MILLER BROTHERS REUSE

A NEW FACILITY FOR INDIANA VOCATIONAL TECHNICAL COLLEGE

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THESIS STATEMENT

"The Times They Are A Changin'"

- Bob Dylan

The Changing Economy

Our nation is currently in the middle of a great shift in its economic realities. The product industries, steel, automobiles and coal, born of the Industrial Revolution and responsible for the fantastic prosperity of our last one hundred years are declining in importance to our economy. The heavy industries that remain at the forefront are rapidly shifting to high technology, automated processes. New giants have stepped in to replace the old. Communications, data processing and the so-called service industries are becoming the new industries of America.

The Effect on Education

With this trend the "unskilled laborer" has become an obsolete commodity. A high school diploma no longer guarantees a good job. More and more young people are forced to seek post secondary education to insure themselves a secure future. Industry no longer needs "strong hands and strong backs". They need strong minds. A relatively new form of education has arisen to fulfill this need for technical education and training - vocational schools. These schools minimize the traditional emphasis on liberal arts and academic subjects and concentrate on developing specific skills and areas of expertise. The usual curriculum is a two year post-high school program. This type of school is growing rapidly in response to industry's demand for skilled technicians.

Offerings include traditional "trade school" programs such as auto and diesel mechanics, welding, machine shop, electronics, drafting, practical nursing, secretarial, etc. Relative newcomers to the field include more technical skills like heating/refrigeration/air conditioning, computer programming, data processing, communications, robotics, and fluid power. If current trends continue, the need for individuals with these skills can only increase. Correspondingly, the number and size of vocational training facilities must increase also.

The Effect on Industry

The shift to service industries and automation of traditional industries has had strong influence on the fabric of our industrial centers. The demands of high technology have forced the abandonment of thousands of antiquated industrial buildings near urban centers. Shiny new "industrial parks" in the suburbs have been replacing the factory districts of past years. With this abandonment of older buildings comes the problem of what to do with these under-utilized or vacant, but often still sound and attractive, buildings. Demolition is the costly and often unfortunate choice in the case of buildings that are still sound. Conversion to urban shopping malls or condominiums can be successful only under a rare set of circumstances. Other alternatives are necessary.
The Proposal

In light of the trends already discussed, the thesis I put forth is a simple and logical conclusion. One alternative to demolition of some obsolete industrial buildings would be to reuse them as vocational training centers.

Initial examination of the proposal would suggest that such a reuse is a "marriage made in Heaven." Older industrial buildings are centrally located in urban populations and accessible by major transportation routes. The buildings themselves have large interior spaces, ample openings for raw materials to enter and products to leave, extensive service cores, and administrative and support areas built in. All of these characteristics are in harmony with the needs of contemporary vocational educational facilities.

In addition, a strong philosophical relationship is created by the idea of educating students of industry in an industrial setting. The student leaves the world of academics and spends two transitional years receiving education in an older industrial area before entering the industrial work force.

The test of my proposal is the design of just such an educational facility in just such a building in Richmond, Indiana. While some of the problems encountered are unique to this specific instance, most can be considered typical of such an undertaking. Judging the success or failure of the project is left to you, the reader. My conclusions appear at the end of this book.
BACKGROUND

Richmond Overview

Richmond, Indiana, is a small city of 4,500, located in East Central Indiana. Interstate 70 passes nearby, connecting Richmond with Indianapolis, 70 miles to the west. It is the largest city in a nine-county area and is the commercial hub of the region.

It is an industrial community that manufactures such items as aluminum pro-

ducts, piston rings, wire and cable, machinery, appliances, and phonograph albums. The diverse array of industries has shielded Richmond from some of the economic distress of the last ten years. Despite this diversity, some factories have closed causing a loss of about 3% in population since 1960. A larger trend has been shaping the character of the city since the turn of the century.

Brief History

Richmond is an old community by Indiana standards. The business district of Richmond grew along the sides of the old "National Road" that led many settlers west in the early 19th century. The steady flow of newcomers along with a ready supply of water power from the Whitewater River caused Richmond to prosper. The Pennsylvania Railroad laid tracks north of town in the 1850's. By the 1880's a bustling factory district had formed near where the railroad crossed the Whitewater. The largest of these factories was the Carr Scott Farm Implement complex near Ft. Wayne Avenue and E Street.

During the same period the railroad replaced their obsolete passenger station with a majestic Romanesque Revival structure, designed by Daniel Burnham, located two blocks from my thesis site. The powerful influence of the railroad and factory district caused a new commercial area to grow in the northern part of town. From the railroad station on E Street down Fort Wayne Avenue became a retail district sandwiched between the factories and residential neighborhoods. It was said that Fort Wayne Avenue was more of a main street to Richmond than the street that bore the name.
The Building's History

Part of this busy new district was a modest three-story brick structure on Fort Wayne Avenue that housed the Miller Brothers Hardware Company. Only 36 feet wide, the building was sandwiched between other storefronts. The business prospered and by 1930 the company had purchased and demolished several nearby buildings, and added on five more bays so that their storefront covered one half of the block. Subsequent additions more than doubled the size of this structure to create "Miller Brothers Block", an imposing structure of 130,000 square feet that lined one entire side of Fort Wayne Avenue between D street and the railroad tracks.

The hardware concern required nowhere near that much space so the balance of the building was occupied by various tenants. The largest and longest lived of these was the International Harvester Company.

The decline in the importance of railroad travel and connections caused a corresponding decline in the retail district. The railroad hotel closed and many other key businesses moved to more advantageous locations. Miller Brothers Hardware Company sold out and was closed. International Harvester moved out in the late 1950's. The structure was purchased by Mr. Charles Mosey of Mosey Manufacturing Company which was located a block away in the also declining factory district. He leased sections of the building and used one part as a warehouse for his company's products. Richmond Industrial Supply Company took over the southernmost section of the building in the early 1960's and have remained ever since. The Mosey Company stopped their warehousing activity there in the 1970's. D & M. Corporation now leases all of the building not occupied by Richmond Industrial Supply except the original four bays of the hardware store. They use only the first floor to warehouse various products. The original section has been donated, for a limited time, to the local civic theater for storage of sets and props.

CURRENT BUILDING USE

![Building Floor Plan]

RICHMOND INDUSTRIAL SUPPLY (3 FLOORS)
D & M MFG.
WAREHOUSE (1ST FLOOR ONLY)
CIVIC THEATER STORAGE (1ST FLOOR ONLY)
PRESSED TIN CEILING 2ND FLOOR
The Study

In the spring of 1983 a group of architecture students from Ball State University studied this railroad retail district under the guidance of Mr. James Massey, former director of the Historic American Buildings Survey. I was one of those students. Our purpose was to inventory the architectural richness of the neighborhood and select boundaries for a proposed historic district. In addition, an urban design study was undertaken to determine what would save the area from future decline.

One proposal of the urban design report suggested retrofitting the railroad station and Miller Brothers buildings, located at opposite ends of the retail district, with new uses that would attract people to the neighborhood. I was intrigued by the architectural character of Miller Brothers Block and began studies to find a reuse.

I soon discovered that most rehabilitations of large industrial buildings were accomplished in much larger cities than Richmond and involved uses that a smaller community could not support. I was forced to seek a more novel approach which is outlined in the thesis statement.
THE PROBLEM

Ivy Tech

Indiana Vocational Technical College has established a system of thirteen "satellite campuses" across Indiana. Programs range in length from one to three years, and include virtually all the skills previously mentioned. The Richmond branch began with machine tool and auto diesel mechanics programs in separate reused structures. The machine tool program was in a small factory building on West 5th Street and auto mechanics was in an unused auto dealership on Highway 40.

An expanded course offering was made possible by the opening of a new building on U.S. 27 near the Indiana University East Extension campus. The new structure has two wings which house different types of activities. One wing contains classrooms for academic subjects such as secretarial training, computer programming, and medical technology. The other wing has large labs for "hands on" training such as fluid power, electronics, and heating/refrigeration/air conditioning.

The enrollment in all programs has been steadily rising. Students are drawn from many nearby communities as well as from western Ohio. Administrators at Ivy Tech are already considering the possibility of further expansion to offer new programs and consolidate the old under one roof. My proposal is to move the "hands on" subjects to the converted Miller Brothers Block along with starting new programs in robotics and computer aided drafting there. Auto mechanics and construction technology would occupy two of the vacated labs at the U.S. 27 facility and the other buildings would be closed, thus consolidating all programs in two buildings.

The Site

The Miller Brothers Building occupies a highly irregular site. The odd angle of Fort Wayne Avenue along with the railroad right-of-way form the northwestern and southeastern boundaries. Neff Street and 6th Street complete the shape. A wide 10 foot sidewalk runs along the front of the building on Fort Wayne Avenue. On the north side, corresponding to the original 4 bays of the hardware store, is a gravel parking/truck maneuvering area. Two loading docks provide service through large doors. Attached to the back of the building is a storage shed.

The northwest side, or back, of the building is the main service zone. A wide covered concrete platform spans the entire length of the new additions. Service doors open onto the platform. The original sections of the building were serviced through three more doors that open to a railroad spur. The curve of this track as it splits from the right-of-way accounts for the angle cut off the northern corner of the building.

On the southwest side, along Neff Street, are three more loading doors serving an interior dock. Wagons and later trucks could back through these doors and be loaded within the building.
Building occupancy. The odd angle aling with the southwestern corner. Neff Street forms the shape. A wide alley along the front of the Avenue. On the side to the original office, is a gravel area. Two loading through large doors of the build-

The office, along Neff side, has freight doors serving and later. These doors and loading.
The balance of the site on the northwest is a gravel lot. On the extreme northwest corner where 6th Street crosses the rail tracks is a 2-story switching tower owned by the railroad. It is no longer in use and has been boarded up.

The Building Fabric

The materials and construction techniques used are consistent throughout the structure. Such things as bay and window size, wall thickness, and slight variations in floor height are the only differences. The building walls rest on stone foundations; the columns on concrete footers. The brick walls are all load-bearing masonry. Beams and columns are wood with steel gussets bolting them together. Column sizes vary from section to section and floor to floor, the smallest being 4" square and the largest 10". The floors and roof are wood planking. The roof decks are gently pitched and drain to gutters along the parapet. The roof membrane is built-up asphalt. Wooden elevator equipment housings and wood or metal skylights protrude from the roof at many locations.

The vast majority of the interior spaces are unfinished. The rustic character of the brick and wood structure shows through. This is not true of the 1st floor of the original hardware store or the offices of International Harvester on the second floor of the south addition. In these areas, pressed tin ceilings hide the structure. The hardware store sports a fine wooden staircase. The Harvester offices have naturally finished hardwood panel partitions and a massive steel and masonry vault for security. Other areas of the building have less decorative stairways, doors, and partitions.

The heating system is steam from three boilers in the basement areas. Radiators line the walls. Cooling is provided by operable windows. Window air conditioners protrude from the office areas. As a rule, the building is hot in summer and cold in winter. Five electric freight elevators dispense throughout the building. The biggest ones are still in use in the newer sections, although limited to 2000 pounds load.

Tight Site

The program of the building suggests a need for three kinds of outdoor space. Room is needed for maneuvering large trucks to dock at Richmond Industrial Supply and the D. & M. Warehouse sections. Parking for about 40 cars either on or off site is a necessity. Finally, some kind of outdoor space is desirable for lounging or eating in good weather. The shape and size of the site makes these three functions difficult to reconcile. They are in direct conflict for space.

Exterior Alterations

Misguided attempts to retard heat loss from the building have led to several alterations of the exterior windows. Some have been covered with corrugated fiberglass sheets. In other locations the windows have been removed completely and bricked up. A solution needs to be found for restoring the building to a semblance of original appearance.
Other areas of decoractive stairways, is steam from basement areas. Cooling is provided by (window air in the office areas) and is not in summer. Electric Freight throughout the building suggests outdoor space. Large trucks and Supply and deliveries. Parking in on or off site is some kind of outdoor lounging or the shape and size provide for some kind of outdoor space. Fortunately, the exterior walls of Miller Brothers Block are penetrated. Unfortunately, the sheer size of the building leaves large areas of darkness in the center.

Lack of Natural Light

Natural light is a magnificent tool for relieving the drabness and claustrophobia typical of industrial buildings. Fortunately, the exterior walls of Miller Brothers Block are amply penetrated. Unfortunately, the sheer size of the building leaves large areas of darkness in the center.

Points to Ponder

In researching precedents for technical school designs I came across a common point that administrators and designers seemed to stress: the need to upgrade the image of vocational education. In the past "trade school" was the unwelcome alternative for those students who could not afford a four-year college or who were academically unskilled. As I have put forth in my thesis statement, today's demands on the labor force have changed that. Vocational students are now entering challenging fields of a highly technical nature and their schools should reflect that change.

Another interesting point involves the characteristics of vocational students. It was found that the typical tech school tended to cluster its labs and classrooms in such a manner that students in different programs had little opportunity to interact with each other. Couple this trend with the fact that about 1/3 of the students attend school less than full time and the situation is created which isolates students from one another. This isolation extends to the faculty also. Vocational students tend to be less academically oriented and therefore are more shy about interaction with faculty members outside the classroom. Accessibility of faculty, mixing of various program spaces, and thoughtful inclusion of gathering places for students all would seem to be worthy counter measures.

Need for Clear Span Areas

Some elements of the program call for spaces that are column free such as lecture halls. This presents a problem since the longest clear span in the building is 15'-6".

Railroad Noise

Both noise and vibration from the still active Conrail tracks presents a problem with regard to the "quiet spaces" of the program. Classrooms and offices will need to be insulated from that noise. Lab spaces, however, present little problem.
A couple of final points that came from research involve the nature of instructional spaces within the building. Psychologists and architects have gotten together on occasion and have discovered that traditional rectangular classrooms are not the ideal shape for a teaching space. Rather, a focused space with the instructor at the focus and students oriented directly toward him or her was found to be most desirable. A wedge-shaped classroom proves to be the best scheme for holding students' attention.

Along the same lines, from studies of laboratory spaces in vocational schools evolved some interesting time-sharing concepts. Lab spaces have always been clustered to take advantage of common service cores. Studies have revealed that further efficiency can be achieved by grouping labs with similar bench, tool, and fabrication space needs. While the students from one lab are receiving the day's instruction, students from another lab can be using workbenches and tools and vice versa.

The last major consideration of my problem involves the historic nature of the building. Miller Brothers Block is part of a nominated historic district. Although the Secretary of the Interior's standards for restoration are not in force at this time, it would be wise to take them into consideration for they may soon be. My philosophy for treatment consists of three points: restore the exterior as much as possible with few alterations, preserve examples of the interior fabric where appropriate, and make any additions harmonious and non-competitive with the original.
THE SOLUTION

The Reuse Strategy

The initial problem, how to re-use the building, has been partially explained in the thesis statement. The problem, however, is not fully solved. The extensive space needs of a new Ivy Tech facility still only require about half the available floor area of the structure. Since the building already houses two viable tenants, the decision was made to consolidate their activities and allow them to remain.

Richmond Industrial Supply has a satisfactory interior arrangement occupying all three floors of the southernmost section of the building. D. & M. currently uses only the first floor of the remainder of the building for storage because of the inadequate elevators in their sections. By replacing the antiquated elevators with new freight elevators they can occupy nearly the same area by using all three floors of the next section north from Richmond Industrial Supply. The remaining sections of the building will house the Ivy Tech spaces.

Each of the two tenants require one loading dock on the west side of the building. This is easily accomplished using existing loading doors. The crumbling concrete dock is unnecessary and will be removed.

General Fix-Up

A far larger problem will be restoring the exterior fabric of the entire building. In the Richmond Industrial Supply section all the original windows have been removed and bricked in to reduce heat loss. This has had a devastating effect on the noble appearance of the facade. Fortunately, the window frames were saved and stored in the basement. I propose reversing the entire process and using insulating glass or interior storm windows to save energy. Also
the solid double doors (necessary for security reasons) that comprise the street entry to Richmond Industrial Supply should be replaced with others of an appropriate historic nature. The additional costs involved in adding security alarms and upgrading heating/air conditioning systems can be offset by federal tax credits offered to owners of restored buildings.

In the D. & M. section of the block, fiberglass panels cover the windows for the same reasons. The Richmond Industrial Supply windows were removed. Similar remedies also apply. There is no need for a street entry to this section but a door should be provided anyway for fire egress. Again, an appropriate historical model would greatly improve the appearance.

The remainder of the exterior windows and doors are virtually intact although some are in disrepair. Replacement of rotting wood sections and installation of insulating glass along with general repair and maintenance should suffice to restore them to their original beauty. Changes in entry and service doors in the Ivy Tech sections will be addressed later.

The masonry portions of the exterior are in excellent condition although in need of a good scrubbing. The roof is another matter. Some existing skylights and elevator housings leak. Even the built-up surface membrane leaks in places. Miraculously, structural damage is minimal. The entire block should be re-roofed which is long overdue. Stripping off the old multiply membrane, replacement of rotting decking, and repair or replacement of skylights and coping tiles will seal the roof with little compromise of historic flavor. Once again, structural changes to the roof will be outlined later.

Site Solution

The complexities of three functions compound the problems of a tight site. Richmond Industrial Supply and D. & M. require space to jockey trucks up to doors along the back. Ivy Tech also needs a loading dock as well as parking for 125 to 140 cars. It is apparent that some compromise is necessary to reconcile these conflicts. The solution is found in a vacant lot on D Street across the intersection from the building. Richmond Industrial Supply already uses the lot for parking because it belongs to Miller Brothers, owners. Charles Mosley. Demolition of a small frame building doubles the size of the lot which can be paved and upgraded to park 80 cars. A landscaped connection across the corner of D Street and Fort Wayne Avenue completes the conversion and provides a directed flow of pedestrians from the off-site parking lot to the northwest side of Fort Wayne Avenue and Miller Brothers block. Parallel parking along Neff Street and Fort Wayne Avenue prove adequate for Richmond Industrial Supply's minor need; D. & M. Warehouse needs no parking.

This solution limits the demand for on-site parking to 45-60 cars, a number that can be easily accommodated. In addition, the old railroad switching tower on the corner of the site can be preserved and re-used to house landscape and maintenance equipment.

This scheme creates two separate parking lots along a drive and truck maneuvering space for all functions. It also sets up the circulation scheme based on three entries: back, relating to student, side for faculty and visitors, and front, for entry along Fort Wayne Avenue from the off-site lot.
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Zoning and Circulation

The building zoning scheme and the circulation evolved together so it is impossible to describe them separately. Careful analysis of the potential of each section of the building led to some basic guidelines for zoning. First, the fire walls separating each subsequent addition to the structure are also load bearing. That means there are two reasons for keeping new penetrations to a minimum. Second, respect for the historic fabric requires keeping structural changes to a minimum.

What evolved from these considerations was a "T" shaped circulation plan with central core/light well for vertical circulation. The shop spaces were zoned to the back of the building where they relate to the loading doors and could be acoustically separated by an existing fire wall. Administrative offices, leisure rooms, and "quiet labs" were zoned to the front of the building both to relate to the most public area, the street front, and to create a quiet zone. In between are the circulation and systems cores as well as the student commons and additional labs.

Light Well

The light well in the center of the building serves the dual purposes of providing natural light to the dark interior areas and acts as an organizer of circulation. The bright space draws people from the three entries to a point of easy reference. The elevator, major stairway, restrooms, and the information desk all spin off of this central space.

The Commons

The desirability of providing a gathering place for student interaction has already been discussed. The Commons area provides this space. The area relates to the sun space and steals light through the existing windows. Connection is provided through the arch of an existing loading door. This area of the building also has the nice pressed tin ceilings of the old hardware store. Tables, a vending area, the student bookstore, video games and other amenities complete the space.
Administrative Area

The offices of the director and his assistants are on the 1st floor, clustered along the front wall of the original hardware store. Secretaries' desks, conference rooms, a reception desk, waiting area, a restroom, and a kitchenette comprise the balance of this zone. The office spaces relate to the visitor parking and reception desk to facilitate easy location. Again, the atmosphere is improved by the existing pressed tin ceiling and more opulent finishes.

Registration and Records

These functions occupy the street front spaces of the 1st historic addition. Offices are provided for advisors and administrative personnel. Secretaries' desks, a waiting area, computer terminals and files complete the needed spaces. This area is zoned in the quiet, street front area and related to the main circulation axis.

The Labs

All "noisy labs" are zoned to the back third of the structure and are separated from the balance of the building by a fire wall and acoustic doors. The labs are paired in similar or related groups to facilitate both space sharing and borrowing of equipment between them. The first floor labs, machine tool and welding, are separated by the main circulation path and have windows into the corridor for observation by passers by. The primary service door is located in the machine tool lab. A freight elevator, storage rooms, and trash room relate to the door and service all six lab spaces.

A mechanical chase and fire stair separate the upper story labs. High voltage electric lines, natural gas, oxygen, and unique systems requirements reach the labs through this core. Special ventilation equipment runs exposed along the ceilings of the labs and connects to filtration equipment outside along the back of the building. No-slip floors, drains, fire equipment, emergency showers, power cut-offs, etc. are dispersed as needed. A clean-up zone is located near the doors in each lab.

Two wedge shaped lecture rooms relate to each pair of labs. These rooms are acoustically separated and contain the usual blackboards, movie screens, desks and other amenities of typical classrooms. "Demonstration modules", portable, self-contained experiments in basic principles, are used extensively by Ivy Tech. Each is about 10 feet long, 3 feet high, and 1 foot deep. These will be used and stored in a special area of each classroom.

Other Labs

Electronics and physics labs are located in the same area of the second and third floors. These "quiet labs" require less specialized ventilation and systems. As a result they are zoned adjacent to but separate from the noisy labs. The drafting and computer aided drafting areas require only electricity and water systems and no special ventilation. Their main requirement is light. These labs are located to take advantage of the large, southwest facing windows of the facade. To aid in promoting interaction between various programs, no doors or walls separate these areas from the circulation paths. Security is provided by locked equipment storage rooms.
and fire stairs.

Labs. High vol-

tal gas, oxygen, and
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Partial ventilation
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A clean-up zone
in each lab.

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General Classrooms

Again, to promote interaction between programs, the lecture spaces for all subjects are clustered on the 3rd floor near the front of the building. These rooms are also of the focused type with two smaller rooms flanking a larger one. The big lecture hall has blackboards along the three walls away from the windows and a movable partition allowing one room to become two. All three schemes allow focused seating.

Faculty Offices

The individual faculty offices are dispersed throughout the building and are open in concept to promote student-faculty interaction. The partitions are only 5 feet high and there are no doors. Office floors are raised 6" from the corridor to define them as personal space. Security is provided by locking drawers and cabinets.

The Addition

The decision to make an addition to the structure evolved from two program requirements. First, the need for a tiered seating demonstration theater. Second, the desire for an outdoor gathering place for students that related to the commons area.

The theater is an essential teaching tool for basic physics, chemistry, and electronics courses. The tiered seating allows students an intimate view of demonstrations taking place, either first hand, or on television monitors. The sloped floor and large clear span required in this space made addition of the existing structure difficult if not impossible.

The programmed outdoor space suffered several discouraging setbacks. The only logical, available space was on the north side of the building. This area is both adjacent to the railroad tracks and in the building’s shadow. The views to the north, while interesting, could hardly be called attractive. Therefore, it was decided to create an interior "sun space" with plants, trees and light scoops to divert sunlight into the space through the roof. This solution provides acoustic and visual screens from the neighboring factories while providing an outdoor-like setting.

The final factor in the decision to add on was the need to insulate the quiet zones from the railroad tracks. The addition provides a buffer.

Additional Character

The decision to add on brought up more issues. They are the typical preservationist’s headaches; how to make the new blend harmoniously with the old, and how to link the old building with the new. I chose to achieve harmony by imitating the rhythm of the old structural bays. The link is reduced to three spandrel panels with recessed connecting fire stair. The existing north wall is left virtually intact, windows and all, on the interior of the addition thus enhancing the outdoor quality of the sun space.

The final function of the addition is a first floor library/media center. This space is one of the primary philosophical gestures of the design. Pedestrians and motorists passing by on Fort Wayne Avenue are treated to a view, through large windows, of students studying in a library, an unexpected sight for a vocational school.
Entries

The three entries to the building are treated in three separate manners. The "main" entry off Fort Wayne Avenue is a pair of doors flush with the facade, mimicking the traditional style. An air-lock within does not violate the appearance. The "back" entry on the west side is recessed inside the existing arch of a loading door. Landscaping and stairs define it as an entry. The "side" entry is an air lock waiting space relating to a drop zone. The air lock spills into the sun space and display area giving a modern appeal to the visitor's entry.
Structural Alterations

Changes in the existing building fabric were intentionally minimized. However, some changes were essential. In order to provide clear sight lines in classroom spaces, the wood columns have to be removed.

The essence of these changes is converting short spans into long ones. Two alternatives are possible: superimposing a new structural system within the old, or reinforcing the existing system to span the longer distance. The latter of the two is preferable because it inherently involves less difficulty supporting the building while changes are taking place.

My solution for creating clear spans involves encasing the existing wood structure with steel members. The wood beams and columns remain in place and continue to bear their loads throughout the conversion. First, steel channels of a length corresponding to the desired clear span are bolted to the sides of the short wood beams to create a single, composite steel and wood beam. Next, the columns at the ends of this new beam are surrounded by more steel channels to carry the increased load to the ground. Footings are reinforced by pouring two new footings adjacent to the old and transferring the load to them by another beam at grade level. When this assembly is complete, the intermediate columns can be removed to create the clear span.

Of course, a much more detailed study would have to be done to determine if this scheme can succeed. In theory, it solves the problem of clear spans but only minimally disturbs the existing structure.

The new light well also requires some changes in the intermediate floors. Simply removing the floor deck and providing handrails opens the well up. The beams and columns can remain and even provide interest. On the roof, three old skylights must be removed and replaced with a single larger one.
Some of the special systems requirements of the lab spaces have already been outlined. The general ventilation, heating, water, and electricity requirements of the building are organized around the corridor of the major axis. Two mechanical rooms on the north side of the corridor house the chases and equipment of the various systems. Hot water from the boilers and electrical and water lines come up from the basement. Cool water from air conditioners and ventilation air come down from the roof in these chases. The overhead area of the main corridor becomes the spine of these systems. Branch lines break off of this spine to disperse air, water, etc., to each space. In the new addition, rooftop units provide both heating and cooling. No attempt is made to disguise the ducts and pipes of the systems. I feel that the visual quality of these elements will actually enhance the industrial atmosphere of the school.
MACHINE LAB PERSPECTIVE

CONCEPT

Introduction

Just like the thesis of many issues, the problem of identification is diverse and extends from methodologies that work for the most part to the ones encountered in similar problems in analysis and design.

Site analysis

The site is very productive. A comprehensive study of the existing conditions and the points of attack and bringing the organization into the area could make a big difference without any significant cost and a commitment of half.

With the solution, the entry is a major feature. Outdoor workability is key. The entry should be ..
CONCLUSIONS

Introduction

Judging the success or failure of this thesis is a very complicated process. So many issues are involved that compromises of ideal solutions were inevitable. Such diverse considerations as historic fabric and exotic systems requirements had to be reconciled. Once again it should be noted that while my solution is somewhat unique, most problems are typical of what would be encountered in similar buildings with similar programs. The following is a brief analysis of some of the major points of the design.

Site and Circulation

The site surrounding Miller Brothers is very small for a building of such size. A compromise was necessary because it was impossible to create a single, main entry to the building. The necessary three entry points caused several problems both in planning the parking scheme and the interior organization. For example, the service zones could have been simpler and more efficient without the intrusion of parking, an entry and a corridor dividing the building in half.

With these considerations in mind, my solution is more than acceptable. The main entry ideal and also the schemes for an outdoor space were compromised to create a workable circulation plan both inside and out. The "T" shaped circulation with an entry at each terminus and vertical access at the intersection is both readable and efficient. It provides flow to all areas of the building within the framework of existing penetrations and provides optimum use of the site.

Zoning

The interior zoning is one of the most successful points of the building. The massive firewalls that divided the space at first seemed to be a problem. They proved to be an asset. Acoustic zoning is a major consideration when dealing with both shops and lecture spaces. The strong dividing walls solved the problem and introduced the quiet to the front, noisy to the back, scheme. In addition, the pressed tin ceilings of the first floor hardware store provide a different atmosphere for the office and Commons spaces.

The contemporary addition reflects contemporary attitudes toward architecture and vocational schools. The new spaces house an interior garden splashed with natural light, a state-of-the-art demonstration space, and a library that illustrates the changes in vocational education. Overall the zoning of the building is workable and demonstrates an alternative to the common "separate wings" planning that is typical of this building type.

Short Span Structure

The relatively short distances between columns was not a major problem in most of the building. The lab areas, offices, and Commons all adapt nicely to column filled spaces. The problems were created by lecture halls and the demonstration theater. These rooms demand clear sight lines. The problem can be solved only by major structural changes or an addition.
SUN SPACE PERSPECTIVE

This made me think of my experiences with certain buildings. Some are too grand and imposing, while others are too small and seem to lack character. I feel the same way about the floors in the building. The height seems to have a...
This necessity could be the fatal drawback to my proposal. In some cases where alterations prove too difficult or additions too costly, the idea is a flop. In my particular example I feel the minor alterations and the addition satisfactorily solve the problem.

**Original Character**

The problem of how to preserve the character of the historic building while imposing a new function proved to be one of the easiest to solve. On the exterior, the fabric remains virtually intact. The walls and windows are restored. New entries are placed within old loading doors. The addition is a subtle recreation of the rhythm of the old building. Even the roof has a minimum of alterations.

On the interior the most worthwhile elements are preserved. The pressed tin ceilings give pleasant detail to the office and Commons areas. The open planning schemes leave wide expanses of rustic beams and columns open to view. Even the elevator cores are reused.

Careful attention to planning of zoning and circulation have allowed the building to adapt to a new function without being gutted or drastically altered. If any complaints can be raised, it is that the building is too much the same. Perhaps the building image does not readily indicate its new function? To this I plead guilty. I feel that this building type can survive without screaming its function at the public. Many new vocational schools more closely resemble factories than schools. Why shouldn't a school in a restored industrial building resemble an old industrial building?

**Trade School Image**

The desire to improve the image of vocational education is a strong argument in favor of my thesis. Rehabilitations of attractive older buildings are very popular with the public. The elaborate decoration of historic facades is a desirable contrast to the slick appearance of modern architecture. It is becoming something of a status symbol to occupy a rehabilitated building. This status image can be used to the advantage of vocational schools. Instead of the sterile, institutional look of most vocational schools, they can display the rich interesting appeal of an historic structure. Instead of concrete block and steel joists, wood timbers and pressed metal ceilings can enhance the school's atmosphere.

**Student Interaction And Open Planning**

Two initial goals of this design were to promote mingling of students and faculty from diverse programs, and to develop a design which provides acoustic separation of noisy and quiet spaces. Open planning schemes would be the easiest solution to the interaction problem but a disaster with regard to acoustics. My solution attempts to compromise the two. Interaction is promoted by including a gathering place for students and applying open planning concepts whenever possible. The acoustic problems are solved through zoning. I feel the design is a success in both respects. There is enough openness and overlapping of spaces to prevent segregation by program.
Final Analysis

Overall, I think the project is quite successful. The resesign handily accommodates all of the program requirements and my own philosophical goals. The issue that I did not deal with is what will finally determine if my thesis can be a total success, economics. Can the cost savings of purchasing an under-utilized building in a declining neighborhood make up for the cost of an addition, structural alterations, extensive systems improvements, and fix-up costs? I haven't the means to determine the answer. Perhaps this thesis will inspire someone to explore its feasibility. If it does, then it will have served its purpose.

This project has been a fine learning experience. The challenging site and even more challenging building shell have taxed the limits of my problem solving ability as well as my imagination.

To all who assisted me in this endeavor, I say thank you. To all who follow me out of these doors, I say Good Luck!
BIBLIOGRAPHY


