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ABSTRACT

The New Designs for the Comprehensive High School project used the break-the-mold design-down process to develop a prototype high school. The basic building block of this design is the personal workstation, not the classroom. Combining the personal workstation with the desire for teaming leads to the idea of a small, flexible group space that accommodates several personal workstations. High school students are grouped into approximately 100 pupils and gathered around a resource/production space to facilitate project-focused tasks. Neighborhoods that are virtually stand-alone schools are created. Along with the multiple-use commons, they give students a meaningful environment with a special identity. The flexible studio frees the school organization from the limitations of the physical environment and allows for the complete integration of vocational and academic subject matter. Support staff are located in as friendly and accessible a manner as possible. Learning technology permits information to be everywhere. Instructional material centers, computer rooms, and the problems of scheduling access to them no longer exist. Many places in the design provide for demonstration and display, now an important part of assessment. This design connects students to their surroundings and provides space for the community in the school. (Three tables show hierarchical organization and space requirements. Eleven figures depict relationship diagrams and graphic representations of the new designs.) (YLB)

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LEARNING ENVIRONMENT: AN ARCHITECTURAL INTERPRETATION OF A NEW DESIGNS ARCHETYPE HIGH SCHOOL

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THE LEARNING ENVIRONMENT: AN ARCHITECTURAL INTERPRETATION OF A NEW DESIGNS ARCHETYPE HIGH SCHOOL

Altering the public's image of school facilities may be the single most difficult part of the needed transformation in American education. The American public must somehow come to see that it is possible, important, and necessary not only to transform schooling, but to design school facilities that differ sharply from the traditional school facilities of the past. Research of educational and architectural literature of the past two decades disclosed that very little has been or is being done by either educators or architects on the myriad of design decisions that a responsible architect has to make in the course of designing, renovating, or expanding a school building. This paper will develop some *break-the-mold* school building concepts.

Learning takes place in many different settings. The institution of education uses the setting of the school for focused learning. The success of the school as a *places for learning* depends on its ability to create and support learning opportunities. These opportunities occur both within a school facility and beyond its walls. Therefore the school must also enhance the linkage to settings in the greater comr unity.

It has been suggested by some authorities that all learning ought to occur without schools. Although this is an alternative, the concept of a comprehensive high school benefits from having a place for learning in the following ways:

1. The school as a place is a symbol to offer hope.

2. The school as a central place can be the broker for sending youngsters to and from *real world experiences.*

3. The school can be a place for the socialization of youth.

4. The school can be a place where real world experience are synthesized, analyzed, and understood by the pupils.

5. The school can be an amenable place for exploring self.

6. The school can be a safe place when the individual's welfare is at risk.

When students learn outside the place called school, it is more likely that they will be able to humanize the place called school (Weinstock, 1973). A simple rule of thumb ought to be that whenever you can do a thing better in school, or a place called school, that's where you do it. If you can do it better *out there*, you do it out there.

The other research and synthesis papers which are a part of this project address an approach to structuring education based on the logical progression from general concepts to specific thoughts about organizational aspects of the learning process. This architectural interpretation of a New Designs archetype high school continues the application of that logic to the learning environments. The spaces for learning need to house the activities that will be determined by the educational philosophy, by the goals and objectives, and by the organization of students, staff, time, curriculum, assessment, and instruction. The character of these spaces reflects the values of the community and the needs of the students. Together the definition of spaces and character will lead to the creation of places for learning (Crumpacker, 1992).

"Schooling in America is changing—school design must follow suit" (Prairie School, 1992). This paper follows that statement by: (a) identifying the educational concepts that affect the learning environment, (b) describing how the educational concepts translate into design concepts, and (c) illustrating applications to a real design. Throughout the discussion, comparison is made to the traditional high school designs.

Educational Concepts

The traditional high school design is strongly determined by the daily schedule, which is driven by the Carnegie Unit. The number of classrooms, their size, and their location are a result of efficiently grouping and moving students so they may accumulate their time units. *Outcome Based Education* (OBE) totally changes this focus. When learning is no longer a group of students in front of a teacher every aspect of schooling changes (e.g., pedagogy, governance, calendar, curriculum, assessment, accountability, educational technology). The idea of a classroom of students doing the same thing in the same way vanishes. These changes in virtually every fundamental area clarify why the schools of the past are increasingly seen as unable to prepare today's youth for today's world. Yet the emerging new format of education for the twenty-first century is struggling to be born in nineteenth century buildings.

Schools of the past emphasized an instructional approach of a teacher directing a group of pupils in a uniform manner. This is seen as efficient and results in school buildings that are teacher-centered. The *learning community* concept of this project places the student at the center of the school organization. The OBE philosophy reinforces this approach. Learning now means individual and small groups of students posing questions, generating information from multiple sources, tracking it down and seeing where it leads, manipulating the information, and re-communicating it to others. The teacher—no longer a lecturer—now serves as a keen observer of learning and of her or his own teaching, whose task it is to foster students' thinking. The teacher is changing from the provider of information to a participant observer, mentor, and coach in the learning process.

Another feature of traditional high school design is to create different areas of the building for academic and vocational subject matter. This contributes to a them vs. us attitude. By *integration* of these areas a building layout based on such a distinction is circumvented. This change is also facilitated by the *modernization of vocational curriculum*. Together these two educational concepts allow for new spaces and spatial relationships in high schools.

High schools often are seen as isolated institutions. This perception is reinforced by a *closed campus* operation with students entering at 8:20 a.m. and leaving at 3:10 p.m. Only the main entrance is open during the day. Designs that reinforce isolation feel forbidding and, along with the cellular arrangement of classrooms, are characterized as prisons. Implementing an approach to *partnerships, community service, and other school-community links* will demand a different, more open interface between the school and its surroundings. The new designs will encourage movement to and from the school and its environs. The community becomes part of the school.

Classrooms for twenty-five to thirty pupils work to support the lecture format of instruction although some research has shown that it may not be one hundred percent effective. Education that embraces concepts of *problem solving, learning to learn*, and *flexibility* requires different activities and, therefore, different spaces. The activities become more project oriented and include more experimentation. Supporting these activities are new (and some traditional) types of furnishings, equipment, and technology. The hardware and software of schools become a resource and are used on an *as needed* basis in addition to being used for instruction. Spaces that house these activities are highly accessible.

Another reason to reexamine the traditional classroom is the emphasis on *teamwork*. Cooperative learning research has defined patterns that aid in implementing this concept. Groups that form in size ranging from two to six and gather formally, informally, or as base groups require supportive spaces and furnishings. Although cooperative grouping is done in traditional classrooms—(they have not had much choice)—difficulties exist. The activities of several groups working in a room designed for desks in a row creates audio and visual disturbances. The alternatives are either conference-type rooms or a larger room that allows adequate space between groups.

Approaching *assessments to improve learning* also affects a school's spaces. Individual testing in groups of thirty works in the classroom environment. However, when assessment includes portfolios, displays, and demonstrations optional places are preferred. Every space in the learning environment should provide for these activities. This will vary from small, intimate places to complex large group spaces.

The use of resources is becoming increasingly important in all schools. The traditional high school is reflecting this by building larger, centrally-located Instructional Material Centers and an increasing number of computer rooms. Full implementation of *learning technologies* turns this approach upside down. Electronic access to audio, video, and data information alleviates the need for physically centralizing these resources. A totally decentralize strategy, where each student has access to this information at a workstation, is feasible and desirable. The complications of scheduling and proximity vanish. Computer rooms no longer are required and libraries become either a small space for print media or nonexistent as students use the larger community libraries.

Traditional high schools have large central offices titled *Administration*. These offices were conceived as the control center of the school with rooms for the principal, the assistant principals, the dean, attendance staff, counselors, athletic director, and other administrative staff. Students and parents often find this setting intimidating. By *decentralizing authority* these roles change in both character and location. The result is that the central office becomes smaller and shares governance with the *student council*. Small spaces are provided locally throughout the school in order to increase the involvement of administrators and counselor with the students and teaching staff. These spaces are designed to be inviting and allow for spontaneous meetings among the participants.

All students can learn is one additional idea that affects the spatial design of the comprehensive high school. Traditional schools often provided special facilities for special needs students, alternative settings or the students who dropped-out. Through OBE these students no longer are distinguished because of their learning abilities. They therefore do not have separate places nor the stigma those places generate. As with the administration, the staff needed to assist these students is locally placed and fully accessible.

Design Concepts

To properly design a physical environment for learning, the educational concepts need to be translated into the language of the architect. This is the bridge between the educator and the designer. The following design concepts are that connection.

Personal Workstation

The basic building block of both yesterday's and today's high schools is the classroom. Sized for thirty pupils and, when necessary, having special equipment, these rooms are connected by corridors to facilitate the mass movement of pupils between class periods. This arrangement is primarily for lecture-type instruction. The learner-focused school makes minimal use of this instructional method; and, therefore, it is not supported by the traditional layout. Another approach examined was an assembly of the large, medium, and small group rooms similar, to those of flexible modular scheduling schools. Considering that this approach is only a variation on the traditional high school (i.e., the numbers of pupils change), it is not suitable for the learner environment envisioned in the educational concepts of this project.

The New Design high school environment suggests that the *personal workstation* is an alternative to the classroom, and should be the basic building block of the high school design. In the personal workstation, each student has a place to study and do small projects, keep books, papers, and personal belongings, and connect into the technology network. Each student has a notebook computer. Considering the significance that the usual student locker plays in the high school experience such a personal place will enhance the student's self concept.

Group

The personal workstation is learner-focused, however, it is weak in addressing the educational concept of teaming. Combining the personal workstation with the desire for teaming leads to the idea of a small, flexible *group space* that would accommodate several personal workstations. This building block needs the support of spaces for instruction, production, resources, and demonstration. This arrangement is similar to many real world work settings.

The research on cooperative learning and student teaming indicates that numbers of two to six people in a group work well. Because there is no apparent, perfect number, flexibility to change the group size is desirable. Cooperative learning theories also address the need for flexibility in task, participants, and time. The method to achieve this is to identify formal, informal, and base groups. The first two groupings are project driven while the base group is long term—from one year to the complete high school experience. It is this base group, each with a small, flexibly-arranged personal workstation, which makes up the basic building block of the new comprehensive high school.

The next level of design for the learning environment deals with the organization of the personal workstation groups. In what manner and number will they be arranged? What functions and spaces will adjoin and support the groups? Answers to these issues are driven by educational concepts.

Family and Resource/Production Area

The idea of a learning environment must be both functional and perceptible for it to be meaningful to the participants. Functionally central to the student groups are the activities of accessing resources and producing projects. The space for these activities and the materials contained in the space vary with the number of students being served. Experience in schools that have developed team teaching, interdisciplinary instruction, and multi-disciplinary teams indicate a range from 75 to 125 students as being viable. This allows the faculty to get to know the students and still be cost effective. Resources appropriate to this size of student body include powerful microcomputers, laser disks, CD-ROM, audio/video technologies, and selected software and printed material. Production support includes space for medium-size projects, viewing area, art projects, and tables for the formal and informal groupings. It would also allow for demonstration and display. This space is physically an extension of the group workstations and central to them.

Perceptually it is the unifying element to this medium-size group of students and would double as their assembly space.

Supporting this student body are spaces for small, medium, and large group instruction, laboratory work, staff personal workstations, and private conferences. These spaces along with the personal workstation groups and the resource/production space are identified as the *family*.

Neighborhood

Further development of the learning environment involves the gathering of several families and identifying their unifying, central element. The pattern is the personal workstation group as the basic building block. These are assembled to create the family with its center. The next level uses the family as the building block to establish a group of families with a center. This level (except for a few specialized spaces) can function as a stand-alone high school.

Recent research has supported the idea of smaller high schools. Sizes ranging from 250 to 500 pupils are recommended. With a complimentary educational delivery system, schools this size can offer a full curriculum without loosing the individual student in the mass. Where community culture and demographics require larger high schools, this approach becomes a school-within-a-school strategy.

Neighborhood Commons

The components of this level of organization start with the family. Four families are recommended to achieve the size indicated by research. To establish the sense of a learning environment, the next component is that which is both functionally and perceptually the center. Functions involving all students of a high school are dining, socialization, demonstration, display, and large assembly. A flexible, multiple use space that accommodates these activities is a *commons*. It is of a size and function that support its role as a center and at the same time its casual nature complements the more rigorous center of the family, the resource/production space. As with the family center, the commons is readily accessible from all areas and is perceivable as the unifying element for the four families.

Studios

The support spaces to round out this level of the design include specialized, yet flexible, *studios*; spaces for additional staff including student support services, specialists, and school management; and a technologically advanced, electronically interactive instruction and demonstration room.

The studios are for instruction and production. They are flexible in that each is similarly outfitted with systems for technology networking, electronic power, general and task lighting, water and sewer, air exchange, and special ventilation and storage. Their use would be determined by the curriculum and the corresponding movable furnishings and equipment. This apparatus is plugged in and removed as the curriculum and projects change.

The studio is the focal point of the integrated academic and vocational programs. It is here where projects involving disciplines (e.g., mathematics, language arts, technology, business, agriculture, family and consumer education, art, history, and music) are carried out. There are several of these studios allowing for each one to have a different focus at any one time. This focus would evolve out of agreements among the students, faculty, parents and partnership representatives. This approach and its inherent flexibility allows for a variety of educational delivery systems. Whether the school is departmental, multi-disciplinary, interdisciplinary or thematic, the physical environment is not a constraint.

Staff Spaces

The spaces for the staff that are not located in the family are designed to maximize their accessibility to the students. Their role as support to the students, their families, and other stakeholders suggests an environment that is welcoming and friendly—not intimidating. This group is categorized into three functions. The first is the leadership of the school-within-a-school. In addition to the general management function as a primary task, this position has responsibility for the coordination of particular student activities in the larger community. Here the identification, scheduling, and feedback of community partnerships occurs. This includes such things as community service, working in the local businesses and governments, and participation of local people in the activities of the school. Next are the support people usually identified as counselors, social workers, and psychologists. Their focus is to establish a comfortable relationship with the students and their families. Their accessibility is essential. The third group consists of the specialists. Their role is to work with students with extraordinary needs, which would include both

physical and mental issues ranging from remedial to gifted and talented. As with the other support staff, their accessibility is essential. In addition to these staff spaces are conference rooms for private meetings.

Electronically Interactive Room

The other major support space is the technologically advanced, electronically interactive instructional and demonstration room. This space has two main functions. The first makes use of technology for interactive instruction. All stations in this lecture like configured space would be equipped with a local area network computer outlet. Students would bring their notebook computers, plug them in and communicate interactively over the network with each other and the instructor. At the front of the room is a large display monitor so all participants can view the electronic dialogue. The second use would be as a formal presentation room where students present their projects and research to their peers and faculty as part of the assessment process.

The gathering of four families, the central commons, and their support spaces defined above is called a *neighborhood.* The neighborhood almost is a stand-alone school; only a few specialized spaces are missing. Also, some communities may require accommodations for a larger student body. In addition, some of these specialized spaces may be provided in the surrounding greater community.

To complete the development of this archetype, certain assumptions must be made. However, in making these assumptions it is important to point out the flexibility and the alternatives that are possible within different settings.

Community-level Spaces

Because size is a major variable, the first assumption made is that the archetype school consists of four neighborhoods in a *community.* This incorporates the strategy of a school-within-a-school. The specialized spaces would serve all four neighborhoods. The neighborhoods become the building blocks of the archetypal school as the families are for the neighborhood. Consistent with the design approach to reflect the educational concept of a learning community, the specialized spaces break down into those forming a centralized, unifying space and those forming the support spaces.

The list for these spaces includes physical education rooms (e.g., gymnasium, weights, swimming pool, and locker rooms); large group rehearsal rooms for music, dance and drama; Auditorium theater for very large group assembly; library; audio/video studio; governance center; community services; and others depending on the community.

Some of these functions can be served outside the school (e.g., swimming) or the school could provide these to complement those in the greater community (e.g., library). The number and size of these facilities also will vary with the number of neighborhoods. For example, a one neighborhood school may not have an auditorium and only a single-station gym. An eight-neighborhood school may have a performing arts center to seat one thousand and an athletic field house. Another possibility is to have several single neighborhood schools spread throughout the greater community that would share a centralized special purpose facility containing all the spaces on the list.

The archetype design of four neighborhoods develops the auditorium/ theater/very-large group assembly function as the central, unifying space. Consistent with the educational concepts, placing emphasis on assessment through demonstration and display, this space is conceptualized as a public *forum*. Auditoriums are often sophisticated performance halls where only special events occur. Hundreds of schools have been designed where this facility is at the far end of the building with a separate public entrance. However, during the typical school day it is closed with the lights off and the doors locked to keep out students. In the comprehensive high school this space is located in the center of the facility and open to maximize accessibility and use. Throughout the day it is used for large group gatherings, spontaneous or planned. Students and public passing through can witness the creation of staging and lighting for plays and musicals. This sharing of the process is as important to learning as is the experience of the final product.

The other components of the high school include an activities area, governance, library, instructional technology, community services, and a school store. The activities area includes those functions requiring some separation due to the nature of the activities themselves. This includes the physical education elements of the gymnasium with spectator seating. Although the assumption could have been that this function can occur in the greater community, it is included here because of the opportunity it provides to involve citizens in the school and the identity given through athletic events. Also included are gymnastics/dance, fitness/weights, and locker room spaces.

The other activity area spaces focus on large group music functions. Facilitating rehearsal acoustical control is necessary. However, these spaces are located in proximity to the athletic spaces to encourage the incorporation of music in the physical education program (e.g., dance and gymnastics).

The governance spaces include not only the overall school management and heath functions but also contain the *council hall.* This room is like the senate chambers in that the appointed and elected representatives meet to govern the school. Represented are students, staff, parents, partnership, citizens and administration. The space doubles as a staff development center.

The library is a more traditional place for books and other printed media. With the decentralization of the electronic information, the development of a large instructional media center is not required.

The instructional technology space serves a new function in schools. It is a center for all the school technology networks and connections to technology systems outside the school (e.g., satellite TV, cable TV, modems to databases). In addition, this area houses a TV studio and a multimedia room for virtual reality explorations.

The community service space provides a place for those functions in society that are evolving in response to the changing demographics and work force. The exact nature of these services has not been defined in this high school. However, they could include such services as medical/dental, therapy, welfare or police liaison. These would vary significantly from community to community.

The school store serves two functions: (a) it provides an opportunity for students to experience the challenges of the world of commerce, and, (b) it will aid in providing the materials and products needed by all students to carry out their various projects. These projects can be complicated and time consuming and the school store will minimize the time needed to secure the necessary equipment.

Summary of Design Concepts

The four neighborhoods, the forum, their support spaces, and the necessary utilitarian building services constitute what is labeled the *community.* The analogy used to identify the different levels in the new comprehensive high school (personal workstation

group, family, neighborhood, and community) is intended to not only reflect the hierarchical nature of these spaces but also to aid in disassociating the new design with any preconceived notions of what a high school should be. The intention is to conceptualize a learning environment based on the educational concepts developed in this project. There may be—and should be—other approaches to this challenge.

One additional level in this hierarchy needs to be addressed before the new designs for a comprehensive high school is complete. This is the context in which this learning environment is to exist. Previous statements have referred to this as the *greater community*. Any school project that is to be meaningful needs to be created someplace to serve somebody. This could be in an urban, suburban, or rural setting. It could be in a tropical or frigid climate. It could be in a conservative or liberal culture. The physical design that follows assumes an urban setting in a cold temperate climate and a pluralistic culture with multiple values.

Educationally the completion of the environment depends upon strong connections to the greater community. Part of the students' learning process includes involvement in this community. Time would be spent doing community service, working in local businesses, churches, and governments and bringing some of the community's concern back into the main school for exploration. In addition to this the school building, in turn, offers a symbol of growth and development to the community. This is reflected in the design of the environment in two ways. First, the involvement of the students in the greater community is encouraged and facilitated by each neighborhood having its own inviting entrance between the school and the community. Second, the school as a whole has a main entrance statement, which would be used for the ceremony and rituals that go along with the meaning of educating children so they may enter the adult world as full participants. The complete hierarchy described above is expressed in Table J.1.

Table J.1

New Designs for the Comprehensive High School Hierarchical Organization

Level	Base Unit	Center	Support
Individual	Workstation	Desk	Storage
Group	Individual	Table	Others
Family	Group	Resource/Production	Faculty Group instruction Laboratory
Neighborhood	Family	Commons	Studios Support staff Dialogue room
Community	Neighborhood	Forum	Activity spaces Governance Library Community services
Greater Community	School Community	School	Business Government Commerce Church Artistic

Archetype Design

Given the design concepts and the assumptions described above, the next step in creating an archetype design for the educational environment is to develop a space program. This is a listing of the individual spaces, their number, and their size in square feet. These spaces are organized in the program in a manner that reflects their organization in the school. A major objective of the program is for the total square footage to be consistent with that of a traditional high school to assure that the cost is comparable. The number of students to be accommodated is shown in Table J.2.

Table J.2
Arrangement of Students

Personal Workstation Group	5 students	2 five student groups*
Family	100 students	10 group pairs
Neighborhood	400 students	4 families
Community	1600 students	4 neighborhoods

Note: Groups are paired for flexible grouping of up to ten students.

The following *High School Space Program* brings all the above information into a condensed expression of the facilities needed with the exception of those activities that occur in the greater community. The total square footage of 350,000 square feet is similar to a traditional high school for 1,600 students with an auditorium, and located in a northern climate. The cost of this school would be comparable to a traditional high school on the same site and in the same community.

The prototype design is for a new facility. This provides the best opportunity to develop and illustrate new spatial concepts based on the new educational concepts. With these tools it is both possible and advisable to explore renovations of existing high schools or other facilities to implement the educational ideas. The High School Space Program would hold true for restructuring an existing high school as long as the same assumptions applied (1,600 students with an auditorium and located in a northern climate).

Table J.3
High School Space Program

FAMILY LEVEL (4 @ 100)

Spaces	No.	Area	Sub-total	Total SF
Family				
Group (5)	20	150	3000	
Product/Resource	1	1750	1750	
Large Group (100)	1	1500	1500	
Medium Group (15)	1	400	400	
Lab (20)	1	1250	1250	
Planning/Off (6)	1	400	400	
Storage	1	200	200	
Total (x4)			8500	34000
Family Total (x4)				136,000

NEIGHBORHOOD LEVEL (4 @ 400)

Spaces	No.	Area	Sub-total	Total SF
Commons (x4)				
Dining/Social/Activity	1	2000	2000	
Serving	1	400	400	9600
Shared Studios (x4)				
Studios	4	2000	8000	
Dialogue Room	1	1500	1500	38000
Coordinator (x4)				
General office	1	250	250	
Dean	1	125	125	
Office	1	125	125	
Conference	1	250	250	
Workroom	1	250	250	4000
Learning Services (x4)				
Work Resource	1	250	250	
Offices	4	125	500	
Special Needs	1	500	500	
Special Activities	1	500	500	
Conference	2	250	500	9000
Neighborhood Total (x4)				60,600
Family & Neighborhood Total				196,600

Table J.3 (cont.)

COMMUNITY LEVEL Spaces	No.	Area	Sub-total	Total SF
Forum				
Cavea (800)	1	8500	8500	
Stage	1	2000	2000	
Backstage	1	3000	3000	13500
Instructional Tech.				
Video Studio	1	1750	1750	
Multimedia Room	2	1000	1000	
Equipment Room	1	500	500	3250
Library				
Reading Room	1	3000	3000	
Workroom/Off/Storage	1	500	500	
Faculty Resource	1	750	750	4250
Governance				
Council Hall	1	1500	1500	
General Office	1	500	500	
Principal	1	125	125	
Offices	2	125	250	
Conferences	1	250	250	
Workroom/Files	1	400	400	
Health	1	400	400	3425
Community Services				
General Office	1	250	250	
Offices	3	125	375	
Conferences	1	125	125	750
Activity Spaces				
Instrument/Rehearsal	1	2000	2000	
Vocal Rehearsal	1	1500	1500	
Ensemble	1	750	750	
Individual Practice	6	50	300	
Storage	2	400	800	
Planning/Office (5)	1	400	400	
Gymnasium (2500 seats)	1	11000	11000	
Gymnastics/Dance	1	5000	5000	
Fitness/Weights	1	5000	5000	
Gym Storage	1	1000	1000	
Training Room	1	750	750	
Men's Locker Room	2	2500	5000	
Women's Locker Room	2	2500	5000	38500
Community Store	1	500	500	500
Food Service	1	2500	2500	2500
Custodial	1	6500	6500	6500
Community Level Total				73,175
Family & Neighborhood Total				196,600
GRAND TOTAL SQUARE FEET—NET				296,775
TOTAL SQUARE FEET—GROSS				350,000

Relationship Diagrams

Relationship diagrams are the next step in the design process. These are based on the space program and the design concepts and form the foundation for an architectural design. They are graphic illustrations of the key room adjacencies. The three diagrams for the prototype are based on the three levels of family, neighborhood, and community (as shown in Figures 1, 2, and 3).

Diagram of a 100-Student Family (Figure 1):

The five student group spaces gather around their center, the resource/production space. The support spaces are at the periphery.

Diagram of a 400-Student Neighborhood (Figure 2):

Four families and their support spaces are united by the centrally located commons.

Diagram of the 1,600-Student Community (Figure 3):

Four neighborhoods and the activity block (physical education and rehearsal) surround the forum with library, governance, school store, community services, and other areas.

School Context and Character

The three diagrams described above form the basis of the plans. However, this is only one aspect of architecture. Two others that must be discussed are: (a) the context or surrounding setting, and (b)the character of the design. The school context or surrounding setting are a central concern of educational facility architects. Actual projects have a real site with specific street locations, orientations, adjoining buildings, and topography. The assumptions made for this project are shown in the drawing labeled *View of an Urban Comprehensive High School* (Figure 4).

The aspect of character of the design deals with aesthetics and spirit of the design. This is what creates that sense of place (Crumpacker, 1992). Full development of character is beyond the scope of the drawings, however some comments can be made. The character of a school will reflect the community's values and will be sensitive to the psychological needs of this age-group of students. The following are some ideas in this regard that are adapted from the ideas of Crumpacker (1992) and Weinstock (1973).

1. *Human scale:* Physical settings must satisfy the need for a sense of identity. That won't be found in the totally illuminated, smoothly air-conditioned, precision-controlled container of space where you can't find the center.

2. *Personal territory:* Students and teachers alike need a sense of their own turf: a personal place to be alone and separate from group pressures, to work, to store and retrieve information and tools gathered for projects in progress.

3. *Spatial variation:* A building should provide options in the size and shapes of sub-spaces so people can gather in groups of two or four, ten or twenty, or one hundred and, in each case, provide the right amount of visual and auditory privacy.

4. *Spatial order:* Patterns of use should not be totally predetermined. The space should permit people to array themselves in relationships natural to communication for the work at hand with allowances for random meetings and room for peer play, as well.

5. *Manipulability:* The environment must allow itself to be manipulated by its users so spaces can be changed (i.e., lamps turned on and off, tools moved from here to there). Functional considerations aside, a facility that allows itself to be manipulated gives its users a sense of ownership.

6. *Access to information and tools:* The management posture must emphasize service. It must make things easily available and invite *hands-on* use.

7. *Environmental feedback:* A school facility must allow its occupants to stamp their presence on it. The builders must be able to accept the graphic presentation of student activities and interests so that it reflects who is inhabiting it and how they are doing. Displays of student work help to build a sense of identity. These displays also make the surroundings more lively and relevant.

8. *Optional seating and work surfaces:* The facility must acknowledge that people work in a variety of natural postures: sitting up straight, lounging, leaning, perching, standing. It should offer a variety of seating (including the floor) and work-surface heights to accommodate various work postures.

9. *Graceful wear and renewal:* Furniture should be allowed to be worn, used up, and renewed. Furnishings bought for qualities of permanence tend to be cold, unyielding, anti-people, and it wears out anyway, becoming more unpleasant as it does.

10. *Work aesthetic:* The look of learning in action is a busy one, with things out and in active use. Although this seems to violate some cultural sense of order, administrators, teachers, and custodians will need to understand that a space by being useful, interesting, and relevant, becomes attractive to its users.

11. *Friendly:* Above all, the new school needs to be a child- and family-friendly institution where all feel welcome and have a sense of belonging in spaces that flow from social and public areas, to smaller work areas, to private spaces that encourage contemplation

Graphic Representation

The graphic representations of the new designs for the comprehensive high school are contained in the eight drawings described below. They represent one interpretation of the educational and design concepts.

Personal Workstations for Groups of Five Students (Figure 5)

The personal workstation is the basic building block of the design. This home for the *base* cooperative group is intended to have a sense of place for five students. The furnishings are modular and can be arranged to suit the occupants. The space maintains a feeling of openness to strengthen the connectives to the family. Each student has a workstation, including a desk with drawer, chair and a computer network connection. The group shares a wardrobe cabinet and a round table for group work. The upper portion of the drawing shows a view of a pair of groups; two groups of five are paired to allow for flexibility. The lower portion shows a plan of three pairs with alternative furnishing layout. The pair on the left could be working as a team of ten.

Plan of a 100-Student Family (Figure 6)

The 100 student family is comprised of ten pairs of groups that are gathered around the resource/production area. Also in proximity is the faculty planning/office. To the top right of the drawing is the laboratory. This would be flexibly equipped for exploration in

the various sciences. To the left is the large group room sized to seat one hundred in lecture formation. It can be subdivided for two classroom size groups. Adjacent to this is a medium size group room to accommodate fifteen.

View of a 100-Student Family (Figure 7)

The focus of this drawing is the resource/production space. Connected to the commons (bottom of drawing) the entry passes the planning/office. Except for the skylight, all furnishings and equipment are movable. The example layout shows places for display, tables for group work, high technology equipment, small group video demonstration, accessible resources, art production, and casual gathering at the skylight well. This space becomes both the functional and symbolic image of the family. Each family has its own identity through the displays and artifacts that personalize each resource/production place.

Plans of a 400-Student Neighborhood (Figure 8)

The 400 student neighborhood is a drawing of a first- and second-floor plan of the neighborhood. Because of the assumptions of 1,600 students and an urban setting, the two story scheme is logical. In a rural setting a smaller school could be one story. The central feature is the commons on the first floor. It is a two-story space and opens to the second floor. To the top of the commons on the first floor is the entry court. The families flank the entry court and have a direct connection to the commons (by stairs for the second floor families). Flanking the commons are spaces for the neighborhood support staff. These are open spaces and are furnished with modular, office landscape systems (not shown). This accomplishes two objectives: (a) as staffing needs change the spaces are flexible to adjust, and (b) all staff need to be as accessible as possible. There are conference rooms for private meetings.

In both the lower right and left corners of each floor are the studios. The studios are for both instruction and production. They are flexible in that each is similarly outfitted with systems for technology networking, electronic power, general and task lighting, water and sewer, air exchange and special ventilation, and storage. Their use would be determined by the curriculum and the corresponding movable furnishings and equipment. This apparatus would be plugged in and removed as the curriculum and projects change.

The last major space in the neighborhood is the *dialogue room.* It is the technologically advanced, electronically interactive instructional and demonstration room. This space is used for interactive instruction and formal presentations.

View of a Neighborhood Commons (Figure 9)

The centrally located two-story commons is the informal heart of the neighborhood. The function of dining, cafe style, occurs here. Although large enough to seat four hundred, that would be the exception. Lunch or snacks are available throughout the day and, at most, only one hundred students eat at once. The space also is used for informal socialization. A comprehensive high school educates on many levels including social and interpersonal skills. This is also the space were large groups (up to four hundred) can gather for demonstrations or pep rallies. Equally significant in this image is the entry court. With the extensive involvement of students in the greater community there will be more traffic in and out of the school. Instead of funneling all students through one or two main entrances, a separate entrance to their neighborhood is provided. It is designed to be welcoming and sheltering. In good weather it can be used for school activities.

Plan Diagrams for a 1,600-Student Community (Figure 10)

There are many possible ways to assemble four neighborhoods, a central forum, and an activity block. Site, climate, and community culture will influence the outcome. Four different arrangements are shown. This archetype is not so much a final solution as it is *a kit of parts.* Alternatives also include a different-size student body or a rural or suburban setting. As the number of neighborhoods change, so does the size of the central forum and the activity block. Nearby facilities also could impact the final design. A YWCA across the street could reduce or eliminate the need for physical education spaces. Important features in any development include the forum as the central space to the community, the entrance to this center space and, if there is one, to the competition gymnasium, the direct connection of the neighborhood commons, and the development of outdoor environmental labs.

View of a 1,600-Student Community (Figure 11)

The view of the 1600 student community diagram is developed into a three-dimensional view. The forum is central both in circulation and spatial dominance. It also has the option of opening to an outdoor amphitheater. The neighborhood commons open on to the forum. The gym has a separate entrance and can serve the greater community,

while the rest of the building is secure. The court formed by the L-shaped building gives identity and comfort to the entrance. Two environmental labs are included.

With Figure 11 and the previous drawings, two significant features become evident. First, with the exception of the activity block, there are no corridors or hallways in this design. Students, faculty, or parents can enter through the main doors, go past the forum (and experience the activities there), move into the neighborhood commons, walk to the resource/production space, and arrive at the personal workstation group without going through a single corridor. Second, virtually all spaces are lit by natural daylight. This includes the forum, the gym, the commons, the resource/production space, and the personal workstation groups.

View of an Urban Comprehensive High School (Figure 4)

Schools do not exist in isolation. They relate to the surrounding environment functionally, culturally, and visually. The comprehensive high school incorporates the greater community into its educational process. The intention of this drawing is to reinforce that unity. The park, the homeless shelter, the low income housing, the public library, the clinic, the retail business, the professional offices, the elder care facilities, and others all have a give-and- take exchange with the school. Although the setting is an urban one, a suburban setting would be similar. A rural setting would not have as many adjoining facilities but would make greater use of student enterprise endeavors.

Break-The-Mold Concepts

This New Designs for the Comprehensive High School has evolved out of the educational and design concepts identified elsewhere in the report. As such, it may provide a contrast to the more-common approach to high school design—an approach that evolves from a review of recent projects in publications or in the district across town. Although there is something to learn from others, in this era of rapid change the process of reusing the *tried and true* is not valid. Of the several *break-the-mold* concepts in the design, the design-down process is the most significant. In the spirit of developing a prototype that will provide a basis for others in creating a new high school, the design-down process is the tool to begin with. Other break-the-mold features of this design include

- The basic building block is the personal workstation group, not the classroom.

- High school students will be grouped into approximately one hundred pupils; gathering them around a resource/production space to facilitate project-focused tasks.

- Neighborhoods that are virtually stand-alone schools will be created. Along with the multiple-use commons, they give students a meaningful environment with a special identity.

- The flexible studio frees the school organization from the limitations of the physical environment. and also allows for the complete integration of vocational and academic subject matter.

- Support staff are located in as friendly and accessible manner as possible, not behind intimidating facades with the large letters spelling ADMINISTRATION.

- Learning technology permits information to be everywhere. Instructional material centers and computer rooms no longer exist nor do the limits of scheduling access to those areas.

- Many places in the design provide for demonstration and display, now an important part of assessment. However, the most powerful place for this, the auditorium, has been freed from its bonds and is now the central forum, open for all to experience every day.

- The school is a part of the web of the greater community. This design connects students to their surroundings, as well as provides space for the community in the school.

Some of these ideas have been implemented in isolated places around the country and abroad. Bringing them together with other newer ideas into a cohesive whole is a sign of hope.

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Prairie School. (1992, May). *School design and school reform: Architects and educators seek keys to creating better learning environments.* News release from The Second Education. (Available from The Prairie School, 4050 Lighthouse Drive, Racine, WI 53402).

Weinstock, R. (1973). *The greening of the high school.* New York, NY: Educational Facilities Laboratories.

Figure J.1
Diagram of a 100-Student Family

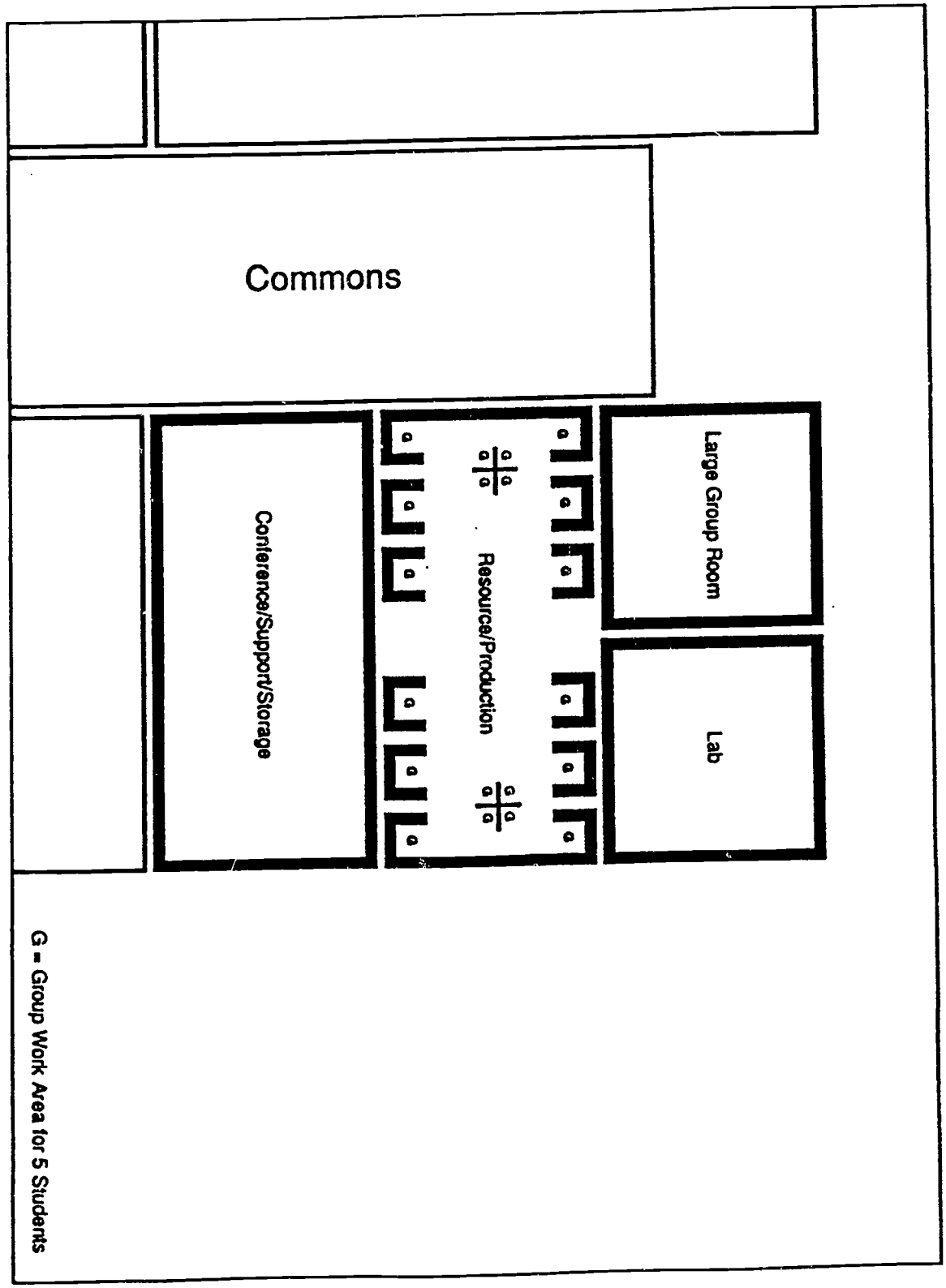


Figure J.2
Diagram of a 400-Student Neighborhood

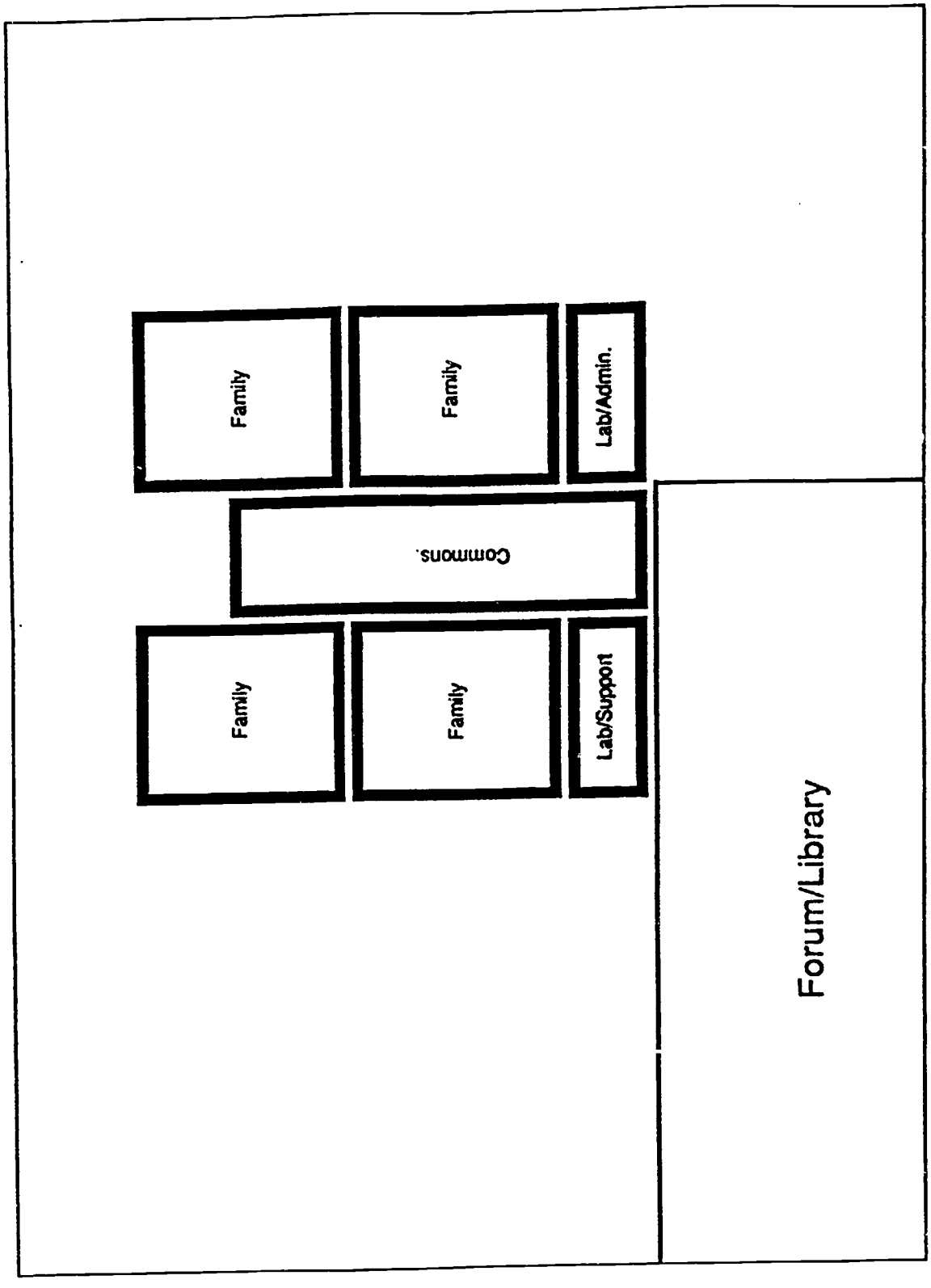


Figure J.3
Diagram of the 1,600-Student Community

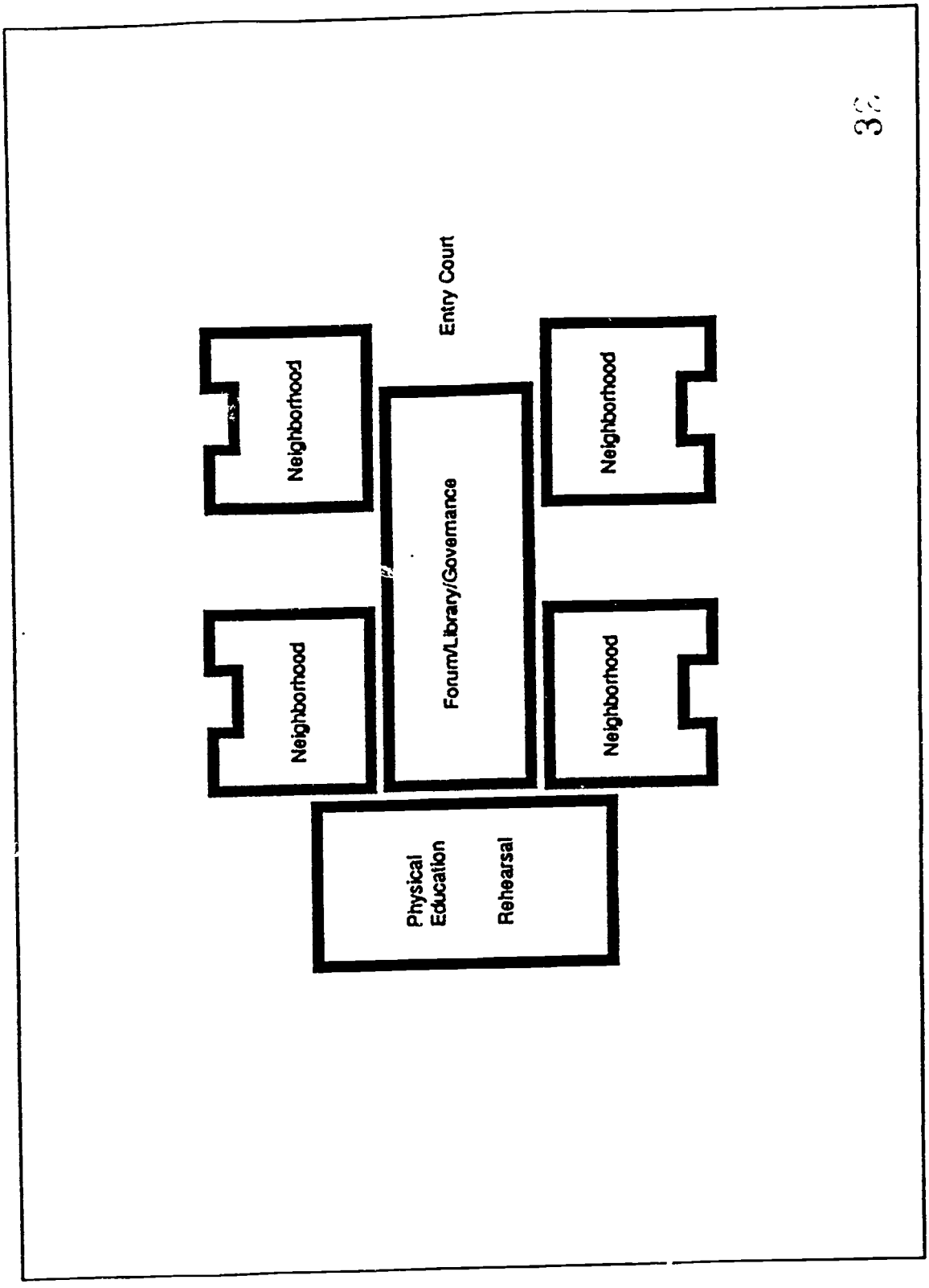
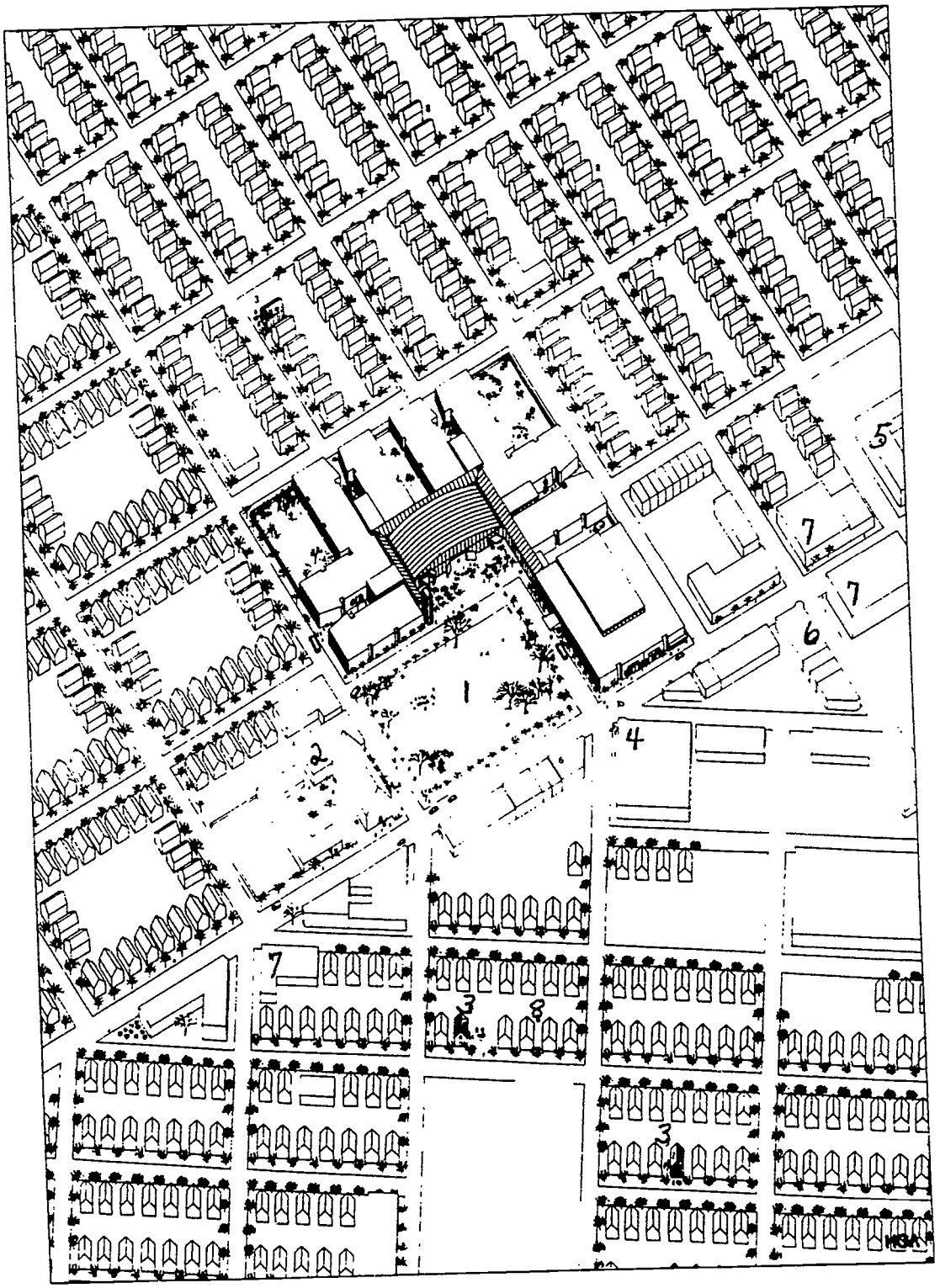


Figure J.4
View of an Urban Comprehensive High School



1 City Park
2 Homeless Shelter
3 New Low Income Houses
4 Public Library
5 Clinic
6 Retail Businesses
7 Professional Offices
8 Elder Care

Figure J.5
Personal Workstations for Groups of Five Students

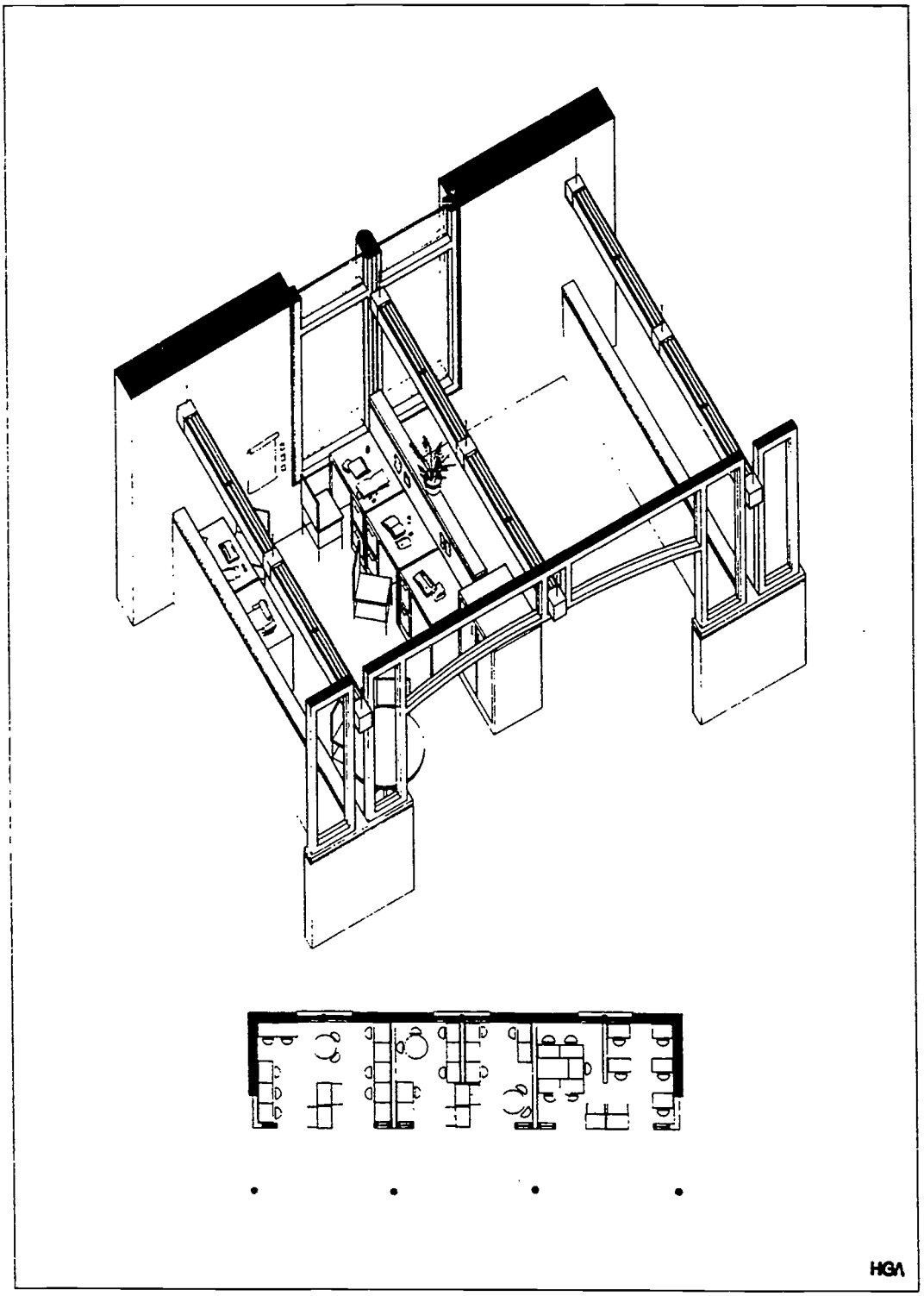
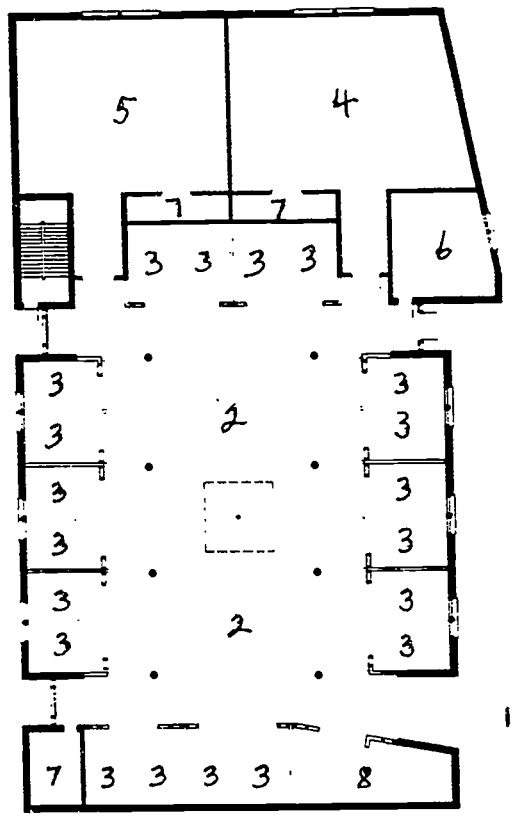


Figure J.6
Plan of a 100-Student Family



1 Commons
2 Production/Resource
3 Student Group Room (5)
4 Large Group (100)
5 Lab
6 Medium Group (15)
7 Storage
8 Planning/Office

HGA

Figure J.7
View of a 100-Student Family

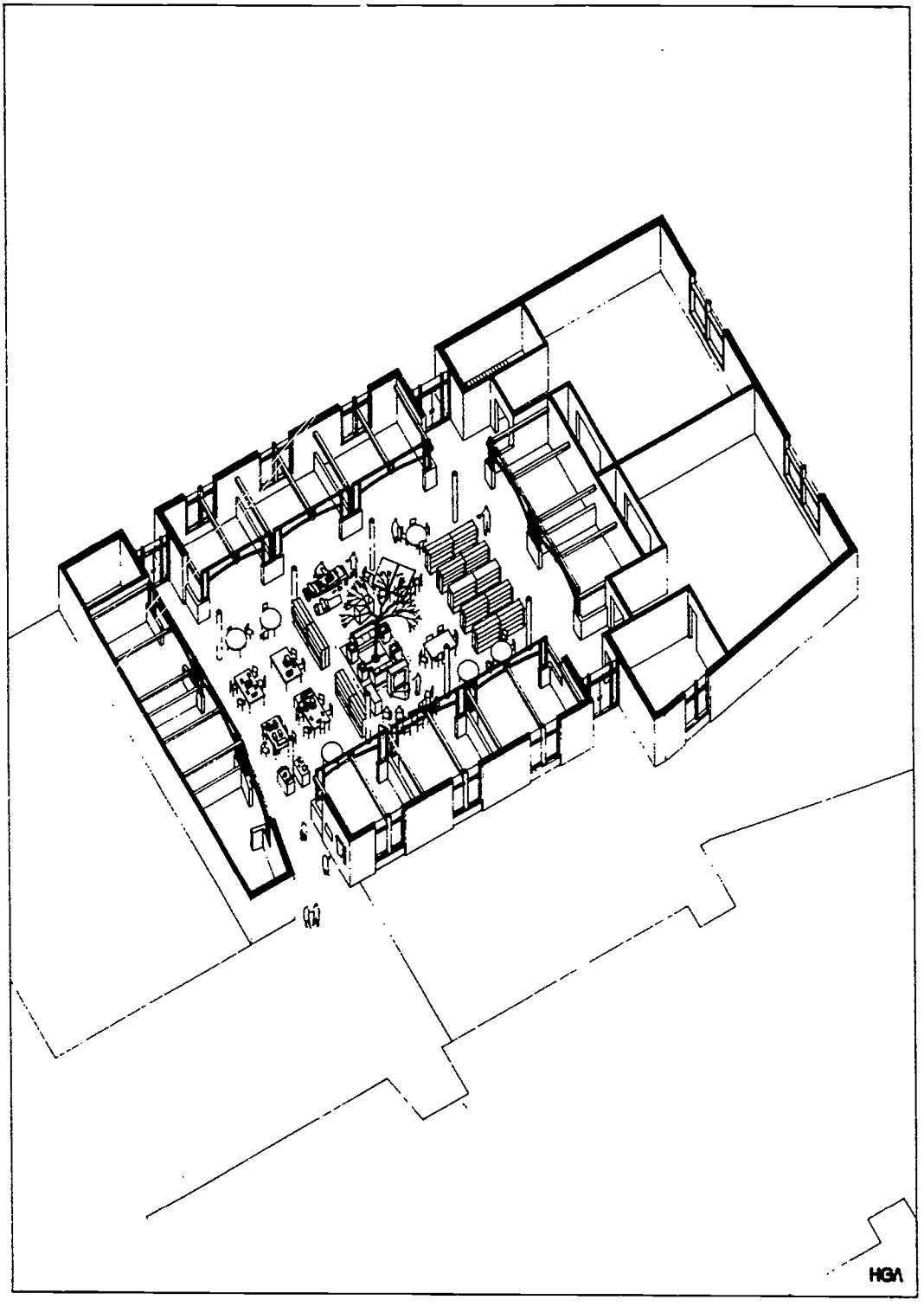
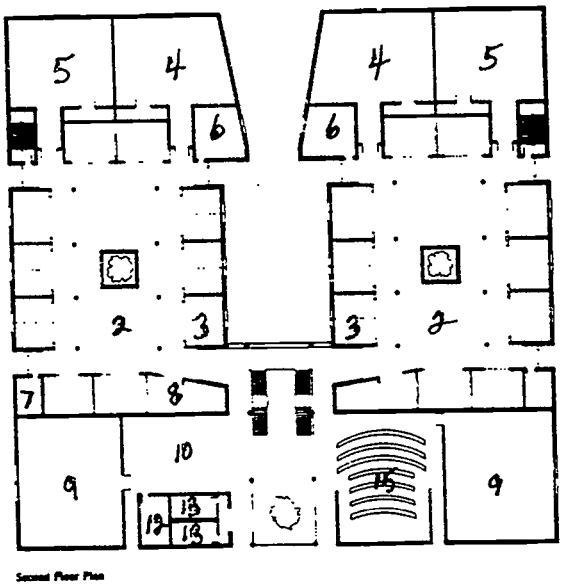
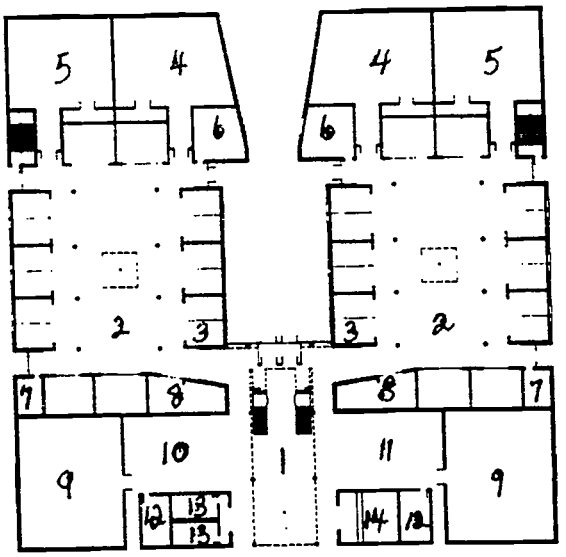


Figure J.8
Plans of a 400-Student Neighborhood



Second Floor Plan



First Floor Plan

1 Commons
2 Production/Resource
3 Student Group Room
4 Large Group
5 Lab
6 Medium Group
7 Storage
8 Planning/Office
9 Studio
10 Learning Services
11 Coordinator
12 Conference
13 Toilet
14 Food Service
15 Dialogue Room

HSA

Figure J.9
View of a Neighborhood Commons

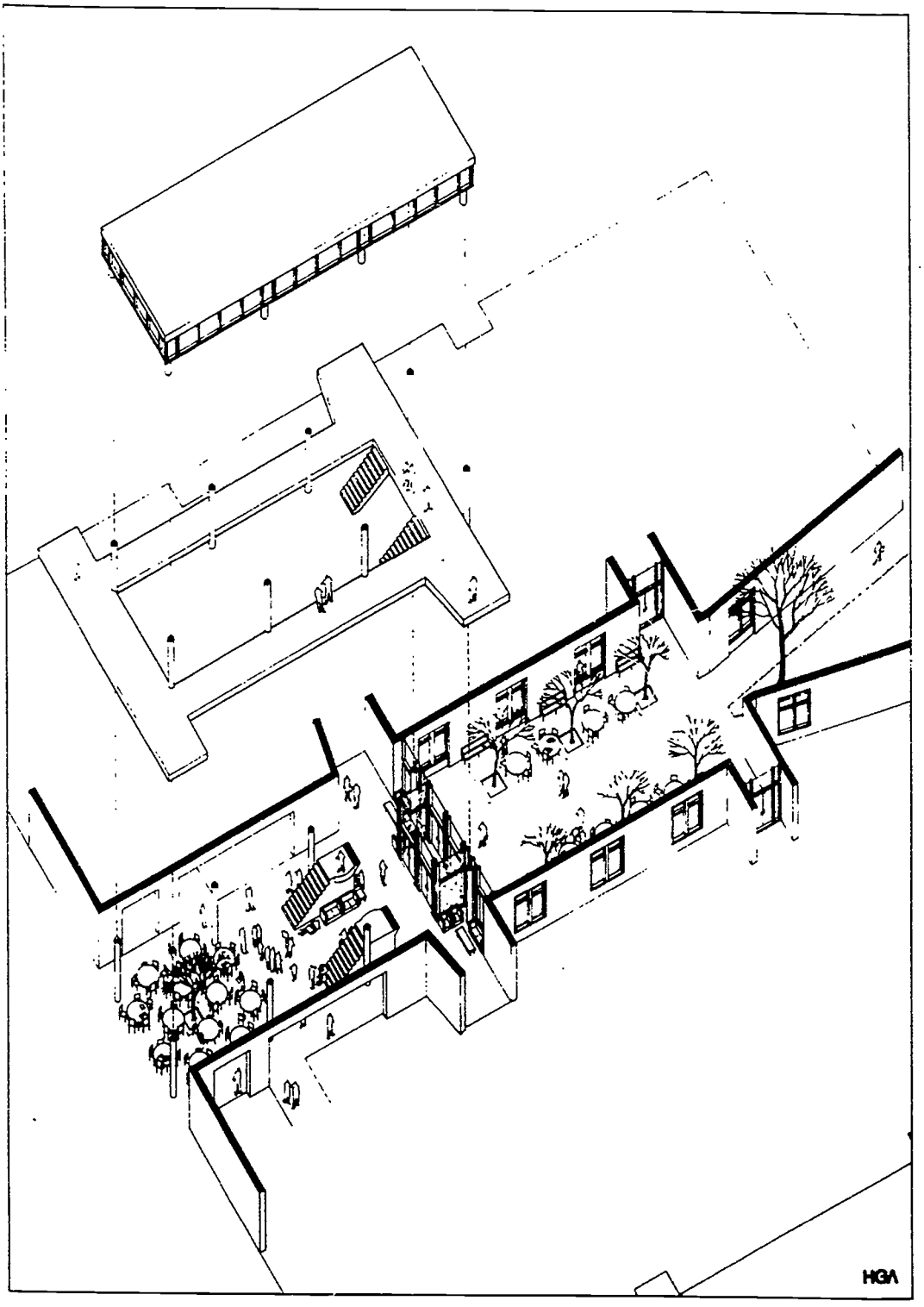
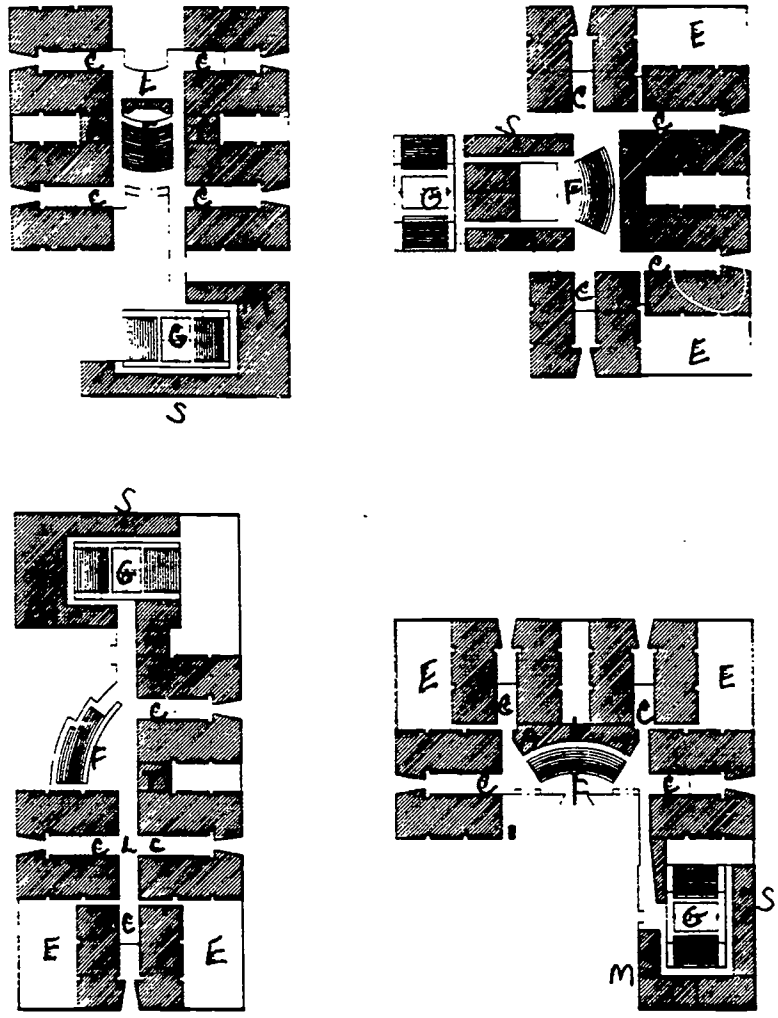


Figure J.10
Plan Diagrams for a 1,600-Student Community



C Commons
F Forum
L Library
A Governance
T Instructional Tech
M Music
S Building Services
G Gymnasium
E Environmental Lab

HGA

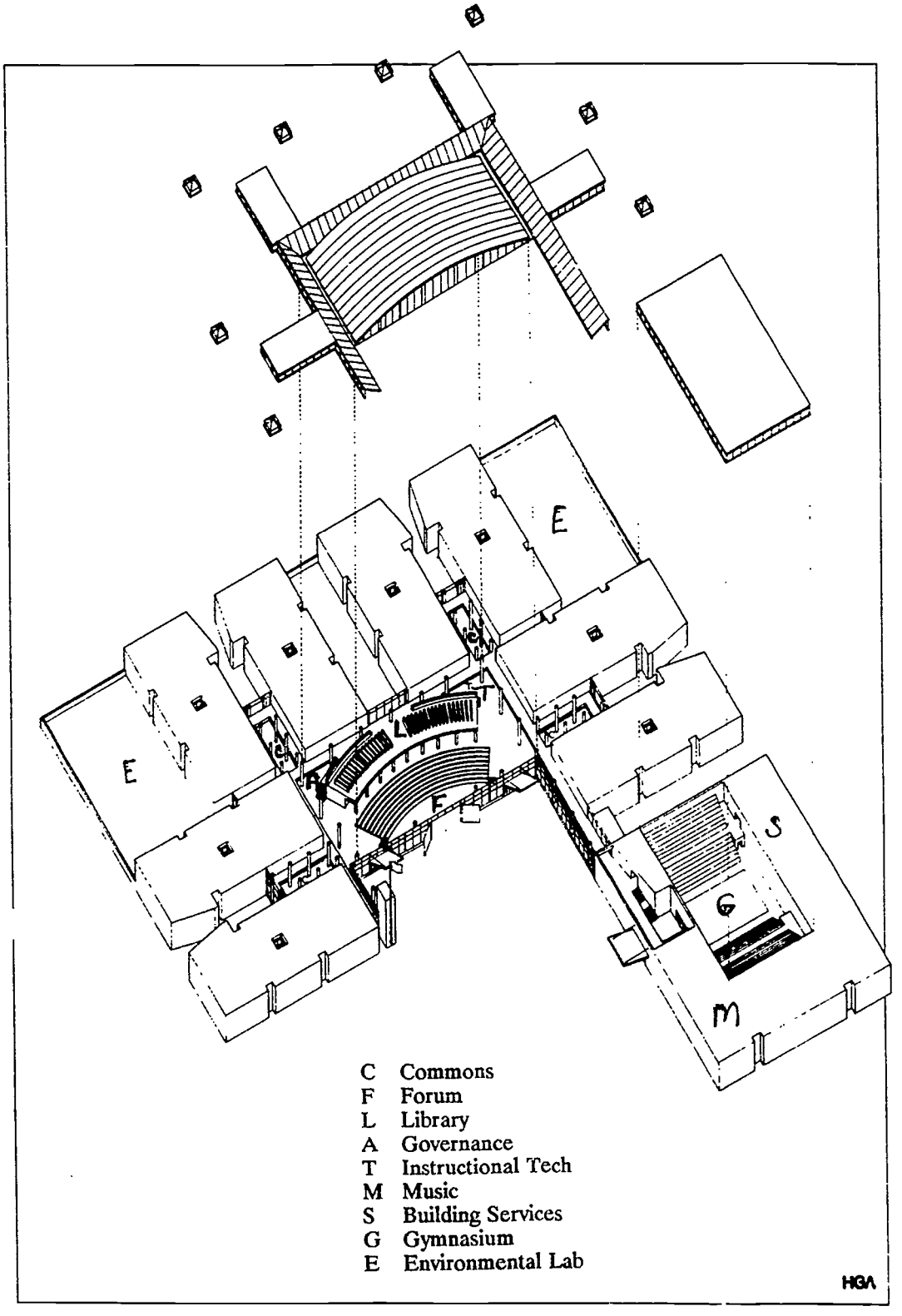



Figure J.11
View of a 1,600-Student Community