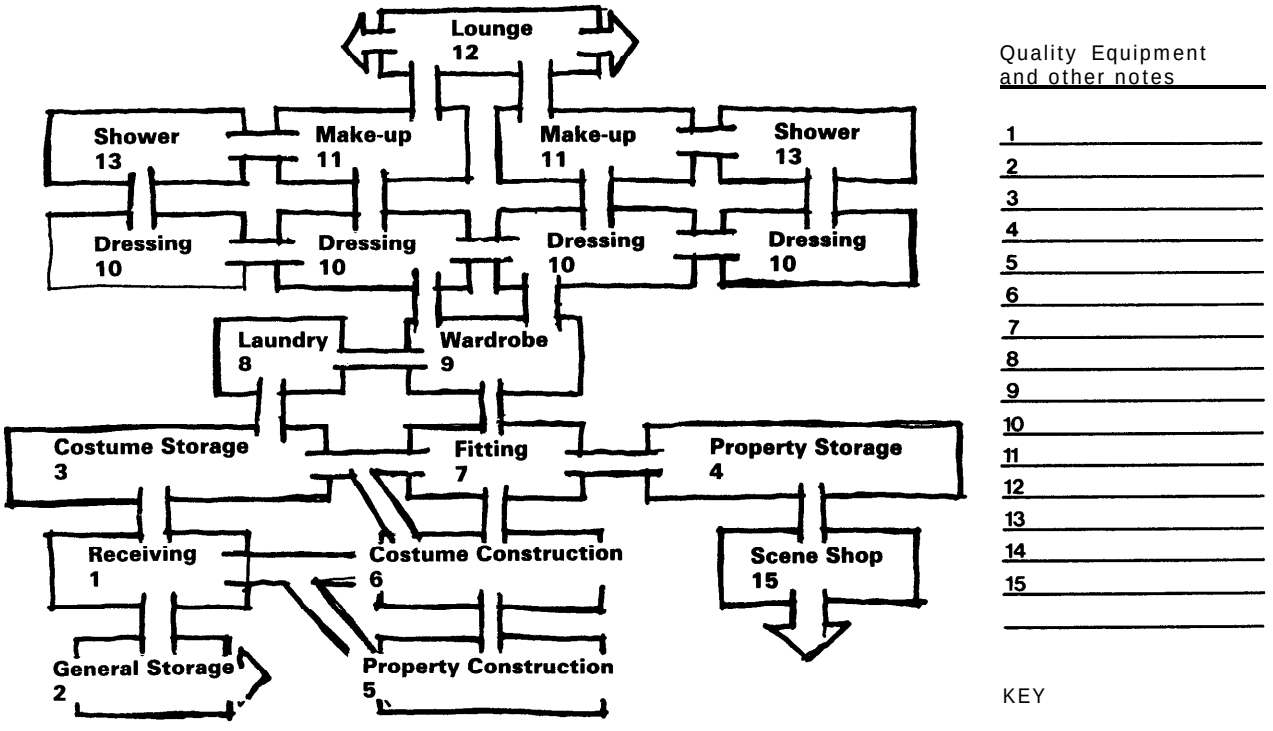


FIGURE 2-8.2 PROCESS RELATIONSHIPS NOTATION

functional direction (soldiers per square foot, dollars per square foot) beyond statistical averages. Except for applying regulation constraints, the square foot characteristic should be used thoughtfully (for required stage area or viewport size, for instance). In most cases, dimensioning should be done by use, such as number of people seated, space for a grand piano, turning area for a semitrailer, and storage for fifty stacking chairs.

There will be some minimum functional size or capacity not readily apparent, such as allowance for future growth of lighting equipment inventory, in which case an area figure generalizes. Other capacity factors might include provision for blank conduit and cable trays, power service, structural design loads, rigging sets and battens, microphone jacks and similar system characteristics.

C. EQUIPMENT

This characteristic is singled out because of the Army funding policies, which differentiate built-in equipment from moveable equipment. The MDC planner may have some problems here since the "essential" nature of certain equipment may not be evident to the budget reviewer. AR 415-15 paragraph 7-4 should be studied carefully. Equipment that can be built-in without impairing its functional quality should be so described to avoid confusion.

For example, theater lighting systems and instruments are certainly essential to the primary facility, but it may not be realized that portable dimmer racks. (part of the system) are functionally preferable to fixed dimmers, or that the stage and certain railings are preferably demountable in part and adaptable in general. Loose seating requires built-in storage depending on the selected chair.

A separation list of essential equipment must be made. If it is not part of the construction contract but proposed for MCA funding, consult AR 37-108 and paragraph 3-22 of AR 415-15.

D. SPECIAL DIMENSIONS

The using service should be on the alert for spe-

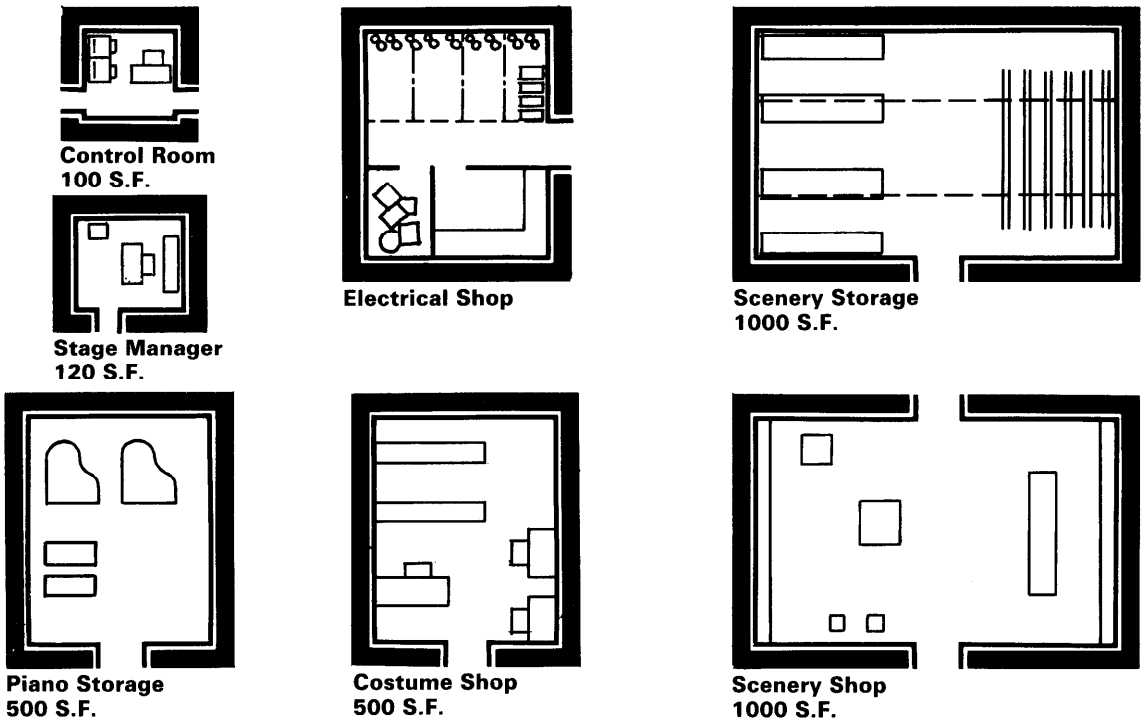


FIGURE 2–8.3 SPACE ALLOCATION NOTATION

cial dimensions in addition to relationship and capacity measures. The piano lift is useless if the piano cannot be maneuvered onto it. The follow spot booth can be ample in size but have a window too small.

Circulation and access routes are obvious candidates for scrutiny. Critical clearances should be stated in operational terms (e.g., require the ability to move an 8 x 16 x 16 foot piece from truck to shop to stage rather than request a 9 foot cooridor). There will also be critical distances connected with lighting, acoustics, and vision; critical proportions related to stage and room areas; and critical elevations for rigging iron. Many of these are covered by design criteria in this Guide, but variations must be noted.

E. PRIORITIES

Characteristics should be numbered and grouped by priority. Wherever desired characteristics might reasonably be in conflict as design proceeds, state which is more important: seating capacity, comfortable legroom or viewing distances.

F. OTHER CHARACTERISTICS

There is no particular limit to the number and detail of functional requirements the using service planners can state, provided they feel confident they are correct, verifiable, and reasonably practicable with respect to larger issues and budget. At the same time they should not feel compelled to spell out requirements that are normal good practice. It is fair to assume competent designers and technical consultants will be retained in accordance with Chapter 1. When determining characteristics in terms of specific activity groups, general building characteristics cannot be overlooked. Criteria for noise control, illumination levels, relative humidity, and security which affect the entire building should be defined by using this Guide and other technical references.

2-9. SITE PLANNING

A. GENERAL CONSIDERATIONS

The principles of Functional Planning can also be applied to Site Planning. However, there are three conditions which should be considered. First, site planning for an MDC contains relatively few special criteria not previously identified in TM-5-803-1, 3, 6 or TM-5-830-1 (See Table 1-5-1). Second, the using service will not have examined outdoor activities with anything like the detail of indoor programs, which is the basis for functional planning. However, a certain level of detail has already been achieved in Paragraph 2-5, Selecting the Site. Third, the military construction program emphasizes site planning in advance of building concepts and identifies it separately for budget data, requiring a rather complete analysis for the PDB.

Climate conditions and the utility services are determined prior to the development of mechanical system concepts and potentials for utilizing outdoor spaces. Since significant funds are involved in site improvements, the using service should pay attention to their effective deployment and recognize it will ultimately be responsible for upkeep.

B. ACCESS AND PARKING

In addition to the site selection considerations discussed in 2-5, the using service should explore possible alternative uses of paved areas in fair weather. This can boost attendance and public visibility, and can permit continuing local activity while the theater is dark for dress rehearsals, setting and striking major productions.

If a desirable activity program includes occasional shows drawing audiences in excess of normal capacity, an outdoor amphitheater seating area related to the stagehouse might be considered. Special attention should be given to the establishment of overall site development conditions which are compatible with provision of accessibility for the physically handicapped. Refer to DOD 4270.1-M, EM 111O-1-103 Design for the Physically Handicapped and ER 1110-1-102. Where required, steps and stepped ramps should conform to TM 5-803-3.

C. SITE FURNISHINGS

1. Signage

Site signage has three main functions: to identify the facility, to direct various groups, and to regulate vehicular traffic on the site. In some cases

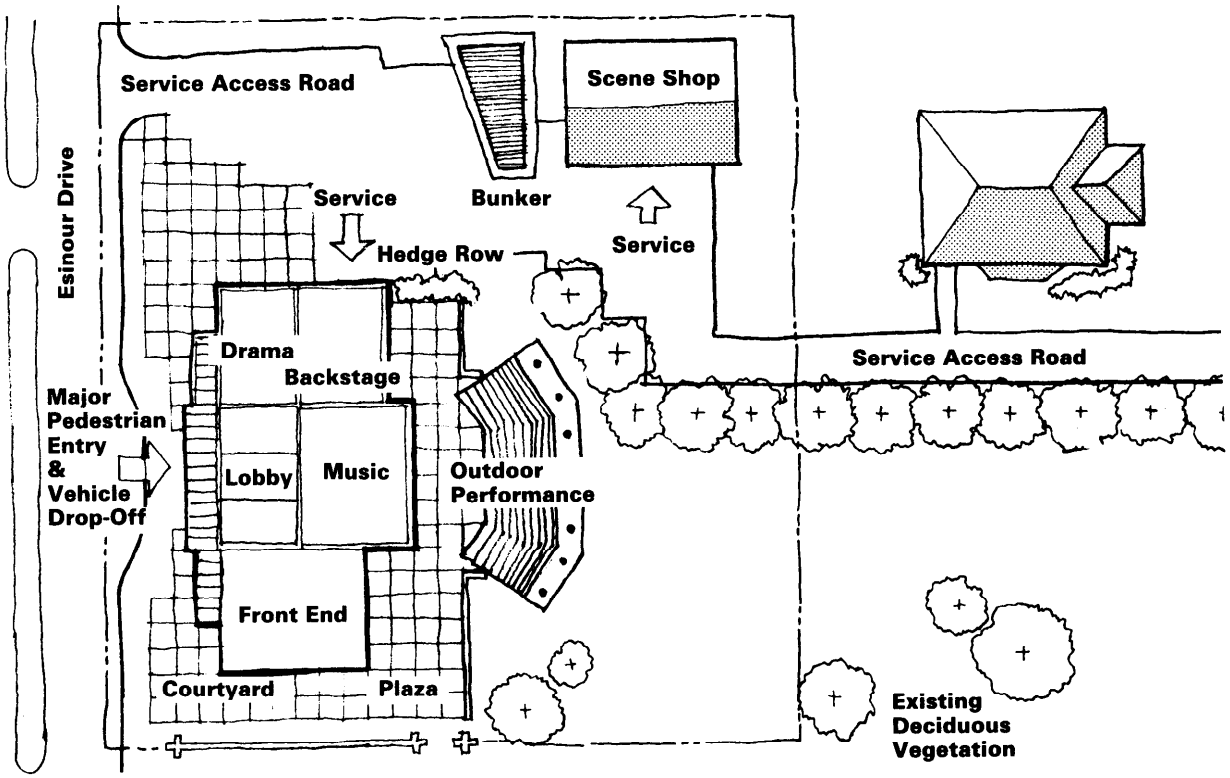


FIGURE 2-9.1 SITE PLANNING

the design of the building itself will be adequate signage to identify the structure. Traffic control and other directional signage should be simple, easily read and large enough to be seen from a moving vehicle.

2. Lighting

In general refer to the guidelines established in DOD 4270.1-M and TM 5-803-3. A combination of exterior and interior lighting should improve the relaxed atmosphere surrounding a performance. The tone of lighting design should surpass the strictly functional security and safety lighting required of all buildings.

3. Other Furnishings

The colors, shapes, scale and placement of benches, bollards, handrails, steps and other gradechange "edges" should enhance the feeling of public space that is both part of the Music and Drama facility and the street. Extensions of indoor public spaces are to be paved and furnished with consideration for visitors in 'dress" attire.

D. PLANTING

Typical site plan development will include new plantings of trees, shrubs and grass, and where possible the preservation of existing vegetation. For guidance see TM 5-830-1 and 4 and TM 5-803-3. Planting design should consider the selection of plant materials which are readily available and easily maintained and compatible with the environment. The ultimate growth characteristics of all planting should be considered, as well as their effect on the micro-climate.

E. IMAGE

The impression created by the building and site is as important to program success as it is to the more general goal of design quality. Persons approaching the site by car normally view the building from an oncoming angle of 30 to 45 degrees. This oblique view of the facility gives a person his first impression of the structure and signals him to prepare to turn into the entry drive. For this reason location of parked cars, stands of trees or shrubs, or obscuring landforms should be taken into account. Traditionally, people gathered in a forecourt or inside a lighted lobby visible from the street serve as a

theater's most inviting advertisement. Since the largest element of a theater building is always windowless for light and sound control, the lobby or entrance foyer will be the element which visually and physically connects the facility to the outdoors and the street. The public approach to the Music and Drama Center should be especially inviting and in the spirit of an arts oriented facility.

The influences of local architectural traditions should be considered, as well as significant historical and cultural landmarks with which the population already identifies. The facility must have an architectural integrity of its own; it is unwise to parrot the design style and details of an authentic historic building. New and old will both suffer in the comparison. Respect for neighboring facilities of historic importance should be maintained by thoughtful use of compatible or sympathetic forms, details, textures, colors and materials.

Climatic conditions will also affect the final design's appearance according to the degree of shading, openness, wind exposure, and softening influence of landscape elements.

2-10. ENVIRONMENTAL SYSTEMS PLANNING

Performance facilities pose unusual problems for mechanical systems design; normal practice will not suffice. The mechanical engineer for an MDC should demonstrate qualifications similar to the architect's, and begin his work very early in the design process to ensure its integration, careful detailing, and ultimate efficiency. Technical criteria are noted in Chapters 3 and 4 and several Technical Manuals, while DOD 4270.1-M states Army-wide policies. From the planner's viewpoint, the using service should understand the characteristics of properly operating systems in relation to the functional requirements of performing arts activities. These are discussed in Chapter 3 and broadly categorized below.

A. HVAC

Every MDC will require air conditioning in its construction, designed to overcome the high heat gain from lighting instruments, large crowds and physical effort. In the closed, windowless environment, the system also provides ventilating air changes and maintains year round constant relative humidity. Particular attention is paid the air distribution subsystem in performance spaces to minimize noise transmission and noise generation. Air movement must be carefully regulated to prevent drafts that cause curtains to billow,. scenery movement, and acoustical aberrations.

All mechanical equipment should be as remote from performance areas as possible, preferably independent of the main building structure. Economy demands consideration of incremental capacity to deal with large variations in load, seasonally and daily. Finally, given the installed capacity of air handling equipment, its potential should be explored as an emergency exhaust system in case of fire.

B. ELECTRICAL

Power service requirements are established by a relatively high peak demand resulting from lighting, electro-mechanical devices, and air conditioning. Adequate allowance must be made for reserve and future capacity, and flexibility in power distribution with a proper selection of voltages.

Design of theatrical lighting systems is the province of special technical consultants, and functionally separate from the ordinary building system. But the same standards of safety and workmanship apply to both. The using service will identify in its functional requirements all known special equipment loads and voltages. It will also specify any unusual illumination requirements in work areas and accessory spaces, and note outdoor spaces to be developed with lighting and/or power supply.

C. PLUMBING

Standard technical criteria apply to plumbing, water supply and sanitary waste disposal. However, the functional requirements of backstage and public facilities must be delineated by the using service. In particular, provision of sufficient lavatory basins in makeup rooms, toilets and showers for the cast and for the stage crew, and laundry hook-ups in wardrobe maintenance

Utilities																
			POWER													
		FUEL														
	WATER															
SEWER																
	Storm Drainage	Sanitary Waste Removal	Water for Fire Prevention	Cold Water	Hot Water	Cooling Air Conditioning	Heating	Ventilation	Lighting	Emergency Generators	Motors	Communications/Security				
						■	■	■	■					Latitude	LOCATIONAL CONTEXT	System Selection & Load Factors
						■	■	■						Climate		
	■	■	■	■	■	■								Water Supply Line Availability		
						■	■	■	■	■	■			Power Supply Line Availability		
	■	■												Storm/Sanitary Sewer Infrastructure		
				■	■	■	■			■	■			Existing Mechanical Plant		
			■							■		■		Proximity to Fire Fighting Station		
					■	■	■			■				Local Fuel/Energy Sources & Availability		
					■	■	■	■	■		■			Facility Growth Potential		
	■					■	■	■						Micro-Climate	SITE CONDITIONS	
						■	■	■						Prevailing Winds		
	■					■	■							Vegetation		
	■													Soil Type		
	■	■												Depth to Water Table		
	■	■				■	■	■						Topography/Slope		
	■	■												Watershed		
			■	■	■	■	■	■	■	■	■	■		Use/Activity Types	BUILDING FACTORS	
		■				■	■	■	■					Number of Occupants		
						■	■	■	■	■	■	■		Hours of Operation		
							■	■	■					Heating Design Temperature		
						■		■	■					Cooling Design Temperature		
					■	■	■	■	■		■			Mechanical System Efficiency		
				■	■	■	■	■	■	■				Solar Energy Assist		
						■	■	■	■					Building Orientation		
						■	■	■	■					Configuration		
						■	■	■						Volume		
						■	■							Surface Area		
						■	■	■	■					Fenestration Area/Type		
						■	■							Thermal Coefficients		
			■			■	■		■					Materials Selected		

TABLE 2-10.1 ENVIRONMENTAL SYSTEMS PLANNING INFORMATION NEEDED

areas are to be called out. Public toilets must include provisions for physically handicapped, drinking fountains made available in the foyer, and the possible inclusion of a unit kitchenette considered for extended use of public areas. Janitor's closets with mop sinks should be located near public facilities and backstage at stage level.

D. FIRE PROTECTION

Life safety precautions and property protection will strictly adhere to Chapter 8 of National Fire Protection Association's Standard No. 101. System considerations are detailed in TM 5-812-1 and their application prescribed by DOD 4270.1-M.

The using service in coordination with facilities engineers should be particularly clear as to the classification of assembly occupancy and stage types; these determine the kinds of construction and protective devices required. Fire protection subsystems include extinguishment (automatic or manual sprinklers, fire extinguishers and hose standpipes), smoke and heat detection and venting, and manual or automatic alarms. Exit directions and emergency illumination assist occupants to reach safety without panic. Containment of fire and smoke is a function of fire resistant construction, opening protectives and self-closing doors, and a fire curtain installed in a proscenium stage with flyloft.

E. LIFE CYCLE COSTS

For each installation, selection of environmental system components should include analysis of long term cost over the life of the building. This approach compares initial installed cost with the ongoing cost of operation and maintenance adjusted for inflation. An increase in first cost can sometimes be shown to result in overall savings. Using service and design personnel should both be involved in these decisions, since the special technical and functional criteria for MDC systems must not be compromised for minor hypothetical savings. Detailed analysis of alternatives is recommended.

2-11. INTERIOR PLANNING

Interior design features are to be developed in conjunction with architectural design. All features of the building relative to the interior design, whether they are furnished and installed as part of the construction contract or later provided by the using service, should be developed as an overall scheme. Standard practice for military construction projects requires that when estimating the cost of interior design components, all items of equipment and furnishing which are permanently built-in or attached to the structure are normally considered part of the construction contract. Items which are loose, portable or can be detached from the structure without tools, are generally provided by the using service under separate contract. Interior building surfaces, paint, floors and signage will be specified as part of the construction contract in coordination with the overall design.

A. ESSENTIAL ELEMENTS

In the planning stage, the using service must be able to identify the furnishings and appliances needed to carry out supporting activities, although the items themselves need not be selected until a preliminary architectural design has been made. However, provisions for certain kinds of furnishings affect the architectural design, as noted in section 2-8, and should be chosen early. These include major appliances, vending machines, office machines, power tools and knock-down furnishings that require storage.

B. FITTINGS AND FURNISHINGS

A tabulation of room contents accompanying each space use description is the most satisfactory means of accounting for furnishings. It will also assist the designer to understand the activities contemplated and lend substance to decisions about functional space configurations. Compiling a list might also help identify redundancies and those purposes which might be better served by built-in cabinetwork, closets or shelves.

C. FINISHES

In performance space, finish materials, colors, textures and details are normally chosen to support the architectural design idea, tempered only by practical and technical considerations which affect acoustics and lighting. It is this practical

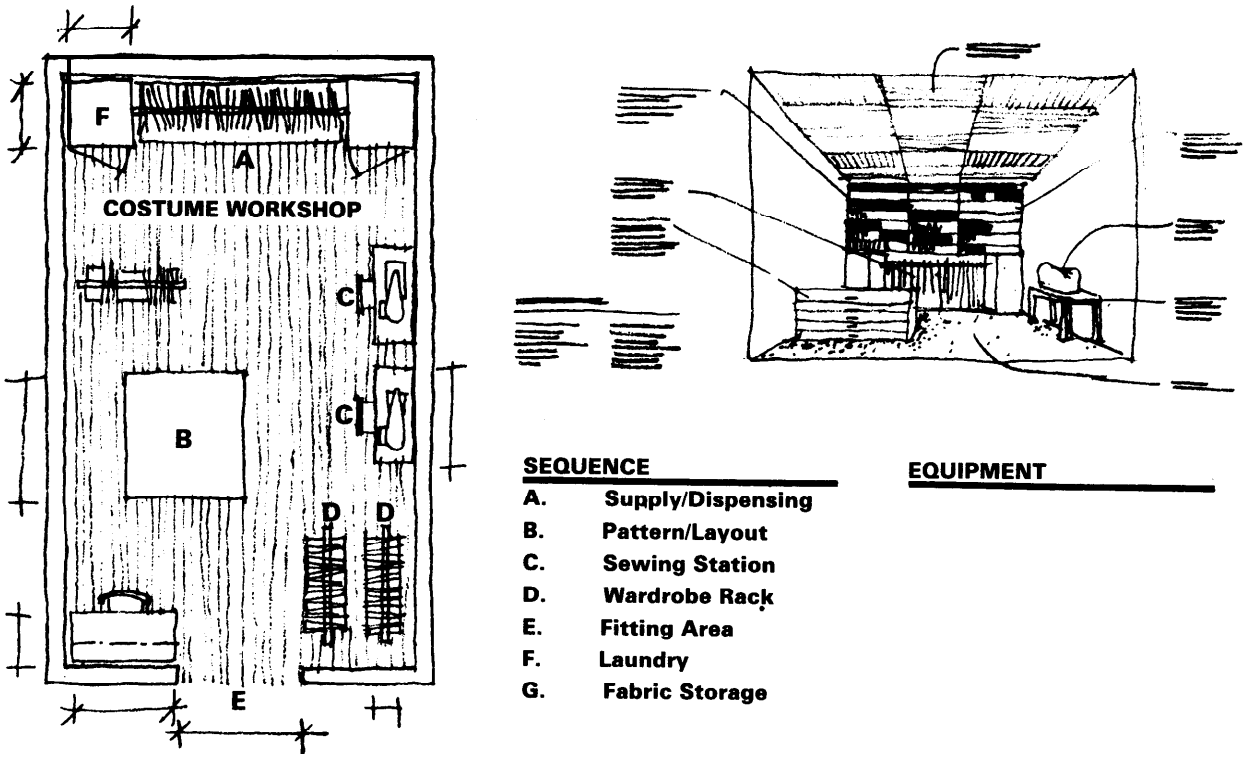


FIGURE 2-11.1 INTERIOR PLANNING

aspect that is appropriately noted as functional requirements. Certain uses may require specific finishes (e.g., smooth plaster for film projections, impervious finishes near washbasins). The using service should make plain its concern for low maintenance and durability, or if judged desirable, ease of replacement.

Finally, the using service should not hesitate to indicate the impression it wishes to convey; ceremonial, warm and inviting, elegant, contemporary, etc. These qualities may, in fact, have functional significance to program goals. Planners should refrain from stipulating color schemes, specific materials or brands on a purely personal, preferential basis.

D. SPECIFIED ATTRIBUTES

Chapters 3 and 4 will provide data concerning required criteria and details of functionally critical elements. These will include criteria for seating, wall construction, resilient dance floors, and illumination levels.

Specific finish attributes are also governed by regulations for life safety (flame spread and smoke production rates) and safe, barrier-free access (non-skid ramp surfaces, panic hardware, exit identification). Such considerations override all others.

E. MANDATORY SOURCES

Sources for selection and procurement of furnishings are listed in the GSA periodical listings of National and Regional Federal Supply Schedules, and the general GSA catalog. Procurement from these sources by the using service is mandatory provided the items available meet requirements.

2-12. COMPLETION RECORDS

A. GENERAL REQUIREMENTS

Individual projects will require the assembly of completion records prepared in accordance with AR 415-10 and current Engineering Regulations. Generally, the material to be included in these records will cover major design intention for the utilization of interior spaces and built-in design features. Records are turned over at the end of construction and include as-built drawings, equipment manufacturers' warranties and maintenance instructions, parts lists, valve and switch schedules, etc.

B. OPERATING MANUAL/USERS GUIDE

Since there is such a large proportion of special equipment and custom design involved in the MDC, an extra effort should be made to correlate normal completion records with additional useful information in a readable format.

It should include a summary of how the program and functional requirements were developed, memoranda of subsequent design reviews, recommendations of consultants, and modifications introduced during construction. Since the facility occupants may be new to it, every piece of information that can add perspective will be a valuable aid to making the best use of it.

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Design

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3-1. INTRODUCTION

Theater and concert hall design is both artistically and functionally complex. As in all architectural design, the making of qualitatively effective and technically functional space at an economical cost is paramount, but compared to other architectural building types, performance facilities are set apart by sophisticated electro/mechanical devices and technology needed to support performance. The ultimate fine-tuning of this balance of diverse, interdependent factors is the architect's and technical consultants' particular responsibility. However, during the process (outlined in Chapter 2) of designing an Army Music and Drama Center (MDC), many decisions must be made by the MDC staff and facilities engineers before the design professional is hired.

The MDC planners must be familiar with information in this chapter in order to complete the documentation required for project initiation and ensure that a project is in compliance with Army standards for good design. It is also strongly recommended that a technical consultant be brought into the design process as early as possible, preferably in the Project Development Brochure (PDB) planning stage of design.

In terms of project documentation this chapter provides basic information for development of the Design Criteria Requirements of the PDB. It should be utilized by using service staff, facilities engineers and technical consultants in program development, in formulating the functional requirements of the PDB and DD Form 1391, and in review of the Concept Design.

This Guide deals with the basic configurations and principles at work in performance facilities. Chapter 3 presents both general and specific guidance which affects the design for an MDC. The chapter is organized in three divisions corresponding to the three primary spatial divisions: the facilities which bring performers and audience together in one or more controlled relationships; the facilities which support performers and production; and the facilities which support the audience and audience involvement.

Each division begins with the largest, most inclusive definitions, disassembles them into manageable parts, points out how they are similar or dissimilar, and how they interlock. General standards for comparison and measurement will be developed along with the means for applying them.

Noise control ratings, illumination levels, anthropometric data, technical details and lists of equipment required will be further developed in Chapter 4.

To assist Design Guide users in finding relevant information within the logical context of its application, Table 3-1.1 summarizes the organization of Chapter 3.

DIVISION 1: THE ROOM

3-2. ROOM CHARACTERISTICS

A. EXTERNAL RELATIONSHIPS

The heart of any performance facility is the Room, the place of performance. The Room includes seating and stage. The definition of all other activities and spaces within the facility relates to the activity of performance and the Room, either directly or indirectly. Audience facilities are directly related in terms of capacity and access, and indirectly by the desired ambience and image to be created. Backstage facilities are directly related in terms of scene handling, stage form and stage access requirements, and indirectly by the use of the Room for rehearsals and set assembly.

B. INTERNAL RELATIONSHIPS

The three primary variables affecting physical characteristics of the Room are size, shape and arrangement of participants. These interact in the following ways: Size is implied by seating capacity, and by anticipated use of the stage. These factors vary with the formal relationship of the seating to the stage. Size is also linked to acoustic properties and perception of intimacy.

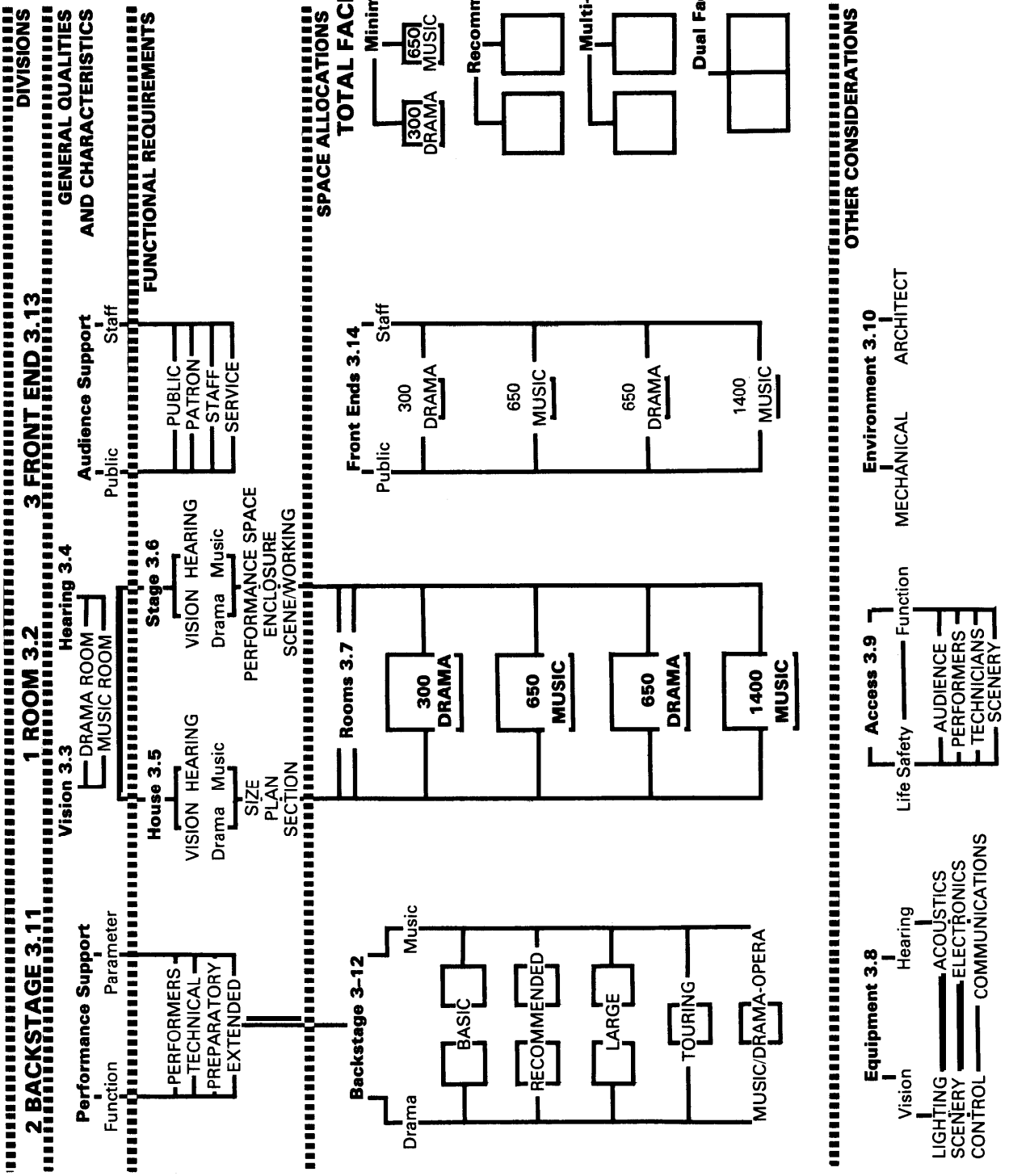


TABLE 3-1.1 ORDER OF CONSIDERATIONS

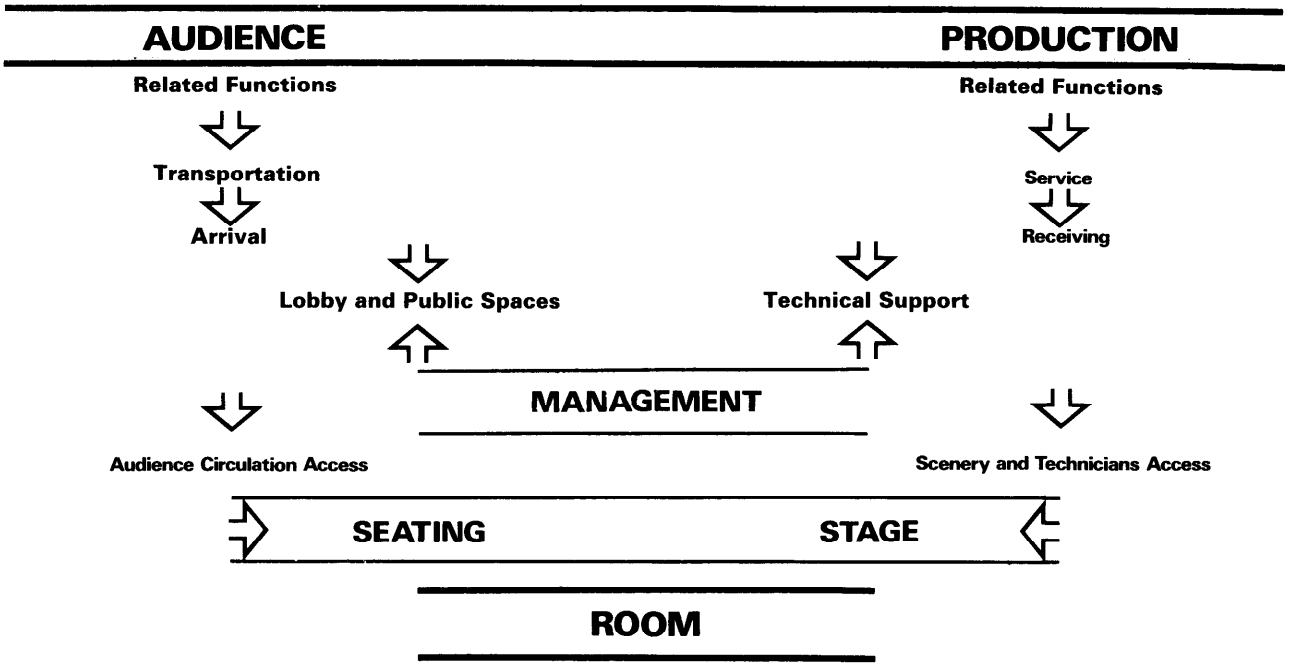


FIGURE 3-2.1 ROOM CHARACTERISTICS: EXTERNAL RELATIONSHIPS

Shape is implied by criteria for vision and hearing, and so interacts with size (volume and distance), but is most strongly defined by arrangement of people in the Room. Hence, the audience/performer relationship (arrangement) is physically and conceptually the first choice to be made. There are other variables; secondary considerations of accessory equipment, access to seating and stage, and appropriate environmental conditions also influence the physical character of the Room. Finally, questions of flexibility and adaptability stemming from the using service's program emphasis are very real factors of choice. These secondary and tertiary concepts will be introduced and developed as discussion goes on.

C. BASIC CHOICES

Major differences between music and drama first appear in Room design. However, there are a few important choices related to both uses, roughly corresponding to the three primary variables above. The choices are:

- ***Use of the Room for music, drama or both (shape).***
- ***Relationship of audience and performers in Frontal, Thrust or Surround form (arrangement).***
- ***Estimated seating capacity (size).***

In the context of Army Performing Arts program goals and constraints developed in Chapter 2, the force of logic favors answers that amount to "most likely" choices, although it should not preclude variation.

1. Uses

Will the Room be used for both music and drama, and if so, to what degree is each to be stressed? This question has many implications which will be discussed in conjunction with Room criteria for each use. This Guide assumes that in all cases one use will dominate according to program emphasis.

2. Arrangement of Participants

What will be the spatial and operational relationship of audience to performers? The most common forms this relationship takes all recognize the separateness of stage and audience. These forms are called Frontal (proscenium), Thrust (projected), and Surround (arena). In

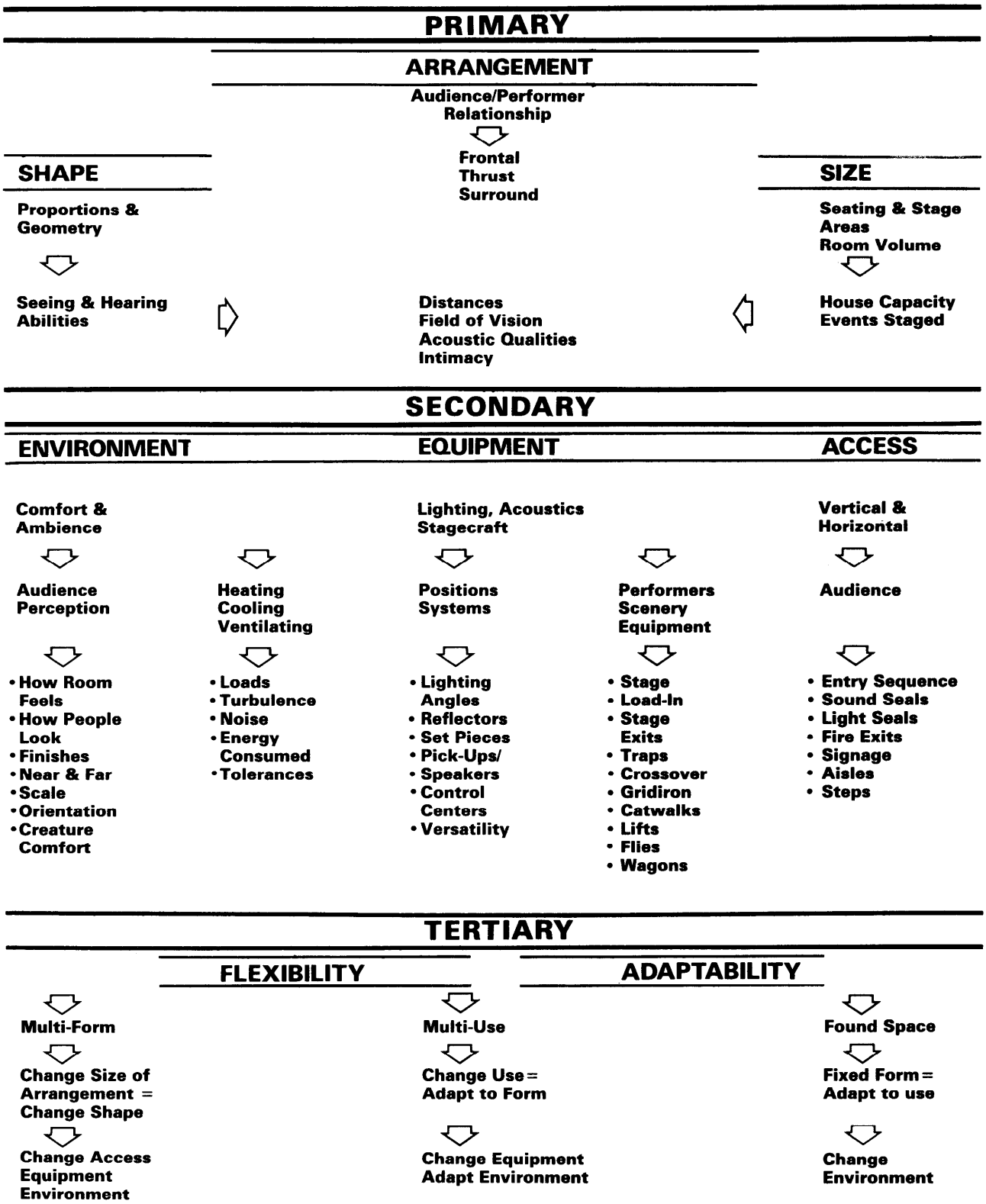


FIGURE 3-2.2 ROOM CHARACTERISTICS: INTERNAL RELATIONSHIPS

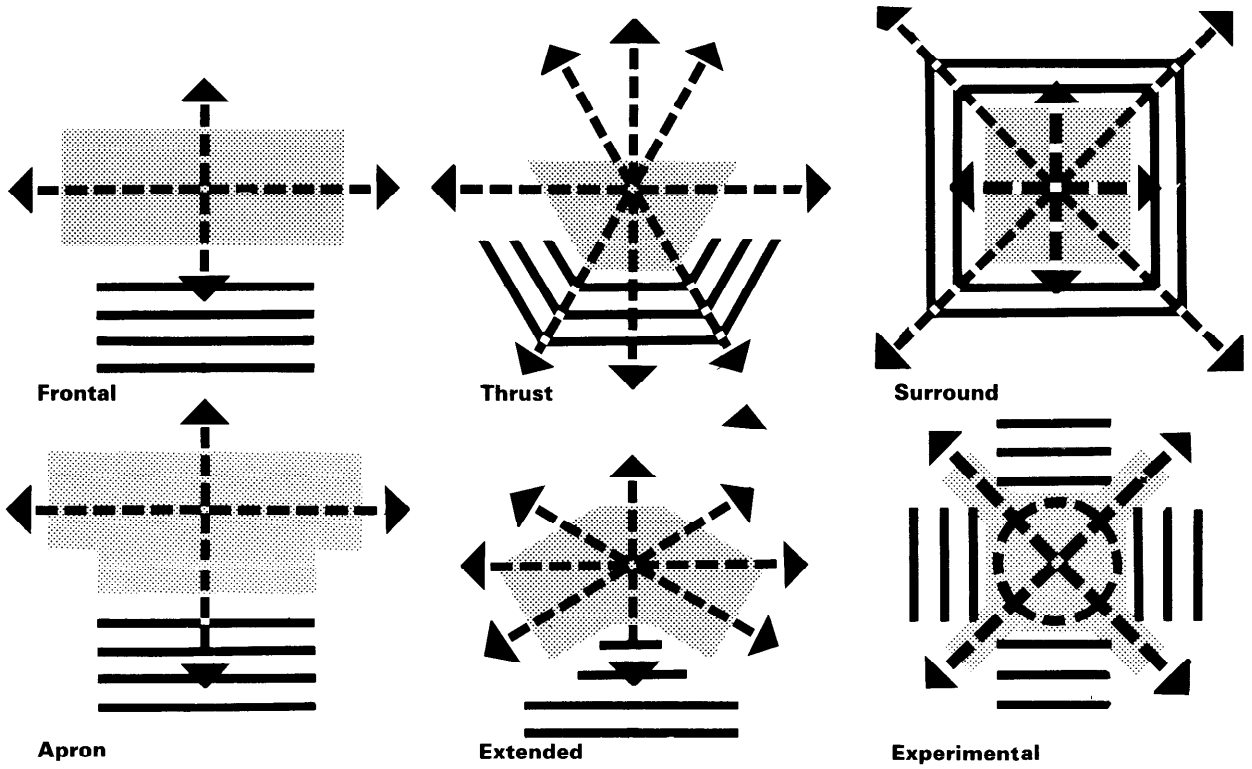


FIGURE 3–2.3 AUDIENCE-PERFORMER ARRANGEMENTS

Army performing arts activities the Frontal form offers substantial advantages, and in most cases this form will be chosen by Army Program Directors.

- ***a.*** *The bulk of repertory and music literature assumes Frontal.*
- ***b.*** *A proscenium is a ready-made frame of reference for actors, directors, and technical designers.*
- ***c.*** *Performers and audience have established expectations based on experience with the most common (proscenium) theater form.*
- ***d.*** *A proscenium generally results in maximum impact of scenic effect.*
- ***e.*** *Scenery creates opportunity for backstage involvement of non-acting participants.*
- ***f.*** *Pre-designed stage equipment relationships are most likely to provide consistent built-in production quality, with a 'memory" for improvements.*
- ***g.*** *Incoming touring shows are typically designed for the most common theater form.*

Moreover, the Frontal form is most versatile for the likely range of Army secondary uses (see Section 3-7 for detailed discussion):

- ***h.*** *Dance presentation will work if the stage is large enough.*
- ***i.*** *Variety revues find Frontal most adaptable to different acts.*
- ***j.*** *Public addresses, ceremonies and lecture demonstrations favor uniform viewing relationships.*
- ***k.*** *A range of music group sizes fit the stage, and established methods for adjusting acoustics are well developed.*

3. Audience Capacity

How large should the House be? How many seats? In terms of audience size, basic design criteria such as viewing distance and acoustical characteristics determine capacity according to performance type, Room volume, and Room configuration. However, in order to begin planning a new facility one must have some general idea of potential audience size, (see 2-4.d).

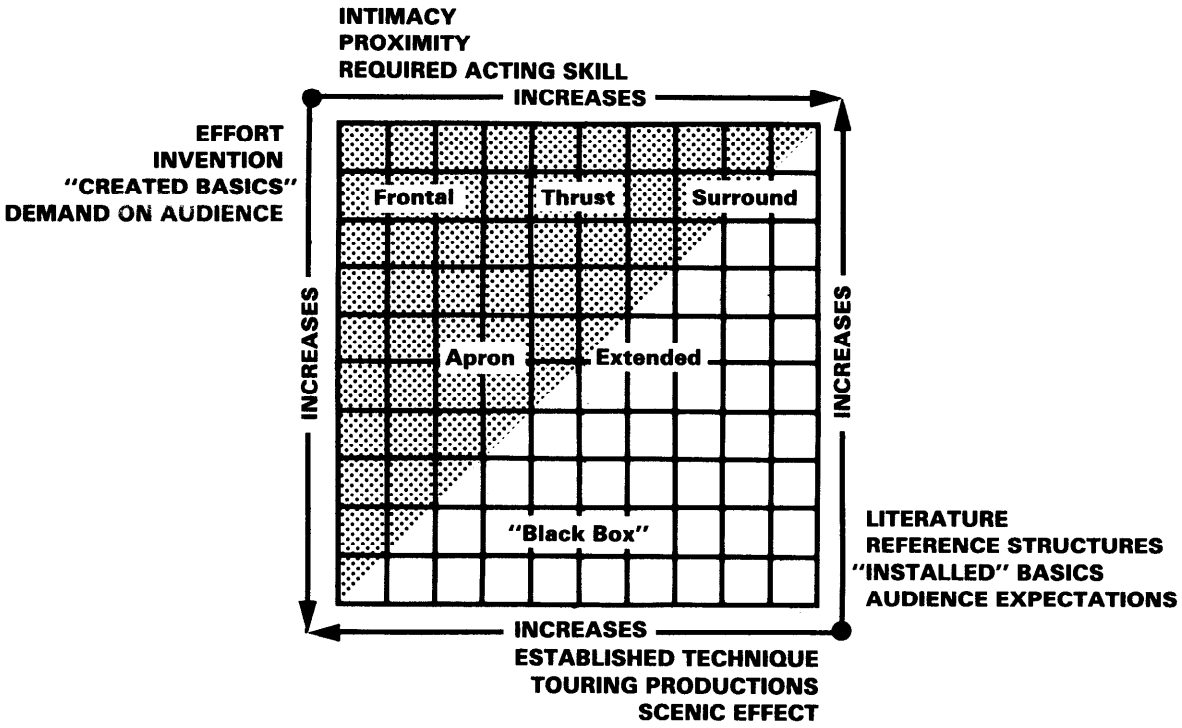


FIGURE 3-2.4 ROOM FORMS: PROBABLE CHOICES

This Guide will discuss three seating capacities as most likely choices for Army Music and Drama Programs. They have been chosen primarily because they work well with established music and theater design criteria. The capacities are approximate numbers which can give or take 100 seats.

Facilities of existing installations do not necessarily conform to these three groupings. Smaller houses of around 100 seats have been developed as dinner theaters adjunct to a regular drama program. Generally, dinner theaters require more square footage per seat, plus considerable food service area. They are most successful when an intimate relationship between audience and performer is established by the arrangement of the Room.

Many existing 300-500 seat Army facilities are conversions of former 1000 seat movie houses. The 300 seat range appears most commonly at small installations where space for support facilities (Backstage and Front End) are at a premium.

At an installation having a 500 seat facility used for varying types of activities, the Program Director found that 500 works well for most legitimate drama, is too large for "serious" plays, and too small for musicals which consistently sell out.

a. 300 Seats:

For technical reasons 300-seats represents a small legitimate drama house for a modest, local community audience. It offers economical production, which in turn encourages exploration and frequent turnover for varied experience and participation. Its concept is pre-professional or avocational involvement. A smaller house lacks "critical mass" to appeal to general audience interest and will find it difficult to justify the cost of equipment needed for a working plant.

b. 650 Seats:

Because it verges on the limit of optimum vision conditions in a Frontal house, 650-seats represents a large legitimate theater. Of course, there are many larger commercial theaters. For music 650 corresponds to the smallest music house likely to be built as a singular facility. Smaller rooms are not ruled out, but they are technically limited to music forms,

such as chamber quartets that comprise a very small portion of today's listening audience.

c. 1400 Seats:
By American standards 1400-seats represents a large recital-ensemble room, or a medium capacity concert hall. Most recent symphony halls, partly for economic reasons, seat 2300-2500 (a practical upper limit for Frontal design with natural acoustics).

While the Design Guide's emphasis of primary-purpose Frontal form facilities of three capacities is intended to add clarity in subsequent discussion, these "most likely" choices are also founded on functional and practical considerations special to the military context. In general, the economic forces and institutional motivations at work in civilian communities inevitably result in slightly different trends, toward large capacity multi-use stagehouse rooms and more modest open stage or non-Frontal theaters. However, basic design principles are similar.

Unlike many privately sponsored performing arts facilities which develop over many years, permanent Army MDC's are expected to be one time capital expenditures, completely operational on opening day. It will be advantageous to choose a theater design that provides today most of the physical plant and technical components foreseeable as future needs. The chance to add a stagehouse, orchestra pit or balcony, or to otherwise appreciably alter a permanent facility, is remote. In part, the Design Guide emphasizes the Frontal Room equipped with a fly-loft because it utilizes (and illustrates) the most frequently desired hardware lacking at existing (temporary) Army installations. In addition, there are many practical arguments favoring the proscenium theater/concert hall for military communities.

These considerations notwithstanding, open stage, Frontal, non-Frontal (Thrust or Surround) and adaptable configurations may be appropriate choices in some cases. Section 3-8A outlines important differences in the use of an open stage, but its main feature is the substitution of movement, lighting and relatively portable stage pieces for the more traditional scenic investiture.

A serious non-Frontal facility might be undertaken in response to a well-defined need in the community (for instance, if it already has a good conventional theater) or to a special set of program goals (such as minimal scenic repertoire and maximum role-playing development) or to unusual environmental factors (open air facilities, highly mobile installations, inaccessible locations). An isolated post need not worry about attracting attendance, critical acclaim, or regular commercial road shows, but it could have an extra requirement for intimacy. A highly transient population would best use performance facilities designed for spontaneity and minimal production time.

There are two categories into which appropriate non-Frontal Rooms may fall: large scale and small scale. Operating elements must be manageable in number and complexity to yield the maximum range of variation. Whereas a small Room can contain a kit of many parts, a larger Room should have a few major devices by which it effects change when needed: the orientation, extension or dressing of the stage; placement of an orchestra enclosure or choral risers; preset lighting configurations; portable acoustic absorption or reflectors; preset electronic sound reinforcement pattern.

Large-Scale Room:
The factor of scale makes inclusion of a large non-Frontal Room in the institutional context of the Army necessarily a very deliberate choice. Scale has its impact in cost, quality of acoustics and visual environment, potential technical snags and conflicts, and the importance of seat-filling performance. Failure is magnified more than success.

Small-Scale Room:
The small-scale versions will probably be 'alternative" Rooms-that is, Rooms in addition to a more typical facility-for the purpose of experimenting. Hence, these Rooms will be multiform spaces with readily transformed moveable seating and/or staging elements.

There are doubtless similar exceptions to the seating capacities recommended by this Guide. Existing Army theater facilities do not conform to these size categories, mainly due to constraints imposed by conversion of found space in repetitive (temporary) building stock. Smaller houses of around 100 seats have been developed as dinner theaters adjunct to a regular Drama program. Generally, dinner theaters require more square footage per seat, plus considerable food service area. They are most successful when an intimate relationship between audience and performer is established by the arrangement of the Room.

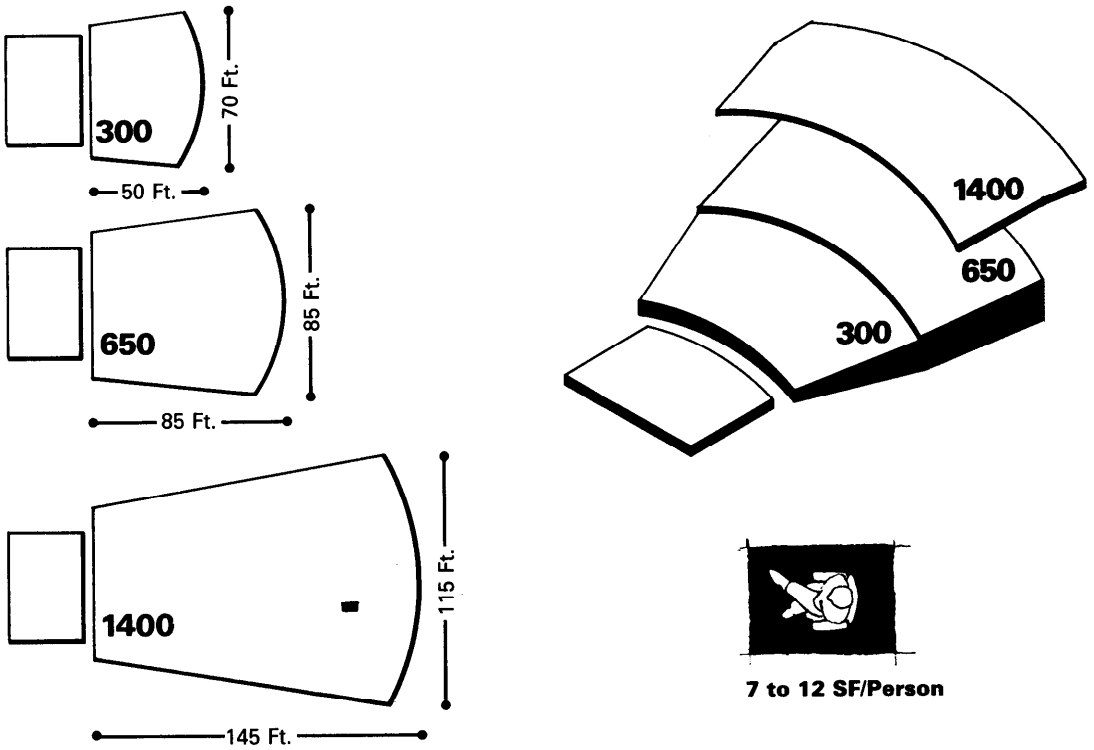


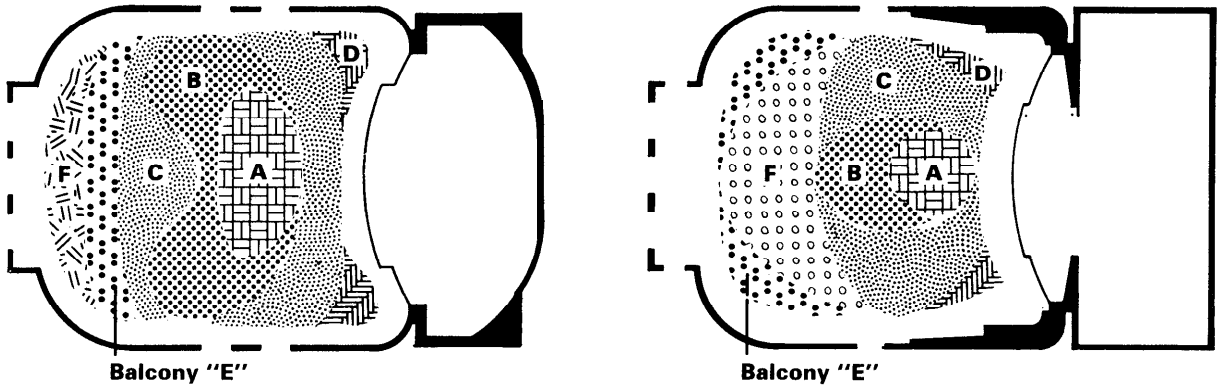
FIGURE 3–2.5 CAPACITY

Many existing 300-500 seat facilities are conversions of former 1,000 seat movie houses. The 10,000 SF movie theater ground plan was divided either to favor the Stage (with almost no audience support-only 1100 GSF) or the Front End (leaving only 2000 GSF for all stage functions). Lean-tos were added for dressing rooms and the house would seat 200-250. In most cases, additional space was borrowed for workshops, storage and rehearsal at remote locations. Often, administrative offices were shared or separately housed. These scattered, temporary facilities are a serious disadvantage and scarcely resemble a Music and Drama Center.

At an installation having a 500 seat facility used for varying types of activities, the Program Director found that it worked well for most legitimate drama, was too large for "serious" plays, and too small for musicals which consistently sold out.

It is presently difficult to find cause for building concert halls within the installation level Army Performing Arts Program, which tends toward the popular (amplified) music of today. Possibly in the future changing tastes and education could alter this. General assembly auditoriums seating 1000 are found on many Army installations, but they are not designed for Music. Large field houses, stadiums and amphitheaters seating thousands are available for massive events like rock concerts, with amplification the primary acoustic consideration. Therefore, 1400 seats was arrived at by eliminating the larger symphony hall as a special or occasional-use facility. A 70 piece orchestra, somewhat smaller band, a choir or combined vocal and instrumental presentation (or any of several possible smaller ensembles) would be best suited to a 1400 seat Room.

Finally, these are special constraints imposed by Army regulations. DOD 4270.1-M space allowance criteria were first applied to theaters in the early 1970's context of found space conversions and all-purpose recreation/entertainment centers. Section 3-15 of this Guide tabulates area requirements for a range of MDC types; the requirements of even minimum functioning facilities exceed the current DOD criteria of 14,000 and 20,000 GSF for small and large MDC's, respectively. The amount of difference is about equal to the Front End (audience support) com-



Music
Based on Auditory Quality

Drama
Based on Visual Quality

FIGURE 3–2.6 AUDIENCE SEATING PREFERENCES

ponent. Since, for the most part, cast quarters are minimal-well below professional standards-no reduction can be looked for in Backstage area.

Cutting the recommended seating capacities in half (150,300 and 500 seats according to whether Music or Drama programs are involved) would bring all but the Large Music facility within the current DOD criteria but essentially perpetuate existing inadequte conditions. It is expected publication of this Design Guide will bring about a review and adjustment of space allowance criteria.

D. ROOM QUALITIES

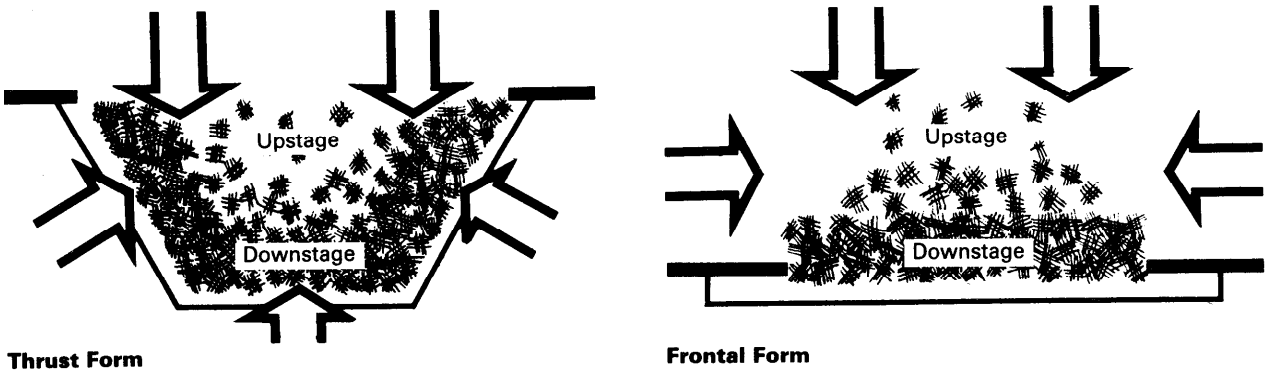
Performance is communication and Drama Rooms differ from Music Rooms according to the medium of communication between performers and audience. Drama works with visual illusion, movement, gesture and the articulation of spoken words. Music works with aural illusion, rhythmic patterns, tonal variations and subtle interactions of sound. In live performances, the give-and-take of communication relies on both vision and hearing, but each art form emphasizes one or the other. Desirable Room qualities vary accordingly. When these desired characteristics are followed out to their physical and functional implications, they describe different Rooms.

The following two sections discuss the qualities of Drama Rooms and Music Rooms sought by audiences, performers, writers and composers. Naturally, descriptive language tends to reflect their separate viewpoints. The Room must assist performers to deliver, and audiences to appreciate, the full content and embellishment of the literature. Because many works are written with a specific theater configuration or acoustic character in mind, directors for a given Room may have to select or modify productions to suit it, or modify the Room itself.

Between Drama and Music there are broad differences in the way quality is described. As long as the actors' speech can be clearly understood, vision qualities are the most important measures of Drama Rooms. For Music, the quality of sound is the dominant consideration. Good vision is easier to define in objective terms; the spatial relationships governing vision are relatively direct and geometrical. Good sound is a far more subjective impression. Human hearing combines direct and indirect sources, responds to pitch and intensity in a non-linear fashion, and is affected acutely by the additional dimension of time.

Analogies between the behavior of light and sound have been made to help describe subjective impressions, but these are inadequate for determining acoustic criteria and design guidance. The many similar terms that are used to describe both phenomena-color, warmth, clarity, tone, intensity, brilliance, intimacy-need examination and redefinition. This is the acoustician's specialty, no less a craft than stage and lighting design, involving variations of technique and conceptual inclination as well as science.

An overview of important considerations is furnished next. It begins to suggest the functional priorities inherent in Drama and Music.



Thrust Form Frontal Form

FIGURE 3–3.1 ACTING AREA ZONE

3-3. DRAMA ROOM QUALITIES

A. VISION FACTORS

A Room built for Drama should enhance the special qualities of live performance that cannot be transmitted in film, video or printed media. Among these are continuity and individual control of viewpoint and the communication of spontaneous reactions, shared with others and registered on the course of events. Some of this is verbal byplay, but theater is a place where images become as malleable as words. Certain qualities of the Room lend facility to this purpose.

1. Ability to See Stage

The best Rooms permit a clear view of the entire performance area and surrounding scene space. On a Frontal Stage, the most critical vision field is downstage for the width of the acting area. However, the acting ***space*** *must be seen in depth, too.*

2. Ability to See Action

A key element of Drama is movement, which is most readily perceived across the line of vision. For the Frontal form, this movement is basically side-to-side with respect to the centerline of the Room. A proscenium in the foreground is the major frame of reference, while scenic elements furnish context and scale. In the absence of a proscenium (open stage) action assumes an immediate, "in the same room" quality unless scenery and lighting contrasts are made to perform the proscenium function. For projected stage forms with no proscenium, action is perceived from several directions. In this case, perception of relationships among actors is critical and scenic material should not hinder vision. Dramatic and directors' interpretations may place different stress on foreground, context, and background references. Within limits, the same literature can be adapted to different stage forms.

3. Ability to See Detail

Dramatic performance emphasizes perception of actors' expressions, gestures, and body movements. Perception of detail is related to viewing distance and angle of address. Distorted perspective, usually a result of close quarters, and foreshortening due to elevation of the viewer, should be avoided.

4. Uniformity

This is a double-edged judgment of quality. Everyone should have a superb experience of the drama, but it will not necessarily be the ***same*** *experience. If one assumes the artist's purpose is to communicate to the audience a specific image, the uniformity of what every viewer sees is a positive value. This concept of "uniform effect" is sometimes considered an advantage of a Frontal configuration, based on maximizing seats near the Room centerline.*

Obviously, factors of distance and vertical angle can be equally important. If the artist's purpose is to communicate ***with*** *the audience, proximity and focus are also positive values. The quality of "intimacy" is more easily associated with the Thrust and Surround configurations that create the sense of audience and performers together in one space. A Frontal room can also be intimate, either because it is small enough to promote eye-contact or because the audience is aware it shares a mutual experience within the space.*

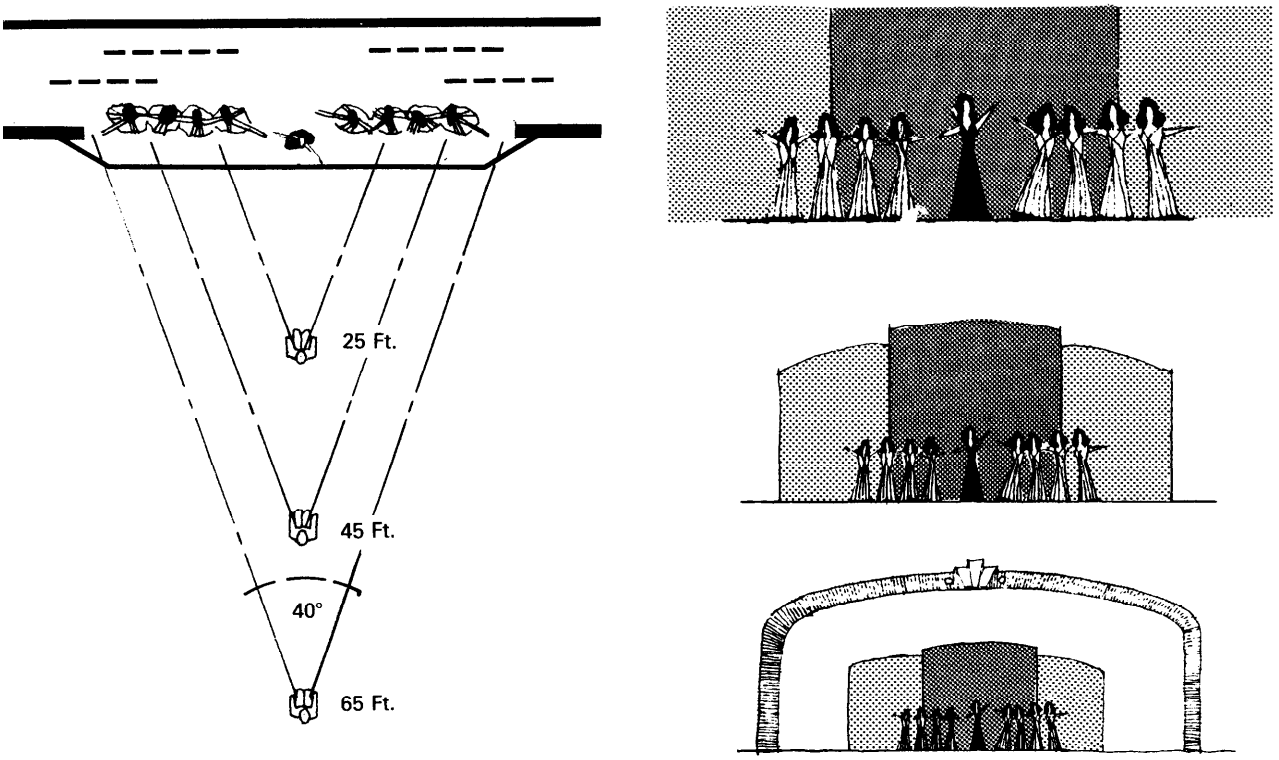


FIGURE 3-3.2 DISTANCE AND DETAIL

Uniformity comes to mean that everyone has an equal chance for a fine experience in a Room that may offer a variety of viewing positions, none of which can be easily labelled "better".

5. Actors' Ability to Orient

In the Frontal form actors orient to the proscenium and/or stage set, and gauge their movements accordingly. The shape and arrangement of the acting area can also be used to differentiate regions within the world created by the play. When there is little scenic material, this definition of "'place" assumes greater importance for both actors and audience.

6. Actors' Ability to Sense the Audience

Actors play to the audience. They need to see the audience response-another factor for audience proximity. Moreover, actors respond best to an apparently full house. The seating area should not be oversized; at least, its configuration should permit maximum use of near stage seating.

7. Functional Technical Support

Vision factors enter in to placement and selection of accessory equipment. Lighting angles affect an instrument's field of coverage and uniformity of intensity, while distance accounts for required power. Persons con trolling these instruments need to see the action from an audience point of view. Offstage prompters need to be seen by actors, and unseen by audience. Pit musicians need to see the conductor, who in turn must coordinate their efforts with the action on stage.

8. Overall Influence of Vision Factors, Drama

Geometric and psychological aspects of vision determine many point-to-point relationships in the Drama Room. Vision criteria are essential to setting the dimensions and positions of floor planes on which the audience sits, points in space where equipment is mounted, and the location of the proscenium and stage dressing-all in relation to the acting area.

B. HEARING FACTORS

For Drama, the implications of hearing criteria are less complex than for Music, but qualities discussed here are important to Drama.

1. Ability to Comprehend Speech

Articulation and intelligibility are essential. The

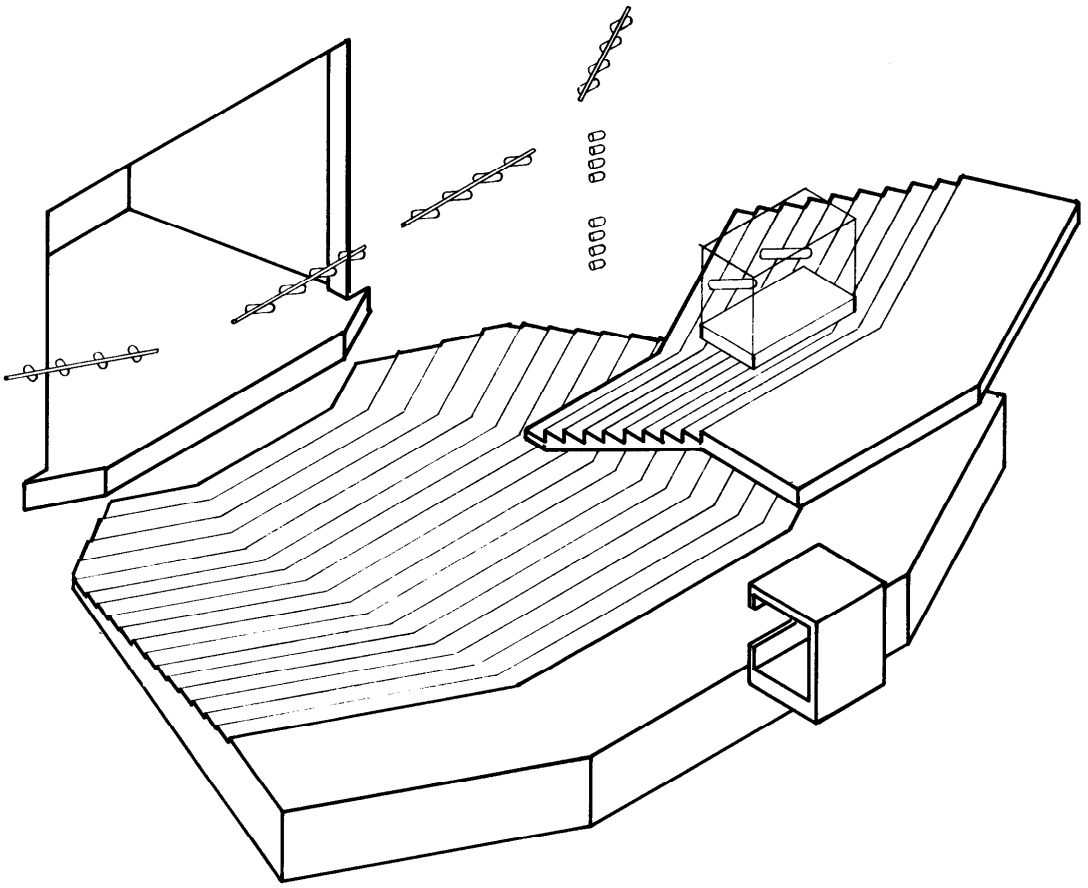


FIGURE 3-3.3 DRAMA ROOM-SHAPED FOR VISION

actors' voices should not be garbled by reverberations and echoes.

2. Ability to Hear

Speech sound levels must be high in every part of the house relative to background noise. The human voice is not especially powerful as a source without careful training, but the discriminatory powers of the ear are amazing. Forced loudness is immediately discernible as unnatural.

3. Freedom From Distraction

While continuous noise sets the level against which speech is heard, isolated, unrelated sound events and discontinuities in noise levels draw attention to themselves and constitute distractions and annoyances.

4. Congruence of Action and Sound

Both our ears and our eyes possess directional abilities. If our ears and eyes disagree about directions we are uncomfortable. Similarly, the nonsimultaneity of observed action with perceived sound can be disturbing. Dramatic impact often depends on close timing and convincing sound effects.

5. Ability to Assess Projection and Hear Cues

Actors have hearing requirements, too. They need to hear cues in order to coordinate actions. They also need to estimate the intensity of voice perceived by the audience. Hence, relative sound levels and qualities should be the same on stage and in the house.

6. Ability to Modulate Accompaniment

Musical accompanists need to hear the principal actors or singers in relation to their own sound production as the audience hears it. At the least, the conductor must be able to coordinate musical accompaniment with other sounds leaving the stage.

7. Ability to Adjust Sound Levels
Technicians must hear what the audience hears in order to adjust artificially produced sound levels, or to signal actors or musicians if an imbalance occurs.

8. Overall Influence of Hearing Factors, Drama
Hearing requirements set up criteria for reverberation, ambient noise levels, sound intensity, time delay and directionality that in general will be shown to relate to details of the Room's enclosure and boundary surfaces. Hearing factors also influence pit and stagehouse design, control locations, and sound system criteria.

C. OTHER FACTORS

Some desirable Room qualities stem from functional needs that have more to do with ease of use, economy, comfort and safety than with the performance experience. These have been called secondary and tertiary considerations (see 3-2b) to denote order of treatment.

1. Equipment
Lighting, rigging and scene handling activity involve a great deal of physical mobility during the performance and its preparation, but it must not impinge on or distract from the performance. Also, the design and location of this equipment in turn influences Room configuration, building structure and power system design.

Equipment quality refers to usefulness and sufficiency in application. Quantities of equipment can be rented when needed, but the basic systems must be completely thought out to anticipate a range of circumstances. Poor equipment limits production choices.

2. Access
Moving scenery and people on and off stage in various ways before and during performance is no small feat. Lighting and rigging equipment requires technicians' access for adjustment, control and maintenance in place. Moreover, the need for safe and efficient audience entry and exit paths will affect house layout. These all have direct consequences in physical form.

Access quality is judged by the ease and efficiency of its accomplishment. Poor access can limit production choices and lengthen production time. It can also prohibit adjustment of house capacity and arrangement.

3. Environment
Heat generated by lighting equipment and an assembled crowd must be dealt with by an air conditioning system that does not hinder performance activities, create noise and draft, or obtrude on enjoyment of the drama. Environmental systems should readily adjust to varying demand.

Environmental quality is measured by the absence of discomfort. A poor system can restrict audience size and stagecraft techniques employed. It can also be expensive to operate in the long run.

4. Flexibility
The ability to use the Room in different ways is to some extent proportional to the magnitude and flexibility of equipment systems. However, reliance on equipment can be a limiting factor, and very expensive, if equipment is not planned as accessory to the Room itself

*Flexibility is evaluated as the ability to accommodate **anticipated** uses, not just any use. This means providing the Room qualities for each use, some of which imply unchangeable concrete decisions that will rule out options for other qualities. The basic choice of arrangement (3-2c) must be made in anticipation of multiple uses. Poor planning for flexibility results in facilities that are not especially good for anything.*

If a Drama Room is to be used for Music, it will be easier to adjust for the vision factors than hearing (acoustic) qualities. Without sophisticated electronics, the Multi-Use Drama Room has distinct limitations in this regard.

3-4. MUSIC ROOM QUALITIES

A. HEARING FACTORS

A Room built for Music is intended to add to the sounds experienced, just as the Drama Room adds light, color, movement and continuity. We cannot define why music is pleasurable, but there are qualities of live performance that cannot be recorded and reproduced elsewhere; every space adds its characteristic stamp to the sound generated in it. Musicians adjust their technique in response to what they see and hear

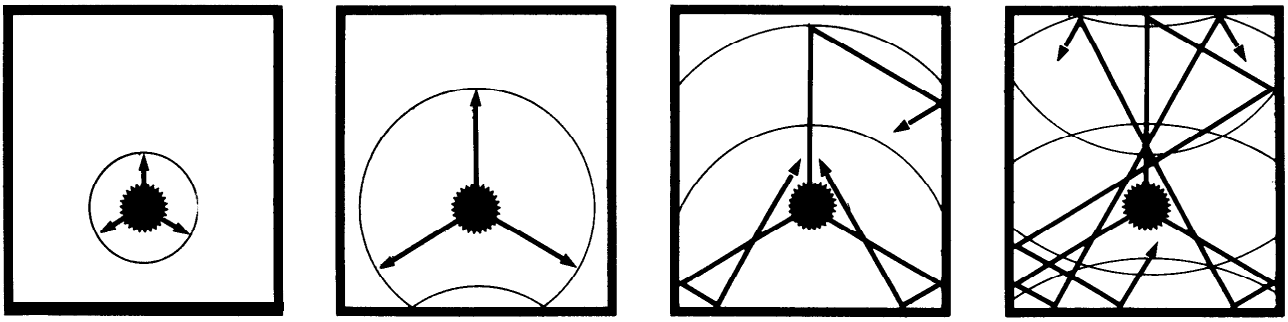


FIGURE 3–4.1 SOUND WAVE IN ENCLOSED SPACE

and listeners are caught up in the continuing improvisation, making for a fuller appreciation of subtle variations and combinations. Observation reveals certain qualities that enhance this experience.

1. Ability to Hear All Levels of Sound

This is sometimes generalized in terms of the dynamic range of music that can be heard in the Room. It is evaluated in terms of loudness, or the strength of sound perceived by the listener and the evenness of this characteristic over a range from the quietest (audience noise) to the strongest fortissimo that does not produce discomfort.

Loudness in music listening is a complex subjective measure. We hear the sound issuing directly from the performer and its reverberations in the Room as "one sound" unless something is very wrong acoustically.

2. Appropriate Reverberation

An important measure of Music Room fitness is decay of reverberation over time, or the persistence of audible sound after its source has stopped. Normally, two to three seconds elapse.

Like loudness, reverberation time is not a simple measure. One Room's reverberant characteristics will differ from another's and the pattern will also differ with musical pitch. Thus as the liveness also contributes to dynamic range, dynamic range can be one guide to how well a given piece of music or collection of instruments will be heard. In terms of loudness, reverberant characteristics are clues to tonal qualities and the styles of music that will sound "right". Composers write music with the reverberant environment in mind, be it a cathedral, recital hall or parade ground.

3. Enhancement of Musical Qualities

Subjective opinion, comparison with familiar models, education of the ear, and individual preference all enter into the judgment of what makes one Music Room better than or different from another.

The acoustician, musician, and critic do not lay claim to a precise science, but to observable phenomena. Rooms that are judged good from these viewpoints have been carefully examined for consistent evidence. As a result, acousticians have gathered a better understanding of how subjective impressions are formed and the conditions that produce them.

a. *The relationship of direct (source) sound to reverberant (reflected) sound influences many of the subjective impressions of quality. Loudness of direct sound falls off with distance and is affected by the design of the stage and its surrounding surfaces.*

A portion of this sound strikes reflective surfaces and reverberates, losing energy as it travels and bounces. Loudness of reverberant sound therefore falls off in proportion to the amount of absorptive materials (including people) in the Room and to the fraction of direct energy that does ***not*** *go straight to the listener. In a small Room, the direct/reverberant ratio is high and reverberation time short. Music sounds dry, sharp and even clinical.*

Increasing the volume will lengthen reverberation. Altering the "sending end" can increase the portion of sound directed into this volume versus that sent the listener. So doing results in a "fuller" tone.

b. *Tonal quality is a judgment of what the Room adds to or subtracts from the sound. "Brilliance" refers to enrichment of high*

frequencies relative to mid-frequencies. "Warmth" refers to fullness of bass tones. The reverberation time for mid-frequencies is the primary reference for these qualities and the measure of a Room's "liveness".

c. *"Definition" and "clarity" describe how distinctly sequential and simultaneous sounds are heard. It is a function of reverberation time, direct/reverberant loudness, and blend.*

d. *"Balance") the perceived relationship among sections of the orchestra, and "blend", the harmonious mixing of instrumental voices, are related to the disposition of the players and design of the stage enclosure.*

e. *"Intimacy" or presence is what we hear in a small Room. Our impression of a Room's size is determined by the time interval between hearing direct sound and its first reflection. Moreover, the direct/reflected loudness ratio must not be too small.*

4. Musicians' Needs

Musicians are sensitive to the ability to hear themselves. Two qualities are important: 'ensemble", ability to hear others and play in unison, and "attack", the immediacy with which first reflections return to the musician, and by which he may gauge the effects of his playing. Both are functions of the stage enclosure and nearby portions of the Room.

5. Absence of Aberration

Exaggeration or lack of any valued quality is an aberration. The worst aberration is echo, a long-delayed and sufficiently loud reflection that can be distinguished by the ear as a separate impulse.

Geometric focussing intensifies echo. Since the size of a given surface can selectively reflect certain wavelengths, particular frequencies may be concentrated at a point resulting in the perception of a sudden intense slap. Near-parallel surfaces will produce a flutter echo.

Standing waves arise between parallel surfaces spaced a multiple of one-half a given wavelength. A continuous tone will cancel itself at one point and double at another.

6. Limiting of Noise

Noise can originate within the Room or outside of it. Continuous noise generated within the Room by the audience and mechanical system operation forms the reference baseline of perception and dynamic range. Intermittent noises

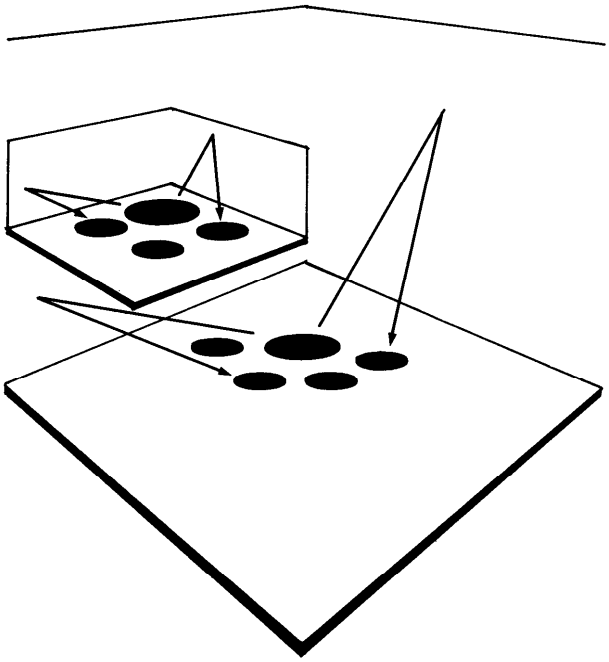


FIGURE 3-4.2 INTIMACY

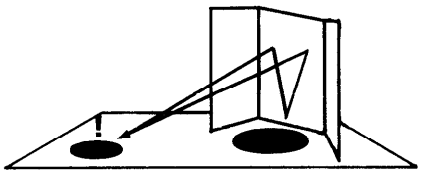
louder than this ambient level are annoying. Acousticians have developed empirical standards called preferred noise criteria (PNC) curves for various listening activities.

External noise is to be eliminated. The construction that retains sound energy in the Room generally excludes only air-borne noise. Sound can be transmitted by structure as well as by air. Hence, either the noise or the structure must be isolated.

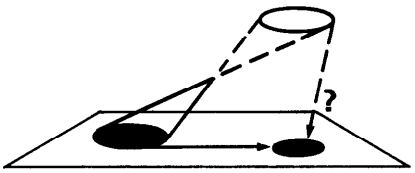
7. Fitness to Performance Type

Music types have varying properties and are intended to be heard in specific acoustic environments. A high degree of reverberant fullness is important to romantic works, while contemporary and chamber music profit from definition. Small orchestras and soloists emit less energy and should be heard in small Rooms. The composition of a marching band is designed for field house and parade ground.

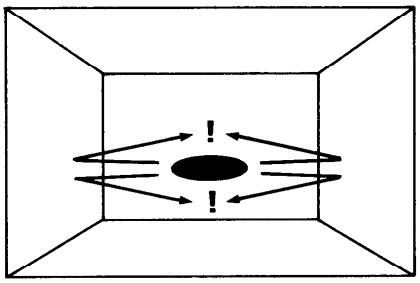
There is no average, all-purpose Music Room. It must be matched to the music intended to be heard. If the Room does nothing to enhance the listening experience, a good electronic playback



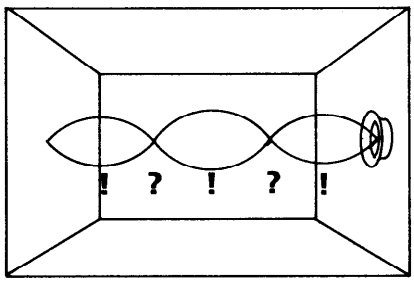
Focus
(Condensed Reflection)



Echo
(Delayed Recognizable Reflection)



Flutter Echo
(Rapid Series of Coincident Reflections)



Standing Wave
(Sound Pressure Build-Up/Cancellation)

FIGURE 3-4.3 ABBERATIONS

system is preferable; at least people don't risk disappointment that way.

8. Overall Influence of Hearing Factors, Music
Hearing (perceptual) and acoustic (physical) phenomena determine many of the desired characteristics of the Room enclosure and boundary surfaces, proportions, volume, materials, and connection to the external world.

B. VISION FACTORS

For Music, the influences of vision criteria are similar to those for Drama, but less crucial to success. Direct functional relationships dominate.

1. Performers' Ability to Read Music
Musicians are constantly looking away from the score and back again. For rapid accurate reading illumination levels, angles, evenness and relative contrast must be carefully controlled. Adequate space is needed to arrange awkward instruments and shared music stands.

2. Ability to See Each Other
Arrangement also permits needed eye contact among musicians and easy view of the conductor. Its importance increases when soloists or dancers are involved.

3. Ability to See the Audience
The best performance is one in which performers and audience respond to each other. Again, relative illumination and arrangement are important. Moreover, musicians are sensitive to the Room's ambience, its color values, and (statistics show) its "woodiness".

4. Functional Technical Support
Broadcast, recording, sound reinforcement and lighting technicians need to see performance activity, preferably as the audience does.

5. Audience Ability to See Musicians
The finest sound reproduction system cannot duplicate the experience of a live concert's extra dimensions of anticipation and participation.

6. Ability to Read and Navigate
Total absorption in performance is not characterisic of music audiences. In the absence of spoken narrative, reading the program notes adds to enjoyment and comprehension. Of course, listeners have to find their seats, the coatroom, restrooms, etc.

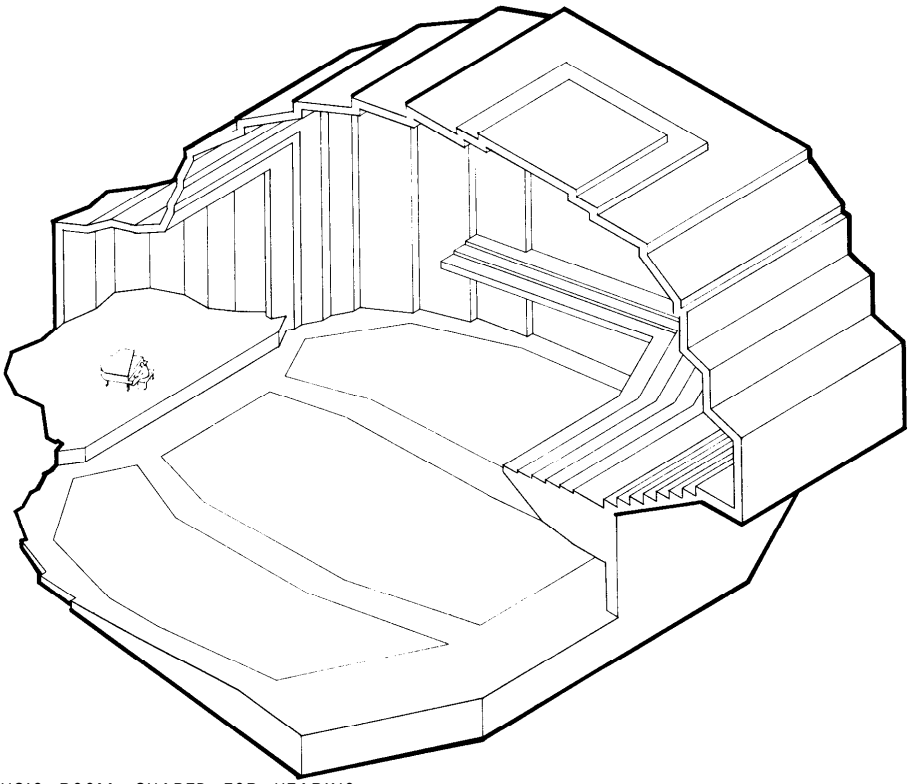


FIGURE 3-4.4 MUSIC ROOM–-SHAPED FOR HEARING

7. Perceptual Psychology

Room ambience is a description of how people look in terms of color and modeling of features. It is also how the Room looks in terms of color and "drama". Concert lighting is relatively simple. Since there is usually little movement, lighting shifts add interest and relative brightness focuses interest.

8. Overall Influence of Vision Factors, Music

Vision parameters mainly affect illumination, room finishes and arrangement of performers functionally. Physical design "improvements" for sight lines should be carefully weighed against potential ill-effect acoustically.

C. OTHER FACTORS

Four other factors (see 3-3c) have qualitative impact on Music Room design. Brief comments below indicate the emphasis regarding Music criteria.

1. Equipment

Accessory equipment for Music is typically less extensive in quantity than for Drama, but since it is most often custom made to suit specific needs, it is also more costly to replace. Therefore good built-in permanent equipment has real value. All theatrical equipment is subject to high standards of construction and installation to limit noise generation.

2. Access

There must be access to the stage for piano, chairs and stands, musicians and risers. Providing a suitable number and size of openings can affect the design of the orchestra enclosure. Doors, for audience access and egress, should be limited in number and carefully sealed to reduce sound loss and noise intrusion.

3. Environment

Since the audience is relatively sedentary, noise criteria are more stringent. Temperature and humidity stability are extremely important to maintaining musical instruments in tune. House lighting levels are slightly higher than for Drama.

4. Flexibility

In general, the ability to use the Room for different music presentation types depends a lot on repositioning sound sources (musicians) in relation to surfaces near them. These surfaces can

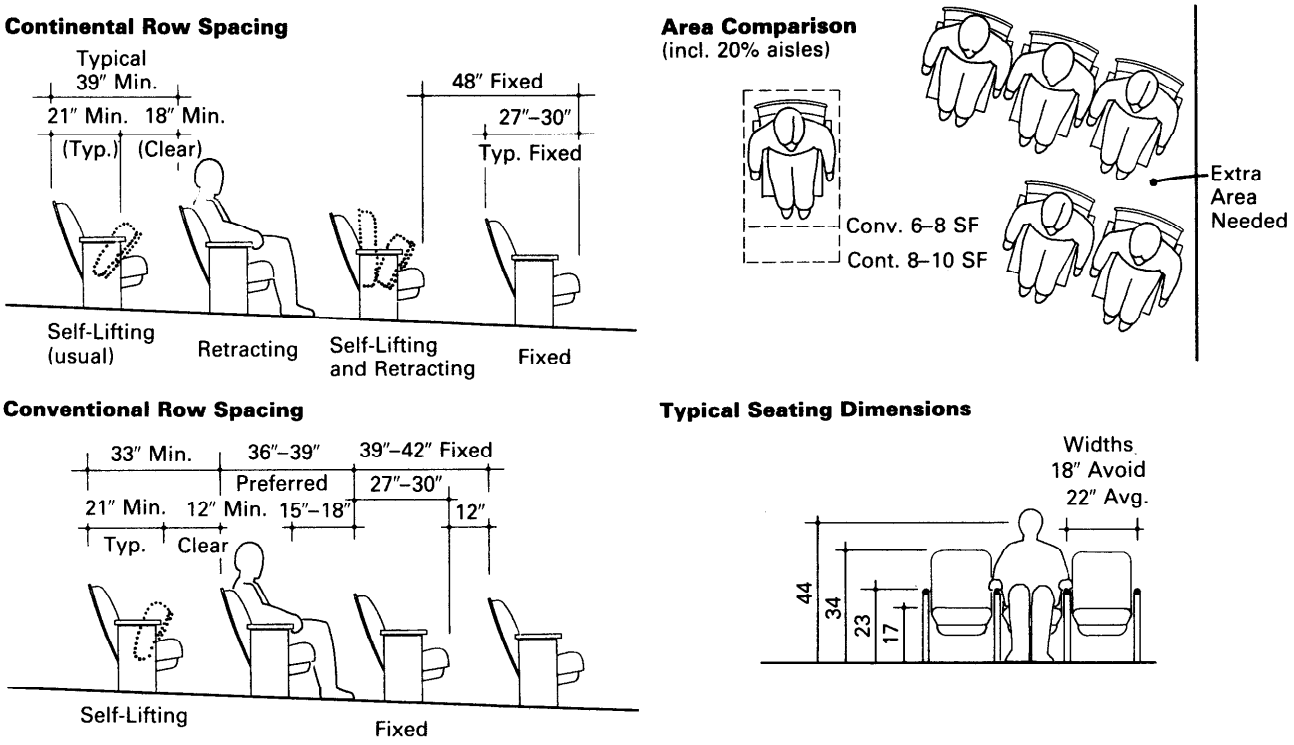


FIGURE 3-5.1 SEATING AREA UNITS

themselves be adjusted, but physical alteration of the enclosure should be undertaken with restraint, under supervision of a knowledgeable acoustician.

Flexibility refers to the conditions favorable for various music types, not strictly the number of musicians on the platform. Favorable conditions can often be accomplished by relatively small changes in several parts of the Room, balancing the type of music, number of musicians and size of the audience.

If a Music Room is to be used for Drama, it will be easier to adjust acoustic conditions than vision criteria. The Multi-Form Room concept is the most impractical for Music.

3-5. THE HOUSE

The House is one half of the Room. Investigation reveals two general concepts about it. Vision criteria, the major organizing principles of Drama uses, define the distribution of people in the House while hearing-criteria, the major organizing principles of Music uses, define the distribution of boundary surfaces. Second, varying the size of a Drama audience mainly influences the linear and planar geometry of the House, while varying the Music audience mainly influences volumetric geometry.

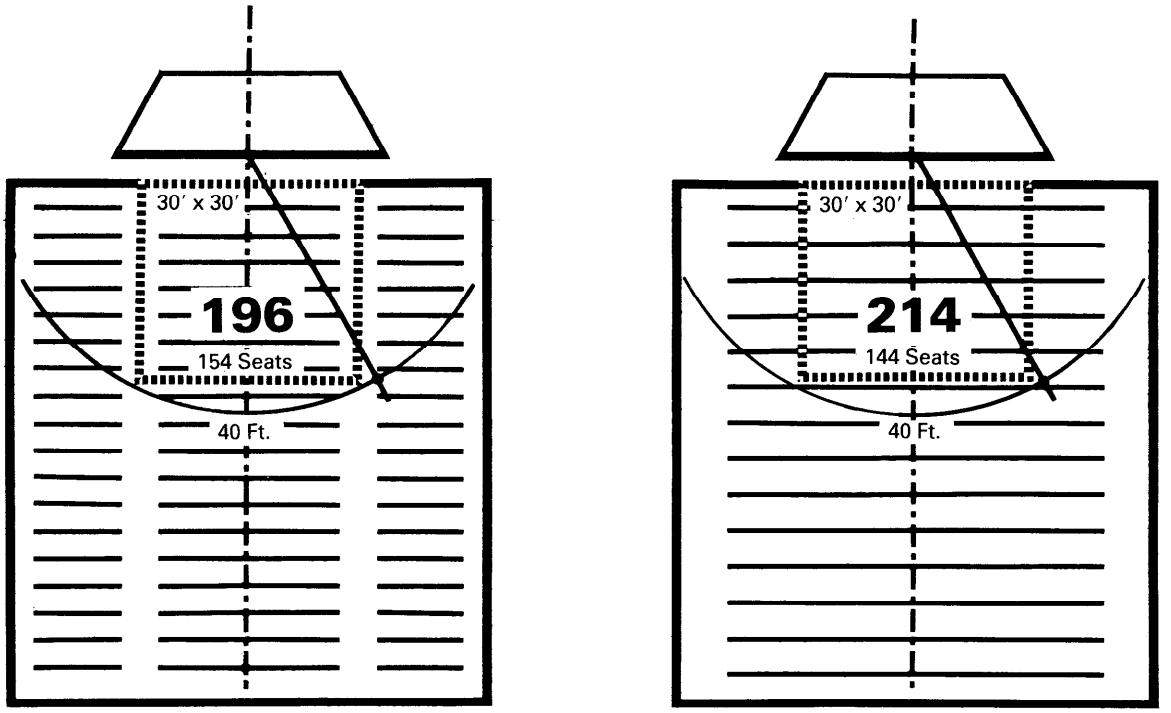
In this section, Drama (vision) and Music (hearing) considerations will be applied to the audience portion of a Room, in terms of the primary attributes of size, shape and arrangement. The effect of varying house capacity will be studied, but variations in the form of presentation will be addressed in discussion of the Stage (Section 3-6). For now, a Frontal arrangement is assumed, either legitimate drama or orchestra on stage. Details and technical data will be treated in succeeding sections and in Chapter 4 as appropriate.

A. DRAMA HOUSES

1. Seating Area Dimensions

The number and arrangement of seats defines the net floor area of the House (an aspect of size).

Reckoning of area includes allowance for aisles



CONVENTIONAL
(More Seats Centered)

CONTINENTAL
(More Seats Near Stage)

FIGURE 3-5.2 CONVENTIONAL VS. CONTINENTAL SEATING

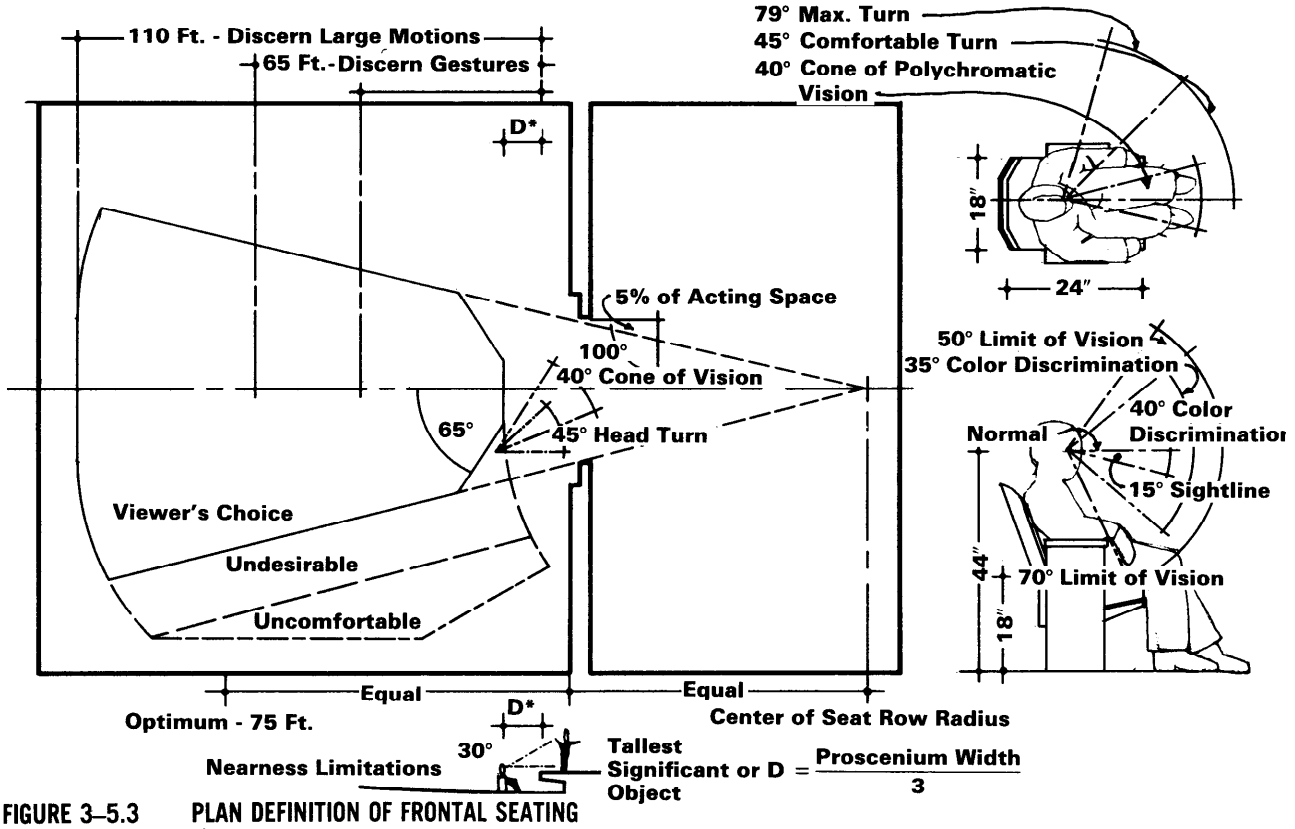


FIGURE 3–5.3 PLAN DEFINITION OF FRONTAL SEATING

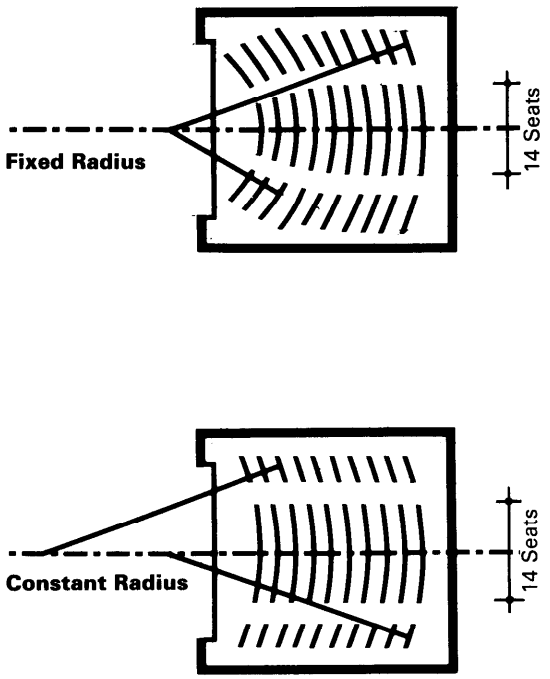


FIGURE 3-5.4 PLAN CURVATURE

and varies from 6 to 10 square feet per seat. Generally, a figure of 8 s.f. is good for first estimates although a higher number is usually needed for smaller capacities. This variation is caused less by differing seat dimensions than by conditions of arrangement. Sharp radius curves and ragged aisles introduce triangular residual areas. If seating is moveable, additional allowance must be made for imprecision and maneuvering clearances (13-15 s.f. is commonly used).

To assure a speedy exit in emergencies, conventional seating usually limits row length to seven seats accessible from one aisle or fourteen from two, with rows spaced not less than 33". Row spacing must be greater for continental seating, which is practically unlimited in row length. Continental requires wider end aisles with closely spaced exit doors. Continental gives more legroom seated, but more interference from latecomers. It also heightens the sense of vastness in a large Room. On balance, floor area per seat is the same for both methods.

2. Plan Arrangement with Respect to Stage

Vision criteria define the horizontal proportions (plan shape) of the Room with reference to the

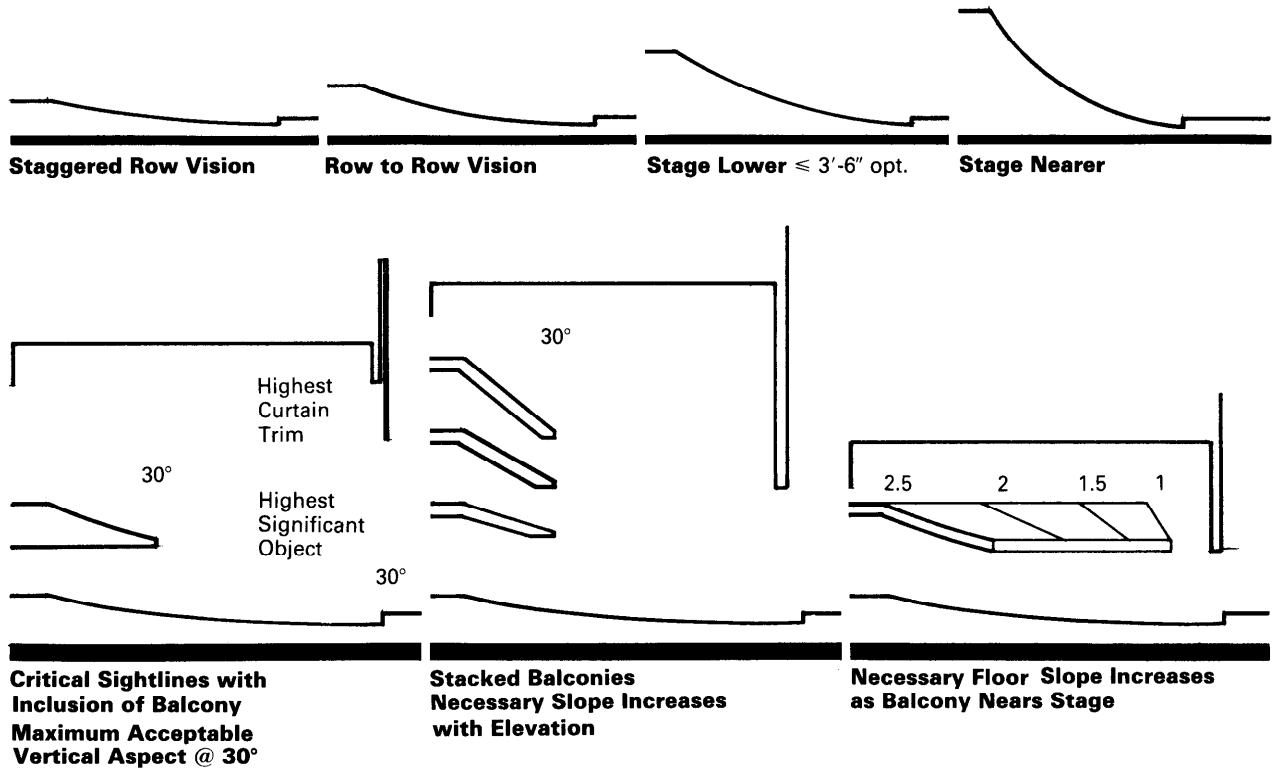


FIGURE 3–5.5 FLOOR SLOPE-SIGHTLINE RELATIONSHIP

stage configuration and proscenium width.

The dominant side-to-side movement on a Frontal stage places value on proximity to the Room centerline, while the desirability of short viewing distance works in the other direction. The objective logically should be to maximize the number of seats in the center front region.

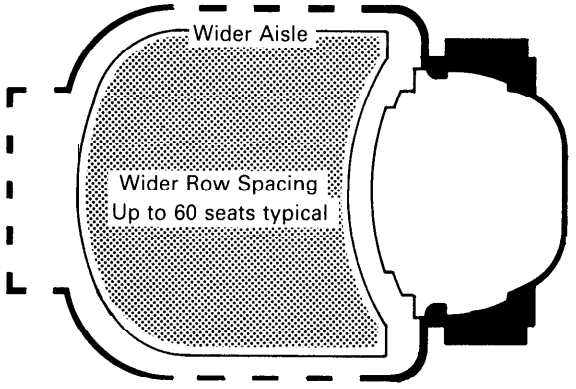
Actors' expressions are difficult to see beyond 40 feet, gestures past 65 feet, and only large body movements can be seen between 65 and 110 feet. Location of drama audiences should be within 65 feet, if possible. Viewing at an oblique angle foreshortens the image and may require neck craning. The normal cone of optimum vision covers 30 degrees vertically and 40 degrees horizontally. Viewing angle works against front corner seats, which have the most oblique view from which portions of the acting area may be obscured. For that matter, any "front row" seat requires a lot of head movement to take in the entire acting area. A 45 degree pivot is considered maximum tolerable exercise.

The intimacy of Drama is enriched by focused orientation. Curved rows reinforce the impression of uniformity by centering attention. If the center point of curvature is on stage, the nearest rows are sharply arched. But the longer the radius, the less appreciable its effect. If conventional seating is employed, (with longest rows of 14 seats) the radiating aisles eliminate a number of near-center seats. An alternate conventional plan places a cross aisle nearer the stage, which eliminates seats within the optimum vision distance. Continental seating avoids these radial geometry issues entirely.

Curved rows of gentle arc can have identical radius with the focus somewhat reduced, but allowing uniform, maximum row length and flush aisles with conventional seating. This "rectangular" arrangement requires varied seat unit size in order to provide staggered seats from row to row. Staggered seats permit one viewer to see between heads in the next row.

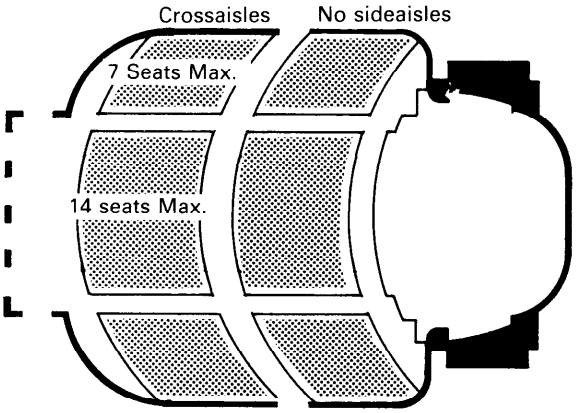
3. Vertical Arrangement with Respect to Stage
Sight line criteria in the vertical dimension help define floor slope (an aspect of sectional shape).

Flat-floor Rooms are limited in capacity by the problem of seeing past a few rows of people. A



Continental

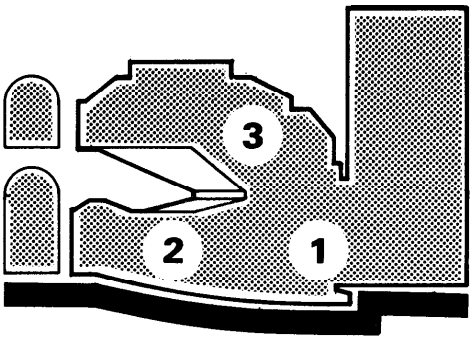
+Economic Use of Space
+More Leg Room
–Less Comfortable Seat Access
–Numerous Exit Doors



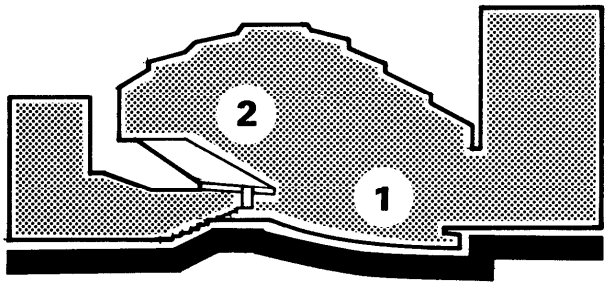
Conventional

+Easy Seat Access
+Fewer Exits
–Less Leg Room
–Aisles take up space

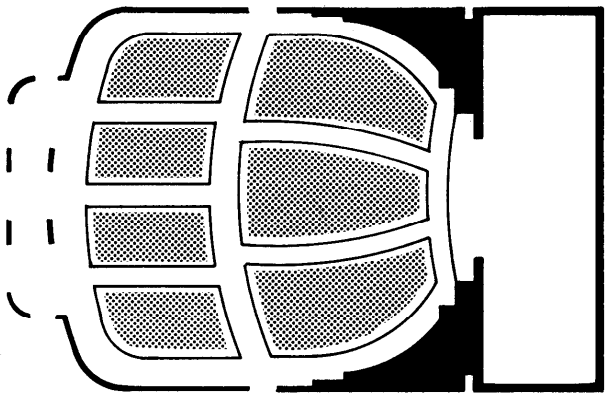
FIGURE 3-5.6 LARGE HOUSE PROBLEMS



Balcony: 3 places



Ledge: 2 places



Berry Patch

FIGURE 3-5.7 LARGER HOUSE SUBDIVISIONS

straight rake (ramped) floor improves conditions for a short distance only. With each successive row, the steepness of slope must increase in order to accomplish the same geometric sightline clearance from row to row-optimum 5 or 6 inches-every two rows if seats are staggered. The relative stage level is a factor here-a lower stage favors a steeper floor. Since concern for comfort and safety limits the maximum ramp slope and discourages single risers in aisles, a limit is implied for the number of rows before a cross aisle or other device breaks the pattern. Where steps are necessary, they should be between 4½" and 8" high and clearly marked or illuminated. Aisle slopes should not exceed one foot in eight.

Rising curvature is a difficult construction condition. When compounded with horizontal radii a "dish" or "teacup" is formed. Converging aisles become a necessity, which for safety should run in the direction of slope.

Dished floors present slight disadvantages in terms of adaptability to other arrangements. If level terraces are desired on a temporary basis (dinner theater or experimental forms) no section of infill platform is alike. A constant radius or rectangular plan is more easily adaptable at some expense to intimacy of focus.

4. The Large Room

Special problems are associated with size increase, including the impression of scale conveyed by a sea of people. It makes the performance seem more remote, the individual less important, the experience less intense (aspects of arrangement).

Continental "wall-to-wall" seating can heighten this impression, although it is more efficient at large capacities because cross aisles are not needed. Nevertheless, aisles do help define smaller units of seating, which may make the Room seem smaller.

As distances increase, the effects of floor slope are amplified. Entry and exit doors occur at greater elevational differences, not necessarily in equal increments, which affects design of surrounding spaces and access patterns. Further, as aisle length increases with conventional seating good practice requires cross aisles to ensure reasonable travel distance to exits. The cross aisle is a means of collecting exiting audience from more than one aisle, and is consequently quite wide. It eliminates two or more rows of seats.

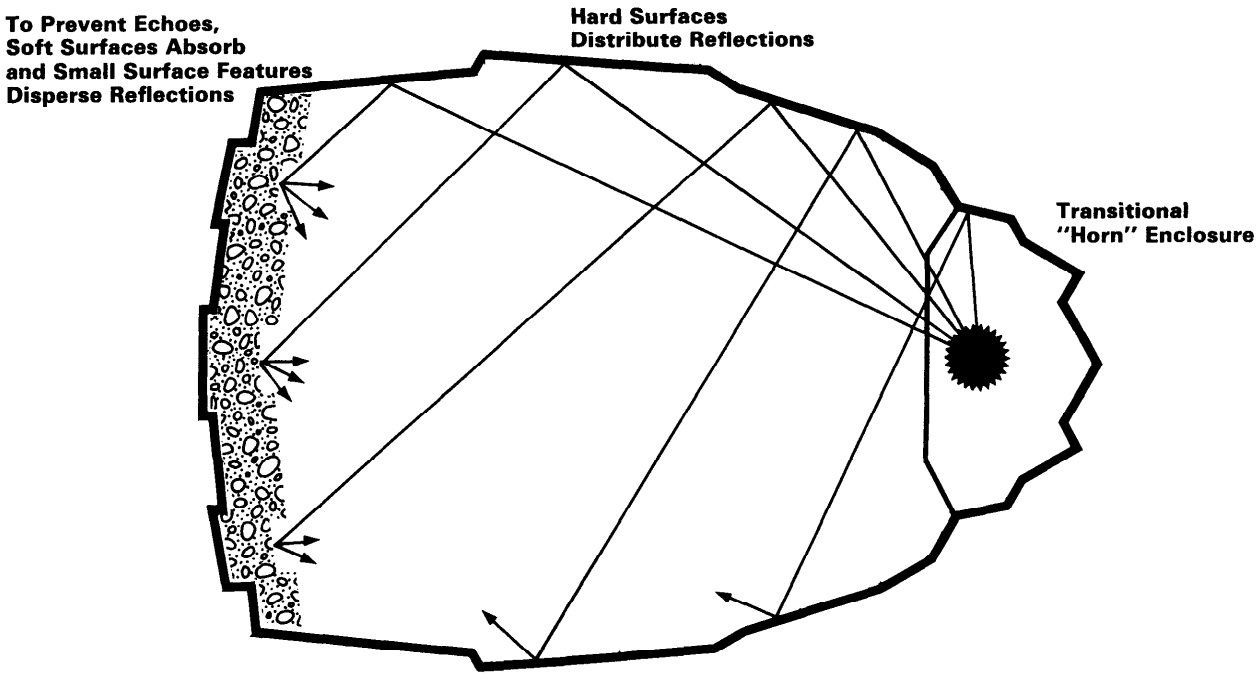


FIGURE 3-5.8 SOUND DISTRIBUTION FUNCTION

Increased seating area can also have a psychological effect on performers confronted with fractional attendance that seems even smaller relative to empty seats. There are several alternatives to choose from in countering the results of larger size.

Berry-patching, *or horizontally offsetting sections of the audience area, answers the questions of aisle length and to some degree identifies smaller reference units for viewers, but introduces cross-aisles.*

A ***ledge*** *may be incorporated, with or without a cross aisle, vertically offsetting the house floor and defining two places in the Room. Also, assigning seating priority to the lower section reduces apparent emptiness.*

Finally, a ***balcony*** *solution brings about three places of different flavor. Each place provides a strong visual frame of reference more intimate than the total.*

The ability to shutdown or darken the balcony effectively removes it from the actors' estimate of the house. The problem of aisle slopes exceeding maximum is removed; essentially, the

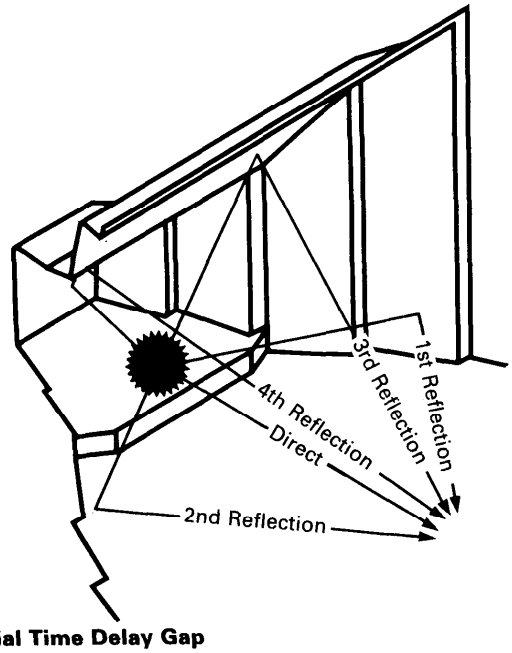


FIGURE 3-5.9 DIRECT AND REFLECTED SOUND

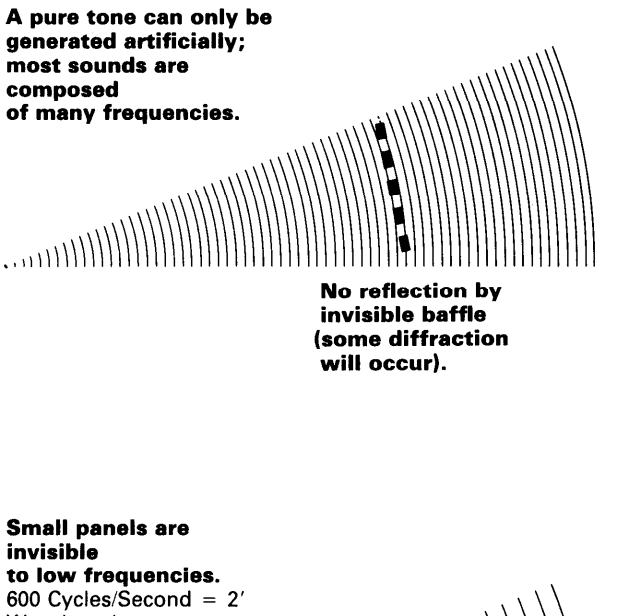


FIGURE 3-5.10 FREQUENCY SELECTIVE REFLECTION

steep area at the rear is lifted to form the balcony, acquiring an even steeper slope navigable by steps. Entry/exit is distinctly "two-story". Finally, lifting and tilting (the balcony) may enable it to be moved forward slightly, bringing more front row audience within range of the actor, and partially obscuring the rear of the house where the empty seats are.

Sitting under a very deep balcony can sometimes be like sitting in another room. The rearmost row should at least be able to see the top of the proscenium. Balconies also tend to blanket an area acoustically, preventing reflected sound from reaching back rows. The acoustically acceptable overhang can be greater for Drama than for Music since the reverberant contribution is smaller. Moreover, since speech intelligibility favors a proportionally high direct/reverberant ratio it improves with steeper floor rake and short throw.

If amplified or pre-recorded sound is employed, correct positioning of loudspeakers may influence Room shape. Normally, a central loudspeaker cluster is located over the stage so that actor and loudspeaker are equidistant from listener. The acoustic shadow cast by a low balcony can be a problem best dealt with by raising the balcony. (see Fig. 3-5.14).

B. MUSIC HOUSES

1. Seating Area Dimensions

The acoustical importance of the audience area is its contribution to the Room's total sound absorption, which is a significant factor in reverberation time. For a given Rt, absorption is proportional to volume (three-dimensional size).

The design of chairs for Music audiences is a critical concern because the most absorptive element in the Room is people. The acoustic character of the Room should not vary greatly due to attendance rates. Thus, the absorption spectrum of an empty chair should roughly approximate one occupied by a human body.

Since people absorb sound, tighter average spacing of seats (7-8 s.f.) may be called for to reduce total absorption area. This is more likely to be important for very large audiences when conservation of sound energy is critical. It is the total absorption of the Room that matters. Hence, absorption influences criteria for sound retentive construction as well as the volume required.

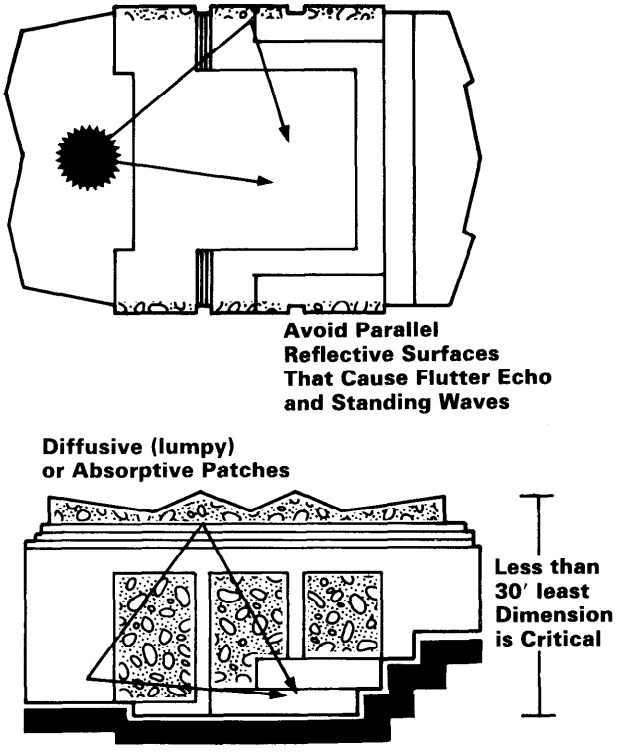


FIGURE 3–5.11 SMALL MUSIC ROOM CONSIDERATIONS

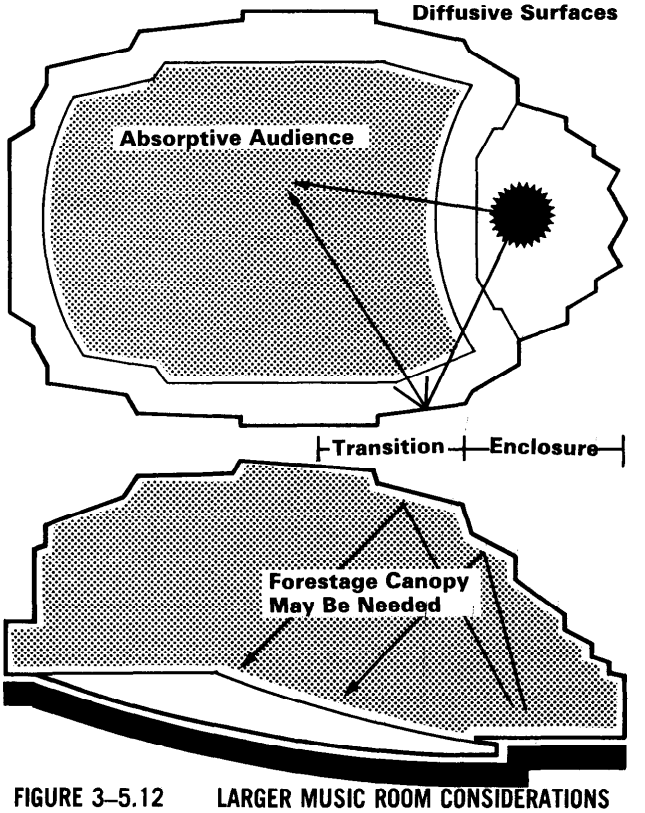


FIGURE 3–5.12 LARGER MUSIC ROOM CONSIDERATIONS

2. Plan Arrangement with Respect to Stage
Plan geometry for Music has as much if not more to do with wall positions than with the audience distribution.

The form of stage enclosure and its transition to the house influences Room shape. Musicians may be located in the Room on an open stage, or in an enclosure at one end. Small Frontal Rooms favor the orchestra-in-the-Room condition, larger Rooms the orchestra-in-enclosure.

Because direct sound dominates the small Room, the directional enclosure is less advantageous than a high ceiling (for reverberant volume). With increased absorption (people) and distance from source, the reverse is true; large Rooms have directional enclosures to boost direct sound levels.

The smaller of plan dimensions (usually width) may determine first reflection time (intimacy) and also the potential for troublesome standing waves. This dimension should be at least 30 feet for Music, 15 for speech. It is normally a concern for small Rooms. In larger Rooms, the proximity and orientation of surfaces near the stage control first reflections.

To avoid flutter echoes, no two walls should be parallel. Reflecting walls are shaped to distribute rebounding sound. Surface variations should include a large range of sizes "seen" by various wavelengths in the audible range (from ½" = 20,000 cps to 50 feet = 20 cps) and especially at mid-frequencies (3-8 feet). Great variation yields good diffusion and uniformity of blend.

Room length is related to potential for echo from long delayed reflections off the rear wall. The wall may be tilted or rumpled for diffusion.

Focusing curvatures are sometimes a problem of large Rooms that conform to vision criteria for seating. Fan-shaped Rooms must be examined for potential sound traps (acute intersections) and uneven distribution of reflections.

3. Vertical Arrangement with Respect to Stage
Sound is a spherical phenomenon; similar considerations apply to both horizontal and vertical shape.

Floor slope affects the portion of direct sound received at distant seats. Tilting the audience exposes them to a larger wedge of radiating en-

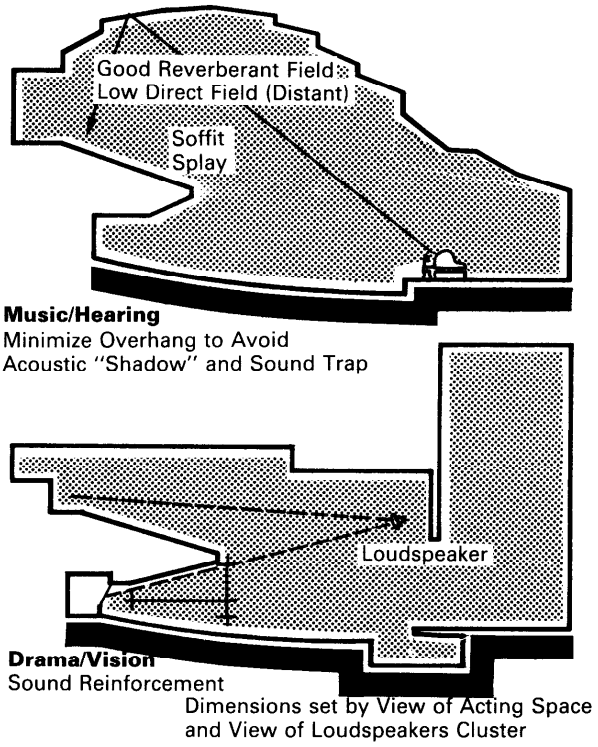


FIGURE 3–5.13 BALCONIES-MUSIC OR DRAMA

ergy. Small Rooms can afford to have flatter floors since the general level of direct sound is high. Increasing the available volume (which increases reverberant contribution) will permit steeper floors.

The factor of least (smallest) dimension applies vertically as well as in plan. Since the ceiling height of a small Room is likely to be less than or near 30 feet, it is wise to build in undulations ensuring its non-parallel relationship to the floor. As the Room size and height increases, the ceiling over center forestage plays a major role in providing early first reflections to center seats. If the ceiling must rise for volume, a partial suspended canopy may be required.

Reverberant field in large Rooms does not fall off so rapidly as direct sound. The evenness of reflected sound distribution is therefore important. Much of this characteristic relates to the ceiling transition shape, progressively slanted to reflect sound into the audience where it's needed.

Balcony seats have the advantage of nearness to the ceiling; initial-time-delay is very short and reverberant field rich. However, weak direct sound is a common problem in balconies of larger halls.

Balconies can have unpleasant consequences for occupants of other portions of the Room. Depth should be limited to 1-1/2 times vertical opening, and soffits splayed to reflect sound to seats. The upturned fronts can focus certain frequencies on the musicians platform and should be tilted and rumpled for diffusion.

Balcony or box seats near the front corners of the House typically have poor sightlines and receive late reflections. Nonetheless, this feature of traditional concert hall design is a useful way to provide diffusion and early reflections to the main seating area. With an orchestra in the pit, front box seats are often the finest.

3-6. THE STAGE

Stage dimensions and volumetric relationships have a fundamental effect in establishing the geometries of the House. This section will build on discussion of the House to help determine what makes one Stage configuration different from another. Afterward (Section 3-7) variations of Stage and House will be brought together for evaluation. The physical characteristics of the Stage are functions of its intended use. Seven performance types pertinent to Frontal Stage criteria will be looked at briefly to see where they differ. Four are especially relevant to Army facilities: legitimate drama, dance, musical drama, and music.

A. GENERAL CONSIDERATIONS

Variations among Stage forms have two levels of impact on Room design-Vision parameters (location of audience) and Hearing parameters (location of boundary surfaces).

1. Vision Parameters
These are related to the dimensions of performing (acting) area:

- ***Width/depth/shape of acting area.***
- ***Height of proscenium (if any).***
- ***Elevation and/or rake of stage.***
- ***Location of acting area relative to proscenium.***

2. Hearing Parameters
These are related to boundaries of the Stage enclosure:

- ***Size/shape of enclosing shell (if any).***
- ***Nature of coupled volumes (if any).***
- ***Absorptive properties of enclosure.***
- ***Location of sound source relative to enclosure.***

The corresponding functional elements depend on the use for which the Stage is designed. A few categorical terms will be of help in comparative treatments of stage types. Performing (acting) area is the portion of stage space meant to be seen. The stage enclosure defines a volume contiguous with the stage space, communicating with the house. Together, these constitute the bare minimum Open Stage. The stage floor may be stepped or sloped ("raked"). If a wall divides the stage space from the house the opening in it is the proscenium and the volume behind it is stagehouse.

For Music, an enclosure within the stagehouse is a shell, its overhead extension into the house a forestage canopy. If a portion of the remaining stagehouse volume communicates with the house, it is said to be coupled.

For Drama, scene space surrounds the acting space, and is surrounded by working space within the stagehouse-around, above or below. An open stage can have scene and working space, but scenic material may not be withdrawn vertically unless there is a proscenium wall and flyloft-i.e., a stagehouse-separable from the audience house by a fire curtain closure. Belowstage working space (trap room) must also be separated from the house except through the proscenium. An orchestra pit communicates with the house in front of the proscenium and fire curtain.

The reader will find it necessary to refer to other sections of this Guide for a more detailed treatment of some topics, such as performance accessory equipment, environmental systems and access considerations. However, there are a few "no option" requirements that relate to stagehouse construction especially. Safety is one; quantities of scene materials and fabrics suspended over hot lights, wood flooring, rigging lines, wiring and electrical equipment, power tools, and a lot of independent activity makes the theater stage a potentially hazardous region. The best protection is alertness and goodhousekeeping. Additionally, materials used in the stagehouse or stored there shall be fire-retardant.

If a flyloft is built, the proscenium wall must have a 2-hour fire rating and self-closing incombustible fire curtain, roof vents (at least 5% of floor area) activated by smoke and heat detectors, automatic sprinklers, and 2½" diameter firehose standpipes at each side. Sprinklers are required below the stage, too. If there is no flyloft (stagehouse ceiling less than five feet above proscenium) no fire curtain is required.

Stage floors are designed for 125-150 psf live load, gridirons for 75 psf with head and loft block beams designed for 250 plf. All permanent floor structure shall be non-combustible except the stage floor deck, which in almost all cases should be white pine or fir softwood tongue and groove, totalling 2" thick. It should have a matte finish and be built in sections enabling repair and replacement. This construction extends six feet past the proscenium offstage.

B. FUNCTIONAL REQUIREMENTS

The following are desirable Stage characteristics for various performance types. Also refer to respective sketches and to detail data of Chapter 4 regarding special equipment and construction criteria. Discussion here stresses key functions and design rationale.

1. Legitimate Drama
The medium includes speech, action and scenic context. The human figure is extremely important; scenic illusion refers to this for dimensional scale. Dominant movement across the acting area, entering left and right, makes other entries special events. Drama usually works through sustained continuity over a series of unfolding, developing events and situations; the ability to control changes in context, pace, center of attention and atmospheric tone is essential.

Performance Space: *Acting area is approximately 35' w x 20' d (40' x 25' usual maximum). This defines the downstage zone of most action; however, the full stage depth is utilized. It has a level floor that can be built upon, normally 30-36" above front row of house. Traps are recommended in key acting area.*

Enclosure: *A stagehouse is recommended, with a proscenium portal 35' w x 26' (can be larger). Stagehouse configuration is related to scene handling methods; flyloft is recommended strongly.*

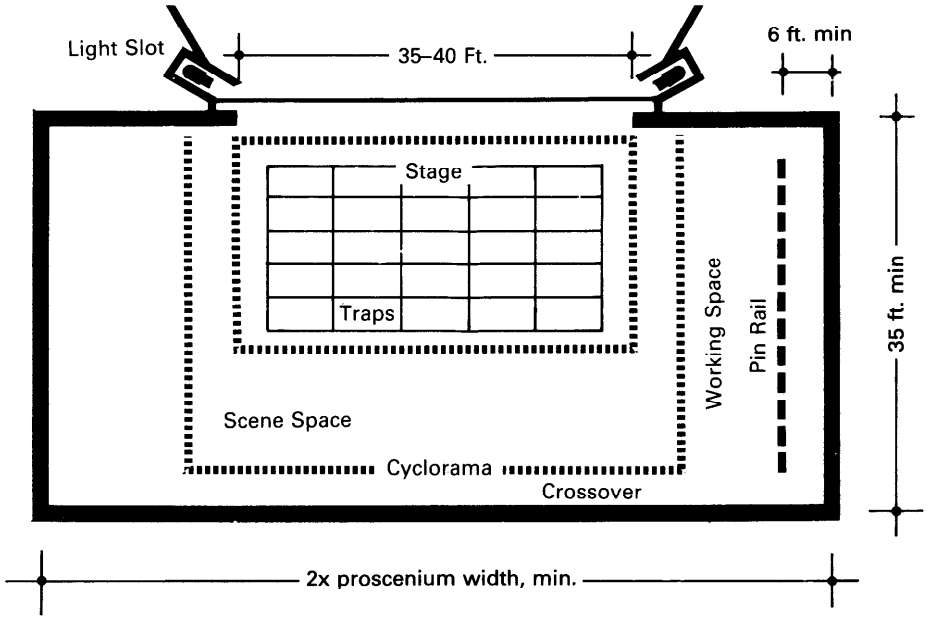


FIGURE 3–6.1 DRAMA STAGE

Scene/Working Space: *Wrap-around scene space is required for flats, drops, wagons. Allow ample horizontal working space for the largest set piece plus actors' passage, waiting areas, technicians' workspace, counterweights and pinrail, curtain space and switchgear. Use inside clearances and keep the plan shape compact and rectangular. Overhead working space must accept the longest flown piece plus borders plus gridiron and line space plus man-high passage above grid. Understage working space should be at least eight feet clear height. If any portion of working space is omitted by design,. stage level allocation should be increased 50%.*

2. Dance

The medium consists of action with music and some scenic context. Large movements of dancers in two directions (to-fro, side-side) physically occupy a region 15 feet above the floor. Dancers' entry from scene space on all sides is important. Scenery is often minimal, but not stage lighting. Although recorded music can be used, a dance facility should provide for a live orchestra. A dance concert usually consists of a series of separate pieces or events with rest periods between during which the stage is reset and the audience must be otherwise occupied. The technical qualities that help sustain continuity during performance should be versatile and sophistica ted, especially lighting controls. Also, music is to be heard on stage distinctly.

Performance Space: *Acting area is typically 50' w x 40' d, although 40' width will accommodate modern dance and small troupes. Higher sightlines (lower stage in steeper house) improve perception of deep movements. Construction of a resilient dance floor is essential, e.g. on built-up criss-crossed sleepers with neoprene cushions between. Sponge mats are not springy enough, and injuries can result. Often, a removable linoleum, vinyl or hardboard surface is put down, with seams taped.*

Enclosure: *A high proscenium is needed in large Rooms for clear view of the dancers' space, or no proscenium at all in intimate Rooms. Stagehouse requirements relate to scenery components.*

Scene/Working Space: *Scene space at each side is usually devoted to entry legs and tabs for the depth of the stage. A cyclorama or back-*

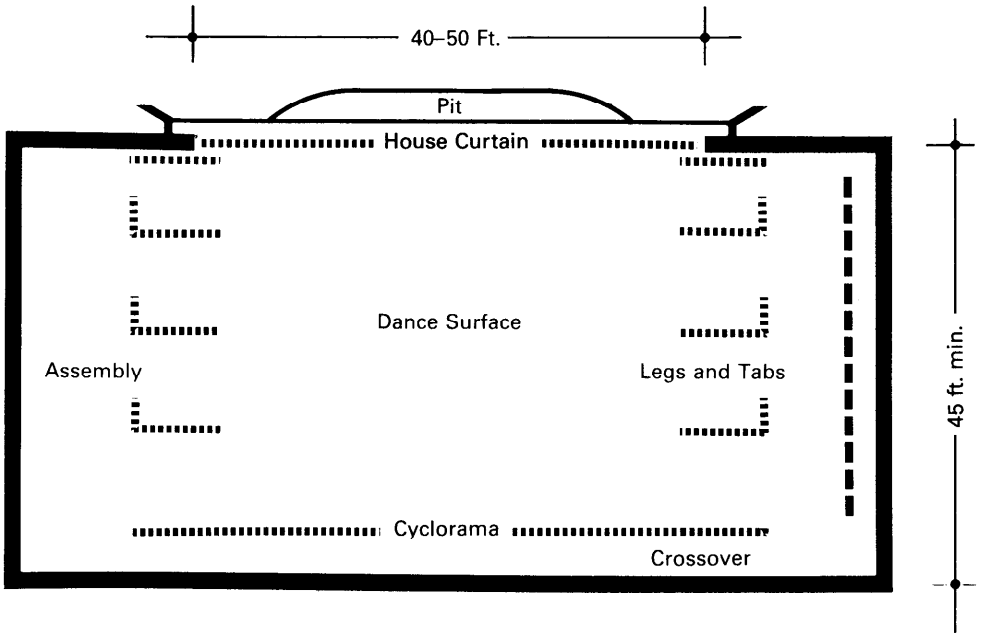


FIGURE 3-6.2 DANCE STAGE

drop is frequently used. Unimpeded crossover passage is very important, preferably wide enough for costumed dancers to pass each other without disturbing drapery, etc. Wing space must accommodate assembled dancers. An orchestra pit is very desirable, for 20-50 musicians.

3. Music-Drama

Speech, music, action and scenic components are all incorporated in this form of presentation, sometimes called light opera or musical comedy. It is similar to straight drama in its storyline continuity, which demands directorial skill in successfully alternating speech, song and dance, and also relies heavily on stagecraft and technical support. The musical component is a key feature of transitions, requiring expert control. A relatively large cast and crew is typical with up to 50 people on stage at once and quantities of scenery to manage. Coordinating all this activity is a major problem requiring, besides extensive preparations, an excellent communications system during performance.

Performance Space: *Although principal attention is generally focused downstage, background "chorus" activity and the ability to have "cross talk" at the same time makes a wide, deep acting area desirable, about 60' x 45' deep. For a given production, this can be masked down. The floor should be danceable, although it needn't be very sophisticated in construction; the ability to build on and anchor to it is as important. Traps and pit-type cyclorama are desirable.*

Enclosure: *A 30'-35' high proscenium arch is recommended, along with flyloft stagehouse. Stagehouse proportions recognize that wingspace is as important as loft space.*

Scene/Working Space: *Wrap-around scene space must accept a large variety of rather elaborate scenery. The dimension of this zone must allow for structural support of stand-up sets with recesses and overhangs, often in combination with flown portions. Wagon sets are very useful as well, but require substantial working space in addition to that for cast assembly, other properties and technicians. Symmetrical working space is advised, to simplify maneuvering during scene changes. Since live music is essential, provide an orchestra pit for 15-30 musicians.*

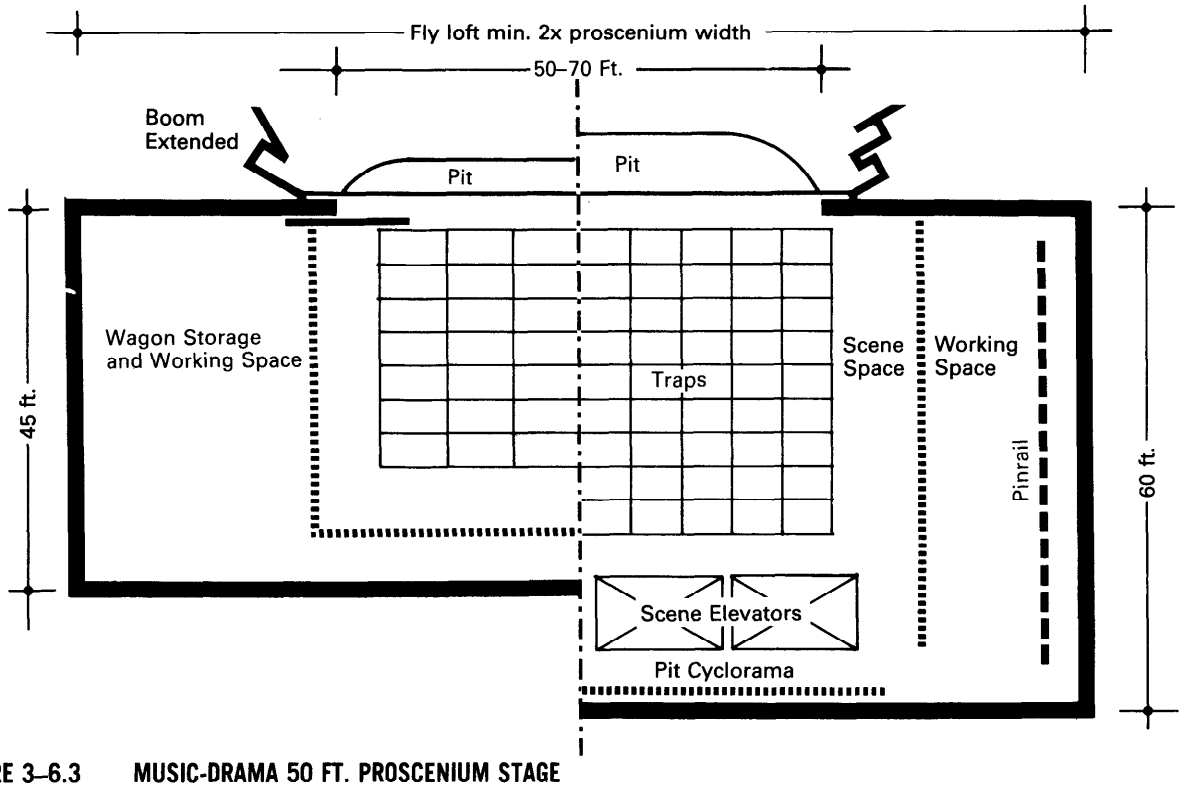


FIGURE 3–6.3 MUSIC-DRAMA 50 FT. PROSCENIUM STAGE GRAND OPERA 70 FT. PROSCENIUM STAGE

4. Orchestral Music

First identify the kind of orchestra for which the facility is primarily intended. Both its size and instrumental composition have a part in determining its characteristic sound, intensity, the literature emphasized, and requirements of physical arrangement. This suggests a Room designed for its "most likely" users nevertheless involves tolerances for variations. Music concerts consist of a series of uninterrupted performance periods of varying length. In the intervals instrumental components may be changed, reorganized and *retuned while the audience, immobilized during performance, refreshes itself. The sometimes* subtle alterations must *be* carefully prearranged *in a rehearsal situation as similar to concert conditions as possible.*

Performance Space: *Orchestra set-ups are usually as compact as practicable, in order to* hear each *other, see each other, and share sheet music. Stage area averages 16-20 square feet per musician and proscenium widths range from 55-80 feet. For various groups, this amounts to:*

- ***Ensemble or band, 30-50 musicians, 800-900 S.f.***
- ***Medium orchestra, 50–80 musicians, 1200–1500 s.f.***
- ***Medium orchestra and chorus, 50–100 voices, 1800–2300 s.f.***
- ***Symphony orchestra, 80–125 musicians, 2000–2400 s.f.***
- ***Symphony and large chorus of 100–200 voices, 2800–3500 s.f.***

Flexibility will help achieve sectional balance. A flat floor with portable riser platforms is advised, although some orchestras will not use risers. Performances with musicians and chorus often require extension forward and split-level arrangement with chorus behind orchestra. This can be accomplished on a large symphony stage with reduced orchestra, or by extension of an apron over the pit. Moving the orchestra forward alters the relationship to the enclosure. Smaller music ensembles and bands can be accommodated on a theoretically large stage with suitable adjustment of enclosure and musician arrangement. Therefore, the suggested approach is to size the stage for the largest likely group. Stage floor construction noted under 3-6a is applicable, provided the deck is mounted with felt cush-

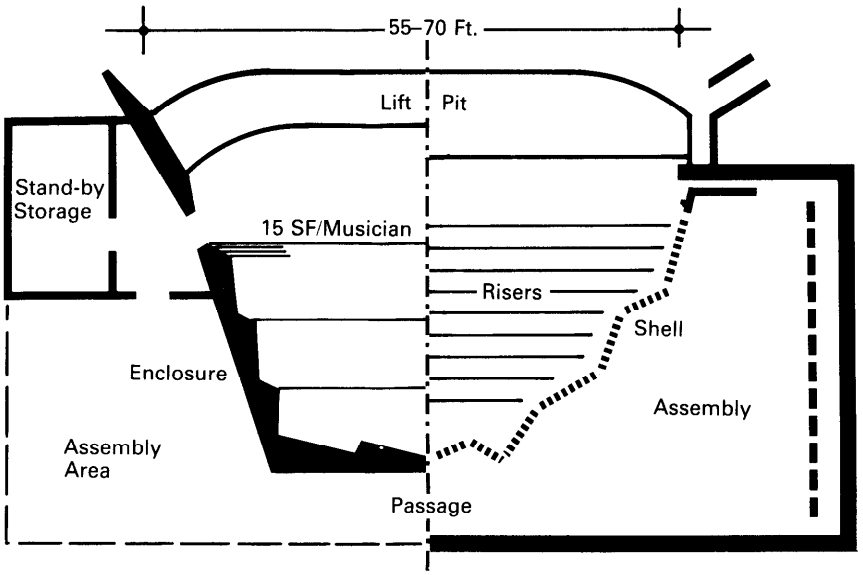


FIGURE 3-6.4 ORCHESTRAL-CHORAL STAGE

ions under sleepers variably spaced to dampen resonant vibration. If understage is unused, the structural base can be a ground slab.

***Enclosure:** Disregarding open stage forms applicable to small Rooms, two kinds of "sending end" enclosures are possible: the "hole in the wall" associated with traditional drama proscениums and the "'horn" that gradually becomes the Room. The latter is permanent construction especially designed for Music use, with structural qualities similar to the House. The first type (proscenium) is normally employed in multi-use Rooms or theater conversions, consisting of a demountable shell erected in the stagehouse. Both types have a degree of geometric adjustability.*

***Scene/Working Space:** Stagehouse functions, if any, are minimal for Music; most support activity takes place backstage or from control areas in the House. However, space adjoining the performance area should be allotted for performers' assembly and temporary instrument standby (pianos, extra chairs and stands). There may also be separate rooms for broadcast, recording equipment and lighting switchgear. If there is a story below stage, thoughtful planning of freight lifts is needed to make stage loading efficient. Installing a lift platform in the orchestra pit is recommended only if the acoustic enclosure design makes provision for the platform's use as performance area–i.e., if a proper forestage canopy is installed.*

5. Recital

Instrumental and vocal recital rooms are the most intimate music spaces. The presentation format is similar to orchestral concerts, but musicians are fewer in number and share a much more personal relationship with the listener. Recital acoustics provide greater definition among instruments.

***Performance Space:** The platform area depends somewhat on anticipated music group sizes, 400-600 square feet typically. A low elevation, 24"-30", is usual and portable risers may be employed for the larger groups or for choral performances.*

***Enclosure:** The surfaces near the platform may be treated with adjustable panels that are reflective, absorptive or both. These are normally intended to adjust hearing on stage rather than project sound to the house, and a*

high degree of diffusion is desirable. The ceiling over the stage, or suspended reflectors, should be within 20 feet and no walls parallel. Occasionally, a false or open work proscenium is used to support and screen lighting and audio equipment.

Scene/Working Space: *No scenery is involved, unless the Room has secondary uses. Piano, risers and chairs are stored adjoining the stage. There should be a lounge to which musicians may retire, and dimmers for house and stage lights.*

6. Choral

Basically a musical medium, group singing can have some of the characteristics of dramatic speech depending on the literature presented. Intelligibility is more important for secular works in terms of lyric continuity than for liturgical and choral-symphonic combinations. Choral requirements fall somewhere between those of a large recital hall and medium-sized orchestral facility, depending also on the number of voices.

Performance Space: *A rather close packing of singers is desirable in most cases to facilitate their mutual hearing and visual contact. Instruments and music stands are not involved. Singers may be seated for long or intermittent performance, or may stand throughout. Between 5 and 9 square feet of stage area is needed per singer. Additional area should be allowed for piano or instrumental accompaniment. Portable adjustable risers in 8 inch increments are a definite advantage over fixed risers. The floor area is normally twice as wide as deep.*

Enclosure: *Recital or orchestral considerations are similar, although a shaped enclosure or shell is more likely to prove successful in larger Rooms. The human voice is relatively directional but not as powerful as many instruments until carefully trained, and rarely for sustained periods. The enclosures' function to blend, balance and contain sound energy is important.*

Scene/Working Space: *Similar considerations pertain to recital, although offstage assembly space must be larger and is best with entries provided from both sides of the performance area. For orchestral accompaniment a pit is desirable, and actually necessary for large scale events. The alternative is a very large open stage arrangement.*

7. Opera

Musical drama is the middle ground between operatic recital and grand opera, since it makes more or less equal use of song, speech, music, dance and scenic elements. Operatic recital emphasizes music and song over action and scenery, and grand opera may be considered song, music and spectacle. The storyline is often well-known and diminishes in importance compared to musical execution. Traditionally lavish costumery and settings are involved along with a large cast of singers and musicians supporting lead soloists. Opera recital may involve two or more small groups on a stage similar to that for musical drama or smaller, with minimal scenic devices and dance activity. Grand opera involves a great deal of background movement, multiple entry points, stagecraft, special effects, and scene changes.

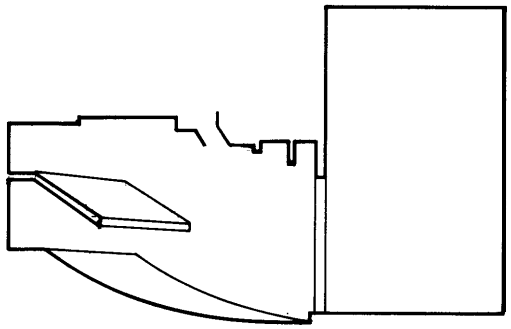
Performance Space: *Wider and deeper than others, it is typically 75' x 55' d. Traps, multilevel constructions, stage elevators and lifts are used extensively. The great depth and width of stage is not merely a tradition, nor the requirement of elephants, camels and chariots. Dramatic part-singing demands a great deal of movement on stage, reassembling of voices, and accommodation of a large chorus. Since it is difficult to sing while moving, the cast moves to new relationships with the soloists.*

Enclosure: *The opera proscenium is typically 65-80' wide and 40-50' high. This promotes acoustic coupling of the deep stage to the house and recognizes the probable height of a multi-tiered audience requiring good sightlines. The enormity of stage and stagehouse places premium value on trained, powerful voices and drama tic presence.*

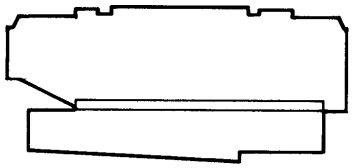
Scene/Working Space: *Opera stages are often the most technically sophisticated, the scenery vast and expensive because of its importance to performance. A person on an empty opera stage is dwarfed. He must move from prop to carefully selected prop, in order to maintain continuity of scale. Grand opera requires substantial scene space and offstage working space on all sides. A large, fully equipped flyloft, or a combination with scene elevators from below stage, is also needed. The flyloft must furnish generous flexible lighting points behind the proscenium and above stage, often including sidelighting towers in the wings.*

An orchestra pit is essential to grand opera. The pit locates musicians properly relative to

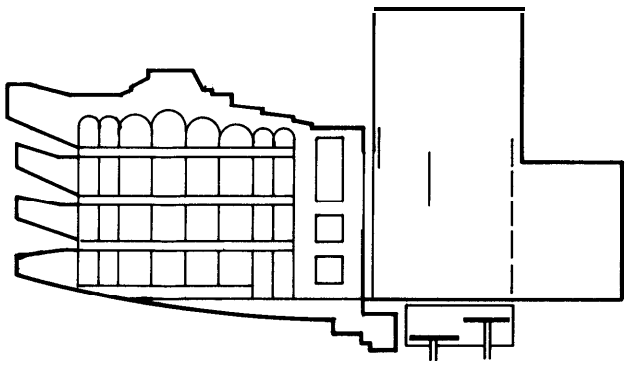
the action, but out of direct line of sight. It enables eye contact between the conductor and musicians and singers. It also enables singers and musicians to hear themselves best. Grand opera requires an especially large pit (80 musicians) and careful acoustic design. This design often reflects the nature of opera music; the pit has a mainly reverberant contribution at low intensity so as not to overpower voice intelligibility. The deep Bayreuth pit was developed expressly for Wagnerian opera, giving an eerie non-directional sound.



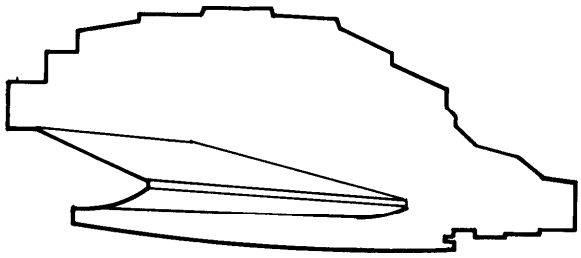
Drama



recital Hall



Opera or Dance



Orchestral

FIGURE 3-7.1 FOUR KINDS OF SINGLE-PURPOSE ROOMS

3-7. PRIMARY AND SECONDARY USES

A. FUNCTIONAL RELATIONSHIP OF STAGE TO ROOM

No single stage form can best satisfy the functional requirements of all performance types.

But a given stage form can often accommodate more than one performance type:

1. *Where the secondary performance type makes the best of the circumstances and accepts/ adapts to limitations of the primary form.*
2. *Where some or all of the necessary additional facility is built into the primary form.*
3. *Where temporary demountable modifications are provided to facilitate secondary use.*
4. *Where the best primary configuration is compromised to adapt to secondary uses.*

In terms of primary use, the four alternatives above are listed in descending order to desirability. While single-purpose Rooms are typically best suited to their uses, the likelihood is that some degree of multi-use will exist. Unfortunately the prevalent tendency to begin with multi-use as a major design objective too often leads, to disappointing, costly failures. Attempts to "install" flexibility take the form of mechanical devices; apron lifts and moving walls are the usual culprits. See Section 3-8 for discussion. Careful attention must be given to the Program Emphasis considerations discussed under 2-3, Establishing Program Goals. Section 3-15, Com-

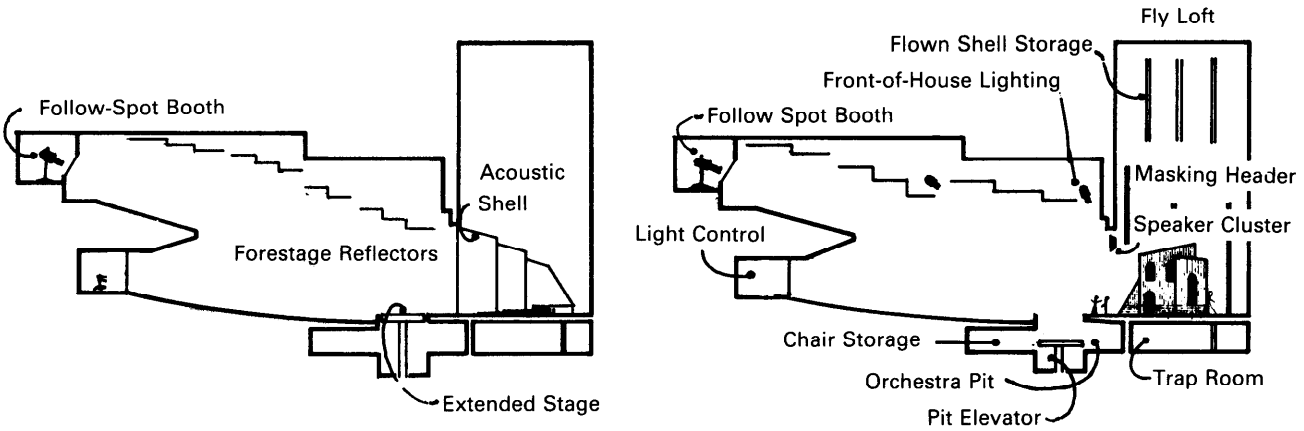


FIGURE 3–7.2 THE MULTI-USE ROOM

posite Building Programs, is also recommended as an overview of alternative approaches to the multi-use MDC.

Performance types can be grouped according to similarity of stage requirements as a first step, but it is important to bear in mind that both Stage and House are interdependent parts of the total Room. Any alteration of selection criteria for one has impact on the other particularly with regard to vision and hearing parameters. The audience arrangement in the House is based on the task of seeing action on the Stage, and this basis changes with the stage form and type of performance. The enclosure construction for both House and Stage corresponds to hearing tasks, and if the tasks or any part of the enclosure varies, adjustment may be required to obtain the best conditions.

B. SECONDARY USE CONSIDERATIONS

Section 3-2 identified four Frontal Room types to be elaborated, two capacities for Drama and two for Music, Sections 3-3 and 3-4 discussed the principal functional requirements of Drama and Music, and Section 3-5 developed some of the physical implications for design of the House. Having examined seven performance types of varying Drama and Music composition related to Stage requirements, the task remains to put Stage and House together again. A useful approach begins with the four Rooms of Section 3-2, exploring the major characteristics of each by noting adjustments required to accept any of six secondary uses.

1. 300 Seat Drama Room

Consider a 300 seat House with Legitimate Drama Stage of minimum acceptable proportions: 35' wide proscenium with flyloft, 35' deep to backwall, approximately 3000 net s.f. in the stagehouse. The fairly compact, intimate audience area will occupy 2400 net s.f., but an allowance of 10% for structure and inaccessible areas, plus at least 15% for control booths, service spaces and connecting circulation locks yields a total Room of at least 7200 gross square feet. The reverberant decay period (see Chapter 4) for drama should be between 0.9 and 1.2 seconds. Based on an average of typical absorption spectrum for drama houses, Room volume will be about 75,000 cubic feet, for an average ceiling of 25' (all such figures are intended to be plausible-not model calculations).

For the six other performance types, secondary use considerations follow:

a. Dance:

- *Proscenium preferably wider than 35'. Stage depth therefore deeper to permit crossover, and sightlines adjusted to take in deep stage.*
- *Flyloft should extend full depth if used.*
- *Require leg and tab drapes for entry both sides.*
- *Require smooth resilient dance floor.*
- *Require music source, live or recorded,*

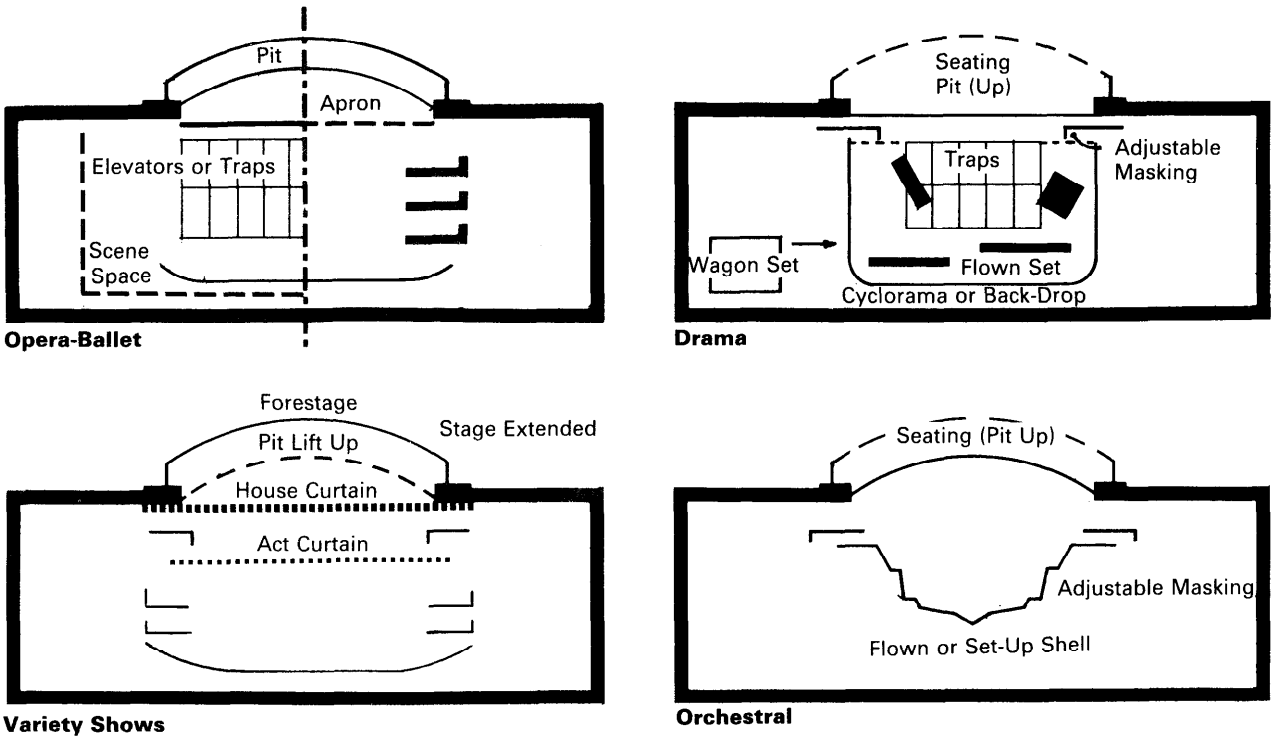


FIGURE 3-7.3 THE MULTI-USE STAGE

and appropriate Room acoustics, possibly an orchestra pit.

- *Multiple, high quality followspots.*
- *High-rake house seating preferable, with short view.*
- *Reverberant decay depends on music source; 1.0-1.2 seconds for electronic system. Suggests slightly live (reverberant) initial design.*

b. Musical Drama:

- *Stage configuration similar* to Dance.
- *Extra stage depth essential for scenery.*
- *Wingspace essential for scenery and cast entry.*
- *Pit for musicians essential.* Pit space will consume a part of prime audience seats.*
- *Proper reverberant decay 1.2-1.4 seconds = about 86-100,000 cu. ft. = avg. 36 foot ceiling. Room must have sufficient volume for music (over-large for 300 seat drama) or electro-acoustic enhancement.*
- *Typically large "market" implies larger house, higher production cost, fewer performance units.*
- *Conclude larger Room desirable if substantial amount of Musical Drama is anticipated.*

c. Orchestral:

- *Music shell may be necessary in stagehouse.*
- *Greater volume needed rules out large groups.*
- *Small groups (dance band and chamber ensemble) require acoustic consideration of Room shape and volume, or electronic adjustment.*
- *Dance band with sound system requires 1.0-1.2 seconds, may be compatible.*
- *Classical chamber music requires 1.4-1.7 seconds, needs help.*

d. Choral:

- *Small choral group concerns are similar to Orchestral, but Room volume not as great a problem. 1.2-1.6 seconds prefer-*

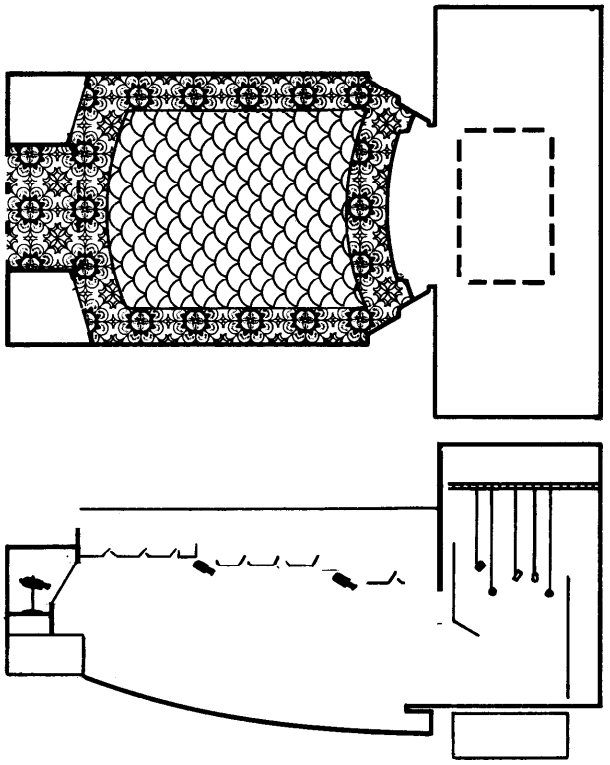


FIGURE 3-7.4 DRAMA ROOM-300 SEAT

able, perhaps attained with adjustable absorption, coupled volume, or electronics.

- *Stagehouse reflectors or shell desirable.*

e. Recital:

- *Longer reverberation desirable, 1.4-1.7 seconds (similar to chamber orchestra).*
- *Intimate scale desirable-low stage and close proximity to audience.*
- *Enclosure from stagehouse desirable, probably necessary.*
- *Room proportions preferably narrower than likely Drama House, or use forestage canopy reflectors.*

f. Opera:

- *Not reasonable except as voice recital of simplest character.*

2. 650 Seat Drama Room

Consider the same Legitimate Drama Stage as for the 300 seat Room. For a 35' wide proscenium, the first row and its aisles would not exceed 45' in width, and 300 seats would be within 50' viewing distance-an intimate Room. But 650 seats arranged in a rectangle would have the last row 115' from the Stage, well in excess of the optimum of 65'. In order to bring this row to 65' an average House width of 80' is needed-the last row would be 115' long-with side aisles more than 30 degrees to the centerline. Such an extreme wedge might be acceptable for Thrust or Open Stage configuration, but not for Proscenium.

Locating 500 seats on the main floor within 65' of the stage results in a wedge 75' at the rear-most row with side aisles just 13 degress to centerline. The remaining 150 seats would occupy a six row rear balcony-a good number, since six rows do not exceed 20' as a dead end aisle. An additional 5' rear aisle, control booths, etc., will create about 800 GSF in the balcony and 5333 GSF on the main floor. Adding the stagehouse results in a total Room area of 11,333 GSF. For the appropriate reverberation period (0.9-1.2 seconds) between 130,000 and 160,000 cubic feet of volume is needed. Discounting by 50% the acoustically shadowed balcony area, an average ceiling of 30' is probable. The balcony would have an overhang ratio of about 2:1.

Here are the secondary use considerations:

a. Dance:

- *Stage configuration concerns similar to 300 seat.*
- *Sightlines become more critical for larger house, may require wider proscenium or projected stage. However, balcony mitigates the problem.*
- *Balcony design to consider acoustics and vision, and to accommodate multiple follow-spots.*
- *Acoustical adjustment is more feasible than for Small Drama, suggesting desirability of live music and orchestra pit. Pit location to consider impact on seating capacity.*
- *1.4-1.7 second delay preferable for modest orchestra, or 1.2-1.4 with sound system.*

b. Musical Drama:

- *Stage design should reflect need for more scene handling space (3600 net s.f.) and direct loading from trailer trucks in addition to minimum requirements suggested for 300 seat house.*

- *Preferable to build-in pit space if Musical Drama is a substantial use.*
- *This is a reasonable capacity for Musical Drama, small for professional road shows but modest for community theater.*

c. Orchestral:

- *House size begins to be viable. With a substantial flown orchestra shell a 40-piece group could be comfortable within the 35' proscenium. Retractable legs permitting enlargement of the opening by 10' would accommodate 70 musicians.*
- *As the orchestra increases in size, longer reverberation is generally desirable for blending of sound. At 1.5-1.9 seconds, for contemporary works or Mozart symphonies, Room volume would preferably be 50% greater (250,000 cu. ft.). However, this creates a relatively "live" house unsuitable for primary Drama use. If medium-size orchestra is contemplated as a fairly regular event, electro-acoustic enhancement is advised.*
- *Conclude that primary Drama use is not readily compatible with larger orchestral works.*

d. Choral:

- *A demountable shell designed to reduce sound losses in the stagehouse would make choral presentation possible.*
- *Substantial choral works are typically written for orchestral accompaniment, and are therefore likely to be limited according to pit accommodations for musicians. A string/woodwind ensemble and 40 voices could reasonable occupy the stage without pit.*
- *Decay time slightly longer (1.2-1.6 seconds) than for Musical Drama would be appropriate for choral compositions in which lyrics must be intelligible.*
- *Choral music that needs blending (Handel) should have 1.7-2.0 seconds decay. An electronic system is recommended.*
- *Liturgical music, composed for reverberation extending 2-3 seconds or more could not be finely accomplished even with electronics. The audience will immediately note the artificial character of "big sound" in a small Room.*

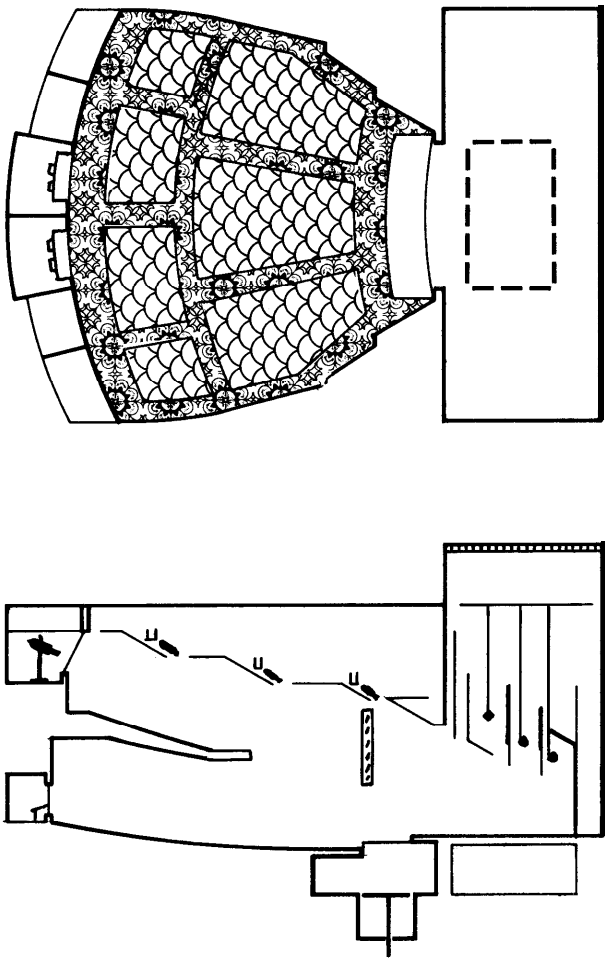


FIGURE 3-7.5 DRAMA ROOM-650 SEAT

e. Recital:

- *Comments noted under 300 seat similar.*
- *Absorptive quality of the drama house and scale of stage tend to make recital problematic without electronic assistance and careful visual setting.*
- *The first problem, absorption, is especially critical with a balcony arrangement that is a bit too deep. Over-sizing the volume for Music and introducing added absorption for Drama, the primary use, will compromise voice audibility and require speech*

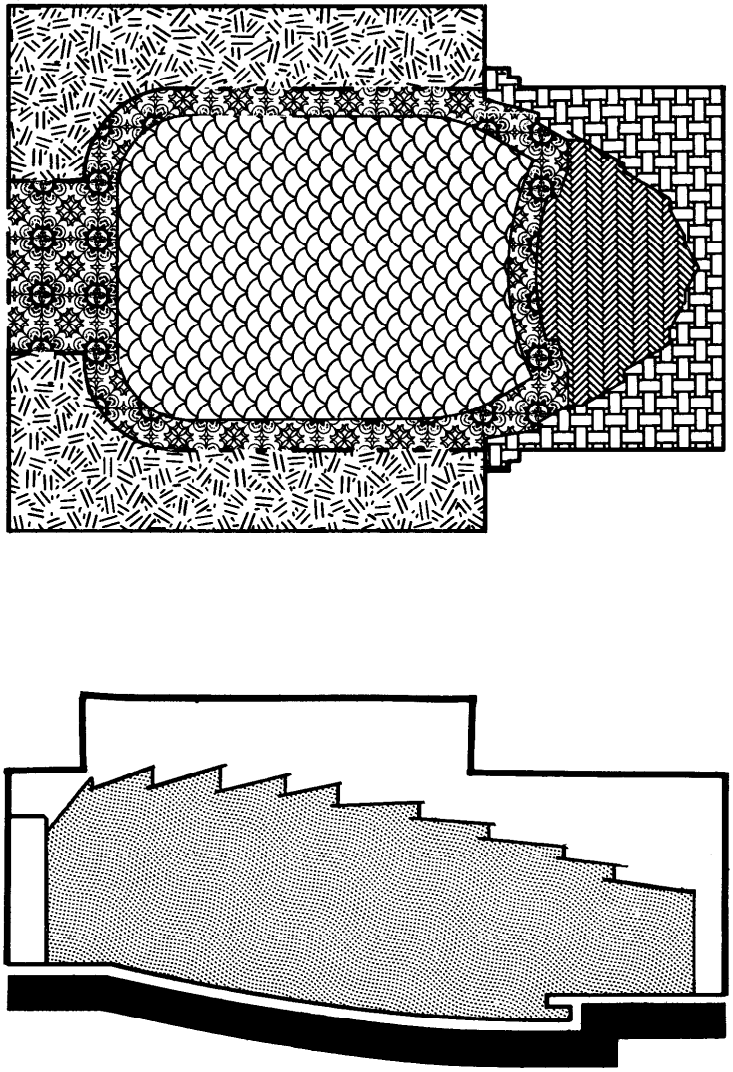


FIGURE 3-7.6 MUSIC ROOM-650 SEAT

amplification.

- *The secondary problem, stage scale for solo or small group music, can be overcome by design and provision of a shell.*
- *If Drama use is primary, recital should have electronic assistance.*

f. Opera:

- *Light opera amounts to Musical Drama, although somewhat longer reverberation improves music quality.*
- *A. reduced version of classical opera, verging on operatic recital, could be managed on a Musical Drama stage enlarged slightly. The lack of reverberance would be noticeable as would the small orchestra accommodated in the pit.*
- *Professional opera singers would definitely require rehearsal to modulate the intensity of their voices in a small Room.*

3. 650 Seat Music Room

Consider a Room shaped for 650 seat Music pres-

entation. It may have an Open Stage with suspended canopy, or an enclosure transitional with House surfaces, the ceiling turning down behind the platform equipped with reflective elements of various sizes. The 1400 s.f. platform (55 x 25) would accommodate 70 musicians. Seats and aisles will occupy 4600 net s. f. on one level, the farthest seat about 80' from the stage. Reverberation time of 1.8 seconds or more would be provided by 225,000 cubic feet of volume in a Room averaging 40' in height, but not necessarily rectangular in three dimensions. Continental seating would require many doors (about 10) to corridors on each side; total gross area of 9000 s.f. yields a net/gross ratio of 67%.
Small and moderate sized instrumental groups are most appropriate. Long reverberation would suit most symphonic works, and could be shortened. A rehearsal curtain is probably required.

Secondary uses are possible as follows:

a. Legitimate Drama:

- *In the Open Stage version, a large motorized wall might divide house volume in half, 50 seats placed on part of the stage, and absorption added to help offset 41,000 cubic feet of excess volume. This would yield a 375 seat Drama House needing electronic reinforcement.*
- *The resulting square plan would have minimal scenery; actors' entries would have to be considered in platform design, and traps built in.*
- *Improbable for legitimate theater.*

b. Dance:

- *It is conceivable that limited dance presentation is possible without stagehouse and scenic material.*
- *Musicians (small ensemble) could be seated on stage or house floor.*
- *Extension into the house is limited by fixed seat orientation.*
- *Stage proportions would preferably deepen, perhaps with an apron extension. A dished seating plan would make this more feasible.*
- *Alternatively, simple drapery or freestanding masks might serve the entry/proscenium function.*

c. Musical Drama:

- *Importance of scenery, orchestra pit, stagehouse and cast size, as well as fire safety, etc., prohibit this use in any practical sense.*

d. Choral:

- *Risers required on stage.*
- *Piano accompaniment may be sufficient for very large chorus (200); instrumental accompaniment requires balance adjustment of enclosure for combined 150 voices and 15 instruments all on stage. Larger orchestra and chorus combinations involve stepped stage extension and additional adjustable reflectors or electronics.*
- *1.8 second reverberation just right for most choral works, could be adjusted.*
- *Substantially good Room for choral performance.*

e. Recital:

- *This is close to "one room" intimacy, appropriate visual scale attained with careful lighting.*
- *Room proportions important to avoid "big sound" or hollowness; a bit large. Careful location of music source may also compensate first reflection weaknesses, or adjustment of enclosure and canopy.*
- *Reverberation a bit long for recital (should be 1.4-1.7 seconds) and will tend to increase due to empty stage.*
- *Instrumental or vocal recital possible.*

f. Opera:

- *Opera recital appropriate-especially with addition (3000 s.f.) of simple wingspace and false proscenium. A relatively high stage or split level construction to counter low angle of audience vision obviates need for pit.*
- *Reverberation a bit long-should be 1.3-1.6 seconds.*
- *Grand opera not reasonable without scenic element.*

4. 1400 Seat Music Room
An orchestra platform in an end-of-Room enclosure approximately 70' wide and 35' deep (2450 net s.f.) will seat 115-125 piece symphony orchestra. Seats occupy 9800 net s.f.; a rectangle

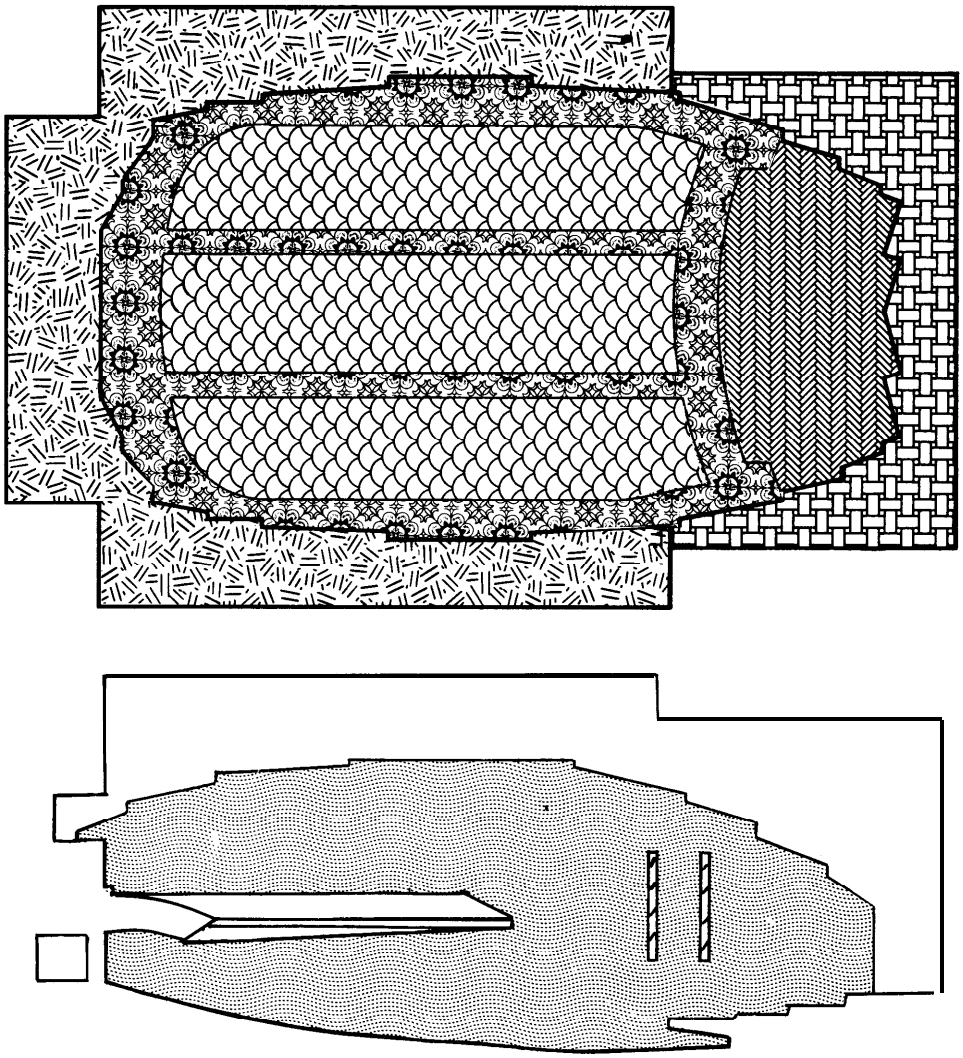


FIGURE 3-7.7 MUSIC ROOM-1400 SEAT

70' x 740' (with conventional seating, 2 sections of 14 seats per row, 50 rows deep) would be too long for vision and direct sound levels. Make one shallow, three-legged balcony seating 300, leaving a main floor 110' long.

The balcony is five rows deep at rear and two rows deep at sides, which extend 70' toward stage. Gross area of the Room (including Stage) is about 14,500 s.f., but balcony access will require corridors and stairs, for total 16,500 GSF (75% net/gross). Reverberation time of 1.6-2.0 seconds requires 450-480,000 cubic feet, for an average ceiling of 45'.

The Room described is a traditional concert hall. It will be suitable for full symphonic music. Its reverberant volume is medium for symphony, since a smaller House than typical for American halls means a proportionally higher component of direct sound relative to reverberation; however, definition and clarity of tone is considered desirable for contemporary music.

Secondary uses are limited:

a. Legitimate Drama:

- *Not possible.*

b. Dance:

- *Similar concerns of 650 seat Music, without benefit of Open Stage suspended grid.*
- *Existence of balcony improves potential for Dance, although house size would mean extreme distance from rear seats.*
- *Extension into audience would be more feasible, especially with 3-side balcony, but extension introduces problems of entry of dancers, stage lighting, and reorienting fixed seats. Not likely except for "rug concert" seatless occasions.*

c. Musical Drama:

- *Provision of stagehouse and pit (4500 s.f.) essential.*
- *Stagehouse accommodations may dispense with flyloft if generous offstage and wingspace is included. This means compromise of primary use by requirement of demountable orchestra shell.*
- *Orchestra pit is essential for reasonably unobstructed vision and Drama lighting angles.*
- *Reverberation time should be cut drastically. Introduction of sufficient absorption will select out mid and high frequencies, resulting in a weak, unnatural voice quality. Selective sound reinforcement would be desirable.*
- *House size and viewing distance sightlines acceptable for infrequent Musical Drama use, or Broadway revues.*

d. Choral:

- *50 musicians and 200 voices could occupy the stage described, without pit.*
- *With an extended stage for more musicians, large works (Beethoven's Ninth Symphony) are possible.*
- *With 50 musicians in an 800 s.f. pit, major choral works for 350 voices might be heard.*
- *Reverberation time would be just right (1.7-2.0 seconds desirable).*

e. Recital:

- *Chamber music and small ensembles would not suffer greatly if some adjustment were made, especially at the stage enclosure.*
- *Skillful lighting and backdrop design can mitigate apparent distortion of human scale.*
- *The Room is slightly large for recital intimacy, and too reverberant (1.4-1.6 seconds desirable).*

f. Opera:

- *Provision of stagehouse and pit essential (5000 s.f.).*
- *Operatic drama begs for a flyloft, deep stage and generous orchestra pit. Operatic drama also fares better with shorter sightlines and more intimacy than afforded by the plan described. This typically leads to the high, tiered horseshoe plan.*
- *Serious consideration of opera would begin at this capacity normally, in particular "intimate" opera as opposed to Wagnerian spectacle.*
- *Treated as light opera, Musical Drama considerations would apply with somewhat less success dramatically, but better performance musically.*
- *If serious effort is to be devoted to opera, consider designing the Room for it, since opera criteria combine requirements for orchestral Music and large scale Drama.*

3-8. ACCESSORY EQUIPMENT

Accessory equipment includes fixed and moveable devices, fittings, scenic properties, draperies, rigging and control systems that are desirable and often necessary to each performance type. Equipment design cannot be separated from or sequential to the Room design; it should not be thought of as "added to" the building. Acoustical design and theater stage technology are subjects for specialized technical consultants.

The architect's role is to coordinate consultants' efforts with the concerns of using service and

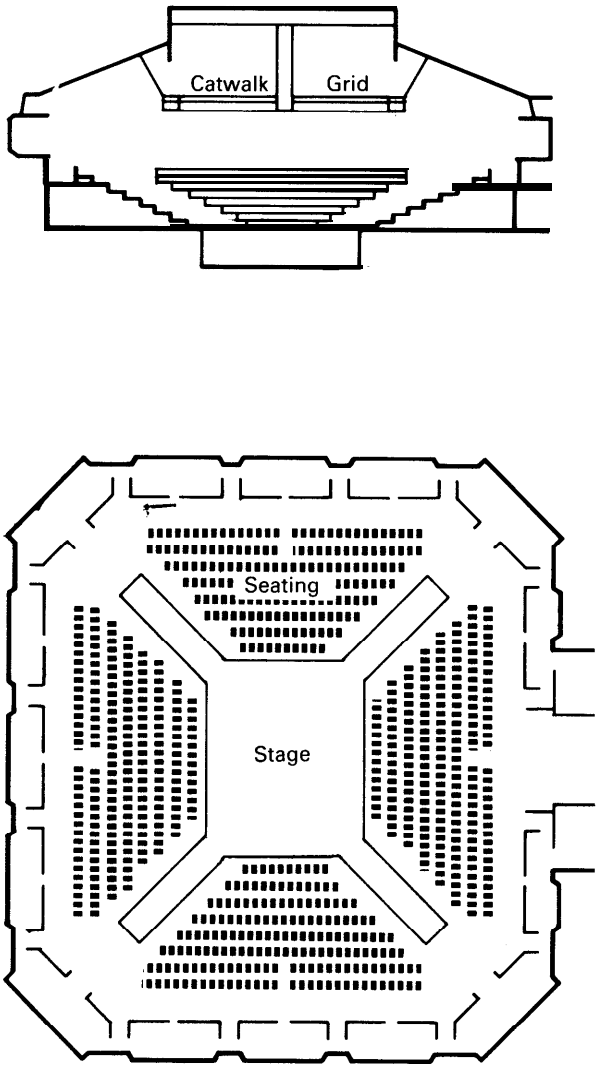


FIGURE 3-8.1 NON-FRONTAL ROOM

construction service. Room configurations must account for location and functional operation of accessory equipment in harmony with other criteria.

While detailed recommendations and technical discussion will be found in Chapter 4 of this Guide, the purpose of this section is to identify equipment's place in overall facility design by noting its general function, position and circumstances of use. Support and attachment, power supply, service access, enclosure, etc., are provisions that will be made for it in the architectural design.

A. GENERAL CONSIDERATIONS

1. Non Frontal

It is assumed the vast majority of Rooms will be Frontal in concept, and subsequent discussion reflects this. Departure from the Frontal form gives rise to a host of differences in the concepts of equipment use and placement. Certain principles hold true while their physical implications change greatly. Nevertheless, non-Frontal configurations do have application as potential Army facilities, especially where conversions of existing buildings or found space, independent rehearsal rooms, outdoor staging and exploratory programs are involved. A few general statements should be kept in mind regarding non-Frontal and Open Stage equipment.

The Open Stage relies less on a framed view, elaborate scenery and hidden devices than on lighting and suggestion for visual impact. Similarly, electronic and acoustic supplements and tuneability acquire greater value relative to enclosure design. As concealment becomes impossible, equipment assumes an important role visually. Careful detailing and good housekeeping can turn this into a gratifying, even exciting experience for all.

Perhaps the most significant benefit of non-frontal and Open Stage theatercraft is derived by users who have limited technical manpower, production funds or time for preparation. The absence of traditional stagehouse facilities frees them from production inertia and the obligation to fulfill ingrained audience expectations.

In general, non-Frontal and Open Stage forms are appropriate for small scale, intimate Rooms for legitimate drama, modern dance and small ensemble music. Equipment is lightweight, low-power, short-throw, portable and flexible in application. The stagehouse function is accomplished by a catwalk grid suspended 22-26 feet above the stage with supplemental low-angle lighting from positions in the house, installed in balcony fronts, clamped to railings, wall or ceiling bars. Very little scenery is hung or flown; there are no house curtains, etc. Without wingspace, entry points from the house itself are necessary via runways, vomitories and a trapped stage. The stage is sometimes the lowest point in a steeply raked initimate Room. Portions of seating may be demounted and rearranged to alter acting area configuration. In the typical small Room of this kind, acoustical precision is less practicable than for fixed Frontal arrangements, and less important.

2. Frontal

Most Rooms under discussion in this Guide are Frontal, one of three capacities or sizes, for presentations of four varieties: drama, dance, musical drama, and music. The following discussion is concerned with accessory equipment's basic purpose and functional impact within such Room environments.

B. CLASSIFICATION OF ACCESSORY FACILITIES

Accessory functions may be grouped according to the communicative media they enhance. Here they are listed in two groups associated with Vision and Hearing.

Vision:

1. *Lighting of performance and sets, and special effects.*
2. *Masks, screens, closures.*
3. *Backgrounds.*
4. *Sets, properties.*
5. *Visual monitoring for control of lighting and action.*
6. *Television for broadcast.*
7. *Film projection.*

Hearing:

1. *Source positioning, risers, pits.*
2. *Enclosures, shells.*
3. *Reflectors, diffusers, absorbers.*
4. *Additive/subtractive volumes.*
5. *Electronic audio systems.*
6. *Aural monitoring for control of electronic systems.*
7. *Communication systems*

The existence and operation of these accessories in the Room has impact on the total environment in both physical and perceptual terms. The kind and quantity of accessories is related to the nature of performance in much the same way desired Drama and Music Room qualities are associated with vision and hearing parameters.

C. VISION-RELATED ACCESSORIES

Beyond the needs of operational utility, the purpose of vision-related accessories is to enhance visual perception emphasized in performances of legitimate drama, musical drama, and opera. Dance and operatic recital should be provided with a modest facility for scenic effects and dramatic lighting. Music presentations, including choral and recital forms, require the smallest amount of visual enhancement in the form of concert lighting, and in some cases profit from backdrops and masking to set scale and conceal distracting equipment.

1. Lighting

This is the most important drama accessory. It furnishes color, mood, atmospheric effects on stage; indicates change of context, passage of time, symbolic change of scene; and it centers attention on specific actors or regions of the stage.

Theatrical lighting is not like architectural or exhibition lighting; it is constantly changing during performance and no two productions are likely to repeat a given array. Every sequence of dramatic events has a corresponding series of lighting events. At any point, there may be half a dozen ways to light an actor, a group of actors, a set piece, a single property, a backdrop, the stage floor and enframement. Each may involve several angles, colors, intensities and beam widths. When the actor moves the light moves with him, or it may move without him. In short, the lighting scenario is as much an element of theater arts as the reading of a script. Lighting systems must be able to facilitate change with the greatest range of options.

A combination of portable fixtures, on-stage adjustable attachment points, and house wall and ceiling positions allows the selection of several basic types of lighting:

On The Actor

- *Downlighting, creating pools of light on the floor from above.*
- *Sidelighting, giving form and color to the actor's body.*
- *Backlighting, making the actor stand out from the background.*
- *Frontlighting, coloring his body from the front.*
- *Area lighting, providing basic reference visibility from the front.*

On Scenery

- *Deck lighting, washing the floor with color from striplights overhead.*
- *Cyclorama lighting, coloring the backcloth with striplights over it or along side.*
- *Droplighting, coloring legs, borders and other drops with striplights.*
- *Specials, lighting specific pieces of scenery, such as sunlight through a window.*

Each instrument employed during the performance must be fed power from dimmer circuits that allow one person to control relative brightness from a central location. Each mounting position includes one or more circuits routed to a patch panel where they are selected or combined for separate or simultaneous control.

The majority of theatrical lighting instruments are located in the stagehouse. About 25% are located on the audience side of the proscenium.

a. Stagehouse Lighting

Positions must be provided over the stage at various elevations interspersed with rigging lines and battens. Lighting is also mounted on vertical booms at either side of the acting space.

While instruments may be assembled to pipes at stage level and hoisted as a unit, final adjustment is accomplished from portable ladders. Stages without flylofts provide a network of catwalks for attachment of overhead lighting.

In general, stagehouse lighting helps create the context of action; the parameters of its disposition are non-interference with movement on stage and invisibility from the audience. It is especially important for performance with minimal set material, such as dance.

b. Proscenium Lighting

Positions above and alongside enable the curtains to be washed with color. Troughs with deck plate covers can also be installed at the leading edge of the stage, or pop-up footlights. Proscenium lighting functions to establish foreground attention at the curtain line, which can be useful between scenes and as a transition between concentration on the play and the general illumination of the house.

c. Forestage Lighting

An elaboration of proscenium lighting occurs in some instances where a deep forestage apron or pit elevator extends into the house. The effective use of this projected area requires overhead lighting from a position equivalent to stagehouse lighting. It will also require adjustment of lighting from the house which is normally directed at the downstage curtainline zone.

The usefulness of an apron in straight drama is therefore questionable since it also alters sightline considerations and defeats the purpose of a stagehouse; it is neither a Proscenium Stage nor a Thrust Stage. The forestage concept arises from multi-use considerations where a music shell installation requires a canopy for acoustics anyway (it can be motorized and retracted), or where occasional enlargement of the stage by covering the pit is deemed valuable for specific uses. The canopy position may also be occupied by loudspeakers and other electronic equipment. The pit itself can usually be lighted from house ceiling positions.

d. Lighting From The House

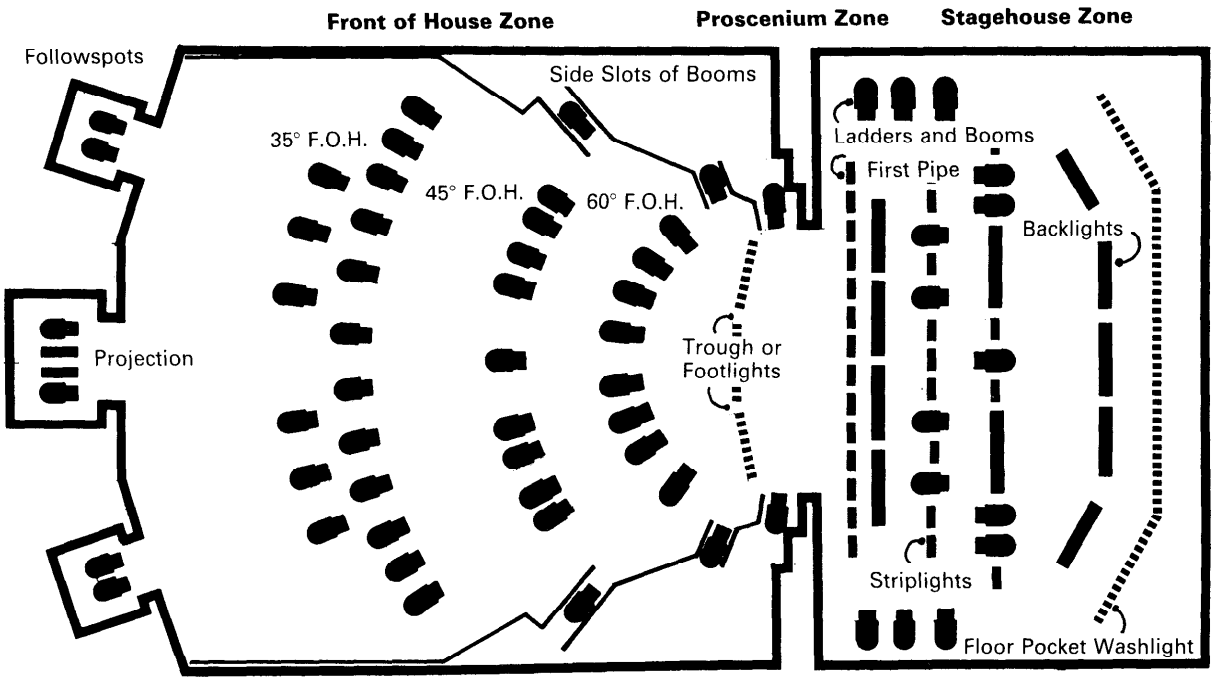
The principal illumination of actors must occur at an angle from behind the audience to avoid the distorting effect of long vertical and diverging shadows. Most of this lighting is directed to the forward portion of the stage from vertical pipes concealed in the sidewalls of the Room and from catwalks near or above the ceiling.

This lighting imparts the modeling component of shadow important to perception of features, shapes and textures. The catwalks, ladders and/or booms are permanent construction on which the portable fixtures are mounted and adjusted. Their location should allow incident angles of 60 and 45 degrees from horizontal. Balcony fronts near the stage often serve as mounting points also.

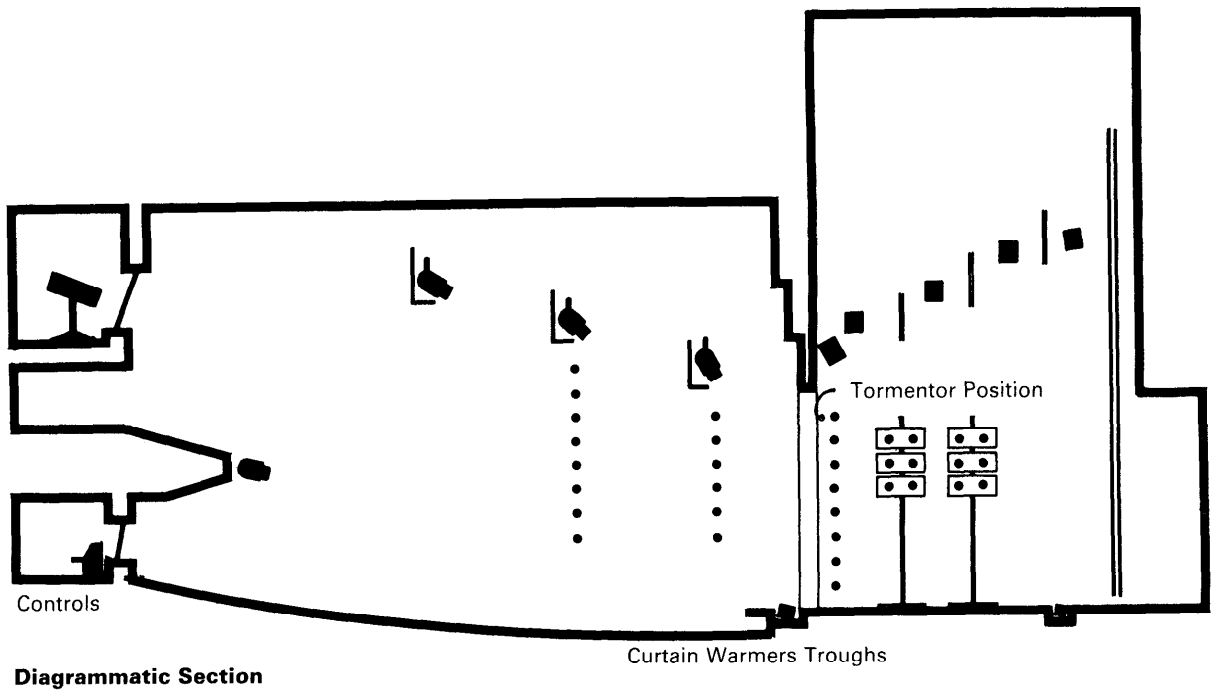
Give special attention to the distance relationship involved in obtaining these necessary lighting angles. Beam control decreases while fixture size, cost, power consumption and heat generated increases with distance. It is generally more economical and flexible to make the most of positions within 40 feet of the subject.

e. Follow Spots

The lowest line of lighting (30 degrees) is mainly devoted to manned followspots, although a few ellipsoidal projectors are often useful at this angle too. Small portable followspots on stands with a maximum throw of 60' are very useful for drama, and may be used from platforms in the house.



Diagrammatic Plan



Diagrammatic Section

FIGURE 3-8.2 LIGHTING POSITIONS

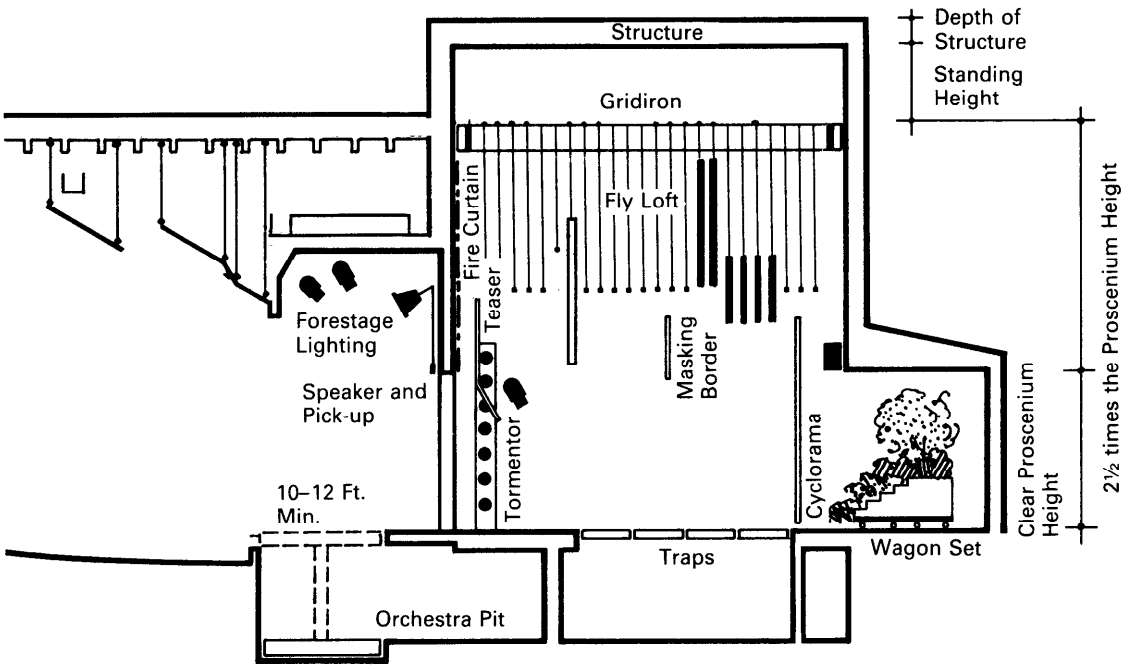


FIGURE 3-8.3 STAGEHOUSE ACCESSORIES-VISION RELATED

Carbon arc followspots with a maximum throw of 200' generate poisonous fumes that must be mechanically vented; they are operated from an enclosed booth. This booth is at the rear of the house, often near or just below the ceiling. It contains at least two permanently mounted carbon arc lights with interchangeable color filters.

f. Houselights

Permanent auditorium illumination is mentioned here because its operation parallels theatrical lighting. Separate dimmers are used, controlled from the theater lighting console. A preset dimmer sequence is often used to gradually reduce intensities of separate sources progressively, at the same time bringing up aisle lights and exit signs. In Music Rooms, the houselights rarely go dark; about 20 footcandles is often maintained for program reading.

g. Concert Lighting

Music Rooms without a stagehouse have a less extensive lighting system-because stagehouse and proscenium requirements are greatly reduced along with the need for a constantly changing program of color and intensity. Nevertheless, adjustable lighting from the house, followspots and enclosure/stage lighting need be furnished with suitable controls and dimmers. The ability to alter the color composition and pattern of concert lighting is important to obtaining desired mood and scale relationships for the occasion. Performance area lighting must also be adapted to musicians' comfort and seeing tasks, requiring high angle fixture placement, 70 footcandles with low specularity, and a relatively bright background field.

h. Touring Companies

Road shows and troupes, especially commercial entertainment and drama groups, often travel with their own lighting equipment including instruments, controls and cable. Facility for temporary equipment becomes important. Depending on the situation, portions of the installation's equipment-in-place may be used, especially on the house side. Therefore, the selection of compatible standard interlocks and modular systems is advised; the management should be very clear about what it has to offer and what the touring group anticipates using or connecting. In any case, a company switch is provided for visitors' direct power takeoff.

2. Masks, Screens, Closures

These are usually the function of draperies, which define acting and scenery spaces; screen equipment, sets and actors entries from view; surround stage space with light and color, or frame it in darkness; and close off or screen the stage from view between scenes. Draperies are discussed at greater length in Chapter 4.

The relationship of draperies, lights and scenery within the stagehouse is best understood in terms of flyloft layout for the traditional Proscenium Stage. It also makes clearer the conceptual differences of the Open Stage. (See 3-9e and Chapter 4 regarding the mechanical workings of the flyloft).

Rigging flyloft stage equipment is accomplished with parallel pipes slightly longer than the proscenium is wide, normally able to be hung every six inches from the proscenium to the back wall of the stagehouse. These pipes are suspended by hemp and wire ropes from a gridiron high above the stage floor, in order that drops and drapes may be drawn up clear of the acting space. A large number of lines is required because of the many pipes (or battens) and because each batten has several suspension points to limit deflection.

Rigging the open stage is accomplished from a lighter-weight grid fixed 25-30 feet above the stage floor, about where the top of a proscenium would be. It functions as an attachment network for light pipes and drops, but very little is ever drawn up (or flown) above it. This grid is often a series of catwalks to which lines, pipes and lighting instruments are clamped directly. Variations include wire net “trampoline” grids through which lines are dropped.

The proscenium wall is a substantial piece of structure, since it must span a large opening, bear part of the heavy gridiron load and separate the audience from the stagehouse with fire resistive construction.

a. Fire Curtain

It is hoped this apparatus need never be used, and certainly will not be in the normal course of performance. Although it is not a vision-related accessory, it is always the first line of actual closure between the stage and house, operating automatically and independent of performance rigging upon activation of smoke and heat detectors. It retards the passage of flames, smoke and toxic gases in the event of fire, providing a margin of safety for evacuating the building. (See also remarks under 3-6a).

Non combustible construction of asbestos fabric and/or steel slats similar to a coiling tambour door is typical. It has been found that asbestos cloth loses its structural integrity under high heat; when used, it is incorporated in a steel frame. In some circumstances (see NFPA Standard 101), a water-flood system may be used to soak the house curtain or the fire curtain for a specified period, in lieu of or additional to shuttering.

b. Forestage

Depending on Room configuration and uses, certain functions can take place in front of the proscenium. The stage may be equipped with a forestage or motorized pit lift capable of forming an apron in front of the principal curtain. In some cases, the proscenium is expanded in depth over this region and may contain supplemental borders and drapes, lighting, acoustical equipment, loudspeakers and movie screen.

This arrangement can be useful where music or small scale performances are interspersed with full drama productions, allowing rehearsal and set up to take place within the stagehouse without interference from ongoing programs. Forestage draperies, etc., are typically simple by comparison, especially since the fire curtain function cannot be effective.

3. Backgrounds

Including the fabric drops mentioned above, backgrounds may be the blank backwall of the stagehouse, or elaborate “‘murals”. One useful form of background is the cyclorama, which wraps around the scene space and may curve in two directions-vertically and horizontally. The cyclorama used to be a curved white plaster wall, but is now more often constructed of cloth, hung or stretched over a pipe frame at the back wall, white or medium gray in color. It has the advantage of portability and ease of maintenance, and can accept film projections from either side.

4. Sets And Properties

Scene elements are created or selected for the specific literature presented. Scene pieces are constructed and vary in complexity from painted drops and flats to elaborate multilevel structures,

replica interiors and the like ("box sets"). The term properties generally refers to individual pieces within the acting space, such as furniture, vehicles and items carried by the performers. Sets and properties may be broken down and reassembled or revised for several different productions.

5. Visual Monitoring For Control

Coordination of performance accessories over time requires a viewpoint approximating that of the audience. Hence, a control room is best located at the rear of the house, unobtrusive but in communication with the stage, lighting and rigging technicians, and performers. It must have complete surveillance of the action.

6. Television Broadcast

If video recording or broadcast is contemplated, required facilities must be anticipated in planning the Room. Camera placements should not interfere with audience sightlines and should not divert attention. If fixed or concealed camera positions are provided, they must be carefully preplanned. Also note that higher illumination levels (150 footcandles) are required for TV, especially color-casts. These circumstances must be evaluated for their influence on performance. A broadcast control booth need not impinge on the Room, since camera control deals with video images. Most broadcast networks furnish mobile vans for this purpose and require only cable entrance and camera positions as built-in components.

7. Film Projection

Except for its use as a scene accessory this capability is not an essential element, but after other functional requirements are met, slide and movie film projection may be deemed a useful accessory.

The similarity between drama and cinema ends with the audience facing a framed image in a darkened room. Generally, a Frontal Room designed for drama can accommodate film by providing a flown screen, with projectors adjacent to the lighting control booth addressing the screen at a right angle to avoid distortion of the image. Obviously, available projector locations may be less than satisfactory if their accommodation is not considered in the design.

16MM movies and 35MM slides are the most likely formats, but standard portable equipment does not have the light output sufficient for distances exceeding 30 or 40 feet. More powerful projectors, and equipment for 35MM and 70MM movies of commercial variety require enclosed, ventilated, fire protected booths and permanent mounts, much like carbon arc followspots. While large format film can be ruled out, it is still recommended that a suitably positioned booth with at least two projector ports be installed at the rear center of a small house. For occasional use in a larger house, power supply to a demountable platform within range of the screen may be desired.

D. HEARING-RELATED ACCESSORIES

Electronic amplification, recording and playback, microphones, loudspeaker systems, and intercommunications readily come within the definition of accessory equipment as do any non-electronic adjustable acoustic devices such as reflectors and absorbers. But it should not be forgotten that seemingly commonplace fittings like chairs and risers are equally important equipment components for the enhancement of performance quality and flexibility.

A more thorough discussion of equipment functions and techniques is contained in Chapter 4. This section (3-8) is concerned with their implications in architectural (Room design) terms. Decisions about the seven topics treated below will affect dimensional, structural and material considerations.

1. Sound Source Positioning

Successful music presentation requires the ability to locate musicians in varying relationships to each other and to the Room. This is important to balancing sound emerging from the stage. It provides essential flexibility for group size, instrumental makeup, and differences of presentation content.

Consideration of accessory devices need be given to the two principal areas of music performance - the stage (or platform), and the pit.

For instance, the musicians' elevation relative to the audience tends to increase direct sound levels. Also, the position of musicians relative to the stage enclosure walls can be especially critical in elliptical and parabolic geometries sometimes found in large Rooms, and where sources of uneven intensity must be balanced (such as soloists and ensemble, strings and brass).

Similarly, a deep orchestra pit yields primarily reverberant sound. The treatment of the pit or the decision to do without one has considerable impact on the use of the Room acoustically quite

as much as operationally; the pit is more than a convenient place to tuck the orchestra out of the way. For dance or musical drama, the pit substitutes for the enclosure needed by musicians to hear themselves. It also serves to blend and subdue musical accompaniment relative to voice on stage.

Pit musicianship is a specialized art requiring experience and precision (so does stage singing). If a less experienced group is involved, the pit treatment can help by introducing absorption to reduce sound levels and allow for electronic amplification. Consider two examples of all-music presentation-chorus and orchestra.

a. Chorus

The chorus is compactly arranged on risers for geometric reinforcement, maximum projection, and ability to hear each other in circumstances that reflect maximum energy into the house. In this case, the orchestra is often located in a recessed pit, contributing reverberant tones without interfering with articulation of voices in the direct sound field. Rooms have often been designed primarily for chorus or orchestra with no pit, due to the misconception that a pit is a drama accessory.

b. Orchestra

Arrangement of musicians on stage should be at the conductor's option. Some orchestras prefer to set up on the flat, others on risers. Smaller groups and contemporary material may benefit in particular from steep riser arrangements or careful location horizontally; many halls have developed "'soloist points". Finally, recall that musical instruments exhibit handedness, especially those with resonant chambers and sounding boards (violins and pianos) that may dictate a proper orientation to the listeners. Brass instruments are highly directional; the musician may have difficulty assessing the intensity of his efforts perceived by others. All of these are conditions tempered by position and arrangement.

Among the devices to have on hand is a good assortment of portable riser platforms stored convenient to the stage. The most commonly used arrangements may be fitted to the stage, but should be modifiable by reassembly as need arises. A 4' x 6' folding unit is a practical large size, with interchangeable legs in 8" increments. Normally, 36"-40" tiers are wide enough for seated musicians and singers, while 24" widths are better for standing chorus. Musicians' chairs should be carefully selected. They should be firm, "four-square" in stability, broad rather than contoured, and of unitized squeakless construction.

2. Enclosures and Shells

These function to condense spherical wave radiation and direct it toward the audience and into the house volume. In a Room without a shell (Thrust or Surround) vocal sound emerges with a 5db drop to the side and 10db to the rear. A 10db drop means the sound seems half as loud.

An enclosure is built into the Room permanently. However, some degree of adjustability is usually incorporated in the enclosure itself, including moveable panels, additive reflective components or absorptive elements. These enable the enclosure to be "tuned" to varying music group sizes, instrumental makeups, and desired sectional balance, though its effect is probably most noticeable in smaller Rooms and recital halls. For large Rooms, adjustment is mainly for the benefit of the musicians.

The shell may be more easily understood to be "equipment" since it is demountable. It is necessary for a multi-purpose Room with stagehouse. The shell can be wholly or partially disassembled for storage off stage if there is no flyloft. The decision to have a shell, its design and placement, depends very much on the volume and shape of the Room, and all the uses to which it will be put.

Shell design requires expertise. If a shell is to be used intermittently, lightweight highly portable construction is needed. Lightweight, however, means less low-frequency energy is reflected. This is typical of the flown shell, which may have self-supporting wall panels. If a shell will remain in place for some time, a more substantial bolt-together articulated panel system is common. The ceiling should be 20-25 feet above the musicians, and in large Rooms, may extend into a forestage canopy.

3. Reflectors, Diffusers, Absorbers

Hard, dense surfaces of varying sizes reflect varying wave lengths. Convex and irregular surfaces break up and distribute reflections of characteristic wavelengths in many directions. Porous surfaces absorb high frequencies. Dense hangings and pliant material (such as people) absorb midfrequencies. Large resiliently mounted surfaces with cavities behind them absorb low frequencies.

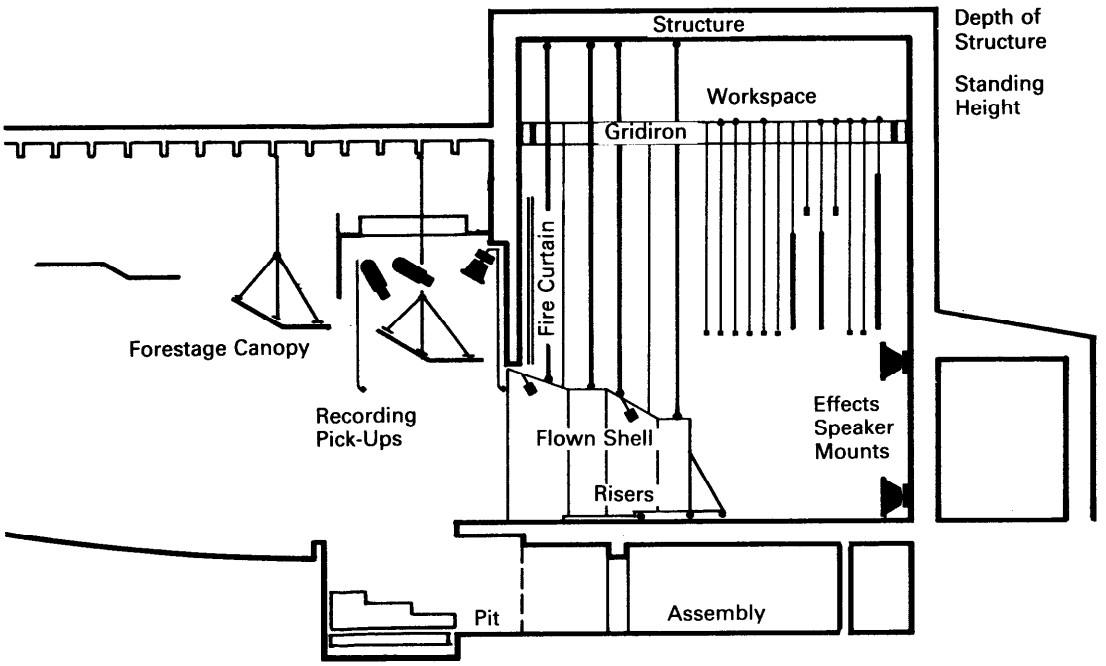


FIGURE 3-8.4 STAGEHOUSE ACCESSORIES-HEARING RELATED

The materials and details of construction enclosing a Room are critical factors in its performance acoustically. Reverberant decay is a function of the net reflective property of boundary surfaces and the volume in which the sound rattles around. While this is a general Room quality, adjustment in specific areas can be an accessory function.

Typically adjustable reflector positions include the region over musicians (either in the stage enclosure or in a forestage canopy for pit orchestra), the region above and between musicians and audience (forestage canopy), and trouble spots likely to occur in found space conversions (acute corners, domes and focusing coves). Reflectors should almost always incorporate diffusion to scatter reflected waves. This is accomplished with convexity and surface irregularities.

Absorption devices may be employed for several purposes:

- *Reduce the reverberation time of a large volume for adaptation to speech.*
- *Permit rehearsal in a highly reverberant empty house.*
- *Compensate for low attendance rates.*
- *Alleviate echoes and focused reflections.*
- *Reduce sound levels emanating from the pit.*

However, absorption must be properly used. Its addition results in lower overall sound levels, which may necessitate installation of electronic amplification. Absorptive material can be frequency-selective resulting in unnatural or unbalanced attenuation just as non-diffuse reflectors can intensify a given frequency.

The common practice of alleviating harshness, focused reflections or flutter echoes by hanging draperies on one wall, would often yield more satisfactory results if diffusion were employed instead. Long, even reverberation is gained by provision of cubic volume in correct proportion to absorption; adding absorption when it isn't needed essentially defeats a Music Room's intent.

4. Additive/Subtractive Volume

This is a recent approach to variable reverberation based on the volume/absorption principle. Efficient coupling or separation is critical to success. Subtraction is possible by sealing off a por-

tion of the Room, or by moving musicians out of the enclosure and sealing it behind them. Addition is possible by two methods with variations: physically expanding the volume of Room increases reverberation time generally, and coupling other volumes in proximity to the source increases reverberation of a portion of the frequency spectrum.

The sophisticated technology involved tends to limit application to special circumstances arising from Room configurations dictated by unusual program goals; the likelihood of such circumstances is small and more readily solved by firm decision. Although adaptive electronic systems will probably prove more feasible, consideration of coupled volumes may help avert related problems.

Actually enlarging or decreasing effective Room volume at will is rarely practical. Given a deep upper balcony, it is possible to close it off by drawing a heavy, specially designed sectional partition between its front row and the ceiling. Schemes to mechanically raise and lower the ceiling itself have been plagued with problems of acoustical seals, integral lighting and mechanical systems and great weight. Annexing adjoining spaces and corridors fails on account of their contents, and practical dimensions determined by normal use. The coupled volume must become part of the Room.

The most useful volumes are in proximity to the music source. Their use results in strengthened low frequencies for added "warmth". One of these volumes is the stagehouse itself, connected through a large proscenium. The installation of a partially "transparent" shell reflects mid and high frequencies. Low frequencies enter the stagehouse where they reverberate and emerge into the house a short time later, effectively lengthening low frequency decay. However, the volume must be relatively free of absorptive materials, which limits the kind and quantity of drops stored there.

Perhaps a more practical possibility is the utilization of understage volume in a similar fashion, with the ability to control absorption. In this case, the stage floor behaves like a drumhead or violin body. When the volume is coupled with the Room it enhances reverberant field for the audience near the stage especially, who often suffer from high direct/reverberant ratios. This method has had application in non-stagehouse Rooms, too.

Coupling has also been accomplished electronically, using the stagehouse as a reverberant chamber connected by microphones to speakers in the house. The advantage of electronic coupling is ability to turn it off in multi-use Rooms, so that undue scene change noise is not transmitted during drama performances. Air-coupled volumes must be mechanically separated, with absorptive draperies added to deaden the space. There are also issues of fire separation to contend with.

The practice of closing the proscenium or orchestra enclosure and staging small scale music performances in front of it carries with it the need for reflective surfaces around the musicians. These may be set up on the apron or lowered from a forestage canopy. The proscenium closure must be more dense and reflective than the typical house curtain.

5. Electronics and Sound Systems

As with demountable shells, it is easier to think of electronic components as accessory 'equipment". They serve three general functions in terms of performance acoustics: enhancement of natural acoustic qualities, amplification of sound, and theatrical sound effects.

In terms of Room design impact, the first function (electro-acoustic enhancement) is most significant, as it deals with objectives that could otherwise be effected only by physical changes in the structure. This system's sole purpose is to increase reverberation time by electronically introducing very small delays between input and output. The system must be designed for the Room and should only be undertaken by a qualified acoustician.

Amplification (sound reinforcement) raises the level of direct sound radiated into the Room. This too must be designed by a well-informed specialist. Its architectural implications reside in the placement of loudspeakers, the choice of which must belong to the acoustician. Depending on

Room use and configuration, loudspeakers may be located in a central cluster above the proscenium, in several groups above the proscenium, on both sides of the proscenium, or distributed in the house. Improper placement of loudspeakers and microphones can destroy the usefulness of the Room.

An audio effects system provides the aural equivalent of visual (lighting and scenic) con-

tent-illusion, atmospheric mood and color, and thematic continuity. The effects system will be independent of the reinforcement system, for the very reason that directional illusion (or realism) may demand that sound effects originate offstage or behind the audience or in a moving pattern. Multiple outlet jacks are required for portable speakers controlled through a special effects console.

6. Monitoring and Control

Production lighting control from the lighting booth is especially relevant to drama productions where visual monitoring is essential. By the same token, sound control where electronic systems are involved should be properly monitored from an audience reference point, also normally located in the rear quarter of a frontal house.

Whereas lighting control is often separated from the house by plate glass to avoid audible intrusion on the audience, sound control requires the actual sound in the Room be heard for appropriate balance adjustment to be made. The control console "cockpit" is best located in the audience area. Solid state electronics allow it to be quite compact, tied into remote power amplifiers of the reinforcement system. Location and control wiring connections will be specified by the system designer.

7. Communications

There are several important systems of communications to be considered. The principal design requirement is separation of message channels to limit them to those for whom the message is intended. This may involve separate wiring, input and output sources, and isolated enclosures. In this category are public address, broadcast and recording, performance monitoring and production communications.

The purpose of public address is to make general announcements to groups of people, which may mean the seated audience, those assembled in the lobby or out-of-doors, and those assembled in the stagehouse or backstage during rehearsals. Its key architectural implication is the acoustic separation of message zones and restricted control of input channels to prevent unwitting intrusion on performance activities. This demands appropriate door seals (and the discipline to keep them closed) and level adjustments of the loudspeakers, with master controls in the control booth and stage manager's console.

Archival recording and broadcast functions utilize signals from monitor microphones suspended in front of the proscenium over the first few rows of seats (or derived from the reinforcement system inputs) which hear what the audience hears. These signals may be fed directly to a remote broadcast/control booth where an announcer's voice-over can be dubbed in, and/or to a recording control booth. Broadcast programs are either recorded for replay or relayed to the station for transmission. The architectural requirement is for cable entry to the building and provision of a soundproof announcer's booth with a view of the performance.

The function of performance monitoring is twofold: to communicate the performance to latecomers waiting in a lobby area separate from the Room, and to artists and technicians backstage, permitting them to follow the performance from remote locations. It is intended to minimize interruptions and milling around while waiting to be seated or to enter the stage. The monitor system should be adjusted to operate without supervision and without being heard in the Room. The requirements of public address systems apply here as well.

Finally, production communications are necessary during performance. One of these is actors' call, enabling the stage manager to alert actors waiting for entry cues backstage. This may be a visual signal light system operated from the stage manager's position in the wings and/or a voice communication "squawk box" from the control booth.

A headset system connects the stage manager with technical staff in lighting positions, fly gallery and rigging control points, trap room and orchestra pit, sound reinforcement and effects control consoles, lighting control, projection and followspot booths-in short, with all the action stations to be coordinated. Normally, a two way single channel system (all-talk, all-listen) is sufficient for this activity. Jacks must be provided at all relevant positions, unless wireless receivers are employed.

Selective station-to-station communication should also be provided via house telephone, connecting stage manager, house manager, control booth, stage door security, and similar points. This may be an extension of the outside line telephone system.

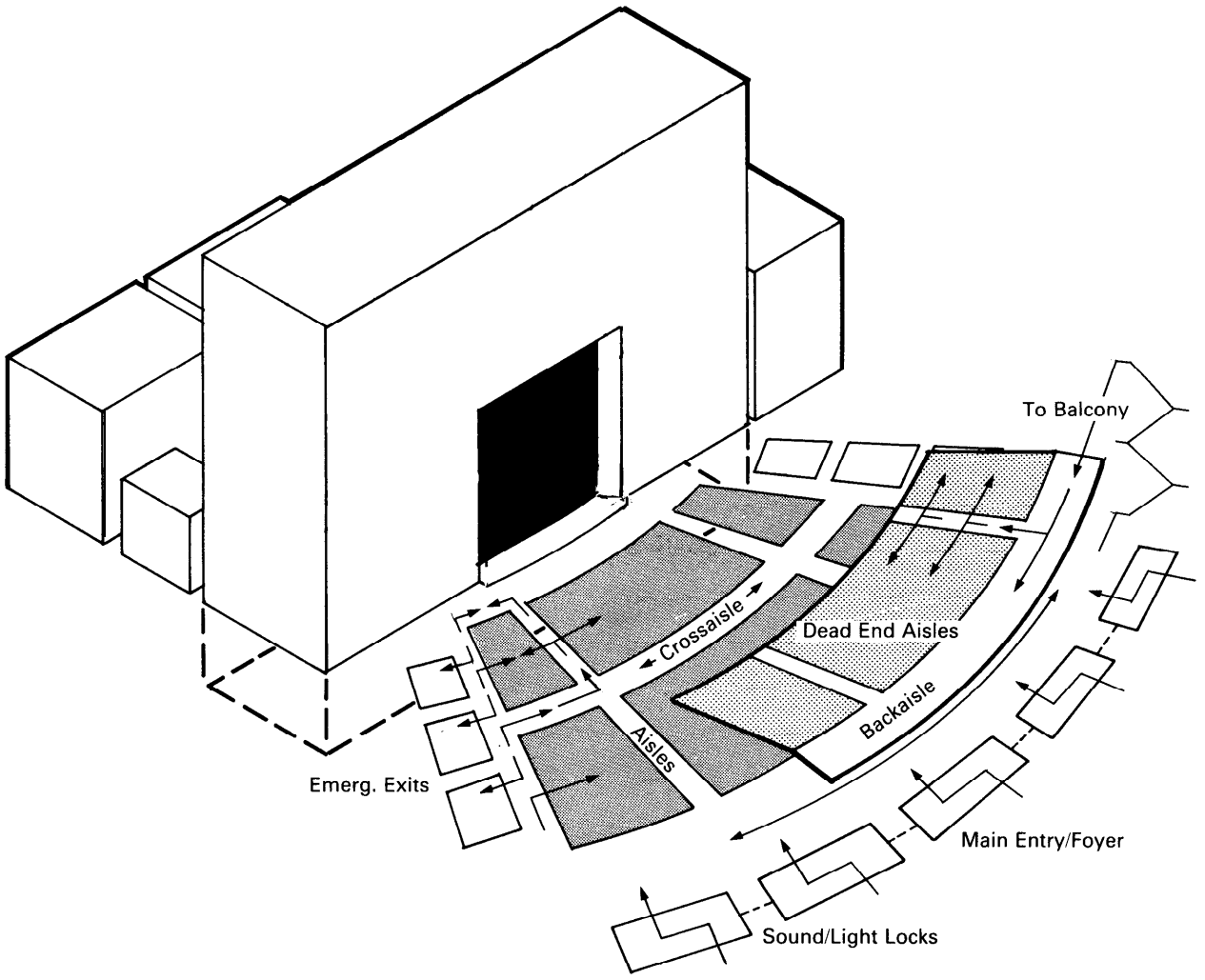


FIGURE 3-9.1 ACCESS SYSTEMS-AUDIENCE

3-9. ACCESS

Planning of circulation and access systems is necessarily integral with space planning for specific facilities. Access is influenced by external relationships to adjoining facilities and by site characteristics. Moreover, access and circulation systems have considerable impact on the realization of a Room design. While individual requirements will vary, this section (3-9) provides a checklist of the questions that must be answered. The basic approach is to define major functional access criteria for the following users:

- Audience, *to ensure firesafety exiting, Room entry orientation and control, and access to public facilities during performance.*
- Performers, *to permit firesafety exiting, movement within stagehouse and between it and backstage areas.*
- Technicians, *to prevent injury, and allow control point and equipment mount access.*
- Scenery and Properties, *to facilitate both horizontal and vertical movement.*

The required information has two sources-recognized codes and standards, and functional operating requirements of performance-related activities. DOD criteria recognize guidelines set forth by the National Fire Protection Association in its Pamphlet No. 101, Life Safety Standards, with particular reference to Chapter 8, Assembly Occupancies. Several functional requirements are also discussed in preceding sections of this Guide.

A. AUDIENCE ACCESS

1. Life Safety and Exit Parameters

Life safety considerations have the greatest influence on the design of audience circulation and access. The best practice is to go directly to the referenced standards, paying careful attention to the design implications of categorical definitions. Chief among these is the size of the audience related to the number, size and location of means of egress. The main entry shall not be expected to handle more than 50% of the occupants, and if two additional exits are provided, each shall accommodate at least one third. 1000 or more occupants require at least three exits of equal size in addition to the main exit.

Next, consider the line of travel to the nearest enclosed (2 hour rated) exitway for positioning exits, which should not exceed 150 feet (or 200 feet if the room is sprinkler-equipped). It should not be possible to travel more than 20 feet to a dead end; the guiding principle is to ensure each occupant has a choice of at least two exits. Note that continental seating, because it slows movement, requires many more exit doors, and that no exitway or aisle may diminish in width toward the exit.

Exit doors must be equipped with non-locking panic bolts, open in the direction of exit, and be identified with illuminated signs. Aisles and exitways must also be illuminated, fitted with battery-packs or emergency generator power systems in case of power failure.

Ramped aisles are limited to a gradient of 1:8; and the rules governing maximum step riser heights differ for the main floor (7½") and balconies (8'). These factors form limits to the theoretical functional considerations developed in Section 3-5.

2. Functional Parameters

Entry to the Room must account for sound and light barriers, which are vestibules and door seals. Where acoustic separation is important double door sets are superior to extra special door seals on a single set since the seal doesn't function when the door opens. Vestibules should be of a size to admit several people and/or wheelchair occupants easily, so that the first door set can close behind before the inner set is opened.

Except for exit considerations, the location of entries and layout of aisles are determined by factors discussed under Section 3-5 and by external relationships to audience support facilities (Section 3-13) and the building exterior. The Room's organization should facilitate newcomers' ability to find their seats without confusion. Entry patterns should minimize disturbances of sea ted patrons.

Although entrance from the rear of the House is typical (perhaps because public areas tend to be zoned toward the street side of an urban building lot), entrance facing the audience tends to be more ultimate and social in orientation.

Recognizing such options may mean the design can take advantage of site features or respond to other program relationships.

B. PERFORMER ACCESS

1. Life Safety and Exit Parameters

Similar concerns apply to audience and performers-two ways out, short travel, adequate illumination, and non-hazardous routes. The performance area should be separated from the house, although final exit may converge in an enclosed passage provided there is no confusion as to direction of exit. Performers must also be able to exit from dressing rooms and backstage areas without entering the house or stagehouse.

2. Functional Parameters

Multiple entry and circulation opportunities are essential to performance. Entry to performance space includes provision for crossing the stage unseen, entry from below via traps, pit access, and entries from the house side which are especially important in Thrust and Surround configurations. This last is usually accomplished from actors' vomitories in the audience area rather than from audience aisles, but even Frontal Rooms should allow access to the Stage from the House via demountable or permanent steps at each side.

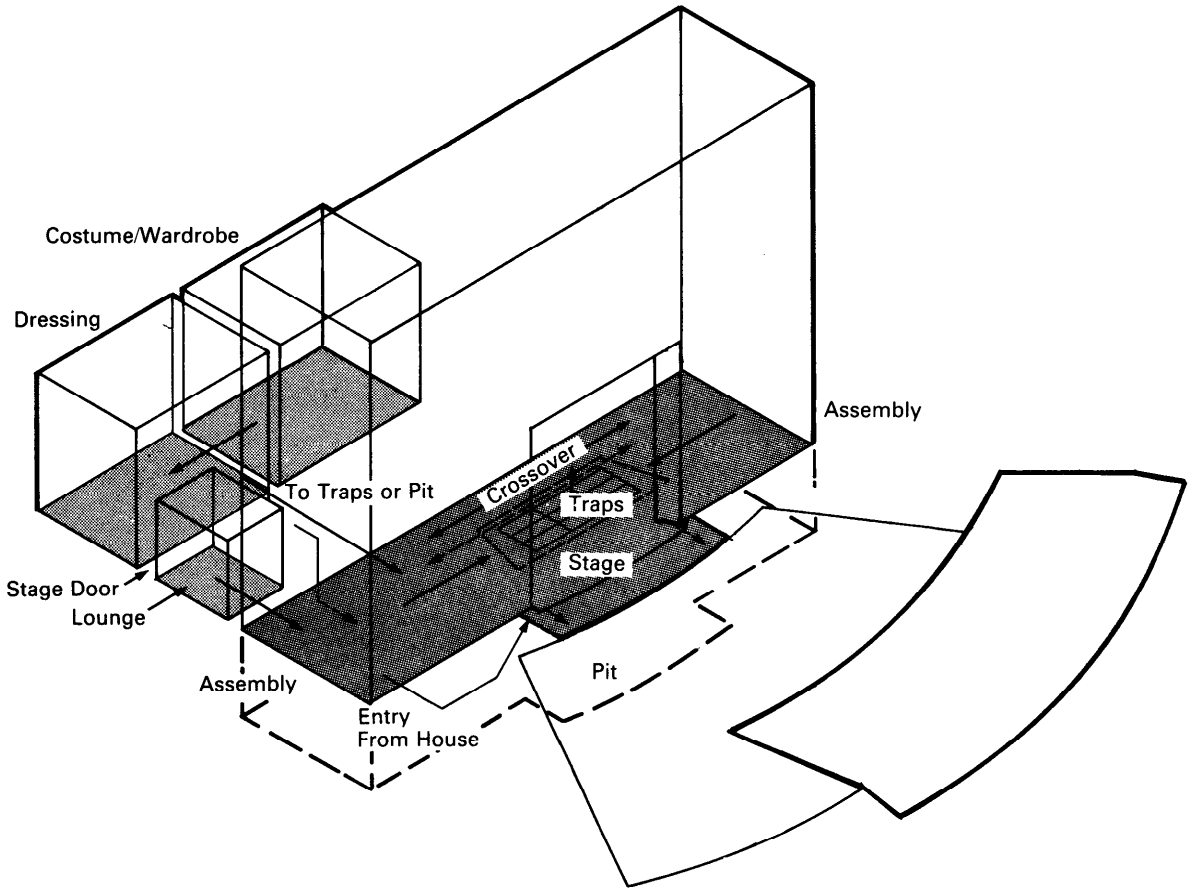


FIGURE 3-9.2 ACCESS SYSTEMS-PERFORMERS

Access to sets and musicians' risers at several levels should be considered, especially where a permanent acoustical enclosure is combined with portable platforms; door openings of sufficient height are needed.

Space must be allowed for performers to assemble just before entering the stage or pit, perhaps carrying instruments, etc. Assembly area is in addition to backstage artists' lounges and warm-up areas. The number of cast members onstage at one time depends on anticipated performance types. The recommended approach is to plan for critical circulation, such as crossover and assembly area, in addition to performance, scene and working space, for the most effective and flexible use of valuable stage area. Circulation space need not occupy the full height of a stagehouse.

C. TECHNICIAN ACCESS

1. Life Safety and Accident Prevention

The emphasis in technicians' areas is on prevention of injuries to themselves, bystanders and cast and audience members. Common sense, discipline, and a healthy respect for potential

consequences of negligence are the most important guidelines; in many situations, technical systems cannot be both functional and foolproof. Reference to OSHA Safety Standards will help identify hazardous conditions and methods of abatement.

Most access to equipment leads through other activity areas, such as the stagehouse and house balcony, and shares fire exit-ways. High fire hazard uses, including followspot and projection booths, are enclosed in noncombustible construction provided with two exits. Exits from other workstations are governed by the number of occupant technicians. The same is true for stairways and ladders, which normally need not conform to public egress requirements. They should, however, be noncombustible, non-slip, with adequate handrails and cages.

Technician accessways are used all the time, not just during performance. An even higher level of safety consciousness is required to prevent missteps and personal injuries when the audience is not a present reminder and work effort is great. Observance of this intent will keep personnel passages clear of obstructions, provide safety nets and toeboards to catch falling objects, and allow for secure equipment mounting with safety lines. Thorough grounding of electrical equipment and its location away from traffic will minimize occurrence of shocks and burns.

2. Functional Parameters

Access to performance equipment has greatest influence on Room design where technical operations are concerned. The position of lighting and rigging devices must be set by functional requirements, and access follows. It is best to integrate them structurally wherever possible, as in gridiron, front-of-house lighting catwalks, and boom towers. With the possible exception of border lights on winched battens, all lighting equipment must be accessible for final adjustment in place. In the stagehouse, this can be accomplished from portable ladders and manlifts, but front-lighting should always be associated with catwalks.

Manned instruments, such as short-throw followspots and TV cameras should have preplanned locations including necessary power and communications jacks. Access to these locations, control booths and consoles should not conflict with audience access or vision, nor with fixed instruments. Onstage, working space must be generous to permit crew movement around waiting set pieces and a location should be provided for the stage manager's work-station. Other work area access includes the gridiron loftblocks and weight loading gallery or pinrail. Ample clearance is needed around electrical equipment racks and dimmer banks which in some cases are located at one end of the stagehouse.

D. SCENERY ACCESS

1. Life Safety

The primary goal is to remove people from danger as efficiently as possible; protection of property and equipment is a secondary concern. But inasmuch as retarding the spread of smoke and flames adds to the margin of safety for existing personnel, scrupulous attention need be given fire protection and detection systems in the stagehouse.

All material used in the construction of the stage, stagehouse and scenery must be flameproof or fire-retardant, with a flame-spread rating of 25 or less. Treatment of draperies and fabrics should be repeated annually. Where hemp rigging is employed, it is wise to provide wire or chain safety lines on stored or unmoving battens and drops. And in addition to sprinklers and firehoses, strategically located fire extinguishers are highly recommended, including carbon dioxide and foam cannisters near electrical equipment.

2. Functional Parameters

The operating aspects of scenery movement are major influences in stagehouse design. Even Rooms without stagehouses and productions using fixed sets must facilitate the entry and assembly of substantial amounts of equipment, platforms and backdrops. A concert grand piano will be 5½ feet wide and up to 12 feet long, weighing 1000 pounds. While scenery drops and flats are relatively light in weight, they are unwieldy in size and very fragile. A demountable orchestra shell, depending on its design and purpose, may be both heavy and bulky.

While the diverse characteristics of scenic material and accessory equipment establish the immediate parameters for design, early planning decisions have tremendous impact on the way these needs are best met. It is essential to match initial investment and known operating resources for long term effectiveness. A key factor is the cost and availability of manpower.

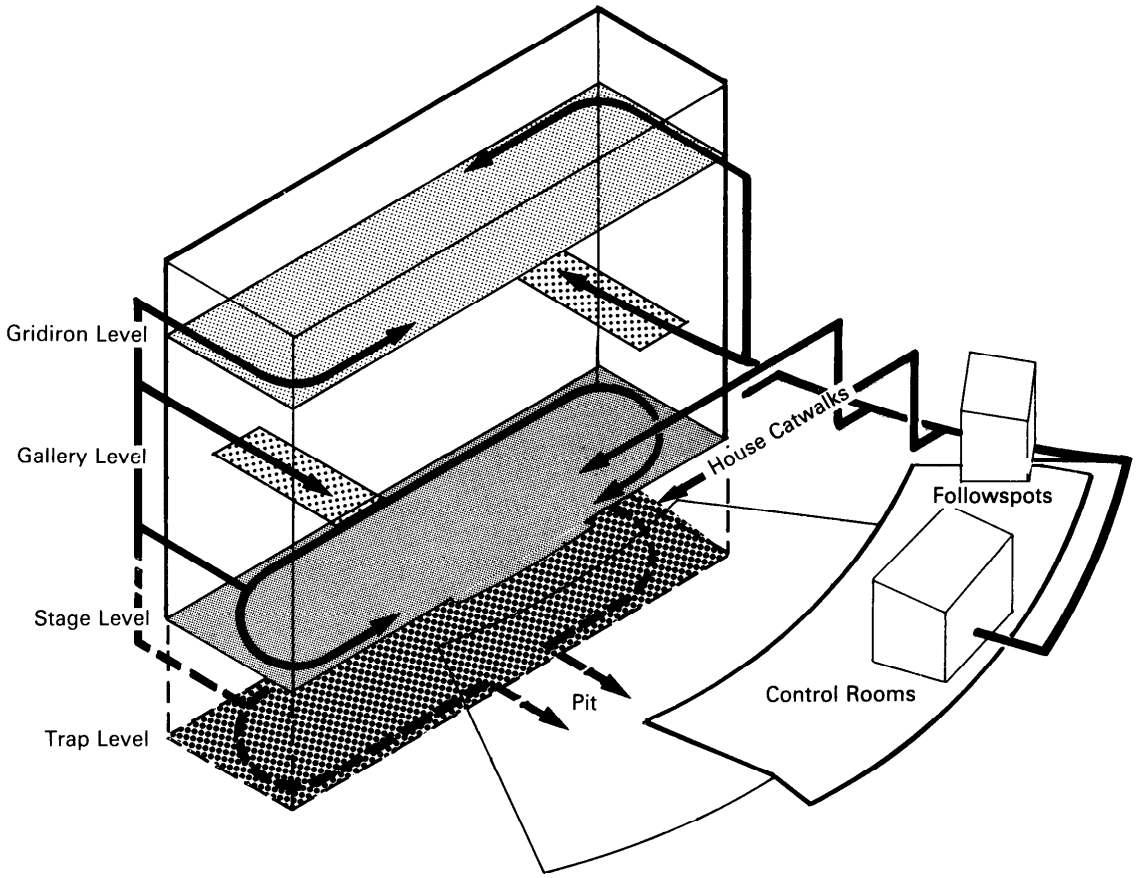


FIGURE 3-9.3 ACCESS SYSTEMS-TECHNICIANS

For example, lighting instruments are costly and require special handling. They must be frequently repositioned unless remounting can be reduced by keeping a large stock in place at all times. Similarly, sets can be broken down into small units and reassembled for each new production, or they can be stored and reused in large units.

While the Army and other volunteer-participation programs benefit from comparatively abundant labor, there are some counter-productive aspects of reliance on predominantly manual effort: inability to accommodate first-rate bus-and-truck touring shows with preassembled equipment and scene components; inability to move swiftly from production to production or to have a recurring cycle of various performance formats; inability to consistently repeat success as the crew roster turns over; and inability to "revive" demonstrably successful repertoire after a season. Mobility is the important factor, whether achieved through stage mechanical equipment or by the application of many willing, well-directed hands. It is a mistake to suppose provision of motorized platform lifts, elevators, folding

walls and sophisticated rigging systems will alone take care of these issues. Without forethought, half this equipment will be underutilized, purchased at the expense of vital needs, leaving many of the problems unsolved. Planners should invest enough time to thoroughly model and enact on paper the entire sequence of every production activity envisioned.

In part, this planning relates to support facilities (workshops, storage, dressing, warm-up, construction-rehearsal-performance conflicts), in part to the intended primary use of the Room, and in part to external factors dictating the physical relationship of building zones, site access, facility sharing, and budget constraints.

a. Horizontal Access

The path of loading onto stage should be plotted from the receiving area (truck dock), storage area and workshop for continuous clearance in height and width and preferably on one level. loading is usually from the side of the stagehouse opposite the pinrail or counterweight pit, but occasionally through the backwall. Loading through the backwall needs a deep stage, careful placement of gridiron columns, scheduling of deliveries so as not to interfere with sets on stage, and maintenance of actors' crossover passage during performance. Loading from the pinrail side requires a very high pinrail and weight gallery with special line systems and weight hoists.

No loading door should be less than 8' x 8', and for theaters, 10' wide by 14' high is not exceptional. Consider the longest batten in calculating turning chords of indirect passages. Road shows or use of a remote scene shop make loading direct from trucks important. Provide a receiving vestibule or weatherhood at the dock. Allow sufficient indoor space to completely unload a truck, with clearance remaining to reload it with material already on stage-about 400, but not less than 300 square feet.

Scene changes can be handled horizontally, as in open stage configurations, by a variety of means. The use of scene wagons requires ample working space surrounding the performance area for the advance and withdrawal of sets. The more space, the more varied the complement of sets can be. A considerable amount of construction work must take place on stage or in a closely related shop. Modular set design should be coordinated with wagon arrangements. Such sets are difficult to store for long periods. Variations on the scene wagon have included belts and turntables, both of which impose scene design and technical limitations that should not be first choices for new construction.

b. Vertical Access

Where site conditions or other considerations warrant bi-level facilities, planning requirements are not unlike those for direct horizontal loading except in the matter of expense. It may be that loading can be accomplished at stage level where other facilities, such as repair shops or rehearsal rooms, are below stage. Frequent use of a trapped stage or orchestra pit can require a piano lift in the pit or stage floor. Additional substage activities will justify a freight elevator.

Loading at other than stage level poses problems because of the vertical clearances needed. Truly bi-level facilities have great floor-to-floor heights and large-platform, multi-cylinder lifts. Where level changes are smaller, but too large to navigate in 10% maximum ramps, installation of cruder pneumatic or screwjack lifts may be feasible in the loading area. It is most important to define real needs; there are great differences in cost and application of motor driven cable hoists, screwjack and pneumatic piston mechanisms, geared freight elevators, and oil-hydraulic cylinder lifts. Second thoughts will usually reveal a simpler, equally satisfactory solution.

Scene changes in the vertical mode refer to flyloft capabilities, although very lightweight properties may be hoisted from a catwalk grid over an open stage, using rope lines tied off at a pinrail or at the catwalk rails. Fly systems require a stagehouse more than twice as high as the proscenium, in order that flown sets can be withdrawn from line of sight.

Evaluating possible combinations of flown and/or horizontal scene handling suggests that a well-developed fly system is in order for most new Army MDC's. In a generous stagehouse, elements of horizontal systems can be employed to advantage, but full development of ***both*** *methods entails an enormous stagehouse volume, high costs and technical wrinkles that may be self-defeating. On the other hand, conversions of existing spaces are most successfully approached as open-stage Rooms having generous offstage working area.*

Loft rigging with wire lines and counter-weight sets is discussed more completely in Section 3-8 and Chapter 4. In general flown sets have the advantage of traditional techniques most

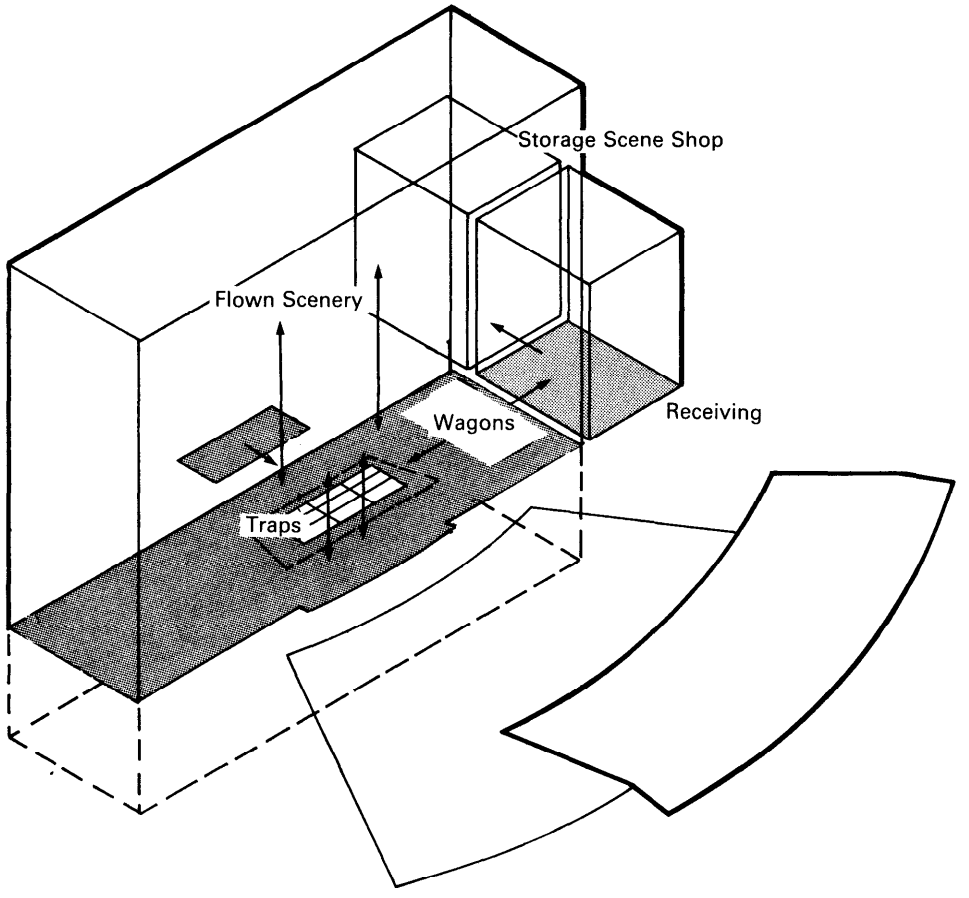


FIGURE 3-9.4 ACCESS SYSTEMS-SCENERY

used by touring shows, rapid access for scene changes, and holding capacity (storage) especially useful for fast-paced program turnover.

3-10. ENVIRONMENT

Physical and psychological environmental factors are a part of the total performance experience. In a sense, Theater is the creation of special environments of light, images, sounds and symbols. The ordinary creature comforts we expect must also be furnished if the whole experience is not to be marred. Interestingly, human abilities to distinguish and delight in subtle differences of pitch, harmonics, color and brightness over a broad natural spectrum do not extend to our tolerance of temperature variations except after lengthy periods of acclimation.

In terms of architecture and engineering, performance activities generate extremes of environmental control problems. Large numbers of people occupy a confined seating area while per-

formers undertake some of the most strenuous sustained exercise in human capability. A battery of high power lights and motorized devices emit still more heat into a carefully sealed enclosure, wherein the engineer is called upon to maintain comfort conditions without attracting the notice of the occupants. At the same time, the architectural design must maintain (and periodically vary) environmental characteristics that are at best subjectively defined. The patron who was absorbed in the presentation must at some point return to the everyday world, collect wraps and go home, satisfied.

A. MECHANICAL SYSTEM FACTORS

1. Heat Gain

During performances, mechanical systems are devoted to cooling and ventilating. Cooling loads are the product of people, power consumption, and local climate conditions.

Although the major loads are internal, the required properties of building enclosure will have bearing on the contribution of external loads. Insolation (glass gain) will be small, but large surface areas are involved. The acoustic benefits of massive masonry construction for Music facilities, in particular, necessitate a concern for thermal lag contribution to the load at peak evening hours.

Special characteristics associated with Drama activity include a proportionately higher contribution from extensive lighting equipment and hoist motors, as well as from strenuous effort occasioned by dancers and scene handling crews. Special characteristics for Music activity include lower lighting and effort loads, but typically a larger total occupancy. Moreover, the duration of critical tolerances extends beyond performance hours in the interest of maintaining constant conditions for musical instruments. This includes relative humidity near 50%, which will incur additional power consumption depending on outdoor conditions.

2. System Characteristics

Drama facility systems will encounter high peak cooling loads and high peak power loads, and must be able to handle large fresh air changes. Loads peak rapidly as the audience enters and the performance begins. The logical tendency to start-up systems in advance of curtain time often results in a period of discomfort until actual loads catch up.

On the other hand, many Rooms have inadequate noise reduction details built into their systerns. As a result, the systems are shut down during performance, causing increasing discomfort that must be offset between the acts with high load cycling. In comparison, initial discomfort is preferable.

Music facility peak cooling and power loads will be less exaggerated. Considerable sophistication of control systems is involved, and the acoustic noise control criteria applied to air distribution and mechanical devices are among the strictest practicable. Acoustic linings, sound traps and isolators, and required low velocity at supply grilles necessitates extensive ductwork and the treatment of large amounts of outside air.

DOD Construction Criteria recognizes ASHRAE standards and procedures in most details. However, the latest reference ASHRAE Handbook and military technical manuals should be checked to be sure the critical noise control, pressure balances and humidity criteria are correctly identified before design begins. Designers should be certain that every relevant factor is pinned down and included in the final load calculation, including all appliance loads, occupants, orientation of the building and ventilation requirements.

Recommended ventilation at 30CFM per person includes fresh air at 15CFM per person when no air conditioning takes place. In mild weather, preperformance cycling of this kind may be sufficient, but as heat loads increase, cooling and dehumidifying become necessary. Since the stale air is being filtered, treated, and mixed with fresh air, conditioned air may be supplied at a lower rate-25CFM per person-with only 10CFM of outside air. This should provide a comfortable 8 air changes per hour and a reasonable economy in the cooling cycle.

3. Typical Approaches

Because of the closed nature of performance Rooms, heat generation needs will be relatively low. Considering fuel resources nationally, it will be wise to consider convertible sources-such as interruptible gas and stored fuel oil combinations-or electricity. Since many Army installation community cores are relatively compact, available or proposed central steam generation should be evaluated, recognizing the relatively low carrying load for heating. Cooling is the principal demand. Absorption cooling using steam supply may be feasible if excess capacity in yearround steam generation exists at peak perfor-

mance facility hours. Otherwise, central complex or individual facility chillers and centrifugal compressors are likely candidates. There are long hours during the day when the Room is occupied by only a few people without attendant lighting loads, at which time low level air conditioning is required. Heat pump applications should not be overlooked if a substantial facility with a high level of active programming is expected. Since performance hours coincide with winter heating demand in some latitudes, the excess heat of the facility can be transferred to neighboring rooms or buildings.

Effective zoning is an important consideration in system design, especially where Room use is intermittent while support facilities are occupied on a regular daily schedule. Central incremental hot and chilled water generation is often employed with separate air handling units for each zone. Where support facilities are insignificant, remote, or separately dealt with, the performance Room air distribution system will usually have its own central air handling unit, since the major supply zone is a single space. However, it is not unreasonable to consider a multizone package unit for a small facility, provided adequate modifications of standard fabrication can be obtained to account for noise reduction and control system criteria.

The largest of the facilities proposed in this Guide might make use of medium pressure variable volume supply in connection with support facilities, kicking in the main space system as required. The key requirement in all cases is a separate, carefully preset and balanced Room system to minimize noise, disturbing air currents and pressure differences that can cause curtains to billow.

In the House, air is supplied from the ceiling, the side walls, and the edges of balconies at low velocity. In order to obtain uniform distribution, return air is drawn from the center of the seating area through 'mushrooms" under the seats, sometimes using the wedge shaped space below the floor as a plenum (return ducts are preferred for the ability to regulate volume and control noise). For shallow balconies, the side wall supply is usually sufficient, but deep balconies require overhead soffit supply and perhaps some underseat returns. A small amount of air should be exhausted from the ceiling to prevent formation of hot pockets that can have a radiant effect. However, 40-60% of the lighting load can be removed by exhausting air around the instruments, which is especially relevant to front-of-house booms and catwalks, followspot booths and on-stage power panels.

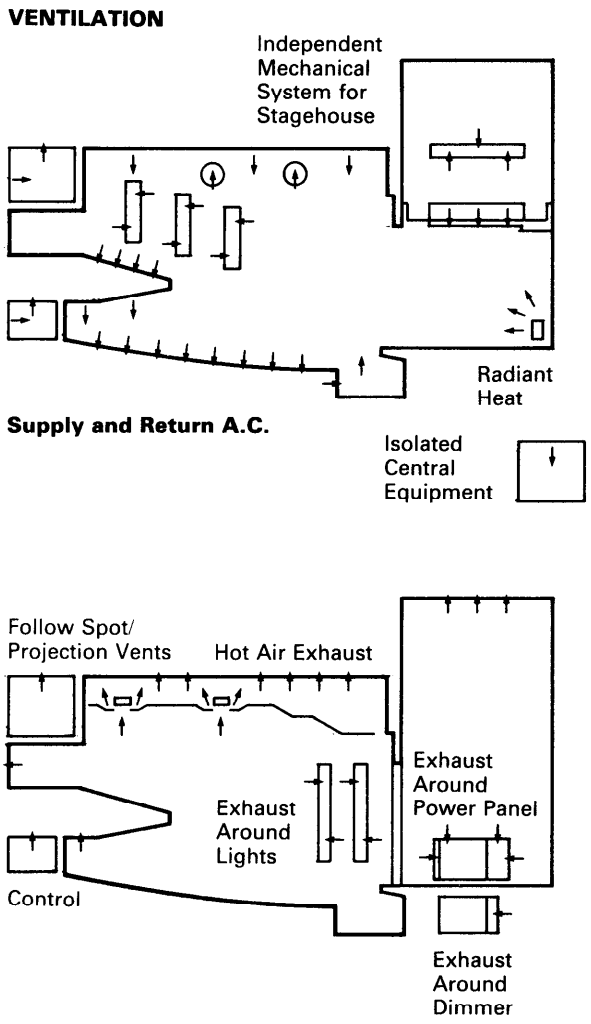


FIGURE 3-10.1 HVAC SYSTEMS

Design of the stagehouse system is most critical. To prevent billowing curtains and movement of lightweight scenery it is essential to carefully balance air pressures between Stage and House. The best practice is to pre-cool before the curtain goes up, relying on the house systems to maintain tolerable conditions during performance. Therefore, the essential ingredients are control of the stagehouse system from the stage itself,

and balanced supply and return ***both*** *within the stagehouse volume.*

There is very little room for ductwork in the stagehouse. Recommended practice is a "dump-down" low velocity supply under the fly gallery with a wall return grill just above, obviating the need to *cool the* hot *air of upper regions* which *is exhausted. For low-load, non-performance hours, fin-tube or electrical radiation may be required* along exterior *walls.*

The upper level exhaust out-take can serve double duty for smoke removal in emergency mode by cutting in fans activated by detectors above the gridiron and by manual throw fire alarm. Normally, heat and smoke detectors are located in return ducts serving the House.

B. ARCHITECTURAL DESIGN FACTORS

1. Functional Considerations

Measurable environmental criteria are readily obtained from such standards as the ASHRAE Handbook referred to above, IES Illumination levels for various tasks, and empirically determined preferred noise criteria (PNC) for various space uses. These most often relate to equipment systems and details of construction.

A more general criterion of good design relates to the organizational clarity of public assembly facilities, the ease of orientation and fulfillment of expectations. It makes little sense to arbitrarily "design" complexity into ordinary activities like finding one's seat. Comfort involves relaxation and a sense of control.

Public space design must naturally minimize questions of procedure. Inherent clarity in architectural space results in functional efficiencies, too-in operating factors like anticipated depreciation and repair, the number of directional signage devices needed, the prevention of accidental injury, and effective security control.

A second functional concern involves the acoustic and visual effects of materials and finishes in performance facilities. No furnishings, fixtures, draperies, paints or wall coverings should be installed without investigation of their properties with respect to desired Room qualities.

While this is especially true for acoustic criteria, a poor selection of lighting fixtures, a paint pigment that behaves oddly under performance lights, a glossy material in the wrong place can wreak havoc on a carefully crafted visual presentation. As a general rule, finishes at the stage end of the Room should have the characteristics of matte surface; black, white or neutral color; and ease of maintenance, cleaning or replacement.

2. Ambience

Concern for environment extends beyond measurable functional needs. The need that generated *the performance is not measurable, yet it must be reckoned with. Gatherings of people are social events-an opportunity to see and be seen by others in a particular context. The appearance of the Room, and of people in it, is an essential quality. This quality translates to a simple rule; the people should be seen first and best. Finish selection, lighting color, level, softness, and modeling effect should be keyed to human features and skin tones. A little glitter gives a helping hand to social dress, but it should not distract. The scale of detail and pattern against which people are seen should match human dimensions. Finishes should be considered in their relationship to people (next to, near, and far away), and in terms of richness and warmth, contrast, and finally overall tone.*

DIVISION 2
THE BACKSTAGE

3-11. PERFORMANCE SUPPORT

This section discusses the second major component of a performance facility-backstage production support. The process of identifying priorities is made easier by the selection of stagehouse functions. The task is to match an appropriate complement of support facilities with the range of anticipated presentations. Many of the choices can be approached by asking who is to use and

Type of Show	Actors		Plan Dressing Rooms For		Stage Hands	Musicians	Managers	Directors	Designers
	Principals	Extras	Principals	Extras					
Pageant	10–50	100–200	40	500	50	100	4–10	3	3
Grand Opera	4–10	20–100	10	100	50	80	2–4	3	3
Presentation	4–10	20–100	10	50	30	30–200	2–4	3	3
Vaudeville/Revue	4–10	20–50	10	50	30	10–30	2	0–3	0–3
Operetta Musical Comedy	4–10	20–50	10	50	30	10–30	2–4	3	3
Legit. Drama	2–20	10–50	20	30	3–30	8–20	1–4	1	3
Motion Picture Palace		None			2	0–50	0	0	0
Neighborhood Cinema					0	0	0	0	0

TABLE 3-11.1 TYPICAL CAST AND CREW SIZES

benefit from support facilities and in what way.

Since the performance types dealt with in this Guide will consist of various blends of music and drama activity, it is useful to discuss backstage functions in terms of Music and/or Drama support. Begin by identifying basic, minimum supports for a functioning facility, and enlarge on or specialize them to answer further demands.

A. GENERAL CONSIDERATIONS

While the production needs of Drama are quite different from those of Music, within each category basic needs are similar regardless of house capacity or specific presentation types (choral vs. instrumental music, for example). With the possible exception of scene handling support (simple open stage sets vs. flyloft box sets and wagons), basic needs are also similar for various stage forms.

The required quantity and quality of specific facilities are related to program objectives and operating levels. MDC planners and designers should refer to procedures of Chapter 2, and be sure to account for the anticipated rate of production turnover, the ratio of professional touring shows to those locally produced, the relative emphasis of training, education and skill development, and the categories of use to which future budgets may pertain. Since construction resources are limited either by dollars or space allowances, some crucial facilities will be implemented at the expense of others less vital.

B. CLASSIFICATION OF PERFORMANCE SUPPORT

Allocation of limited resources among potential support functions is aided by differentiating the activities served. Three classes can be defined:

- ***Performers' facilities*** *are those that accommodate cast activity during scheduled performances (including dress rehearsals).*
- ***Technical facilities*** *accommodate activity accessory to scheduled performances.*
- ***Preparatory facilities*** *are for production and maintenance activities prior to performances, which in most cases continue year-round and day-to-day.*

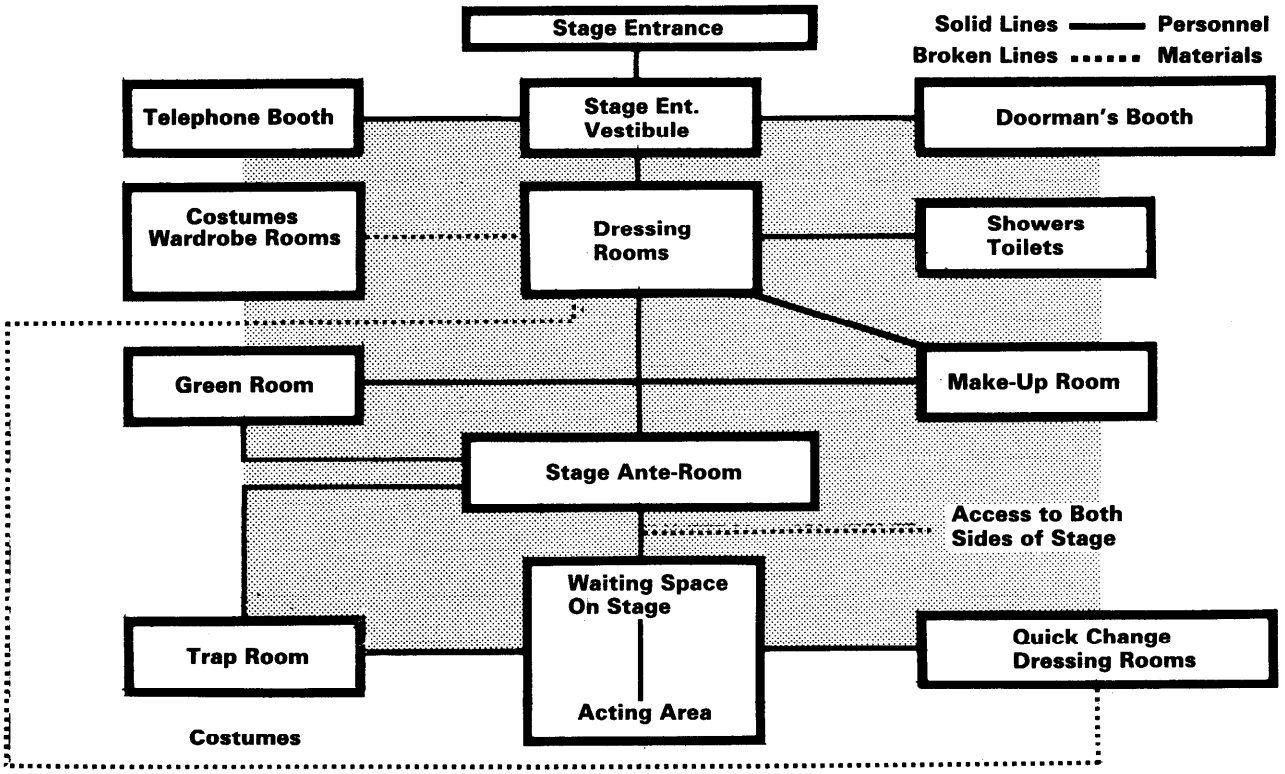


FIGURE 3–11.1 PERFORMERS' TRAFFIC PATTERN

In general, performers' facilities for Music or Drama are similar in functional objectives while technical and preparatory facilities reflect the differences of vision and hearing criteria. Unfortunately, when ambitions are pared down to match resources, technical and preparatory facilities too often suffer undue diminishment.

Selecting appropriate emphasis requires understanding the parameters that influence scope (size or quantity) of facilities. Quality has more to do with understanding of function. Both scope and quality are proportional to cost.

C. PERFORMERS' FACILITIES

1. Parameters

The anticipated size of the most likely cast is a key factor, as well as its composition by sex and by artistic discipline. Comparative cast sizes are mentioned in Section 3-6, but much depends on the dramatic literature and interpretive technique employed by the director. There are usually equal facilities for men and women, but the choice between group and individual dressing facilities may affect ability to vary this ratio. The needs of musicians and actors differ and respective facilities are often separate. Finally, planners must weigh the merits of recognizing "billing" of performers (prima, star, soloist, lead) as an incentive or as an undesirable qualification. Large MDC's anticipating exceptional professional touring programs may find guest artist suites an important consideration.

2. Functions

Dressing, toilets, artists' lounge, green room, stage door, and pre-entry assembly areas are commonly provided for all performing arts disciplines. Musicians' dressing is typically locker room fashion. Showers are especially important for drama and dance. Choice of group or individual dressing areas depends on the parameters noted above. An artists' lounge gains importance when group dressing facilities are provided; it is a place where performers can relax, wait for their calls and refresh themselves. The green room is slightly more formal, a place to meet invited guests and the press, and may sometimes double for small rehearsals and cast parties. It is accessible from the House or public lobby. The stage door provides controlled entry to backstage away from the public entry, often

with a security post offstage. Assembly areas are discussed under stagehouse access.

Drama facilities must provide makeup areas, often separate from dressing, with suitable mirrors, lighting, countertop and washbasins. A costume wardrobe is recommended, communicating with dressing rooms. Full length mirrors are needed for dressing, makeup and assembly areas.

Musicians need areas for warm-up and tuning prior to performance. If none can be provided, a more generous sound proofed dressing room is essential. Instruments too large to be carried through dressing should have a locked standby area offstage.

D. TECHNICAL FACILITIES

1. Parameters

The relative dominance of Music or Drama content in primary presentation types will be reflected in technical needs, as will the extent and magnitude of accessory equipment. This is discussed more fully in Section 3-8. In general, no element of basic technical facility can be done without, although varying levels of development should be considered carefully; certain additional functions may be judged important for special purposes (see 3-11f Extended Facilities and 3-12 Space Allocations).

*The nature and size of technical facilities greatly depends on the number of non-performer crew-*persons *and whether they are touring personnel or resident production staff.*

2. Functions

Basic technical facilities for both Music and Drama include lighting and sound control, manned equipment positions and accessways, and *the stage* manager's *command post. A substantial stage crew may require a waiting lounge and locker area of its own.*

E. PREPARATORY FACILITIES

1. Parameters

There are two sorts of basic preparatory activities corresponding to performers' and technical facilities and similarly qualified by respective parameters. The performer who prepares by repetition and practice can sometimes use the Room and its support facilities for rehearsal between actual performances. It is decidedly desirable to limit this situation to dress rehearsals only. Technical preparations, however, require a set of quite different facilities which should therefore have priority status in construction plans. In either case, the scope of these facilities is proportional to the rate of production turnover and program variety.

Since the performance Room is literally a single space, conflicting use cannot be concurrent. Auditions, part-reading, dance exercise, orchestra rehearsal, set-building and lighting run-throughs are mutually exclusive. Scheduling this activity in alternate time periods sometimes results in very few productions per season and limits the occasions when touring shows can be fitted in. As voluntary leisure activity, most preparation takes place in the evening, which is also prime performance time. The ability to separate greatly conflicting activities, handle them simultaneously, and free the Room for regular performances is vital to a healthy MDC program.

2. Functions

Every performing arts facility requires a loading door and receiving area (see Section 3-9e) with associated trunk storage (for road boxes) and general storage (for bulk material). At least a maintenance *shop* with tool storage *should be provided adjoining the stage crew quarters and office. Ideally, rehearsal space should be readily accessible from these areas, unless a remote rehearsal facility is provided.*

Drama facilities require a scene shop rather than (or in addition to) a maintenance shop. As a minimum, it should be nearly as large as the performing area of the stage and directly accessible to the stagehouse. The layout of the shop is important to the smooth flow of work from general storage to fabrication and assembly, then to the finishing area before moving the piece on stage or to temporary set storage. A separate shop is needed for costume fabrication and maintenance. Even a modest repertory theater should have generous wardrobe storage to protect its substantial investment. Long-term storage can be at a remote location if necessary. The production wardrobe work area itself adjoins the dressing areas. Space for the storage and repair of lighting instruments and electric gear should also be provided in a separate, secure room furnished with workbench, cable reels, shelving and wall mounted or overhead hooks and clamping bars for fixture storage.

Music facilities tend to require fewer technical construction spaces and more for preparing the performer. These consist of several small practice rooms for individuals, at least one for piano and voice coaching, and a sectional warm-up room for rehearsing portions of the resident orchestra or chorus. The total complement of practice room uses and sizes ultimately depends on the music program. They should be accessible from the dressing areas and stage during performance hours. An MDC designed primarily for Music will have instrument storage and a repair shop in addition to general storage and maintenance, plus chair, stands, riser and lighting storage, and probably a score library.

Musical drama and dance require both scene production and practice facilities according to the MDC's primary emphasis. It is most likely that the Drama preparatory facilities will dominate with the possible addition of a dance rehearsal and warm-up studio.

F. EXTENDED SUPPORT FACILITIES

1. Parameters

The preceding discussion of production facilities has focused on minimum basic requirements in support of performance. While frequent actual performance is the ultimate objective, catalyst and measure of the Army Performing Arts Program, significant goals of community and skill development are also reached through collective activities that involve people and educate audiences. If the first objective-adequate performance-oriented facilities-can be obtained within available resources, the extension of selected support facilities may be contemplated. These are not strictly required for performance support, but reinforce and enhance resident programs. As such, they have important application to Army program goals.

Selection of extended facilities is based on evaluation of each installation's program, context and population characteristics. Desire for a high level of amateur participation may mean extensive skill development is needed to form a reservoir of potential cast members. If no similar cultural facility exists in the community, skill development opportunities will attract and educate an audience as well. On the other hand, the military and/or civilian community may have an exceptionally well-educated population that demands a level of sophistication attainable only by intensive training for special skills.

The combined factors of audience demand for performing arts, ready availability of professional touring companies, and the mix of non-appropriated and appropriated funds in the MDC's operating/production budget may make for a very full performance schedule. If not, intervals between productions can be programmed with community educational activity.

Extended facilities will regularly involve more people or accommodate a broad range of participatory activities, or both. Consequently, multi-use and combined Music and Drama MDC's are likely choices. (See also Section 3-15.)

2. Functions

Any MDC may have extended support facilities in the form of a large multi-use rehearsal room with associated equipment and chair storage. This may be structurally and mechanically independent of the performance plant. In fact, the small dinner theater popular at many installations is an extension that encourages frequent small-scale entertainments and builds support for main facility programs. Other extensions may provide for classrooms, workshops, studios and instructors' offices shared by several branches of MSA programs in the community center. These are not specifically MDC functions, and the performance facility should not attempt to serve many masters. But cooperative use of certain shared facilities can have many benefits by bringing together active, creative minds and increasing awareness of the arts.

Drama facilities may develop special uses such as a literature and script library; a permanent dance studio; a film or video studio and auditing library with facilities for recording, instruction and equipment loan. A full performance schedule can involve many non-actors in an expanded scene and costume shop or set and lighting design workshops.

Music facilities may have score and record libraries that are not duplicated in unit subprogram facilities. The MDC can also provide larger, more specialized rehearsal rooms or a recording studio with professional equipment, instruction and editing facilities.

3-12. PERFORMANCE SUPPORT SPACE ALLOCATION

The following is a series of net area tabulations suggested for various levels of performance support. The basic allocation corresponds to the simplest functioning facility. Recommended adjustments are noted as the next step toward improved quality of service.

Special and extended programs address requirements resulting from uncommon facility size, purpose, guest performance use, and multi-use.

Figures in parentheses have been accounted for in Room tabulations (Section 3-7b). Section 3-15 will sum up all parts of representative MDC facilities, and Chapter 4 will furnish technical criteria and dimensional detail.

A. BASIC DRAMA SUPPORT

This is the minimum recommended backstage support requirement consistent with small scale infrequent productions with an average cast of thirty.

Facility	Net Area (SF)
• group dressing—2 @ 300	600
wardrobe	80
make-up	200
• toilets & showers—2 @ 200	400
• artists' lounge	300
• assembly onstage—2 @ 80	(160)
Performers' Areas	**1580**
• lighting control	(100)
• sound control	(60)
• tech. positions onstage—3 @ 40	(120)
• followspot positions in house—2 @ 40	(80)
• stage crew waiting lounge	150
Technical Areas	**150**
• loading/receiving	300
• general storage	1000
• shop—tool storage and assembly	1500
• costumes storage	500
• costume workroom—assembly	300
• laundry & dye works	150
• lighting instruments storage	150
• electrical shop	120
• tech. crew office/design/toilet	440
Preparatory Areas	**4460**
	6190
	+20%
Basic Drama Support Total	**7500 Gross SF**

B. RECOMMENDED ADDITIONAL DRAMA SUPPORT

An MDC that expects to maintain a moderate-to-full level of Drama programming, including (if desired) professional touring companies, will require backstage support comparable to that shown below. In particular, enlargement of preparatory areas is needed to handle resident scenic repertory. A cast of thirty or more is likely.

Facility	Net Area (SF)	Added (SF)
• add 4 double dressing private or 5 singles in suite	1320	+720
• separate group makeup (2 @150)	300	+100
• lounge becomes green room	500	+200
• add vending or kitchen unit	50	+ 50
• add "stage door" waiting	100	+100
• other Basic areas	480	
Performers' Areas	**2750**	**1170**
• enlarge lighting and sound control	(260)	+(100)
• add record/playback booth	(60)	+(60)
• allow 3 followspots	(120)	+(40)
• enlarge stage crew, lockers	200	+ 50
Technical Areas	**200**	**50**
• enlarge receiving	400	+100
• enlarge storage, long & short term	1500	+500
• enlarge scene shop, construction, and assembly	2000	+500
• add property storage, small items	200	+200
• enlarge costume storage and wardrobe	1000	+500
• enlarge lighting storage	250	+100
• other Basic areas	1010	
Preparatory Areas	**6360**	**1900**
	9310	3120
	+20%	
Recommended Drama Support Total	**11,200**	**Gross SF**

C. BASIC MUSIC SUPPORT

The minimum recommended Music support requirement is established here for fifty performers. It includes no rehearsal space and the most spartan accommodations for incoming touring groups and performances prepared in other locations.

Facility	Net Area (SF)
• dressing and lockers	600
• toilets and showers (2)	400
• warm up areas (2)	200
• artists' lounge	400
• assembly area offstage	(500)
• conductor dressing	180
Performers' Areas	**1780**
• lighting control	(75)
• sound control	(75)

• followspots—2 @ 40	(80)
• technical onstage—2 @ 40	(80)
• stage crew waiting	100
Technical Areas	**100**
• loading/receiving	300
• general storage	200
• maintenance shop	300
• instrument storage	400
• stands and chair storage	75
• score storage, duplicating	80
• technical director's office	100
• electrical shop/storage	200
Preparatory Areas	**1655**
	3535
	+20%
Basic Music Support Total	**4300 Gross SF**

D. RECOMMENDED ADDITIONAL MUSIC SUPPORT

For Music programs that anticipate developing their own "resident" orchestras in addition to a modest schedule of professional guest performances, it will be necessary to incorporate rehearsal and practice facilities and to improve performers' facilities for fifty or more musicians. Preparatory facilities are about equivalent to a modest high school music department

Facility	Net Area (SF)	Added (SF)
• add 4 soloists private dressing	1000	+400
• lounge becomes green room	500	+100
• add storage/kitchenette	50	+ 50
• add "stage door" reception	100	+100
• other Basic areas	780	
Performers' Areas	**2430**	**650**
• enlarge control/projection	(250)	+(100)
• add third followspot	(120)	+(40)
• enlarge stage crew quarters	200	+ 100
Technical Areas	**200**	**100**
• enclose and enlarge receiving	600	+300
• add trunk storage minimum	150	+150
• enlarge shop, shop storage	500	+200
• piano storage	550	+150
• riser storage	225	+150
• enlarge T.D. office (stage manager)	200	+100
• add rehearsal room	800	+800
• add recording control/storage	150	+150
• add practice rooms—2 @ 300 + 2 @ 90	780	+780
• other Basic areas	480	
Preparatory Areas	**4435**	**2780**
	7065	3530
	+20%	
Recommended Music Support Total	**8500 Gross SF**	

E. SPECIAL REQUIREMENTS FOR MULTI-USE AND EXTENDED PROGRAMS

1. Large Scale Music Facility

Large installations located near major cities will be able to draw on the skills and sophisticated audience interest of the urban population. This may be especially true of new fast-growing metropolitan areas short on cultural facilities but long on educated, active young families.

The large scale music facility may also be applicable to installations with an existing strong Music program ready for professional quality facilities or interested in consolidating far-flung outmoded accommodations.

The large scale music facility described below is about equivalent to a college music center suitable for visiting symphonic groups and a resident contingent of 120 performers. It is an expansion of the Recommended Music Support (3-12d).

Facility	Net Area (SF)	Added (SF)
• near double dressing & warmup	1800	+1100
• add concert master dressing	180	+ 180
• enlarge green room	700	+ 200
• add artists' lounge	500	+ 500
• other Recommended areas	1230	
Performers' Areas	**4410**	**1980**
• add broadcast control and announcer	(75)	+ (75)
• add stage manager to crew area	250	+ 50
Technical Areas	**250**	**50**
• enlarge offstage storage	500	+ 275
• enlarge trunk & instrument storage	1300	+ 600
• enlarge score library	230	+ 150
• enlarge general storage	500	+ 300
• add for 2 sectional warm-ups @ 400	800	+ 200
•'1 string warm-up (for 60)	1200	+1200
• add 6 practice rooms @ 120	900	+ 720
• other Recommended areas	2450	
Preparatory Areas	**7880**	**3445**
	12,540	5475
	+20%	
Large Scale Music Support Total	**15,000 Gross SF**	

2. Extended Program Drama Facility

The installation that has a strong Drama program and a population that shows an avid interest in participation and skill development will wish to involve more of them in a broad range of activities. This can have the spin-off benefit of improved production quality and variety, which builds audiences and morale as well.

Extended drama support increases the scale of production to a cast of fifty and adds to the recommended technical and preparatory facilities. It enables more kinds of theater art specialization on an on-going basis, with provision for instructional workshops.

Facility	Net Area (SF)	Added (SF)
• enlarge group dressing & makeup	1920	+ 300
• enlarge production wardrobe	180	+ 100
• enlarge toilets and showers	550	+ 150
• add artists' lounge	300	+ 300
• other Recommended areas	650	
Performers' Areas	**3600**	**850**
• add stage mgr. to crew area	350	+ 150
• add video broadcast control/ record	(100)	
Technical Areas	**350**	**150**
• enlarge electrical shop	220	+ 100
• enlarge costume assembly, wig room	600	+ 300
• enlarge laundry	200	+ 50
• add scene paint shop	2450	+ 450
• add script library	100	+ 100
• dance studio/rehearsal room	1800	+ 1800
• film/video studio and control	600	+ 600
• editing and equipment	200	+ 200
• other Recommended areas	3790	
Preparatory Areas	**9960**	**3600**
	13,910	
	+ 20%	4600
Extended Drama Support Total	**17,000**	**Gross SF**

3. Touring Group Accommodations

Installations anticipating a heavy schedule of professional road shows are advised to further supplement backstage support facilities. The intent is to separate touring group from resident areas to reduce conflicts with on-going activities. This will permit visiting troupes engagements of varying duration and allow for rapid loading-in and out for the fullest performance calendar.

An MDC used for professional touring shows should begin with better than basic support facilities. For frequent incoming shows, the following net areas are added. Large music centers are also advised to provide truck trailer enclosure adjoining the receiving area in which musical instruments can be maintained at indoor temperature and humidity conditions.

Facility	Added (SF)
• add guest artist's dressing	+ 250
• add roadbox storage	+ 500
• add road manager/ technical office	+ 180
• enlarge offstage storage	+ 300
	1230

Touring Group Accommodations

With Recommended Drama (9310)	**10,540 (Net)**	**13,000 Gross**
With Extended Drama (13,910)	**15,140**	**18,000**
With Recommended Music (7065)	**8,295**	**10,000**
With Large Scale Music (12,540)	**13,770**	**16,500**
Add Tour Trailer Garage @ 600	**14,370**	**17,250**

4. Musical Drama/Opera Facility

The ability to perform musical dramas and operas is largely determined by the nature of Room facilities, but the ability to develop and produce them requires a combination of drama and music support activities. In most cases, a modest Drama program will include musical drama by obtaining an orchestra's services for the performance run. Unfortunately, the orchestra's work schedule may not coincide with that of the drama group; there will be insufficient rehearsal dates, for instance, or inability to "'hold-over" a wildly successful production to meet audience demand. Installations that can support a strong musical drama program may find it wise and efficient to add Basic Music Support to backstage facilities.

The following example presupposes a strong Drama program with facilities for the development of drama-related skills and technically fine stagecraft. The Extended Drama Support facility required is modified mainly by the addition of musicians' quarters and storage for equipment. The addition does not duplicate technical or preparatory spaces, nor does it include music rehearsal and instruction. The resulting MDC would be appropriate if the installation operates an exchange program with a neighboring college music department or with another installation's strong Music program. It may also apply to an installation with existing well-developed Music Subprogram activities housed in unit-level facilities. This example provides for a cast of 50 actors and 40 musicians.

Facility	Net Area Combined (SF)	
• Extended Drama performers' area	3600	
• Basic Music performers' area	1780	
Performers' Areas	**5380**	
• Extended Drama technical area	350	
Technical Areas	**350**	
• Extended Drama preparatory area	9960	
• enlarge offstage storage	+300	
• less film/video installation	−800	
• add piano storage, voice practice	+550	
Preparatory Areas	**10,010**	
	15,740	
	+20%	
Musical Drama/Opera Support Total	**19,000**	**Gross SF**

DIVISION 3
THE FRONT END

3-13. AUDIENCE SUPPORT

A. GENERAL CONSIDERATIONS

Front End activity consists of the group of functions aimed at securing, organizing and serving the public occupancy of a performing arts facility. Compared to the Room and Backstage divisions, it is the least dependent on the specific performance type for function definition and physical planning.

Physical planning does follow Room design in its relationship to access patterns, but special functions derive from the using service's objectives, orientation toward the public, and identification of needs beyond common requirements. For this reason, careful attention must be given to the results of Chapter 2 evaluations in order that Front End design fits anticipated audience development and intended secondary uses of the MDC.

B. CLASSIFICATION OF AUDIENCE SUPPORT

There are three classes of Front End facilities defined by their users' activities.

1. Public Facilities
These accommodate visitors and audience members. At performance times, they serve to control entry, provide for waiting and circulation of many people, and permit social interaction appropriate to community gatherings. In off hours, they may be used for other group activities and include standard subfunctions required for assembly purposes, such as rest-rooms, drinking fountains and coin telephones.

2. Staff Facilities
These accommodate the administrative management. Except for box office activity and house security, most use occurs between performances. Regular activity includes promotional work, arranging bookings, accounting and clerical, advance and mail order ticket distribution, program planning and general office work.

3. Service Facilities
These accommodate operating staff and special functions arising from public assembly activity. Custodial, office supply storage and staff lockers are needed, as are coat rooms, food and beverage service, and first aid equipment for the public and staff.

C. CHARACTERISTICS OF AUDIENCE SUPPORT FUNCTIONS

Every performing arts facility intended for public presentations requires all three classes of audience support. The dimensions and treatment of each depends on the using service's objectives as much as on the size of the audience.

1. Public Functions
These reflect established operating procedures and common-sense requirements for dealing with large numbers of people in an orderly fashion. However, an attitude toward public participation is also conveyed, and for this reason the definition of functions should be predicated on a clear statement of purpose. The visitor's initial experience prepares him for the central purpose of the facility. A receptive state of mind is essential to enjoyment, which in turn registers with the performers and adds greatly to general sat-

isfaction. Crowding, confusion, long waits and discomfort lend a negative note at the outset.

The desired social ambience of a live performance can be reinforced by the architecture. This is less a matter of decor and finishes than of emphasis, scale and organization of space use, attributes that can establish impressions of grandness, ceremonial ritual, participatory involvement, club-like exclusiveness, or community openness. Any of these images may be appropriate, but one should be chosen and expressed by design.

The public's introduction should of course be related to primary performance content and the way the Room "feels". Since the Room design is of primary importance, its development precedes and aids that of public support space. The relationship may be by contrast, providing a distinctly inviting, lively, open environment in relief to a closed, centered interior. It may also be related by gradation, formal symmetry and recurrence of design theme culminating in the Room experience.

A second consideration is the environmental context of the MDC. Public entry is a transition. The building's setting will also have a strong influence on the function of public spaces (see discussions under Sections 2-5 and 2-9). Physical conditions of topography, climate, access and egress routes, site dimensions and neighboring land and building uses must be taken into account. For instance, an axial rectangular geometry may be impractical even if appropriate.

The function of transitional design is to adjust to external factors in a natural way, in order to spare the Room this necessity. A building in an urban setting is usually expected to respond to the order and scale of its neighbors and give something to the quality of the street. A building in a natural or suburban setting is usually expected to conform to landscape features and refrain from intrusion on the daily lives of inhabitants. On the other hand, the building may have special meaning and pride of place to the community, justifying a prominent stance.

2. Staff Functions

The definition and organization of staff offices is related to staff size and level of activity. A busy production schedule entails extensive clerical work, bookkeeping, mail handling and telephone communications. Generating such a schedule is the work of a Program Director (or Bookings Manager for a heavy schedule of incoming touring shows and professional musicians). This effort must be matched by the Technical Director's ability to meet production schedules with a high level of artistic quality. The routine operations of maintenance, inventory upkeep, ticketing and administrative direction is the task of the House Manager. Peak output involves both combined and separate activity at various times, so an efficient but flexible office design is very important.

Administrative facilities are usually located adjacent the public entry for efficiency; although program emphasis may make other arrangements more beneficial. The administration represents the facility to the public and should be accessible. Location and accessibility of staff is a factor in establishing a public image.

Entry control and ticketing are staff operations of an on-going nature, and public access for other than audience purposes should be confined to avoid interruption of performance preparation. This will also make for efficient building operations since office activity during regular hours does not always coincide with artistic and technical activity.

Then again, an extensive "hands-on" training program or road show schedule can shift the non-performance activity center to the backstage areas, making administrative facilities there a convenience that allows public spaces to be shutdown when not in use. The main concern is that box office and limited daytime public access is not impeded; administrative activity does not usually occur during performance hours.

3. Service Functions

These are generally related to public use although a split front-end arrangement mentioned above may result in split services accordingly. Functions requiring public access or contact, are of course associated with the lobby. Functions limited to staff access may be situated in association with administrative offices.

Public access services typically include a coat checking facility, food and beverage service or vending machine area, first aid and ladies lounge. Staff access services typically include ushers' lockers, a supply room for sundries, programs, chainposts, etc., and a custodial supply and mop closet. Some special service functions are not essential to the conduct of performance, but are included if deemed important to program goals. They might be found in education-oriented fa-

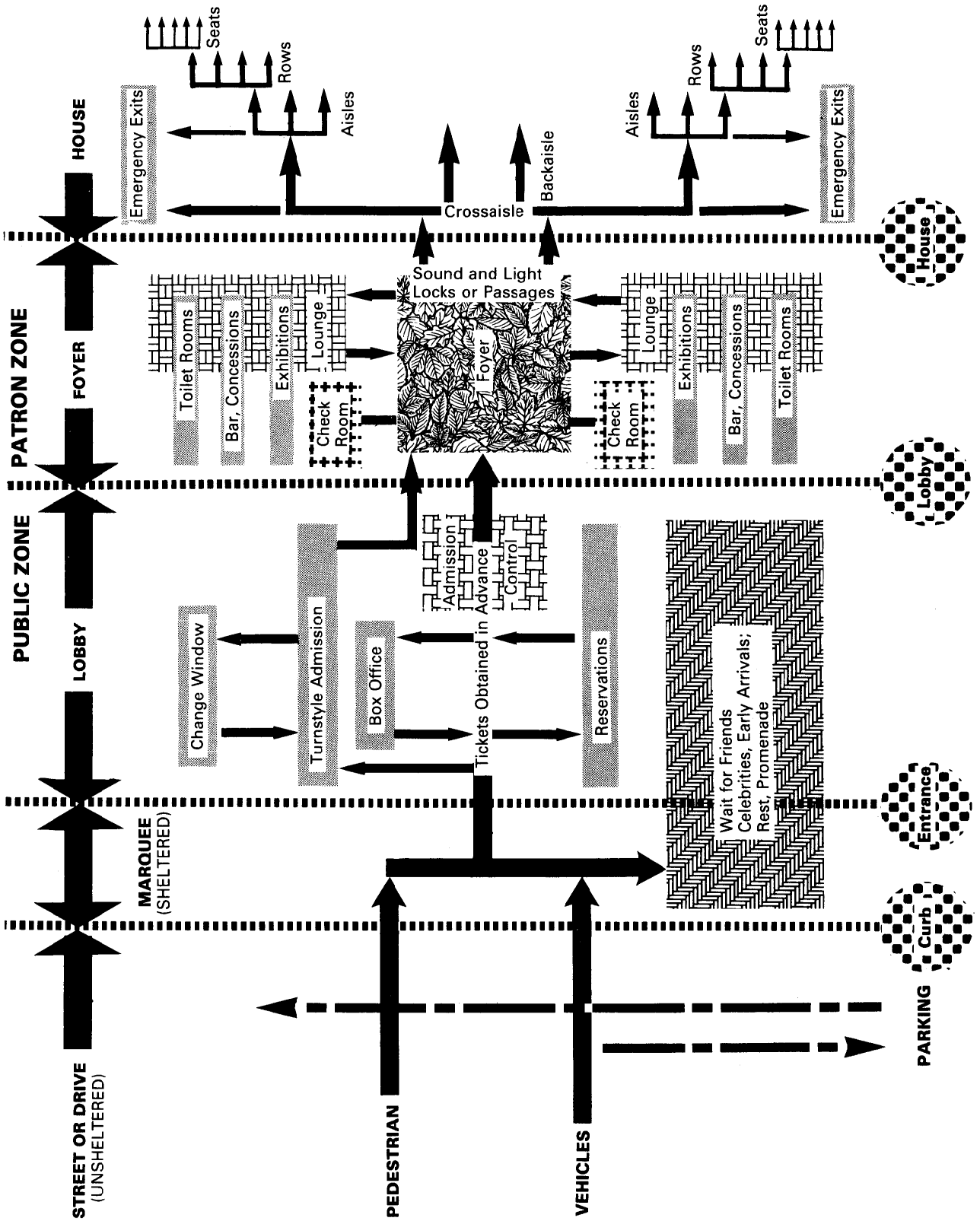


FIGURE 3–13.1 AUDIENCE'S TRAFFIC PATTERN

Statistical Averages	Opera and Concert	Legitimate and Musical	Movies and Spectaculars
% of audience which waits to meet friends in the Lobby	6	10	Negligible
% of audience which buys tickets within 20 minutes of curtain time	8	20	100
Time spent in line for tickets purchased or reserved	2–15 Min.	2–5 Min.	Negligible
Time spent in line to ticket taker	1 Min.	1 Min.	0
Overall time, curb to seat	4–12 min. depending upon location. 4 min. to box.	6 min. to orch. 8 min. to mezz. 9 min. to balcony.	2–5 Min. depending upon location.
% of audience which checks its wraps	18	10	Negligible

FIGURE 3–13.2 ARRIVAL CHARACTERISTICS

cilities seeking to develop audiences and amateur participation.

Special services include a children's play area or nursery, a library for score, script, film, tape and book collections and a lounge equipped for visual arts exhibitions. Clearly, these functions may be regarded as extensions and variations of formal lobby and administrative uses, but involve consideration of fittings that may not otherwise be foreseen. Moreover, inclusion of such functions may indicate design decisions as to scale, arrangement and access quite different from typical audience support.

D. FUNCTIONAL REQUIREMENTS OF AUDIENCE SUPPORT

Approved military standards furnish detailed criteria for determining load capacity, exit size and number, fire protection, gradients, fresh air ventilation and plumbing fixture counts generally in proportion to the number of persons assembled. This discussion is primarily concerned with the logical order and nature of spaces.

1. Public Spaces

The organization of public spaces is established by entry sequence and control. Two distinct zones are created by means of ticket-taking, which may be called the public zone and the patron or audience zone.

***The public zone** includes all spaces accessible from the entrance without surrendering one's ticket, and indeed without having one. In temperate climates, this may be an outdoor sheltered area under a marquee or pentroof. When enclosed, it is referred to as a Lobby, which may communicate with one or more spaces beyond, or with multiple performance facilities. (Terminology varies; it is sometimes called a Foyer-a term this Guide uses differently below.)*

Activities of the public zone are arrival, vehicular drop-off, waiting for friends or for the doors to open, lining up for tickets or admission, purchase of advance tickets, obtaining the season schedule or coming events information.

The extent of this zone depends on schedule conditions and management policies. If the bulk of tickets are sold at the door, accommodating lines of people at peak hours is of concern. This can be relieved by permitting early entry for ticket holders and provision of adequately delineated queuing areas that do not obstruct entry or exit of previous audience. Two separate ticket windows are advised if a full schedule of events is expected to yield advance sales.

The Lobby is an ideal information and promotion center generating interest in upcoming productions. It may also serve as a circulation "valve" directing off-hour visitors to administrative or other spaces. If a large enough indoor space cannot be provided, ticket windows should be accessible from outdoors with the Lobby functioning as a vestibule.

The double door vestibule is in any case impor-

Statistical Averages	Performance Type	
	Opera and Concert	Legitimate and Musical
% of audience which leaves seats during intermissions	75	60
Walking time: seat to lounge	4 Min.	4 Min.
Time in lavatory line	1 Min.	6 Min.
Time spent in line at check room after show	3 Min.	5 Min.
Seat to curb time (without checkroom stop)	5 Min.	6 Min.
Waiting time for cab or car	0–15 Min.	0–15 Min.

FIGURE 3-13.3 INTERMISSION AND DEPARTURE CHARACTERISTICS

tant as a sound barrier, and must be provided in sequence with the Lobby, or in some cases between the Room and audience support spaces to stop both light and sound.

The patron zone *includes all spaces communicating with the House after surrendering one's ticket. It is important that all essential services, such as restrooms and checkrooms, be accessible without recrossing the control point.*

Besides permitting circulation to seats, the patron zone includes a Foyer where the audience may foregather or retire during intermissions. Treatment of the Foyer largely sets the tone of audience consciousness in its transition to the performance.

A small Lobby warrants a generous Foyer. Low-keyed comfortable appointments and spatial dimensions calculated to respect human scale and focus small clusters of people, are appropriate to the intimate facilities suggested. Lighting and color selections should compliment human skin tones, with enough sparkle to highlight the social occasion. Monumental spaces may be appropriate in larger urban centers where a transition space may capitalize on the excitement of large crowds and celebrity glitter. But most Army installations are small communities in which the same people are encountered on a daily basis. Every effort should be made to encourage a relaxed, cordial atmosphere in which workday role relationships are discreetly levelled.

Pre-performance gathering may involve snacks or beverage service, conversation, and polite sociability. Intermission leg-stretching allows for discussion of the performance and use of restrooms or powder rooms. Post-performance gathering permits the patrons to meet the cast, await transportation, reclaim wraps, and in general make an orderly departure. (Note: opening or closing night cast parties, press conferences and guest artist receptions are typically limited by invitation and often occur backstage-specifically, in the green room if one is available).

Coat checking is often omitted, although the best Music Rooms deserve this consideration. Despite discomfort, patrons are often reluctant to check wraps, which add to the absorptive content of the Room. Encouragement by way of free attended checkrooms or keyed lockers is reinforced by providing an unhurried after-theater atmosphere. Allowances for emergency situations demand a first aid room or supply locker, usually supervised by the ushers or theater staff.

Circulation to seating is the main activity influenced directly by Room configuration, and circulation may in turn affect planning of audience support. Long travel distance and vertical separations discourage intermission activity, which may in part be compensated by sub-foyers or loggias at balcony levels, terminations of cross-aisles, or along both sides of a house having continental seating.

For small Rooms, side spaces can defeat the purpose of the Foyer by dilution of activity. Therefore the small house may be equipped with doors that are direct exits for emergency while normal circulation is directed through the Foyer. Audience entry can take any of several relationships to the house. (See 3-9b).

For the larger Room, and especially for concert

halls, every exterior door is a potential sound leak and noise entry. An unoccupied, absorptive vestibule can often be less costly than comparable door seals. If this same space is extended as a buffer corridor or sub-foyer it does double duty between performances as access to services and convenient milling space. Coat lockers may also be located here, near one's seat, and a gradual adjustment of illumination levels is permitted.

2. Administrative Spaces

The staff may spend many hours here each day. Office task illumination and environmental control are essential, daylight and exterior views aye desirable. The choice of individual versus open office space depends on the using service requirements. A mobile, multi-functional or largely volunteer staff may find a single space most efficient to control and use flexibly. A heavy schedule of events, however, will keep the House Manager and clerical staff routinely busy, in which case separate offices are advised. Touring show programs may operate with different rhythm, as will the promotional activities for coming events; these also benefit from relatively independent operation. Functionally separate Directors' offices enable private telephone and conference conversation for each individual, and intercommunication among them. Intercommunication should extend to the backstage and control room, and include performance monitoring. At least one private conference area should be available for interviews, counseling, budget reviews and the like.

Box Office facilities should be separate from general administration, especially where cash receipts are involved; furnish door security, wicket shutters, and a safe. The ticket sales area should accommodate more than one person. Ticket racks should be within easy reach and internal communication possible without leaving the window.

A general staff work area is desirable for joint planning, coordination, program assembly, mailings, and miscellaneous clerical work.

3.14 AUDIENCE SUPPORT SPACE ALLOCATION

Planners can generalize about Front End area allowances with about the same precision applicable to Room figures; a great deal depends on shape, arrangement, intended use and the total number of people served.

Since Front End facilities are less critical to performance quality than the Room and Backstage components, the using service and design agency is invited to view audience support allocations creatively. Much will depend on justifiable attendance expectations, climate and neighborhood context.

A. PUBLIC USE AREAS

In typical civilian facilities, net public spaces (Lobby and Foyer) range from 5 to 8 square feet per seat, excluding corridors, stairs and vestibules. Twenty percent may be added for circulation areas. If a portion of the audience is seated immediately, a definable Main Foyer having 5 SF per seat is minimum. Ingenuity in using "left-over" corners, outdoor extensions, mezzanines, and compact shapes (minimum dedicated to circulation) improves both apparent spaciousness and actual efficiency. Another 20% will normally account for services like toilets, closets, first aid room and coat storage.

Checkrooms should have 50 SF per hundred patrons. Restrooms are not directly proportional to capacity: allow 260 SF for 300 seats, 350 SF for 650 seats, and 500 SF for 1400 seats. Recommended minimum for an entry vestibule is 150 SF for limited ticket sale, or 500 SF for moderate queuing.

The best balance between public and patron (free and paid) zones for a given facility can only be estimated case by case, according to operating conditions and practices. A generous public zone is justified where regular daytime, pre-performance activity takes place. If a rich schedule of events attracts many varied interest groups, or if the facility is part of a larger complex, an attractive entranceway invites advance ticket sales and spontaneous participation. It may sometimes be necessary to purposely generate supporting activity, such as food and beverage service, exhibitions and other entertainments which the facility's locale does not provide. In urban neighborhoods, it will be more natural to walk in off the street and be seated promptly, as in a Broadway theater.

	Public Lobby per seat	Patron Lounge per seat
Opera House	2 SF	8 SF
Commercial Theatre	1.8 SF	6 SF
Noncommercial Theatre		6 SF
School	1.2 SF	6 SF
College and University	1.4 SF	8 SF
Community	1.4 SF	2 SF
Summer Theater	1 SF	10 SF out of doors (veranda, lawn, garden, patio)

FIGURE 3-14.1 TYPICAL FREE AND PAID ZONE ALLOCATIONS

A generous patron zone is justified by consistent full house capacities. The patron zone serves the performance audience rather than the prospective audience. It's easy to undervalue audience comfort as a factor contributing to success, except when one facility faces direct competition from another (more likely among commercial houses). However, bui!t-in discomfort may inhibit audience growth; there is no advantage in beginning with it. Pre-performance is the key time period. People will arrive earlier if they can expect comfort; this ensures a punctual curtain preceded by the least tedium.

B. STAFF AND SERVICE AREAS

Staff space allocations depend more on staff size than house capacities. Commercial and civic performance facilities often devote 15% of the Front End area to offices alone. Military facilities tend to have a much smaller permanent staff that seems to function "family style." Directors' offices of 120 to 150 SF each are suggested for prolonged use. If smaller, a 150 SF conference room is advised. The House Manager requires 100 SF in connection with ticket sales of 60 SF for small houses, twice that for the largest. General office space should reasonably be 200 SF for one fulltime clerical and occasional group activity, plus 70 SF for storage and duplicating.

A small contingent of ushers may share with first aid an area of 120 SF; a separate lounge is recommended for the largest capacity. At least one custodian's mop closet is required at each floor, plus storage for Foyer and Lobby fittings (chairs, etc., at least 75 SF.). Another 50-75 SF may be devoted to snack and beverage service equipment, more if secondary banquet uses are contemplated. Special services should not escape attention. If a tape or reading library of the simplest nature is planned, 125 SF of storage controlled by administration personnel is needed.

Here follows summary allocations for four typical performance facility Front Ends. The Drama facilities allow for simple, minimum public spaces. The Music facilities are slightly more generous to compensate for typically tighter seating patterns in the Room.

C. 300 SEAT DRAMA AUDIENCE SUPPORT

Facility	Net Area (SF)	
• Vestibule (not including marquee)	200	
• Foyer ("living room" image assumed)	1800	
• mini-kitchen unit	30	
• storage	70	
• toilets and J.C.	260	
• circulation (25%)	600	
Public Uses	**2960**	
• Director's office	150	
• general office	280	
• Box Office	60	
• Storage	50	
Staff Uses	**540**	
	3500	
	525	
Total simplest Front End + structure and mechanical (15%)	**4025**	**Gross SF**

D. 650 SEAT DRAMA AUDIENCE SUPPORT

Facility	Net Area (SF)	
• Lobby	350	
• Foyer ("art gallery" image assumed)	2600	
• food/beverage	60	
• storage	75	
• toilets and J.C.	350	
• balcony foyer (open to Main Foyer)	600	
• entry locks and circulation (25%)	1000	
Public Uses	**5035**	
• Directors (2 @ 150)	300	
• House Manager	100	
• Box Office	60	
• general office	180	
• storage/duplicating	80	
• library storage	80	
• ushers	120	
Staff Uses	**920**	
Total Medium Front End	5955	
+ structure and mechanical (15%)	895	
	6850	**Gross SF**

E. 650 SEAT MUSIC AUDIENCE SUPPORT

Facility	Net Area (SF)	
• Lobby	350	
• Main Foyer	3000	
• sub-foyers	1000	
• food/beverage	60	
• storage	75	
• toilets and J.C.	350	
• checkroom	300	
• circulation (20%)	1030	
Public Uses	**6165**	
Staff Uses (same as 650 Seat Drama)	920	
Total Modest Front End	7085	
+ structure and mechanical (15%)	1050	
	8145	**Gross SF**

F. 1400 SEAT MUSIC-DRAMA AUDIENCE SUPPORT

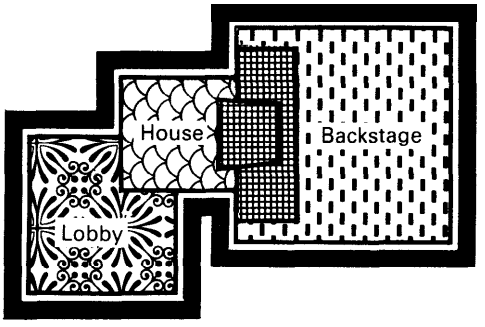
Facility	Net Area (SF)	
• Lobby	600	
• Grand Foyer	5000	
• Upper Foyer	1800	
• food/beverage (2)	125	
• storage (2)	150	
• toilets and J.C. (2)	650	
• 700 coat lockers, circulation (30%)	2500	
Public Uses	**10,825**	
• Directors (2 @ 150)	300	
• publicity	120	
• House Manager & security	180	
• Box Office	130	
• general office	180	
• workroom	150	
• storage/duplication	80	
• library	125	
• ushers	150	
• first aid room	190	
Staff Uses	**1605**	
Total Large Front End	12,430	
+ structure and mechanical (15%)	1,870	
	14,300	**Gross SF**

3-15. COMPOSITE BUILDING PROGRAMS

This last section of Chapter 3 examines the possible results of adding up major divisions of performance facilities selected from the examples developed to this point. The Guide has identified the three functional parts of a performance facility, likely variations of program, parameters of Music versus Drama production, and factors of scale. Only single Room facilities have been discussed, each to be used primarily for one form of music or drama presentation while recognizing that multi-use is to some extent inevitable. Referring to Sections 3-7, 3-12, and 3-14, minimum functioning facilities can be described for each of the four capacity-and-use programs discussed in Sections 2-4 and 3-2.

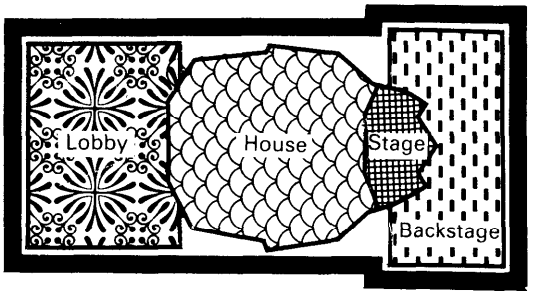
A. MINIMUM FUNCTIONING FACILITIES

Facility	Room Backstage Front End	Total Building Area
		18,725
Small Drama	.7200	GSF
300 seat legitimate drama	.7500	
	.4025	
		25,700
Large Drama	.11350	GSF
650 seat legitimate drama	.7500	
	.6850	



18.725 GSF
"Minimum" Facility
Conventional Seating
Offset Stagehouse

FIGURE 3-15.1 300 SEAT, DRAMA HALL



23.350 GSF
"Minimum" Facility
Conventional Seating
Single Purpose

FIGURE 3-15.2 650 SEAT, MUSIC HALL

		23,350
Small Music	.9000	GSF
650 seat concert hall	.4300	
	.8150	
		39,300
Large Music	.16500	GSF
1400 seat concert hall	.8500	
	.14300	

These provide single-purpose facilities only, for legitimate drama and 70-piece orchestra respectively. No stagehouse or pit is provided for Music Rooms, no pit or flexibility for the relatively small Drama stage to accept dance or musical drama. The total areas nevertheless exceed current DOD 4270.1-M space allowance criteria of 14,000 and 20,000 GSF for small and large MDC's, respectively. The amount of difference is equal to the Front End component.

Cutting the seating capacity in half would bring all but the Large Music facility within the DOD criteria, which implies constraint on House capacity equal to 150,300 and 500 seats according to whether Music or Drama programs are involved. For the most part, cast quarters are minimal-well below professional standards. Consequently no reduction can be looked for in Backstage area.

These results appear to approximate the Army Performing Arts program's situation in the early 1970's, at about the time the DOD criteria were first applied to theaters. Preparations for this Design Guide indicated that Army facilities of the above capacities had typically been established in converted movie houses having none of the stage and backstage facilities needed.

The 10,000 SF movie theater ground plan was divided either to favor the Stage End (with almost no audience support-only 1100 GSF) or the Front End (leaving only 2000 GSF for all Stage functions). Lean-tos were added for dressing rooms and the house would seat 200-250. In most cases, additional space was borrowed for workshops, storage and rehearsal at remote locations. Often, administrative off ices were shared or separately housed. These scattered, temporary facilities are a serious disadvantage and scarcely resemble a Music and Drama Center.

The Minimum facilities described above will not permit frequent or varied productions of quality.

Simple improvement of each facility, without greatly improving multi-use potential, will require additions mainly to the Backstage spaces.

B. IMPROVED FUNCTIONING FACILITIES

Facility	Added Area	Total Area
Small Drama		
300 seat legitimate drama with Recommended support	+3700	22,425 GSF
Large Drama		
650 seat drama with pit with Recommended support	+4200	29,900 GSF
Small Music		
650 seat concert hall, pit, with Recommended support, more public space	+7500	30,850 GSF
Large Music		
1400 seat concert hall, 120-piece orchestra with Large Scale support	+6500	45,800 GSF

In order to provide multi-use facilities of satisfactory quality, able to deal with a full schedule of events including well-known touring shows, MDC's of the following sizes are adequate, though not top notch. Additions to the improved single-purpose facilities are in the Stage and Backstage areas.

C. MULTI-USE FUNCTIONING FACILITIES

Facility	Added Area	Total Area
Small Drama		
300 seat community theater with 20 piece pit and more audience support	+1440	23,915 GSF
Large Drama		
650 seat facility with Extended Drama support minus video studio, with 20 piece pit	+7000	36,850 GSF
Small Music		
650 seat concert hall, with modest stagehouse, Basic Drama dressing and scene shop	+7200	38,050 GSF
Plus road show accommodations and Recommended dressing to include professional light opera	+9700	40,550 GSF
Large Music		
1400 seat concert hall with dance stage, grid, and Basic Drama dressing	+2950	48,820 GSF
Plus stagehouse and pit for touring musical drama	+5650	51,520 GSF
Plus scene shop to produce light opera	+7150	53,020 GSF

Comparison with the Minimum figures first given illustrates the breadth of possibility, mindful that these increases must be carefully weighed against the likelihoods of effective utilization of these capabilities now and in the future. Area allocations given here are miserly. As a benchmark, a typical frontal symphony hall seating 2400 for Music only (no stagehouse) found in many major U.S. cities, will total more than 110,000 GSF with only modest support spaces. The most luxurious facility above is comparatively austere.

D. MULTI-USE VERSUS MULTI-ROOM

The question is: at what point has the single multi-use facility capabilities (and constraints) in excess of specific user needs? None of the Rooms described need be especially advanced technologically. But can a more efficient distribution of the same resources serve better purpose?

For instance, it may be supposed the 53,000 GSF, 1400 seat music facility fulfills the requirements of enabling Drama and/or Music performances with a fair degree of quality in the same facility. In fact, mounting an intimate amateur production there would be quite difficult. Such a Room is best suited to professional management with an eye to commercial demand. Music and Drama would essentially take turns with road shows, and probably come out the worse for low attendance. There are very few semi-professional orchestras of 120 pieces with a substantial repertoire.

However, it is quite possible that a multi-use 650 seat music facility of 38,000 GSF would be a suitable choice, permitting musical drama and popular bands and ensembles a regular schedule. The using service is still faced with a Room that is neither fish nor fowl, and the necessity of adjusting it for alternate uses.

This Guide's basic contention has been that for each Room, one sort of use should be primary. If both Music and Drama are important programs, two different Rooms should be provided. The choice and planning of dual facilities naturally includes considerations previously developed, with an assessment of financial resources. If on this basis a dual facility is feasible, refine-

22,475 GSF
"Improved" Facility
Continental Seating
Extended Stagehouse

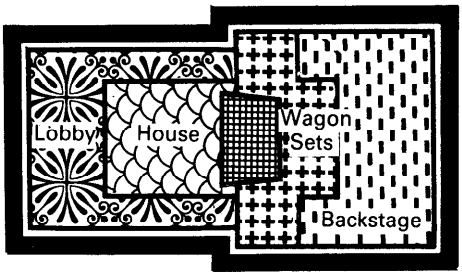


FIGURE 3–15.3 300 SEAT, DRAMA HALL

29,850 GSF
"Improved" Facility
Conventional Seating
Balcony
Bi-Level Foyer

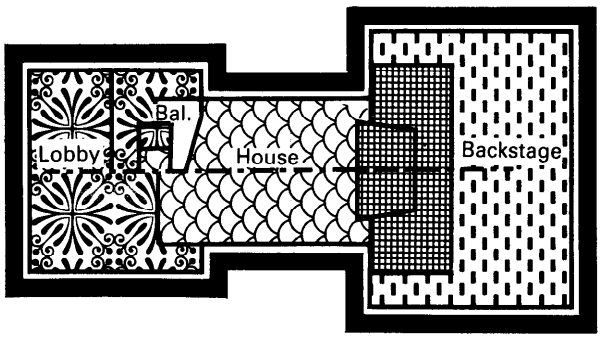


FIGURE 3–15.4 650 SEAT, DRAMA HALL

45,870 GSF
"Improved" Facility for
Symphonic Support
Conventional Seating, Balcony

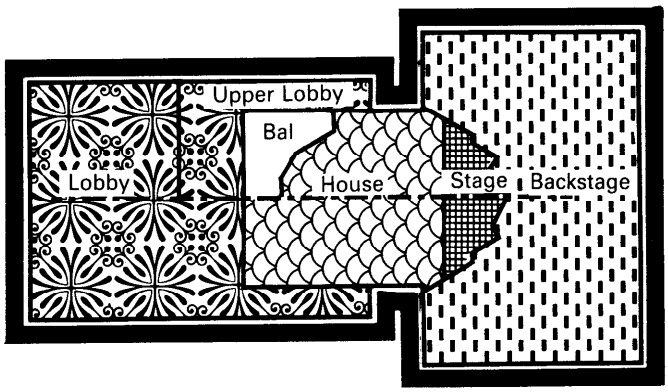


FIGURE 3–15.5 1400 SEAT, MUSIC HALL

36,850 GSF
"Extended" Multi-Use
Continental Seating

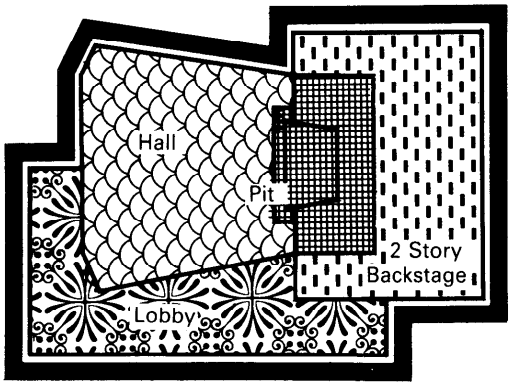


FIGURE 3–15.6 650 SEAT, DRAMA HALL

38,050 GSF
"Multi-Use" Modest Musical
Drama Support
Conventional 'Berry-Patch' Seating

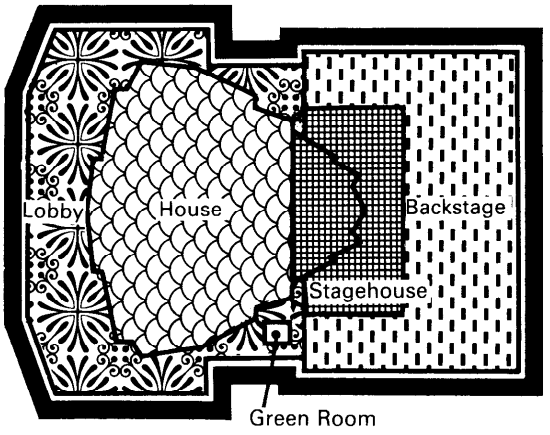


FIGURE 3–15.7 650 SEAT, MUSIC HALL

51,520 GSF
"Multi-Use" Facility with
Generous Support
Continental Seating,
Balcony

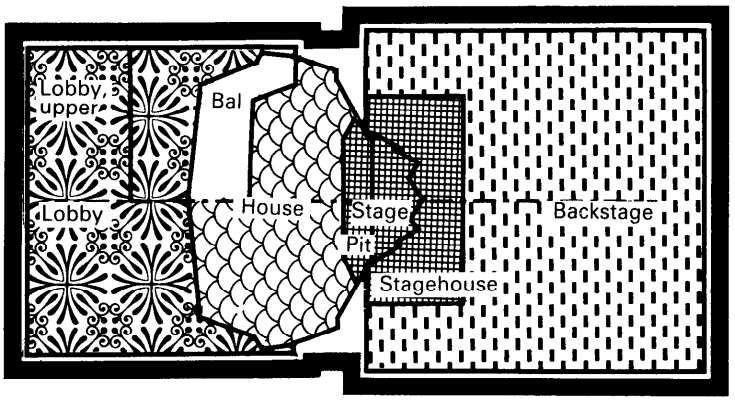


FIGURE 3–15.8 1400 SEAT, MUSIC/DRAMA HALL

ment of planning deliberations may reveal strengths not yet addressed.

E. DUAL FACILITIES

One activity and its audience supports and adds to another, in terms of public awareness and audience-building. Various performing and visual arts overlap; a constant supply of inspiration and skilled personnel working simultaneously will help fill practical gaps too, at those awkward times when the principal dancer falls ill or the pit musicians go on strike. Many technical support systems and facilities need not be duplicated for two Rooms, and indeed, one Room may serve as preparatory site for production in the other. Public and administrative facilities often benefit from combinatory scale and space-borrowing.

Without retreading previous ground at this time, here are two sample descriptions of combined-use facilities differing in scale and rationale. The first (smaller) facility addresses the desire for frequent varied presentations of manageable scale for primarily amateur casts. It offers stimulating involvement of many people with many interests and trades. Such a facility is developed with participation especially in mind.

The second (larger) facility attempts to fill two needs. The first is involvement of amateurs and semi-professionals with local audiences in relatively small-scale productions. Second, it affords the opportunity for those with a serious interest in a potential career to rub elbows with professionals. Moreover, a professional house will attract audiences and critical notice most amateur playhouses can't. The shared limelight serves the Army's public relations interest as well as the striving artist's.

1. Dual-Use Facility Alternate One: Combined facilities:

- *200-250 seat Chamber Recital Hall, flat floor.*
- *500 seat Frontal/Thrust Theater*

This combination of two performance places stresses the theatrical (drama) program, since the flat floor chamber hall can double as informal experimental theater, dance studio, or rehearsal space. The larger theater would be a different kind of Room with multi-use options.

The larger theater will have a stagehouse, flyloft and orchestra pit for proscenium form. It could also be set as an apron Thrust stage, allowing productions rehearsed in the other Room to be presented with minimum change-over interference. Preparations for the next major presentation can be taking place behind the proscenium concurrent with the Thrust performance run. The small Room would then be available for short-run experimental productions, music presentation, or other general assembly. Thus, a continual schedule of varied presentations is possible.

The small Room would be designed for natural acoustics, permitting small group presentations from a low platform at one end. It could contain a lighting grid and moveable seating to clear the floor for dances or cabaret activity and for rehearsals, or it could be set with a center stage and arena seating.

Common stage level and loading/storage/workshop/dressing facilities would enhance production turnover. This would also offer maximum educational exposure in theater arts and stagecraft.

Concentration on common backstage facilities is probably more important than common audience facilities. Most non-military combined facilities stress generous shared public space because the sales appeal of luxury plus the economics of commercial enterprise make this a cost-effective choice. The priorities are here reversed: distinctions between players and audience are less clear, the audience is more "captive", and profit motive hardly enters the picture. Efficiency of labor intensity and energy direction backstage is of the essence. It is possible that a single audience/lobby/box office facility can serve both Rooms, but modest separate lobbies would not be out of the question.

Estimated Building Program, Dual Use Facility One:

Components	Areas (GSF)
• 250 seat house	3250
• platform	600
Room Total #1	3850
• 500 seat house	5000
• stage house	3000
Room Total #2	8000
• dressing, makeup, showers	1440
• two double dressing	480
• musicians' lockers	480
• warm-up	240
• green room	600
Performers' Facilities	3240

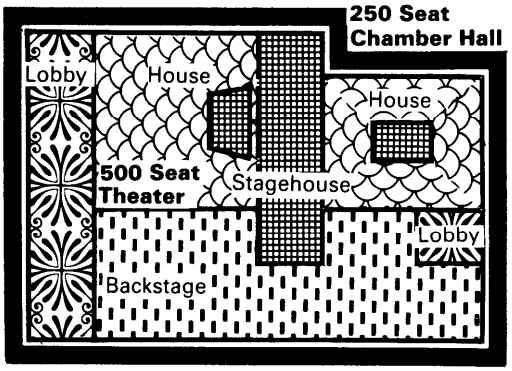


FIGURE 3-15.9 DUAL USE FACILITY 1

• lighting and sound control (both Rooms)	480
• lighting positions (500 seat)	170
• crew lounge	240
Technical Facilities	890
• Basic Drama shops, storage, loading +1000 SF	5200
• instruments, musicians' chairs, scores (500 seat)	600
• technical director/stage manager/ design area	650
• chair/riser storage (250 seat)	240
Preparatory Areas	6690
• Rooms	11,850
• Backstage	10,820
• Front End (sim. to 650 seat drama)	6,800
Total Facility	29,470 GSF

2. Dual-Use Facility Alternate Two: Combined Facilities:

- *1200 seat Opera/Concert Hall*
- *450 seat Experimental Theater*

This MDC is the largest suggested by this Guide and probably least typical. Careful preplanning and study would of course take place to target actual needs, but a large capacity hall may be called for at a major installation adjoining an urban civilian community that has no similar facility, or whose facilities are remote, fully programmed for other purposes, or economically prohibitive for Army cooperative use. Or, a cooperative arrangement with a nearby university may make full programming and joint use feasible where neither institution could alone generate the activity and support.

A smaller, highly flexible working theater provides the constant level of involvement important to Army objectives, permitting frequent hands-on productions and short term amateur exposure needed to generate the interest and skilled crew for more ambitious undertakings. The larger house is more attractive to full-fledged professional road shows and popular entertainment.

The successful management of the larger Room probably demands a different set of administrative functions, including bookings and advertising, House Manager, Technical Director and staff. Perhaps a system of visiting or rotating Artistic Directors would develop around a General Manager.

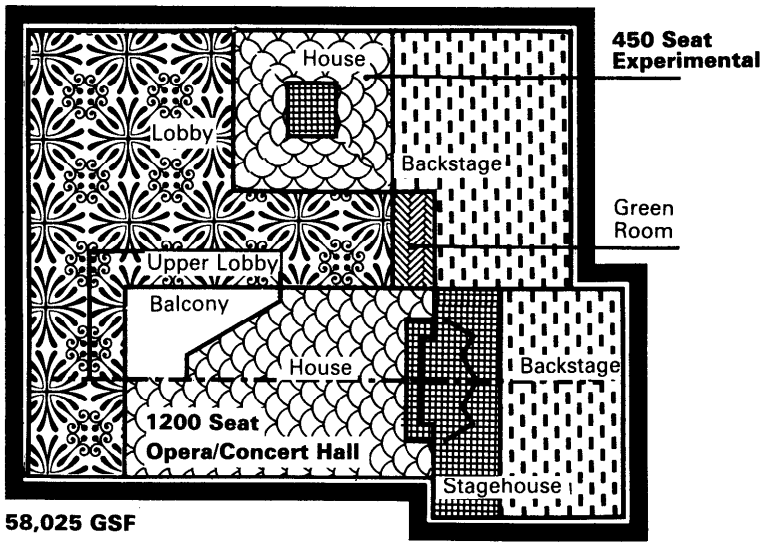


FIGURE 3-15.10 DUAL USE FACILITY 2

The large Room should have a full stagehouse complement including a flown orchestra shell and pit, and a stage suitable for dance, Broadway musicals and light opera. Special attention should be given to loading in from trucks. However, the actual production plant might be more closely related to the smaller theater, so that traveling shows and orchestral presentations are disentangled from on-going scene construction. A typical Broadway theater packs in a large crowd but has the barest of performers' facilities and almost no preparatory spaces.

Given the larger formal Room, the smaller should be the most malleable, flexible "machine" possible, perhaps spartan in appointments, but well-equipped technically. In this case, common public facilities seem to be in order-to conserve building plant, for one thing, and to identify both Rooms as important rather than "big and little." Nor will production activity create this impression, as it is likely the smaller theater will have its own schedule of events, and may in fact be more active.

Estimated Building Program, Dual Use Facility Two:

Components	Areas (GSF)
• 450 seat house	5000
• stage and traps	1500
Room Total #1	6500
• 1200 seat house	11,000
• stagehouse and pit	5,000
Room Total #2	16,000
• dressing, warm-up, and green room	4200
• receiving, trunk and set storage, workshop	4200
• technical facilities	1050
Large House Backstage	9450
• Basic Drama backstage +2000 s.f.	10,050
Small House Backstage	10,050
• public uses for 1400 seats +1500 s.f.	14,200
• staff uses for 1400 seats	1,800
Front End	16,000
• Rooms	22,500
• Backstage	19,500
• Front End (+15%)	16,000
Total Facility	58,000 GSF

Chapter 4
Technical Packages

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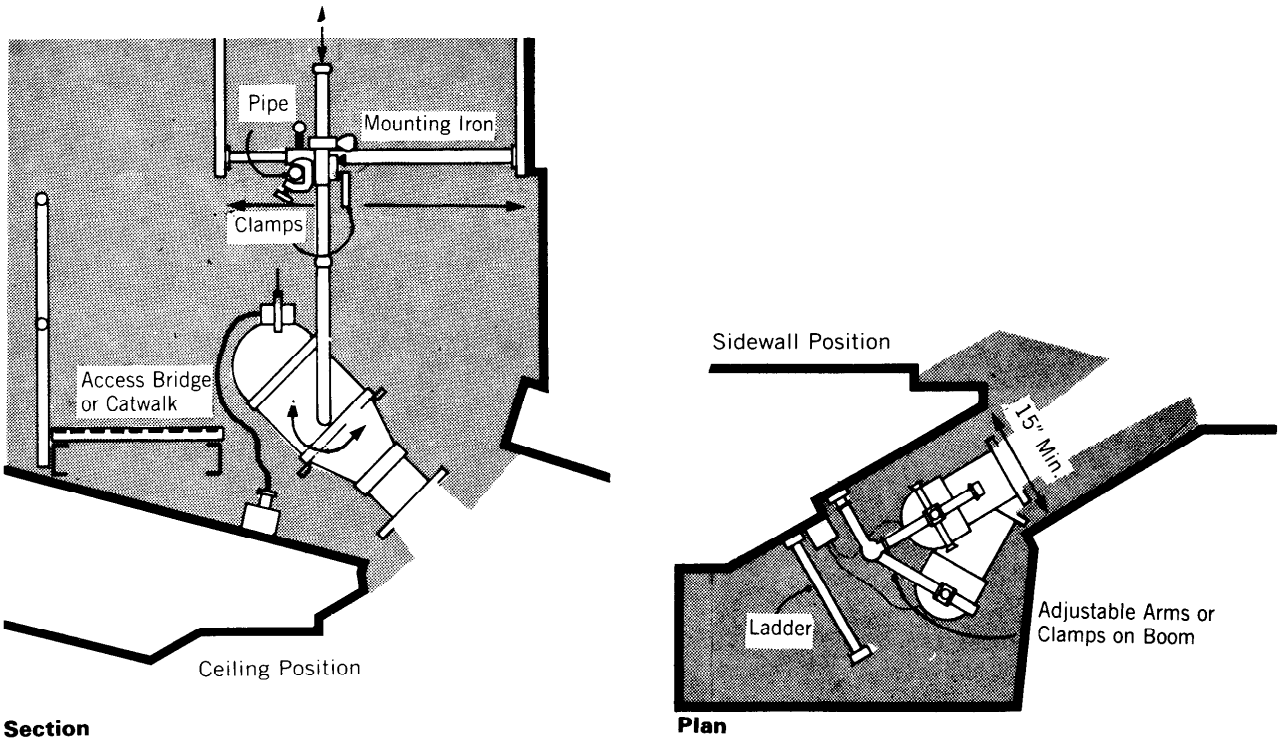


FIGURE 4-1.1 CEILING AND SIDEWALL SLOTS

Chapter 4 contains collected technical information and equipment requirements for the construction and operation of Army Music and Drama Centers. The topics addressed have been treated in less detail in preceding chapters, in order to preserve the pace of conceptual discussion. Chapter 4 is intended to give the design service and reviewing agencies an understanding of the scope of equipment and detailed study needed to produce a fully functional performance facility. It is not to be considered a substitute for technical expertise essential to project development. However, project participants will find it a useful reference in making statements of functional requirements and as a budget preparation checklist.

4-1. THEATER LIGHTING

The function of theater lighting and its relationship to Room design is discussed in Section 3-8C, in terms of its position in space, and in 3-9D regarding access to it. This Section contains a more succinct enumeration of system components.

Overstage positions: Pipes and bridges extend the width of the acting area in pairs 7-10 feet apart up and down-stage for the full depth of the stage, and are adjustable in elevation. Instruments are clamped in place, adjusted in place, and powered through pigtail interlocking plugs to cable carried in raceway or tied to the pipes. The cables run to an interconnect panel or patch-board on stage. Bridges permit maintenance and manual adjustment without lowering the entire line of instruments and without the use of ladders. Bridges are recommended for the most-used first pipe “teaser” position and for the cyclorama backdrop position, where large quantities of several kinds of instruments are common. Bridges extend to the fly gallery for access, and are invaluable where box sets interfere with lowered pipes.

Sidestage positions: Pipe booms are floor supported and ladder frames are hung from the gridiron. The fly gallery and wall-mounted ladders may also be utilized, as well as tormentor

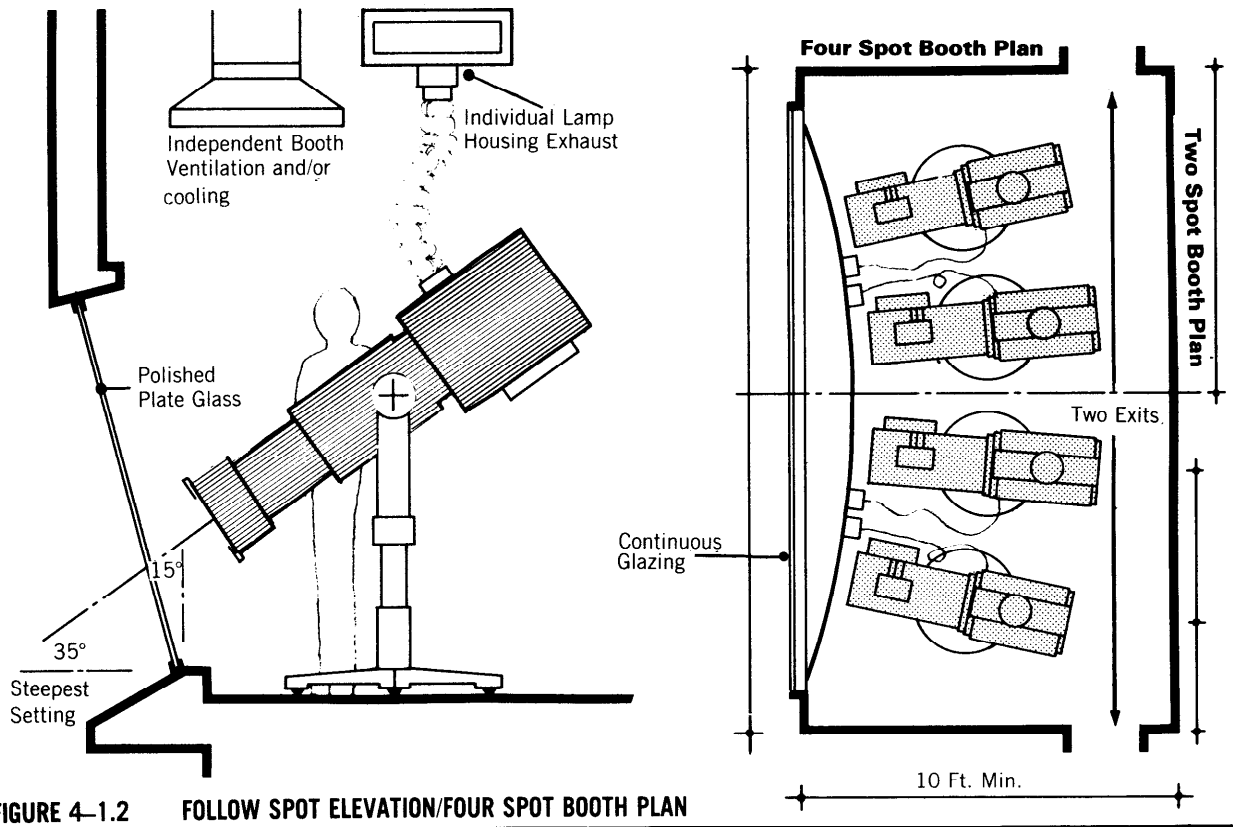


FIGURE 4–1.2 FOLLOW SPOT ELEVATION/FOUR SPOT BOOTH PLAN

locations just behind the proscenium arch. One sidestage position on each side of the stage is generally associated with each overhead pair of pipes.

Stage floor positions: Footlight troughs, cyclorama pit and deck boxes called "floor pockets" accept sub-surface instruments for wash-lighting scenery and drops; footlights are rarely used to light actors but are commonly used to light scenery. There may also be individual instruments on portable stands.

Proscenium positions: Slots alongside and above the proscenium on the house side contain specials, wash, strip and spotlights in proximity to a personnel ladder giving access to the overhead catwalk.

Sidewall positions: Vertical slots in the house walls or surface-mounted arms carry spotlights essential for down-stage and forestage lighting.

Ceiling positions: Catwalks at or above the house ceiling carry the bulk of front lighting. They extend wall to wall. Critical dimensions are incident angle to the actor's face, distance of throw and angle of adjustable aim. Frontlights must be adjustable in place from a technicians' catwalk, and each spotlight must have a clear shot at the whole stage.

Balcony positions: Supplemental spotlighting is sometimes mounted on fascias. The mount must have a pan to catch dropped filters and burst lamps. Electricians also stand in the pan to adjust the spotlights.

Followspots and projectors: At least two instruments per booth or platform is recommended. One center position may be augmented by one at each side. Booths may be shared with film projectors for scenic images. An incident angle of 30-35° to the leading edge of stage may in some cases permit movie projection on an elevated screen. However, a separate film projection booth under the balcony or at the back aisle is preferred.

Lighting control systems: With the possible exception of house and worklight autotransformer dimming from a position on stage, theater lighting makes use of indirect electronic dimming controls operated from a small console in

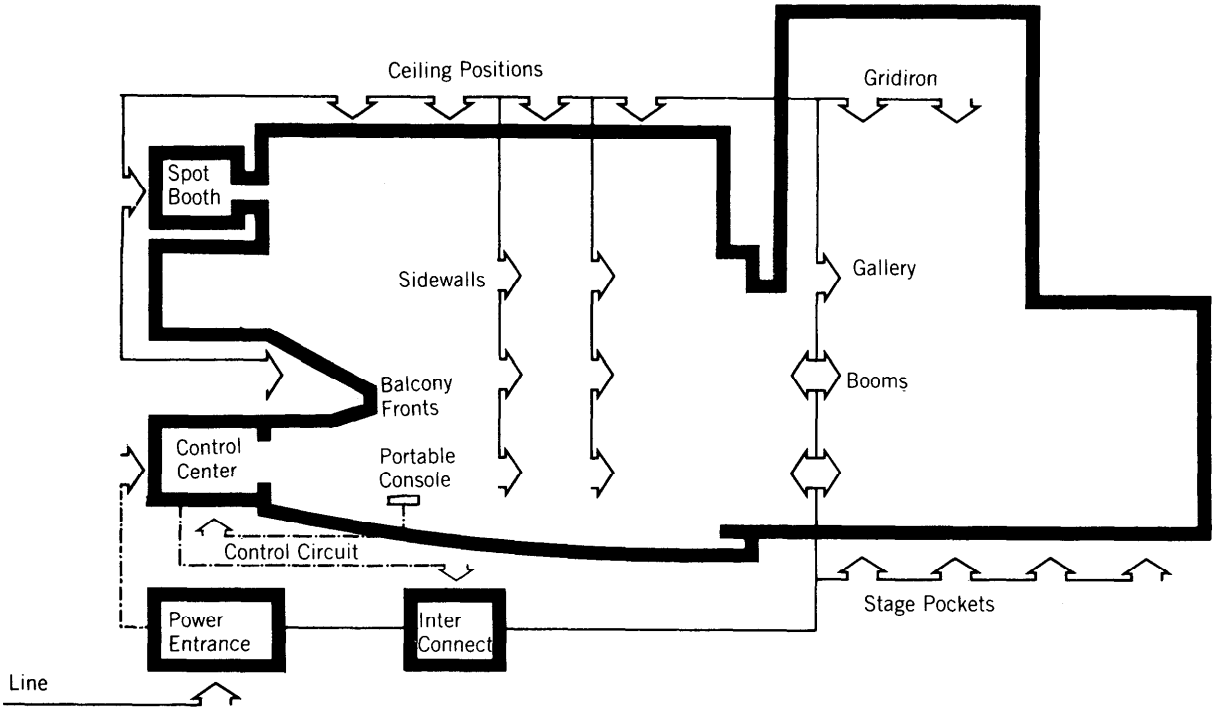


FIGURE 4-1.3 POWER CENTER DISTRIBUTION

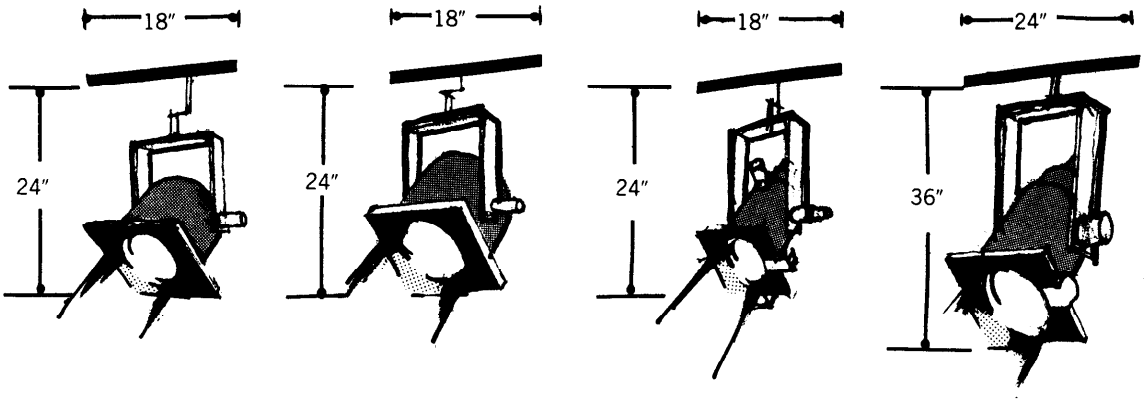
or behind the house. The remotely controlled dimmer bank is normally located in low-value space under or alongside the house and between the control center and patch panel. It is preferably nearer the patch panel to minimize high-load wiring, but the location of power service entry of 300-800 KVA to the dimmers may rule the choice. The bank needs no access during performance, but the patch panel is located on or near stage, again to minimize load-circuit wiring to the lighting positions. The patch panel requires continuous access from the stage. Low-voltage control circuits activate the dimmers which feed load circuits selected at the patch panel and into which circuits the lighting instruments are plugged.

A more recent and economical development is the dimmer-per-circuit system. The interconnect (patch panel) function takes place at the control center in low-voltage circuitry. Dimmers are installed in racks in or adjacent to the stagehouse, one dimmer per loaded circuit into which instruments are selectively plugged. Remember that dimmers make noise and should be isolated.

Control center equipment: Controls include manual and automatic preset potentiometers, or memory systems, or both. Power levels are set manually as the lighting plot is developed. These are recorded when satisfactory and a fade-duration established for cross fading from one scene to the next. The operator can manually set the levels and durations during performance, activating the sequence on cue, or the entire plot can be fed into a memory system that operates the cues and displays the status of the plot for on-the-spot adjustments. Except in very small systems the memory controls are less expensive, more capable, and therefore preferred.

In any case, house lights, work lights and lecture lights are separately controlled to avoid disturbing console setups. Touring groups often travel with their own lighting equipment, including controls, and are provided a power takeoff and company switch in the stagehouse. This is another reason for careful consideration of power service entrance location and selection of the most common compatible system interconnections to enable use of the facility's control center.

Power Consumption: By its very nature, stage-lighting power demand tends to be related to the acting area dimensions, as is the number of in-



Instrument	6" Fresnel	8" Fresnel	6" Ellipsoidal	8" Ellipsoidal
Wattage	750W	1,000W	750W	1,000W
Absolute Maximum Distance	25′	40′	40′	60′
Use	Spotlight	Spotlight	Framing Spotlight	Framing Spotlight

FIGURE 4–1.4 LIGHTING INSTRUMENTS

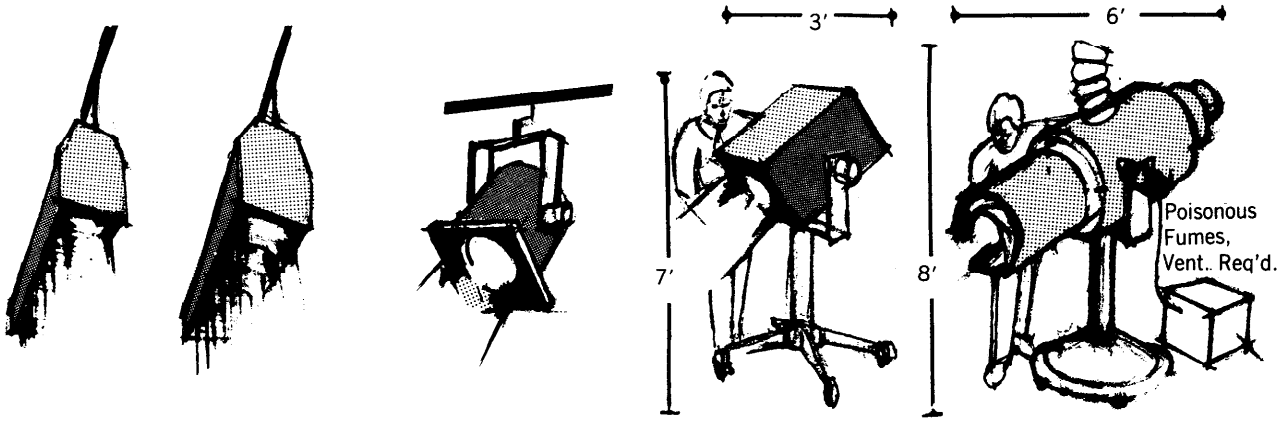
The sizes and quantities of stage lighting equipment are determined primarily by the net stage area and secondarily by the type of use. Refer to Sections 3–6 and 3–7 for typical stage configurations and potential use combinations.

The quantities given in table 4–1.1 are for multi-purpose rooms. Apply the following multipliers for other uses.

Use	**Multiplying Factor**
Broadcast Quality Color Television	1.3
Drama	1.0
Musical Comedy	1.0
Opera	1.0
Closed Circuit Television	.5 to .8
Entertainment (Rock & Roll)	.8
Symphonic Concert Music	.5

NET STAGE AREA IN S.F.[1]	**1000**	**1500**	**2000**	**2500**
Stage lighting electrical feed to dim. rack & co. sw. in KVA[2]	**216**	**288**	**432**	**432**
Total # of stage lighting circuits[3]	**180**	**270**	**360**	**450**
Near auditorium ceiling	12	18	18	18
Mid auditorium ceiling	20	30	30	36
Far auditorium ceiling	12	18	24	36
Auditorium side wall pos.	12	18	30	42
First electric pipe	24	30	36	42
Upstage light pipes	60	112	164	204
Side stage booms and ladders	32	32	40	48
Stage Floor	8	12	18	24
Number of dimmers[4] [5]	**60**	**80**	**100**	**120**
Number of stage lighting fixtures				
40° Ellipsoidal Refl. spotlight	8	12	16	20
30° Ellipsoidal Refl. spotlight	40	60	80	60
20° Ellipsoidal Refl. spotlight	20	30	50	80

TABLE 4–1.1 STAGE LIGHTING REQUIREMENTS



6″ Striplight	8″ striplight	Par 64	Small Followspot for Drama	Large Followspot for Entertainment
150W Lamps Every 6″ on 4 color circuits	300W Lamps Every 8″ on 4 color circuits	100W	1,000W	20 Amparc
30′	40′	VNSP 60′ NSP 50′ MFL 40′ WFL 30′	60′	200′
Wash for Hanging Scenery and Floors Normal Section 6′ long	Wash for Hanging Scenery and Floors Normal Section 8′ long	Work-lights, Special Washes, Accents, Backlight	Notes: Lamps have stagepin connectors on 36″ pigtails, clamps for 1½″ I.D. pipe, and color frames. Followspots have a 6-color color changer. All lighting from the auditorium is done with Ellipsoidals and Followspots.	

12° Ellipsoidal Refl. spotlight	16	30	60	80
10° Ellipsoidal Refl. spotlight	0	0	18	36
6″ Fresnel Lens spotlight	8	12	16	20
8″ Fresnel Lens spotlight	20	30	40	50
Par 64 units	16	24	32	40
6″ striplights	30	30	40	40
8″ striplights	20	20	20	20
Followspots[6,7]	2	2	2	4
Approximate # of pipe battens used as light pipes	6	9	12	15
Accessories[8]				
Pipe booms or ladders	10	10	10	10
Side arms with tees	60	90	120	150
Hi Hats	40	60	80	100
Stage Cables 5′	20	30	40	50
10′	20	30	40	50
25′	20	30	40	50
50′	20	30	40	50
100′	10	15	20	25
"Twofers"	20	30	40	50

Notes

1 Width of proscenium opening and full depth from lip of stage to back wall.

2 Company switch and dimmer rack feeder are each this size, but total instantaneous connected load will not be greater than this.

3 90% of circuits are 20 amp, run with 2 # 10 AWG, no common neutrals.
10% of circuits are 50 amp, run with 2 # 6 AWG, no common neutrals.

4 If dimmer-per-circuit is used, number of dimmers is approximately the same as number of circuits, eliminating the patch panel.

5 40% of dimmers are 3–4 KW, 40% are 6–7.2 KW, and 20% are 10–12 KW. except for dimmer-per-circuit where 90% are 2.4 KW., and 10% are 6 KW.

6 Follow spots for use in drama must be incandescent. White followspots for use in all other situations must be arc lamps, of which there are several types.

7 Adjacent to the followspots actually purchased, allow space and power for temporary addition of two more.

8 These are in addition to accessories which come with each fixture such as color frames, clamps, and connectors.

struments needed. It is unwise to underestimate potential connected load in sizing the service. Common practice is to apply a factor of 80% to the total dimmer capacity, but this should be carefully considered. (N.B., 50% to 80% for dimmer-per-circuit systems). Planners must ask themselves, does installed capacity take into account likely future growth (it always grows) and the arrival of a road show with super power amplifiers and motorized devices as well as lighting equipment?

The sizes and quantities of stage lighting equipment are determined primarily by the net stage area and secondarily by the type of use. Refer to Sections 3-6 and 3-7 for typical stage configurations and potential use combinations.

4-2. SCENERY AND SOFTGOODS

The topic of stage dressing and sets is discussed briefly in Sections 3-6 through 3-8 and elsewhere in terms of its influence on stage shape, vision criteria, movement, sound absorption and production activities—in short, it relates to many functional requirements of theater design primarily because it is an indeterminate element of the artist's stagecraft. This Guide seeks only to ensure free 'reign to his creativity. From this viewpoint, the major concern is to define adequate space, built-in mechanisms, lighting, safety provisions and organization to facilitate set construction. and use. Draperies and softgoods, however, must be either furnished or built custom fit, and merit discussion here.

House Curtains: The major proscenium drape was traditionally an ornate biparting curtain. It is often of heavy opaque material to muffle preparations on stage as the audience is being seated. It signals the beginning and end of major sections, the points at which house lights are lowered or raised and the audience is returned to "the real world". Modern practice installs the house curtain on the first pipe or set of rigging, enabling it to be drawn both vertically aloft and horizontally on a traveller. Before performance, it is usually lighted with "curtain warmers".

Teaser or Header: The second pipe holds the foremost border behind the house curtain. It forms the apparent frame during performance. The proscenium may be higher, and curved or splayed for acoustic purposes, while the teaser sets the initial scale of audience/performer contact. It may be moved up or down, and hides the lighting bridge or pipe immediately behind it.

Tormentors or Legs: The third pipe holds the principal legs or side masks that can be moved on or offstage to set the width of the opening. In fact, both tormentors and teaser can be soft fabric draperies, wood or steel frames covered with fabric or solid panel construction. The stretched fabric may be chosen for its appearance, ability to assume a particular shape, or its ability to screen temporary or permanent loudspeakers. It is usually required for trimming to a shaped music shell; some. shells work better with solid panel masks. Heavy tormentors can be mounted on tracks supported on the stage floor, and may carry lighting towers with them. The fabric is usually black velour.

Performance Curtain: The fourth and sometimes fifth pipes usually hold lighting instruments. However, the fourth pipe may hold a second, lightweight curtain that rises on the scene after lighting levels and audience vision have adjusted, the entr'acte or overture concludes, etc. It provides the intermediate veiling and unveiling of the stage set during performance without grossly interrupting continuity. The fourth pipe may also hold a scenic image for a transformation effect.

Legs and Borders: The remaining pipes are assigned as needed to lighting, scenery or more masking. Legs and borders form a series of parallel frames that screen lighting instruments, flies and wagon sets awaiting use, and actors or cast members offstage. The position of legs can be varied to alter the acting area shape and size, and borders can be raised or lowered to adjust the impression of great height or "interior" scale. With lighting alone, successive frames can create a wide range of depth illusion. Three to five such frames are provided depending on stage size, and are typically black velour fabric. This technique has particular application to Dance, Opera and some Drama where constructed "box sets" are not used.

Other Draperies: Typical accessory draperies include a full size black velour backdrop, a full size mid-stage black velour drop, a black sharks tooth scrim, miscellaneous special purpose black velour pieces, and a projection screen. Sometimes variety acts are performed in front of the Act Curtain, usually the liveliest backdrop visually, which serves to screen scene changes being

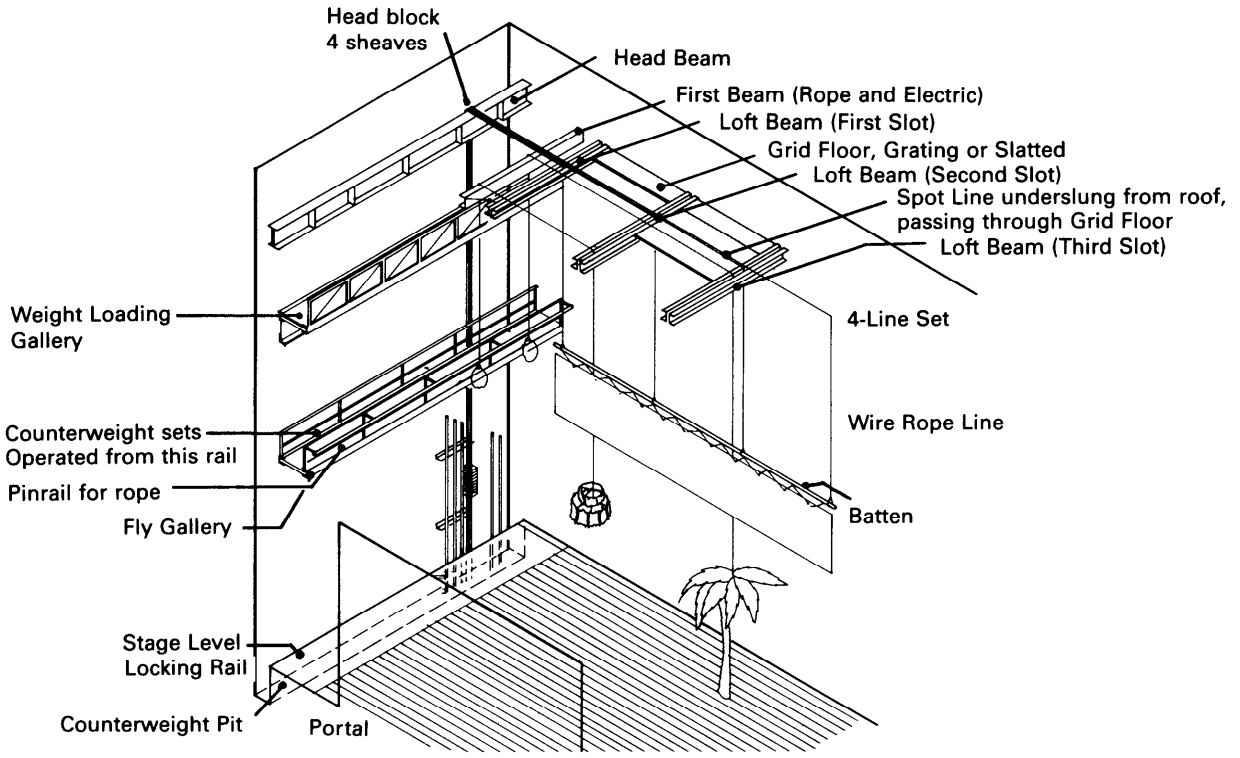


FIGURE 4-3.1 GRIDIRON RIGGING

made behind it while the variety act is in progress. It is functionally much like the optional Performance Curtain, but hangs eight to twelve feet behind the House Curtain. Frequent use of a movie projection screen suggests a position in front of the teaser and Performance Curtain.

Accessories: Typical accessories in the soft goods include storage bags and demountable traveller tracks.

4-3. RIGGING AND STAGE MECHANISMS

A. COMMENTARY

The Room design implications of scene handling devices and their basic purpose is noted in sections 3-6, 3-8 and 3-9. Selection of systems is based on anticipated performance uses.

1. Fly-Loft Components

Scenery, drapes and lights are moved vertically by a system of lines, pulleys, counterweights and/or winches supporting a pipe, all of which constitute a ***set.*** *Sets are supported on a structural grating, the* ***gridiron,*** *above the stage and fixed in place at a* ***pinrail*** *or* ***locking rail*** *anchored to the stagehouse wall, floor, or fly gallery.* ***Gridiron*** *is positioned to allow man-high working space below the roof structure.* ***Loft beams*** *comprised of 10 inch steel channels extend the full depth of the stagehouse in pairs, providing a cable slot every 10 or 12 feet. The* ***grid floor*** *normally consists of 1½" x 3" channel steel laid web-up 6" on center, or 1½" subway grating. Individual lines can thus be dropped through almost anywhere on stage. At one end of the stagehouse, major* ***head block beams*** *resist the lateral and vertical loads imposed by the sets.*

Line sets *consist of two or more rope or wire cable lines attached to each flown unit as it rests on the stage floor. The lines run up over moveable* ***loft blocks*** *mounted on the loft beams; blocks shift up and downstage for adjustment. Individual (single) rope lines may also pass through the grid floor. The lines of each set are*

	Recommended Minimum Number of Sets	Recommended Maximum Working Load
Elaborate Musical Comedy	**30 or more sets**	**700 lbs./set**
Ordinary Musical and Revue	**10 to 20 sets**	**700 lbs./set**
Opera	**5 to 15 sets**	**1000 lbs./set**
Presentation	**5 to 10 sets**	**1000 lbs./set**
Elaborate Drama	**15 sets**	**700 lbs./set**
Ordinary Drama	**5 to 10 sets**	**700 lbs./set**

TABLE 4-3.1 TYPICAL LINE SETS NEEDED

*collected at a **head block** with multiple sheaves and then pass downward. Each set is trimmed to equalize tension according to the load, and hoisted as a unit. Battens are loaded with a gross weight of 30 pounds per linear foot and usually extend 3 to 5 feet past the proscenium opening. Rope lines are tied off on a **pinrail,** which is the onstage edge of the **fly gallery** from which the flies are operated. Each line may be sandbagged to adjust tension. The fly gallery keeps this activity away from the stage floor, where space is highly-valued. The gallery's elevation is usually set by the tallest piece of standing scenery and the ability to see into the flies-that is, 20 to 30 feet above the floor, and at least as high as the proscenium opening.*

*Wire line sets are **counterweight sets.** After passing over the head block, the lines are fastened by chains and turnbuckles to a counterweight carriage. The turnbuckles enable the set to be trimmed. The carriage runs up and down, usually at the wall, travelling a distance equal to that travelled by the flown pipe. The weights are pig-iron, added incrementally until the set is counterbalanced to a degree that permits manual operation by pulling on a manila **purchase line** attached to the top of the carriage, running over the headblock, down through a rope lock to a tension block at the floor and up again to the carriage. The lines are operated from the fly gallery or from stage floor, but the weights are stored and added at a **loading gallery** at the top of the carriage run, level with the carriage bottom to minimize lifting. Dimensional difficulties in the design of counterweight systems usually require provision of a **counterweight pit** in the stage floor to increase carriage travel. If it is absolutely essential that the floor be kept clear (e.g., for the movement of scene wagons) a combination of pulleys can reduce carriage travel to half the fly, by placing the tension block at fly gallery elevation-a complicated, expensive, and inconvenient arrangement.*

*There are three kinds of carriage guide systems. The least costly is the **wire guide,** two tensioned cables engaged by the carriage. Since there are no wall anchors, the sets can be moved up and downstage. Carriage sway requires they be spaced approximately a foot apart to avoid fouling. The maximum height of wire guide systems is 30 feet.*

***T-Track guides** are steel or aluminum rails standing out from the wall, each engaged by two carriages. The resultant close grouping of sets provides the maximum number of available sets per linear depth of stage, but where only a few sets are installed in a group, their effective gridiron coverage is limited by the divergent angle of lines passing over the head blocks. **Lattice tracks** for single carriages consist of two guide rails separated by ladder-like rungs. They are useful for isolated sets such as house curtains or fire curtains.*

***Winch systems** are based on a somewhat different organizational logic. The gridiron line set concept assumes that most flown material is arranged in parallel planes behind the proscenium. However, there are situations in which randomly located lines are of great value; for instance, for diagonal drops and flown orchestra shells and reflectors. The winch lines can be used in combination with conventional sets by locating the loft blocks above the gridiron, underslung from the roof structure. Each line is taken up on a rotating drum driven by a speed-controlled synchronous motor. Controls can be located anywhere and there are no weight guides, lines, sandbags or pinrails to deal with. However,*

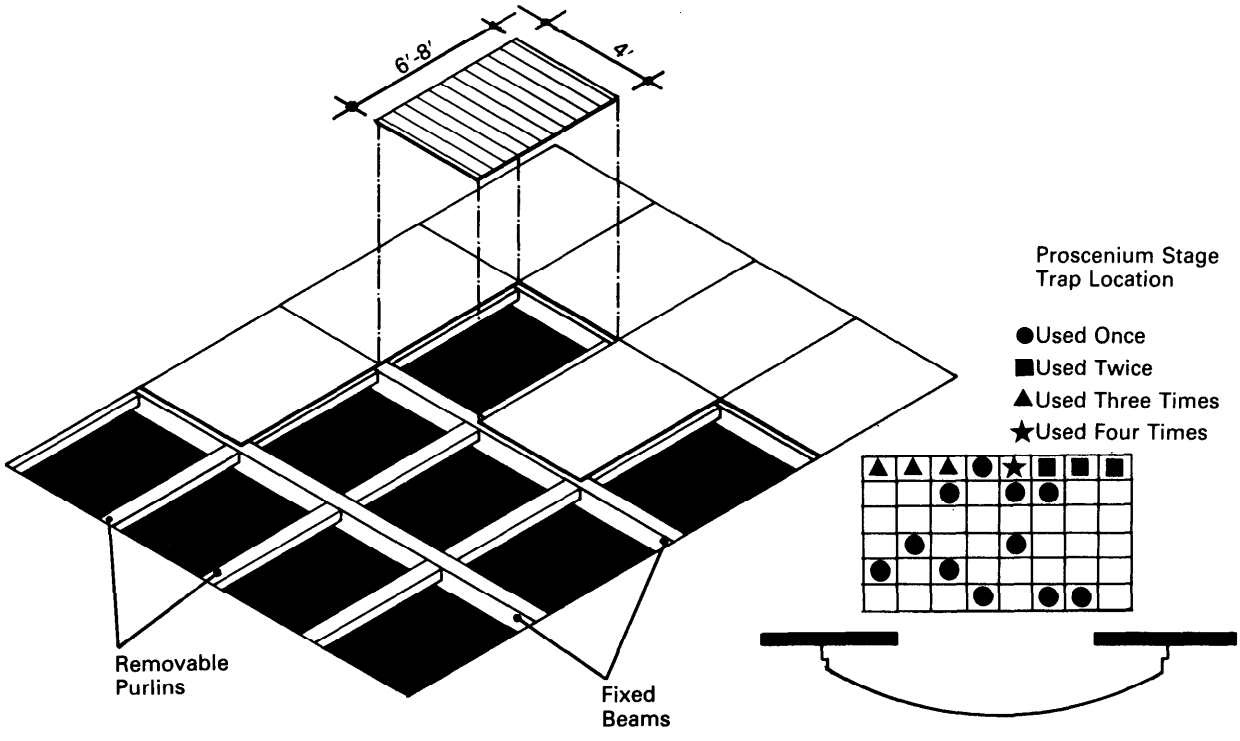


FIGURE 4–3.2 TRAPS

winches are expensive and slow-acting. A similar single-line arrangement with overhead blocks can be used to hang lightweight objects above an open stage, the lines tied back to catwalk rails. Counterweight sets can also be winch driven, which is considered safer because the winch takes up only part of the load.

2. Stage-Level Components

Standing scenery is moved horizontally on casters and dollies, or on tracked chassis called ***wagons,*** *or on* ***turntables.***

The decision to employ roll-on scene pieces must be part of early planning, since it has great impact on the organization of other stagehouse mechanisms. Wagon guide tracks, if used, must be recessed in the floor. This will affect structure, trap locations, details of wingspace layout, and the form of cyclorama and other accessories such as lightbooms that might otherwise be floor-supported. Steel plate tracks are needed to prevent damage to the softwood floor. Rolling sets have beneficial application to the open stage without flyloft, and to musical drama employing elaborate constructed scenery as well as flown pieces. Wagons are also commonly built by the user as part of portable scenery. Wing space is used to hold these wagons when they are not on stage. Each scene change involves clearing the stage floor and moving the next set in. Each wagon must also have a storage area out of the scene space.

Wing storage *can be used in several ways. Wagons slightly wider than the acting area can be moved laterally in one motion from either wing; the total stagehouse dimension will be at least four times the proscenium width. Wagons half as wide can be brought together at center for one scene. A second pair upstage forms the next scene, if the stagehouse depth is sufficient. Wagons can jackknife at a downstage pivot point, reducing the wing dimension required, but sweeping a large area.*

Wing storage takes up a great deal of space, congesting side entries. If more than two scenes are required, free storage must be associated with each wagon, so that one may be changed while the other is in use. In that case, any wing storage scheme involves an exceptionally broad stagehouse.

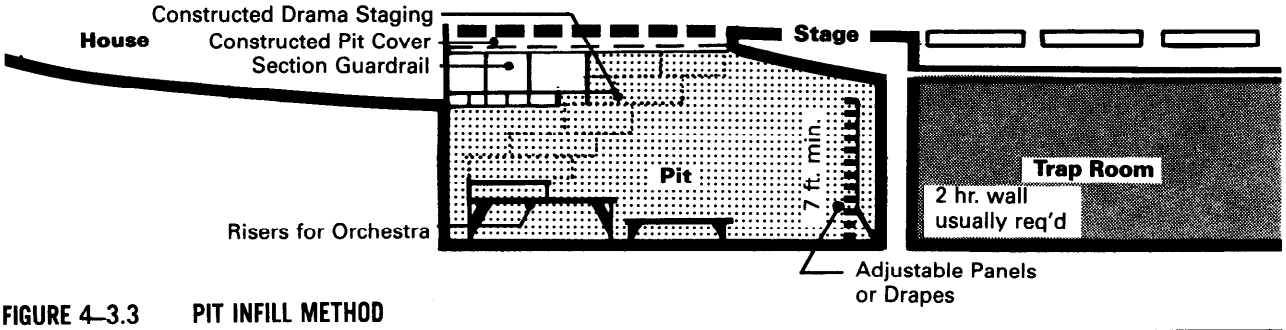


FIGURE 4–3.3 PIT INFILL METHOD

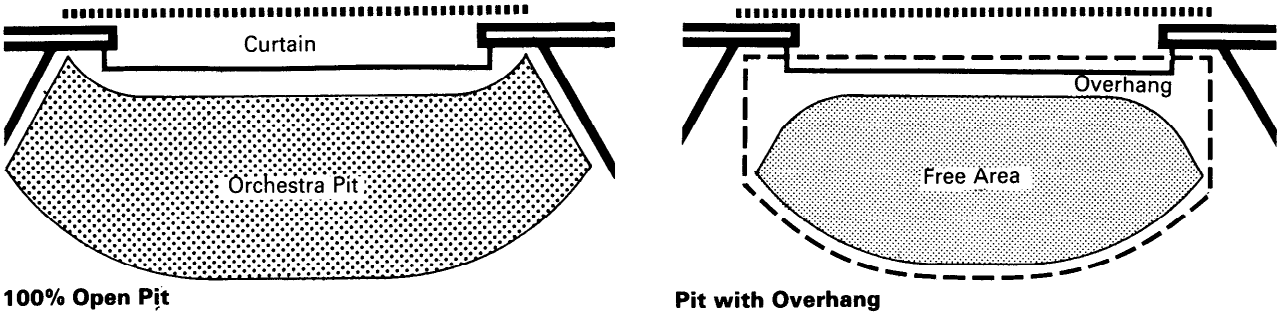


FIGURE 4–3.4 ORCHESTRA PIT PLAN

Upstage storage *can be used to serve additional wagons or to minimize wingspace use. It has the advantage of avoiding pinrail and line sets for the flyloft, and need be only as high as the tallest piece of scenery. A deep stagehouse has other benefits in terms of multi-use and rear projection capability.*

Offstage storage *may be regarded as the logical conclusion. If wagons can be moved out of the stagehouse, scene changes can be effected without noise in the performance Room and under superior conditions of work-lighting and mechanical aids. At other times, the wagon room can be used for set construction and rehearsals.*

Turntables, *while mechanically complex and somewhat more costly, avoid the problem of wingspace interference. Three or four scenes can be constructed on a large revolve and moved into place in no time. Even more scenes can be managed by resetting the segments facing the wingspace. The disadvantages of turntables include the geometric constraints imposed on the scene designer and the restriction of backgrounds to drops that cannot hang to the floor. If the table is demountable, the stage floor must be built up around it, altering sightline conditions. All permanent mechanisms such as wagons and turntables are useful only to the resident user. Touring companies do not expect to find these devices and plan their shows without them.*

3. Understage Components

Scenery and actors are moved vertically from below stage through a system of removable ***traps,*** *on lifts, hoists or stairs and ladders. Included in this concept are* ***orchestra pit elevators*** *and* ***forestage lifts.***

Traps *are removable sections of the stage floor by which actors can enter or descend from the acting area, scenery pushed or hoisted up, or special lighting effects obtained. In comparison to other stage mechanisms, traps are among the best dollar-value assets for the drama stage. Traps are most often used in open stage, projected and surround Rooms as an alternative to the run-on entry from the house, and sometimes are the only way to dispose of scene properties that can't be hoisted into a lot?.*

Stage elevators *used by major opera companies enable whole scene wagons to be brought from below, a luxury too exotic for consideration at the scale of Army MDC's. Large stages for music*

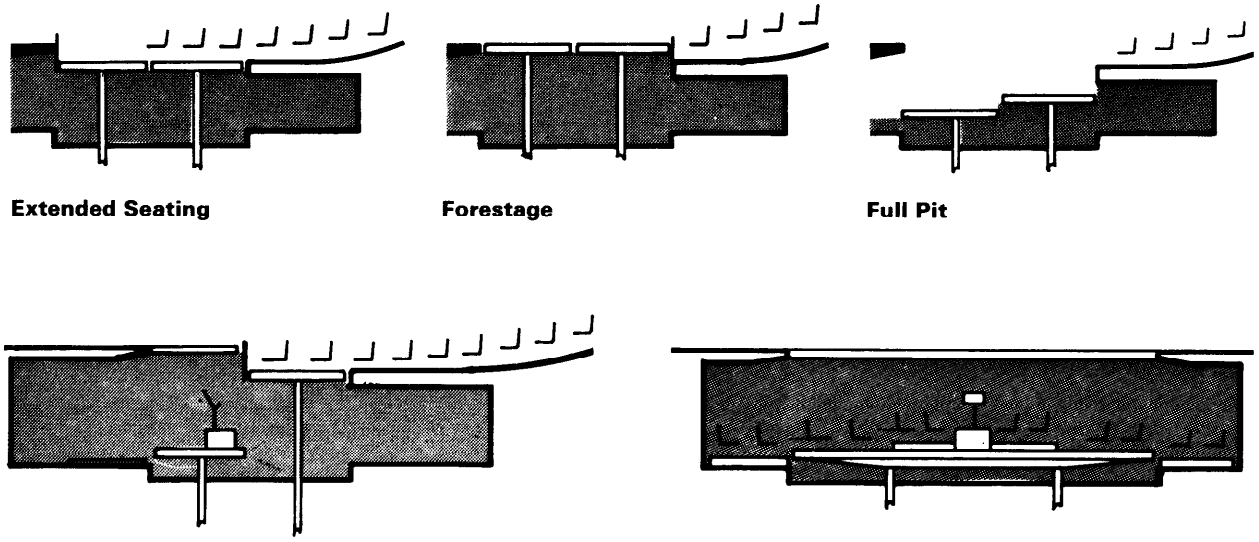


FIGURE 4-3.5 ORCHESTRA PIT SET-UPS

performance in particular may merit installation of low-speed geared or screwjack carriages designed to raise a portion of the stage rather than building up on it. An apron platform and/or hydraulic pit lift is also desirable but of questionable priority in relation to regular use. The pit lift is probably more important than the stage lift. Only exceptional programming and high labor costs can justify the expense. The feasibility of limited travel platform lifts used in combination with a pit cover and infill units should be examined if a mixed program of full orchestra, orchestra and chorus, musical drama and/or dance is contemplated. Unfortunately, there is a tendency to leave things in place if they can't be altered easily. ***Correct sightlines must be planned for the full extension of the stage.*** *The stage apron is in need of the same services as the rear portion of the stage, and should be provided with the same density of rigging, sets, electric pipes, and circuits.*

4. Orchestra Pit

This is indeed a valuable facility where any combination of music and speech is contemplated. In addition to the sightline considerations affecting the conductor's position, the key elements of pit design are adequate floor area, free area, overhang and depth.

The best way to establish floor area and proportions is to mock up full size the pit layout for the largest anticipated group, and be generous. The free area should be no less than 10 feet in the short dimension, and preferably 12 to 15 feet depending on orchestra size and the depth and proportions required to arrange them around the conductor (not in two sections). The overhang of the stage is very important, one of the means by which the acoustic impact of the orchestra can be adjusted. An ample overhang (5 to 8 feet) will permit flexibility of arrangement, modulation of direct intensity by moving in or out from under, and sufficient space for adjustable reflectors, absorbers, and unused instruments. A minimum depth (height) of 7 feet clear of stage structure is recommended. The user will usually cover the pit floor with portable platforms to tailor the heights of each instrument as needed.

B. SUGGESTED RIGGING SET INVENTORY

The basic needs of the fly loft are listed in Table

4-3.1. The quantities given are for multi-use and drama Rooms. Large theaters follow these same rules. Very small theaters could use 4 borders, 8 legs, and 8 tabs. Where only occasional use will be made of the rigging, the spacing of sets can be increased to 8 inches or 12 inches, which are also standard spacings. In no case should the number of sets in a fly loft drop below 30.

Rooms intended for symphonic concert music alone may not need any soft goods for normal uses if the stage is totally masked with a permanent concert shell. Standard practice is to hang portable lights and masking inside the permanent shell for popular entertainment and amplified music. Winch sets and counterweight sets are frequently provided which drop through the orchestra shell to pick up these portable pieces.

1. Permanent Architecture

1. *Gridiron and access*
2. *Loft block beams*
3. *Head block beams*
4. *Loading gallery under head block beam*
5. *Fly galleries; each side with pin rails*
6. *Counterweight pit with locking rail*

2. Permanent Rigging

1. *Fire curtain or deluge curtain*
2. *T-Track counterweight sets, 6 inches on center for the full depth of the stage*
3. *Hemp lines for spot lines and electric pickups*
4. *Hemp sets for masking and special uses*

3. Soft Goods

1. *House curtain*
2. *Portal header or "teaser"*
3. *Portal legs or "tormentors"*
4. *5 borders, 10 legs, and 10 tabs black velour*
5. *Full stage blackout drop, black velour*
6. *Full stage black scrim, black sharkstooth scrim*
7. *Full stage natural muslin cyclorama*
8. *Full stage black velour cyclorama*

A portable demountable concert shell consists of a ceiling and walls all around the sides and back of the stage. The ceiling is usually hung from standard counterweight sets. The walls are usually supported on rolling castered units and are stored in the wings when not in use. Note that the permanent storage space for a shell could be 500 square feet. The ceiling panels must align with the electric pipes so that the concert can be lighted through the gaps between panels.

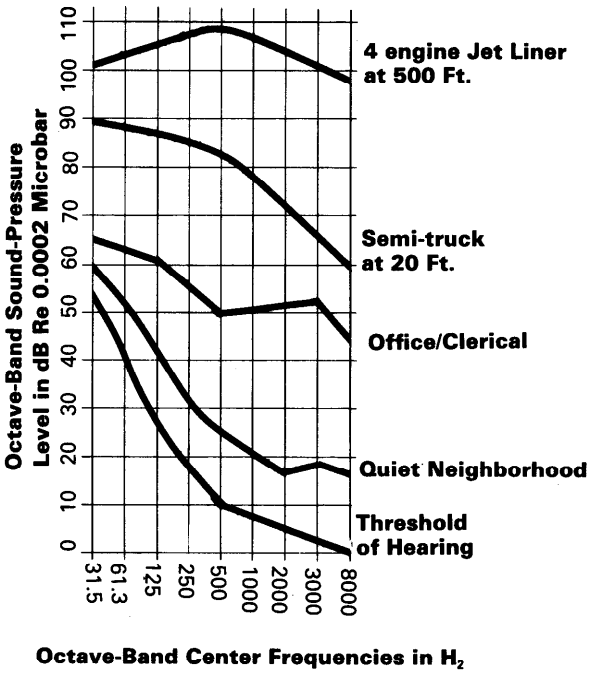


FIGURE 4-4.1 SAMPLE NOISE SOURCE INTENSITY LEVELS

4-4. ACOUSTICAL CONSIDERATIONS

A synopsis of the most important acoustical concepts is presented here. Listening requirements determine acoustic parameters for volume, absorption, background noise, partition isolation, reflection patterns and audience-to-performer relationships. These in turn influence design decisions related to building site, Room scale, materials of construction, Room decor, shapes of surfaces, suspended reflector locations, HVAC air velocities and system treatment, location of ancillary spaces and loudspeaker placement.

Speech intelligibility is essential for a Drama Room. This can be achieved by keeping the volume of the Room low in relation to seating area and placing reflecting surfaces in locations that will direct early high frequency reflections to all listeners.

Background noise must be kept low enough to allow listeners to comfortably perceive average speech sound pressure levels. Continuous background noise from mechanical or electrical

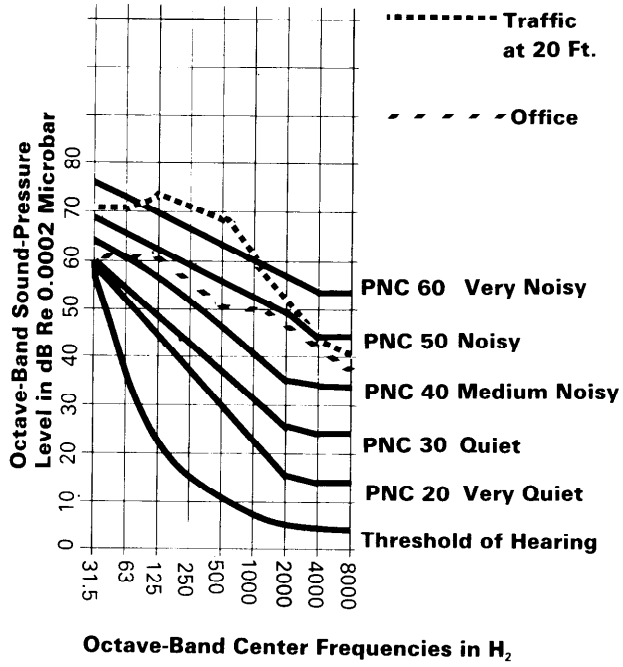


FIGURE 4-4.2 PREFERRED NOISE CRITERIA

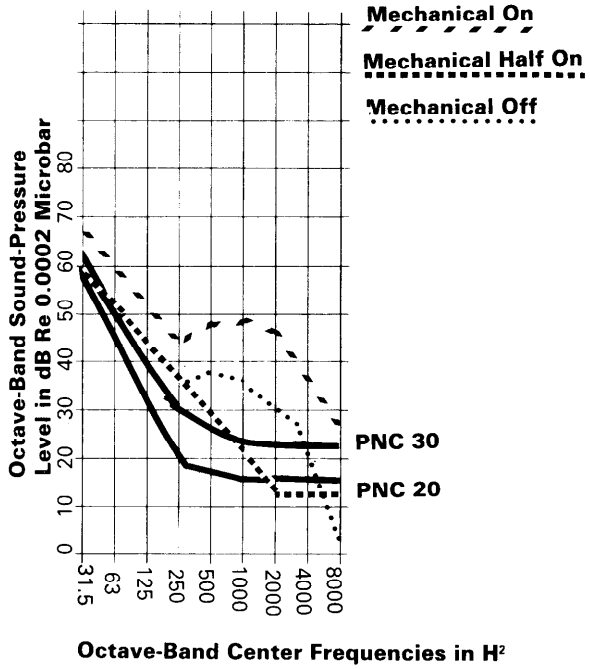


FIGURE 4-4.3 TYPICAL MECHANICAL NOISE CONDITIONS TO BE MITIGATED

equipment can mask speech sounds, making it difficult or impossible to understand performers. Intermittent noise is a distracting element that reduces listening enjoyment.

Acousticians have developed standards for preferred background noise level in relation to activities contemplated in a Room. These standards are referred to as Noise Criteria or NC curves. The NC curve specifies permissible ambient sound pressure levels at each frequency.

Time delays are appreciable. Sound waves moving through air travel much slower (about 1100 fps) than light. This factor must be considered when designing very large Rooms and amphitheaters. Aural and visual perceptions will be non-synchronized when the distance between source and listener is too great. Moreover, live and artificial sound will be non-synchronized and garbled when distributed loudspeakers do not incorporate adjustments for time delay.

Aural feedback is needed by performers to assess their effectiveness. An acoustically "dead" house will cause the actor to force his voice in an unnatural and perhaps harmful manner. Too live a house will produce excessively late reflections which may confuse the actor, causing him to slow his speech in order to gain intelligibility.

Music-theater requires the singing actors to have good aural contact with their accompaniment. This is usually solved by means of good orchestra pit design. When drama or musical-theater is amplified, it is essential that the sound console operator be located somewhere within the audience seating area. Mixing live performance is a delicate and difficult assignment. It cannot be done effectively from a sound booth with or without an operable window.

Music listening enjoyment is largely derived from the relationship between source sound coming from the musicians' instruments and the reflection patterns heard by the listener over a two to three second period. The perception of both the source and reflected sound fields are related to:

1. *Direction from which sound energy reaches listener.*
2. *Amplitude or intensity of sound energy*
3. *Frequency composition of original signal and each reflection.*
4. *Time intervals between arrival of reflected energy signals and direct sound.*

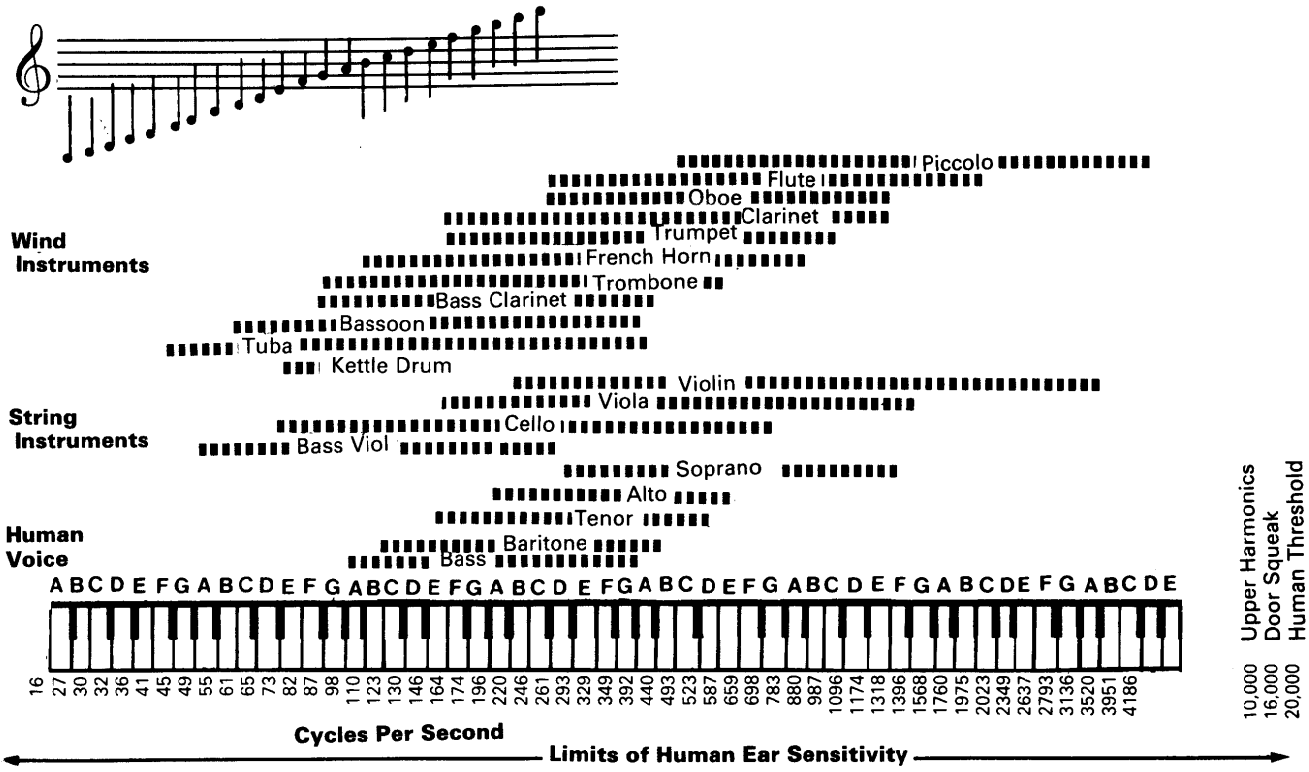


FIGURE 4-4.4 SOUND FREQUENCY CHARACTERISTICS

Reverberation time has been identified as an important general measure of appropriateness for various uses. It is by no means the only measure, nor a simple one. The standard measure is the time required for sound in the Room to decay by 60 decibels after its source is cut off. It differs with frequency and must be evaluated over a range of octaves (frequency bandwidths) discernible by human ears. The typical reference is 500 cycles per second, or C above middle C. However, the center of average hearing range lies between 500 and 1000 cps. A simplified equation for Rt60 is:

$$T = \frac{0.049V}{Sa + 4mV}$$

T = time in seconds; **V** = volume of air in the Room in cubic feet. This includes House and Stage enclosure for Music Rooms. The stagehouse volume behind a Drama curtain is discounted.

Sa = total Room absorption in sabines; it is a function of individual absorption coefficients peculiar to materials and furnishings, and their surface areas. Obviously, practical estimates are employed for analysis purposes.

M = air absorption coefficient, which varies according to relative humidity, stated in inverse feet. The difference between 70% and 30% RH is nearly a factor of two (at 2000 cps, M = 0.0006 and 0.0010 respectively).

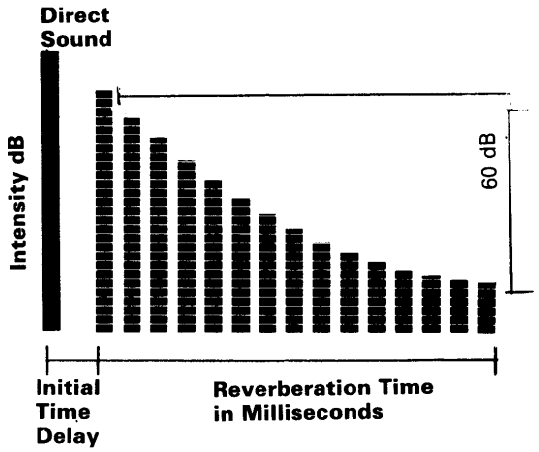


FIGURE 4-4.5 REVERBERATION TIME

Rapid estimates of appropriate Room volume required are made by assuming an "average" Room absorption typical to particular uses, as-

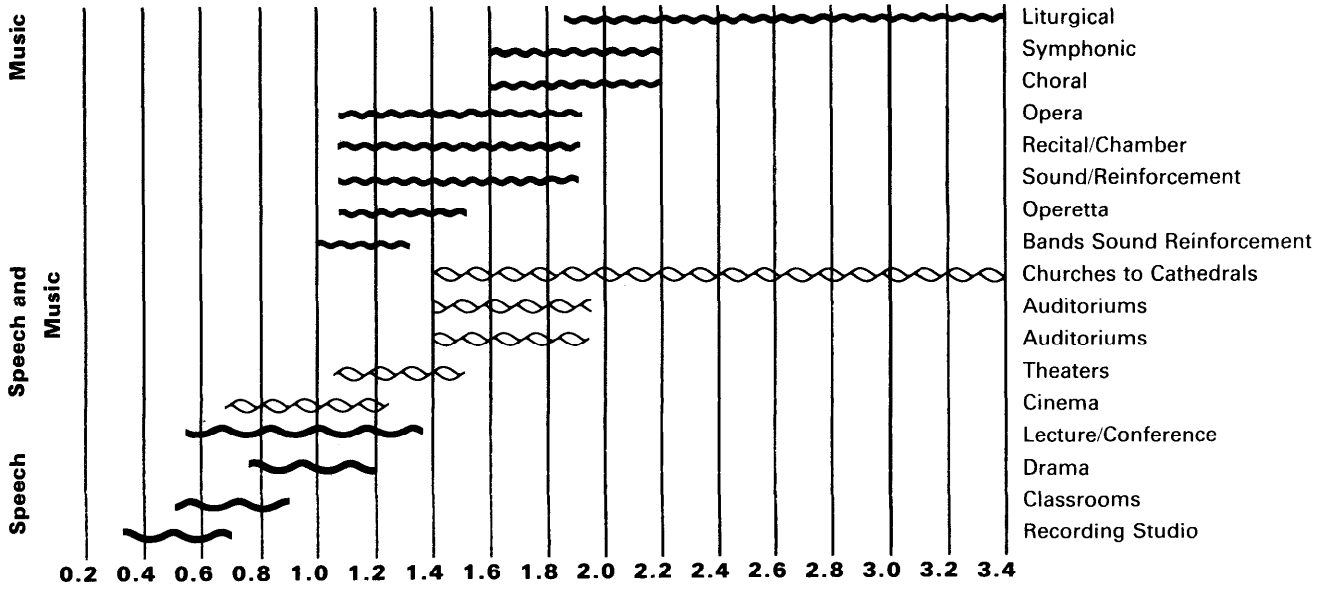


FIGURE 4–4.6 REVERBERATION APPROPRIATE TO PERFORMANCE TYPE

MATERIALS	COEFFICIENTS					
	125H$_z$	250H$_z$	500H$_z$	1000H$_z$	2000H$_z$	4000H$_z$
Brick Unglazed	0.03	0.03	0.03	0.04	0.05	0.07
Carpet Heavy 40 oz. Foam Pad	0.08	0.24	0.57	0.69	0.71	0.73
Concrete Block Coarse	0.36	0.44	0.31	0.29	0.39	0.25
Fabric 10 oz. Velour on Wall	0.03	0.04	0.11	0.17	0.24	0.35
Heavy Velour 18 oz. on Wall	0.14	0.35	0.55	0.72	0.70	0.65
Terrazzo Floor	0.01	0.01	0.015	0.02	0.02	0.02
Wood Floor	0.15	0.11	0.10	0.07	0.06	0.07
Gypsum Brd. ½ in. to 2×4 16 o.c.	0.29	0.10	0.05	0.04	0.07	0.09
Ventilating Grilles				0.15–0.50		
Plaster Smooth on Brick	0.13	0.15	0.02	0.03	0.04	0.05
Air per 1000 cu. ft.	—	—	—	0.9	2.3	7.2
Audience Seated per S.F. flr.	0.60	0.74	0.88	0.96	0.93	0.85
Unoccupied upholstered seats per S.F. flr.	0.49	0.66	0.80	0.88	0.82	0.70
Wooden Pews, occupied S.F. flr.	0.51	0.61	0.75	0.86	0.91	0.86

FIGURE 4–4.7 COEFFICIENTS OF ABSORPTION

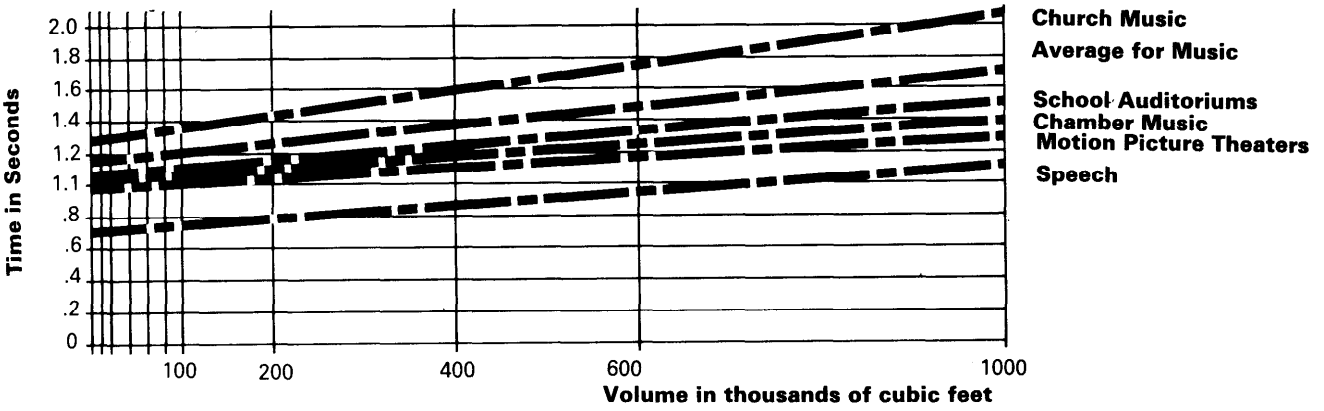


FIGURE 4-4.8 VOLUME ESTIMATE FOR TYPICAL DESIGNS

signing a volume-per-seat factor. This is clearly limited in application to the "typical" Rooms defined. A Surround music hall, for instance, requires a considerably higher volume-per-seat factor.

Decibels are not a direct measure of loudness, but of the difference in the level of two amounts of power-namely, 10 times the logarithm of the ratio. By international agreement, the reference sound intensity of human hearing is 10^{-16} watts per square centimeter. With that as zero decibels, the range extends to 120 decibels, the threshold of discomfort. Decibels measure the energy in a pressure wave. Loudness is a subjective evaluation. A 10db increase doubles apparent loudness, 20db quadruples, etc.

Musicians use their own vocabulary to describe the qualitative aspects of musical sound. It is the role of the acoustician to identify the physical acoustic criteria associated with each subjective parameter and translate these terms into useful architectural concepts.
The accompanying charts and diagrams will help define the empirical basis and physical implications of acoustical properties. Section 4-6 includes sample construction details indicative of requirements for noise control.

4-5. ELECTRONIC SYSTEMS

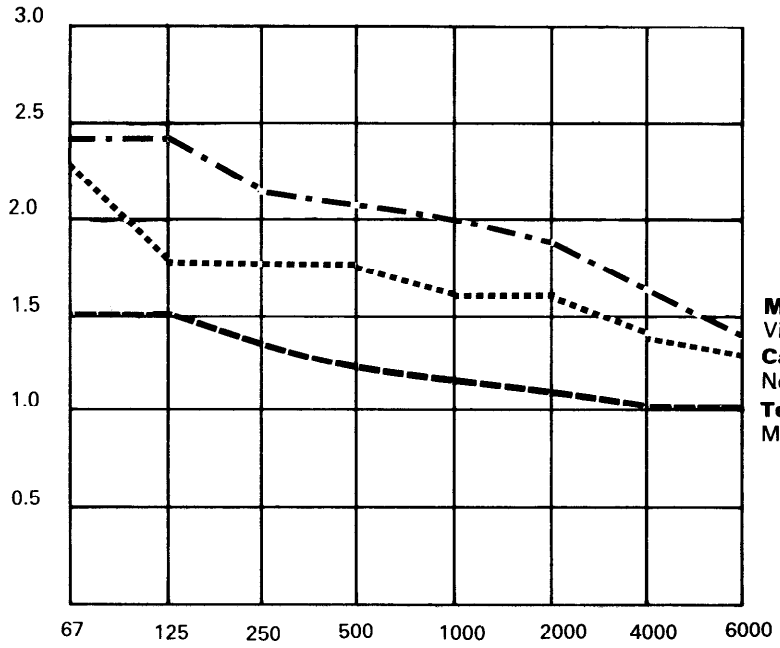
A. COMMENTARY

This Design Guide has tended to emphasize natural acoustics for three reasons. First, it should be remembered that no matter what mechanisms intervene, people hear with their ears, naturally, and impart an innate organization and sensitivity to the process. Second, there may be a tendency for design professionals and non-designers alike to assume the existence of equipment that will "fix" malfunctions brought about by lack of attention to and understanding of acoustic principles; this is usually false, and the misunderstanding can be a costly one. Finally, many of the functional criteria and conditions for good listening apply no matter what means is employed for generating sound to be listened to. Electronic audio systems simply introduce a few more steps in the signal path.

Audio systems have four parts in common: Input transducer (microphone, tape head, phono cartridge), signal processor (tuning, filters, mixing, volume, delay), amplifier, and output transducer (loudspeaker). Signal processing accounts for major differences in application.

Electra-Acoustic Enhancement: This system's purpose is to increase the reverberation time of a Room by introducing very small delays between the input and output by way of a digital processor. It may have one or more predetermined settings appropriate to various Room uses. Ideally, it will not alter the characteristic frequency response spectrum of a well-designed auditorium or provide acoustic gain (increased loudness). But in cases where a portion of the spectrum drops out of reverberant field, the processor can selectively strengthen that part.

This corrective function (called equalization) can be useful when it is desirable to shorten natural reverberation time by adding absorptive material to the volume; the material tends to absorb certain frequencies more than others.

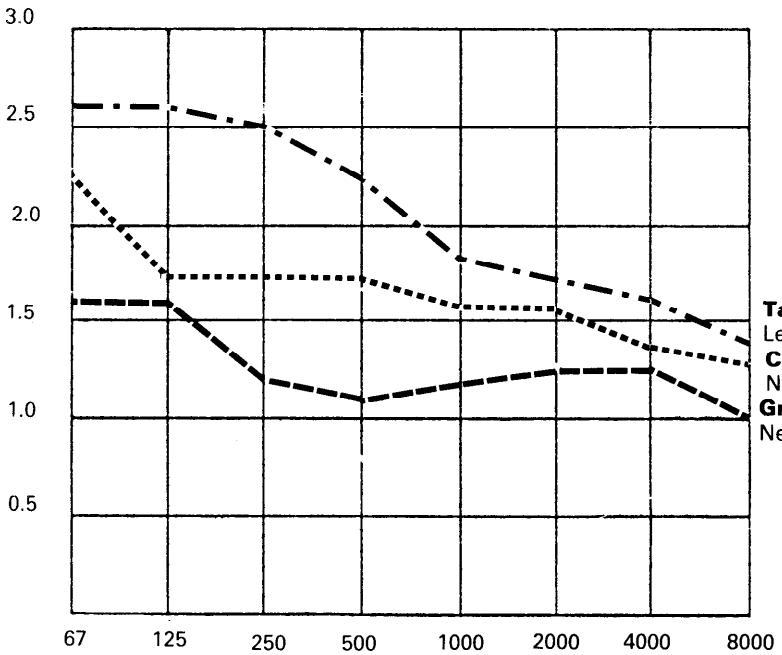


	V	S	V/S	N
A	376,000	15,700	24.0	1658
B	857,000	21,360	40.1	2760
C	397,000	17,600	22.5	2289

	S/N	V/N
Musikvereinssaal—A Vienna, Austria	9.5	227
Carnegie Hall—B New York, New York	7.7	173
Teatro Alla Scala—C Milan, Italy		

FIGURE 4–4.9 REVERBERATION TIME COMPARISON

V = Room Volume
S = Total Absorption
N = Number of Seats



	V	S	V/S	N
A	1,500,000	33,000	45.5	6000
B	857,000	21,360	40.1	2760
C	193,600	6,900	28.1	708

	S/N	V/N
Tanglewood Music Shed—A Lenox, Massachusetts	5.5	250
Carnegie Hall—B New York, New York	7.7	310
Grace Rainey Rogers Auditorium—C New York, New York	9.7	273

FIGURE 4–4.10 REVERBERATION TIME COMPARISON

MUSICIAN TO SCIENTIST TRANSLATION SYSTEM

Symphonic Acoustics	Acoustical	Recital Hall	Music Pavilion	Surround Hall
Warmth-Bass Response	Rich late arriving low frequency reflections	Hard roof cap	Coupled overhead chamber	Coupled moat chamber
Articulation—Definition	Early mid and high reflections (20 ms)	Side walls	Forestage canopy	Forestage canopy
Presence—Intimacy	Early mid and high reflections (20 ms)	Side walls	Forestage canopy	Forestage canopy
Liveness—Reverberation	Proper R/Ts through frequencies	Volume/Absorption Ratio	Volume/Absorption Ratio	Volume/Absorption Ratio
Transparency—Clarity	Smooth R/Ts—Proper stage diffusion	Good diffusion, proper volume, shaping, no echo, no focusing	Good diffusion, proper volume, shaping, no echo, no focusing	Good diffusion, proper volume, shaping, no echo, no focusing
Balance—Sectional Relationships	Stage Design—Orchestral placement	Proper volume, shaping stage, stage risers	Tunable shell and risers	Tunable reflectors and risers
On Stage Hearing—Clarity	Stage Design—Orchestral placement	Proper volume, shaping stage, stage risers	Tunable shell and risers	Tunable reflectors and risers

FIGURE 4-4.11 MUSICIAN TO SCIENTIST TRANSLATION SYSTEM

System design can result in two modes of operation: fixed, unattended, on-off operation; and variable, controlled, programmable operation. For Army facilities, the second system is not recommended, as it requires a fully trained, full-time system operator entirely familiar with its workings and the science of microphone and loudspeaker placement. Although it offers optional control over the widest variety of performance types and conditions of performer and audience arrangement, it will be wiser to build in the quality of selected configurations without reliance on expert operating personnel.

The recommended approach to "assisted resonance" requires a carefully worked out pattern of installation designed for a given Room. Since it is the non-directional reverberant field that is energized, a large number of individual input-output channels may be employed, each covering a limited frequency bandwidth, the total of which cover the low- and mid-range spectrum. One microphone mounted in a selective resonant chamber (usually in the reverberant reaches of the Room near the ceiling) feeds one processor-amplifier that drives one carefully located speaker. In some instances, individual signals originating at the stage or orchestra pit may be mixed and fed to a number of full-range speakers in the house ceiling and balcony soffits.

An enhancement system will probably not be required for new Army facilities; good natural acoustic design is preferable at the scale of Rooms and production types anticipated. It will more likely be applicable to found space conversions where acoustical limitations are inherent in the existing construction.

Sound Reinforcement: Amplification raises the level of direct sound sent into the Room, which can have several purposes. It can ensure sufficient loudness (or balance of loudness between stage and pit sources), intelligibility, naturalness, and directional realism if properly designed. It will be an important requirement of multi-use programs especially when absorptive material is used to reduce reverberation time and where (perhaps in conjunction with enhancement) a stagehouse shell has not been provided for music uses.

System design will depend on conditions of use and Room configuration. There are four basic

approaches related to loudspeaker locations. The most common arrangement employed by touring companies using a Room without adequate installed reinforcement is the temporary placement of speakers on each side of the proscenium. Apart from. ease of set-up, there is sometimes the advantage of reaching into underbalcony recesses. However, for the majority of the audience, unnatural amplification will be evident and in many instances distracting, due to directional conflicts between eyes and ears. In extreme cases, sound from the more distant speaker will be heard as echo.

The most common installed system utilizes a central loudspeaker cluster directly over the proscenium. This very simply eliminates split system problems by positioning the speakers in a complementary spatial and temporal relationship to the onstage source; the sound arrives from the same direction and at the same time. The only exceptional circumstances would be dialogue across a very wide proscenium, down a very deep stage, or in a Thrust or Surround arrangement. In other words, it assumes a dominant central focus. Its only physical disadvantage may be the difficulty of reaching under deep balconies from an especially high proscenium position.

A variation of the central cluster scheme responds to the first exception by locating three to five clusters across the width of the proscenium, with corresponding microphone inputs so that apparent sound direction moves with its source. Either the microphones or the wireless receivers (if used) must have directional qualities while the speakers do not, to avoid differential delays caused by source distance across the stage. Alternatively, fixed omnidirectional microphones may incorporate preset time-delay feeds to each speaker, the longest to the most distant speaker, along with a scaled level adjustment. Often only the central cluster is used for speech presentation, and the others turned on for large choral or orchestral groups, stereophonic effects, or high level amplification (rock or popular music) that would overpower and distort the normal central cluster elements.

Finally, carefully designed directional side clusters or a distributed loudspeaker system may be installed supplemental to the central system, for deep under-balcony spaces or for unusually “dead” or uneven Rooms encountered in found space conversions. The distributed system always incorporates time-delay processing, not to provide reverberation but to ensure that live sound arrives, establishing directional realism, closely followed by reinforcement sound. Criteria include low gain relative to stage and central sources, and required proximity to the affected audience to avoid echo perception at the front of the house. A slightly greater (+2 db) gain can be obtained if under-balcony sound arrives about 15 milliseconds after the cluster sound.

The central cluster arrangement is the most likely choice for Army facilities described in this Guide. In fact, it is probable only the large (1400 seat) House will require a reinforcement system for multi-use programming, to increase speech intelligibility for drama presentation and enable popular entertainers, using electronics as part of their art form, to effectively function in the space.

The main components would be a central cluster three-way loudspeaker system with separate low, mid, and high end speaker components. Each of these components should be amplified separately and balanced with electronic crossover networks. The design of such a system requires an experienced professional.

While this preferred system utilizes a limited number of loudspeaker outputs, it requires a multitude of input microphone receptacles in the stage area and current practice is to provide a 40-pair shielded cable from the stage to the control location in the house and the main control booth.

It is essential that the sound reinforcement console be operated from a position in the house. It is impossible for an operator to achieve good balance of either speech or music programs when operating the system in a closed booth, or in a booth having an operable window. For this reason, the tie lines are split at the stage with one set going to an in-house console location, and another set going back to the control room. Since it is necessary to move the console from the control room to the house position frequently, it might very well be advisable to purchase standard commercial reinforcement consoles in modular sections of 8 to 12 input channels each. Three 8-input channel boards can be plugged together to form a 24-input channel mixer, a reasonably sophisticated device for a 1400-seat house.

Please bear in mind that if the 1400-seat house has high drama use, additional output channels and speaker delegation switches will be re-

quired. The normal sound reinforcement system console does not include these components as a standard part of its design.

Theatrical Sound Effects: An effects system is conceptually the opposite of a reinforcement system. It would usually have a limited number of inputs, 4 to 12, with a large number of outputs. Output delegation switches allow the operator to feed the signal to the loudspeaker of his choice in a wide variety of locations both on stage and in the house. Obviously, in such a situation each speaker must be fed by its own individually controlled amplifier.

This system should be independent of the reinforcement system because directional realism may demand that sound effects such as doorbells, thunder, sirens, shots, etc., appear to originate off stage or even in the house. Therefore, it is advisable to keep the design flexible and just provide receptacles for loudspeaker leads in a variety of locations. One left and right on the proscenium and three or four on the backstage wall would be sufficient. Sometimes a receptacle on the loading gallery and pinrail is advisable.

In terms of the House we may find that the director would like to provide a sound effect that is directionally oriented in relation to the seating area. In other words, sound coming from the left to the rear or from the right of the audience, or perhaps a sound that would be panned across the audience in either direction or panned around the audience from one direction to another. In this instance it is good to put a series of small speakers of bookshelf or studio monitor type around the auditorium in certain locations. A minimum arrangement would be one on both the left and right, which would be located about one third of the way from the proscenium to the rear, and one in the rear.

The inputs of effects systems are usually tape recorders, turntables, cassettes and/or voice announcements over a microphone. The intervening electronics are fairly straight forward in terms of a simple mixing console with the required number of output channels to feed the various loudspeaker locations. This console is often remote from reinforcement controls, with a separate operating technician receiving cues from the stage manager.

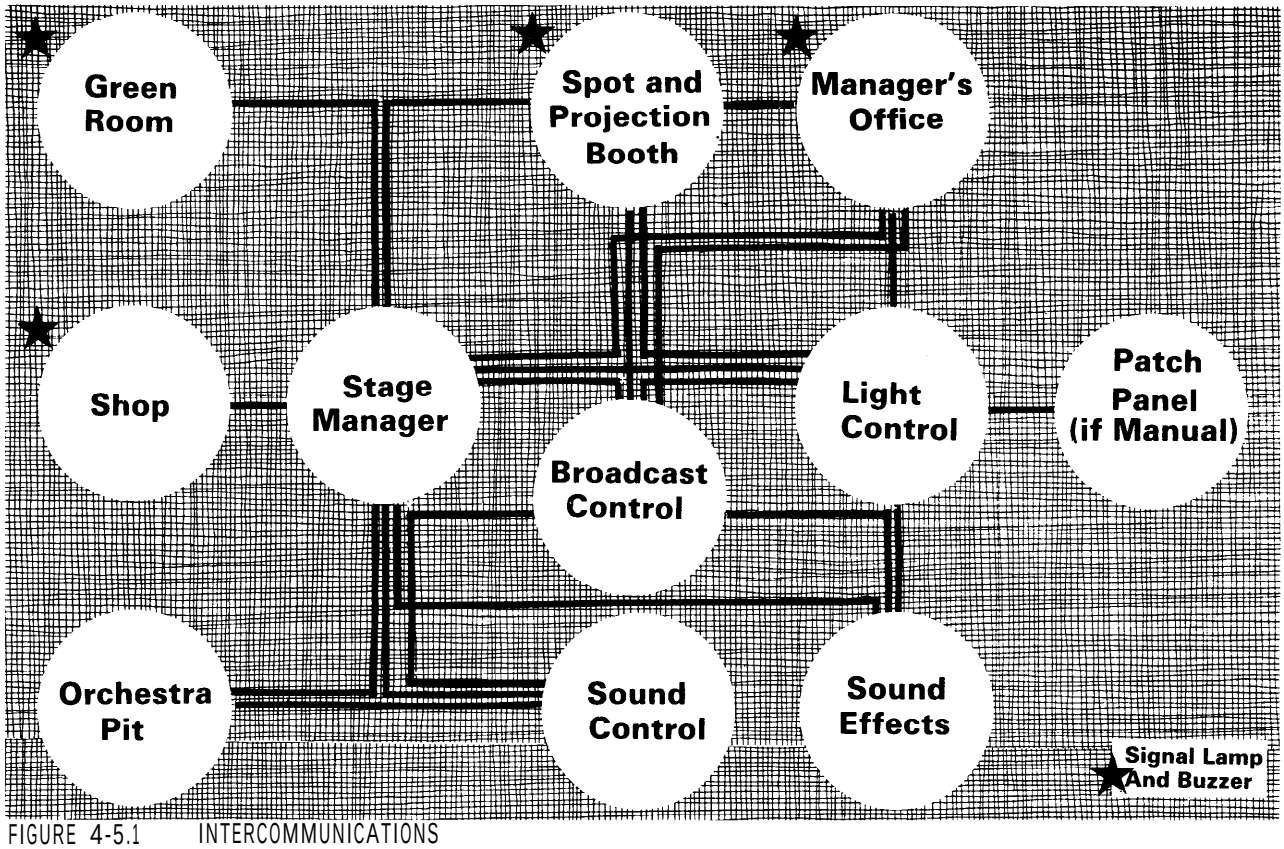


FIGURE 4-5.1 INTERCOMMUNICATIONS

Music reproduction for plays and dance is usually handled through an adaptation of the effects system using all of the same equipment heretofore discussed. Stereo and quadraphonic material can be reproduced as long as four input channels and four output channels are available. In some circumstances the reinforcement speaker clusters may be brought into play. (The reinforcement system has been carefully adjusted to the Room acoustics.) However, when sound does not originate on stage, dancers and other performers may have difficulty hearing it in the stagehouse. In this situation, the music should also be played on stage.

When live music from the pit is miked through the reinforcement system to balance a weak pit orchestra, the above method may need to be modified so that music played on the stage does not arrive in the house too long after the direct and cluster sound. The onstage speakers should be located just behind the proscenium, directed to the actors. Directional pit mikes will minimize feedback. If actors on stage are miked (musical drama) voice/music channel separation becomes very important. A facility with minimal reinforcement capabilities may find it necessary to place a small orchestra itself on stage behind the action, where music and speech sound is picked up by reinforcement microphones.

Microphones: The selection and placement of microphones for various activities is an art in itself and too difficult to describe in this Guide. We would recommend that the using service retain an experienced professional who can assist them in this matter. Most touring drama and professional music groups are familiar with microphone setups and can usually instruct the house crew as to their preference. It is good to have a variety of microphones on hand for various purposes and a good mix is suggested in Table 4-5.1.

Production Communications: These are also discussed under Section 3-8d. A production communication system is one which allows the individual in charge of the production to communicate with members of the technical staff. A minimal system would be a single channel system with the main control position at the stage manager's desk in the stage wing areas. The lighting control operator, the sound effects console operator, the spotlight operators and the crew chief at the stage, pinrail and loading catwalk would all be in communication on this single channel.

Several commercial systems are available. The most popular for theater is a lightweight headset with single earpiece and boom mounted microphone, connected to a separate belt pack that will jack into a wall receptacle. On-stage crewmen sometimes do not like the constriction of this arrangement and prefer their communication in an integral wall mounted unit so they're not trailing any wires. A more sophisticated version of this same system would be a two channel system in which the technical lighting people would be on their own separate cue channel. This is recommended for Drama with more than minimal scenic support.

The actor cue call and program monitor system is usually combined as a single cable loop system starting from the stage manager's desk and going to all the dressing room areas, manager's office, cast bathrooms, assembly areas, technical crew chief's office and general crew offices and staging areas. All of the rooms which are wired to the system will have a single speaker and a wall mounted volume control. A microphone hung just behind the main act curtain on stage will continually feed program and rehearsal material to all of the stations. Concurrently, whenever there is a specific cue call for an actor, orchestra, chorus members, corps de ballet, etc., the announcement emanating from the stage manager's console and activated by a push button will override the program material and announce the cue to all concerned. Should the program material be bothersome at any given time, the control knob on the wall will allow those in the room to reduce the volume to an inaudible level. However, under no circumstances will this deactivate the override actor cue capability. Therefore, even when the control knob is at its lowest position cue calls will always be audible in the various rooms.

In certain rooms it might be desirable to eliminate cue calls; rooms such as the manager's office, the stage manager's office, etc. In these cases the cue call override wire can be snipped and only program material will be fed into these designated spaces.

Table 4-5.1 lists equipment recommended for Army MDC's. Refer to Sections 3-12, 14 and 15. Quantities depend on specific circumstances. Add to these as required (the equipment can be rented) and have on hand at least half as many portable "bookshelf" speakers as there are effects output channels if not permanently mounted.

300 Seat Drama

- Actors call—main plus — 12 stations basic minimum, 20 stations recommended
- Program monitor— 16–24 stations
- Intercom—main plus 10–15 stations
- Effects/reproduction system— 4 input/16 output minimum
- Articulation/ reinforcement— not likely needed

650 Seat Drama

Same systems as 300 seat, more stations likely.

- Actors call — 24 stations extended/touring
- Monitor — 35 stations
- Intercom — 20 stations
- Effects — 8 input/20 output

650 Seat Music

Very little sound equipment is required for a small Music Room.

- Actors call—main plus — 8 stations basic, 12 stations recommended
- Monitor — 15–20 stations
- Intercom—main plus 7–10 stations
- Announce system—portable or built-in, 4 mike locations

1400 Seat Music

Same systems as 650 seat, more stations likely.

- Actors call — 24–30 stations
- Monitor — 36–40 stations
- Intercom — 12–15 stations
- Announce booth plus— 6–8 plug—in receptacles

Multi-Use/Musical Drama

- Actors call — 24–30 stations
- Monitor — 36–40 stations
- Intercom — 24–30 stations
- Effects — 12 input/20–30 output
- Articulation/ Reinforcement — 24–40 input channels

Microphone Assortment, Modest Inventory

- 16 High quality cardioid microphones, either dynamic or condenser type (used for general purpose pickup.)
- 3 Super cardioid microphones (used for difficult situations and for stage floor pickup).
- 3 Omni-directional microphones (especially designed for close-up vocal work).
- 1 Medium quality cardioid microphone with built-in switch (used for off-stage announcements).

2 Lavalier microphones (used for lectures, etc.).

TABLE 4-5.1 SUGGESTED AUDIO/COMMUNICATIONS EQUIPMENT

Qty.	Description	Manufacturer	Type
	1. Articulation System		
2	Loudspeakers	Custom	
3	Microphones	Special	
6	Pre/Summing Amplifiers	Spectra Sonics	110
3	Transformers	" "	T67
3	Power Amplifiers	" "	701
1	Card Holder	" "	202fc
1	Card Holder	" "	201C
1	Regulator	" "	411
1	Power Supply	" "	404RS
1	Rack	Soundolier	300–42
1	Control Panel	Custom	T07
	2. High Level System		
2	Loudspeakers	Spectra Sonics	3000
12	Power Amplifiers	" "	701
2	Electronic Filters	" "	505
2	Transformers	" "	T66
2	Card Holders	" "	202PC
1	Power Supply	" "	404RSD
1	Limiter		610
1	Processor	UREI	567
2	Microphone Plugging Box	Custom	
1	Rack	Emcor	

	3. Effects System		
6	Loudspeaker	JBL	4350
12	Power Amplifier	Spectra Sonics	701
2	Card Holder	" "	202PC
1	Power Supply	" "	404RSD
6	Transformer	" "	T66
2	Patch Panel	ADC	PJ–738
24	Patch Cord	ADC	PJ–712
			TL
	4. Stage Monitor System		
2	Loudspeaker	Bozak	CM–209–11CH
4	Power Amplifier	Spectra Sonics	701
1	Card Holder	" "	202 PC
1	Power Supply	" "	404RS
2	Stage Speaker Plug Box	Custom	
	5. Backstage System		
20	Loudspeaker	Soundolier	C10T70
20	Enclosure	"	95–8
20	Baffle	"	51–8
10	Priority Volume Control	"	AT10PA
2	Power Amplifier	Spectra Sonics	701
1	Line Transformer	" "	T70
1	Power Supply	" "	404RS
1	Card Holder	" "	203 PC
2	Microphone	Electro-Voice	621
1	Fly Microphone	" "	RE–10
2	Mixer/Preamplifier	ALTEC	1589B
1	Stage Manager Control Panel	Custom	
	6. Lobby System		
30	Loudspeaker	Soundolier	C10T70
30	Enclosure	"	95–8
30	Baffle	"	51–8
2	Power Amplifier	Spectra-Sonics	701
	7. Production Intercom		
1	Main Station	Clear-Com	ES–200K
12	Remote Station	" "	RS–100A
12	Headset	" "	CC–240
12	Extension Cable	" "	IC–25
2	King Biscuit	" "	KB–111
	8. Miscellaneous Equipment		
1	Control Console	Tangent	1602a
16	Microphones with Accessories		
1	Tape Recorder	Ampex	AG–440
1	Phono Reproducer		
2	Monitor Speaker	Bozak	CM–200–2
2	Rack	Emcor	

FIGURE 4–5.2 SOUND SYSTEM EQUIPMENT SPECIFIED FOR A 1200 SEAT MUSICAL DRAMA OPEN STAGE

Since the basic house central cluster reinforcement system is of minimal scope for the Army program, it is further suggested the designer furnish sufficient on-stage A.C. power so that touring groups utilizing their own portable sound systems can set them up rapidly, allowing sufficient time for their technical personnel to conduct pre-performance sound checks. This provision is mandatory for the 650 Seat Drama Room and 1400 Seat Music Room having no reinforcement systems.

4-6. CONSTRUCTION DETAILS

These sample details are furnished to illustrate the unusual aspects of performance facility construction. They are by no means exhaustive or prescriptive in definition, but the criteria exemplified will most often be mandatory.

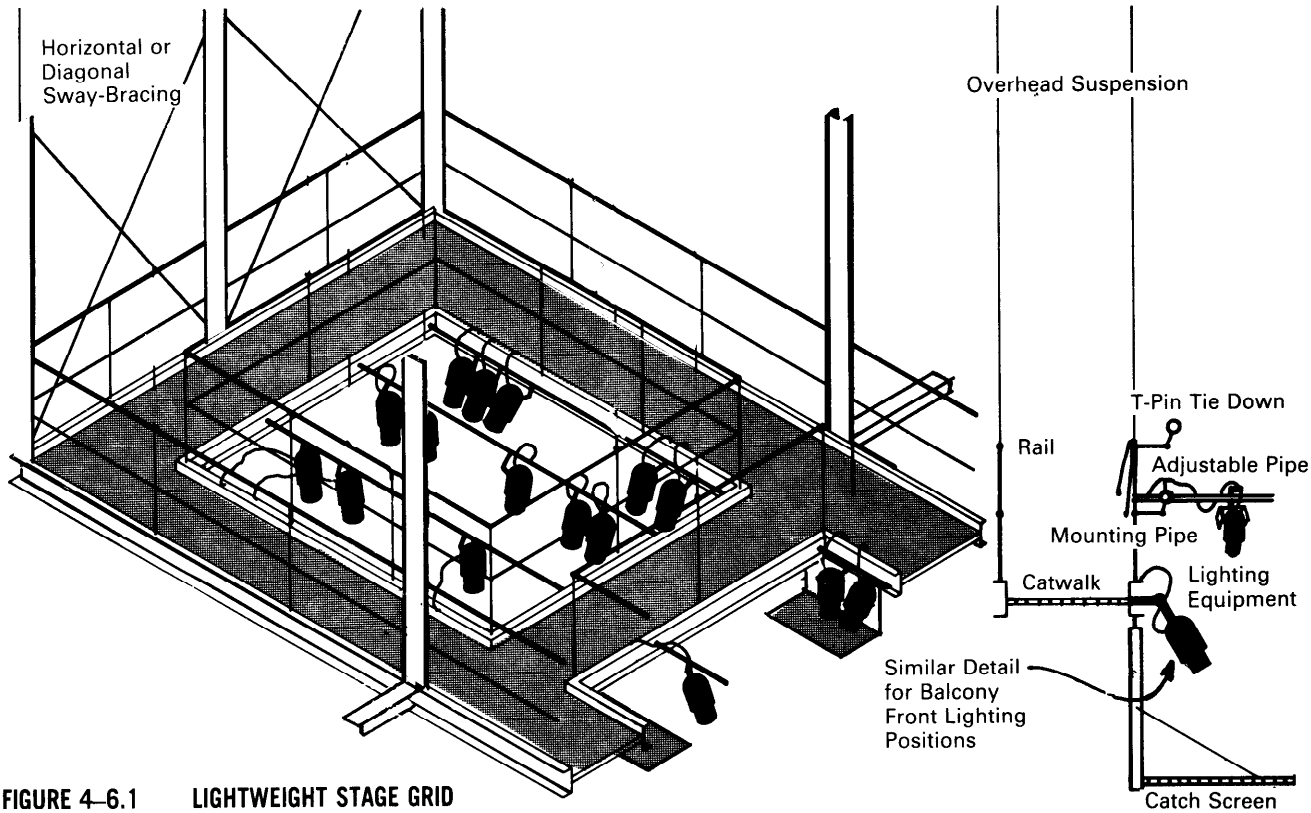
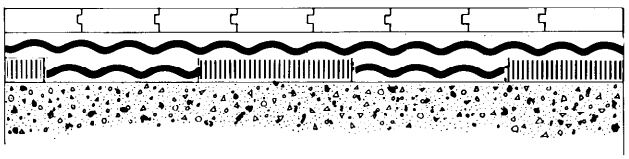
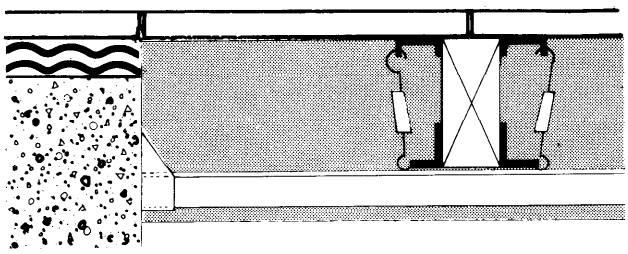


FIGURE 4–6.1 LIGHTWEIGHT STAGE GRID



2″ Tongue and Grove softwood floor on 2″ × 4″ sleepers 16″ on center on 2″ Neoprene Pads 16″ o.c. with fiberglass fill on concrete.

Surface Finish: Sand, Stain, Penetrating Sealant. No varnish or wax.
Music Stages May Require Random Spacing of Sleepers and/or pads.



2″ Tongue and Groove Flooring
4″ × 10″ Wood Purlin
3½″ × 3½″ × ½″ Steel Angles
⅜″ Turnbuckles
6″ × 14″ Wood Joist

FIGURE 4–6.2 STAGE AND REHEARSAL FLOOR CONSTRUCTION TRAP CONSTRUCTION

AIR-BORNE NOISE ORIGINATING IN THE THEATER	
Source	**Method of Prevention**
Radiators	Heat the house entirely by circulated air, or wall or floor radiation. On stage 1. Radiator Return line graded to avoid condensate and resultant banging. No valves to hiss. 2. Circulate hot water rather than steam. 3. Use radiators for rehearsals and pre-performance only.
Stage Wagons, Turntables (Noise magnified because of reverberant stage floor)	1. Well-made ball or roller bearing casters running on level tracks installed over stage floor. 2. Revolving stage on its own support structure. 3. Slow hydraulic elevators are quiet; the screw-jack type are noisy 4. Remote isolated elevator machine room.
Audience (Talk, shuffling)	1. Make crossover sound absorbent. 2. Lobby doors opposite aisles used for exit, not during show. 3. Divide rear crossover from house. 4. Carpets. 5. Silent seats.
Orchestra Pit	1. Rubber feet on chair legs and stands. 2. Prearrange and rehearse placement.
Telephones	Locate only where one open door will not permit sound to reach house or stage. Light instead of bell on stage.
Backstage Noise	Minimize personnel on stage, rehearse cues thoroughly. Minimize loose tools, properties.
SOLID-BORNE NOISES	
Source	**Method of Prevention**
Train or Street Rumble	Vibrant-isolating mounts under columns, vibration-isolating joints in walls. Compliant substance between grade walls and back fill. In case of excessive vibration, float interior walls and floors.
Air-Handling Units	Locate remote. Isolation mounting and soundproof room, regular maintenance.
Vibration from non-theater functions of building	1. Locate in remote building with independent structure. 2. Float the floor of the facility at which the vibration originates. 3. Structurally discontinuous sound-lock connecting passages only.
Motors, Machinery	Vibration-isolating mounts, gearless transmission.
Plumbing	More than one wall between house and facility. Isolate from structural members. Silenced flush valves, vestibule doors.
AIR-BORNE NOISES ORIGINATING OUTSIDE THE HOUSE	
Ingress	**Method of Exclusion**
Doors	Airtight fit (A hairline crack will raise the transmitted sound level 6 db.) Double-door systems are necessary to isolate the scene shop, lobby, street, etc. from the stage. (Doors opening on alleys or halls may be less of a problem than if they open on the street. Open only into spaces which can be kept reasonably quiet.)
Windows	1. Prefer none. 2. Double where used and not capable of being opened.
Ceiling Slots	Exclude sound from loft by roof insulation, solid catwalks, tight doors.
Projection Booth	Quiet machines. Sound absorbent walls and ceiling in booth. Glass in viewing ports.
Ventilation Ducts	1. No metal connection between blower and steel structural members, or blower and duct. 2. Ducts and diffusers sized for PNC when blower operates at full speed (above normal operating speed). 3. Sound-insulated ducts. 4. Long run-out to first diffuser.
Roof	A massive slab with a tight ceiling below it, if necessary. Hang ceiling on resilient mounts.
Alternator, for Motorized Rigging	Locate in soundproof vault outside the theater.

FIGURE 4–6.3 TYPICAL CORRECTIVE MEASURES FOR NOISE CONTROL

	Slot Speed at Terminal	10′ of Duct Before Opening	Next 20 Ft.	Next 20 Ft.
NC–15 Supply	250 Ft/Min.	300	350	400
NC–15 Return	300	350	400	450
NC–20 Supply	300	350	425	500
NC–20 Return	350	400	500	650
NC–25 Supply	350	425	550	700
NC–25 Return	425	500	650	800

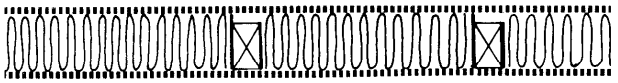
Maximum Duct Velocities (feet/minute)

FIGURE 4–6.4 SUGGESTED HVAC CRITERIA, NOISE CONTROL

CONSTRUCTION	TRANSMISSION LOSS AT LISTEN FREQ. H_z						
Walls	**125**	**250**	**500**	**1000**	**1000**	**4000**	**STC**
2″ Solid gypsum. Sand aggregate plaster 18 PSF	31	32	33	38	45	53	38
4 in. Pumice block, unpainted 16 PSF	18	19	26	32	35	40	38
4½ in. solid brick plastered both sides 45 PSF.	24	35	40	51	57	60	46
2×4 wood studs, ½ in. sand aggregate plaster on ⅜″ gypsum lath both sides 16 PSF	27	25	31	44	34	50	34
3⅝ in. sheetmetal stud ½ in. gypsum board both sides 2½ insulation in airspace 16 PSF	27	36	48	56	50	46	46
2½ in. wire studes ½ in. sand aggregate plaster on ⅜ in. gypsum lath on ½″ resilient metal clips 12 PSF	30	57	43	48	43	60	45
4 in. hollow concrete block 24 PSF painted ½″ gypsum board on resilient furring channels 1″ insulation	27	44	57	64	61	55	51
Two wythes of plastered 4½ solid brick 2″ air space sound absorbing mtl. air space 90 PSF.	43	50	52	61	73	78	59
Floor Ceiling							
Finish & subfloor on wood joists gypsum lath and plaster below 15 PSF	74	32	40	48	51	54	43
Oak flooring on ½″ plywood sub 2×10 joists 6″ o.c., ⅝″ gypsum board on resilient mtl. furring channel.	35	39	45	52	58	63	50
Doors							
1¾″ hollow door hung, ½″ undercut	7	9	13	14	13	12	13
1¾″ special double panel sound absor. flu	31	33	37	40	44	44	40

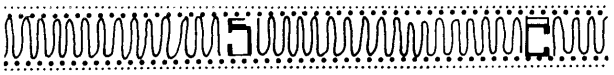
FIGURE 4–6.5 TYPICAL SOUND TRANSMISSION LOSSES

STC

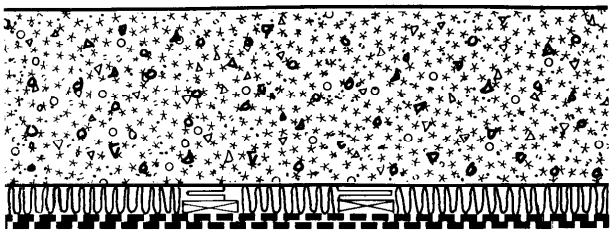


40 ½" wood fiberboard nailed to 2 × 4 stud 16" on center, one side resiliently attached Fiberglass fill.

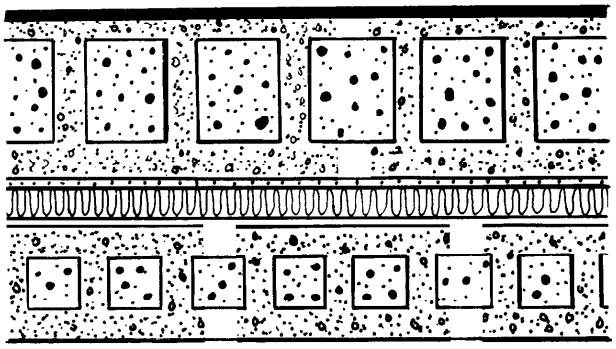
45 ⅝" gypsum board on 3⅝" metal studs 24" on center w/fiberglass fill



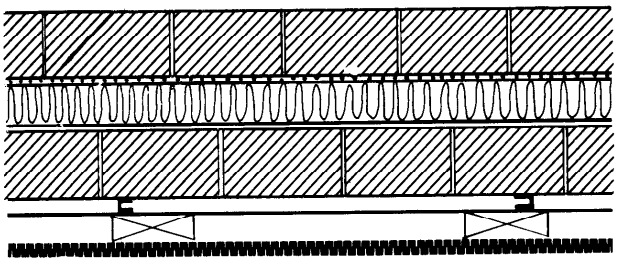
55 ½" sanded gypsum plaster (2 coats) on metal lath resiliently clipped to 3¼" metal studs 16" on center w/fiberglass fill.



65 12" reinforced dense concrete 2 layers ⅝" plywood on furring strips w/1¼" cavity w/fiberglass fill.

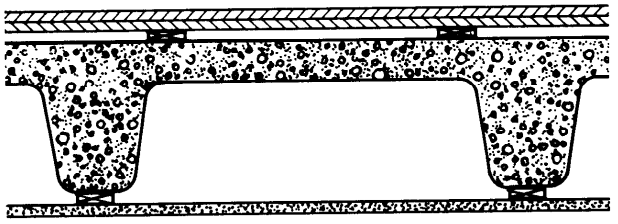


75 12" concrete block w/grout fill 80 Lb/SF 8" concrete block w/grout fill 30 lb/SF plastered cavity w/fiberglass fill

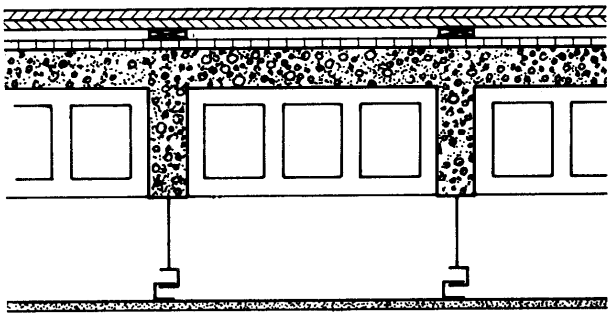


STC	
70	2 wythes brick w/4" air space plastered cavity w/ fiberglass fill 2 layers 5/8" gypsum board on metal furring strips resiliently attached.

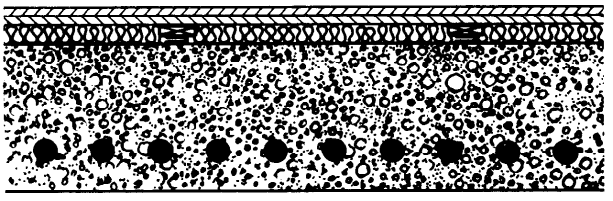
FIGURE 4–6.6 WALL AND PARTITION CONSTRUCTION, NOISE CONTROL



STC	
55	Finished & subfloor on wood sleepers on 2½" concrete slab w/6" ribs 2'0" o.c. 55 Lb/SF w/Ridgidly furred ceiling skin



STC	
75	Finished & subfloor on wood sleepers on resilient fiber board (or eqv.) on 2" slab on 6" hollow filler block 80 lb/SF w/suspended ceiling on resilient runners.

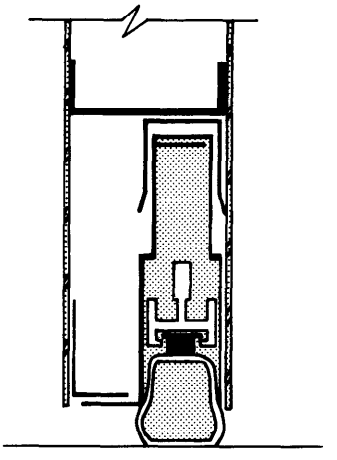


STC	
65	Finish & subfloor on wood sleepers resiliently attached to 8" reinforced concrete 95 lb/SF w/fiberglass fill.

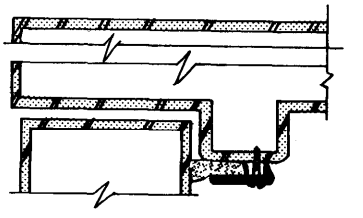
FIGURE 4–6.7 CEILING AND FLOOR CONSTRUCTION, NOISE CONTROL

DOORS

Construction	Thickness	Weight Lb/SF	STC Rating
Hollow core wood	1–3/4″	3.5	19
Solid core wood	1–3/4″	5	29
Hollow metal	1–3/4″	5	30
Packed metal	1–3/4″	7	32
Special Acoustical	1–3/4″	6	35
Sound core wood	2–1/4″	7	32
Special Acoustical	2–1/2″	8	38

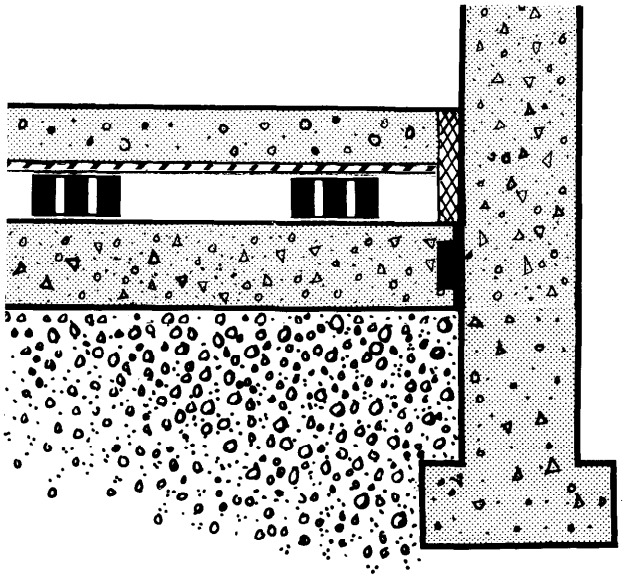


Threshold



Head/Jamb

FIGURE 4–6.8 DOOR CONSTRUCTION, NOISE CONTROL



4″ Reinforced Concrete slab on plastic sheet over ½″ plywood 2″ neoprene pads ≤ 24″ on center on structural slab.

Floating slab and equipment pedestals edged with isolation board.

FIGURE 4–6.9 MECHANICAL ROOM AND EQUIPMENT MOUNTS, NOISE CONTROL

4-7. PRODUCTION SUPPORT

This section is devoted to backstage fittings and essential production equipment required for an operational facility. Basic criteria for support activities are set forth in Sections 3-9 and 3-11.

Costume Workshops require good ventilation and uniform, glare-free illumination. Restful exterior views help combat eyestrain. Deep shelving for bulk material storage is needed, with several mothproof lockers. The design area should have a pattern drafting table 3 x 6 or larger, with overhead diffuse lighting. The construction area requires two or more 3 x 6 cutting tables, a workbench and hand tools, sewing machines and ironing board. If fitting takes place in the shop, it requires full-length dressing mirrors, podium, and ample space to move about (10 x 15) while checking the fit. A separate laundry is recommended, and possibly a dye shop.

Scene Shops will be as elaborate as the scenery is complex. A good scene shop will be two or three times the size of the acting area in order to layout, cut and assemble flats and frames, shift them about and set them up for inspection. Woodworking and welding equipment need a clear-area on all sides to work frames flat, up to 20 feet long and 6 or 8 feet wide. Both linear bulk storage for lumber, plywood, pipe, etc., and vertical storage of flats must be immediately accessible. Overhead rigging is required.

A separate paint shop in which an entire drop can be set up and worked on, should be well ventilated and heated, equipped with a utility sink, paint lockers and storage bins. Drops are as wide as 1½ times the acting area width, 16 to 20 feet high. A winched painter's scaffold is a necessity. Adequate lighting of two kinds is required-daylight fluorescent and stage flood incandescent. Flats should be moved into and out of the paint shop in a straight line, either to shop storage or to the stage.

An electricians shop should be located just offstage with ready access to stagehouse lighting galleries, gridiron and the loft space over the house. The shop is used primarily for repair and maintenance of lighting instruments and stage cables, but it may also serve the sound system and other electronic equipment. Therefore, a separate repair bench area is recommended, one that can be kept dust free and locked to prevent damage to delicate equipment. A combination of fluorescent and incandescent, non-specular lighting will help reduce eyestrain. The bench will have racks for test equipment, drawers for parts and small tools and controlled three-phase AC power supply. The remainder of the shop will have storage for instruments and some of the heavier equipment, cable reels, clamps, pipes and booms, lamp and filter storage and hand tools. Some pre-assembly work will take place here.

Musical instrument repair cannot be done in a scene or general maintenance shop. The work area must be clear of dirt and undue noise. Ideally, it will have a stable temperature and humidity. Repair work may involve carving, shaping, gluing, brazing and metalwork on a small scale as well as electronics. Some repairs will take a considerable time during which the workpiece should remain undisturbed. Therefore, two or more small workbenches are recommended, arranged for non-interference. Lockers or a locked closet should be provided for instruments awaiting attention.

The selection of shop tools and equipment is best done by the skilled personnel or crew chiefs who will use them. Since this may not be practicable, an initial inventory might be guided by the ideal that every piece of equipment should pay for itself through long service, versatility and frequent use. The MDC staff should carefully evaluate the kinds of on-going activity it can reasonably expect to sustain and choose a basic complement before purchasing specialized or sophisticated machinery. After working with it for a few productions, special needs will become apparent.

In hand tools, we suggest good quality for hard use but not the very best cabinetmaker equipment. A high level of volunteer participation will require multiples of basic items, many of which will be inadvertently lost, thrown away or destroyed.

Practicality in selecting power tools depends on several factors besides budget and intended use. When outfitting a shop away from large cities and the maintenance services available there, it may be wisest to purchase all power tools through a reputable supply house that will guarantee repairs and spare parts, or from a nationwide distributor of a good quality line for which parts and servicing are available at local sales

centers or by mail. While it may be possible to reduce the need for parts and service by purchasing only the best quality equipment, there is no perfect power tool. The choice of a personal auto or a kitchenful of appliances is similar.

Figure 4-7.1 is a list of basic tools and equipment compiled for a small country college just initiating its theater program without benefit of permanent staff. It should be regarded as the absolute minimum for a functioning stagecraft support facility.

(Assume a quantity of one unless a greater number follows in parentheses)

1. Power Tools and Accessories

- 10" radial arm saw
- 10" table saw
- 14" band saw
- assorted blades including crosscut, rip, combination, and dado
- router (one H.P. minimum)
- router bit assortment
- 1/4" electric drill (2)
- 1/2" electric drill
- high speed drill bit assortment including countersink and extra length bits
- saber saw (2)
- blade assortment
- orbital sander

2. Hand Tools

- 16 ounce straight claw hammer (8)
- 20 ounce straight claw hammer
- tack hammer (2)
- carpenter's mallet
- nail set assortment
- crow bar
- cross cut saw (2), Diston recommended
- rip saw, Diston recommended
- hack saw
- coping saw
- back saw, Diston recommended
- miter box
- chisel set with ¼, ½, ¾, and 1" blades
- draw knife
- spoke shave
- mat knife (6)
- linoleum knife
- block plane
- jack plane
- oil stone set
- wood rasp assortment
- surform
- brace
- wood bits in assorted sizes including an expansion bit
- framing square (2)
- try square (4)
- combination square (2)
- bevel square
- metal straight edge, 2' long (2)
- metal straight edge, 4' long
- folding rules, 6' (2)
- tape, 8' (6)
- tape, 50'

*snap line

- compass, 8"
- trammel point set
- spirit level
- awl
- C-clamp (12, assorted sizes)
- furniture clamp (4)
- screwdriver, slotted head (12, assorted sizes)
- screwdriver, phillips head (3, assorted sizes)
- screwdriver, ratchet (2), Yankee recommended
- adjustable wrench (4, assorted sizes)
- pipe wrench (2)
- socket wrench set
- hex key wrench set
- slip joint pliers (4)
- long nose pliers (2)
- diagonal cutting pliers (2)
- vise grip pliers
- tin shears
- cold chisel
- metal file assortment
- center punch
- staple gun (2), Arrow T-32 recommended
- staple gun, Arrow T-50 recommended
- staples
- soldering iron
- combination wire stripper and crimper (2)
- volt-ohm meter, Simpson 260 recommended
- continuity tester
- paper cutter with 24" blade
- utility brush, 2" (3)
- utility brush, 3" (3)
- laying-in brush, 4" (6)
- laying-in brush, 6" (4)
- lining brush (6, assorted sizes)
- paint roller, medium size (12)
- roller handle with extension (6)
- compression sprayer (2), Hudson #6335 recommended
- lining stick, 3' (2)
- lining stick, 6'
- pounce wheel
- stencil paper
- bucket, 3 gallon size (4)
- bucket, 1.5 gallon size (6)

3. Miscellaneous

- bench with wood-working vise
- bench with metal-working vise
- extension cords, heavy duty (6, assorted lengths)
- step ladder, 8' (2), recommend wood rather than metal
- step ladder, 14', recommend wood rather than metal
- straight ladder to reach box boom lighting instruments
- vacuum cleaner, wet-dry shop machine recommended
- broom assortment including push brooms and corn brooms
- dust brush (2)
- dust pan (2)
- trash barrels
- general hardware including nails, screws, bolts, washers, etc.
- electrical hardware including solder, electricians tape, etc.
- theatrical hardware including hinges, lash cleats, foot irons, stage screws, etc.
- paint supplies including pigment, canvas, glue, etc.

FIGURE 4-7.1 LIST OF TOOLS AND SHOP EQUIPMENT

Chapter 5
Illustrative Examples

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5-1. INTRODUCTION

A selection of performing arts building projects is presented in this chapter. These are not hypothetical prototypes, but examples of actual responses to several different user programs and design goals. The examples are drawn from the work of a single firm which has seen more than thirty of its performing arts facilities built and successfully operated during the past fifteen years. Thus, a cross-section of recent experience is offered to demonstrate that major variations and similarities among design responses stem from fundamental principles and program demands rather than stylistic choices. Other individual designers would doubtless produce buildings that "look" somewhat different; a secondary purpose of this chapter will be to suggest how the criticism of style can be separated from the analysis of functional rationale.

While this Guide has refrained from imparting aesthetic and formal bias in discussions of design, it has assumed certain conceptual directions and program priorities (see Chapter 2 and Section 3-2) derived from consultations among Army Performing Arts personnel at every level of command. The Music and Drama Center Programs are unique in that they exist within a much larger institutional context and are primarily for the benefit and satisfaction of the soldiers and soldiers' families who participate in the activities. Private and commercial programs have slightly different imperatives with respect to economic survival, academic instruction and artistic or intellectual pursuits. There are no average design responses because there are no average program demands.

5-2. THE CASE FOR SMALL FACILITIES

In the examples which follow–and indeed in recent practice–brand-new small proscenium theaters and small concert halls are seldom found. This may be indicative of the state of the art, but it is also a function of finance. The expenses of building and maintaining a fully-equipped stagehouse or acoustically excellent recital space, plus the expense of mounting a major production or preparing skilled musicians, must ordinarily be offset by consistently high ticket sales and frequent performances to large capacity houses. At the same time, the steady growth of the cinematic, video and electronic recording industries siphons off a considerable portion of the live music and theater audience and has generally altered audience expectations. Even where a commercial theater market survives, the economic risk in full-scale production is great. Most established traditional theaters have undergone extensive modification to accept a variety of backup programs and rapid production turnover. For the successful repertory theater, the existing flyloft is a valuable asset. But the profit margin (if any) is inadequate to attract capital investment in new construction. Regional non-profit cultural centers, sponsored and subsidized on a grand scale, have been the main source of new, fully-equipped multi-use Rooms. Smaller new theaters must either compete in the box-office by offering a difference, an avant-garde contrast, or content themselves with meager budgets. Many small theaters today are low-cost community enterprises or college auxiliaries for whom repertory income is of little consequence. They thrive on ingenuity, involvement and imagination.

5-3. THE INTIMATE ROOM

A theater's purpose is to define and intensify the relationship between audience and performers; in most cases the Room's architecture makes a clear distinction. However, the psychological separation has diminished historically. In the past, ballet, opera, symphony and drama were complete and ordered forms of expression, reinforcing a similar understanding of social and natural order. Contemporary experience is full of conflicting values, variety, fragmentation, absurdity and even brutality. As a way to externalize and deal with this perceived quality of existence, the arts are challenging traditional forms of expression, softening the audience-performer boundaries. The burst of monumental cultural center construction that took place in the late 50's and 60's tended to overemphasize traditional ceremonial patterns for the enshrinement of Art, and glorification of benefactors. The corresponding quests for perfection have made these facilities peculiarly inflexible in the face of new ideas. Yet new approaches to staging, composition and movement demand legitimate architectural solutions.

While experimental designs will doubtless add much to the formal vocabularies of theater arts and architecture, the built-in distinction between audience space and performers' space will most likely remain for the present. Conscious enhancement of psychological participation and intimacy, however, has become a common characteristic sought in new facilities. The three basic audience-performer relationships-Frontal, Thrust and Surround (Section 3-2)–can each be employed to this end.

The eye-to-eye relationship established by Frontal arrangement works well for verbal presentations, the actor's face seen against a background that can itself add meaning and nuance. Thrust staging presents the actor as a freestanding element in relation to a scenic background that identifies location; the performance becomes three-dimensional. Surround arrangement requires the actor to move to be understood, with minimum obscuring scenery; it emphasizes the communicative aspect of body actions. In all, the observer must exert his faculties to make the connections among spoken words, sounds, gestures, images, harmonies and juxtapositions.

Enthusiasm for experimentation has led to fascination with "flexibility" to change the audience-performer relationship. To do so physically at any but small scale (less than 500 people) involves a disproportionate amount of machinery, expense and building volume. It is wiser to permit the stage director and scene designer leeway to explore a variety of production techniques within a fixed relationship. Clarity in the choice of how the audience will meet the performer is essential.

In music, concert hall design seems to be undergoing a slower evolution–but there are so few new concert halls change is deceptive. Electronics and amplification have had profound impact on the content, presentation and audience expectations of music. Users of small rooms often rely on electronic systems to create the listening environment regardless of intrinsic natural qualities. Recent departures from traditional concert hall design have mainly been on a gigantic scale, for mass audiences far exceeding the physical limits of natural acoustics. Ampli-

fication brings to music what the television camera brings to theater, a paradoxically close-in remoteness, an expansion of possibilities along with preselection and control of the delivered experience. In the extreme, electronic media strip music and theater of the give and take between performers and audience, and it is that communion which live music and theater–and the Army's MDC program–seek to restore and enhance.

The attempt to unite audience and performer creates a conflict in architectural objectives. Most of the examples illustrated use an architectural language that acknowledges dissimilar elements, unlikely juxtapositions and frank utility to create a whole understandable for the contrasts among parts. Each has been crafted in its own way, making no assertions about absolute correctness or universality. However, it can be said each addresses the objective of intensifying the audience-performer interaction by using the resources at hand.

The audience can be encouraged to explore visually a great variety of materials, textures and objects taken out of everyday context and set in unexpected juxtaposition. New Lafayette Theater invites the observer's participation in figuring out the room, which is composed of glazed tile, expanded metal, marble, concrete, plywood, corrugated plastic, lightbulbs and fragments of opposing organization. It prepares the audience for what takes place in three dimensions on the Thrust stage.

The audience can be placed unconventionally in an otherwise simple volume, which at once heightens awareness of the overall singular space and the existence of two entities, audience and performers, within it. In a basically Frontal room like the small theater at Eugene Performing Arts Center, one senses an immediate confrontation as the audience advances on the performer from two directions. At Simon's Rock, where dance movement demanded a diagonal placement to increase stage dimension, the performance space seems to cut off and work on the audience. Stage extensions which provide a greater variety of entrances also reinforce the impact of the diagonal.

The audience can be made more aware of itself, which increases the impression of intimacy. Boettcher Concert Hall seats 2,750 listeners in a Surround relationship. But the room's geometry has no single focal point. Each portion of seating is placed at a different level and angle of vision, each occupant has a "special" place but is made aware of the rest of the audience. A surprising proportion of "front-row" seats confronts the performers on all sides, and they must actively address themselves to their audience.

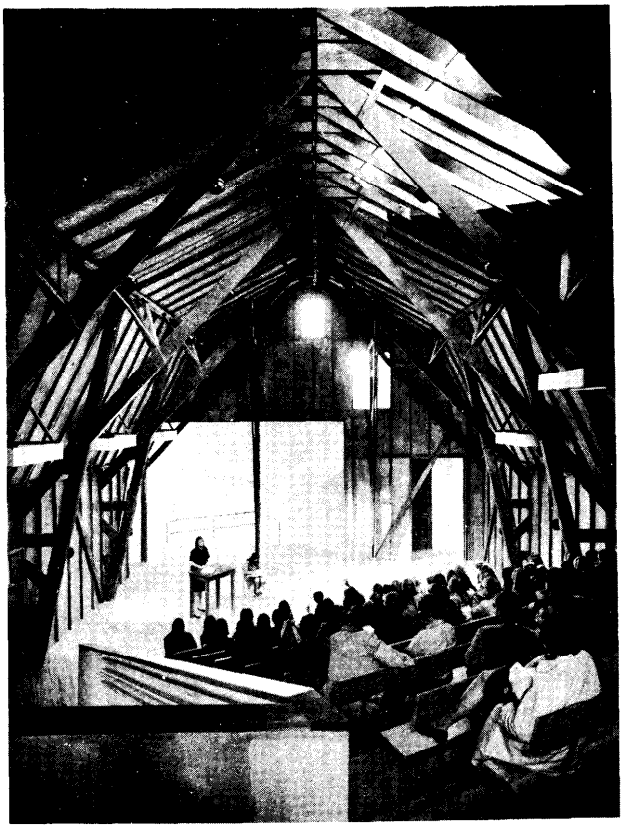
The audience's expectations of traditional formal characteristics can also be played on to refresh awareness of audience-performer relationship. One of the classical characteristics is symmetry. At Playhouse in the Park, a geometrically constant seating bowl meets an asymmetrical playing area; their centerlines do not coincide. One side of the audience is higher above stage than the other as the performing area cuts through and leads to entranceways at different angles. At Fisher Theater, the audience is asymmetrically arranged in two segments, which permits the action to seep into the generous playing area from all corners. Both solutions operate in an active relationship rather than a static one.

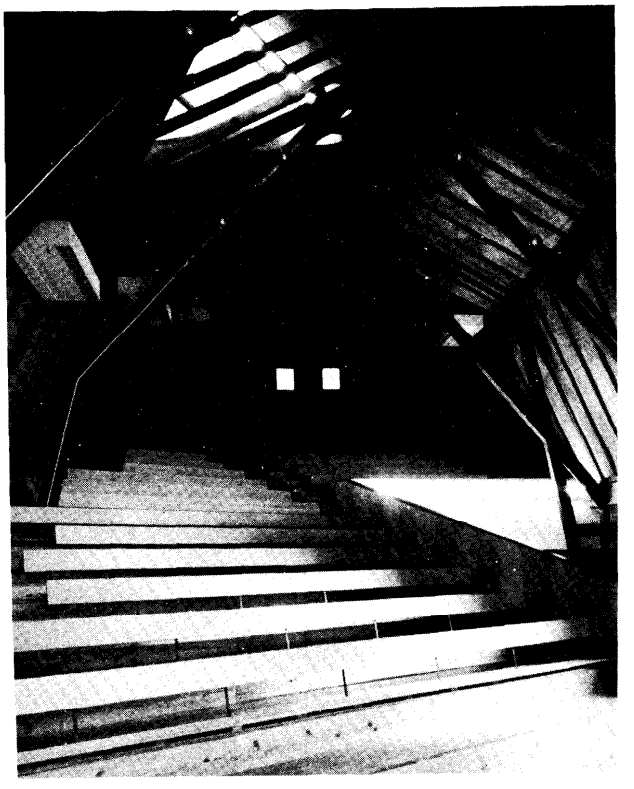
5-4. A SMALL DANCE THEATER

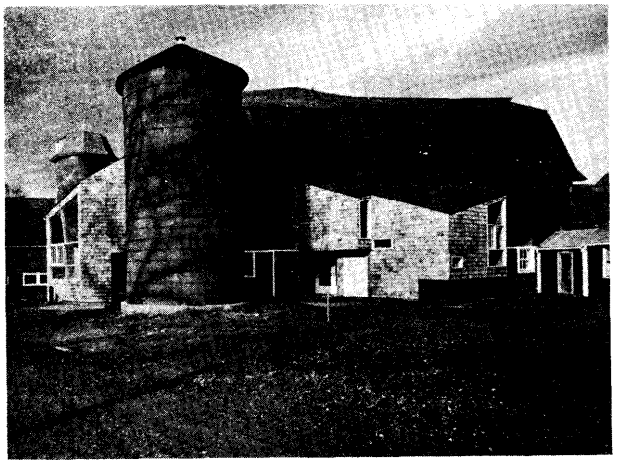
Built for a small progressive college in a rural setting, Simon's Rock Art Center occupies a former dairy farm complex and houses both visual and performing arts in adjoining barns. It is part of a plan for program expansion to include Drama and Music, but present teaching involves dance movement.

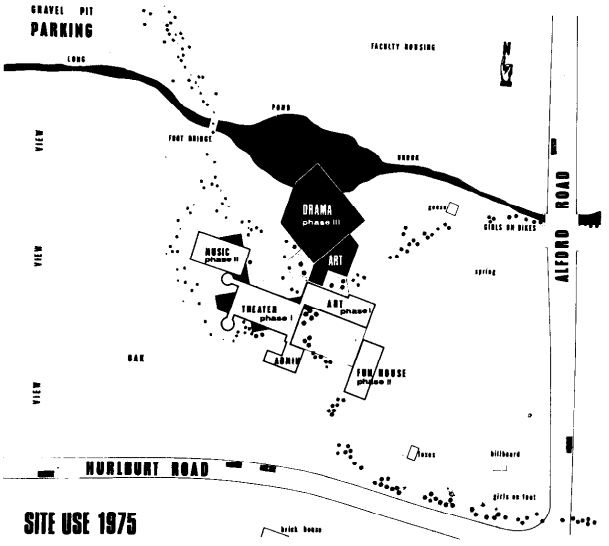
By placing the leading edge of the Stage diagonally in the 30 foot wide barn, 10 feet were added to its dimension. The rest followed logically-extensions in the same geometry to provide six different ways to enter the Stage, and a parallel seating pattern that emphasizes something new and interesting is going on. Another unusual element is the use of natural light called for by the director; it enters through a skylight over the seating area and through an angled window behind the stage.

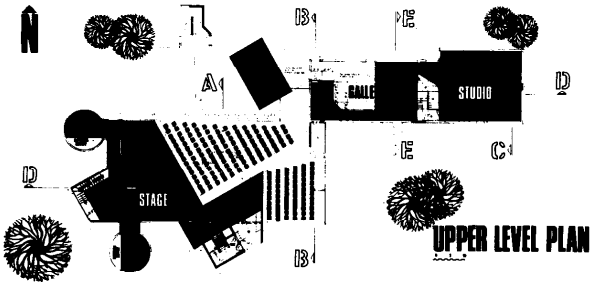
There is a conscious consistency in the way new elements have been added to complement the existing fenestration, structure and materials of the barn which remains intact except for the cattle stanchions. Detailing is simple and low cost. A small but adequate shop and dressing area is tucked into the lower level (originally for farm wagons). Mechanical equipment is housed independent of the structure as an element of an outdoor terrace. Since most access to the complex is literally footpath pedestrian in nature, the outward changes have been kept small in scale and visually engaging at low-speed ambulation.

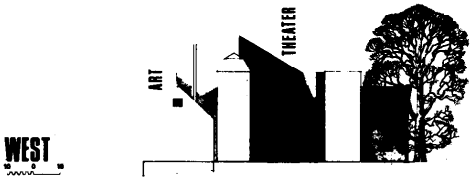












Project:
Simon's Rock Art Center

Location:
Great Barrington, Massachusetts

Date of const:
1966

Owner:
Simon's Rock School

Architect:
Hugh Hardy and Associates

Uses:
Dance Theater and Art Studios

Capacity:
200

Form:
Frontal, Open Stage

*Adjusted Cost:**
$290,000

Gross Area:
11,000 GSF

Net Room Area:
2800 sf

Room Volume:
43,000 cf

Net Backstage:
3700 sf

Net Front End:
N.A.

**All Figures Washington D.C., Jan 81*

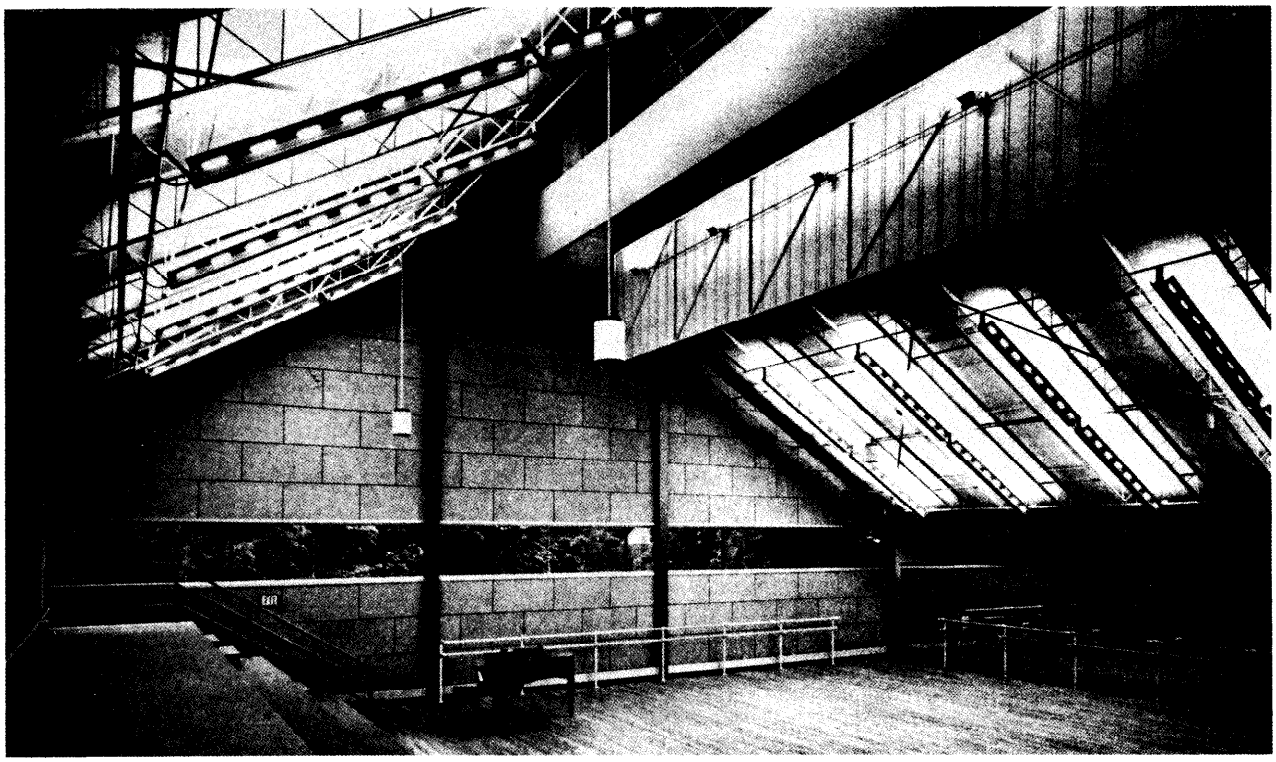
5-5. MUSIC AND DANCE TOGETHER

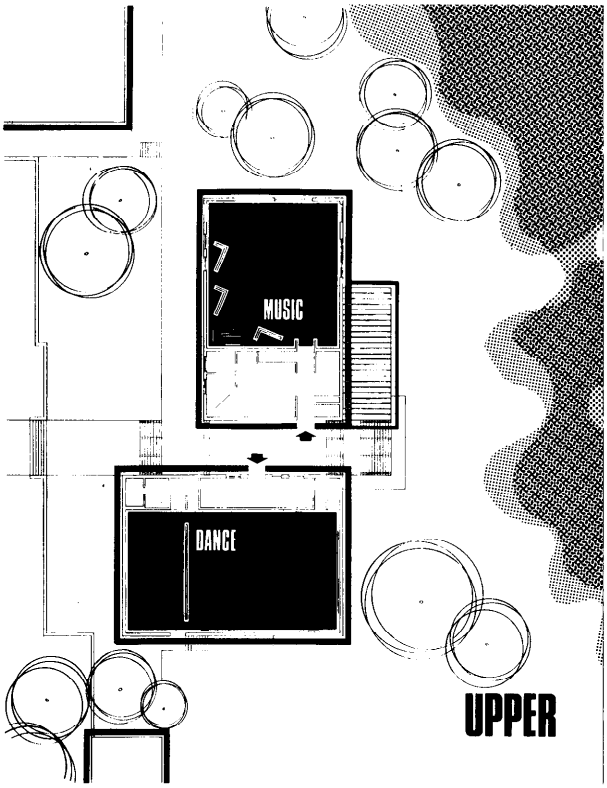
The Performing Arts are an important part of the curriculum at St. Paul's School. For its teaching programs in Drama, Dance and Music, this New England preparatory school chose to build new facilities in the heart of its parklike campus. A 300-seat experimental theater has been added to the existing 750-seat Memorial Hall Auditorium; the small Drama Room is a workshop space, easily altered, square in plan with a universal lighting grid. However, Music and Dance have been housed together in a free-standing building.

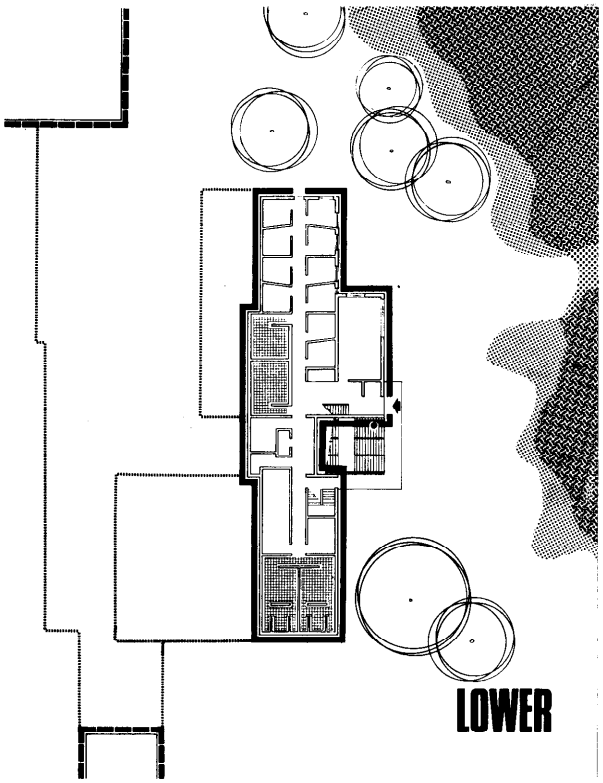
The Dance Studio and Music Performance Hall each accommodate 200 people in separate Rooms rising from a ground floor "podium" which contains dressing and practice rooms. Primarily classrooms in concept and use, each space is technically simple but generous, and has built-in provisions for seating an audience on carpeted bleachers in the Dance Studio and/or moveable chairs. The Studio is equipped with a sound system and is wired for theatrical lighting from a catwalk. The Music Hall has a bi-level floor and flying mezzanine which permit a variety of musician-listener relationships to be explored. Both Rooms have clerestory skylights, but are oriented at right angles, giving each a different quality of natural light. The Studio floor is a soft five-layer basketweave construction; walls and ceiling are mostly surfaced with sound-absorbing tectum panels. Wood finishes dominate the Music Hall; skewed partitions and sloping ceilings mitigate standing waves. Ventilation is supplied at low velocity through oversized lined ductwork from a central plant located below the outdoor plaza from which each Room is entered separately through vestibules.

Support facilities include a library and two listening rooms adjoining the Music Hall entrance, above which is a large music rehearsal room. The lower level contains small and mid-size practice rooms, visitor restrooms, instrument storage and showers, lockers and dressing rooms for men and women.

It is a steel frame structure enclosed with brick-faced concrete block for noise exclusion, except that a corrugated transite skin has been used to accentuate the two "sheared" end faces. Coper roofs are supported on open-web steel joists visible within.







Project:
Dance Studio and Music Performance Hall

Location:
Concord, New Hampshire

Date of Const:
1980

Owner:
St. Paul's School

Architect:
Hardy Holzman Pfeiffer Associates

Uses:
Teaching, Rehearsal and Performance or Dance and Music

Capacity:
150 (Dance)
200 (Music)

Form:
Varied, Open Studios

Adjusted Cost:
$1,120,000

Gross Area:
16,600 GSF

Net Room Area:
3100 sf (Dance)
2850 sf (Music)

Room Volume:
83,000 cf (Dance)
45,000 cf (Music)

Net Backstage:
6000 sf (both)

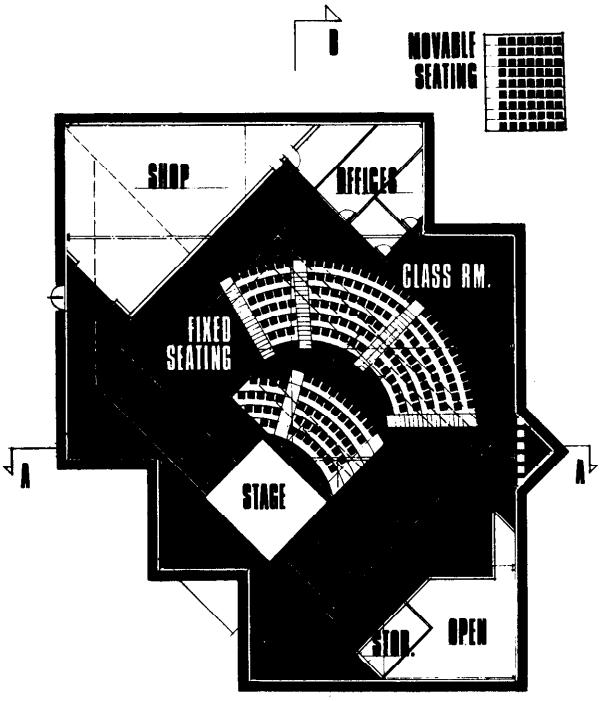
Net Front End:
2100 sf (both)

5-6. TWO SMALL FRONTAL ROOMS

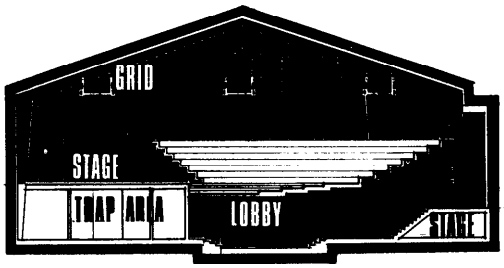
Both of these theaters are examples of small facilities built to a rock-bottom budget, but their design programs involved different site characteristics and different client attitudes toward their eventual appearance. Fisher Theater's sloping site afforded some concealment; the key objective was to provide flexibility in the staging of student productions. Emelin Theater was to be built above an existing parking lot and had to visually blend with a neighboring fieldstone library (1927) and its 1966 addition; its initial program sought to accommodate everything from puppet shows and recitals to theatrical productions.

Fisher Theater seats the audience in a two-part asymmetrical dish. The playing area is very wide; its interpenetration with the seating almost makes the Stage become the entire Room. Combined with the forthright exposure of backstage equipment, lighting, rigging, catwalks and mobile pipe towers, this arrangement provides directors with potentially great flexibility in production design, at the same time, welcoming the audience's visual participation. Since its technical accessories were necessarily fairly basic due to budget, this frankness makes it easy to use and experiment with. A simple catwalk grid allows ample lighting and rigging coverage of the open Stage and reinforces the general orientation of the Room at 45 degrees to the enclosing structure. There is a shop at stage level, traps and three entrance stairs from the lower level dressing facilities. The lower level also contains a rehearsal space of correct size, plus the lobby and audience support.

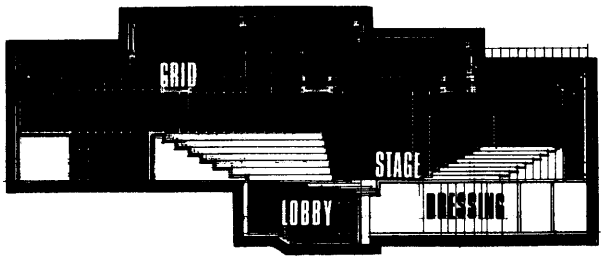
Fisher Theater is constructed of pre-engineered building components readily available "off-the-shelf". However, these systems are designed for single-story applications and compact plans. Consequently, a good deal of modification–reinforcement for suspended loads and extensive foundation work–was required to make standard parts fit a non-standard solution. One would expect to encounter problems similar to those of converting an existing building, but so far, the only criticism is that the height over Stage could be a few feet greater to separate rigging and mechanical system ductwork. It should be noted that more time was spent with shop-drawings than working drawings; the manufacturer furnished half the working drawings from its computer.



PLAN UPPER B



SECTION A-A



SECTION B-B

Project:
Fisher Theater

Location:
Exeter, New Hampshire

Date of Const:
1970

Owner:
Phillips Exeter Academy

Architect:
Hardy Holzman Pfeiffer Associates

Uses:
Production, Rehearsal and Performance of Drama

Capacity:
260

Form:
Frontal, Open Stage

Adjusted Cost:
$1,475,000

Gross Area:
16,500 GSF

Net Room Area:
6700 sf

Room Volume:
163,000 cf

Net Backstage:
6000 sf

Net Front End:
2380 sf

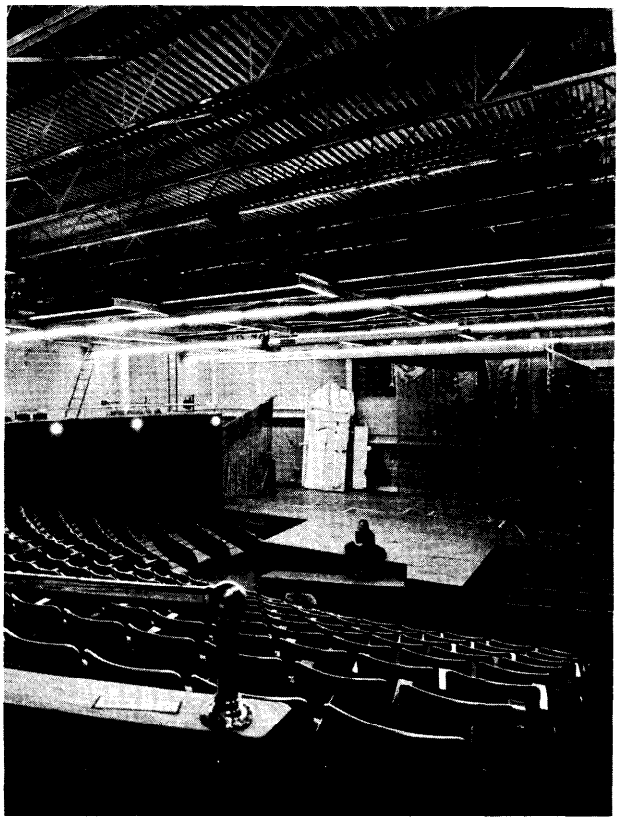
Emelin Theater is less than 40% as large as Fisher Theater, yet it seats a comparable audience in 151 permanent seats plus 114 moveable seats. By repositioning seats and a sliding wall, the audience-performer relationship can be changed from its basically Frontal form. Its small size was achieved by eliminating the backstage–or rather, by combining it with audience facilities. In a one-story plan 72 x 58 feet, every available cranny has been put to use, sometimes to more than one use. The narrow side lobby becomes a side stage. Dressing rooms share a corridor with the box office–latecomers may pass a costumed actor hastening to his entry cue.

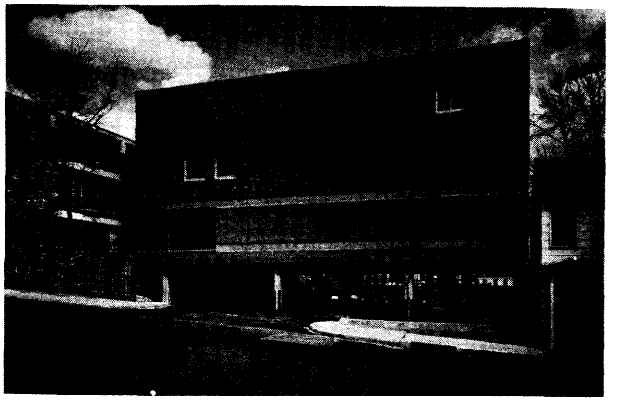
While this spareness is far from ideal, its intimacy has a curiously appealing flavor. The Room works remarkably well with a minimum of fuss. Very little scenery is used, carried in from the side stage (which doubles as musician's platform) or projected on the back wall. Catwalks constructed of long-span joists provide overhead lighting.

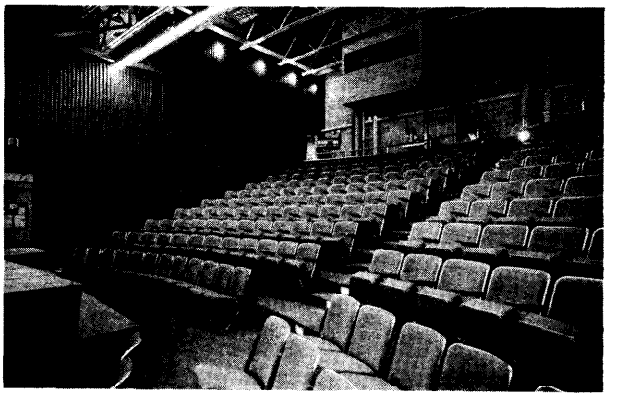
Since Emelin is built over a parking lot, about 30% of the budget went to holding it up on columns, but if the city ever relinquishes the land, a trap room and backstage spaces can be built at ground level.

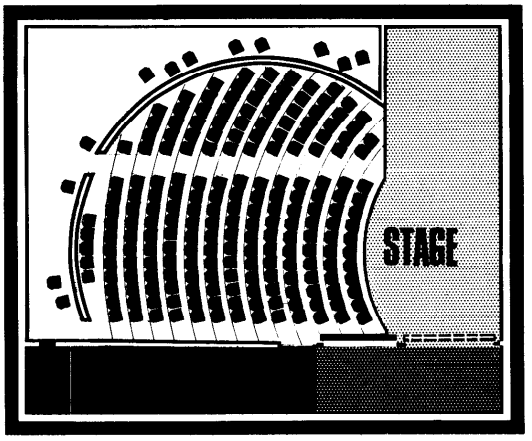
Despite spartan appointments, the Room has very good acoustical qualities due to the wood-faced steel stud walls separating backstage and lobby from auditorium, absorptive fabric-covered curved wall, upholstered seats and carpeted floors.

The building committee rejected the suggestion to use pre-engineered building components. The basic structure is a steel-framed box carried on 10 foot fireproof columns, with a curtain wall of two kinds of concrete block. The ribbed block approximates the texture of fieldstone and the smooth block the limestone bands of the library's cornice, coping and spandrels.

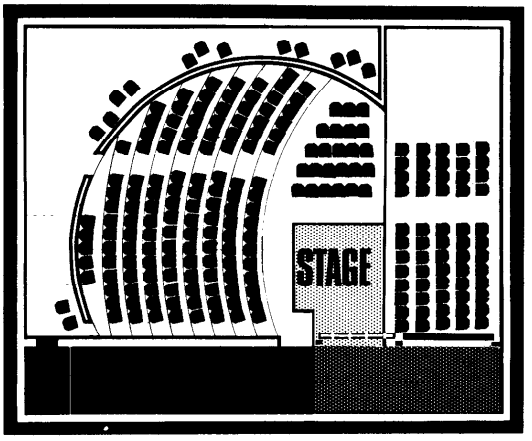




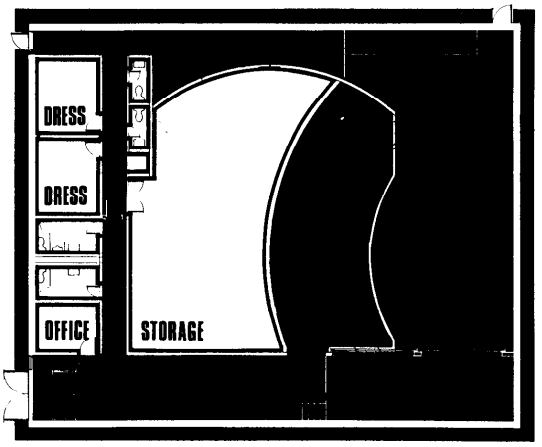




PLAN - A



PLAN - B



PLAN - LOWER

Project:
Emelin Theater

Location:
Mamaroneck, New York

Date of Const:
1972

Owner:
Mamaroneck Free Library

Architect:
Hardy Holzman Pfeiffer Associates

Uses:
Drama, Lecture, Music recital Performance

Capacity:
265

Form:
Frontal or Thrust, Open Stage

Adjusted Cost:
$450,000

Gross Area:
6200 GSF

Net Room Area:
3232 sf

Room Volume:
73,500 cf

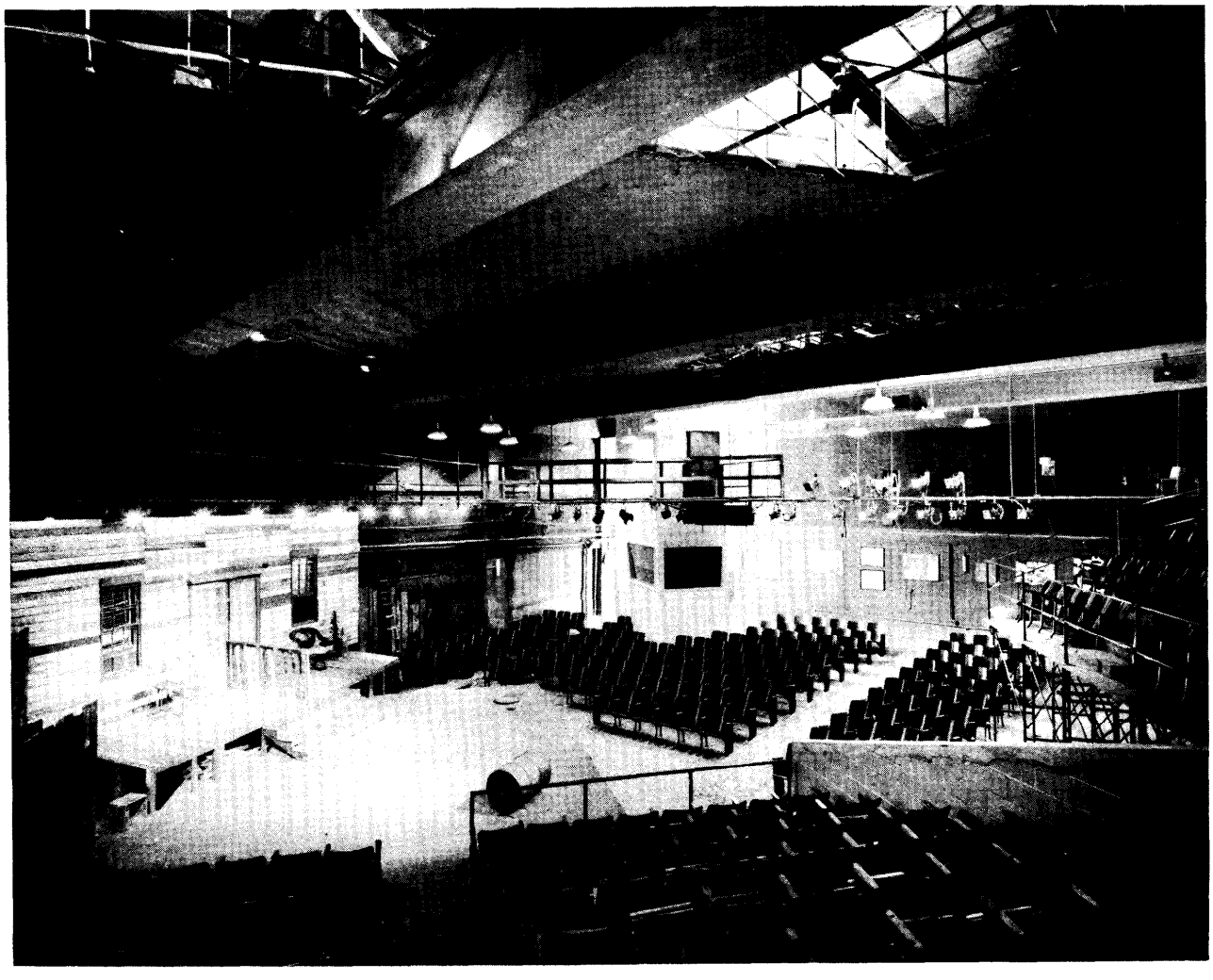
Net Backstage:
1300 sf

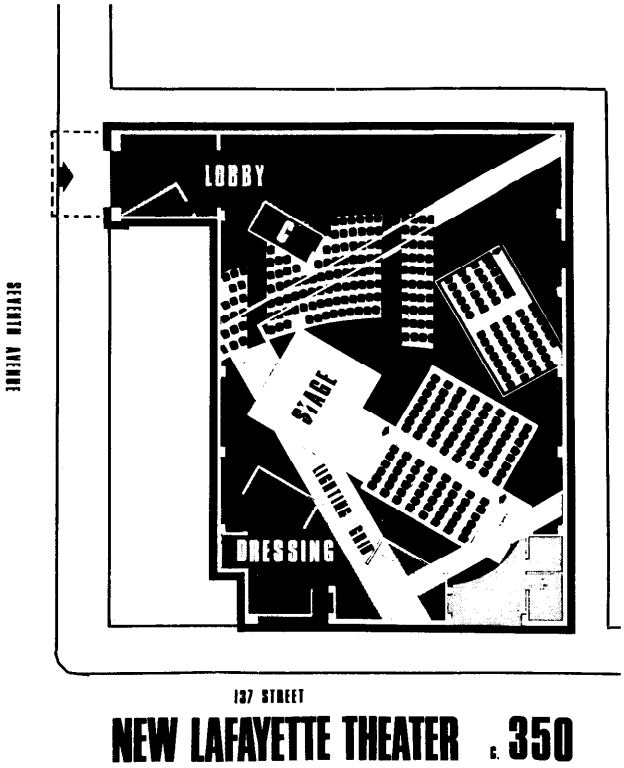
Net Front Bend:
490 sf

5-7. THRUST FORM IN A MOVIE HOUSE

New Lafayette Theater is a community theater for Harlem. The building was typical of urban movie houses, with maximum area devoted to seating, minimum street exposure and lobby space. In this conversion, intermissions take place in the lively setting of the Room. It is an assemblage of contrasting elements that invites participants to think about the many ways things can be built and to speculate actively about what makes this particular room what it is.

A predominantly Thrust relationship has been established between the trapped performance platform and three distinct segments of seating. One of these segments is a portion of the original movie house seating dish recalling the room's origins and the demolished Lafayette Theater, a bygone cultural landmark. A second segment rides in a ceramic tile boat and the third floats above as part of the expanded metal catwalk bridge system. In combination with backdrops, bountiful lighting positions, runways and actor entries, production directors use all these elements and associations to create presentations involving the entire theater environment with great economy of means. Relatively austere performers' facilities occupy the space below the new stage platform.





NEW LAFAYETTE THEATER c. 350

Project:
New Lafayette Theater

Location:
New York, New York

Date of Const:
1968

Owner:
Robert Macbeth

Architect:
Hardy Holzman Pfeiffer Associates

Uses:
Drama and Musical Drama Performance

Capacity:
300

Form:
Thrust, Open Stage

Adjusted Cost:
$362,500

Gross Area:
11,000 GSF

Net Room Area:
7000 sf

Room Volume:
No Data

Net Backstage:
2400 sf

Net Front End:
Adjoining Building

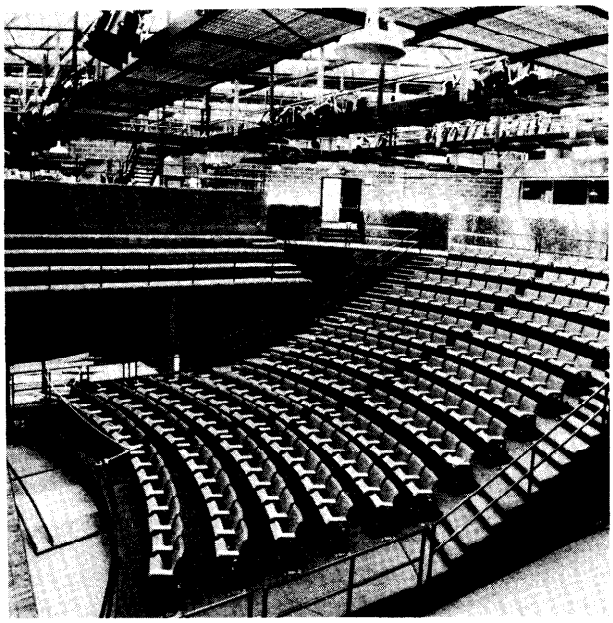
5-8. A MULTI-FORM THEATER

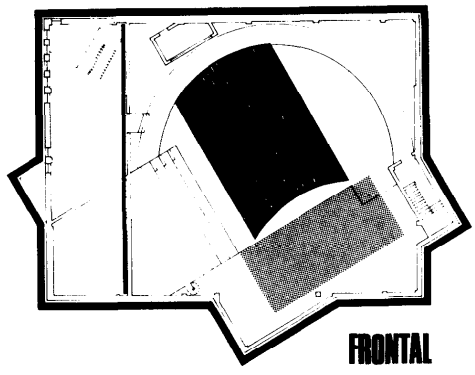
Here is a design solution that appears to contradict one of the fundamental principles emphasized by this Guide–that a Room which seeks to be all things masters none. Olmsted Theater was commissioned by a university to be a laboratory for teaching the basics of theater craft and stage design, beginning with the underlying concepts of audience-performer relationships. The solution was to provide audience seating on modular sections that can be rolled around and cranked up and down while leaving the Stage and related equipment alone. It is an apparatus designed primarily for the performers' experience of various staging situations without complicated or expensive technology. Although resulting sightlines are not always ideal, the "device" functions remarkably well as a theater. It is interesting to note that the full range of potential variations is seldom used for actual productions, which tend to settle on the Frontal or Thrust arrangements.

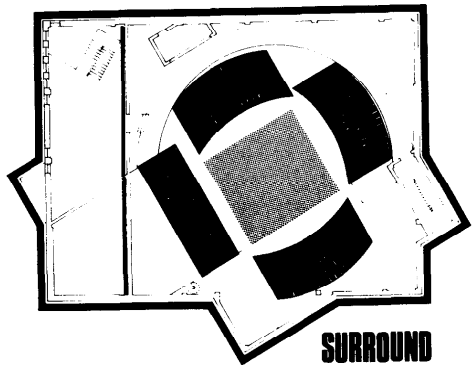
Diagonal orientation was again chosen to create an awareness of enclosing structure around a single space. The masonry box was designed to reject aircraft noise from a major flight path overhead. Work lighting and mechanical systems follow the structural grid, below which an extensive catwalk grid is suspended, rotated 30 degrees for full-coverage theater lighting and rigging. The entire floor can function as stage; there is only one section of fixed seating, elevated for actors and scenery to pass below.

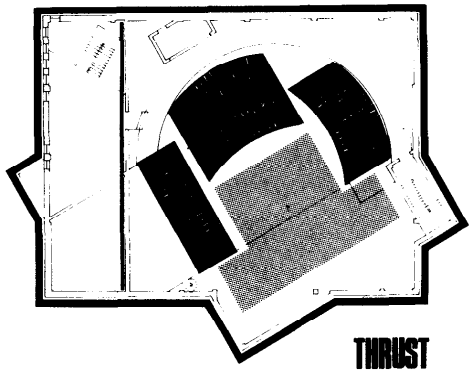
The rolling sections can be locked together and/or to a semicircular track providing upper level audience access. The arcade behind the seating serves sometimes as wrap-around actors' passage, offstage, sidestage or audience cross-aisle. The Stage and double-high shop are located at ground level, both directly accessible from the service receiving yard. The 30 x 65 foot "permanent" Stage has an effective width of 45 feet in Frontal arrangement. Its leading edge and pit zone are fully trapped. Belowstage is devoted to dressing and storage, with a rehearsal classroom under the shop.

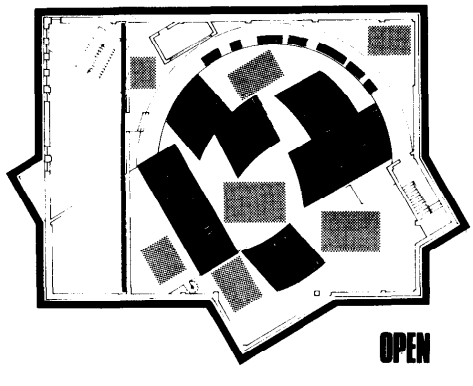
The lobby is entered at ground level under a driveup canopy. The vestibule, angled to improve sound and light interception, leads to a compact multi-level lobby that functions as a stairway. Downstairs a truly spacious public space opens up with a sunken meeting area suitable for impromptu presentations. Half of the area is a sculpture gallery-daylighted, through large plate glass window walls opening to an earth-and-timber amphitheater equal in size to the Room above, yet hidden by the theater's bulk.











Project:
Olmsted Theater

Location:
Garden City, New York

Date of Const:
1974

Owner:
Adelphi University

Architect:
Hardy Holzman Pfeiffer Associates

Uses:
Teaching, Production and Performance of Drama

Capacity:
300

Form:
Variable Frontal, Thrust, Surround

Adjusted Cost:
$1,345,000

Gross Area:
22,000 GSF

Net Room Area:
7000 sf

Room Volume:
198,000 cf

Net backstage:
4900 sf

Net Front End:
5900 sf

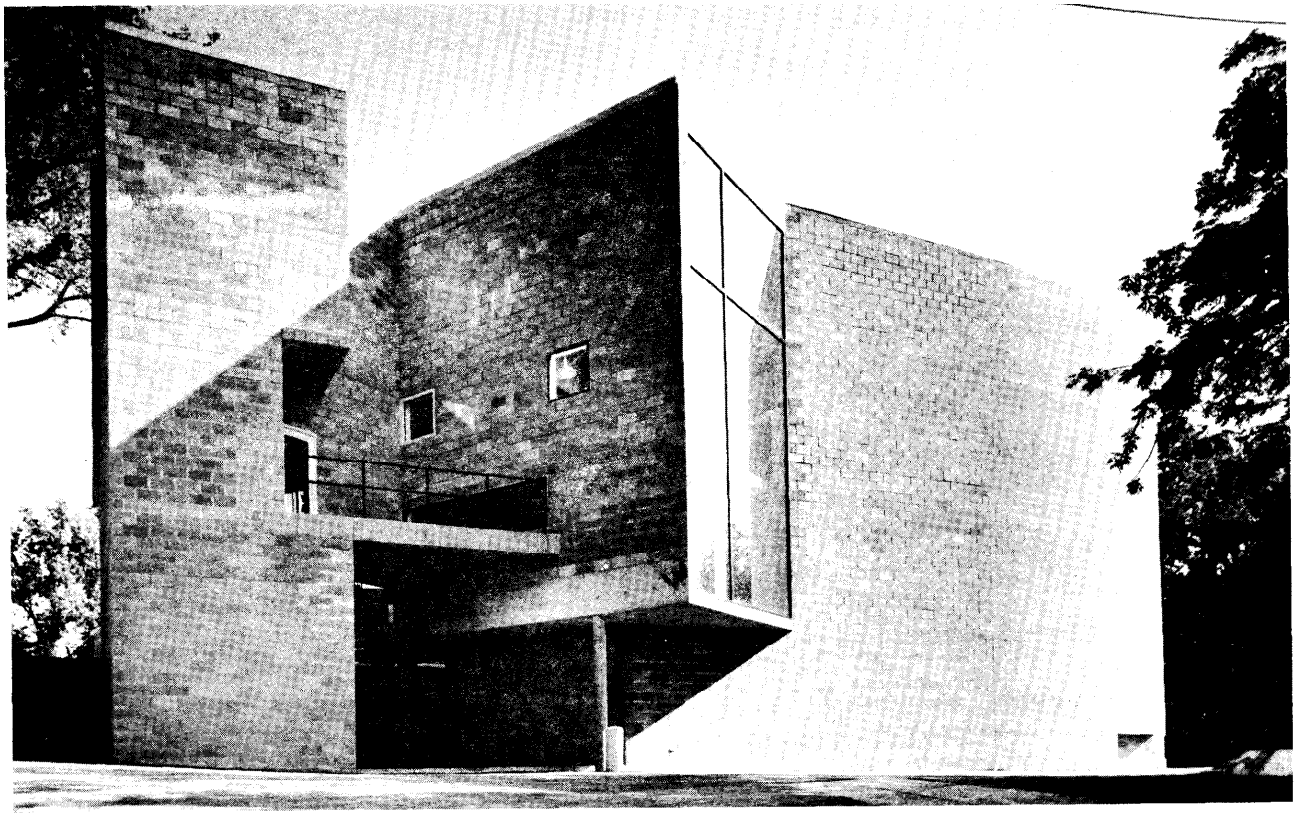
5-9. A LARGER PLAYHOUSE

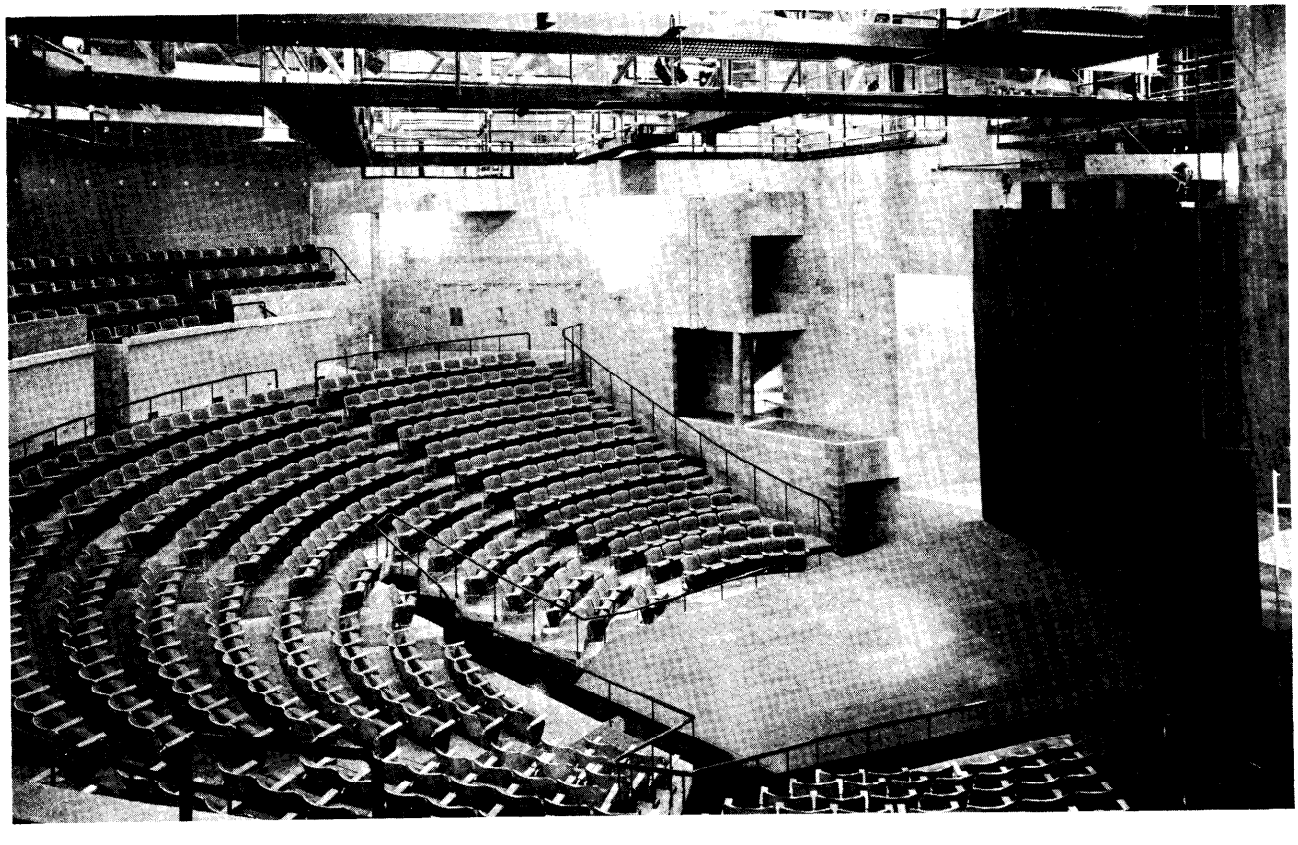
The Robert S. Marx Theater (Playhouse in the Park) in Eden Park is an example of Architect/ Theater Director collaboration. The seating embraces an asymmetrical Thrust Stage, giving the focused "teacup" a multiplicity of interest centers. The classic amphitheater shape contains a maximum optimum capacity with fine sightlines, while its steep slope also delivers a high proportion of direct sound to the audience for heightened intimacy. But the director wanted to maintain the distinction between actors and audience–"actors should be larger-than-life-sized people-"so the Stage was cut off from the seating by a continuous moat that also gave access from any point on its perimeter. Asymmetry increases the tension between audience and performers, and provides opportunities for movement in all sorts of ways. There are 24 distinctly different means to get onto the Stage. Some are provided by the sidewalls, full of holes, projections and levels treated as working extensions of the Stage rather than blank or decorated surfaces.

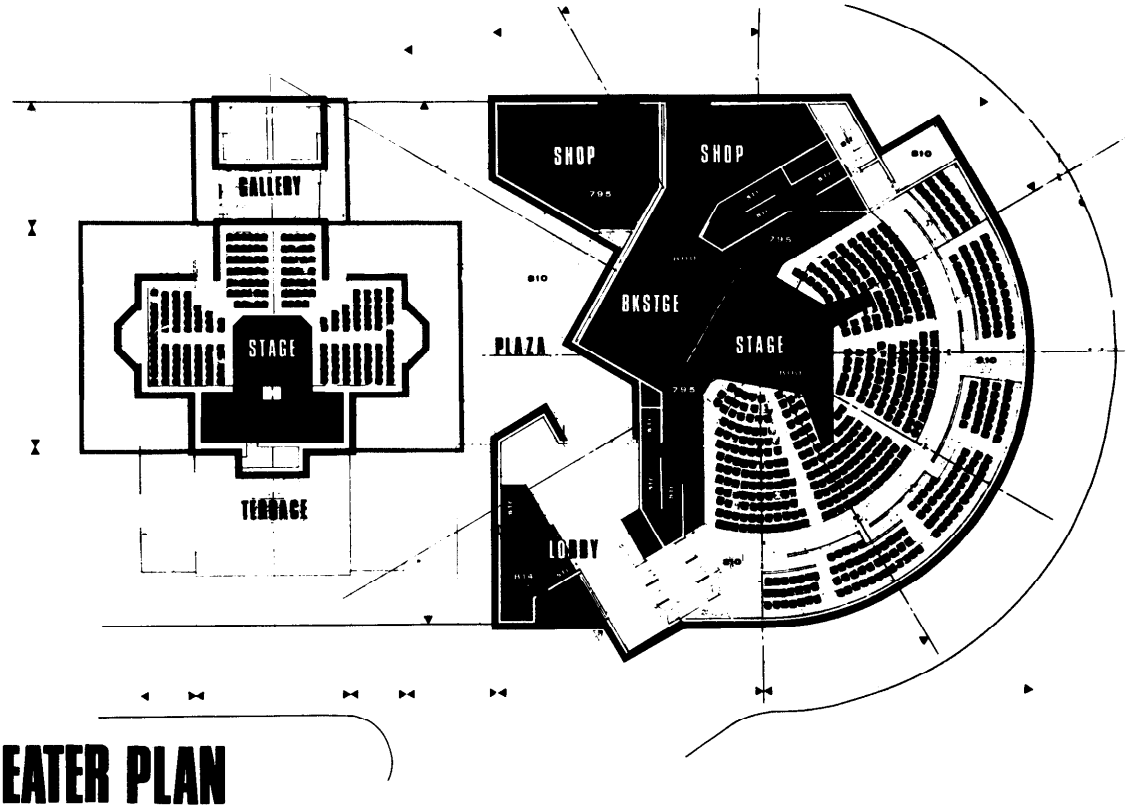
The backwall pivots on a light structural frame that can support scenery or a neutral backdrop or disappear entirely. An extensive catwalk grid covers every lighting angle desired from the house, side angles, overstage and backlighting. Two generous, double-high shops are available, one with direct access to Stage and storage below stage. Other performance support is tucked under the seating dish. It includes dressing for a large cast and a wardrobe workroom.

The five-level lobby is an intricate stairway tying together floor elevations. The entry is from a small plaza shared with the Victorian Playhouse, a former park shelter house. The new building appears small and in scale with its neighbor because the roof slopes down to reduce the lobby wall height. Roof and walls are stainless steel, reflecting the image of the earlier Playhouse and people crossing the plaza. The true bulk of the new building is revealed on the opposite side, because it is sited on a grassy knoll.

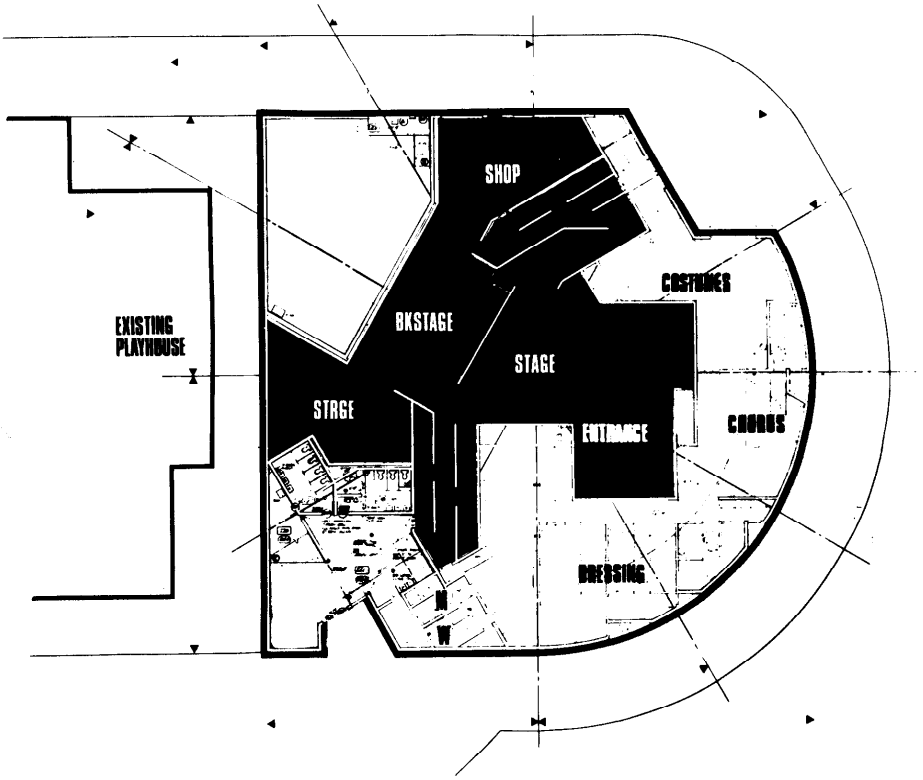
The shelter house was the first theater in the complex. A symmetrical arrangement of 225 seats in three sections with right-angle relationships to the Trust stage was built within the 44-year-old pavilion in 1963. Both production and audience are fixed by the architecture.







THEATER PLAN



LOWER PLAN

Project:
Robert S. Marx Theater

location:
Cincinnati, Ohio

Date of Const:
1968

Owner:
Playhouse in the Park Corporation

Architect:
Hardy Holzman Pfeiffer Associates

Uses:
Production and Performance of Drama

Capacity:
672

Form:
Thrust, Open Stage

Adjusted Cost:
$2,500,000

Gross Area:
28,600 GSF

Net Room Area:
8725 sf

Room Volume:
285,000 cf

Net Backstage:
12,700 sf

Net Front End:
2700 sf

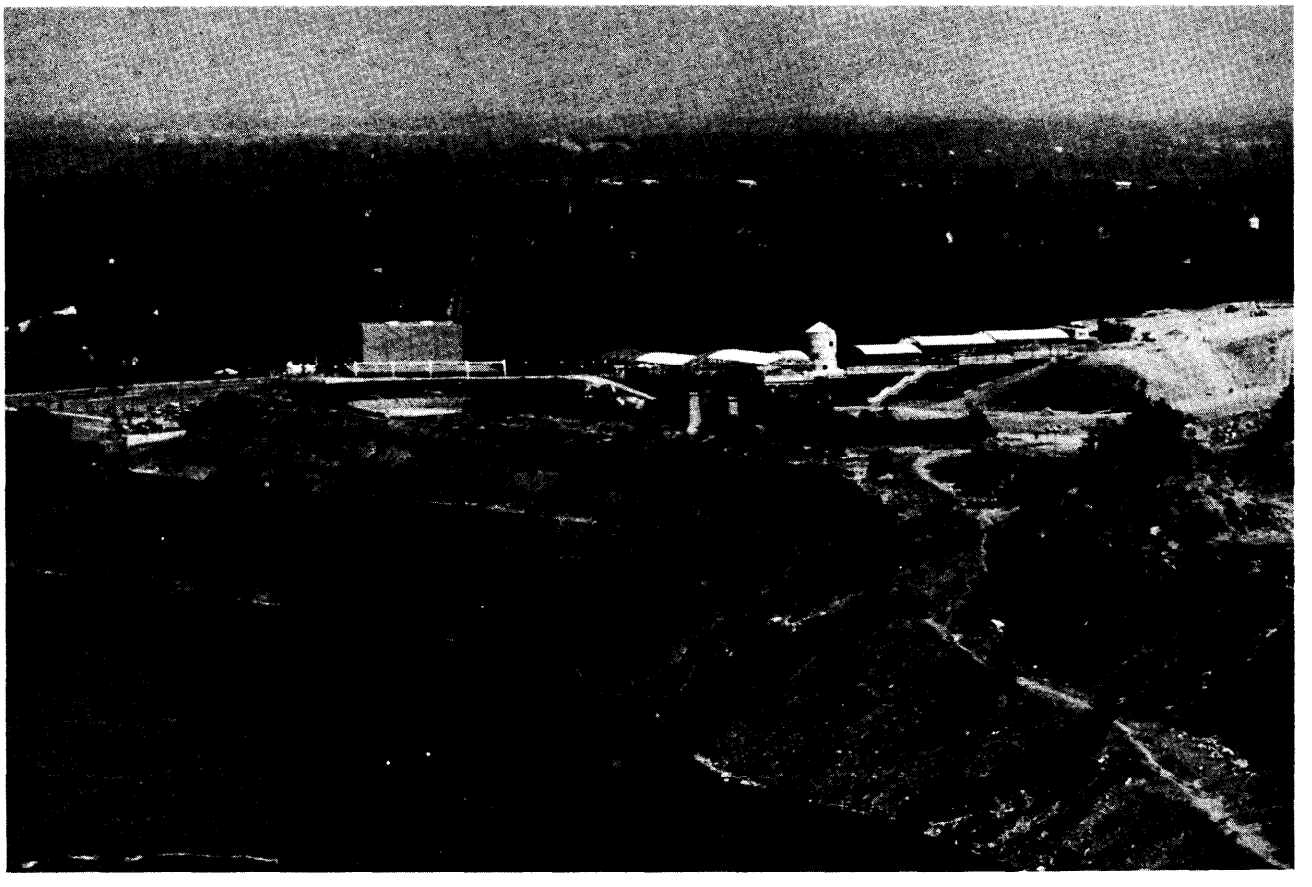
5-10. THE VITAL CONTEXT

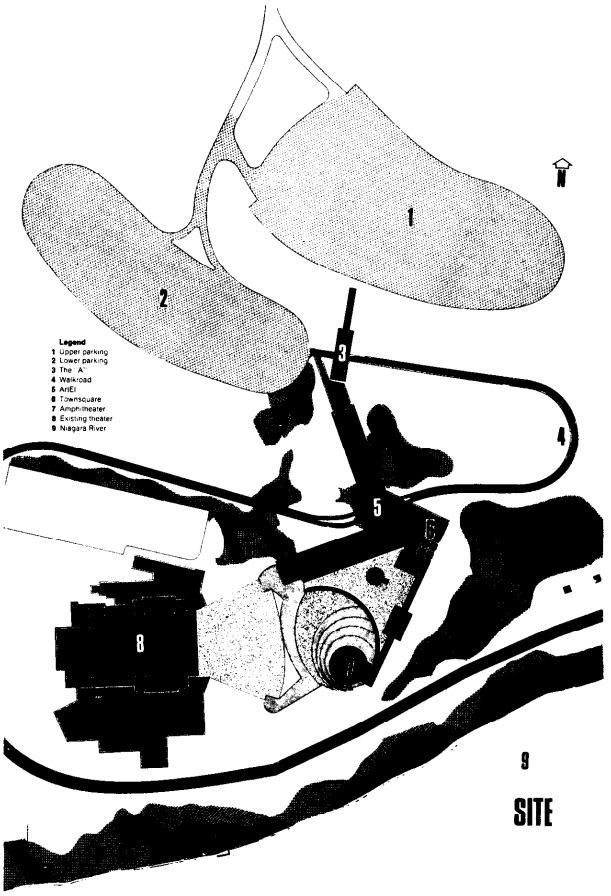
Artpark is cited as a reminder that performing arts cannot survive in a vacuum. On a spectacular site at the edge of the Niagara River Gorge near the small community of Lewiston, New York State built a 2,400-seat summer festival Theater with an outdoor seating lawn to accommodate another 1,500 people. Similar in concept to Wolftrap, it was fully equipped with the latest available technology, and programmed with all facets of the performing arts–classical and popular. The State realized, however, that with no additional activity audiences would be small.

To ensure greater attendance Artpark was developed on an 180-acre landfill and chemical dump adjacent to the Theater as an outdoor cultural center where the public can watch artists and performers at work. Its purpose is to attract and satisfy the widest possible audience, from sophisticated viewers attending matinee and evening productions of ballet and opera to the family-camper tourist.

The activity complex is in three parts: ArtEl, a 500-foot-long, 40-foot-wide L-shaped elevated boardwalk designed to serve as workspace for artists and walkway for theater patrons; a 300-seat amphitheater (a pre-engineered pole-barn contains dressing rooms and storage for mobile stage equipment); and an adjacent brick patio "Town Square". These areas provide a wide range of work and play spaces. The simple amphitheater is occasionally programmed, but continuously active with spontaneous performance before the magnificent natural backdrop.

Although distinct in concept and execution (Artpark was originally considered a temporary expedient), these two major elements of the first State Park developed entirely for the performing and visual arts are mutually supportive during a season which now includes spring as well as summer.





Project:
Earl Bridges Theater/ArtPark

Location:
Lewiston, New York

Date of Const:
1974

Owner:
New York State Parks and Recreation

Architect:
Vollmer Associates (Theater)
Hardy Holzman Pfeiffer Associates (ArtPark)

Uses:
Opera, Symphony and Popular Entertainment (Theater) Impromptu and continuous Drama, Music, Dance, Exhibition and Refreshment (ArtPark)

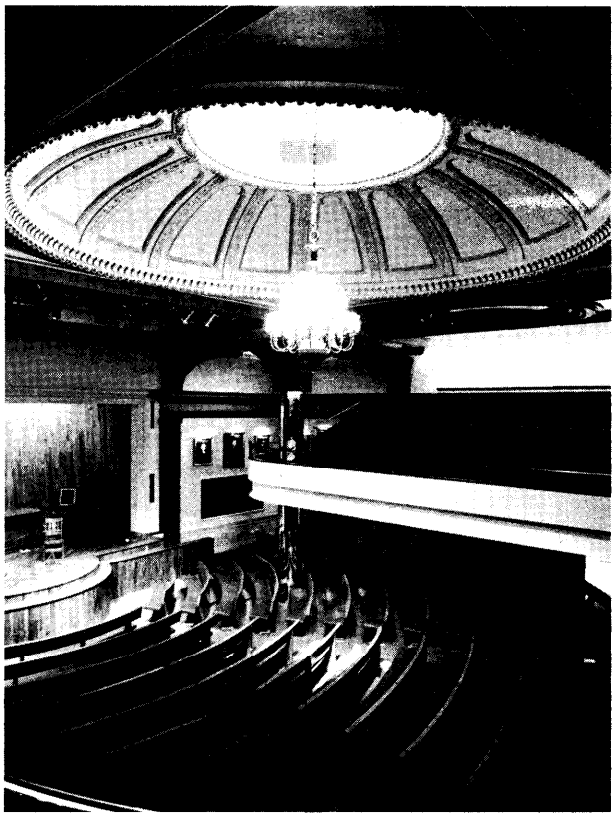
Capacity:
3900 (Theater)
300 (Amphitheater)

Form:
Frontal, with Flyloft and Pit (Theater)
Surround, Open-Air (Amphitheater)

Adjusted Cost:
$10,940,000 (Theater)
I,500,000 (ArtPark)

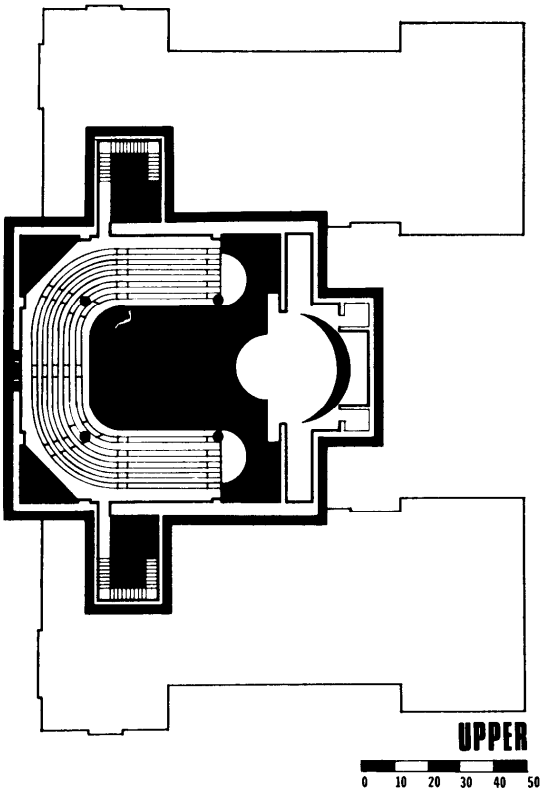
Gross Area:
(ArtPark Only) 34,000 GSF under cover
14,000 GSF amphitheater

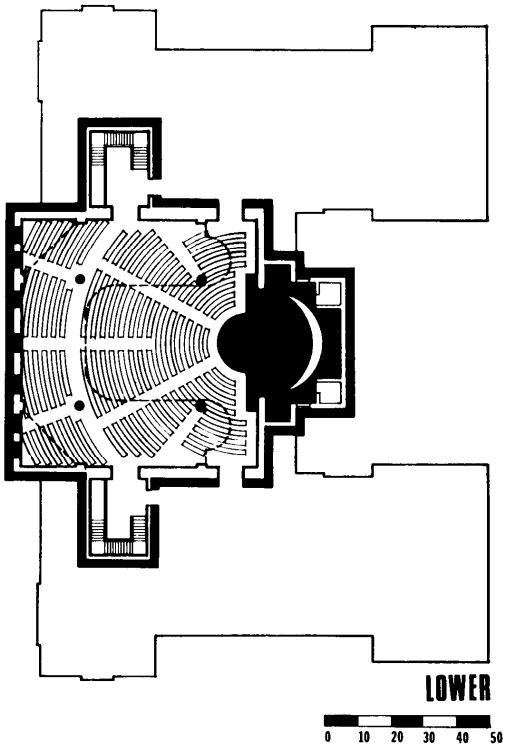
5-11. A RECITAL HALL



Exeter Academy wanted to convert their 40-year-old, 400 seat flat-floor auditorium, Exeter Assembly Hall, into a space that could be a theater, a recital hall and an assembly hall and at the same time keep the renovation within the existing walls. They couldn't have it all and in the end, the recital hall won.

The old Room had character, but no direction. The audience is now seated on benches in a focused, slightly raked pattern around the redesigned platform. The bench seating, besides recalling the old assembly hall, reduces the absorptive value of the audience. A U-shaped balcony floats overhead, near the richly coffered and moulded plaster ceiling; the roof was raised slightly at the perimeter for headroom. In order to improve direct energy (and to discourage the hall's use as a theater) a permanent wood backdrop soundboard was built and the Stage reshaped for small groups. Modest concert lighting has been installed, and portrait lights cast a warm glow. The Room retains its dignity, but it has become intimate.





Project:
Exeter Assembly Hall

Location:
Exeter, New Hampshire

Date of Const:
1969

Owner:
Phillips Exeter Academy

Architect:
Hardy Holzman Pfeiffer Associates

Uses:
Music Recital and General Assembly

Capacity:
1100

Form:
Frontal

Adjusted Cost:
$1,309,000

Gross Area:
13,000 GSF

Net Room Area:
10,000 sf

Room Volume:
195,000 cf

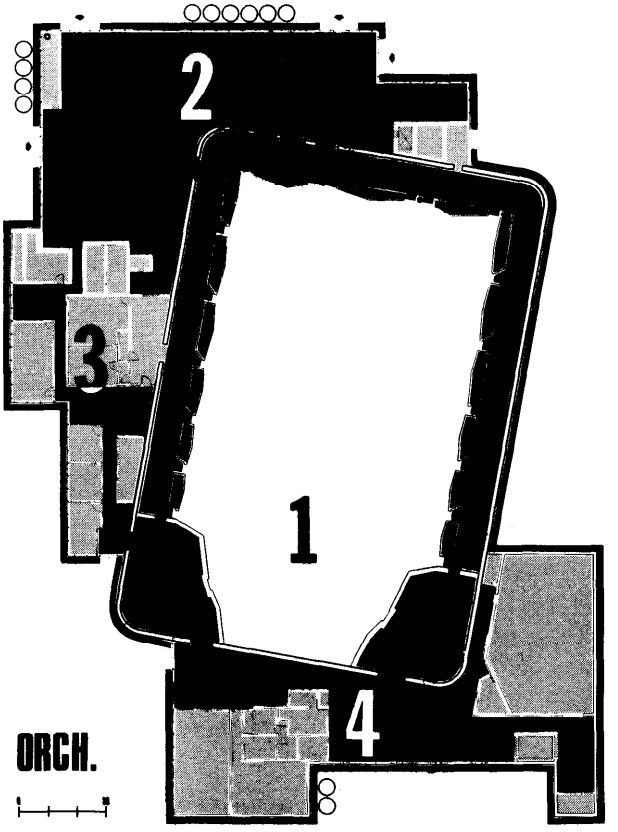
5-12. A TRADITIONAL CONCERT HALL

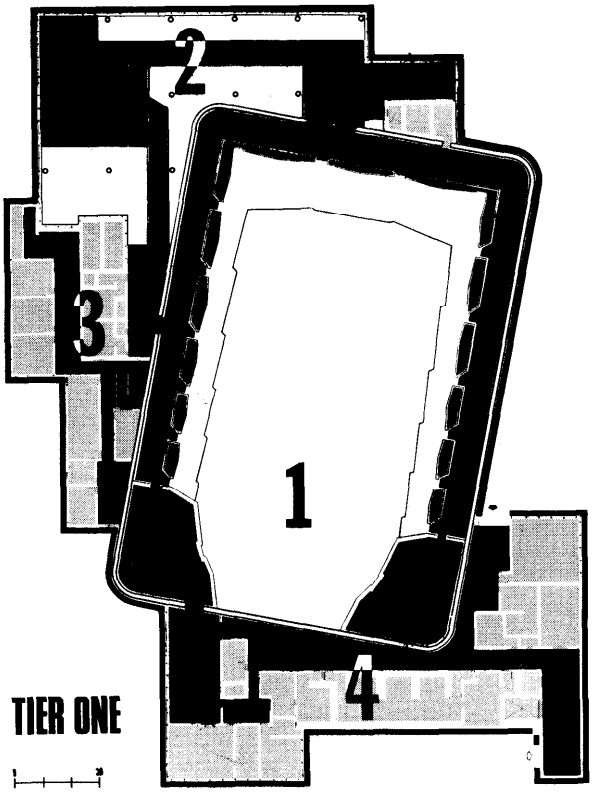
Orchestra Hall exemplifies the traditional approach to concert hall design. It is patterned after a succession of halls harking back to the Leipzig Gewandhaus and Musikvereinsaal in Vienna. The owners required acoustic excellence take precedence over all other considerations.

Traditional halls make use of boundary surfaces to realize acoustic criteria. The orchestra speaks directly into the Room from an unyielding reflective enclosure. Modelled surfaces throughout the hall help diffuse and distribute sound in certain predictable ways. Successive fine-tuning of each new hall has consequently resulted in a number of Rooms very similar in proportions and architectural character, visually grand rather than intimate. An attempt was made at Orchestra Hall to visually shorten the Room by bringing the ceiling pattern down behind the musicians and by segmenting the shallow side balconies.

Typical detail approaches employed here are massive box-within-box construction for noise exclusion, (the entire structure is separated from adjoining construction by a one-inch gap). The audience is urged to leave absorptive wraps in lockers lining the perimeter corridor, which in turn is surfaced on four sides with carpet. Every surface angle was tested in a large scale model to ensure even distribution, using mirrors and a light source. On-site supervision and daily testing during construction resulted in an acoustically acclaimed Hall.

The expense entailed for an excellent Hall curtailed budgets for public, administrative and performers facilities. But the resulting austerity is a lively contrast. The lobby became a large bright volume laced with gangways and stairs from which people could see and be seen during intermission. The musicians' quarters are small but comfortable. Most rehearsals take place in the hall, but there are backstage dressing rooms, lounge, Green Room and a sectional rehearsal space. Offices for the fund-raising and subscription auxiliaries are also accommodated.





Project:
Orchestra Hall

Location:
Minneapolis, Minnesota

Date of Const:
1974

Owner:
Minnesota Orchestral Association

Architect:
Hardy Holzman Pfeiffer Associates (design)
Hammer Green and Abrahamson, Inc. (construction)

Uses:
Orchestral Concerts, Resident Symphony

Capacity:
2540

Form:
Frontal

Adjusted Cost:
$11,225,000

Gross Area:
108,700 GSF

Net Room Area:
22965 sf

Room Volume:
650,000 cf

Net Backstage:
18,800 sf

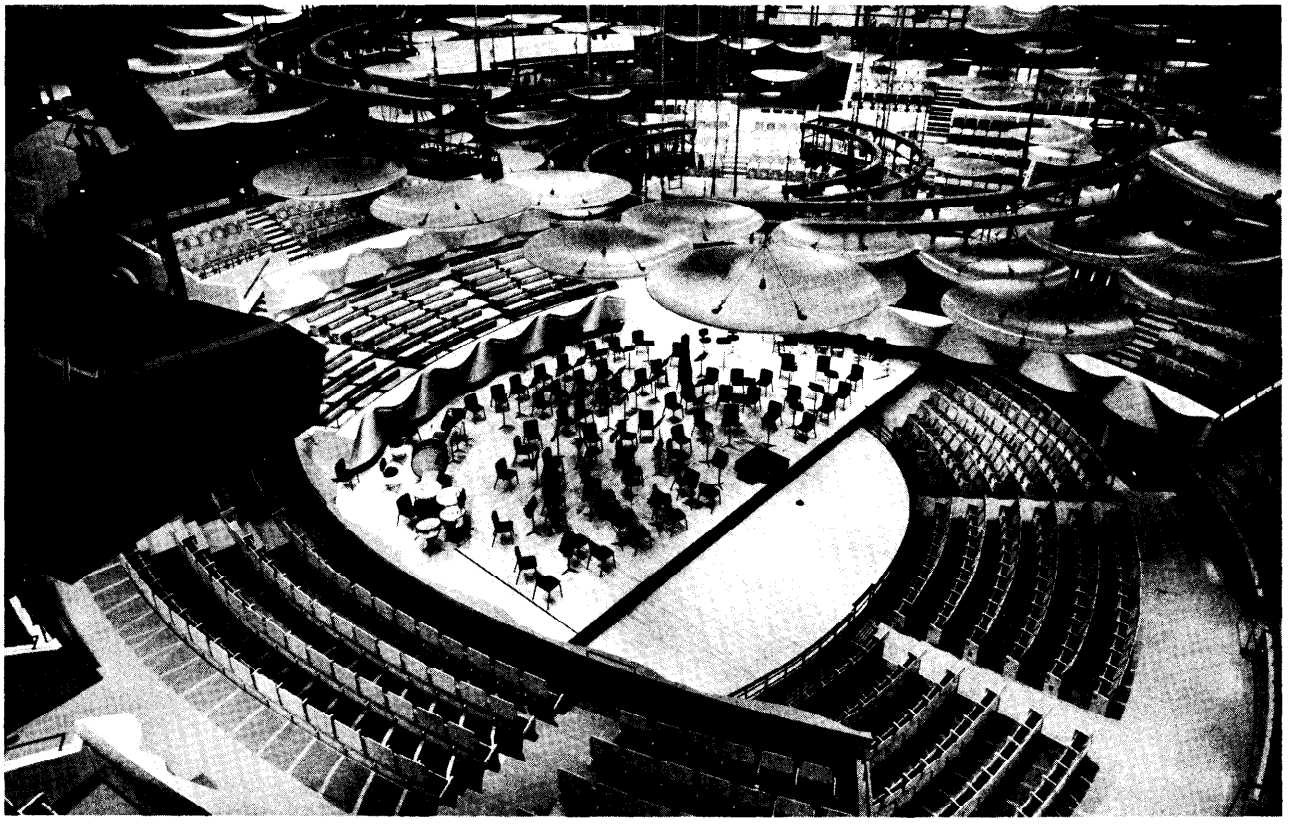
Net Front End:
39,850 sf

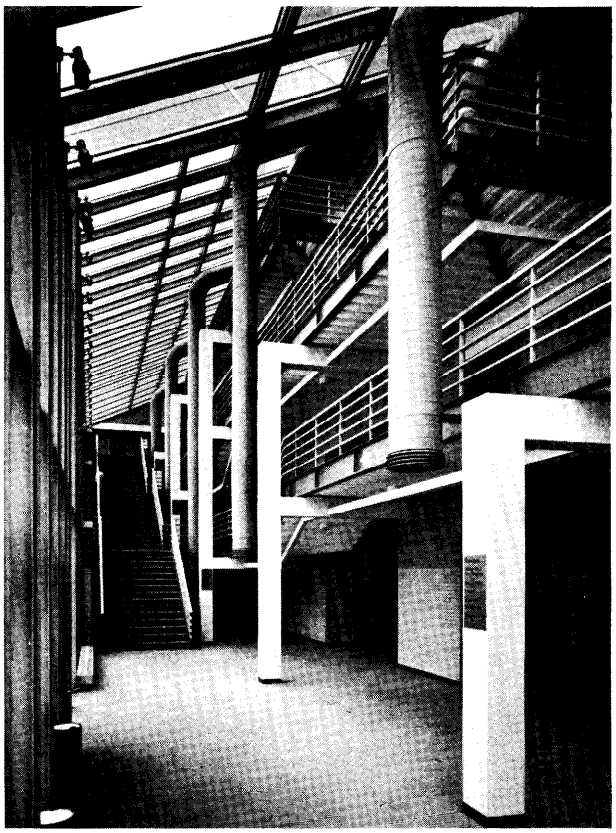
5-13. A SURROUND CONCERT HALL

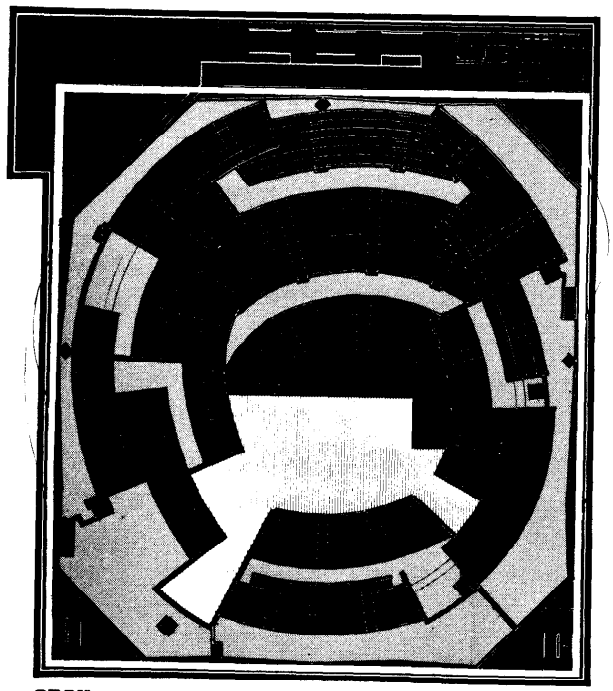
A Surround hall changes the relationship of performers to both the audience and the boundary enclosure, and must therefore realize acoustic criteria by different means. At Boettcher Concert Hall sound emanates from the orchestra in all directions, requiring a canopy over the orchestra to provide early reflections to the audience and balance and blend sound on Stage. The canopy reflectors must be relatively near the audience; some other means is needed to enhance reverberant contribution. Boettcher Concert Hall uses a coupled chamber under the stage to add to the reverberant field in the vicinity of the stage. The large volume overhead also compensates for the rapid dissipation and absorption of energy. Specially designed chairs shield the audience.

Boettcher is noteworthy for its visual intimacy, discussed in Section 5-3, and for the owner's decision to lavish effort on making an exciting humane experience of the Room. Eighty percent of the audience is 65 feet or less from the musicians, and no seat more than 85 feet away. The design goal was informality; there is an abundance of open space and ways to move about within the Room. By contrast, the entry lobby is spare.

Performance support facilities, include a two-part elevator pit, choral seating, piano standby, technical control and broadcast booths all immediately related to the stage. The owners did not rule out new forms of presentation, popular shows and semi-theatrical events when they described the performance types anticipated. Below the terraced seating, a full complement of preparatory facilities has been furnished: musicians' dressing, showers and warm up, artists' lounge and stage door, conductor's and guest artists' suites, concert masters and stage manager's quarters, string, brass, and woodwind warmup rooms and, small practice rooms, score library, storage area, separate piano storage, general receiving and trunk storage, and visitors' dressing associated with a large rehearsal room.







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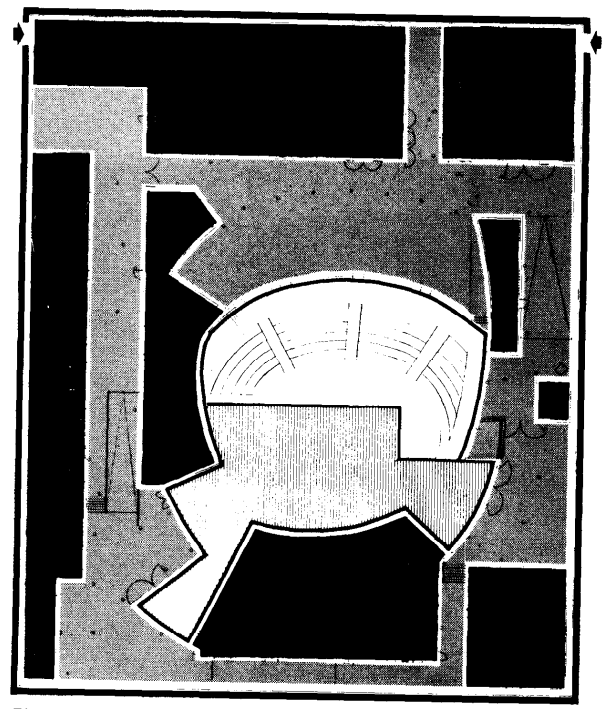
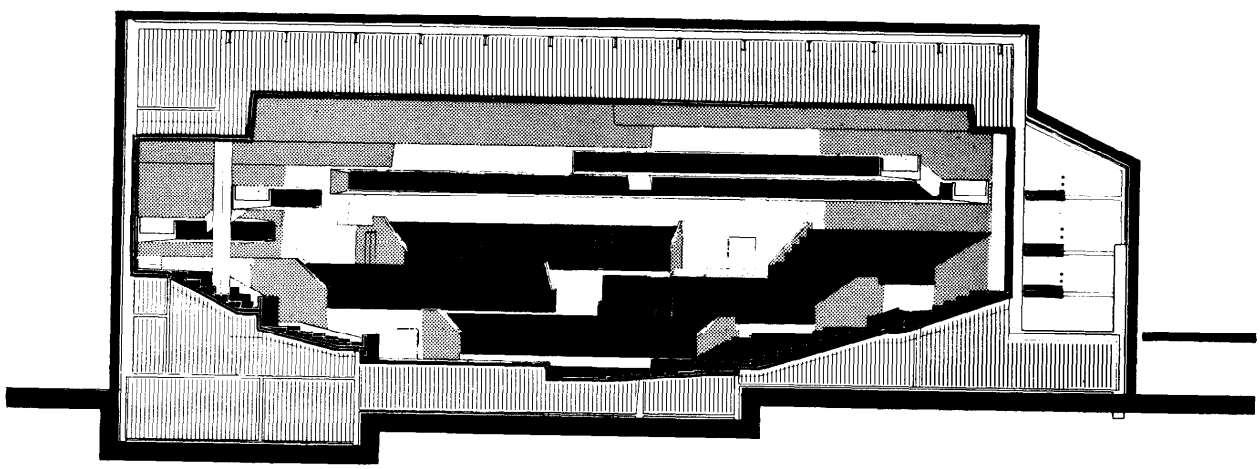


SUPPORT



SECTION

Project:
Boettcher Concert Hall

Location:
Denver, Colorado

Date of Const:
1978

Owner:
Denver Center for Performing Arts

Architect:
Hardy Holzman Pfeiffer Associates

Uses:
Orchestral Concert, Plus Opera Recital and Popular Entertainment, Resident Symphony and Touring Shows.

Capacity:
2750

Form:
Surround

Adjusted Cost:
$12,400,000

Gross Area:
138,000 GSF

Net Room Area:
34,750 sf

Room Volume:
1,100,000 cf

Net Backstage:
21,000 sf

Net Front End:
33,500 sf

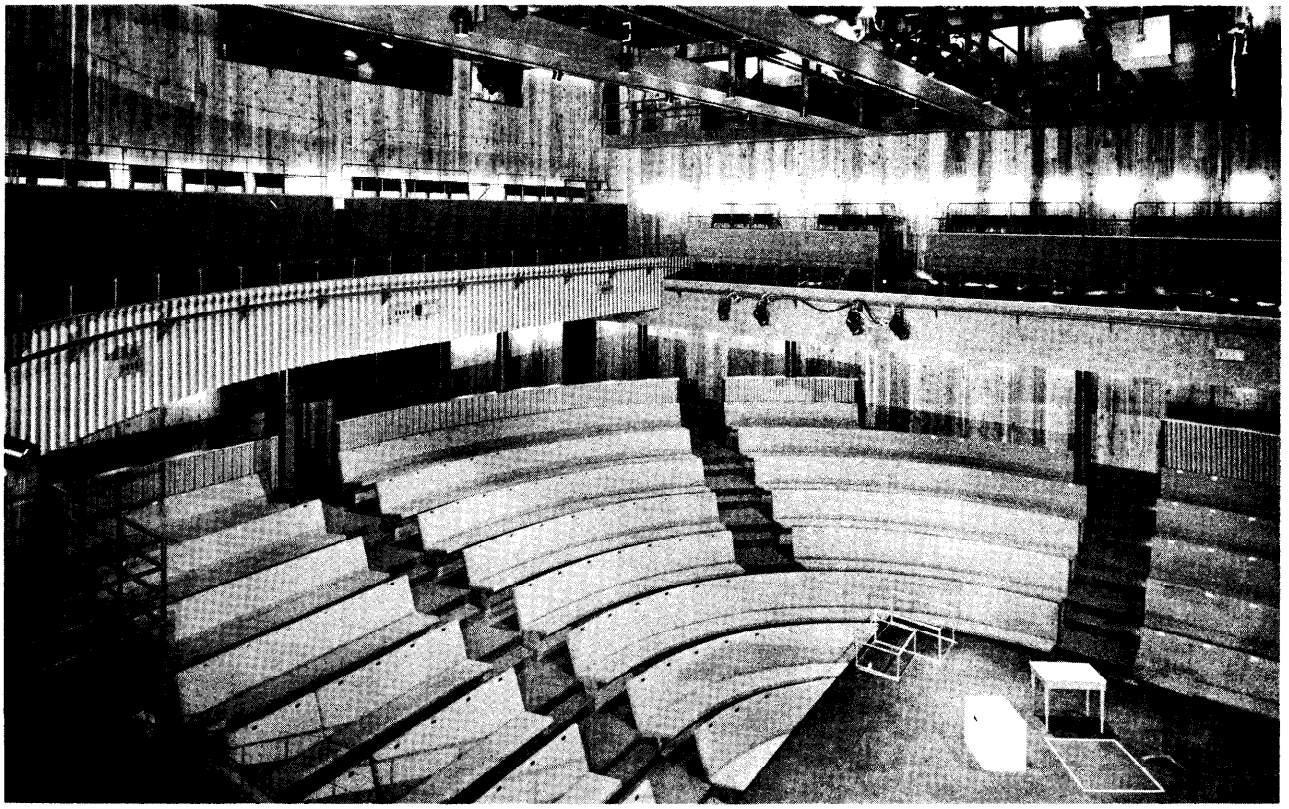
5-14. TWO DUAL FACILITIES

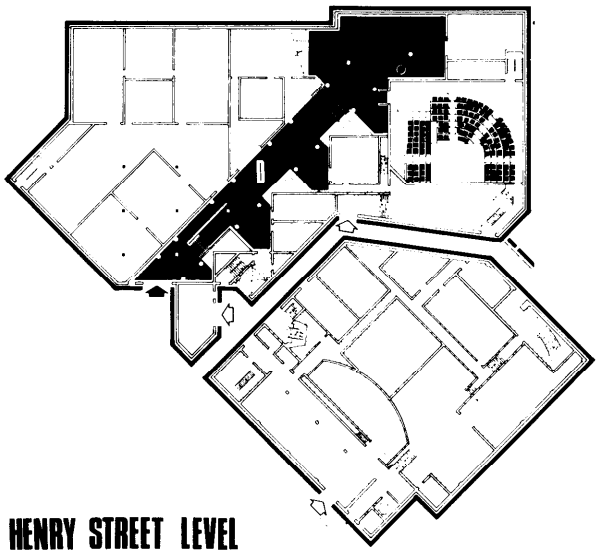
While symphony halls and civic centers have no direct relationship to probable Army Music and Drama Centers in scale, the architectural solutions illustrate program conditions and design tasks found over a broad range of endeavor. In these last examples, the programmers determined it was important to have two Rooms, large and small, to meet the demands of respective communities. For both, the large Room is a multi-use proscenium-and-flyloft space allied with a smaller open stage theater. The first example-the conversion of a complex of adjoining buildings-highlights some of the needs addressed by the second, all-new facility.

Madison Civic Center's downtown site consists of a 1920's movie palace, neighboring street front commercial shops (razed for new construction) and a 1941 Montgomery Ward department store. A multi-level lobby has been carved between the department store and the theater where skewed structural girds meet. The Ward store is now an Art Center; across the way are the two theaters.

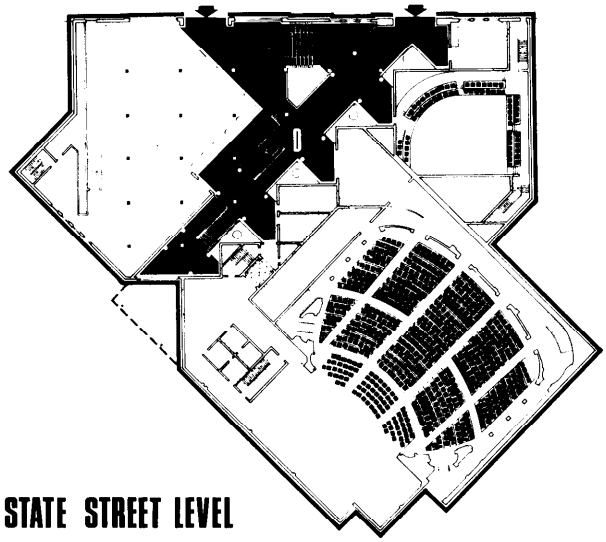
On the house side the Capitol theater has been restored and refinished, including 3500 new seats that are wider and further apart back to back. The seating capacity is the same, shifted proportionately from orchestra to balconies for better drama sightlines. The major change occurred in the stagehouse, originally about 20 feet deep, with a shallow pit for 20 to 30 musicians. To create a drama theater, the backwall was pushed out 15 feet, and four rows of seating were removed to make way for a 20 x 56 foot hydraulic pit lift from the basement loading level: 1900 SF. of wing space were added stage left. Other additions include dressing rooms, rehearsal room, loading doors to the pit lift and backstage elevator, and 1900 S.F. of administrative offices. Space could not be found for construction shops and storage.

The 370 seat Thrust theater is located behind the rear wall of the large house, where it shares a service alley tunnel at basement level. The small Room accommodates productions ranging from children's theater and puppet shows to modern intimate drama lending diversity to the Civic Center's program offerings and audience profile.

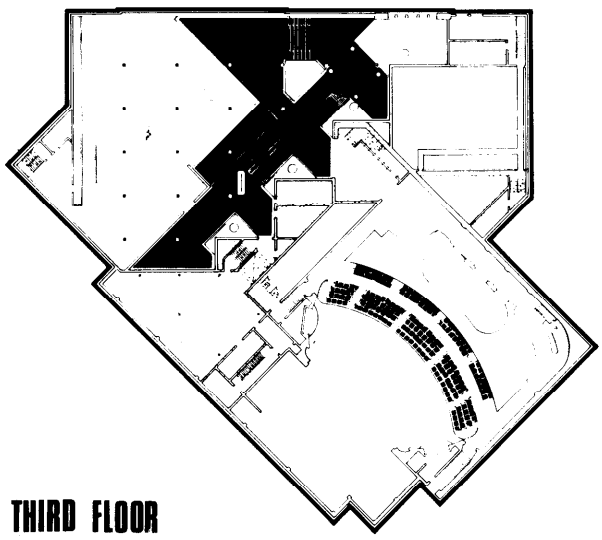




HENRY STREET LEVEL



STATE STREET LEVEL



THIRD FLOOR

Project:
Oscar Meyer Theater and Isthmus Playhouse, Madison Civic Center

Location:
Madison, Wisconsin

Date of Const:
1980

Owner:
City of Madison

Architect:
Hardy Holzman Pfeiffer Associates

Uses:
Orchestra, Opera, Ballet and Popular Entertainment (large room); Intimate Drama, Music and Dance Recital (small room)

Capacity:
2100 (large room)
370 (small room)

Form:
Frontal with Flyloft and Pit (large room)
Thrust, Open Stage (small room)

Adjusted Cost:
$8,025,000

Gross Area:
142,000 GSF (includes 37,500 GSF Art Center)

Net Room Area:
20,800 sf (large)
4000 sf (small)

Room Volume:
No Data

Net Backstage:
21,500 sf

Net Front End:
37,300 sf

The Eugene Performing Arts Center started with a two-block downtown site consolidation which was leveled for construction of its theater center, convention center, hotel, commercial space and parking.

Fund-raising began in the early 60's. A feasibility study was conducted to evaluate population and income trends, needs and preferences, user groups, existing facilities and the economics of their operation. These investigations confirmed and supported the program directions.

Most local users wanted an intimate concert hall, but both the economics of income-producing touring events and the criteria for orchestral acoustics favored a 2400-2500 seat house. The goal was to create an intimate room of this capacity. Several alternative capacities and basic forms were evaluated for the 500-seats, multi-use drama theater. Versatility was desired, so a basically Frontal room of the most-valued capacity was chosen. However, its solution would have a demountable false proscenium and be capable of modified Thrust arrangement by decking over the first 100-150 seats.

Lobby and public space joining the two serves as the front door to the whole project and must reflect the regional character. Shared backstage and support facilities might serve other uses as well.

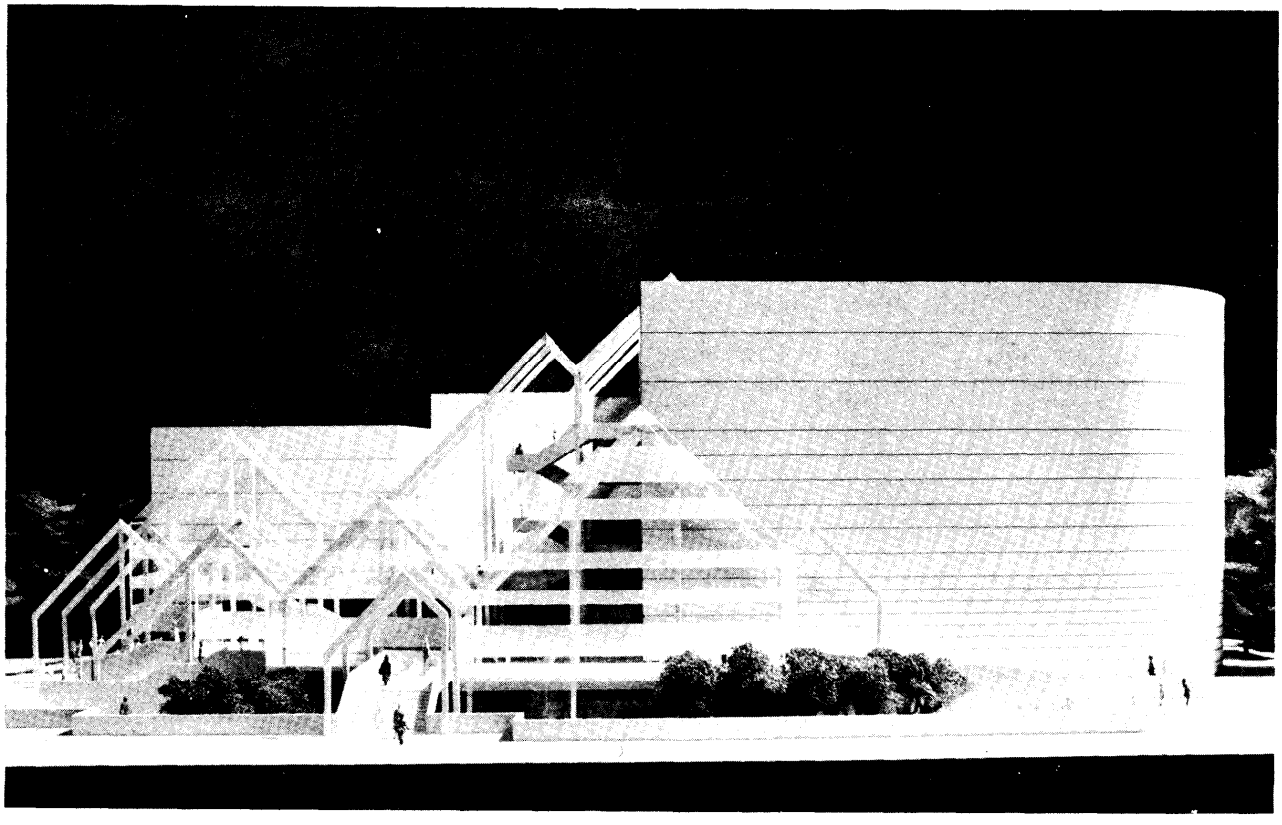
The concept of shared facilities was key to promoting community support and technical development while avoiding duplication of facilities. Sharing public spaces with the street has a healthy effect on local businesses and on the image of the Center. It was expected that rehearsal rooms might be shared by various kinds of performing groups and with the community as meeting rooms and small performance spaces. The spaces were designed to permit these performances in future, but the budget was not.

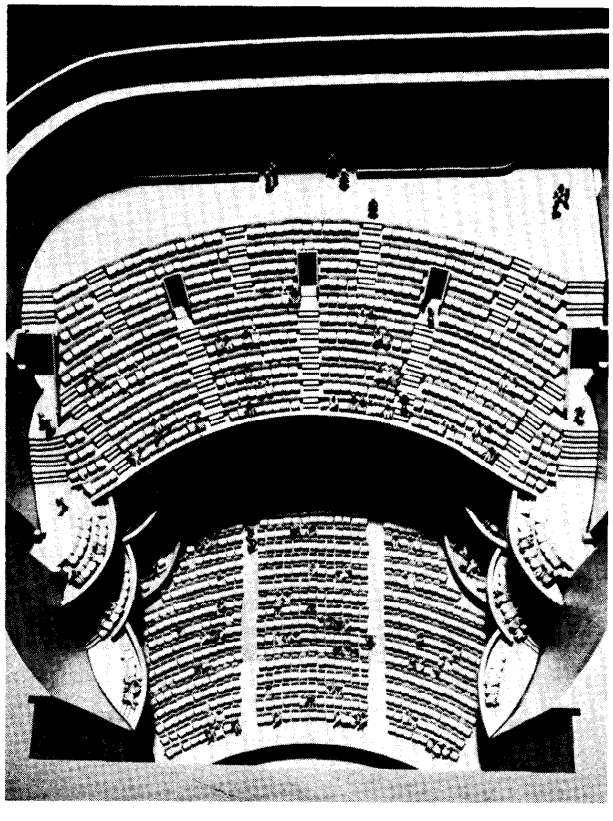
Backstage support is designed to be shared by the various performing groups to be expected in a multi-use facility. Several kinds of dressing facilities are available, some best suited to musicians' needs, some for actors'. Children can be separated from adults. There is a guest star's suite, five private dressing rooms and five rooms for 6-8 people in addition to musicians' warm-up and individual practice rooms. Large and small Green Rooms are associated with respective theaters, in addition to actors' and stage crew lounges.

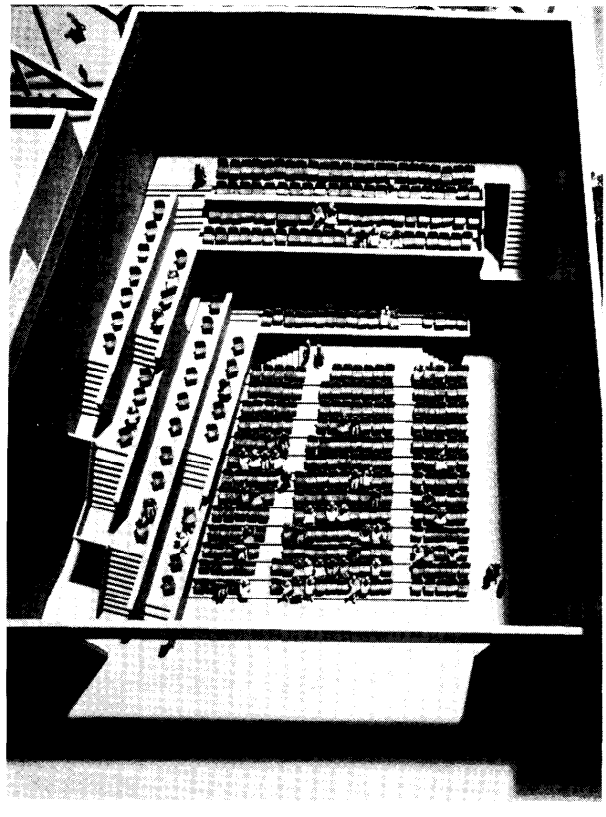
A common receiving dock and stage door serves both theaters. However they do not share stage floor elevations. The loading dock is at the level of the larger stage, from which a large freight elevator services the higher stage of the small theater. Two 45-foot trailers are sheltered at the dock.

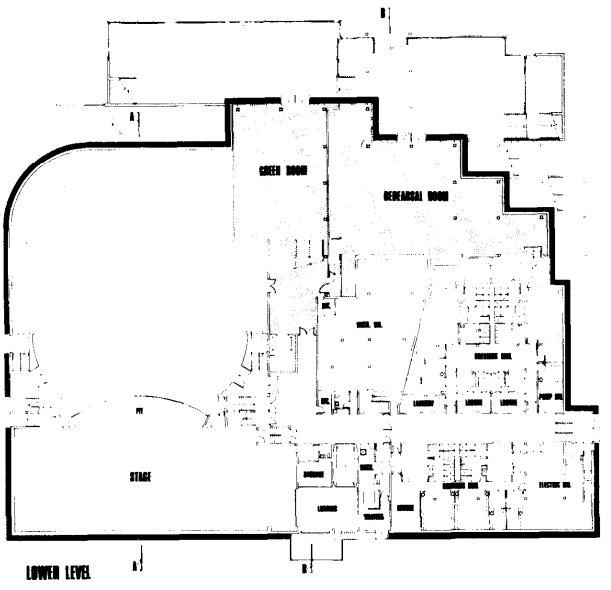
In the larger Room the stagehouse is equipped with 75-100 single purchase sets. Multi-use demands a demountable orchestra shell and motorized canopy, mechanized film projection screen and projection room in addition to sound, lighting and broadcast control booths. The stage will be fully trapped, operated by two moveable hydraulic lifts below stage.

Finally, the audience seating is dished at orchestra level, with wrap-around ledge of steeper rake at the rear. The mezzanine extends toward the stage in a series of descending boxes while the steepest balcony, in two stages of rise, overhangs the mezzanine. The sum effect is that of a short Room, hollowed out of the main volume above the orchestra. Unequal radii and reversing curves create a special, sinuous and intimate environment. The balconies do not project from the walls but through them. Perimeter circulation is within the room, just beyond a large-scale loggia of arches that embraces the total space, making its boundaries seem closer and of the same fabric as the proscenium arch.

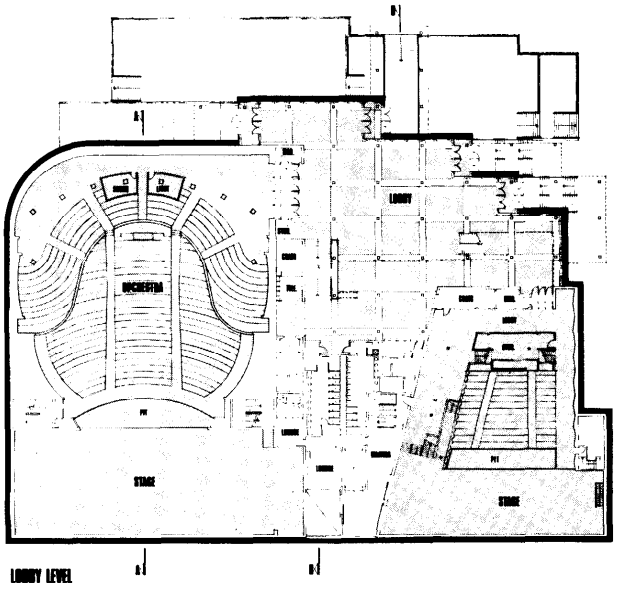




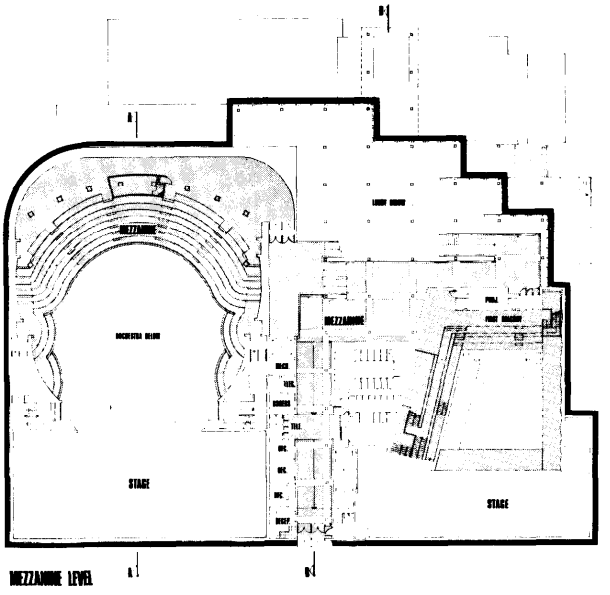




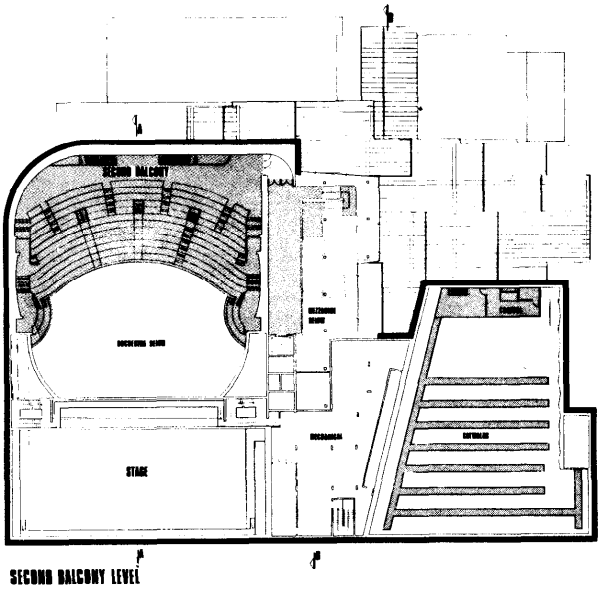
LOWER LEVEL



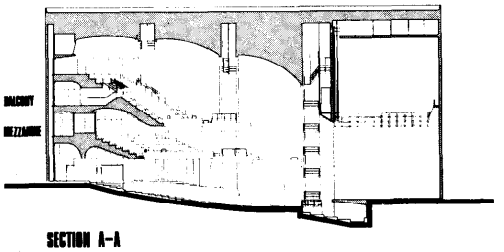
LOBBY LEVEL



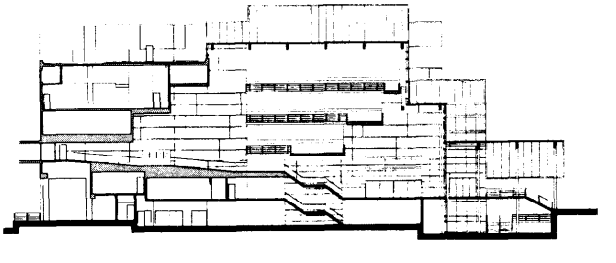
MEZZANINE LEVEL



SECOND BALCONY LEVEL



SECTION A-A



SECTION B-B

Project:
Eugene Performing Arts Center

Location:
Eugene, Oregon

Date of Const:
1982

Owner:
City of Eugene, Oregon

Architect:
Hardy Holzman Pfeiffer Associates

Uses:
Music Concert (large room) Drama (small room), Plus Opera, Musical Theater, Dance and Popular Shows At All Scales.

Capacity:
2400 (large)
500 (small)

Form:
Frontal with Skylight and Pit (large)
Frontal, Open Stage (small)

Adjusted Cost:
$16,350,000

Gross Area:
126,000 GSF

Net Room Area:
32,130 sf (large)
7665 sf (small)

Room Volume:
660,000 cf with shell (large room)

Net Backstage:
23,000 sf (both)

Net Front End:
24,000 sf (both)

United States Army

Office of the Adjutant General

Program Manager for Music and Drama Centers	Margaret Lynn
Assistant Program Manager	Michael Ireland

Corps of Engineers

Project Architect	Robert G. Shibley
Chief of Special Projects	Richard Cramer
Chief of Architectural Branch	Thomas M.A. Payne

Hardy Holzman Pfeiffer Associates

Project Manager	Kurt Kucsma
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