THE CONSTRUCTION AND EQUIPMENT OF THE SECONDARY SCHOOL INSTRUMENTAL MUSIC UNIT

by

MARVIN LEE DOWNIE

B. M. E., Bethany College, 1948

A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Education

KANSAS STATE COLLEGE
OF AGRICULTURE AND APPLIED SCIENCE

1953

TABLE OF CONTENTS

INTRODUCTION

The purpose of this study was to provide a source of information concerning the construction and equipment of an instrumental music unit in a secondary school. In the present era of large enrollments and consequent new construction, many planners have not been aware of the problems of the music director and have not successfully estimated the many sources of irritation which place limits upon his teaching accomplishments. This material has been collected and presented in the hope that it will be useful to those planning new buildings or remodeling the instrumental music facilities in existing ones.

THE PROBLEM

The problem was to collect available data and information relative to planning and equipping an adequate instrumental music facility for a secondary school and to present such material in the form of useable recommendations which would be helpful to school people in building new instrumental music units or remodeling old ones. The necessity for such a study was obvious upon observation of units now in use. A definitive work which is adaptable to one area of the country may prove inadequate in another area, therefore, an instrumental music unit which reflects the needs of Kansas schools was conceived, studied and constructed.

METHOD AND PROCEDURE

Available literature in the fields of architecture, music, education and acoustics was reviewed, practicing music directors were interviewed, and the writer's practical experience was drawn upon to determine standards. Several bulletins from the National Education Association Research Division contained valuable information from various state education offices and city school systems. Actual music units were compared with accepted standards, and weaknesses were pointed out. Diagrams pointing up the efficiency of several recommendations, were made. A final diagram (Plate VI) served as a visual recommendation supplementing written recommendations. Conclusions were drawn and final recommendations were made which, it is hoped, will be helpful to those concerned with planning and equipping instrumental music units in secondary schools.

COMMON ERRORS IN PLANNING MUSIC ROOMS

Instrumental music rooms of today and of years past reflect many serious oversights in planning. A review of these mistakes should prove helpful when considering improvements. Many schools are guilty of one or more of the following mistakes:

1. Assignment of ordinary classrooms for music instruction without consideration of flexibility.

2. Remodeling of ordinary classrooms for music purposes without thought for convenience, interference, sound acoustics, or health.

3. Construction of expensive music rooms which lack adequate planning with regard to structural insulation, placement of heat and air ducts, and selection of acoustically satisfactory material for walls and ceilings.

4. Location of music classrooms, the music library, and instrument storage facilities in areas not adjacent to the auditorium stage.

5. Design of auditorium for beauty without thought of function.

6. Use of gymnasiums as music rooms with no provisions for acoustical treatment, conflicts in schedules, or equipment storage.

Facilities provided through this type of thinking cannot effectively provide an adequate learning environment. Standards must be provided for an effective instrumental program.

The classroom of the future should be designed for the aural as well as the visual sense of both teachers and students. Good rooms can be built at little or no more cost than those that are unsatisfactory if requirements are known prior to construction.

Problems to be considered in planning and equipping adequate music rooms include:[1]

---

[1]Clarence J. Best, Music Rooms and Equipment, p. 5.

1. Production of high caliber music with a minimum of disturbance to other classes.

2. Need for optimum visibility. Members of music organizations must see two and sometimes three areas simultaneously for entire class periods (music notation, words, and the director). Therefore, groups should be on terraced floor sections facing director's podium.

3. Storage facilities for privately owned instruments. Instruments furnished by the school should also have adequate storage space.

4. Proper location. School musical organizations are frequently called upon to perform at school assemblies, concerts and other gatherings in the school auditorium. The ideal location would be near the auditorium stage with instrument storage between.

5. Optimum ventilation. Performance in band, orchestra, ensembles or solos involves some degree of physical exertion; therefore, good ventilation is necessary. Windows should not open on a court upon which other classroom windows open. Heat and air-conditioning ducts should be included.

6. Uniform lighting. Notes are quite small and eyestrain will result in a short time unless adequate lighting is arranged. A special problem results from the irregular seating arrangement and a possible glare from window area.

7. Adequate floor space. The volume of sound produced by combined instruments of a band or an orchestra requires a larger area than an average classroom. A space allotment of fifteen square feet per member is recommended for music classrooms, with floor space of at least eighteen square feet per person for orchestra and band, plus room for aisles, piano, conductor's stand and other furniture.

8. Acoustical engineering. The music room is a musical instrument of major importance from an acoustical point of view. It can deal with the music produced in it with high fidelity or it can seriously impair intelligibility, quality, quantity, balance, and blend of tone, depending upon its size, shape, material and construction. Careful acoustical planning must, therefore, be exercised in order to provide such things as optimum reverberation time, even distribution of sound, and freedom from undesirable absorption at certain pitches. A competent sound engineer should be consulted.

9. Library equipment. The music library is one of the most important, as well as one of the most expensive elements of the music program. Special equipment requires efficient handling to prevent heavy losses.

Sheet music can be stored most satisfactorily in four-drawer steel filing cabinets. Music books should be stored on shelves. Distribution and collection of sheet music is best accomplished through the use of folios in which the music is placed, used,

and then removed from the folios for the files by the librarian. A well-equipped and conveniently located music library, large enough to serve as a workshop, is an essential unit.

These were found to be the problems along with a few broad-term solutions. The following data have been offered as minimum requirements in order of importance.

LOCATION OF MUSIC SUITE

Primary considerations in locating a music room within the total physical school plant have been found to be: segregation from external noise, access to auditorium stage, and access to instrument storage room and music library.[2]

Ideally, the music room should be located in a separate building placed as near as possible to the auditorium stage and, if possible, to the athletic field. If a separate building is not feasible, the room should be adjacent to and on the same floor level as the auditorium stage with the instrument storage and music library between the stage and the music room. This plan, although not as desirable as a separate building arrangement, does provide for efficiency in operation.

Many schools have located the music room on a floor above the remainder of the building, as close as possible to the auditorium stage. Wide stairways or an elevator for convenience and

---

[2]A. L. Niemi, Planning the Housing of the School and Community Music Activities, p. 16.

safety in the transportation of musical instruments and equipment between the music room and auditorium stage are required in this type of arrangement.

Another possible location for the music room has been found to be in a wing or at one end or corner of the building near the auditorium stage, with corridors, storerooms, or stairways separating music rooms from other classrooms.

A highly controversial arrangement has been found to be the use of the auditorium stage as a music room with instrument storage and music library adjoining. This plan limits the use of the auditorium for other classes during music classes but is satisfactory provided acoustical conditions, lighting, moveable risers are included and adequate provision is made for storing music equipment. The principal objection to the use of the auditorium stage for regular music classes is the frequent interruptions due to the many uses for which the auditorium is needed.

The State Department of Education of New York was found to be in disagreement with the plan described above.[3] The division of School Buildings and Grounds of the New York organization maintains that the ideal facility for mass rehearsals of a band, an orchestra and a choral group is to be found in the auditorium. By the use of the stage or the area directly in front of the stage, music groups will prosper.

---

[3]Russell Carter and Carl Payne, Planning the Music Suite for Central Schools, State Department of Education of New York State Bulletin, p. 2.

Probably the least desirable music room arrangement was found to be when the gymnasium and the cafeteria were constructed so that they serve as music rehearsal rooms. This plan should be avoided if at all possible.

These locations, ranging from the highly desirable and practical to the undesirable, tend to frame the philosophy of the instrumental music program. Careful detail as to the location will lead to careful planning of correlated problems.

TYPES OF MUSIC ROOMS

The types and number of music rooms depend upon the maximum number and variety of music courses to be offered.[4] This is arbitrary, but there are many types of rooms, and each school, depending upon the desires and training of the instructor, will have a slightly different emphasis, hence, types of rooms play an important role.

The average school in Kansas was found to have need for but one combined instrumental music room with instrument storage, music storage, practice rooms, uniform storage, and director's office all closely connected. The following discussion will identify these types of rooms.

Band-Orchestra Room

The ideal band-orchestra room should be able to accommodate the largest band ever expected by the school. (The standard band

---

[4]Lawrence B. Perkins and Walter D. Cocking, Schools, p. 157.

numbers between seventy and one hundred players which may vary depending upon marching season and concert season). With each player requiring eighteen square feet for himself, his chair, his instrument and music stand, the number of cubic feet of air space should be approximately two hundred sixty per person.[5]

Permanent risers should be constructed at least forty-eight inches wide to accommodate instruments, stands, chairs, and students. The highest riser should be at least seventy-two inches wide to accommodate the larger instruments, such as bass viols, tympani, bass drum, harp, and sousaphones. At least three elevations are needed above the general floor level with each elevation -- or riser -- being from six to eight inches high.[6] If these risers are higher, there is danger of accidents as well as inconvenience to the conductor. Chairs must be without arms. Space should be provided in front of the risers for a piano, radio-phonograph and recording machine, blackboard, bulletin board, film projector, screen, and electrical outlets. Electrical outlets should be provided across the back wall and on each level of the risers. Carpeted risers prevent accidents and aid acoustic control. If risers are not carpeted, an inch-wide strip of white paint along the edge of each step will constitute a safety aid.

---

[5]A. R. Meadows, Better School Buildings for Alabama, State Board of Education Bulletin 3, p. 88.

[6]Roscoe V. Shores, Educational Specifications for Buildings, Kansas City, Missouri Public Schools Bulletin, 1951, p. 231.

The remainder of the flooring in the music suite should be finished in decorative grease-resistant asphalt tile.

Fortunately, the trend in schoolroom planning is for a complete and beautifully co-ordinated interior. The color scheme should be restful and in good taste.

Theory and Appreciation Room

The ideal theory and appreciation room has been found to be approximately the same size as an ordinary classroom, accommodating twenty to thirty pupils. The three or four rear rows of seats should be elevated on risers six to eight inches high, thirty inches in width, and each riser fitted with stationary theater-type chairs with drop desk arms.

Space at the front of the room should be provided for piano, radio-phonograph, recording machine, teacher's desk, and music cabinet. The front wall needs a blackboard (part of which should be finished with permanently lined music staves). ample bulletin board space, daylight projection screen, and electrical outlets. The back wall should be equipped with an outlet for a film projector. Closet space was found to be necessary for storing music stands, extra chairs, and music appreciation materials.

Such a room has been found also to serve for musical ensembles, section rehearsals, instrument classes, dramatic rehearsals or for classes in which audio-visual aids are used.

Practice Rooms

It has been found that the music department can make the most progress if rooms are provided for individual and small group practice. These rooms should be so located and constructed that supervision may be easily maintained without interruption. The Salina and Great Bend High Schools have a particularly difficult problem because these rooms are across the corridor from the music room, so that poor supervision results.

The usual practice room sizes have been found to be:

(1) Band and orchestra instrumentalists -- six feet by eight feet.

(2) Piano, with provision for one other instrument -- eight feet by ten feet.

(3) Radio-phonograph or small ensemble work -- ten feet by twelve feet.

It was found that rooms generally are built in a series along one side of the wall or corridor with outside windows, double glass windows in the instrument room, and/or doors facing the music room or corridor to permit observation without interruption. Some schools were found to have installed one and two-way sound systems for closer contact.

It was found that rooms should be acoustically treated and insulated against sound transmission to and from other rooms.

Director's Office

The office must be well-located so that, at a glance, the director can see who enters, who is using the practice rooms, and whether they need attention. This office also may be used for conferences with community members and parents.

The size and equipment of the office depends upon the size of the school. The room need not be large but should be quiet. It must be large enough, however, to accommodate a desk, two or three chairs, filing cabinet for correspondence, cabinets for miscellaneous storing, e.g. reeds, oil, personal equipment, and any special equipment such as the Stroboscope, recording machine, et cetera.

Instrument Storage Room

The instrument storage room should be at least twenty feet wide and at least thirty feet long.[7] It should open off the music room or the auditorium stage, preferably both.

It was found that storage lockers for instruments should be placed along both walls. Maximum depth of these lockers was found to be forty-eight inches and maximum height seventy-two inches. It was found that it is a good practice to extend such lockers to the ceiling for storage of equipment used only once

---

[7]Best, op. cit., p. 35.

or twice a year. Special ladders should be provided for reaching the high shelving or locker space.

This room should be well ventilated and protected against excessive moisture, heat or extreme changes in temperature, inasmuch as many music instruments are made of wood with glued joints. Some schools provide only shelves for storing instruments, but this practice is unsatisfactory since most instruments have removable parts which are easily broken or jarred loose and are lost or stolen when instruments are not kept in lockers.

Steel instrument lockers built to specifications for music instrument storage were found to be available from leading manufacturers of locker equipment. Wooden lockers may also be constructed but the steel variety should be given preference.

It was found that many schools now build the instrument storage room within the music room so that by opening a double door the instruments are easily accessible.

It had been found to be good practice to secure specially built racks for sousaphones, bass viols and violoncellos. These racks are built of oak, finished like furniture and fitted with rollers for easy moveability. Some schools have a moveable drum accessory case for sticks, castanets, triangle, wood block, maracas and other small equipment, which, when not being used, rolls into the storage room. All instruments, once within the storage room, can be put under lock.

Music Library Room

It was found that ideally, the music library room should be separated from the instrument storage room. However, it was found to be cheaper and more practical to have the two rooms adjoining the music room or stage or both. It was found that the library should be twenty feet wide to accommodate rows of four-drawer steel filing cases (both legal and letter-size, with more of the legal size provided). In order to utilize the area above the filing cabinets, it seems reasonable to build closed or open shelves up to the ceiling. Such shelving provides storage space for material not used frequently.

This room can be made doubly efficient by using it as an instrument repair room. For such use the addition of running water, natural gas, electrical connections, and repair equipment, i. e. vises, glue, pads, springs, would be necessary.

Uniform Storage Room

Generally, the usefulness of the uniform storage room has been found to be limited to the handing-out, checking-in, and storage of uniforms. The most needed equipment includes the racks and a half-door opening for ease in handling a large group. The myth of the moth being repelled by a cedar-lined room has been removed, consequently the best solution seems to be to build the room as airtight as possible and place a vent shaft in it for fresh air. A small desk, with light, should complete the room furniture.

Operating conditions should be planned to accommodate the largest group that will ever use the facilities. The music suite should have adequate area for the band-orchestra room, instrument storage lockers, uniform storage room, practice rooms, theory and appreciation room, director's office, and music library room. For optimum operation these facilities must be carefully planned prior to construction. Particular attention must be given to location in order that smooth functioning of the total music program can be assured.

ACOUSTICAL CONTROL

Acoustics, like illumination, heating, ventilation and structural engineering, has been found to be an integral characteristic of a building. For a music room, acoustics have been found to be a major item of importance. Desirable sounds should be well heard. Music with clarity and balance, speech with intelligibility are necessary for proper learning.

It has been found that there can not be full enjoyment or appraisal of music performance unless the sound can be heard with some measure of fidelity. Satisfactory acoustics require more than providing a musical performance space free from obvious acoustical faults, and more than isolating sound from persons in surrounding spaces where the sound is not desired. Acoustics of a room need to enhance the quality of music for the listener and

give the performer a sense of achievement which adds to the pleasure of performance.[8]

In order to achieve the best results, acoustics must be integrated with other aspects of architectural design, engineering, and construction.[9] If acoustical control is applied to a completed room as an afterthought, the results are frequently an inferior facility and the cost is usually greater than necessary.

In planning a music suite, an attempt should be made to segregate, both horizontally and vertically, those rooms between which sound transmission must be kept at a minimum. For example, if there is a choice of placing a band room either under a library or under a cafeteria, it should obviously be placed under the cafeteria, where band sounds would be less of a nuisance. Furthermore, closets, corridors, equipment space and other "dead areas" should be used as buffers against sound transmission.

It has been found that in building construction, there are numerous cases in which two possible wall types are about equal in cost and structural properties but different in their abilities to block the passage of sound. Thus a wall of two relatively thin leaves of plastered tile or wood stud construction

---

[8]Richard H. Bolt and Robert B. Newman, "Architectural Acoustics: Good Hearing Conditions", Architectural Record, September, 1950, 108:148

[9]Ibid., p. 149.

separated by a small air space is generally more effective than a single leaf wall of the same weight or thickness. Selections in furnishings and finishes, e.g. thin plywood paneling, carpets and draperies, have been found to help acoustic qualities and add visual beauty as well.

Briefly, the location, the plan of the building, and the arrangement of it's space, room shape, the structural materials and their methods of use, the detailing of doors and windows, and the interior finishes and furnishings -- all may influence acoustic design.

It has been found that the problem of acoustics worries a music director more than many other problems, e.g. students, library, working space and working hours.

Architectural acoustics has been found to have two general purposes: (a) to provide a satisfactory acoustic environment, and (b) to provide good hearing conditions.[10] Though the achievement of these aims sometimes involves similar techniques, there are significant differences between them. Since both types of problems have been found to be involved in music buildings, it is important to understand these distinctions.

Acoustic Environment

The acoustic environment of a given space has been found to be determined by the intensity and character of all sounds existing within the space. A satisfactory environment for a given

---

[10]Bolt and Newman, op. cit., p. 149.

space can be specified only in terms of the functions which that space is to serve. In a hospital room a satisfactory environment requires the reduction of intruding noises to a very low degree, whereas, in a factory, considerably higher noise levels may be tolerated.

It has been found that in a music room, acoustic environment problems are multiple. The practice rooms must be insulated from one another and from other building noises. "Dead" places in the rehearsal room must be eliminated, and the director's office should also have acoustical treatment. In turn, there are libraries, study halls and other classrooms which must be insulated from the sounds generated by the music rooms.

Hearing Conditions

Satisfactory hearing conditions in an enclosed space require:[11]

(a) low level of background noise.

(b) adequate separation of successive sounds (reverberation control).

(c) proper distribution of sounds within the space.

(d) sufficient loudness of sounds which are to be heard.

Each of the conditions specified above for satisfactory environment and good hearing has been found to be subject to certain definite criteria and design objectives.

---

[11]Bolt and Newman, op. cit., p. 150.

Reverberation control has been found to be the condition by which the separation of successive sounds is influenced. Reverberation, the prolongation of sound after a source has stopped, is specified by reverberation time -- the time in seconds for a sound to die away to one millionth of its initial intensity.[12] A large room has been found to require a longer reverberation time than a small room, and music sounds need a longer reverberation time than speech sounds. A certain amount of reverberation has been found to be desirable to aid in the blending of musical tones and the reinforcing of speech.

The third problem -- the requirements for proper distribution of sounds -- indicates that sound should be uniformly diffused without distortion throughout the listening room for satisfactory hearing conditions. The room should be free from distinct echoes and focusing effects. In larger rooms it has been found to be important to direct sounds from the stage in such a way as to reinforce them in the more distant parts of the room.[13]

Sufficient loudness allows sound to be heard easily and intelligibly even in the softest tones of music or speech. As a rule, small rooms need to correct overdue loudness, whereas large rooms require amplification by construction or a mechanical instrument.

---

[12]G. W. Stewart, Introductory Acoustics, p. 82.

[13]Bolt and Newman, op. cit., p. 15.

[14]Best, op. cit., p. 50.

When soloists perform in a large music room or auditorium a public address system may be necessary. Amplification in a poorly designed room involves specialized engineering procedures which allows a satisfactory degree of loudness, naturalness and fidelity to permeate the room, seemingly from its original source.[14]

Sound Isolation

Sound isolation has been found to have been achieved through proper planning to segregate sounds and through proper design of building structures to block effectively the passage of sounds. Briefly, segregation reduces the effects of noises by getting farther away from them; insulation reduces noise by presenting a barrier against its passage; absorption reduces noise by draining off sound energy.

Sound Insulation

Rather than present details involving a study of decibels, sound physics and other technical data, Plate I lists a range of materials and their relative values as insulating factors. (See Plate I.)

Sound Absorption

The third requirement for good hearing conditions has been found to be the most generally used means of obtaining reverberation control. Due to financial necessity, most schools solve

---

[14]Best, op. cit., p. 50.

their problem by placing some type of acoustical material on the walls, floors and ceilings to gain the desired result.

Room Shape

The shape of a room has been found to be of major importance in achieving good hearing conditions, but has little bearing on the problem of acoustical environment under normal conditions. Basically, the shape of the wall determines the direction in which a sound wave will be reflected from it, whereas the absorption coefficient of the wall determines what fraction of the sound energy will be reflected.[15]

Echoes have been found to be the most serious problem in a music room. A hard rear wall forty feet away will send back such a sharp echo that two sounds will be heard instead of one.[16] The solution has been found to be to break the wall up with vertical or horizontal convex curves. Covering the wall will help but usually does not completely overcome the echo trouble. A concave wall will return an accentuated echo that is almost beyong control by absorptive material. Smooth concave wall surfaces give direction to sound, thus sending too much in certain directions and robbing others.

---

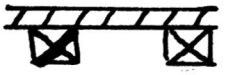
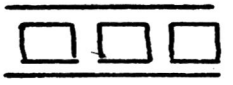
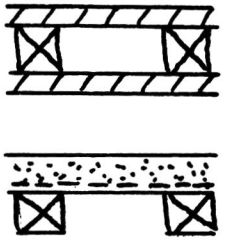
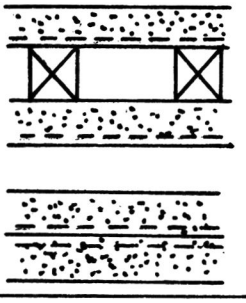
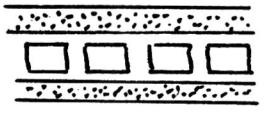
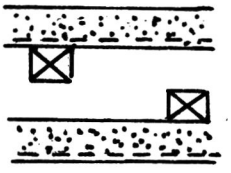
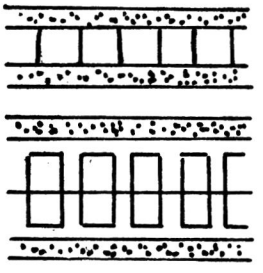
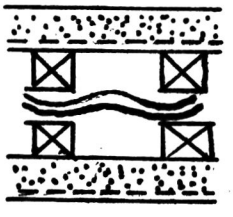
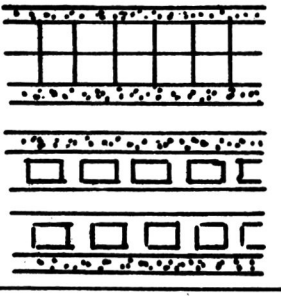
[15]Best, op. cit., p. 56.

[16]Bolt and Newman, op. cit., p. 151.

EXPLANATION OF PLATE I

Building materials and their relative values as insulating factors.

PLATE I

Symbols	Wood and Metal Stud Construction	Tile, Brick, and Solid Plaster	Usual Range of Transmission Loss in Decibels
⊠ = wood or metal stud = ½" plywood or building board = 1" plaster board or plaster = 1" plaster board or plaster on wood or metal lath. = absorptive board or blanket = 4" brick or solid concrete block = 8" brick or solid concrete block = 4" hollow tile = 1" plaster board on plaster			Less than 20
			20-30
			30-40
			40-50
			Over 50

The University of Oklahoma used convex curves around an entire room, eliminating all echoes but yet (with small curves and large units) there is a pleasant listening area throughout the auditorium.

The Great Bend High School Auditorium was found to be graduated from a small stage area (ample for a fifty piece band) to a large rear wall. Since all wall areas are different, it serves as an ideal place for music groups as well as for speech.

Russell High School was found to have a square auditorium with a large balcony in the rear plus heavy drapery on one wall which lent itself easily to both speech and music.

Good acoustical conditions have been found to involve excellent hearing conditions and excellent blending conditions. To achieve excellent hearing qualities there must be a low level of background noise as well as reverberation control, proper distribution of sounds within the space, and sufficient loudness for the sounds to be heard. Excellent blending conditions have been found to require the above plus the insulation of the practice room, director's office and the walls of the rooms to reduce sound from other sources.

Sound insulation, sound isolation, sound absorption, and room shaping have been found to be integral parts of the music room. But, the ideal music room must also be equipped with other facilities of which adequate lighting is probably of greatest importance.

ILLUMINATION

Like the problem of acoustics, the illumination problem had not been improved satisfactorily until the post-war schoolhouse production era. Four two-hundred watt bulbs placed strategically around the room were considered sufficient lighting in former years.

Lighting in school music rooms has been found to present an unusual problem. Musical groups employ an irregular seating arrangement causing a glare due to the positions of the music stands and the upward direction of vision in watching the director. Because music notes are small and often poorly printed, ample lighting, either natural and/or artificial must be uniformly distributed.

Most school authorities and lighting experts recommend bilateral lighting for larger rooms.[17] In unilateral lighting, the illumination due to daylight decreases sharply as one moves away from the rows of windows. (Plate II.)

Many building plans have given no choice as to the direction from which rooms may receive light. Experience shows, however, that east and west exposures afford the best natural light.

---

[17] American Recommended Practice of School Lighting Bulletin, 1938, Illuminating Engineering Society and American Institute of Architects, p. 18.

North and south exposures have been considered the least desirable, one having too much sun and the other too little or none at all.[18]

Other factors affecting natural lighting have been found to be: weather conditions, architectural design, color of walls and ceilings, window shades, position of trees and other obstructions and types of building materials.

The quality and quantity of artificial lighting has been found to be more important to members of bands, orchestras, and choruses than to most students in the school. Many lighting engineers have recommended a minimum of twenty-five foot candles with the best quality of lighting by indirect methods.[19] Fluorescent lighting is now being improved with no-blink starters and "Tulamp" ballasts which eliminate the stroboscopic effect caused by alternating current. Fluorescent lights last longer, give two and one-half times more light and give off very little heat. Cost of installation is high but resultant cost of operation offsets this factor.

Due to the irregular seating arrangement of instrumental music groups, unilateral lighting of smaller rooms and bilateral lighting of larger rooms has been recommended. The newly improved

---

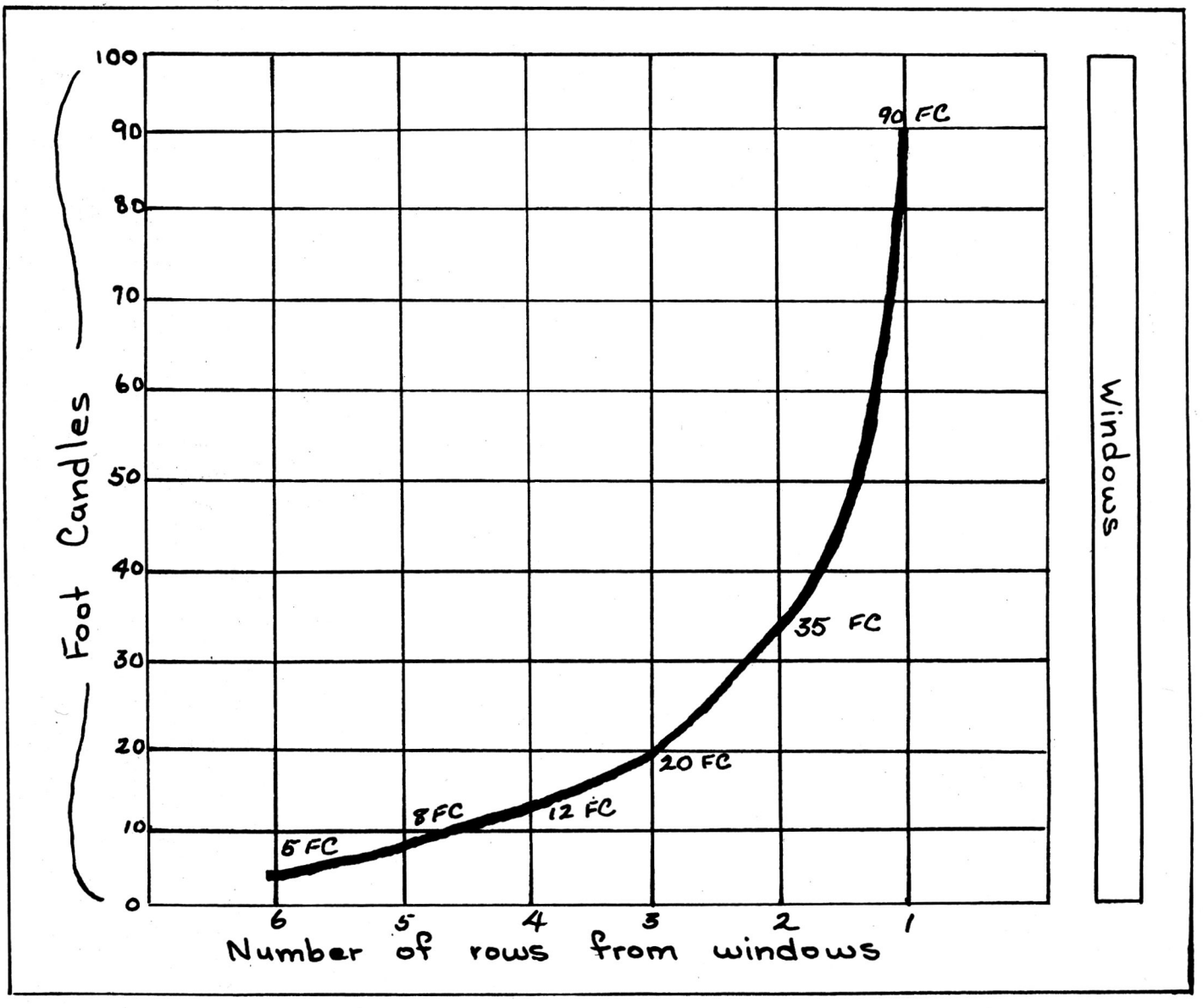
[18] Best, op. cit., p. 62.

[19] American Recommended Practice of School Lighting, op. cit., p. 20.

EXPLANATION OF PLATE II

Natural unilateral daylight distribution given in foot candles in a typical classroom on a clear spring day.

PLATE II


100
90
80
70
60
50
40
30
20
10
0
Foot Candles
90 FC
35 FC
20 FC
12 FC
8 FC
5 FC
6
5
4
3
2
1
Number of rows from windows
Windows

no-blink starter and the "Tulamp" ballast of fluorescent lights had been found to be of major importance for good health. Less heat and longer lasting qualities has made indirect fluorescent light more desirable for instrumental music rooms.

HEATING AND VENTILATION

Like illumination, heating and ventilation should be considered on a room-by-room basis.

The central heating plant should furnish heat for the music department whether it be housed within the main building or a separate building. This is done for the comfort of the students as well as for the effect on pitches of musical instruments. A constant temperature of sixty-eight to seventy degrees, Farenheit, has been found to be ideal according to physicians, public health officials and state building codes.[20] A room thermostat can easily and satisfactorily solve the heating problem.

While heating has been found to be a problem for the entire school, ventilation may be localized in separate rooms. The main purpose is to provide fresh air. Since music students inhale and exhale large quantities of air in the production of musical tones, and since music organizations often involve large

---

[20] N. I. Clark and G. M. Aitchison, Adapting Classroom Activities to the Needs of Youth, National Society for the Study of Education Yearbook, p. 143.

numbers of students using up good air as well as giving off heat, it has been found necessary that a good air-conditioning or ventilating system be used. For the average school, window-gravity ventilation has been found to be best on grounds of comfort and economy.[21]

Present trends indicate that air-conditioning will receive emphasis in the near future. At present, for schools in Kansas, it has been viewed as a luxury and usually bypassed. Holyrood, Kansas Grade School was found to be one of the few air-conditioned school buildings in the state.

Heating and ventilating problems should be solved by engineers trained in this particular field, but the music director should inform the engineer of the following points peculiar to music education.

1. Since sound travels through air and heat ducts, all music rooms should be provided with separate or specially designed forked air and heat ducts.

2. There is increased inhalation and exhalation of air in music tone production which uses up the supply of oxygen in the room and fills the room with carbon dioxide. Means for eliminating the impure air and for supplying ample amounts of pure fresh air should be provided.

3. The pitches of musical instruments are affected by temperature changes but the ratio is not the same for each in-

---

[21]Best, op. cit., p. 68.

strument. Consequently, the temperature should be constant and uniform.

4. Damage may be done to musical instruments if the temperature is varied too much or if the humidity is too high or too low. This is especially true of stringed instruments.

5. Quick mental responses are necessary for music production, and so it follows that healthful and comfortable conditions in the music room must be maintained.

A room thermostat eliminates any heating problems under the jurisdiction of the music instructor.

Music groups have a need for large amounts of fresh air which can be gained most easily through the window-gravity system. All future schools probably should be equipped with complete air-conditioning systems.

EQUIPMENT FOR THE MUSIC DEPARTMENT

Proper equipment within a building has been found to be necessary to make the building functionally effective. A music department poorly equipped, though excellently housed, cannot progress at the desired rate. An important maxim in purchasing school equipment is: buy the best quality product and then take care of it.[22]

---

[22]Rex Putnam, A Manual for School Building Construction, Superintendent of Public Instruction of Oregon, 1947, p. 5.

Functional Furniture

Chairs. One of the problems confronting music directors has been found to be that of getting students to maintain good posture. Correct sitting posture for members of orchestras and bands requires sitting with body erect and slightly forward to permit unrestricted breathing as well as free movement of the arms and shoulders. As far as it has been possible to ascertain, no chair has yet been devised which will insure this correct sitting position for instrumental music performers.[23]

Violoncello players and bass viol players need chairs of different design from those used by players of other instruments. Violoncellists can use the bentwood type with ease but cannot use folding chairs, because they must sit on the forward edge of their chairs to play. Bass viol players need high stools of metal or wood construction. These stools should be thirty to thirty-two inches in height, according to individual needs. The common wood kitchen stool can be used if its legs are sawed off evenly, and rubber crutch tips placed on the legs to prevent sliding.

For long rehearsals, the tympanist needs a chair, but standard chairs are too low and the bass viol stools are too high.

---

[23]Best, op. cit., p. 80.

The trap drummer's "throne" makes an excellent seat since it is adjustable in height and swivels easily.

If the instrumental music room must be used for choral or music theory classes, it was found to be good practice to have chairs with adjustable tablet arms that fold under when the instrumentalists use them. However, the bentwood type chair has been found fairly satisfactory for all music classes.

If chairs are to be moved from one room to another, it would be well to secure "dollies". These chair trucks can be purchased or made in the industrial arts department of the school.

Music Stands. A sufficient number of music stands should be purchased to equip the largest school instrumental music organization. A band or orchestra of ninety requires about sixty stands. This allows two players to a stand where two are reading one part.

A durable metal stand that is adjustable for height and angle of desk is preferred. Many school woodworking or metal shops make stands which are not adjustable and are highly inefficient for school use. The ordinary collapsible music stand is not recommended because it will not hold music folders safely and also may be easily overturned. The professional theater metal stand has a large cast iron base which is ideal but requires a large initial cost.[24]

---

[24]Roscoe V. Shores, op. cit., p. 97.

Director's Stand and Podium. The director's stand should be similar to the other stands recommended but should be heavier and equipped with a music shelf just below the music desk. A podium is necessary for the rehearsal room in order to make the director easily visible to all performers. This is especially true for larger ensembles and for rehearsal rooms without risers.

It is possible to buy a collapsible podium from a commercial manufacturer[25] or to build one in the industrial arts shop in the school. It should be approximately thirty inches square and seven to nine inches high. Optimum size is arbitrary, however, and will vary with the director's personal taste. Oak is perhaps the most durable material because it does not warp easily.[26] Metal gliders placed on the bottom corners make it set solidly. Also, if the top is covered with rubber tread it is not so tiring for the director who must stand on it for long periods of the day.

Music Sorting Rack. Every music department should be equipped with a music sorting rack. Such a rack has been found to be convenient for distributing music to folders and for reassembling the music when ready for storage again. A sorting rack should consist of four or five slanting shelves, one inch by fifteen inches by seventy-five inches (or longer) with one inch by two-inch strips at the bottom of each shelf to hold the music in

---

[25]Humes and Berg Manufacturing Company, Incorporated, 4801 Railroad Avenue, East Chicago, Indiana.

[26]Humes and Berg Manufacturing Company.

place. The size of the largest folios used in schools should be about twelve inches by fifteen inches. Each shelf of the sorting rack should be made to hold a desired number of these folios, allowing two inches between folios for overlapping of music, or fourteen inches width per folio. Sufficient shelf space should be provided for the greatest number of folios used by any one musical organization. (See Plate III.)

Lockers and Cabinets

Instrument lockers and cabinets may be built around the sides and rear of the rehearsal room. A plan that does not use too much floor or wall space provides for construction of cabinets with compartments for clarinets, cornets, flutes, oboes, trumpets, bassoons, alto and bass clarinet, alto saxophones, flugelhorns, violins, and violas.[27] These cabinets should be about fourteen inches deep from front to back with individual compartments from eight to ten inches high. Compartments should start immediately above the baseboard and provide storage to a height of five or six feet in the rehearsal room or in the instrument storage room. Partitions should be placed so as to make spaces from approximately eighteen inches in width for smaller instruments such as cornet, flutes, clarinets, and oboes, to approximately twenty-six inches for longer instruments such as

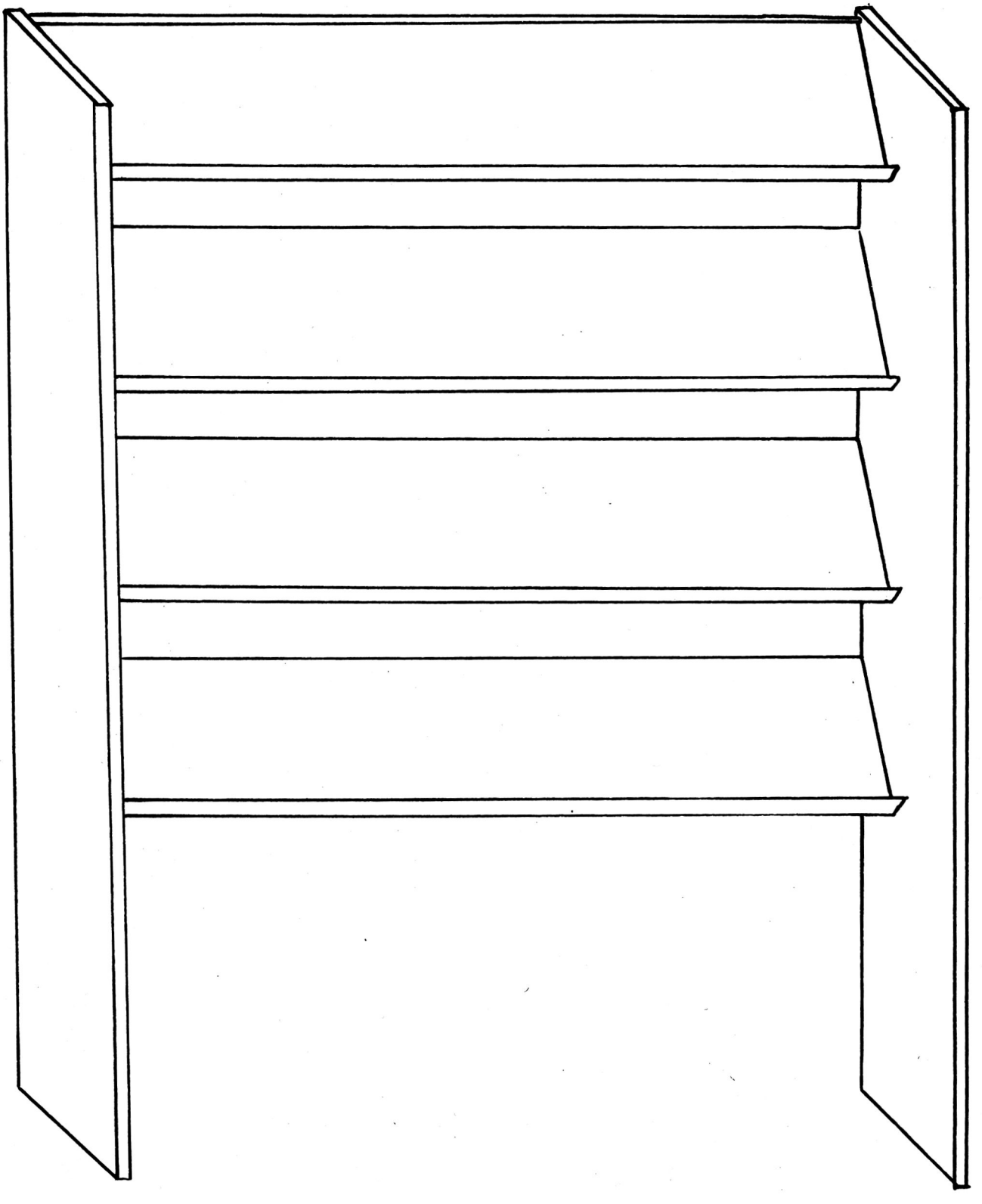
---

[27]L. B. Jones, Building the Instrumental Music Department, p. 57.

EXPLANATION OF PLATE III

Music Sorting Rack

PLATE III



violins and violas. The total number of compartments depends upon the number of instruments for which storage is necessary. Each compartment should be numbered to facilitate the storing of instruments and to prevent misunderstanding among students as to the proper place for each instrument. If storage cabinets are planned before the building is constructed, it is best to have them recessed into the wall. This plan makes the structure more secure and prevents dust and dirt from collecting on top. Instruments other than those named above should be stored in lockers or cabinets built in the instrument storage room. Great care should be taken to see that proper dimensions are planned before construction begins.

Lockers may also serve as storage units for students' books and coats during rehearsals.

Cabinets, free from any obstruction at floor level should be provided for tympani, vibraphone, marimba, and xylophone. These cabinets should be large enough so that the instruments can be rolled into them easily. Double doors should be installed so that the doors will not swing too far into the room. It is advisable to build cabinets for such instruments as snare drum, French horns, trombones, baritones, tenor, baritone and bass saxophones, above the cabinets for tympani and the keyed percussion instruments.

For such instruments as violoncellos, bass viols, and sousaphones, it is suggested that the Sherrard Roll-Away Racks be used. (Plate IV.) Such racks are excellent for the storage and

protection of these instruments. Although the racks are patented, they may be purchased from the designer at reasonable cost.

These racks are furnished with rubber casters, padded with serviceable material to prevent marring of instruments, and are constructed of finished furniture oak.

Violoncellos, bass viols, and sousaphones can be safely stored on the Roll-Away Racks and then moved easily around the rehearsal room for convenient placing. Likewise, the racks facilitate moving these large instruments to the auditorium stage for program use.

Percussion Cabinet. Members of the percussion section of a band or orchestra play many different types of instruments, from real musical instruments such as bells, vibraphone, marimba, celeste, chimes, xylophone, to "gadgets" for sound effects such as triangles, sleigh bells, bird and train whistles, and numerous other special sound effects. It has been found to be best to have all of this small percussion equipment assembled in one place for safe storage as well as accessibility.

A percussion cabinet should be equipped with rubber casters so that it can be moved easily to the part of the rehearsal room where the percussion section is assembled. Shelves should be designed to hold various sizes of cymbals, tom-toms, and tambourines. One shelf should be large enough to hold a set of orchestral bells. Two to four drawers are needed for storing small equipment such as maracas, claves, wire brushes, drum sticks, wood block, bird

EXPLANATION OF PLATE IV

Figure 1. Sherrard Roll-Away Rack for sousaphones.

Figure 2. Sherrard Roll-Away Rack for violoncellos.

PLATE IV

Figure 1.

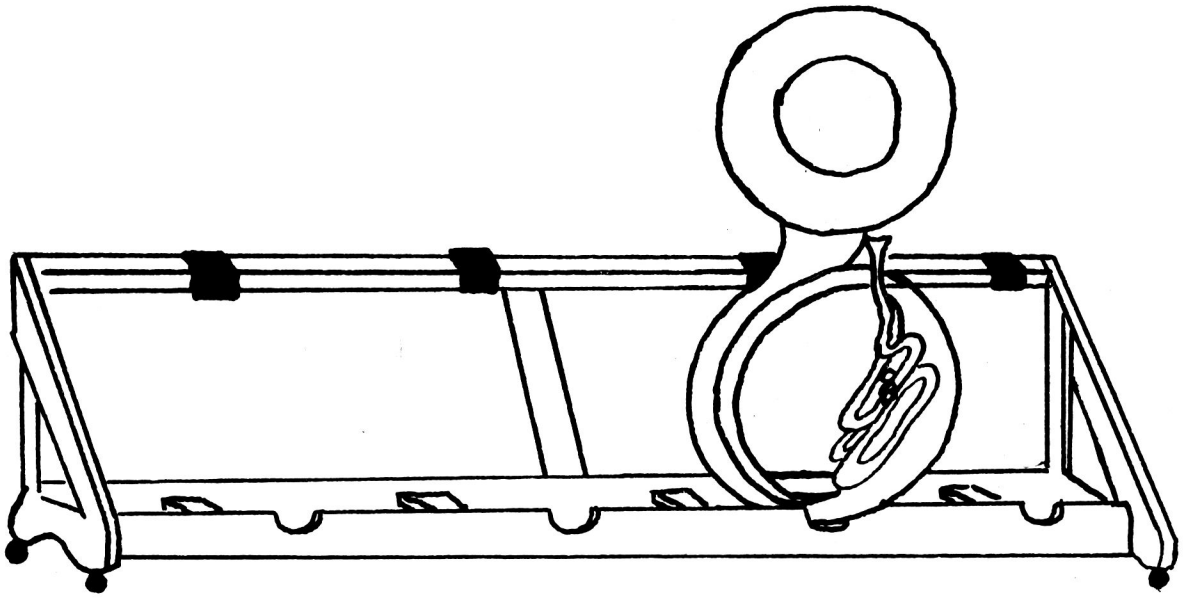
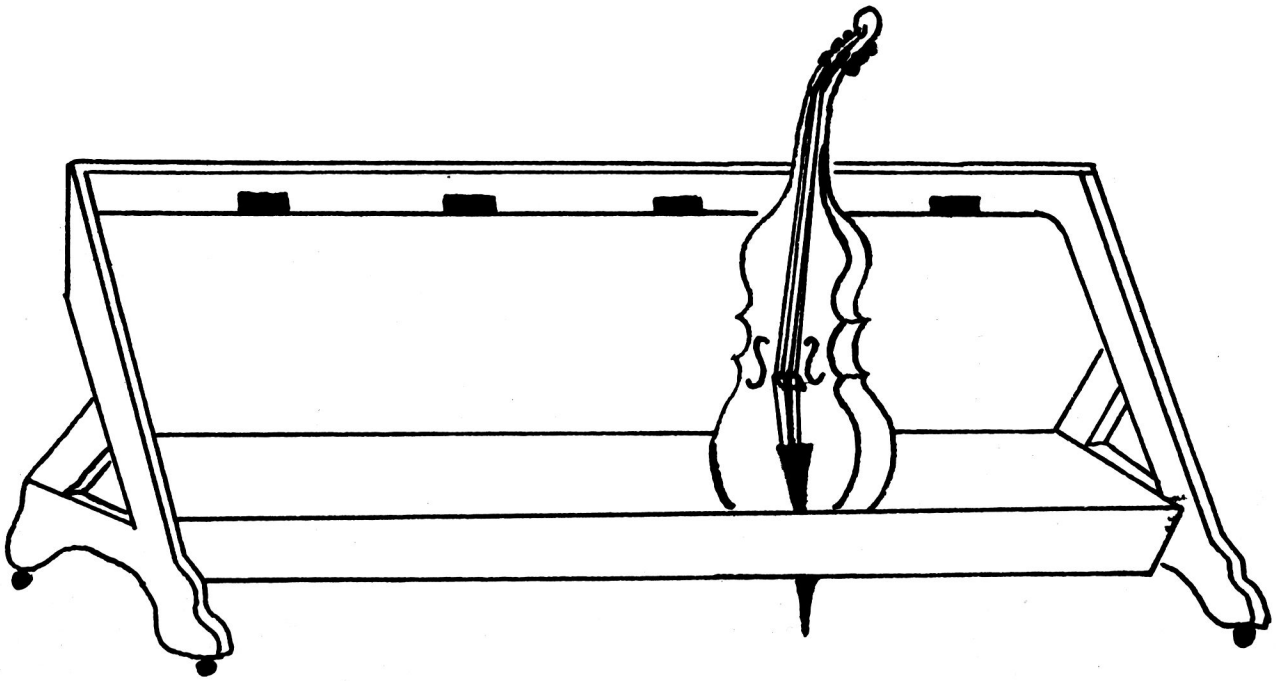


Figure 2.



whistles, mallets, sand blocks, and other small equipment. The cabinet should be equipped with two doors that can be locked securely.

Plate V shows a front view of a percussion cabinet which was designed and built by Jean Hedlund, Kansas State College Band Director.

Music Folder Cabinet. A good storage cabinet for rehearsal folders has been found to be a great convenience and time-saver. To facilitate prompt starting of band and orchestra rehearsals, the folios of music should be accessible to the students as they enter the rehearsal room.

Two folio cabinet styles are in general use. One is the upright cabinet containing compartments fitted to hold the music folders in a vertical manner. Each compartment should be large enough to hold concert-size folders of music with sufficient clearance so that folders will not tear or wear too much as they are removed from or replaced in the cabinet. Approximately seventy compartments (depending upon the maximum number needed), each thirteen and one-half inches by fifteen inches with two inches between partitions, should be provided. One of the compartments should have four to five inches between partitions for the director's music. The director's full scores require more space than do the regular scores for individual music. Unless foresight is used, the cabinet may be top-heavy because of height. A wider cabinet of less height is more serviceable and can be used for a sorting rack.

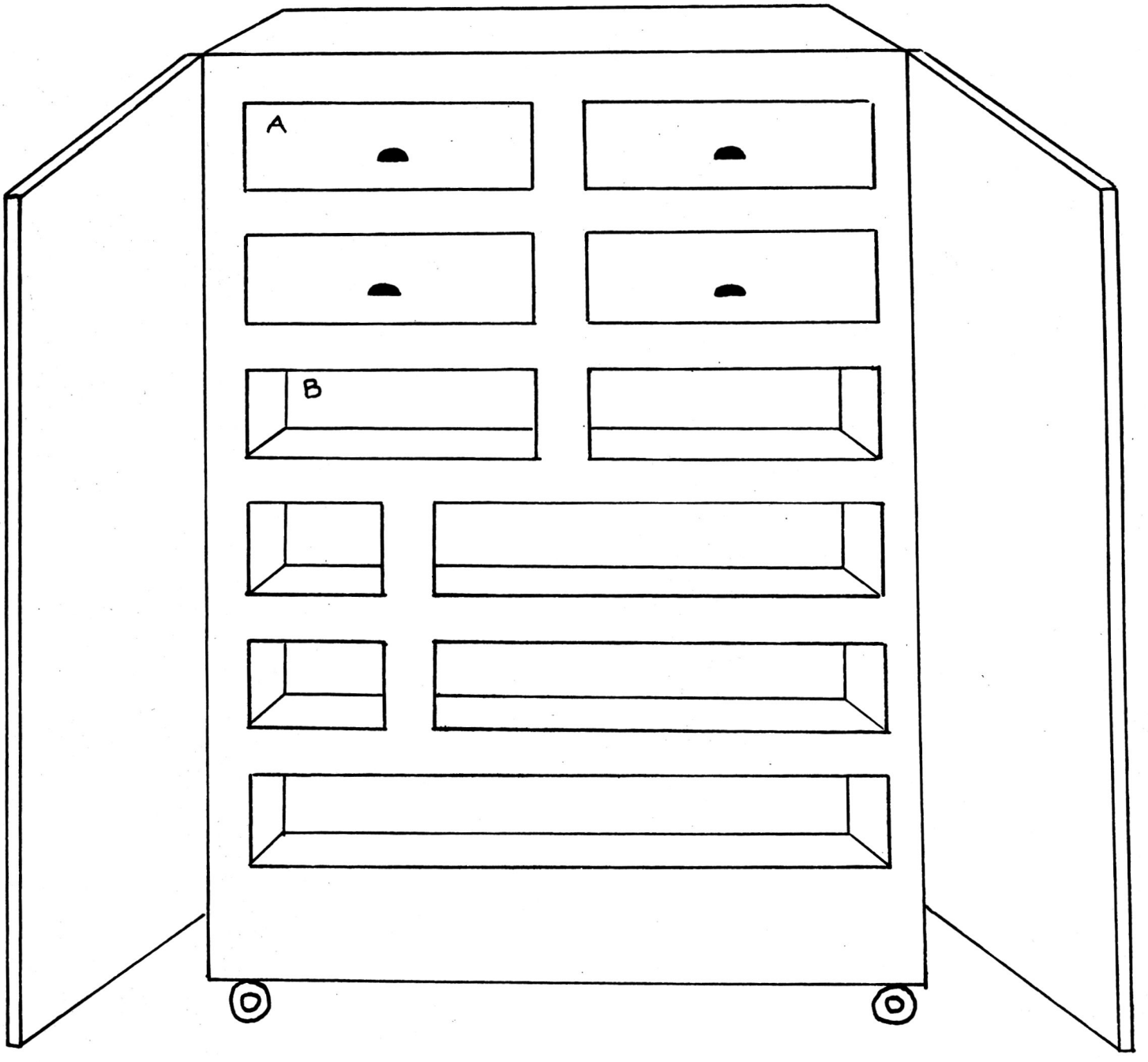
EXPLANATION OF PLATE V

A front view of a percussion cabinet designed and built by Jean Hedlund, Kansas State College Band Director.

A. Drawers

B. Open shelves

PLATE V



A second style has been found to be the horizontal pigeonhole cabinet containing compartments to accommodate all of the folders. The individual compartments need to be the same size as mentioned for the vertical style cabinet. A cabinet that is approximately thirty inches high, thirty inches wide, and sixteen inches deep should hold two rows of eighteen folders and is sufficient for small bands or orchestras.

If the organizations travel extensively these cabinets should be fitted with doors and locks. Since most organizations have their own rehearsal rooms and do not encounter moving problems, doors on cabinets usually are not necessary, however. Each music folder cabinet should be equipped with rubber casters for ease of movement and should have small semi-circular recesses so that folders may be grasped with ease as they are removed from the compartments. The compartments should be numbered, and individual students assigned folder numbers corresponding to compartment numbers.

Music and Record Filing Cabinets. A music department library should be supplied with several steel filing cabinets for vertical filing of music and phonograph records. These cabinets may be purchased in several models but the standard four-drawer model has proved to be the most desirable. The letter-size file serves well for most instrumental music. Foreign music editions and phonograph records fit better into legal-size filing cabinets. If there is indecision on the part of the director as to the correct size of cabinet for his work, his choice should be

the legal-size cabinet.[28]

Filing cabinets equipped with roller or ball bearings are superior to those without bearings. The metal files last longer and work more efficiently than do files made of wood.

If several files are placed together to form a filing unit, shelves or cabinets should be built over the files so as to make the space useful. This also prevents the file from tipping over if all the drawers are pulled out at the same time, and prevents books, music supplies, instruments, and small items from being stacked at random on top of the files.

Storage Cabinets. Storage cabinets made of either wood or steel have been found to be excellent for horizontal storage of music as well as for miscellaneous supplies -- instruction books, manuscript paper, recording discs, paper supply, and music scores. Wooden storage cabinets may be built in the library room or office and steel storage cabinets are sold in standard sizes and may be purchased with adjustable shelving.

Recommended equipment for the instrumental music room should include bentwood type chairs, durable heavy base metal music stands (director's stand with an added shelf), and podium. Storage space above the tympani locker will house the smaller instruments, e.g. clarinets, cornets, flutes, and oboes, and cabinets should be built for the larger instruments, i.e. drums,

---

[28]Best, op. cit., p. 106.

marimba, baritone saxophones, and baritones. Roll-Away Racks work best for sousaphones and violoncellos. A percussion cabinet serves the small sound effects equipment and rhythm instruments.

A music folder cabinet composed of pigeon holes, fifteen inches by thirteen and one-half inches by two inches, allows a numbered area for each folio. For greater efficiency each student should be assigned a definite compartment.

Four-drawer, letter-size, steel filing cabinets should be used for music and student record storage. Foreign music editions and phonograph record storage will necessitate the legal size steel filing cabinet.

Storage for instruction books, manuscript paper, music reference scores, and miscellaneous paper supplies may be shelving of wood or steel.

School-owned Band and Orchestra Instruments

Certain special musical instruments have been found necessary for every band and orchestra. These instruments should be furnished by the school, inasmuch as they are useful only in the band or orchestra (not especially suitable for solo playing), are expensive, and are often heavy and cumbersome to transport.[29]

---

[29]Jones, op. cit., p. 182.

Following is a list of these instruments.

1. String Basses
2. Tubas
3. Tympani
4. Oboes
5. Bassoons
6. French horns
7. Violoncellos
8. Violas
9. Celeste
10. Alto clarinets
11. Bass clarinets
12. Bass drums
13. Baritone saxophones
14. Chimes
15. Xylophones
16. Euphoniums
17. Concert snare drums
18. Field snare drums
19. Bass trombone
20. Percussion trap set

Upright pianos may be used in music rooms but a grand piano is preferred for most musical activities.[30] Pianos should be mounted on large, wide, rubber casters, ball-bearing style, or on metal frames equipped with this type of roller casters. Such equipment facilitates movement and pays dividends in helping keep the piano in tune and in preventing damage to the piano legs and floor.

It has not been found to be advisable to purchase cheap pianos because of the extent of their daily use and relatively long periods of service. A cheap piano cannot produce a desirable quality of tone, often does not hold its tuning, and is not dependable mechanically.

All pianos should be tuned to American Standard Pitch, A-440, three or four times each school year.

---

[30]Perkins and Cocking, op. cit., p. 214.

Audio-Visual Equipment

The ever-increasing development of audio-visual instructional aids has made necessary the installation of proper equipment for presenting such material. No music department can provide a complete program without such teaching devices. A few of the more important audio-visual instruments have been discussed below.

Radio. Because of the rapid development of frequency modulation, the safest procedure would be to secure a combination AM-FM set. A large speaker of not less than twelve inches presents an undistorted tone. In any event, the radio set for the school should be a flexible unit, easily operated, and generally a large portable model. If high fidelity of tone is desired, either the new high fidelity portable units or the more expensive console models are available.

Phonograph. Reproducing instruments of nationally known makes have proved to be the best instruments to purchase for music class use. The turntable should accommodate all size discs including the radio station sixteen-inch type. The instrument should also have a variable speed motor to accommodate all size speed records. High fidelity throughout the entire range of frequencies and record changers for music appreciation classes are important requisites in making a selection.

Combination Radio-Phonograph. The combination radio-phonograph has been found to be cheaper in price than two separate units and requires less space.[31] Usually this combination set is a better purchase for music departments from both the standpoint of cost and quality.

Disc, Wire and Tape-Recording Machines. Many educational authorities believe that whatever the uses made of the disc recorder, considerably more will be found in the greater flexibility of the magnetic recorder. A magnetic recorder assures a higher degree of fidelity of both voice and music, ease of storage, erasures and re-use of tape, moveability, and relative inexpensiveness. As a teaching device placed in suitable recording surroundings, this type of recorder has been found to be an important piece of equipment for all music departments.

Chromatic Stroboscope. The "Stroboconn",[32] a chromatic stroboscope, was the first measuring device on the market for testing the intonation of instruments. A few schools use this as a means of ear training, for harmony and theory classes, physics of music, or testing of various instruments. The cost has been found to be prohibitive in many schools since it ranges in price from four hundred fifty dollars to six hundred dollars.

---

[31]Best, op. cit., p. 109.

[32]Trademark. Manufactured by C. G. Conn, Ltd., Elkhart, Indiana.

Electric Metronomes. Some commercial manufacturers have developed electric metronomes that have proved to be a great help to music teachers. Different pulsations are easily and accurately obtained by a simple adjustment of a dial. Some metronomes are available which give visual as well as aural indications. This is accomplished by means of a small beam of light in addition to the regular pulsations of the aural type.

Lektrotuner[33] and Tuning Bars. The "Lektrotuner" was found to be a vacuum tube instrument which produces a tuning "A" or "B^b" with a wide dynamic range through a built-in speaker. Many directors favor this instead of the tuning bar. The lektrotuner has the advantages of checking both band and orchestral instrument tuning tones as well as maintaining an ever-constant pitch.

Tuning bars have been used for many years but have several disadvantages which are listed below:

(a) striker easily lost

(b) built-in striker easily bent

(c) incorrect pitch given when bar collects dirt

(d) pitch changes in striking

(e) pitch fades quickly after striking

The lektrotuner has been found to be gradually replacing the tuning bar.

---

[33]Trademark. Manufactured by C. G. Conn, Ltd., Elkhart, Indiana.

SUMMARY RECOMMENDATIONS AND CONCLUSIONS

Architects, generally, were found to be weak in the practical aspects of a completed music suite. Each region of the United States calls for a different type of planning and a different set of calculations and should be studied accordingly.

It was found that the location of the music room, because of the sound factor, should be in as remote an area in the school plant as possible and yet near the auditorium stage.

It was found that the band and orchestra room should have permanently built-in risers at least forty-eight inches wide gradually widening toward the top elevation on the fourth or fifth riser. Many teaching devices -- radio-phonograph, bulletin board, periodical and book shelf, and blackboard -- were found to be located at the front of the room. Around the room, especially at the rear, were found to be tympani cabinets and other storage shelves and lockers. The size of the rehearsal room should be adequate for the largest organization ever to be expected in that school.

Other rooms such as the theory and appreciation room, director's office, and practice rooms should be located strategically with sufficient acoustical treatment. The instrument storage room needs cabinets, ventilation, and a constant temperature for maximum instrument protection. The music library room also may be used as a repair room, if desired. Simple

equipment consisting of filing cabinets, a work table, chairs, and a sorting rack have been found to allow maximum benefit from minimum space.

Adequate acoustic control should be planned and developed with the building instead of developing as an expensive afterthought. Sound isolation is primarily a planning responsibility to keep noise areas away from other classrooms. Sound insulation reduces noise by presenting a barrier against it, while sound absorption reduces noise by draining off sound energy. Room shape will not reduce poor acoustics but will give direction to the sound which then may be more easily controlled.

Illumination was found to present a difficult problem due to the irregular seating arrangement and the upward direction of vision of music groups. No-blink starters and "Tulamp" ballast on the new fluorescent lights were found to be highly recommended for removing the stroboscopic pattern of the older type incandescent lamps that have caused annoying headaches from eyestrain. Unilateral lighting has proved satisfactory for smaller music rooms while bilateral lighting is most advantageous for larger rehearsal rooms.

The heating problem should be handled from a central source, while ventilation is recommended on a room-by-room arrangement. Not only should there be an unusual amount of fresh air available during rehearsal, but there must also be vents for uniform storage and instrument storage rooms.

Sound, heating and lighting engineers should be consulted before final approval of plans is given.

The maxim for obtaining equipment for an instrumental room was found to be, "Choose the best quality product then take care of it." Bentwood type chairs were found to be superior to folding chairs for correct seating posture. Carpeting on the permanent risers was found to add safety as well as beauty. Portable risers were found to be, at times, more useful, and with the addition of a strip of white paint on the step edge, thoroughly as safe. The height of each riser, should be from six to eight inches with the depth graduating from forty-eight to seventy-two inches to the top riser.

Durable, heavy-base, adjustable, music stands should be purchased for the largest music group. The director should have the same type stand with a shelf below the desk. Size of the podium was found to be a matter for individual directors to decide.

Storage space may be built around the sides and rear of the rehearsal room as well as in other available places, e.g. instrument storage, above steel filing cabinets, director's office, and music library. Steel filing cabinets were found to be most efficient for music files; Sherrard Roll-Away racks have been recommended for sousaphones and violoncellos. A percussion cabinet with four drawers, two shelves, and casters keeps small instruments and sound effects together and easily accessible.

A music folder cabinet, built with numbered, two-inch pigeon holes, allows each student to quietly and quickly find his music for rehearsal.

Other essential equipment included a piano (preferably grand), legal and letter-size four-drawer filing cabinets, a radio-phonograph capable of all speeds, sizes and high fidelity, a magnetic recording machine (preferably tape), a metronome, a tuning device, a music sorting rack, and school-owned instruments.

Financial support was found to be essential. The feeling seemed to be, "Let's do the building as cheaply as possible." No specialized classroom such as a music room can be constructed effectively by cutting essential items.

Too few music instructors were found who knew what they needed for an effective work area.

PLANNING RECOMMENDATIONS

Constructing and equipping an effective secondary school instrumental department requires a tremendous amount of planning. The following recommendations have been presented in the hope that they may be useful to school personnel who are confronted with the problem of providing their schools with adequate instrumental music facilities.

1. It is recommended that initial planning for construction or remodeling of instrumental music facilities be accomplished through close cooperation of the school administration,

the architect, and the music director. Close harmony among these persons throughout the construction program will eliminate many undesirable features in the finished product.

2. Even minimum requirements for instrumental music facilities were found to be costly. It is suggested, therefore, that adequate financial support be assured before starting a construction or remodeling program. It is better to postpone construction until sufficient funds are assured than to begin the program and then be forced to eliminate essentials.

3. It is recommended that the location of the instrumental music suite be in a separate wing of the school plant. Easy accessibility to the auditorium stage and to the athletic field provides greater convenience for marching rehearsals and for performances taking place on the stage. The post-war concept of school plant design emphasizes the importance of this location.

4. It is further suggested that all room requirements be planned and presented as minimum necessities. Each room should be functionally adapted for the purpose it is intended and should be planned to allow for future growth or increased community need for expanded facilities.

5. Another recommendation concerns the necessity for skilled acoustical engineering. The largest proportion of the director's ability is directed toward helping the students attain correct tone and blend. The music suite is the most important musical instrument of all, therefore the acoustic environment should approach the ultimate standard of perfection.

6. A suggestion on ventilation includes use of the window-gravity system. This is the most satisfactory to date but complete air-conditioning may become predominant in the future. Such items as circulating fans tend to furnish an adequate circulation, constantly keeping a supply of fresh air so vital to a large, concentrating group of hard-working students.

7. It is recommended that artificial lighting facilities include indirect fluorescent tubes. Lighting for irregularly seated groups who must read small notes and notations should not be entirely dependent upon natural sources.

8. It is suggested that interior decorations be as light reflectant and cheerful as possible. Design may depend upon the entire plant plan whereas colors, such as pastel shades, should be selected by the music director.

9. It is recommended that all floor coverings, with the exception of the carpeted risers, consist of grease-resistant asphalt tile. Permanence, beauty and functionalism are the greatest attributes of this type of flooring.

10. Another recommendation reflecting present trends in school construction allows restroom and drinking facilities for each room. This also should be true for the music suite.

11. It is suggested that storage units be large enough to allow for future growth and addition of equipment. Without adequate care, instruments and music must be replaced frequently.

The teaching of responsibility and care is under the supervision of the music director. Until storage space and places are available, sincere appreciation and reasonable treatment of equipment cannot be expected.

12. It is suggested that schools purchase those instruments which are not adaptable for student ownership. Larger and more expensive instruments are tools which should be furnished in the same manner that power tools and other special equipment are furnished for industrial arts students. School-owned instruments provide an opportunity for trial until the student decides upon the instrument best suited for himself. The more progressive the school, the more school musical instruments it makes readily available.

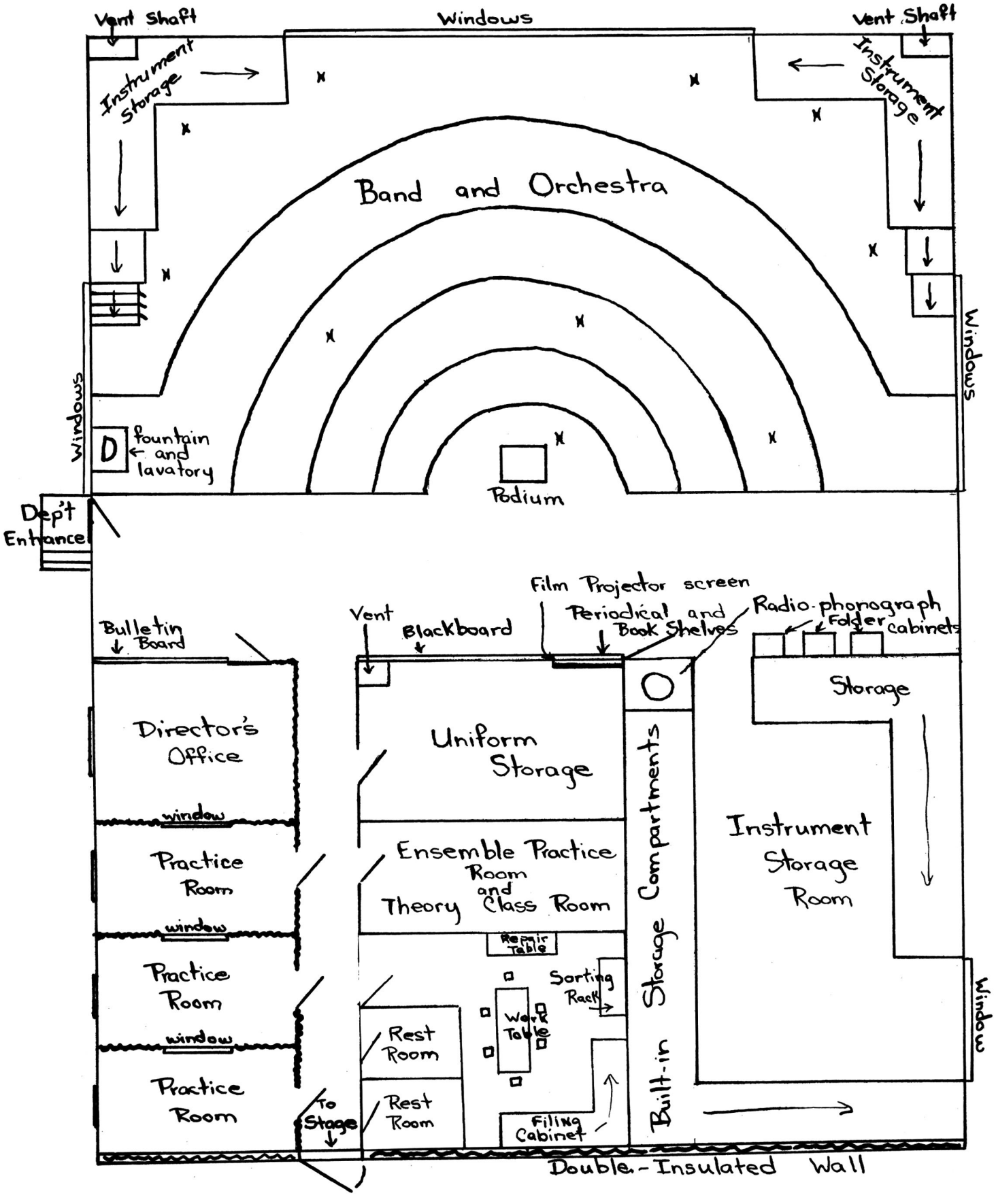
13. It is further recommended that audio-visual equipment be made available with provisions within the instrumental music suite for its use. Such equipment aids instruction and also provides students with opportunities for enjoyment of professional music organizations and artists.

14. The final recommendation is that **Plate VI**, be used as a guide in developing instrumental music facilities. Plate VI is a visual concept of the preceding recommendations. It proposes not only an adequate working area but also allows for revision or enlargement according to local needs. For this reason specific dimensions have not been included.

EXPLANATION OF PLATE VI

Plan for a Music Suite

PLATE VI


Vent Shaft
Windows
Vent Shaft
Instrument Storage
Instrument Storage
Band and Orchestra
Windows
Windows
D
fountain and lavatory
Podium
Dep't Entrance
Film Projector screen
Vent
Blackboard
Periodical and Book Shelves
Radio-phonograph
Folder cabinets
Bulletin Board
Storage
Director's Office
Uniform Storage
window
Practice Room
Ensemble Practice Room and Theory Class Room
Instrument Storage Room
window
Repair Table
Practice Room
Sorting Rack
Storage Compartments
Built-in
Work Table
Window
window
Rest Room
Practice Room
To Stage
Rest Room
Filing Cabinet
Double-Insulated Wall

ACKNOWLEDGMENTS

The author is especially grateful to Dr. O. K. O'Fallon, Kansas State College Department of Education, and Dr. Finis M. Green, Head of the Education Department, Kansas State College, for their valuable suggestions and encouragement throughout the research and writing period of this report.

Many others took part, indirectly, in helping with this work. R. C. Chartier, Salina; Don Bailey, Russell; Alton Foster, Great Bend; Bernard Fitzgerald, University of Texas; Harold Palmer, Fort Hays State College; and others have mentioned progressive ideas or pointed out errors regarding experiences in school music work. Some of these ideas have been entered in this report.

Also, to my wife, Harriet, who has read and typed this work countless times, goes my heartfelt gratitude.

BIBLIOGRAPHY

Books

American School and University. New York: American School and University Publishers, 1952.

Best, Clarence J. Music Rooms and Equipment. New York: Music Educators Research Council, 1949.

Engelhardt, N. L., N. L. Engelhardt, Jr., and Stanton Leggett. Planning Secondary School Buildings. New York: Reinhold Publishing Company, 1949.

Instrumentation and Plant Design. Trapnell Institute.

Jones, L. B. Building the Instrumental Music Department. New York: Carl Fischer, 1949.

Lloyd, L. S. Music and Sound. Oxford, England: Oxford Press, 1951. Second edition.

Niemi, A. L. Planning the Housing of the School and Community Music Activities. New York: Music Educators Research Council, 1951.

Perkins, Lawrence B. and Walter D. Cocking. Schools. New York: Reinhold Publishing Company, 1949.

Stewart, G. W. Introductory Acoustics. New York: D. Van Nostrand Company, 1933.

Periodical Articles

Bernard, E. G. "Well Equipped School." Scholastic, January 4, 1950, 55:6T-7T.

Best, Clarence J. "Guide to Planning Music Rooms." Architectural Record, May, 1950, 107:166.

Bolt, Richard H. and Robert B. Newman. "Architectural Acoustics: Good Hearing Conditions." Architectural Record, September, 1950, 108:148-151.

Burk, C. J. "Teacher Participation in a School Building Program." American School Board Journal, March, 1952, 124:52.

Culpepper, D. L. "A Place to Drum." Parents Magazine, April, 1950, 25:51.

Rockwood, M. "For Good Teaching, Supplies, and Work Space." National Elementary Principal, April, 1953, 32:5-7.

"Schools: Building Types Study." Architectural Record, November, 1952, 112:119-150.

"School Construction in 1952." American School Board Journal, January, 1952, 124:66.

Waite, L. L. "Making Room for the Arts in Planning Elementary and Junior High Buildings." National Education Association Journal, May, 1950, 39:354-355.

Wright, A. G. "Housing the School Music Department." Music Educator's Journal, June, 37:20-21.

Bulletins

American Recommended Practice of School Lighting. Illuminating Engineering Society and American Institute of Architects Bulletin, New York:1938.

Best, Clarence J. Music Rooms and Equipment. Music Educator's National Conference Bulletin 17. New York:1949.

Carpenter, W. W. Schoolhouse Planning and Construction. State Department of Education of Missouri Bulletin 5. Jefferson City: Mid-State Printing Company, 1946.

Carter, Russell and Carl Payne. Planning the Music Suite for Central Schools. State Department of Education of New York State, Division of Buildings and Grounds Bulletin 1. Albany, New York:1947. Reprinted in 1950.

Clark, N. I., and G. M. Aitchison. Adapting Classroom Activities to the Needs of Youth. National Society for the Study of Education Yearbook. Chicago:1953.

Meadows, A. R. Better School Buildings for Alabama. State Board of Education Bulletin 3. Montgomery, Alabama:1950.

McClurkin, W. D. Guide for Planning School Plants. National Council on Schoolhouse Construction. n.p. :1949

Music Supervision and Administration in Schools. Chicago: Music Educator's National Conference:1949.

Putnam, Rex. A Manual for School Building Construction. Superintendent of Public Instruction of Oregon. n.p. :1947.

Shores, Roscoe V. Educational Specifications for Buildings. Kansas City, Missouri Public Schools:1951.