

ARCHITECTURE FOR THE IMAGINATION
A Study of an Elementary Educational Environment

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Thesis submitted to the faculty of Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of
MASTER OF ARCHITECTURE

May, 1999

William Galloway

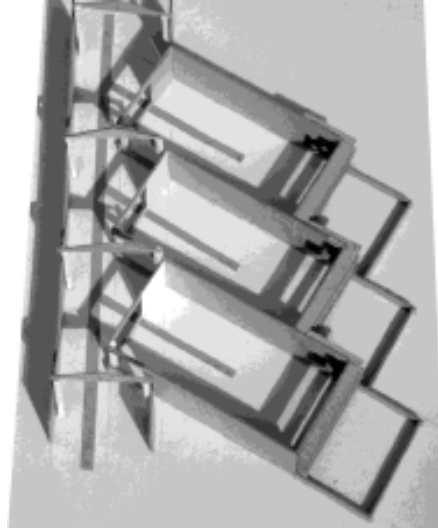
William Brown, Chairman

James R. Jones

This book is dedicated to my wife, Amy,
for all her love and support.

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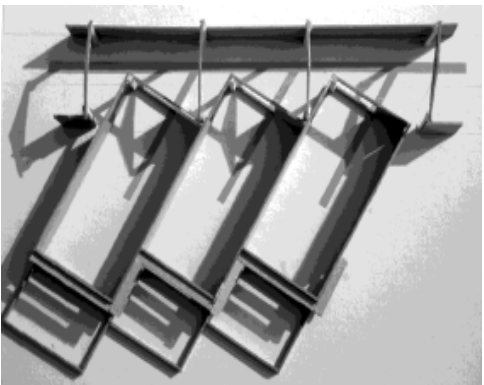
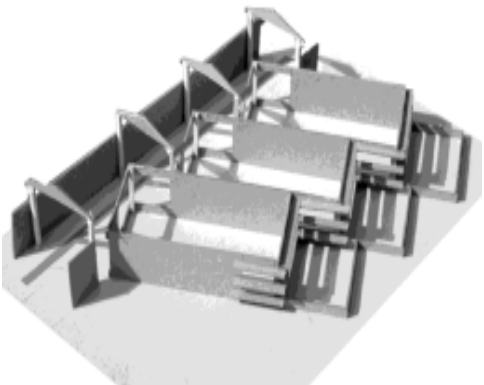
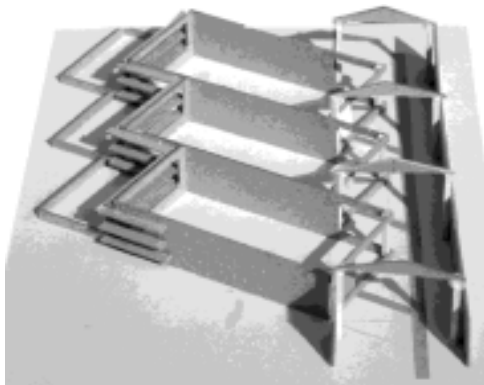
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ABSTRACT

This thesis seeks to create an environment that encourages the learning process by addressing issues of emotional and physical well-being. The concept implies that success in learning can be linked to the environment of an elementary school. The building does not have to teach by itself, but merely facilitate the learning process through the making of a comfortable environment. Designing an elementary school demands that the architect look at the world through the eyes of a child. If the architect considers the scale of the building, both in terms of size and perception, the school becomes an oasis of security for the child that inspires intellectual growth. By integrating environmental design issues that are traditionally ignored in contemporary schools, like natural ventilation or daylighting, the school becomes less of an institution and more like a home.

WHAT QUALITIES OF ARCHITECTURE COULD MAKE LEARNING EASIER?



INTRODUCTION

What environment is most conducive to learning? Contemporary school designers have seemingly forgotten to ask that question. Our public schools have become warehouses, where the primary architectural considerations are state-regulated square footage requirements. Contemporary school design rarely reflects a desire to create an environment where learning could be encouraged by the building itself. What attributes of architecture could make learning easier? This thesis seeks to answer that question through the design of an elementary

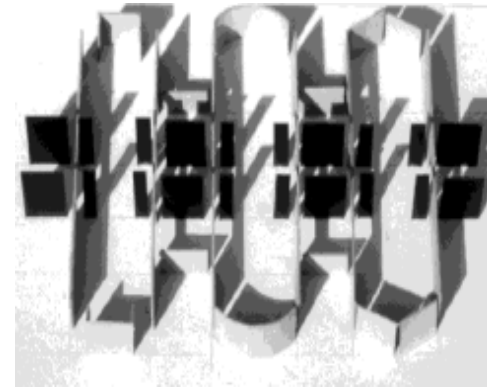
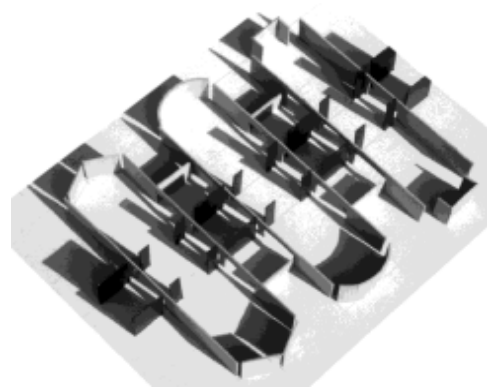
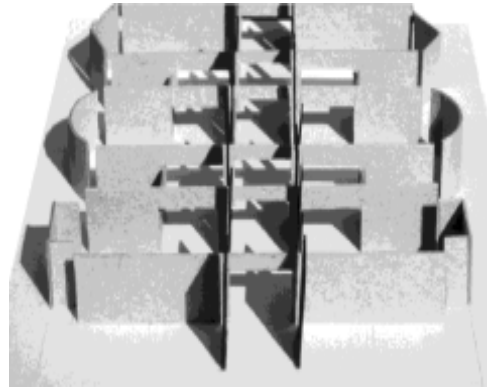
school.

Architecture is physical and emotional.

Inhabiting a building generates many emotions and physical states for an occupant. What are the ideal conditions for an elementary school that will create a positive learning environment? This project tries to instill comfort and pride to the school children through the design of the physical environment. For a young child, physical and emotional well-being can enable a

smooth transition from home to school. If the child is at ease, the child is more likely to learn. Emotional comfort in this thesis project results from looking at the scale of the school from the perspective of a child. Integrating natural systems into the design of the school brings about physical comfort. The development of pride within a child can also inspire learning. The general quality of a child's learning environment can have a great effect on his or her learning. Pride in the physical environment causes teachers and students to feel vested in their school

ARCHITECTURE IS PHYSICAL AND EMOTIONAL.



community. Pride in the physical manifestation of a school building leads to valuing learning. Hopefully, the general quality of architectural space within the school environment will facilitate the learning process.

This project originated as a typological study. The first half of the study was spent designing a prototype condition. School districts often look for prototype schools to save money on design costs. The successive generations of these schools can be refined at little cost to the owners. Most often a prototype school is

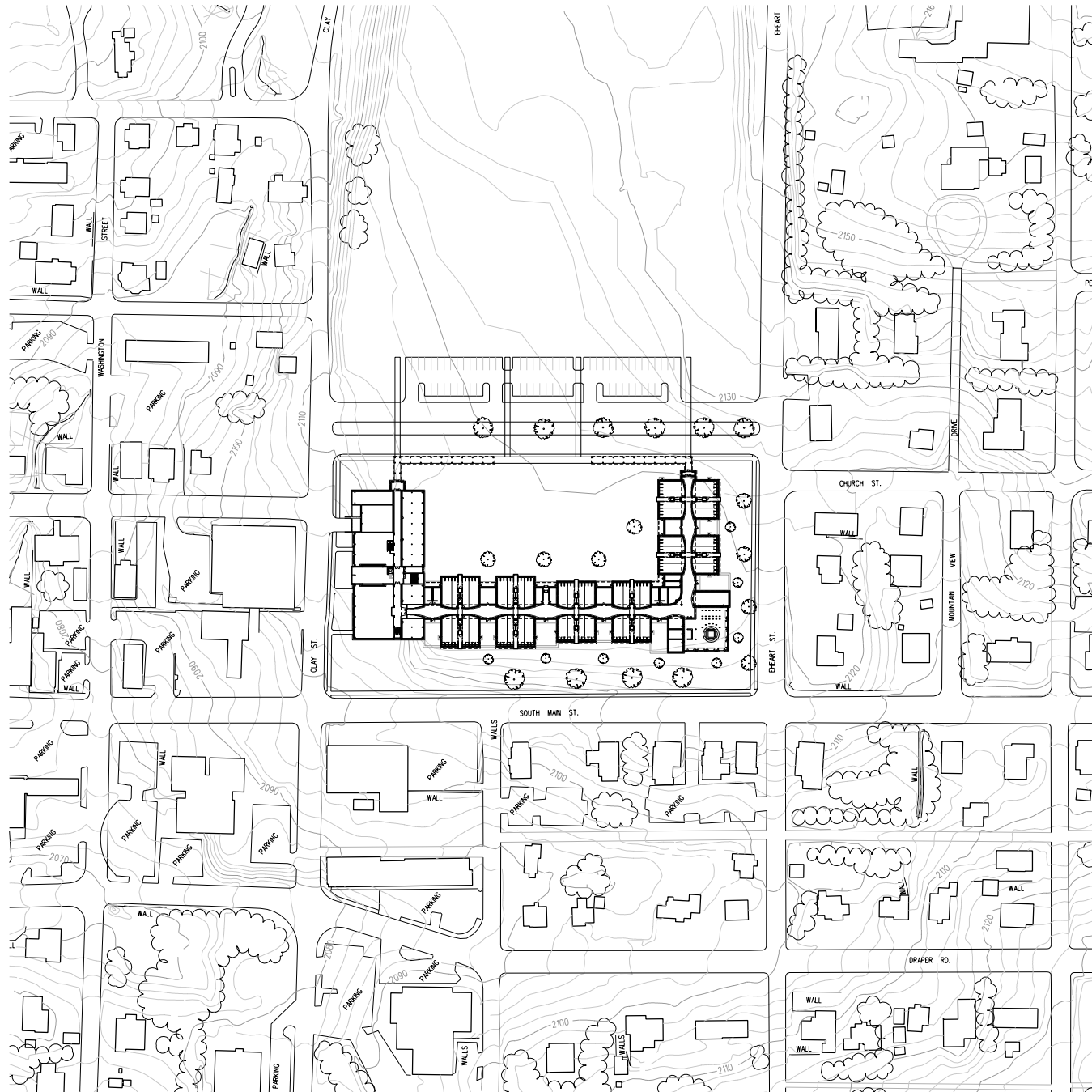
dropped on a site like a child's block, without any regard to how it works with that particular site. What is fundamentally lacking in prototypical school design is a response to climatic and site conditions. My prototype design tries to address these concerns. The architecture can adjust to any site through its arrangement. Instead of designing a complete school, I have designed elements of a school that could be intelligently put together by considering the sun, wind, topography, and function. The second half of this study took the prototype and applied it to a specific

site condition in Blacksburg, Virginia. In response to that particular circumstance, adjustments have been made to the prototype so the building can respond to its environment.

The result of this inquiry is only one of many possible solutions. It does not represent an absolute solution, or for that matter, a concrete design philosophy. It is merely an exploration. The proposal is a response to a specific condition.

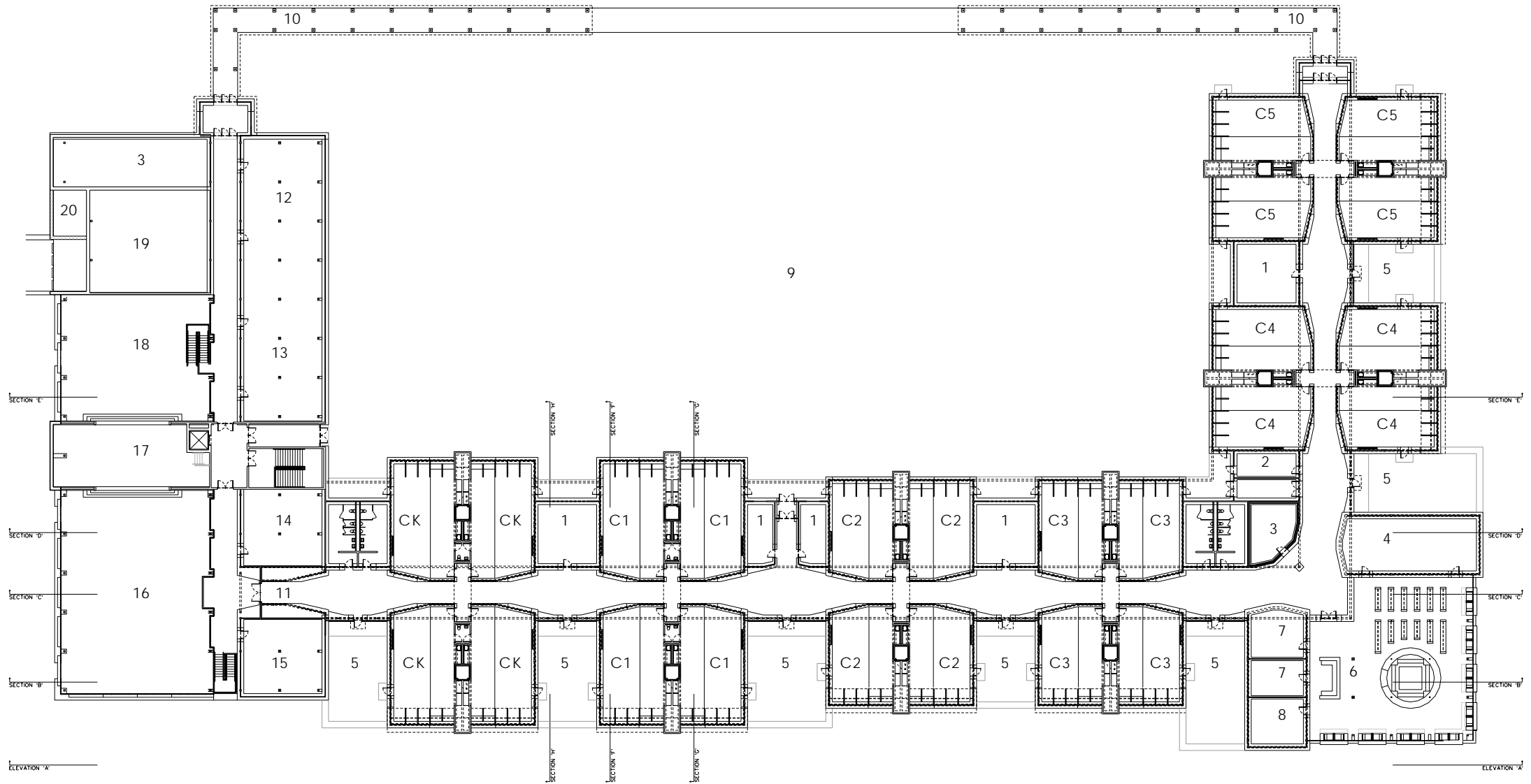
PROJECT DRAWINGS

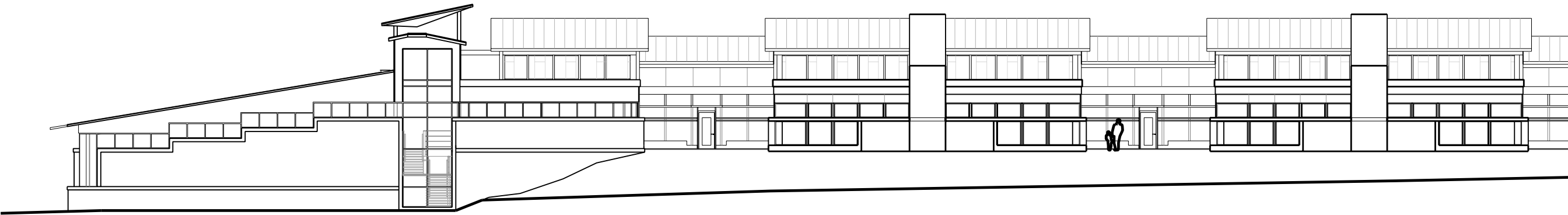
SITE PLAN



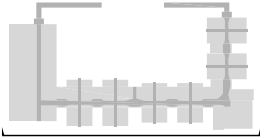
MAIN FLOOR PLAN

C(#)	CLASSROOM (GRADE LEVEL)
1	RESOURCE
2	DATA/COMMUNICATIONS
3	MECHANICAL
4	COMPUTER LAB
5	OUTDOOR TEACHING AREA
6	MEDIA CENTER
7	MEDIA CENTER OFFICE
8	CONFERENCE
9	PLAYGROUND
10	BUS CANOPY
11	DISPLAY CASES
12	ADMINISTRATION
13	GUIDANCE
14	MUSIC CLASSROOM
15	ART CLASSROOM
16	MULTI-PURPOSE ROOM BELOW
17	STAGE BELOW
18	CAFETERIA BELOW
19	KITCHEN BELOW
20	COOLING TOWERS BELOW

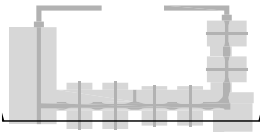


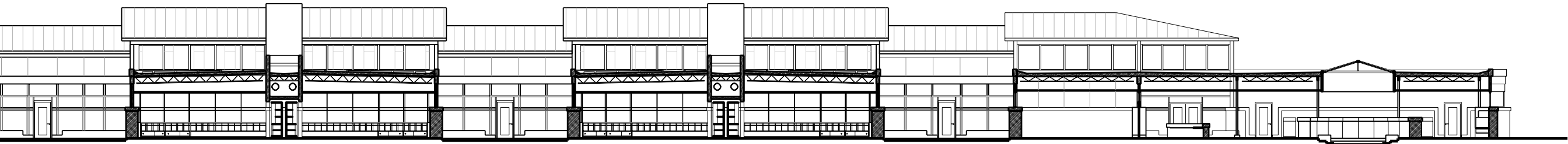
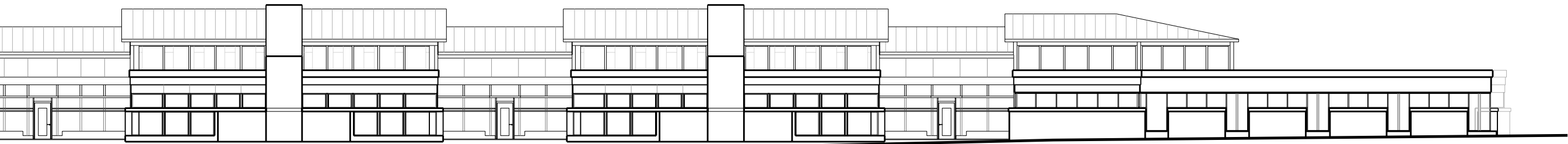


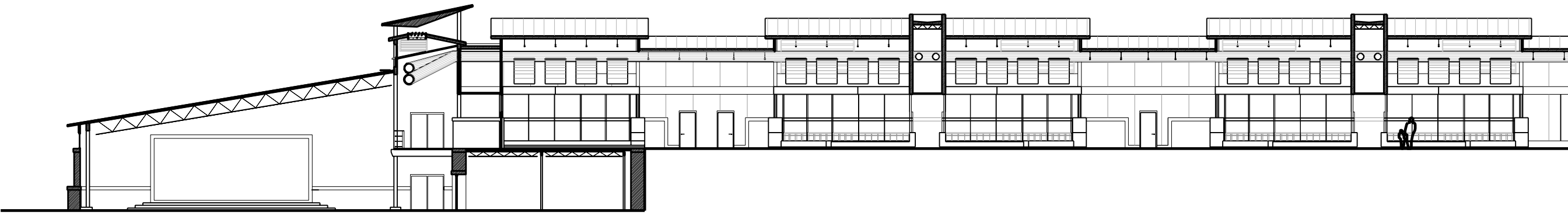
ELEVATION 'A'



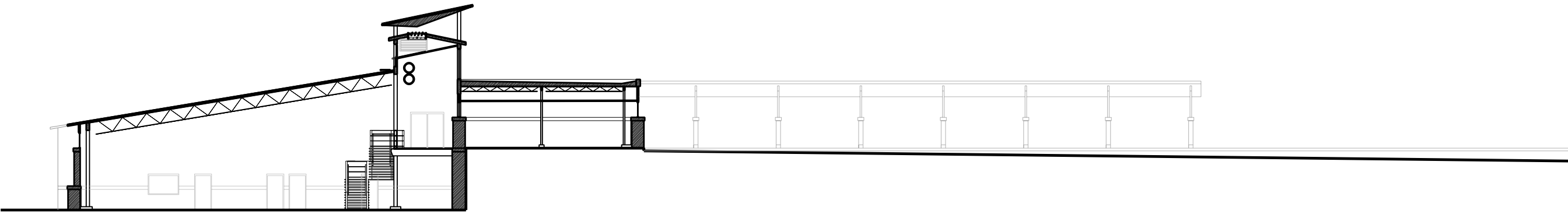
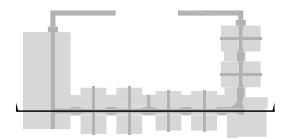
SECTION 'B'



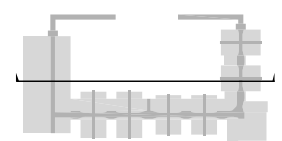


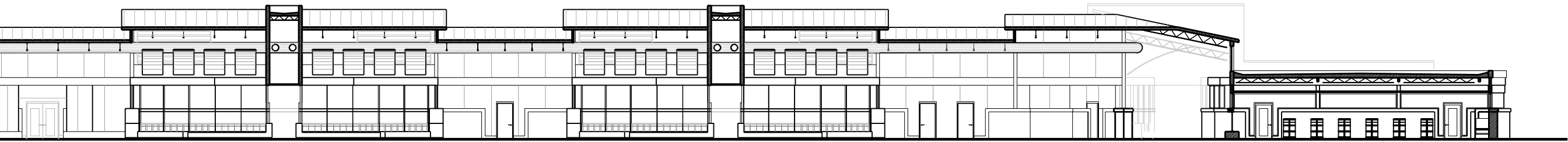


SECTION 'C'



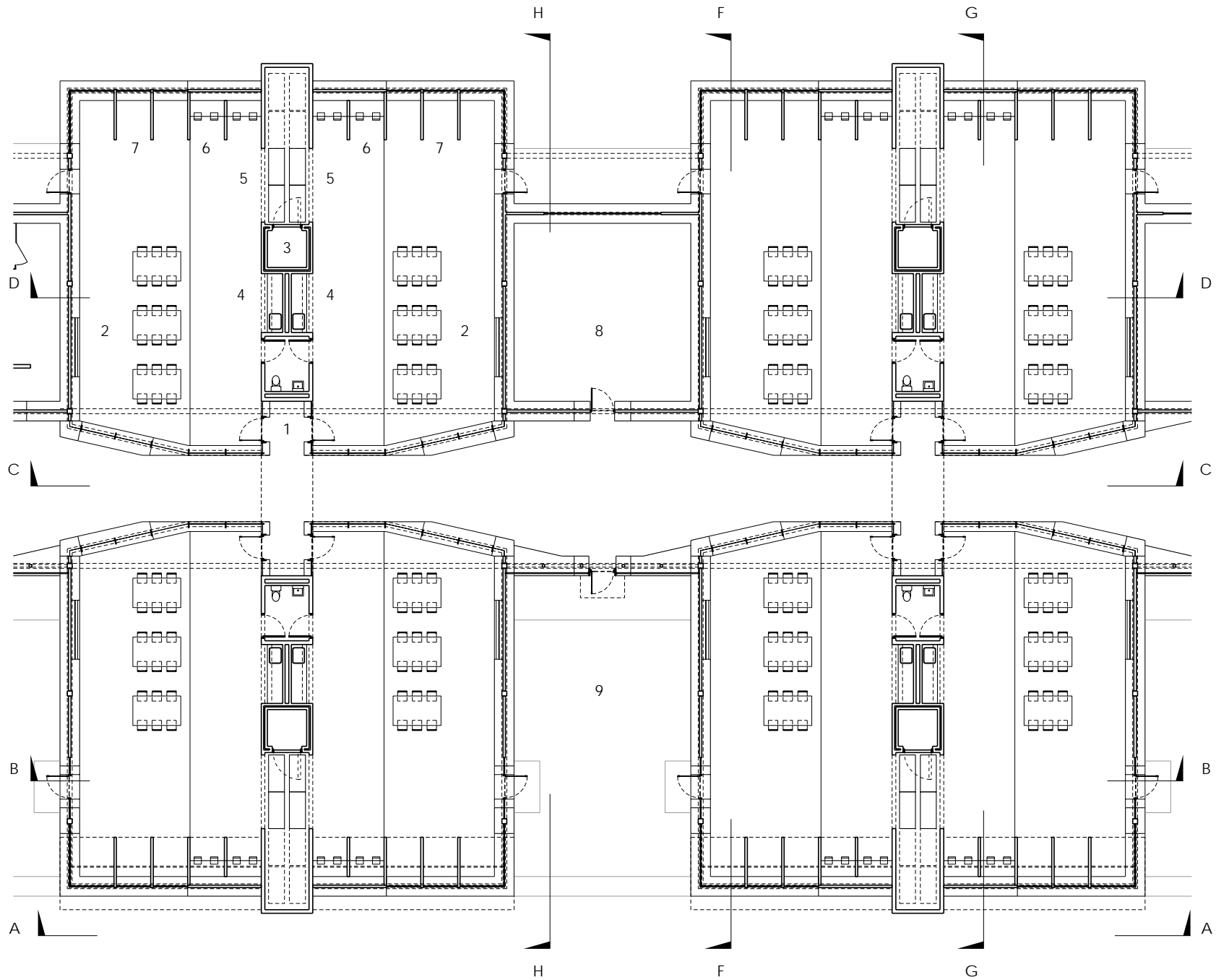
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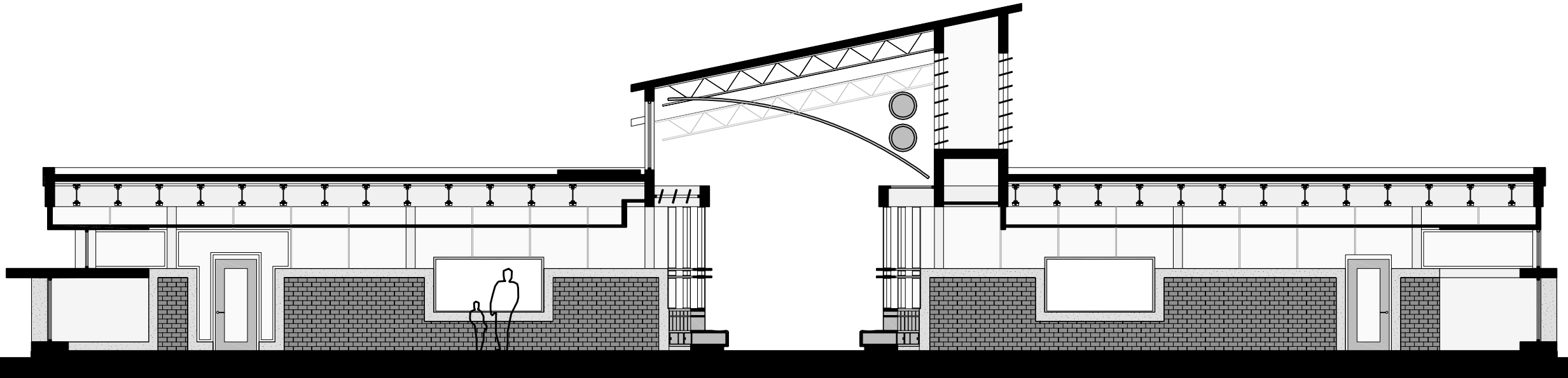




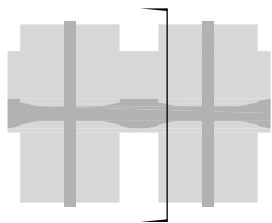
GRADE POD FLOOR PLAN

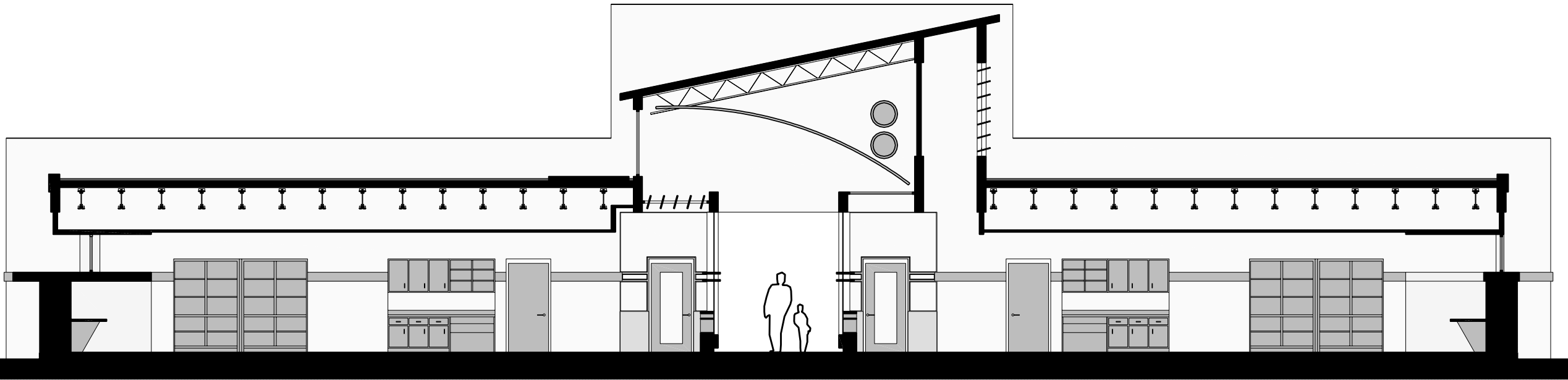
- 1 CLASSROOM ENTRY
- 2 TEACHING AREA
- 3 MECHANICAL SPACE
- 4 COUNTER/SINK AREA
- 5 MOVEABLE STORAGE
- 6 COMPUTER STATIONS
- 7 READING NOOKS
- 8 RESOURCE ROOM
- 9 OUTDOOR TEACHING SPACE



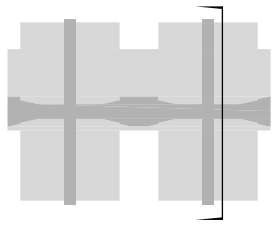


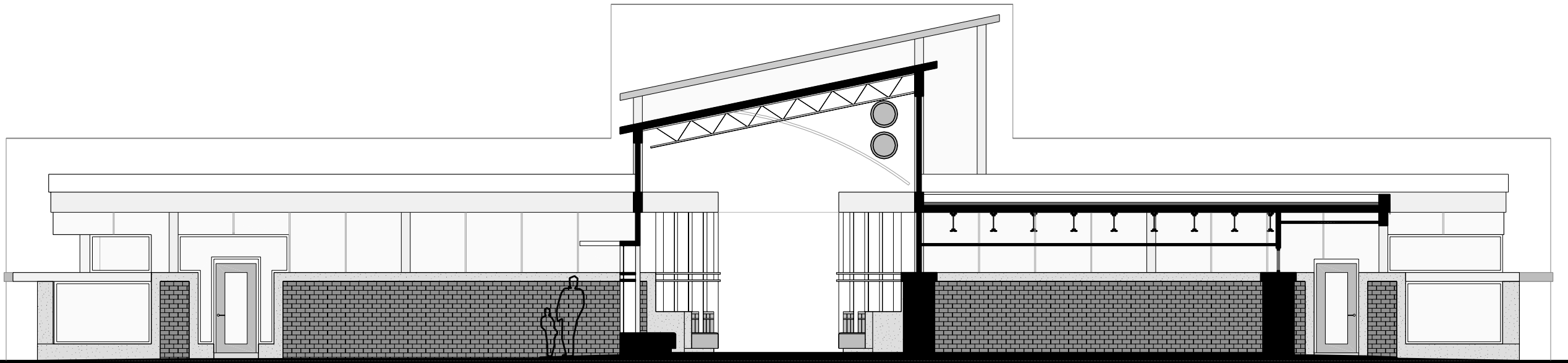
SECTION 'F'



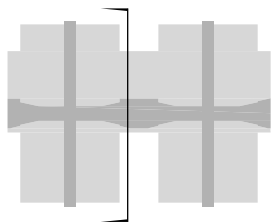


SECTION 'G'



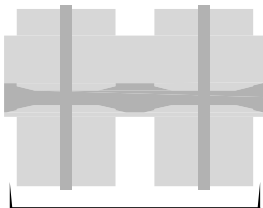


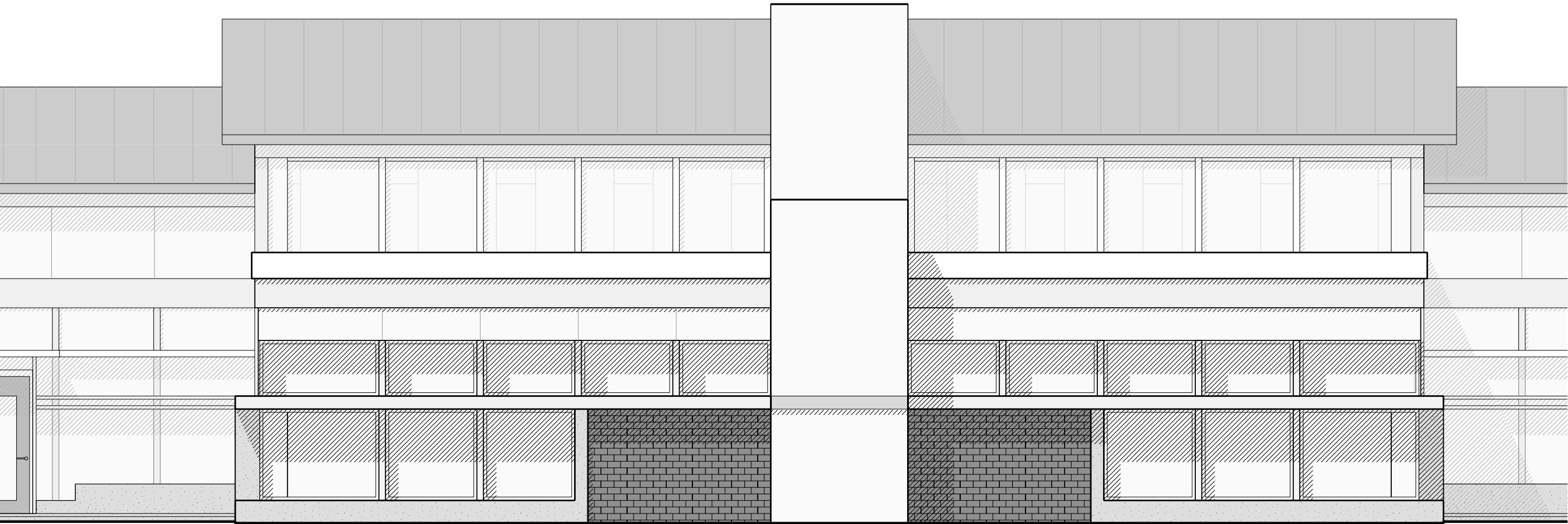
SECTION 'H'





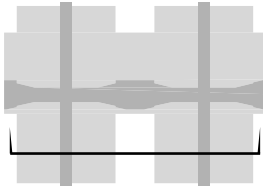
ELEVATION 'A' OF GRADE POD

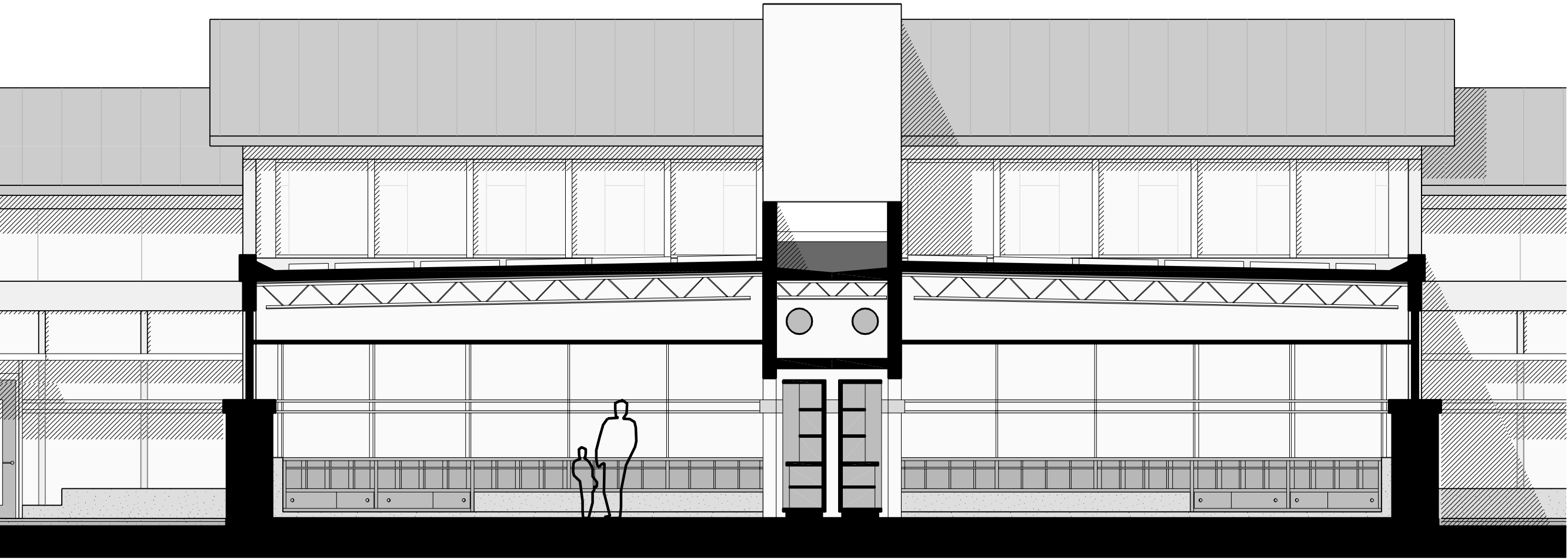






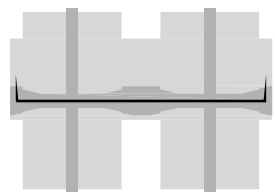
SECTION 'B' THROUGH GRADE POD

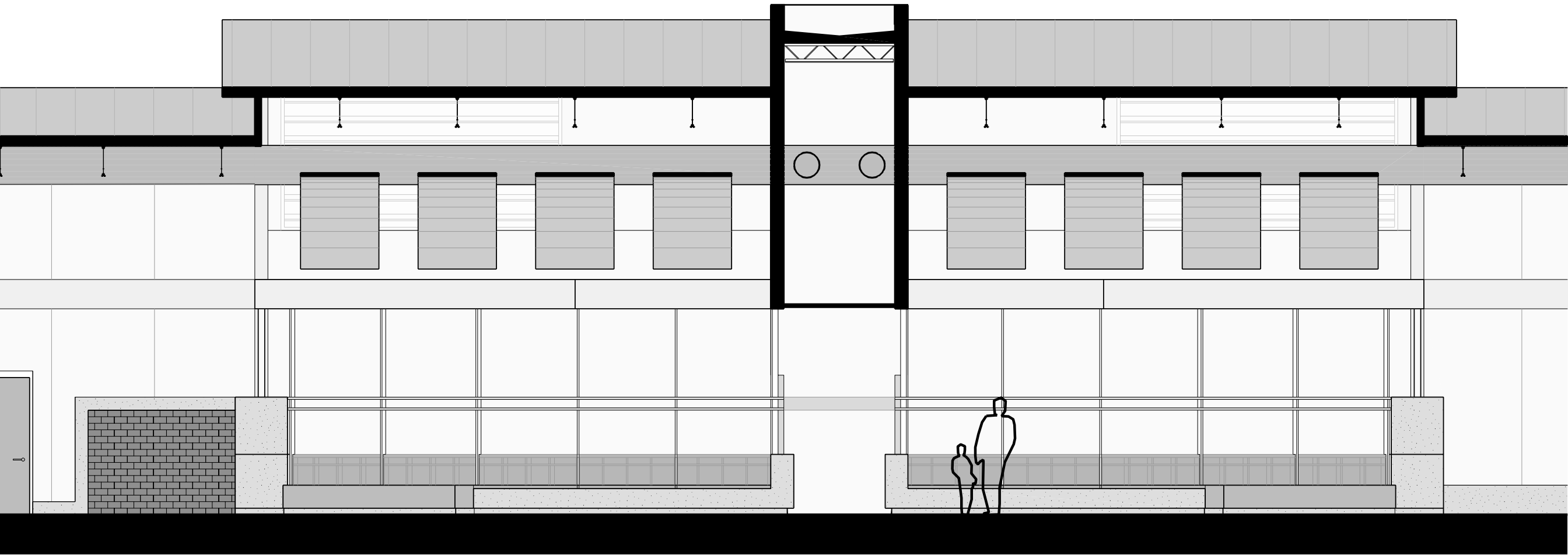


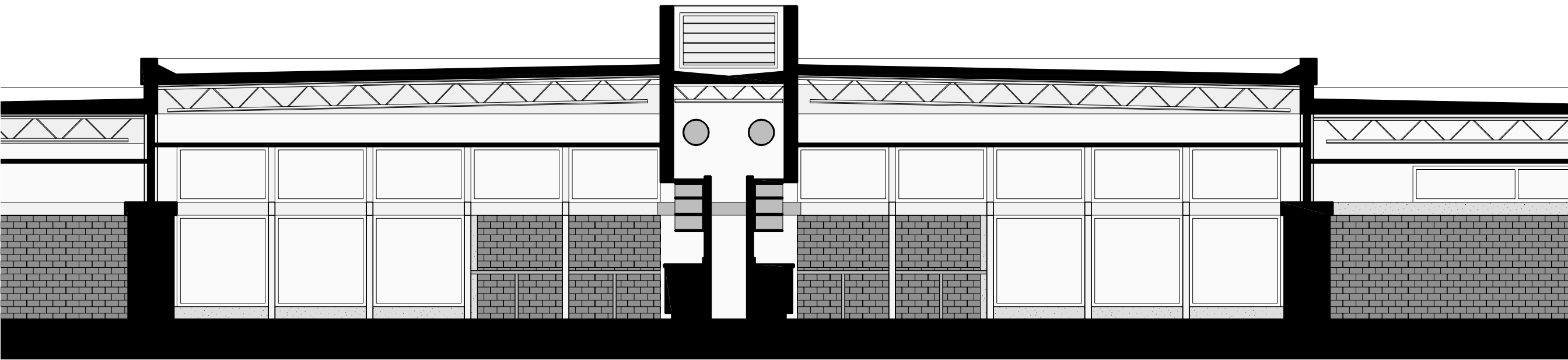




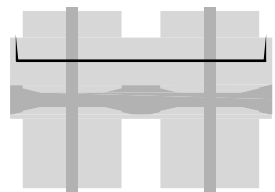
SECTION 'C' THROUGH GRADE POD

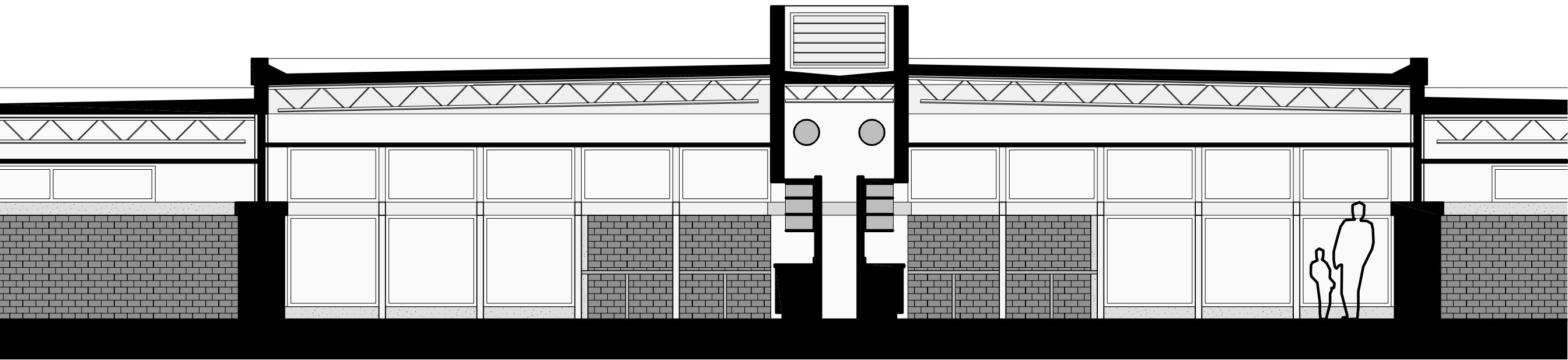






SECTION 'D' THROUGH GRADE POD





PROJECT IDEAS



Luis Barragan and Mathias Goeritz
Monumental Towers, Mexico City, 1957



Gianlorenzo Bernini
Colonade, Piazza of St. Peter's, Rome, 1656



Aldo Van Eyck
Orphanage, Amsterdam 1957-1962



Perkins, Wheeler & Will with Eiel and Eero Saarinen
Crow Island Elementary School
Winnetka, Illinois, 1940

SCALE IS AN ISSUE OF PERCEPTION. IT CAN MAKE YOU FEEL SMALL, LIKE LOOKING THROUGH THE EYES OF A CHILD.

SCALE CAN MAKE YOU COMFORTABLE.

SCALE

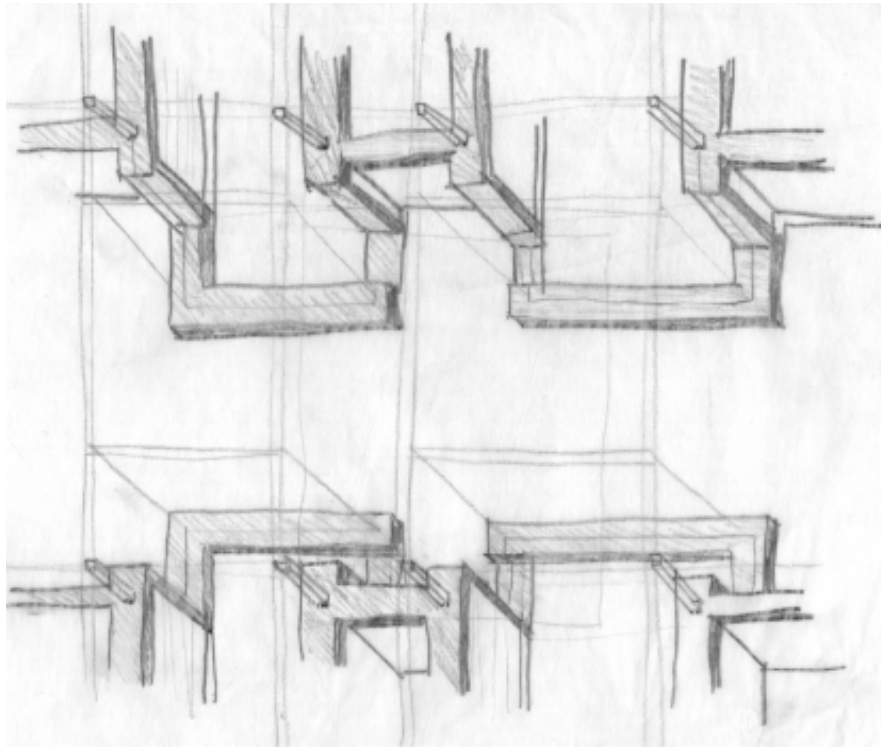
A substantial part of this study of a school environment looked at how the scale of the architecture could enhance the learning atmosphere. Too often in school design we deny the fact that the primary users are small children, and the design of the building reflects the same qualities of an adult oriented office building. This study examines how a building design can be appropriate to the scale of both a child and an adult.

The comfort level of a child within a space contributes to his or her success in learning. This project seeks to use a perceptive scale to give children a comfortable

learning environment. Obviously our schools have to accommodate adults. However, we should not ignore the fact that the primary users are children. Scale is not merely an issue of size. It is also one of perception. What does the scale of the architecture do to the feelings or understanding of the user? Scale in architecture can make you feel small and helpless like a child, or make you feel large and powerful like a giant. Scale of an architectural object can make you feel uneasy or comfortable.

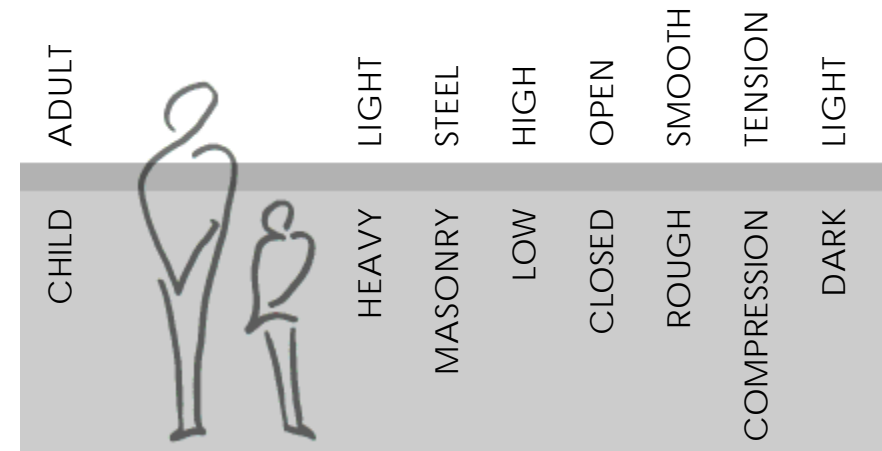
In recent years, there has been a move away from

the traditional classroom setting where the teacher stands in front of the classroom and lectures to the students. The new classroom atmosphere includes spaces for individual exploration, with the teacher acting as a facilitator to the child's education. How can the architecture of our schools respond to this educational philosophy in a way that is not simply reducing the square feet of the spaces? How can this be addressed in the mind of the user, where a classroom may have spaces within spaces to promote individual learning, but still belong to a larger group?



AXONOMETRIC SKETCH, CORRIDOR SHOWING DATUM

A HORIZONTAL DATUM IS PRESENT THROUGHOUT THE BUILDING DEFINING TWO REALMS OF THE SCHOOL. THE REALM OF THE CHILD BELOW. THE REALM OF THE ADULT ABOVE. THE DATUM IMPLIES A CHILD SIZE ROOM WITHIN THE LARGER SPACE.



A horizontal datum is present throughout the building defining two realms of the school. The realm of the child below, and the realm of the adult above. The presence of this datum, mostly at the periphery of rooms, implies a child-size room within the larger space. It creates an implied ceiling appropriate for the size of a child. Although the horizontal datum is

present throughout the building, the form it takes may change to accommodate specific situations. A course of precast concrete is the primary datum element. Below the precast course, brick masonry defines the realm of the child. Above the precast course, steel columns and metal panels define the realm of the adult. The material of the datum may change, but it

remains present throughout the school. In the classrooms, the datum becomes a band of color which helps to identify each grade pod. In other areas that require transparency, the datum becomes window mullions which double as shelves for display of students' work. The datum changes to emphasize



CLASSROOM INTERIOR, VIEW TO OUTSIDE



CLASSROOM INTERIOR, VIEW TO CORRIDOR



CLASSROOM INTERIOR, VIEW OF DOOR TO CORRIDOR

THE DATUM IS PRESENT THROUGHOUT THE BUILDING.

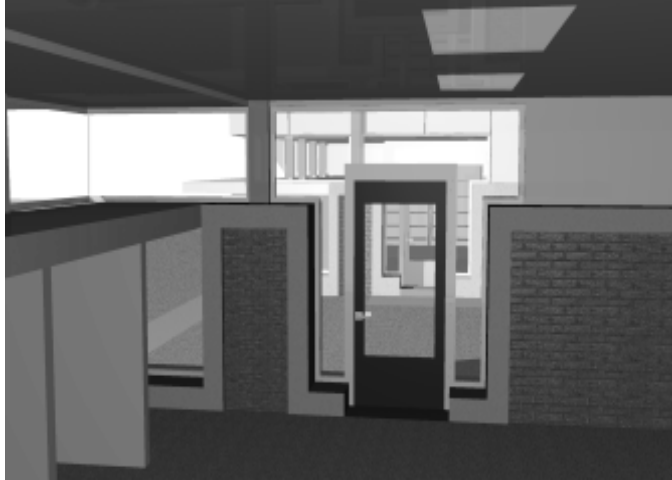
special situations. For example, the datum turns down to create a threshold to emphasize special doorways. In other instances, the datum creates a space for the classroom chalkboard, or a special place to sit and meet in the classroom corridor. In the classrooms, the light shelves of the exterior classroom wall literally

define a child-size space for individual learning. This area in the child-size space under the lightshelf could be used for computer stations or reading areas. The implied small scale of the space gives comfort to the child, and is an ideal space for imagination, repose, or relief from busy activities of the larger classroom

space. The datum also defines spaces within spaces horizontally as well as vertically. For example, the media center's individual study areas define a space vertically using the height of a low wall. The datum turns down to the floor and continues to further define the study area within the floor plane.



DATUM LOWERS TO CREATE CHALKBOARD

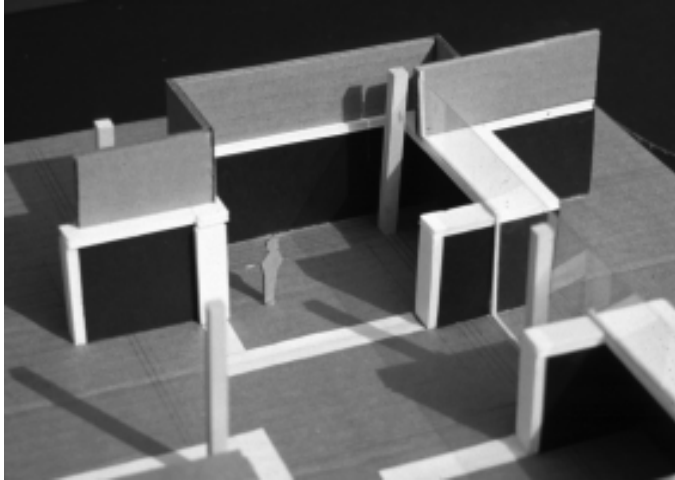


DATUM AS THRESHOLD

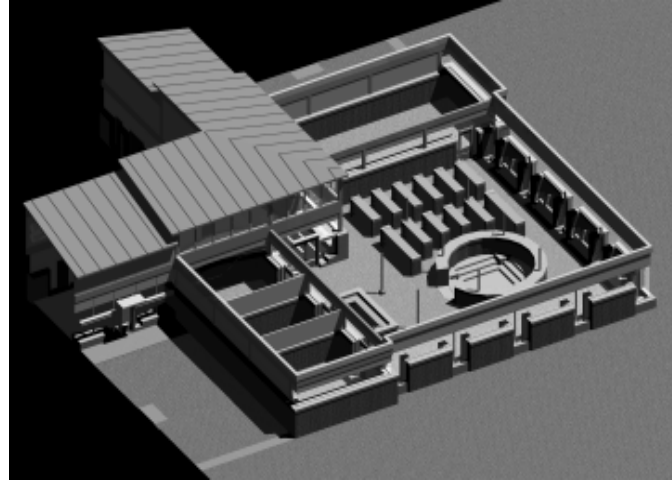


DATUM LOWERS TO SITTING AREAS IN CORRIDOR

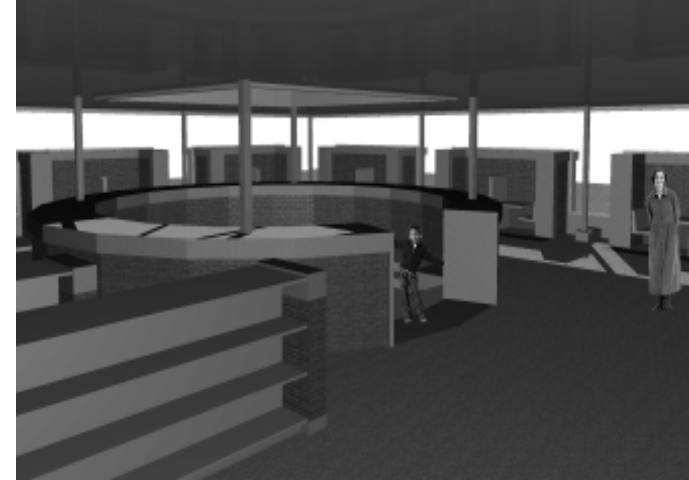
THE DATUM CHANGES TO EXPRESS SPECIAL SITUATIONS.



STUDY MODEL OF MEDIA CENTER SPACE

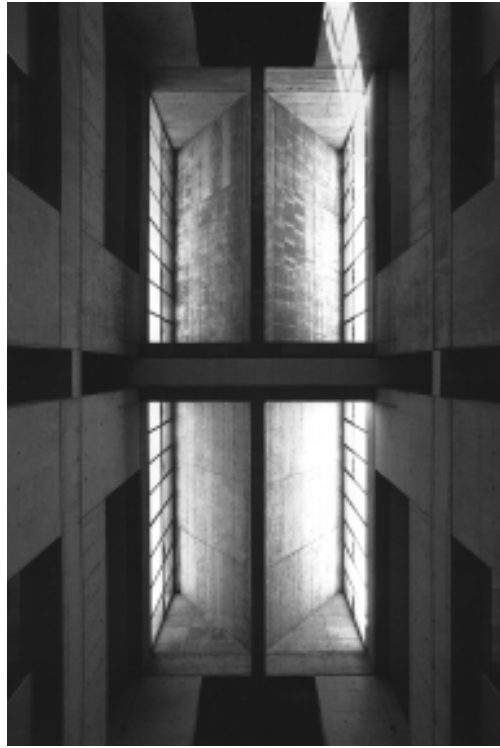


MEDIA CENTER AXONOMETRIC WITHOUT ROOF



MEDIA CENTER INTERIOR VIEW

THE DATUM DEFINES SMALL INDIVIDUAL SPACES WITHIN THE MEDIA CENTER.



Mario Botta, Middle School at Morbio Inferiore
Switzerland, 1972-1977



Giuseppe Terrangi, Asilo Infantile Antonio Sant'Elia
Como, Italy, 1936-1937

ENVIRONMENTAL AND PSYCHOLOGICAL
NEEDS DEMAND THE USE OF NATURAL LIGHT
WITHIN A SCHOOL.



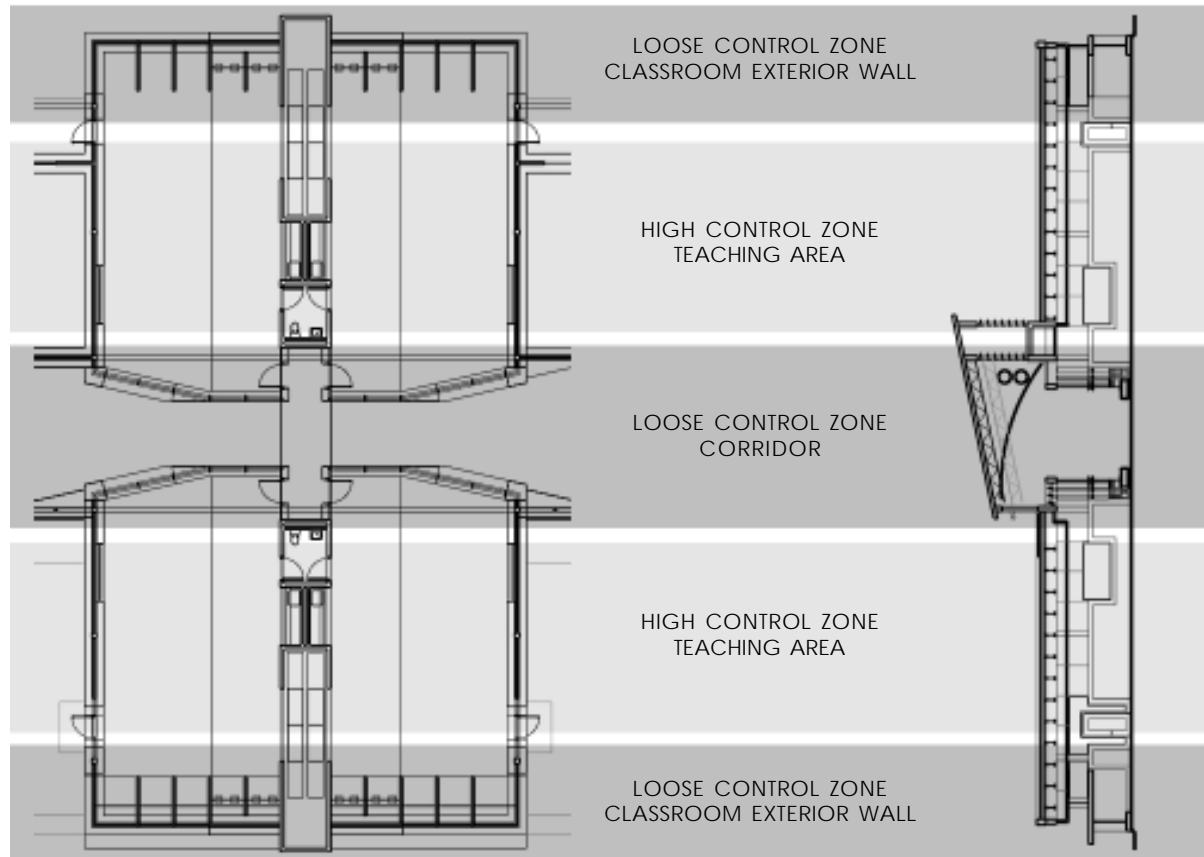
Giuseppe Terrangi, Asilo Infantile Antonio Sant'Elia
Como, Italy, 1936-1937

NATURAL LIGHT

Environmental and psychological needs demand the use of natural light within a school. Effective daylighting that permits light to enter the room without increasing the heating load saves schools money on utility bills. In addition to the financial benefits of daylighting, natural light can also give

comfort to the child. One of the goals of this project was to design a comfortable environment for the children that would facilitate learning. A naturally illuminated classroom with visual connections to the outdoors simulates the home environment, easing the child's transition from home to school. The current

standard of classroom design is seriously deficient in terms of its utilization of natural light. The cell-like spaces of today's classrooms do little to provide a stimulating atmosphere. The sterile quality of these spaces cannot inspire a child to achieve in the classroom setting.



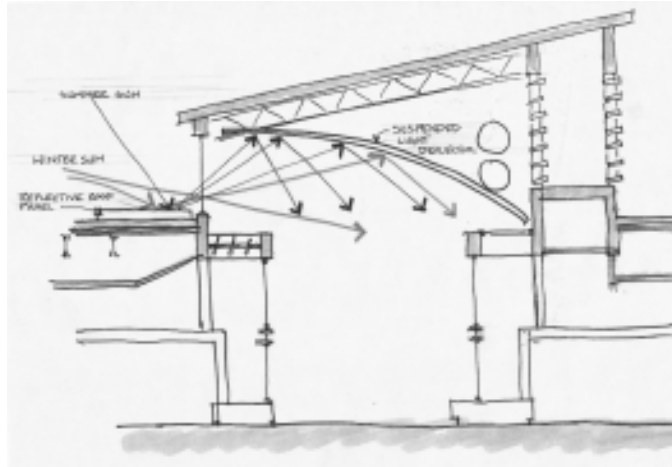
THE CLASSROOM LIGHTING DESIGN IS BASED ON ZONES OF INFLUENCE.

The classroom lighting design is based on zones of influence. Daylight provides illumination in the classroom pods where the light levels do not need to be strictly controlled. In some areas, like the hallways, the lighting levels can fluctuate. There is little need for specific task lighting in these spaces. In other areas, such as the teaching area of the classrooms, the lighting needs to be strictly controlled. Separate zones require varied lighting levels. Artificial

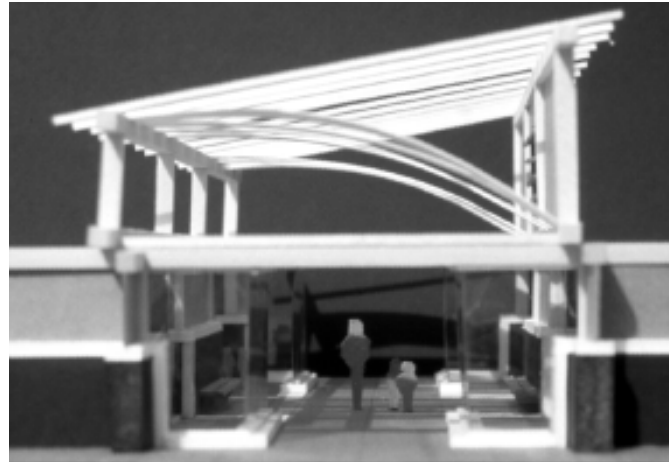
lighting can supplement the areas that need a consistent working environment. Flexible controls of the artificial lighting are critical to the lighting design of the separate zones. Often when buildings use daylighting, the electrical lighting is always turned on, so any financial savings is thrown away because the controls do not offer any interactive flexibility. In such a situation, the benefits of the natural lighting are

lost, because the user cannot adjust the intensity or location of artificial lighting to respond to specific environmental conditions. By simply adding dimming switches to the artificial lighting controls, a high degree of interactive flexibility is achieved. In the long term, the energy savings of the flexible controls can easily recoup the minimal additional cost of installation.

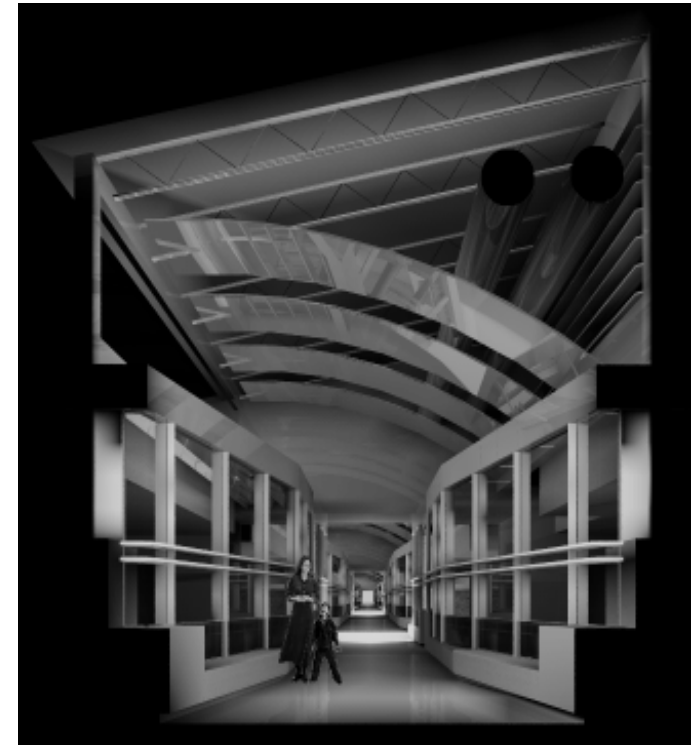
A SYSTEM OF CLERESTORIES AND LIGHT REFLECTORS BRING NATURAL LIGHT INTO THE CORRIDORS.



CORRIDOR DAYLIGHTING SCHEMATIC SKETCH



CORRIDOR STUDY MODEL



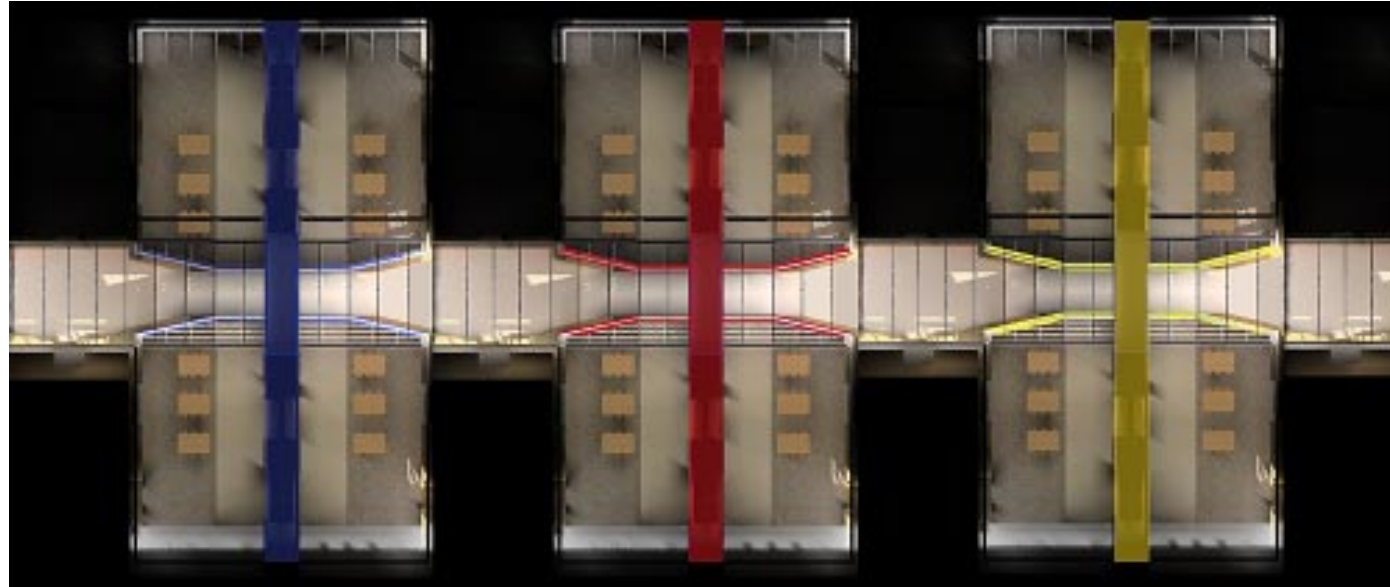
STUDY OF VIEW DOWN CORRIDOR

A system of clerestories and light reflectors bring natural light into the corridors. Light colored roof paver panels reflect light from the roofs of the classrooms to the south of the corridor. Light bounces off of these panels

through the clerestory windows and into the corridor. Large curved reflector panels diffuse the light and direct it down into the corridor. This system brings natural light to the center of an otherwise dark space.

The classroom's mostly transparent corridor walls protrude into the corridor allowing the classrooms to share natural light from the corridor.

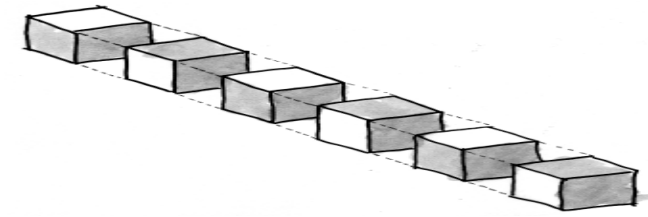
AS A STUDENT TRAVELS DOWN THE HALL, THE CHARACTER AND DIRECTION OF THE DAYLIGHT CHANGES, SETTING UP A RHYTHM WHICH EMPHASIZES THE INDIVIDUAL GRADE PODS.



FLOOR PLAN SHOWING NATURAL LIGHT PATTERN

The natural lighting accentuates the individual character of the grade pods. Expressing the individual identity of the classroom pods was one of the primary goals of the project. By controlling how the light enters the corridor, and the character of the light itself, the daylight can express the individual identity of the grade pods. When a student is in the corridor within

a grade pod, the light enters the space from the clerestory above. When a student is between two grade pods, the light enters the corridor from the side through a glazed wall that looks onto a small courtyard. As a student travels down the hall, the light originates from alternating directions, setting up a rhythm accentuating the location of the child within



CORRIDOR LIGHTING DIAGRAM



EXTERIOR VIEW OF COURTYARD SHOWING VARYING FENESTRATION. CLERESTORIES AT GRADE PODS. WINDOW WALLS BETWEEN PODS.

the school. The rhythm is also expressed by the character of light entering the corridor. At the grade pods where the light comes from clerestories above, the light has a diffuse reflected quality. Between the grade pods, where the light enters the space from the side, the direct light casts severe shadows.



INTERIOR VIEW OF LIGHTSHELF

THE LIGHTSHELF ALLOWS DIFFUSE LIGHT TO ENTER THE CLASSROOMS WHILE ELIMINATING GLARE.



EXTERIOR VIEW OF LIGHTSHELF

Carefully integrated lightshelves provide a natural light source to the exterior walls of the south facing classrooms. The lightshelf allows for a larger proportion of glass on the facade establishing a visual connection to the outdoors without admitting excessive heat or harsh light. Lightshelves are traditionally used most effectively in warmer climates

where they act as shading elements. In this instance, the lightshelf diffuses the light entering the space eliminating glare, and also creates a small space appropriate to the scale of a child. The light shelf houses radiant heating elements to counteract any heat loss due to the higher amount of glazing on the facade and to lower the radiant temperature of the

windows during the winter. Vertical fins running perpendicular to the lightshelf form "egg crate" compartments that also help diffuse the sunlight. The "egg crate" approach allows the same facade to be oriented to the southeast (Grades 4-5) and to the southwest (Grades K-3) and still achieve the reflected diffuse quality of light entering the space.

THE SIMPLE ACT OF OPENING A WINDOW ALLOWS THE USER TO BECOME ACTIVELY ENGAGED IN THE LIFE OF THE BUILDING.



Johannes Duiker, Open Air School
Amsterdam, 1929-1930



RH Partnership, Ionica Building
Cambridge, United Kingdom, 1994



Feilden Clegg Architects, BRE Office of the Future
Garston, Hertfordshire, United Kingdom, 1996

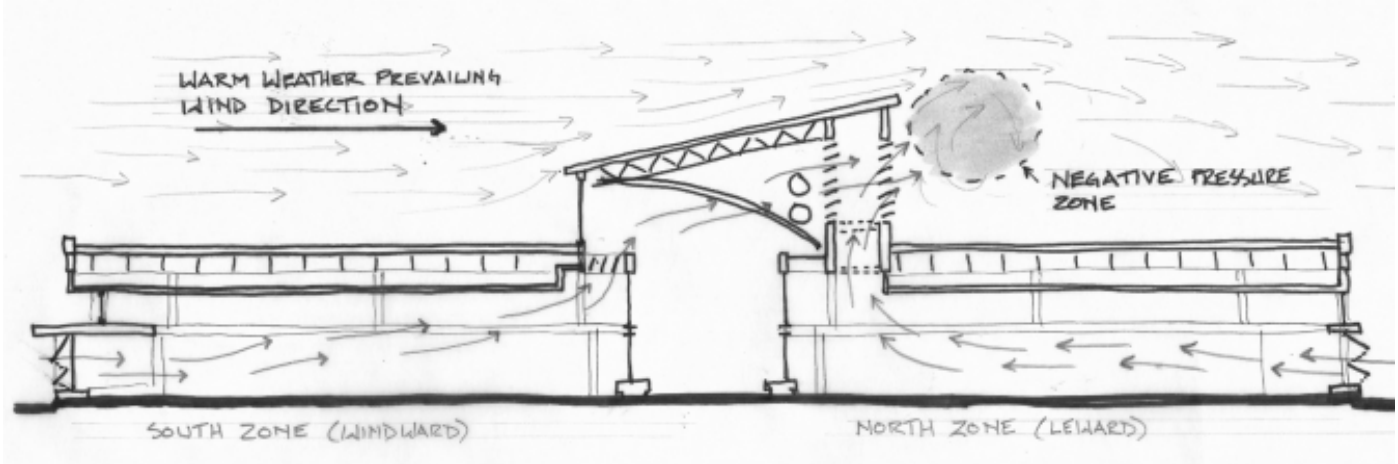
NATURAL VENTILATION

Natural Ventilation can contribute to the environmental and psychological comfort of the child within the school. As with the use of natural light, energy reduction within the school can be achieved by developing a natural ventilation system that compliments a mechanical HVAC system. Educators

want their students to become active participants in the life of a school. The simple act of opening a window allows the user to become actively engaged in the life of the building. The ability to open a window reflects a smaller building type, like a home. Windows that open are not a part of a typical learning

institution, which have become hermetically sealed boxes. By allowing the users to open their own windows, they will become more comfortable with their environment, and therefore it will be easier to learn.

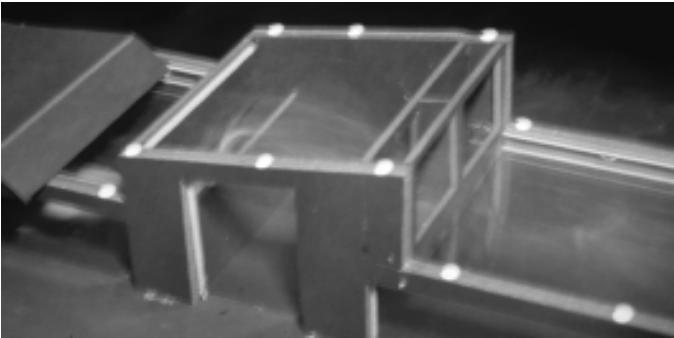
THE TWO ZONE NATURAL VENTILATION SYSTEM USES NEGATIVE PRESSURE CREATED BY THE WIND AS IT TRAVELS OVER THE CORRIDOR ROOF TO DRAW AIR OUT OF THE CLASSROOMS.



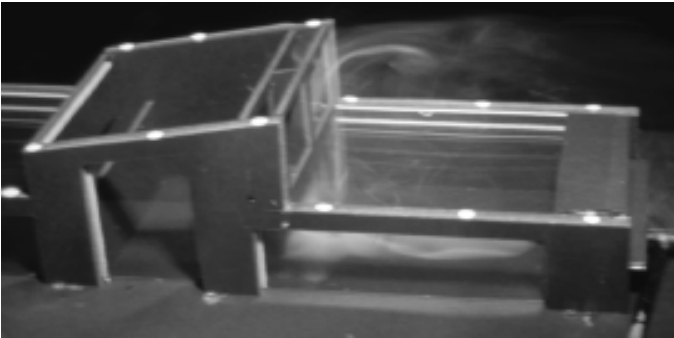
CLASSROOM POD NATURAL VENTILATION DIAGRAM

In the classroom pods, the ventilation system takes advantage of the predominant warm weather breezes coming from the south. The natural ventilation system assists the mechanical system in cooling the space while also providing fresh air. The two zone natural ventilation system uses negative pressure created by the wind as it travels over the corridor roof to pull air out of the classrooms. In the southern

classrooms on the windward side of the corridor, the air enters the classroom through windows in the exterior facade, and travels across the teaching area. The air is pulled through a louver system into the upper part of a corridor. The negative pressure zone created by the corridor roof form then pulls it through additional louvers to the outside. A separate zone for the leeward classrooms on the north side of the



WIND TUNNEL STUDY, AIR FLOW FROM SOUTH ZONE THROUGH CORRIDOR VENTS



WIND TUNNEL STUDY, NORTH ZONE AIR FLOW

corridor draws air through the space using the same negative pressure from the corridor roof. Even though the air current is traveling against the wind direction, the differentiation in air pressure allows for the space to be ventilated.

The design of the controls is critical when introducing a natural ventilation system into the learning



VIEW OF LOUVER SYSTEM AT CORRIDOR

environment. I believe in a building type such as a school, where funds and maintenance are scarce, the control solutions must be very low tech. If very complex, the systems will fail if not carefully maintained. In the classroom pod, the negative pressure created by the roof form does most of the work. The simple louver systems are the only moving

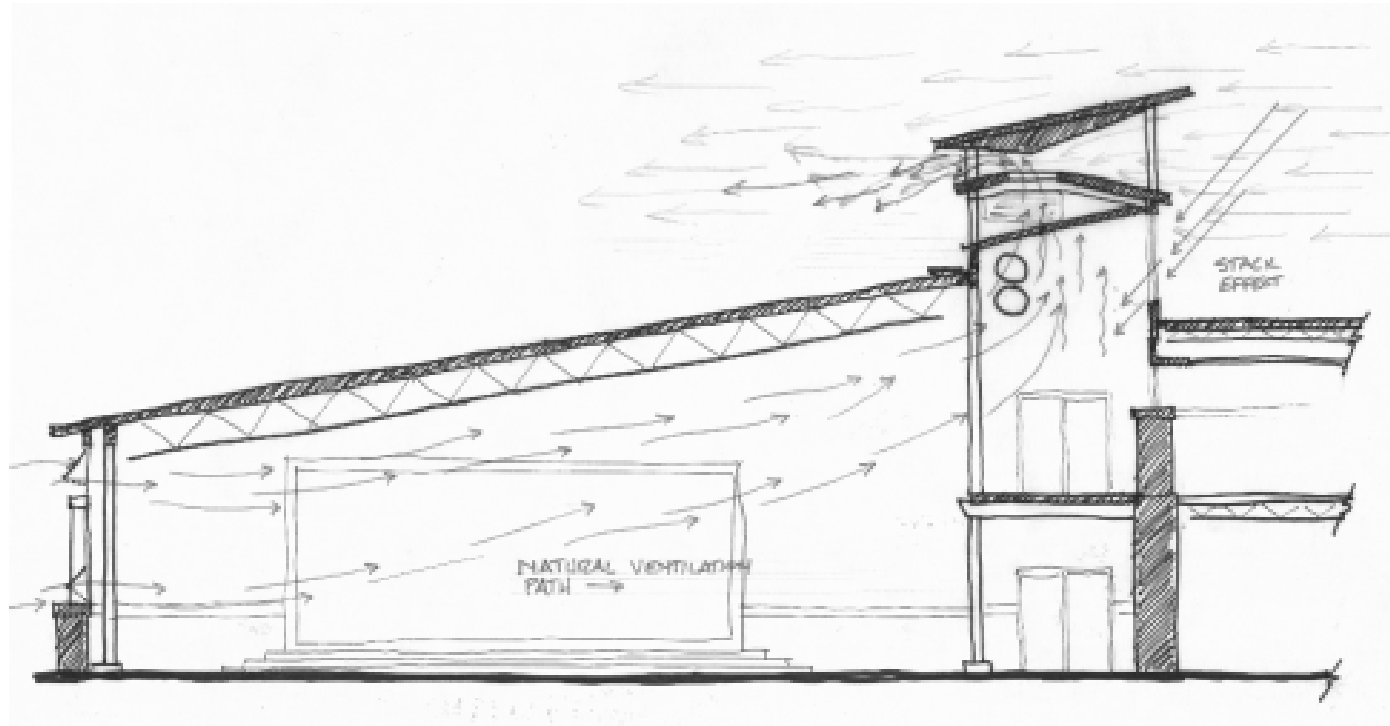
parts. The real challenge comes in the adaptable design of the HVAC system. Developing the natural ventilation provides no benefit if the mechanical system cannot work with it. The HVAC system needs to respond to individual classrooms, so when one teacher opens a window, it doesn't effect all the other classroom spaces or the mechanical system in that



SOUTH ZONE CLASSROOM LOUVERS

THE NEGATIVE PRESSURE CREATED BY THE ROOF FORM DOES MOST OF THE WORK. THE SIMPLE LOUVER SYSTEMS ARE THE ONLY MOVING PARTS.

space continues to pump air into the space. Because of the need for individualized control, the mechanical system takes a decentralized approach. Each grade pod has a pair of mechanical units within the shared wall which only serve two classrooms. These units connect to the main chiller through the conduits which run through the upper level of the corridors.



PUBLIC AREAS NATURAL VENTILATION DIAGRAM

The public areas of the school (multipurpose room, dining) use wind and the stack effect to naturally ventilate the space. Natural light enters through a south-facing clerestory above the mezzanine path. This bathes the public areas in natural light. Any heat gained in the space will rise through the clerestory above and be vented outside. The clerestory uses a wind fin at the roof to create negative wind pressure. As the wind travels by the fin from any direction, the

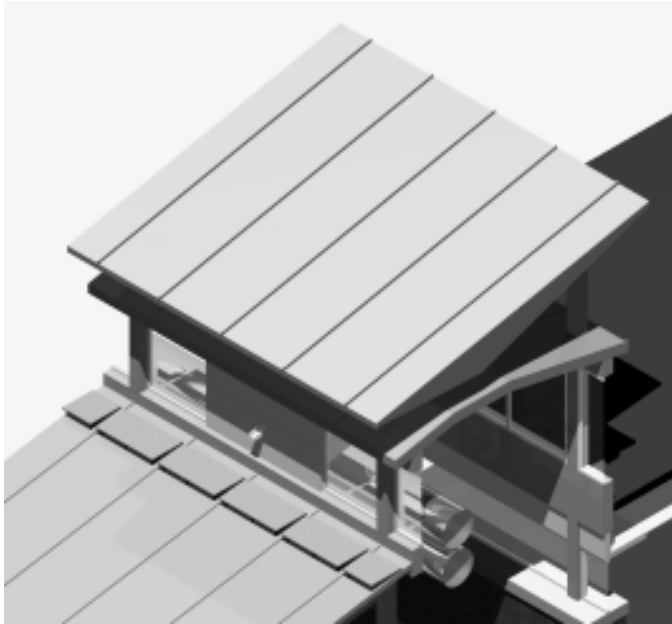
wind is compressed. This phenomenon, known as the Venturi effect, creates a negative pressure zone where the airflow is compressed. A chamber in the clerestory of each structural bay has an outlet for air to pass through. The design of the chamber allows for any wind driven water entering the chamber to be expelled to the roof, prohibiting water from entering into the occupied spaces. If the exterior wind speed



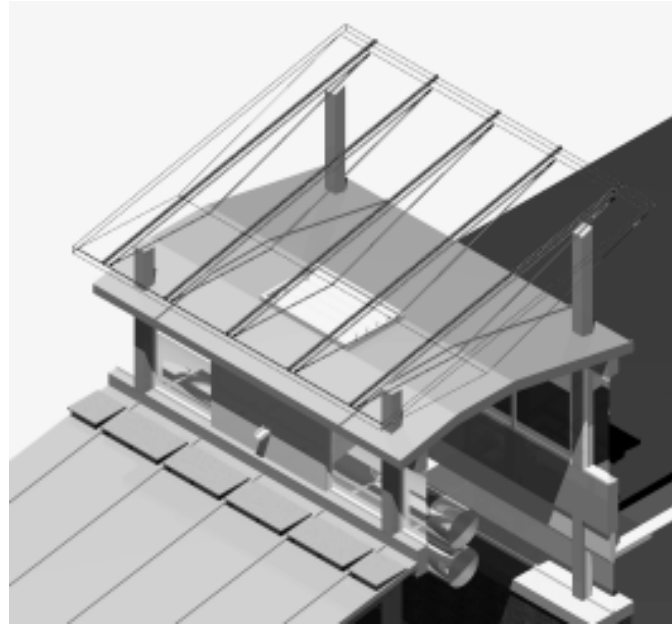
PUBLIC AREA MAIN STREET ELEVATION SHOWING WIND FIN AT CLERESTORY

THE COMBINATION OF THE NATURAL CONVECTION CAUSED BY THE STACK EFFECT, AND THE NEGATIVE PRESSURE CREATED BY THE WIND FIN, DRAWS AIR OUT OF THE PUBLIC SPACES.

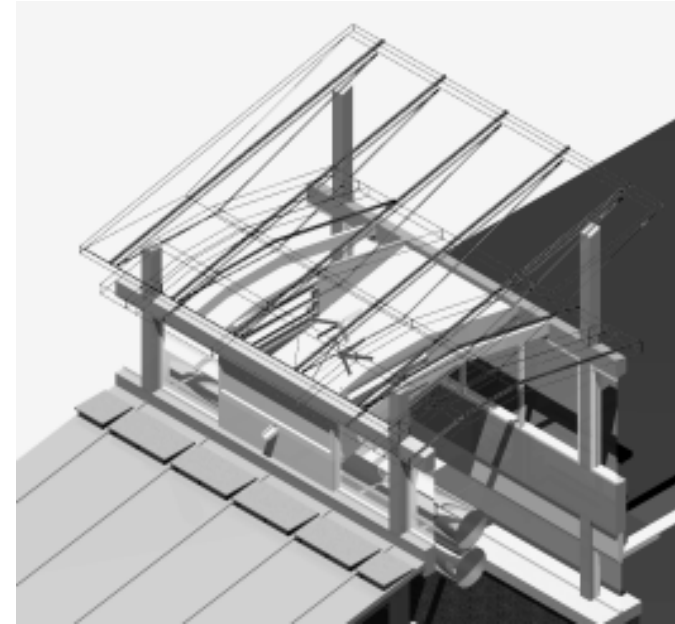
is insufficient to produce airflow through the spaces, a supplemental fan is included at the outlet for low energy ventilation of the space. Maintenance access doors and a roof path are included for easy maintenance of the clerestory chambers. The combination of the natural convection caused by the stack effect, and the negative pressure induced by the Venturi effect, pulls air out of the public spaces.



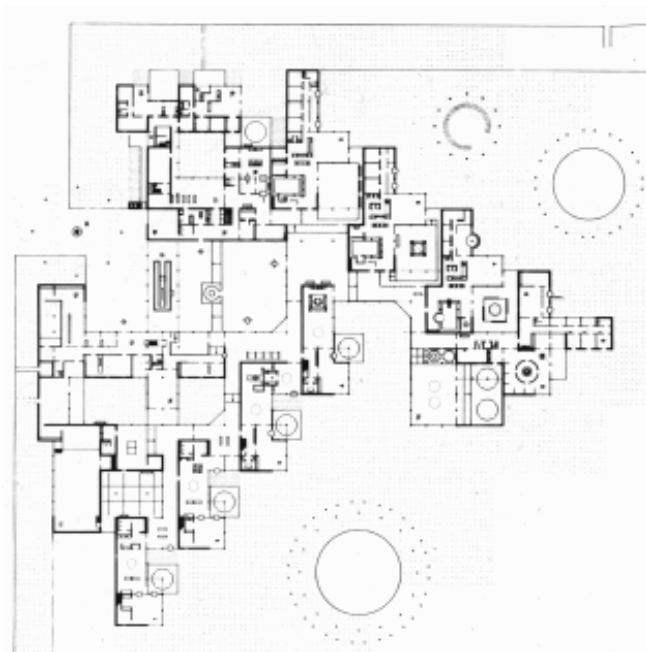
PUBLIC SPACE VENTILATION CHAMBER AT CLERESTORY, SECTIONAL VIEW OF ONE STRUCTURAL BAY



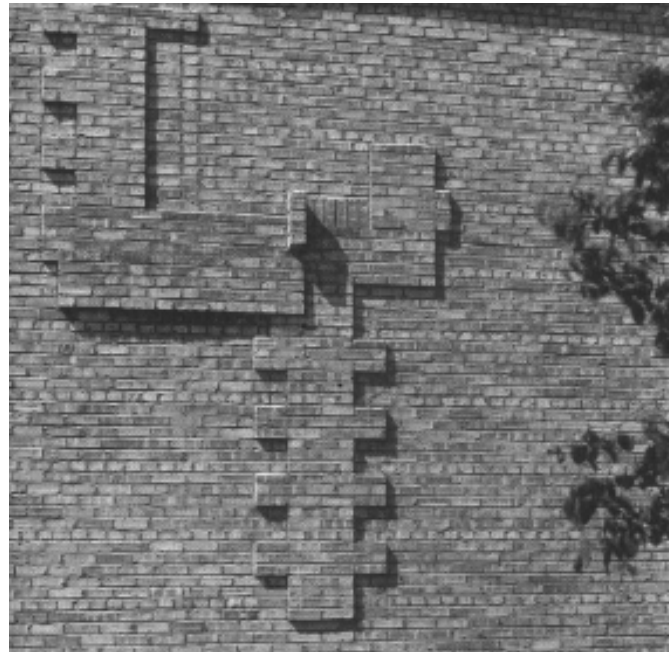
PUBLIC SPACE VENTILATION CHAMBER AT CLERESTORY, SECTIONAL VIEW OF ONE STRUCTURAL BAY, WIND FIN AS WIREFRAME



PUBLIC SPACE VENTILATION CHAMBER AT CLERESTORY, SECTIONAL VIEW OF ONE STRUCTURAL BAY, WIND FIN AND CLERESTORY ROOF AS WIREFRAME



Aldo Van Eyck
Orphanage, Amsterdam 1957-1962



Perkins, Wheeler & Will with Eiel and Eero Saarinen
Crow Island Elementary School, Brick Detail, Plan Diagram
Winnetka, Illinois, 1940

THE SCHOOL DESIGN IS BASED ON A LINEAR GRADE POD SYSTEM, WHICH CREATES A SENSE OF COMMUNITY WITHIN THE SCHOOL.

THE GRADE POD

The school design is based on a linear grade pod system, which tries to create a sense of community within the school. Historically, twentieth century schools were based on a factory model, with classrooms linearly arranged along double loaded corridors. The current fashion in elementary school design is geographically segregated classroom clusters or pods organized by grade. Each grade has their classrooms in a separate wing of the building. Thinking that smaller schools will have better

educational results, this arrangement tries to create schools within schools. The grades are seen as houses, and try to give a sense of community. By associating home and therefore the school with comfort, the school itself will facilitate learning. While the correlation between learning and comfort is valid, the architectural response to this philosophy needs to be rethought for several reasons. The geographically segregated pods do create a sense of community within the grade pod. However, this arrangement

isolates grade levels from each other, and provides no sense of community within the entire school. In practical terms, this geographically segregated pod system breaks down when there are population bubbles within grade levels. What happens when you have four classrooms per pod, and need six classrooms for Kindergarten and two classrooms for First Grade? The intentions of the geographically segregated pod system breaks down when grade classes need to be split up.



FLOOR PLAN OF GRADE PODS

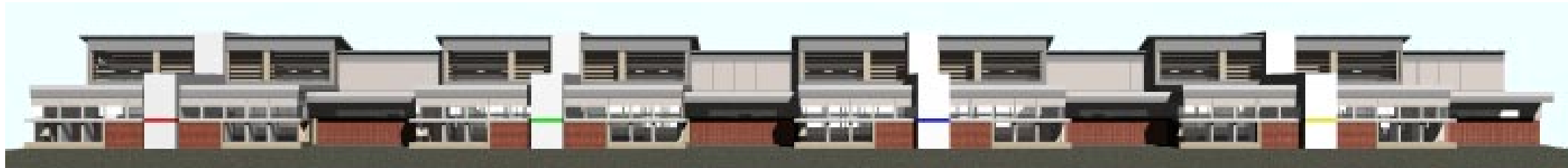
My proposal develops a linear pod system, which incorporates the advantages of both the factory model and the geographically isolated grade pod system. Four classrooms per grade group together creating a grade pod. The grade pods express individual qualities of house or unit through their architectural articulation. A corridor links the pods together, but the pod's form sustains the unique identity

of each grade level. This not only creates a sense of community within the grade pod, but also to a larger extent, within the school. Through the daily activities of going to other areas of the school, children from other grades pass through the pods. If population bubbles occur within this system, additional classrooms can be added to a grade by annexing

classrooms from the adjacent pod. The additional classrooms, while not being strictly within the same pod, will still be geographically close.

The spaces between the classroom pods help distinguish the grades as individual units. On the side of the corridor that faces the street, outdoor

THE GRADE PODS EXPRESS INDIVIDUAL QUALITIES OF HOUSE OR UNIT THROUGH THEIR ARCHITECTURAL ARTICULATION. A CORRIDOR LINKS THE PODS TOGETHER, BUT THEIR FORM SUSTAINS THE UNIQUE IDENTITY OF EACH GRADE LEVEL.



ELEVATION OF GRADE PODS FROM COURTYARD



ELEVATION OF GRADE PODS FROM STREET

classrooms define the spaces between the pods. Grades share these spaces for outside instruction. These areas are minimally defined by the introduction of a masonry strip in the ground plane at the periphery of the space. The breaking of the building massing at the outdoor classroom makes the grade pods seem like individual houses. The mostly transparent glass

facade that connects the corridor to the learning courtyard helps create the distinction between the grade pods. Within the corridor, the spaces between the pods articulate the distinction of the individual pods. The corridor widens to accommodate small meeting spaces between the pods. The horizontal datum lowers to become seating within this area.

On the courtyard side of the corridor, shared resource rooms separate the classroom pods. The resource room roof lines are below the level of the adjacent classrooms, separating the pods. The wall that separates the resource room from the corridor is completely closed, in sharp contrast to the open facades of the classrooms.



Luis Barragan
Galvez House
San Angel, Mexico City, 1955



Louis I. Kahn
Richards Medical Research Building, University of Pennsylvania
Philadelphia, Pennsylvania, 1957-1965

A PHYSICALLY AND PROGRAMMATICALLY
“THICK” WALL ELEMENT ANCHORS EACH
GRADE POD.



Louis I. Kahn
Kimbell Art Museum
Fort Worth, Texas, 1966-1972

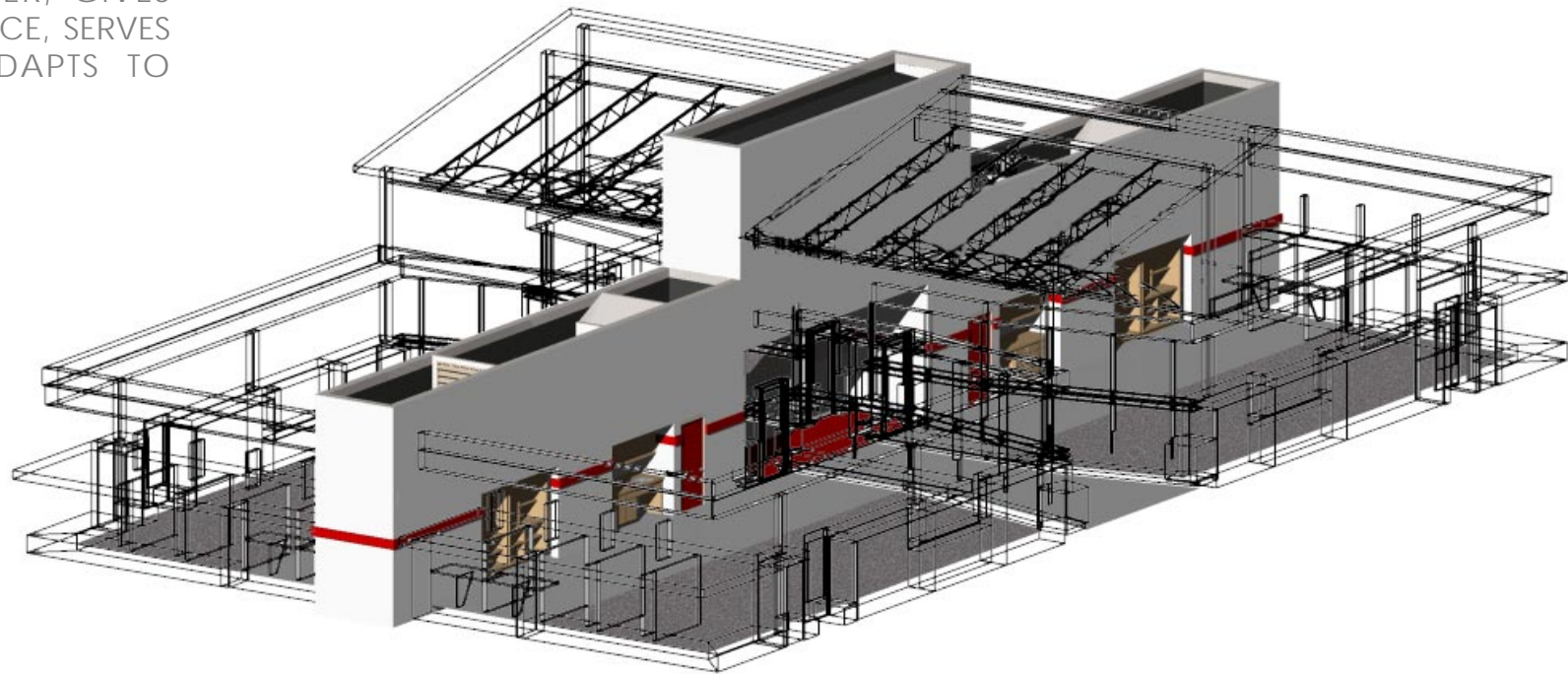
THE WALL ELEMENT

A physically and programmatically “thick” wall element anchors each grade pod. Because of its

physical presence and its many duties, the wall is the hierarchically most important element in each grade

pod. The four classrooms of each grade pod share the wall as one of the walls within each classroom space.

THE WALL ACTS AS A MARKER, GIVES IDENTITY, PROVIDES AN ENTRANCE, SERVES THE CLASSROOMS, AND ADAPTS TO DIFFERENT SITUATIONS.



AXONOMETRIC OF WALL ELEMENT WITH CLASSROOMS AS WIREFRAME

Each “thick” wall acts as a marker, provides an entrance, and supports the mechanical and electrical systems. The wall also adapts to different classroom configurations and gives an identity to each pod. The color of the datum on the wall marks each grade as you walk down the corridor. The excitement of graduating to the next grade level is an important moment for a child, and moving into another pod with a different color scheme can mark this passage. The entrances to the classrooms are directly under the wall, giving an importance to that moment. The wall is also a vital service zone that supports the pod. It is

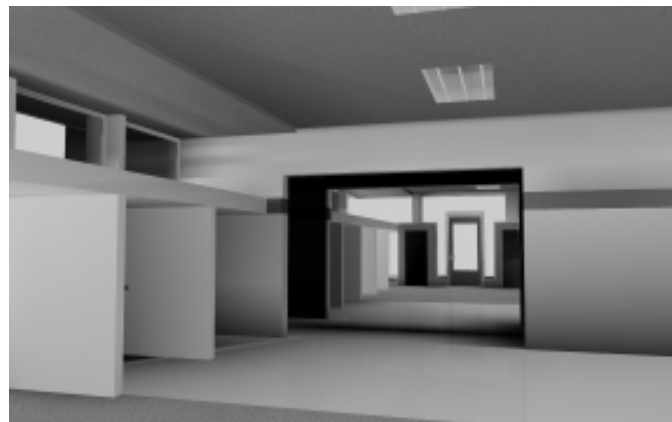
generously sized to house the mechanical, electrical, plumbing, and telecommunications equipment for each grade pod. The thick wall houses cabinets with sinks for each classroom, and toilets in the Kindergarten and First grade pods.

The material articulation of the physically and programmatically “thick” wall element is in stark contrast to the classrooms that are appended to it. This contrast sets up the wall as the most hierarchically important element. The classroom walls that surround

the “thick” wall are highly articulated in their use of materials. These elements are doing what they do best. As Frank Lloyd Wright would say, the materials are true to their nature. The masonry walls provide a base that is in compression. These low walls anchor the pods to the ground. The steel columns above, which are in tension, span the rooms and provide the opportunity for the penetration of natural light. In contrast, the massive wall is almost immaterial. The wall is smooth plane with a band of color as the only articulation.



ADAPTABLE WALL WITH STORAGE UNITS CLOSED



ADAPTABLE WALL WITH STORAGE UNITS OPEN

THE POD WALL OPENS UP TO CREATE A LARGER SPACE FROM TWO ADJACENT CLASSROOMS.

Schools today want adaptable spaces. The pod wall lets two adjacent classrooms open up to create a larger space. The transformation gives more than the typical operable wall. The “door” between the two

classrooms is actually two large storage cases for each classroom that can slide on tracks into the thick wall like pocket doors. When the cabinets are opened, a connection is established between the two adjacent

classrooms allowing for joint instruction. This transformation also gives access to the decentralized mechanical units within the wall that serve each grade pod.



Herman Hertzberger
De Polygoon Primary School
Almere, 1992



Herman Hertzberger
Apollo Montessori School
Amsterdam, 1980-1983

THE CORRIDOR BECOMES A STREET, WITH EACH CLASSROOM ON THE PATH HAVING IT'S OWN IDENTITY.

IDENTITY

The articulation of the classrooms gives the space, and to a larger extent entire grade level, it's own identity. As a child walks down the corridor, each class is easily identified through the activities going on inside the classroom. The corridor becomes a street, with each classroom on the path having it's own identity. The architecture of the school seeks to provide a framework for this realization. This idea is not new in school design, but most attempts are merely scenographic. The identity should come from what is going on inside the classroom, and the architecture should provide the frame to express it. One way the architecture becomes the frame which

expresses the individual quality of each classroom is the massing of the classrooms. Each classroom slightly projects into the hallway, announcing its presence as an individual unit. The upper half of the highly articulated corridor wall is transparent. In addition to the benefits from the shared natural light entering the space, a person in the hall can identify the classroom by the users activity within. The wall's major horizontal mullions, which are an extension of the horizontal datum, allow space for display of student work and art. By obscuring the lower portion of the classroom's corridor wall, children will not be

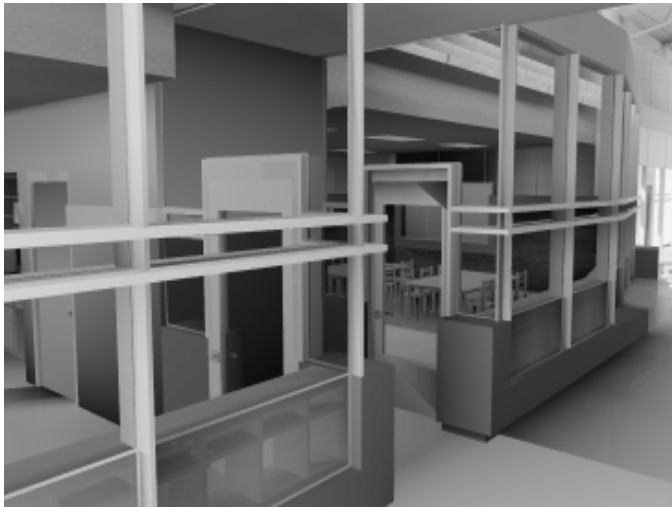
distracted from their studies. The bottom of the wall is a bench on the corridor side, and storage on the classroom side. Above the bench are students' cubbyholes behind translucent glass. All of these elements, which change depending on student activity within the space, give identity to the individual classrooms.

Color also gives identity to each grade pod. The color of the doors, the floor at the classroom entrances, the horizontal mullions of the corridor wall, and the datum on the thick wall change with each pod.

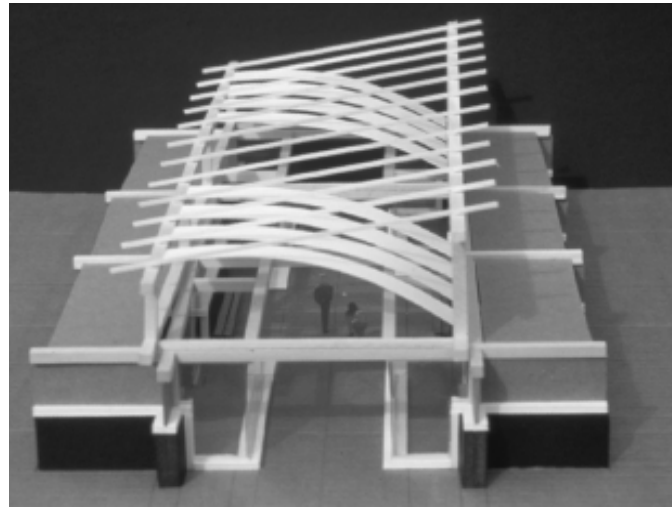


AS A CHILD WALKS DOWN THE CORRIDOR, EACH CLASS IS EASILY IDENTIFIED THROUGH THE ACTIVITIES GOING ON INSIDE THE CLASSROOM.

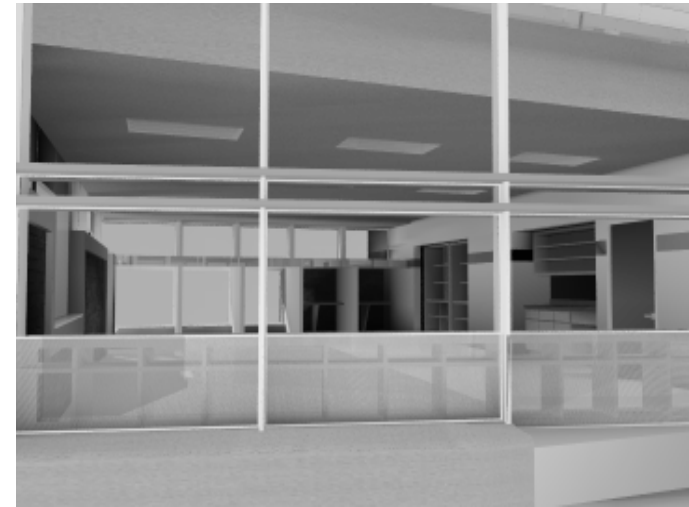
THE IDENTITY SHOULD COME FROM WHAT IS GOING ON INSIDE THE CLASSROOM, AND THE ARCHITECTURE SHOULD PROVIDE A FRAME TO EXPRESS IT.



VIEW OF ENTRY TO CLASSROOM FROM CORRIDOR



CORRIDOR STUDY MODEL



VIEW INTO CLASSROOM FROM CORRIDOR

THE SITE MARKS A THRESHOLD BETWEEN TWO DISTINCT PARTS OF BLACKSBURG.



VIEW OF SITE FROM ACROSS STREET SHOWING EXISTING MIDDLE SCHOOL, NEIGHBORHOOD TO RIGHT (SOUTH), DOWNTOWN TO LEFT (NORTH)

SITE DESIGN

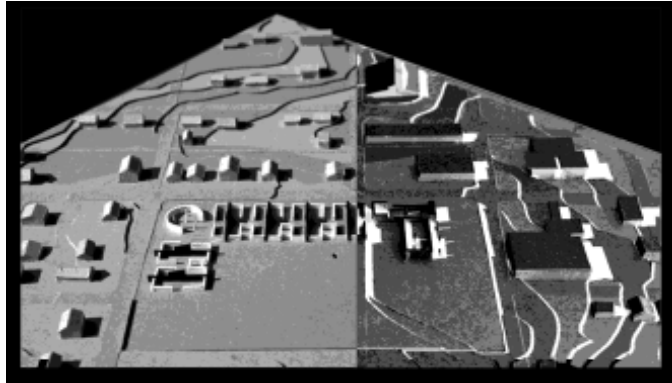
The project is located near downtown Blacksburg on a wide green space lot that fronts Main Street. The site is adjacent to the town's original sixteen square grid, a few blocks from the Virginia Tech campus. An existing middle school currently on the site is the subject of much discussion within the community. Many proposals have been considered in the last few

years as to what to do with the existing building, from comprehensive renovations, to razing it and starting over with a brand new school. My project looks at the latter alternative, and seeks to engage the urban conditions of the area with a new elementary school. The site marks a threshold between two distinct parts of Blacksburg. Most people usually experience the

site by driving or walking along Main Street. Along Main Street to the south, the town is primarily single family homes, with trees and a loose density of buildings. To the north, Main Street becomes part of downtown, with a higher density of buildings and public use. The large open site separates these two zones.

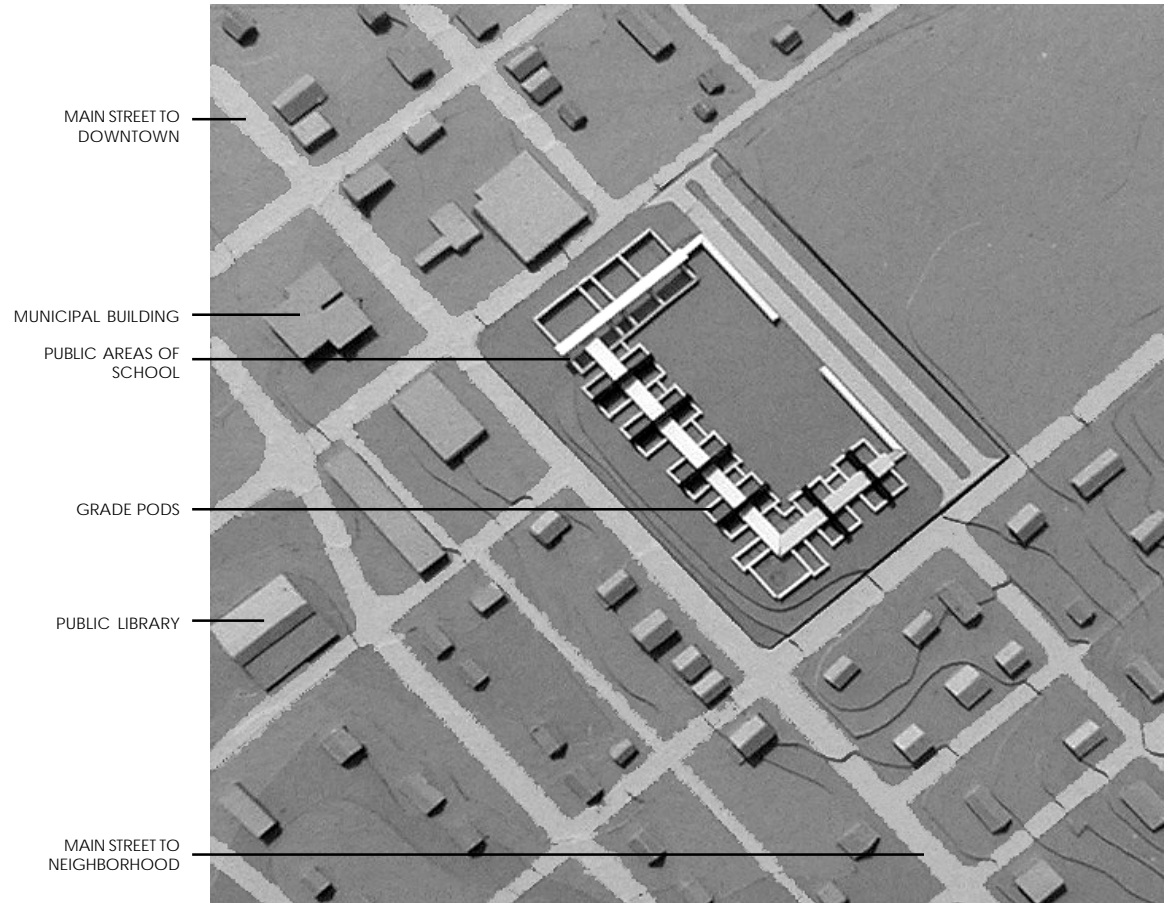


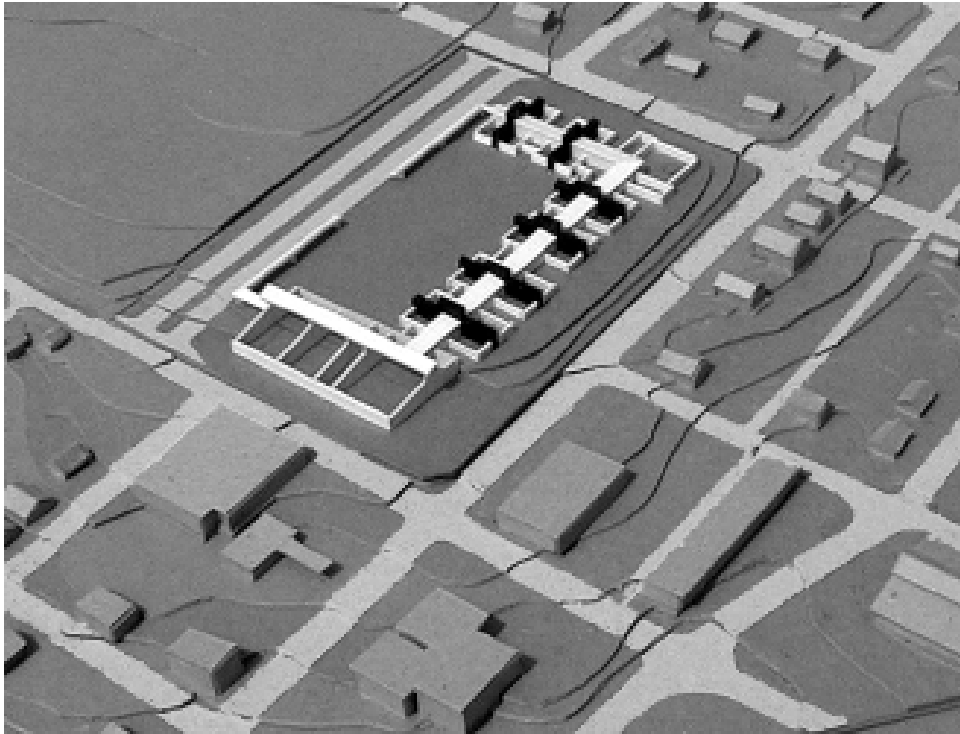
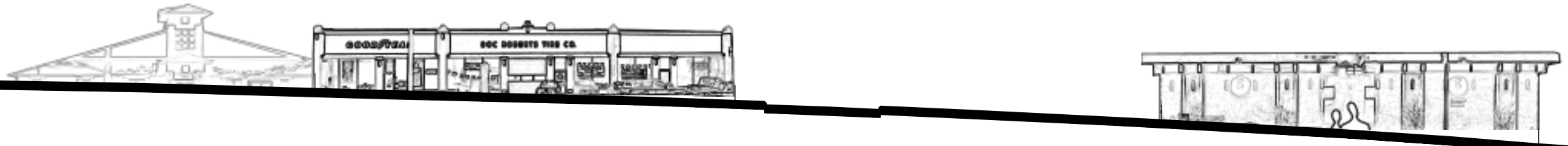
MAIN STREET ELEVATION ACROSS FROM SITE



THRESHOLD BETWEEN NEIGHBORHOOD AND DOWNTOWN

The transition between the two realms of Blacksburg generates the organization of the prototype school elements on the site. The building responds to the transition between the residential character of the neighborhood to the south, and the public realm of downtown to the north. The classroom pods on the south end of the site reflect the massing, siting, and character of the residences across the street. The public realms of the school, meaning the shared spaces within the educational program, respond to the larger public spaces of downtown.

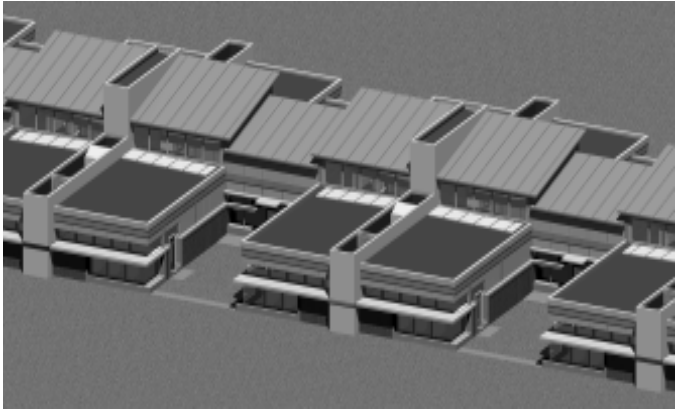




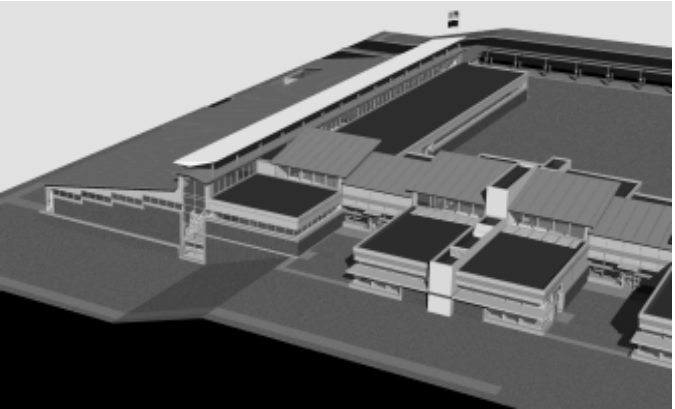
VIEW OF SITE FROM DOWNTOWN

THE SITE DESIGN RESPONDS TO THE TRANSITION BETWEEN THE RESIDENTIAL CHARACTER OF THE NEIGHBORHOOD TO THE SOUTH, AND THE PUBLIC REALM OF DOWNTOWN TO THE NORTH.

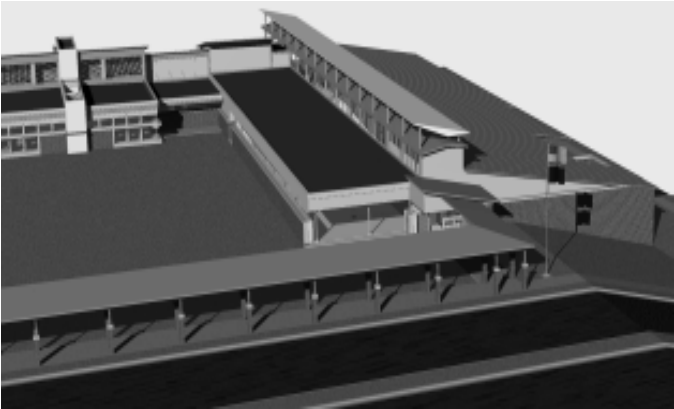
THE SLOPPED ROOF FORMS OF THE CIRCULATION PATH UNIFIES THE SEPARATE ELEMENTS ON THE SITE. ALTHOUGH THE SLOPING ROOF ELEMENT IS PRESENT THROUGHOUT THE SCHOOL, THE SPECIFIC FORM IT TAKES CHANGES TO ACCOMMODATE SPECIFIC SITUATIONS.



AERIAL VIEW OF GRADE POD WING



VIEW OF CONNECTION BETWEEN GRADE POD WING AND PUBLIC SPACES

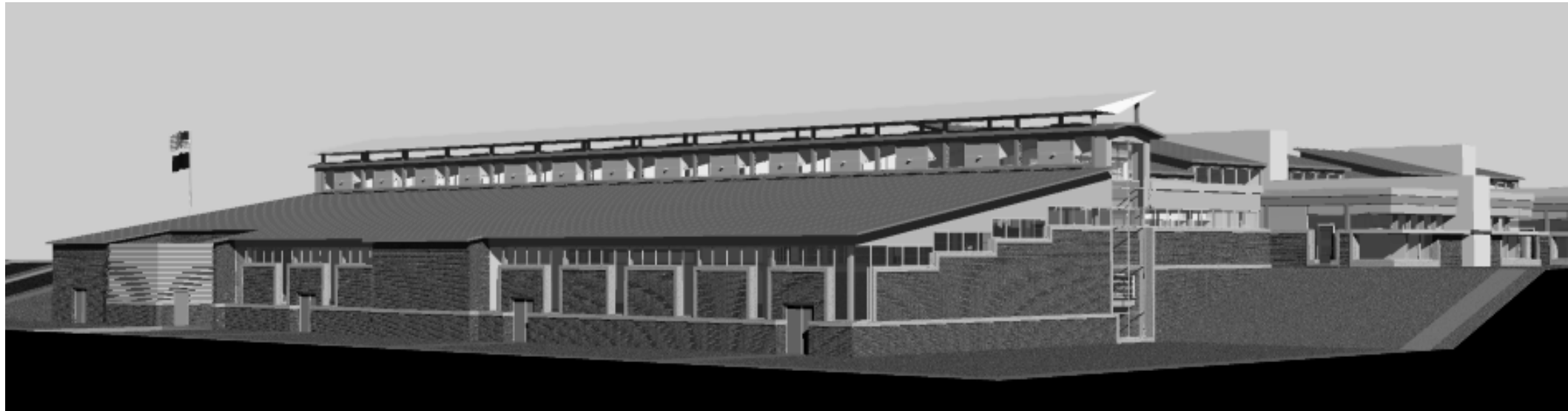


BACK VIEW OF SCHOOL SHOWING PUBLIC AREAS, COURTYARD AND BUS CANOPIES

The classroom pods, public areas, and bus canopies link together to create a courtyard plan for the school. The sloped roof form of the circulation path unifies these separate elements on the site. Although the sloping roof element is present throughout the school, the specific form it takes changes to accommodate specific situations. In the grade pod wing, the roof

changes heights between each grade pod to emphasize the individual character of each grade. Even though there is a change in roof height, the similar form of the roof unifies the elements. The public areas of the school have a similar roof form above the corridor, but it adjusts to integrate a wind fin for the natural ventilation of those spaces. The corridor

roofs extend out to become the entry vestibules and the bus canopies. Vehicular access to the building occurs at the rear of the site. Bus and automobile drop-offs are placed so the children feed into the two entrances. Security is a major concern for elementary schools today, and the courtyard layout of the school ensures a safe environment. The way the building is



VIEW OF PUBLIC AREAS FROM DOWNTOWN

THE SCHOOL USES THE EXISTING TOPOGRAPHY TO FIT THE BUILDING ONTO THE SITE.

shaped, the transparency of the courtyard facades, and the massing of the building provide the security, because the users become the security system. The building cradles the playground and vehicular drop-off areas, providing a barrier of protection to the children. Through their daily activities, teachers, administrators, and other students can see potential

security threats, without consciously supervising the site.

The school design responds to the existing topography in the siting of the building. An existing retaining wall was the inspiration for the placement of the public spaces of the school on the site. The building uses the

drop-off of the terrain to create a larger volume on the public side of the site. The corridor from the grade pods enters the public spaces on a mezzanine level. From there, a student can go down stairs to the multipurpose room or dining room, or walk down the mezzanine to the administration areas and the main school entrance.

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