

Teaching Architecture Students to Work with Distributed Design

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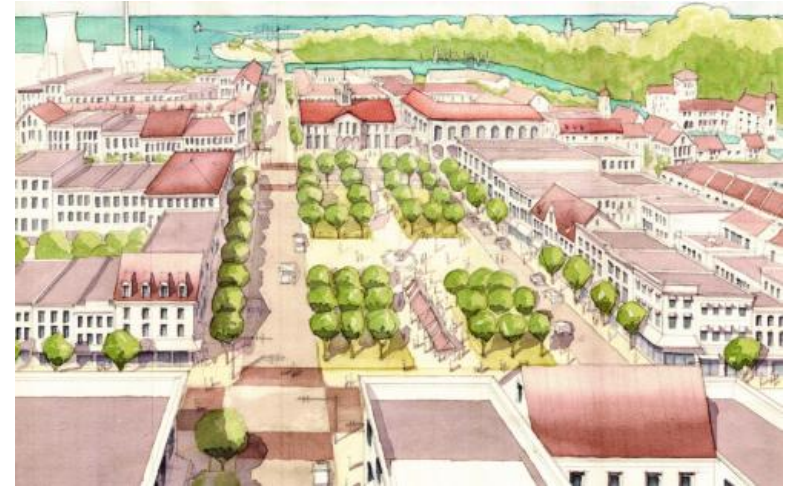


Key points in the paper:

No one designs everything
(All designing is partial)

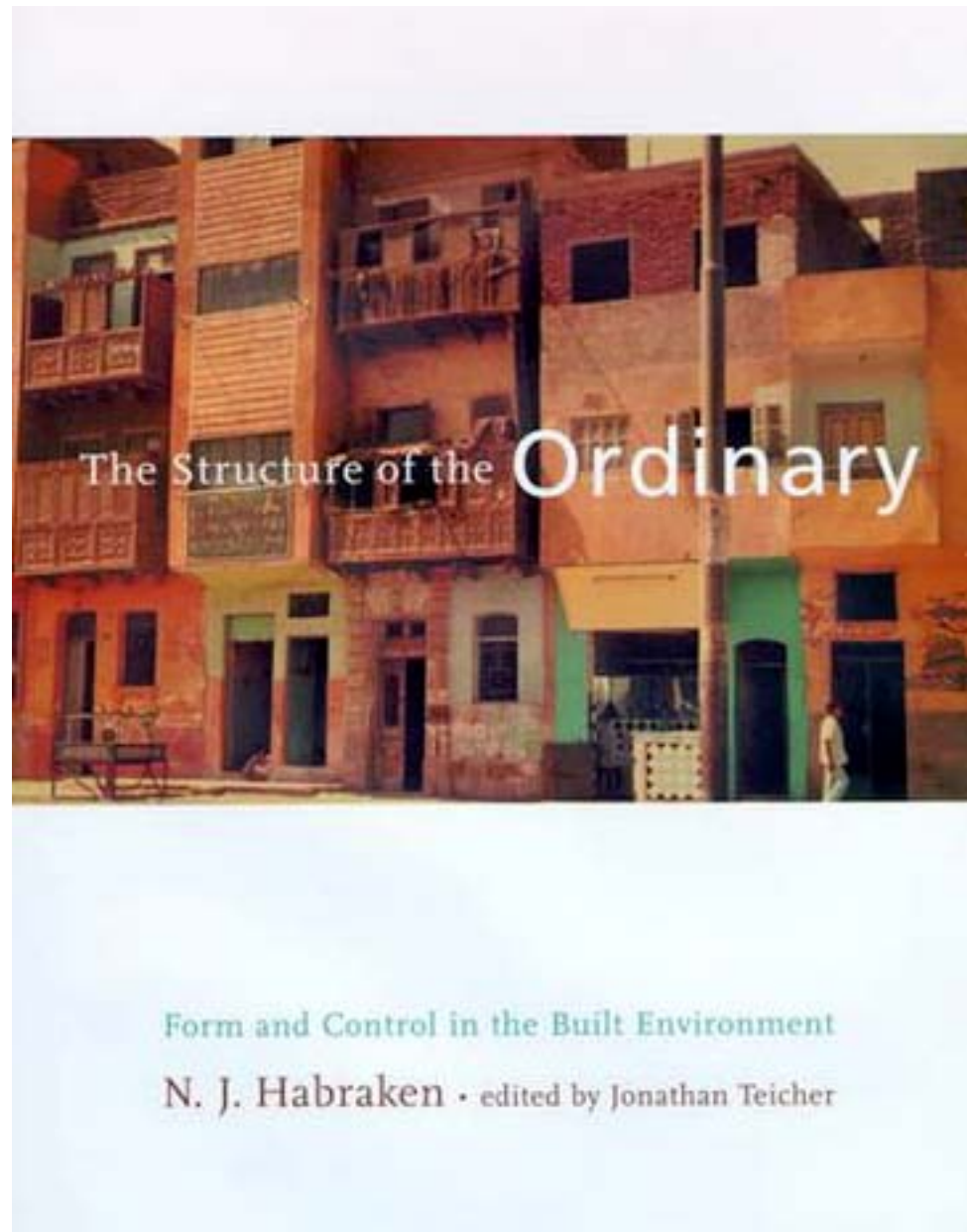
The built environment is never finished
(We always add to what is there, and set the stage for others who follow)

**Why try to bring these ideas
into studio education?**



The reason to do this is because of my view that the quality of the commons - the ordinary, everyday built environment - is the wellspring of architecture. The truly special grows from what is shared and goes beyond it.

That means that we need to know how to see and understand what is shared, in order to be able to handle it and make it better.



The Idea of Exercises



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Kinds of Exercises

based on a concept of levels, as for example:

Urban Structure	Urban Planning
Urban Design	Urban Designer
Base Building	Architect
Infill	Interior Architect
Furnishings	Product Designer

Kinds of Exercises

All of the exercises I have used have at least these common ideas:

Documenting environmental themes, patterns and systems;

The man-made environment is never finished;

Design is distributed;

Designers need to learn to both lead and follow - to set constraints for others to follow, and to follow constraints set by others;

The Street Space Exercises

Bern, Switzerland

- Studying precedents as one basis for designing;
- Documenting themes
- Selecting constraints we want to emulate.



The Street Space Exercises

Bern, Switzerland

Kinds of Constraints

1. Ways of building
3. Defining Territories
5. Sharing territory
7. The street façade as part of the urban tissue
9. Thinking in section
6. Entries



The Street Space Exercises

Bern, Switzerland

Values

I did not make a case that the Bern “theme” was correct in some objective way.



The Street Space Exercises

Bern, Switzerland



Students were given adjacent sites in a city where we would explore variations on the Bernese theme.

The Street Space Exercises

Bern, Switzerland

Explorations



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The Academic Village

Studies of Form Based Codes and architecture in the University context

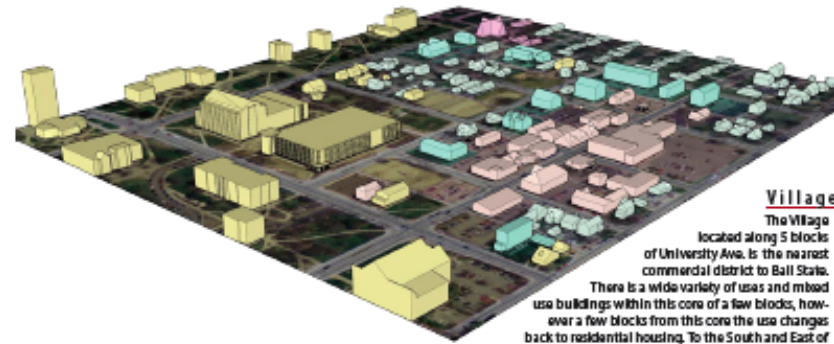
Goals of the Study

First, we studied the Ball State Campus for its history, context, patterns and themes - open space, building types, functions and so on.



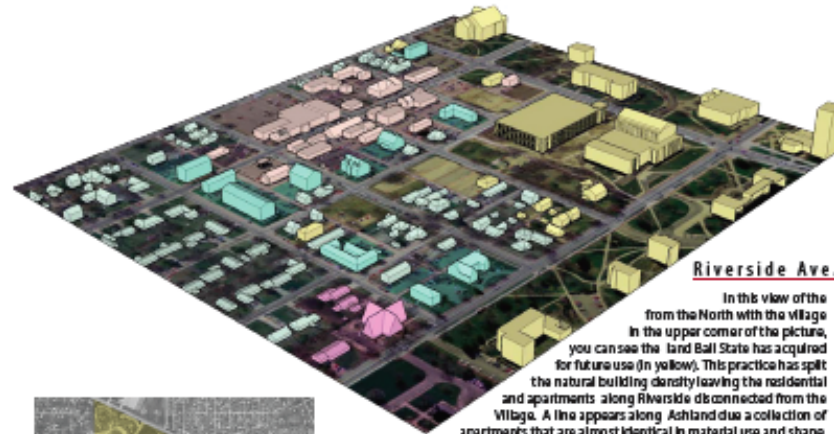
The Academic Village

Studies of Form Based Codes and architecture in the University context



Village

The Village located along 5 blocks of University Ave. is the nearest commercial district to Ball State. There is a wide variety of uses and mixed use buildings within this core of a few blocks, however a few blocks from this core the use changes back to residential housing. To the South and East of the Village, these residential houses are a mix of one to three stories with a variety of roof patterns, materials, and shapes. Parking lots fill the voids left by the buildings. A large parking garage owned by Ball State could help create more open spaces, but few people utilized this service because a fee is collected.



Riverside Ave.

In this view of the from the North with the Village in the upper corner of the picture, you can see the land Ball State has acquired for future use (in yellow). This practice has split the natural building density leaving the residential and apartments along Riverside disconnected from the Village. A line appears along Ashland due a collection of apartments that are almost identical in material use and shape. The east of Dicks St. the density changes again to a collection of slab houses with very slender roofs. At the corner of Dicks and Riverside, a large 3 story A-frame church building drastically contrast this short residential neighborhood, however helps transition the connection along Riverside from one story residential housing to the 2 and 3 story houses and eventually Ball State buildings.

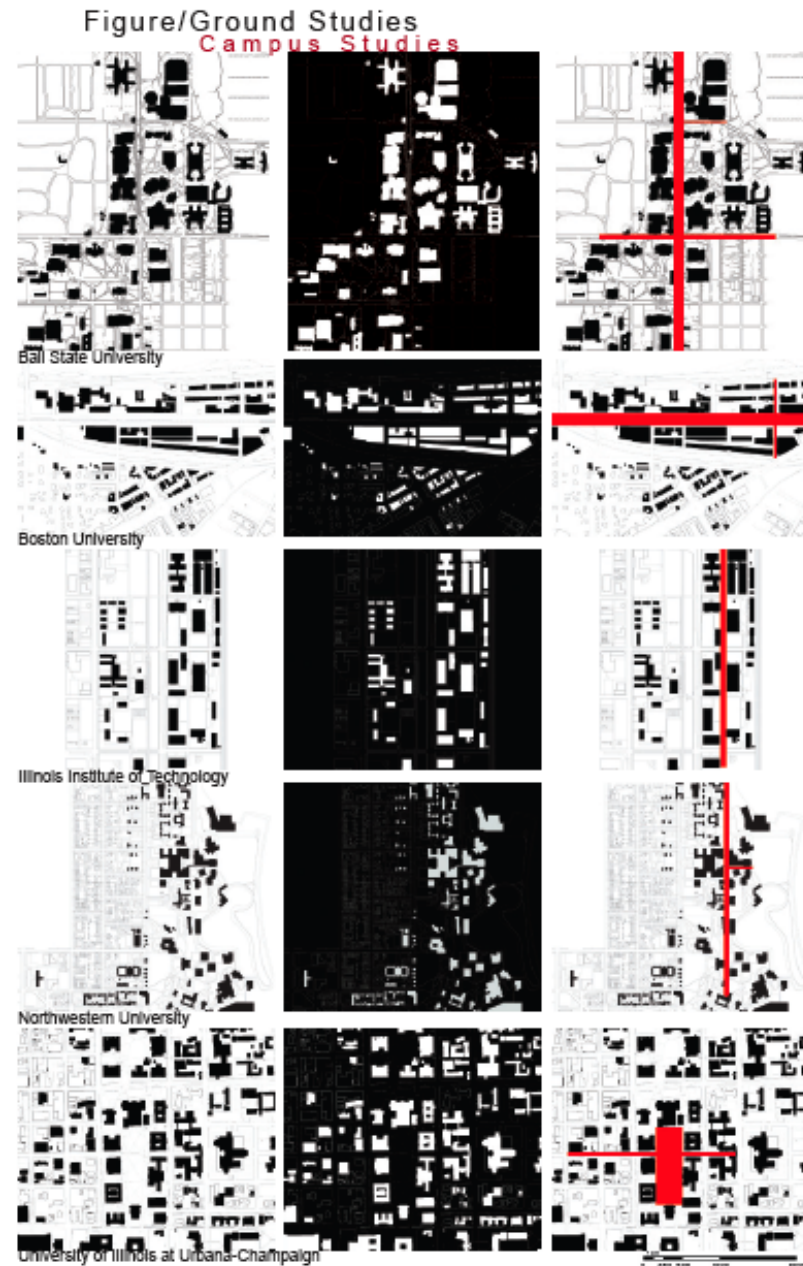


All data was extracted from the Delaware County GIS Map found at <http://www.sfwelmaps.com/webot/delaware00/>

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Studies of Form Based Codes and architecture in the University context

We also compared the campus with other university campuses.



The Academic Village

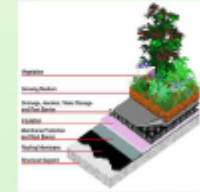
Studies of Form Based Codes and architecture in the University context

We also studied issues of sustainable and “green” architecture and technology.

sustainability

greenroofs& green roofs

The cost of installing a greenroof ranges from \$15-\$40 per square foot, and maintenance costs are usually included in the original budget. The soil substrate and chosen plant types incur the greatest cost. Though the initial greenroof costs are greater than those of a traditional roof, the ability of a greenroof to extend the life of the roof by at least 20 years and to reduce energy usage cause roof lifespan costs of a greenroof to be comparable to those of a conventional roof. Additionally, greenroofs control/slow water runoff and reduce carbon dioxide impact on the environment.



church street station evanston, illinois



multi-family residential
roof area: 8,500 sq ft

- an "escape" from the bustle of the city
- improved view for neighboring buildings

schwab rehab hospital chicago, illinois



healthcare facility
roof area: 10,000 sq ft

- accessible for patients
- horticulture therapy aids patient recovery

millenium park - soldier field - chicago, illinois



public-accessible park
roof area: 1,067,220 sq ft
230,580 sq ft

- covers unsightly parking garage

green roofs: white roofs

White roofs, by nature of their color, can reflect up to 80% of the sun's energy. Traditional black roofs can reach a temperature of 180 F on a sunny windless day - heat which can then be transferred into the building. White and light colored roofs tend to last longer than conventional black roofs as their high reflectivity properties prevent the continuous expansion and contraction that goes with great temperature shifts.



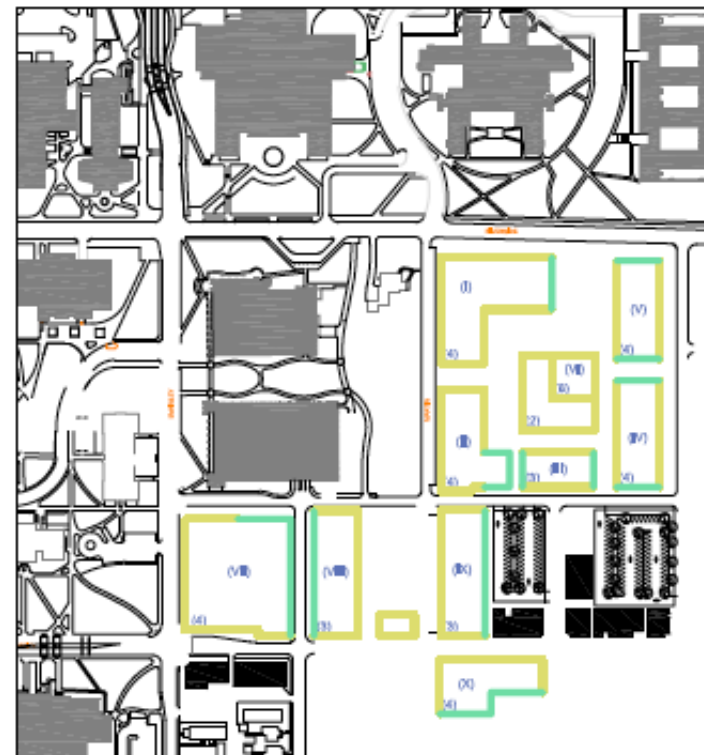
The Academic Village

Studies of Form Based Codes and architecture in the University context

Form Based Codes

Next, we developed FORM BASED CODES. These “CODES” were developed by a consensus process.

Ball State University
Front/Back Diagram
scale: 1"=200'



Building front
Building back

Building front defines the sides of building which must appropriately address the adjacent space as a building front. Building back provides the framework in which one can locate service entries, but is not obligated to.

The Academic Village

Studies of Form Based Codes and architecture in the University context

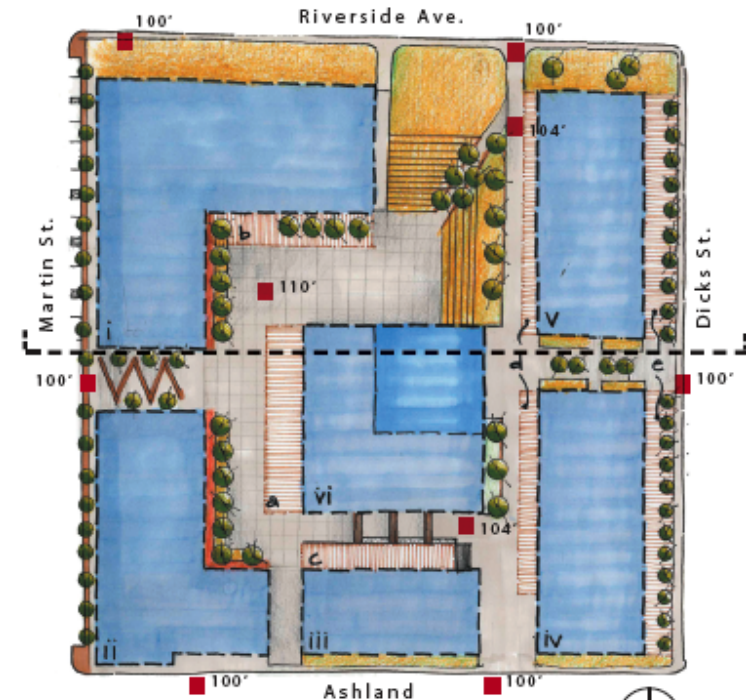
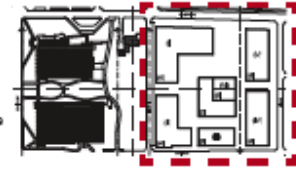
A plan and cross section of part of the new campus development area, showing the massing concept for new buildings and public space.

East Quadrangle Open Space Plan

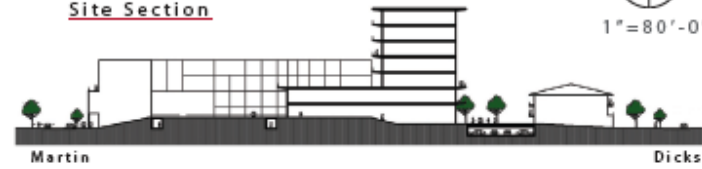
Overall Scheme

The new academic quad will have an identity unique from other areas of the Ball State campus. Due to the integration of classroom, commercial, and research space, it is important for the open space among the proposed structures to facilitate open interaction between different functions within the quad.

The main internal space is raised ten feet above street level, allowing for a sub-terranean tunnel system to connect the four academic buildings while still maintaining street level access. This grade change also provides a visual distinction between the academic center of the quad and commercial and residential spaces.



Site Section



The Academic Village

Studies of Form Based Codes and architecture in the University context

East Quadrangle Open Space Plan



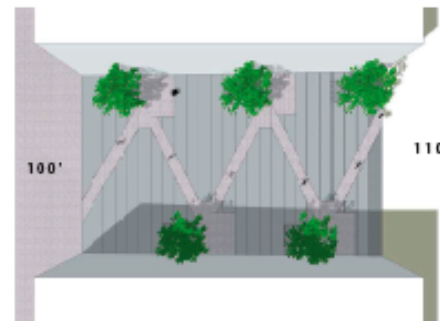
Vertical Transition [1]

The transition space between the business school and the science building is part of a major axis that terminates at the research tower. This space will be a grand entry into the academic plaza at the top of the grade change.

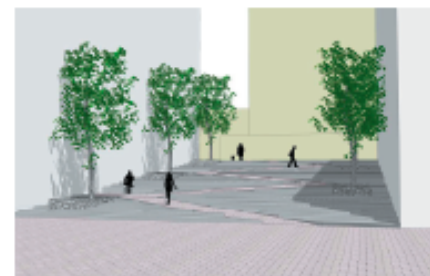
In order to allow all users to equally appreciate this space, a ramp will be incorporated into the steps to create an interesting merging of the two paths of travel. This type of staircase was accomplished by Rem Koolhaas in the Illinois Institute of Technology Student Center, noted in the photos below.

details of some of the public spaces...

Grand Stairway



Aerial view of staircase



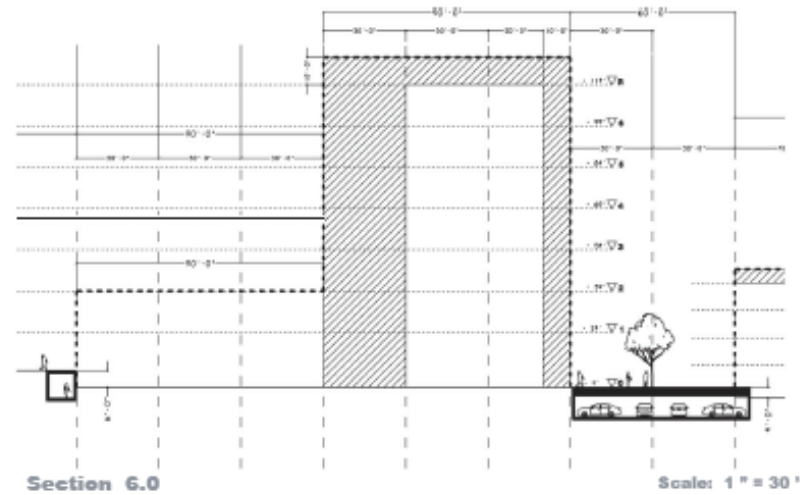
Perspective from Martin St.



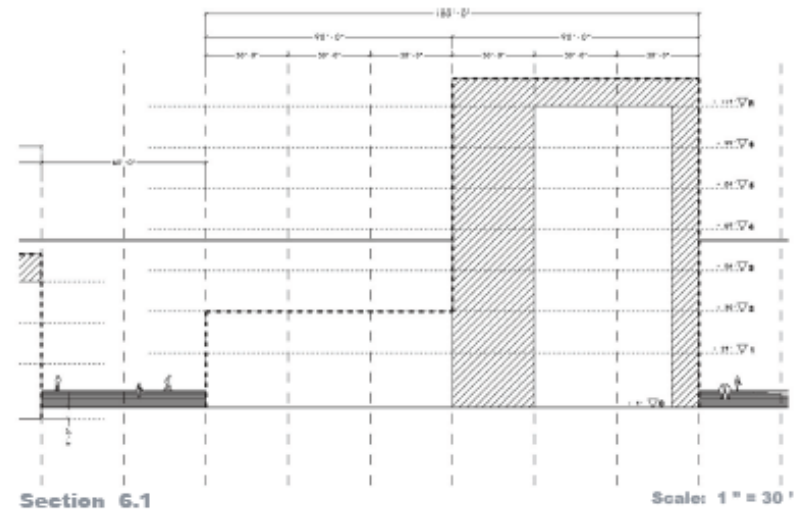
Images of Koolhaas staircase from University of Waterloo

The Academic Village

Studies of Form Based Codes and architecture in the University context



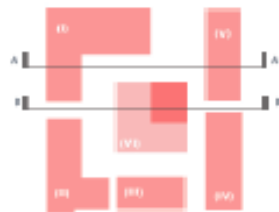
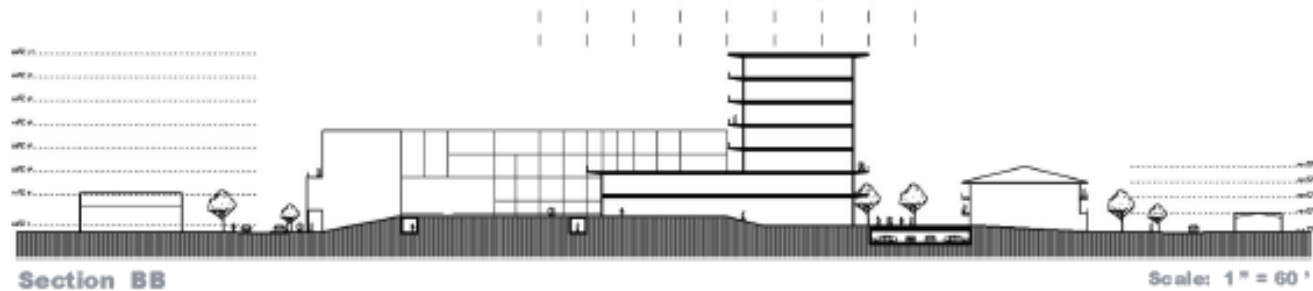
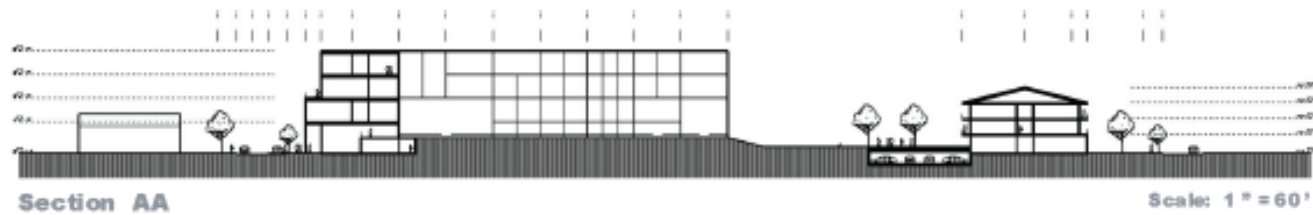
Cross sections showing maximum and minimum building bulk, and showing the required floor-to-floor dimensions that all buildings would use.



The Academic Village

Studies of Form Based Codes and
architecture in the University context

Form Based Codes



The Academic Village

Studies of Form Based Codes and
architecture in the University context

The Site



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"As traditional disciplinary boundaries dissolve and information explodes, Chu and many of his colleagues began to find a whole new way of working was needed. We keep to ourselves, to the groups, the fields, and the students we know," he says, which is fine when the research path is clear. "When you don't know where you are going, in my experience, it's when chance encounters are very important."
- Steven Chu, Stanford University James Russell, AA

"The nucleus of all this is part of how it 'grows' it can be changed... the benches, tables, chairs, and other components are based on standard furniture but have been customized to be easily mixed."
- David Nelson, Foster and Partners James Russell, AA

"...what might as well have been a sign that said 'Interact Here!'"
- David Nelson, Foster and Partners James Russell, AA



Cross-Disciplinary Collaboration in Business Sciences at Ball State University

The Miller College of Business Entrepreneurship Incubator Facility & Student Housing Complex Creating architectural "pockets" of learning, involving innovation and ideas

The proposed extension to the Miller College of Business utilizes learning in a cross-disciplinary collaborative approach. Features in the business college experience learning in multiple levels which include the goal of cross-disciplinary learning business studies are no longer bound to books, accessible to use and they are built but rather integrated in an environment of common "hubs" or "learning" learning to new things. Ideally, the programmatic requirements include a facility to house a growing number of entrepreneurship students looking for space to get their proposed business started. Currently, the space given to these students has been hardly not grown. What is in store for the future is an extension within this proposal that business open to many other non-business college disciplines.

The idea of cross-disciplinary learning has molded this proposal into an open building plan. Floor space is not defined, program within a space are not defined. It is designed to accommodate change and growth. For the entrepreneurship students, the extension allows flexibility from the Clark Center at Stanford University. Students are given an open space, movable desks, tables, chairs, filing cabinets, communication equipment which can be easily moved, adjusted and changed to fit the ever-evolving needs of students and faculty. These program, sharing, meeting, an incubating and create supply shop from the ceiling to create students to essential activities. When change is needed, the utility supply can retract back to the ceiling, the furniture rearranged and process continue.

The proposal seeks to find a social and structural relationship between the three internal programmatic functions. On the first floor an abundance of movable flexible meet space. The second floor house the cross-disciplinary open plan space which the third floor house students. While each floor were completely different functions, the proposal aims to unify students, faculty and staff collaboration into one of collaborative entrepreneurship and "mix and match" students become accustomed to a variety of meeting over different periods of the day.



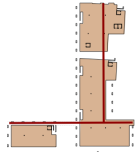
Building Structure

Cast in place concrete structure with prefabricated concrete core elements. Columns @ 30' intervals on two-way grid.



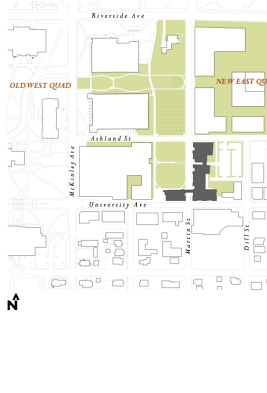
MEP - HVAC

Accessible three floor slabs via elevator core. Heating & cooling supplied by university energy - facility tapped into existing infrastructure.



Primary Circulation

Open building plan - primary circulation provided for single loaded corridor, secondary space to be arranged by tenant.



Proposed East Quad Plan

Scale: 1"=30'-0"



Ground Floor Plan

Scale: 1"=30'-0"

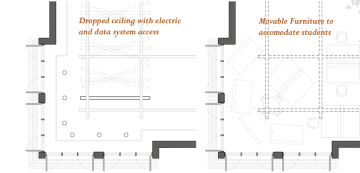
Open building: creating a universal frame to allow maximum flexible space

Creating 'chance encounters' thru dynamics



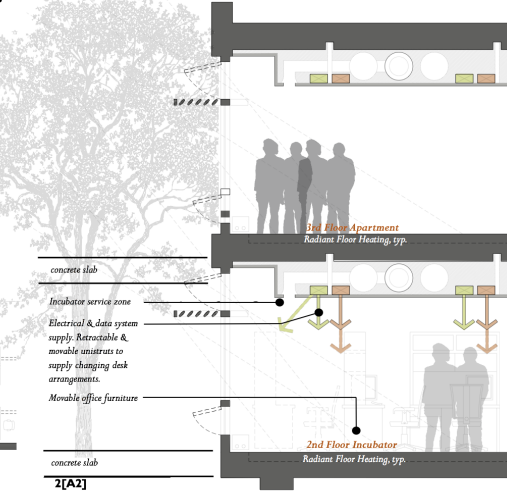
The Clark Center
Stanford University
Foster + Partners MBT Architecture
Riverside 183 Berry Street, Suite 5100
22 Howe Road San Francisco, CA 94107
London SW11 4AN (415) 898-0900

"Facilities intended to foster cross-disciplinary collaboration in the life sciences are in construction or on the boards at universities across the country. Stanford, however, may be unique in the degree to which architecture is used to make the chance encounters Chu and his colleagues envisaged actually happen. For the scientists involved, the green ideas hatched in a cafeteria at Ball Laboratories or at a famous dining hall atop a lab building at Oxford University had already taken a mythic quality."
- James S. Russell, AA, Architectural Record

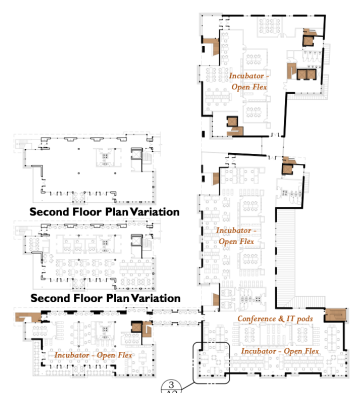


Reflected Ceiling Plan, typ. Scale: NTS

Incubator Utility Dynamics Scale: NTS



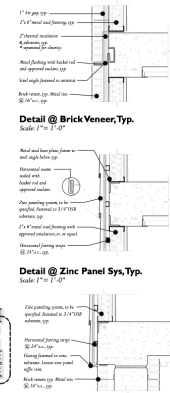
2[A2] Section at Incubator, typ. Scale: 1/2"=1'-0"



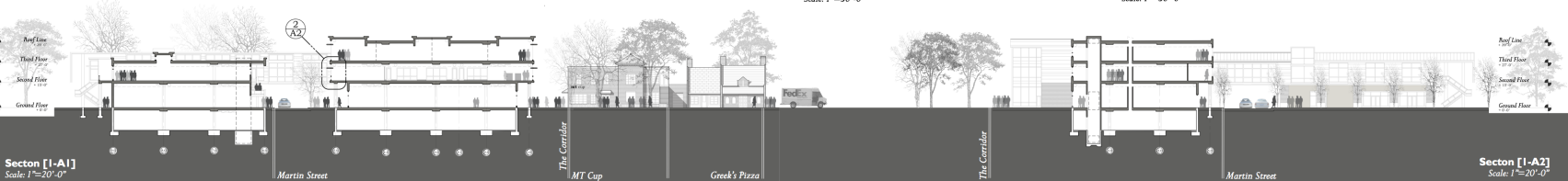
Second Floor Plan Scale: 1"=30'-0"



Third Floor Plan Scale: 1"=30'-0"



Detail @ BrickZinc Trans, Typ. Scale: 1/4"=1'-0"



Section [1-A] Scale: 1"=20'-0"

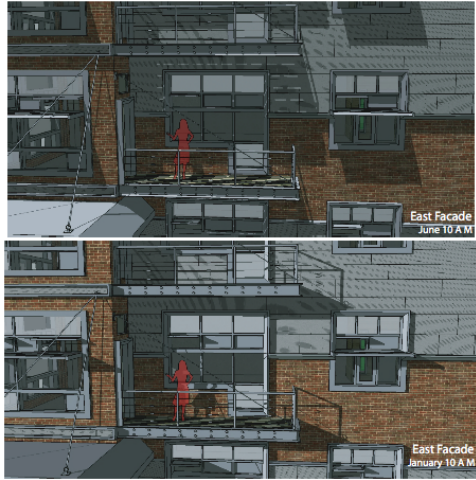
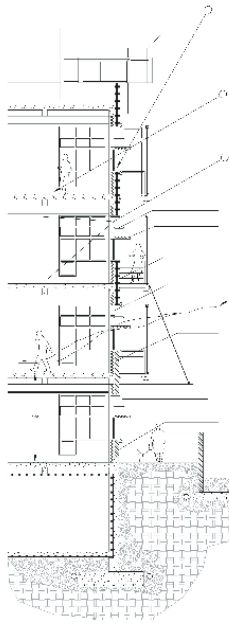
Section [1-A2] Scale: 1"=20'-0"

One of the student proposals

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d. Sustainability



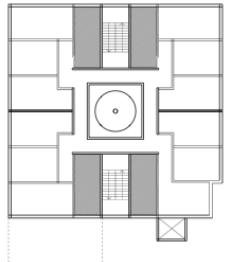
- Lighting studies were conducted to ensure the accuracy of sunshading devices of the facade such as louver systems, translucent glass, and neighboring balconies
- Operable windows controlled by users of the space allow for natural ventilation to accommodate the comforts of the individual resident
 - A band of opaque, operable windows is maintained throughout all windows in each unit
 - These windows are located just above head height allowing for wind to enter through lower windows circulate the space and exit the building
- There are green roofs located on top of each building
 - Reduces heating and cooling loads due to temperature regulation
 - Alleviates storm water draining directly into the system
 - Suppresses carbon in the atmosphere; introduces fresh oxygen

e. Facade

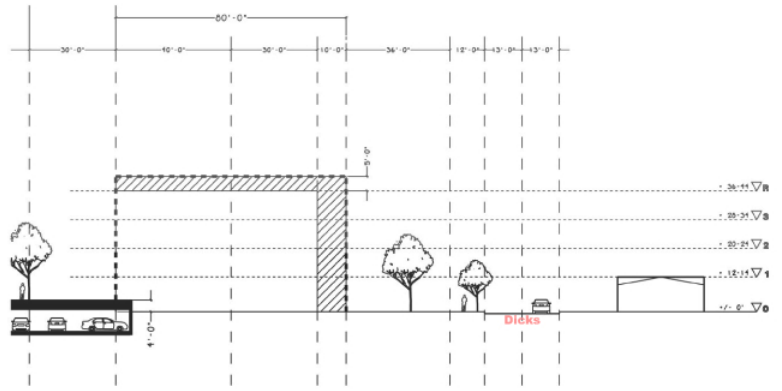
- Exterior materials consist of brick on the bottom third of the building and a metal panel system on the top two-thirds
 - Anywhere the two aforementioned materials come together the metal panel system overlaps the brick giving sense of "old meets the new" (see band of trim for the windows located above the woman's head in the perspectives)
 - This overlapping of materials runs congruently with my concept of the site; the idea of many layers merging at this one particular point or inhabiting the in between (i.e. town + gown relationship or university + village overlap)
- High panels of translucent glass filter out harsh sunlight giving adequate daylight no matter the time of year

f. Capacity to Accomodate Various Scenarios

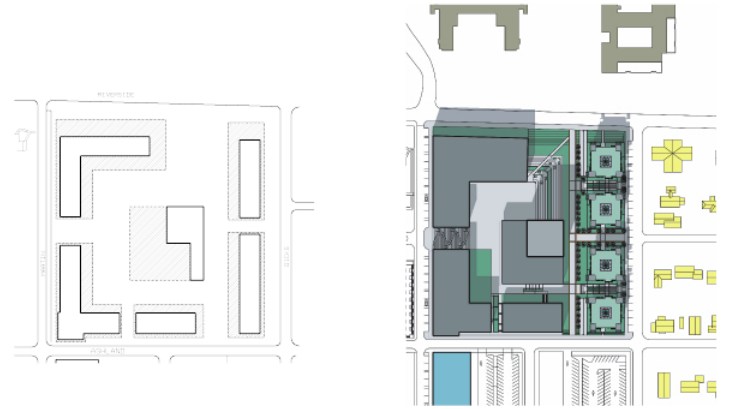
- To the right is a possible layout for a dormitory building with the same structural grid and center atrium as an ordering element



h. Compliance with "form-based codes"



- g. The form based codes established an approximate floor to floor height of 12' - 14' for a three story structure resulting in a maximum building height restriction of 44'.
- This rule was broken due to a lack of housing density created on the site due to the orientation of the buildings resulting in a height of 57' from the street level to the top of the corner towers
 - The rules established for building footprints compromised in a manner conducive to its overarching goals
 - The general rules for setbacks and sightlines were followed except the 2 large housing chunks were divided into four buildings
 - These buildings remain joined by sub grade parking as suggested by the rules

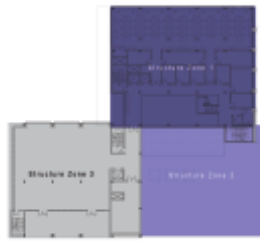


Another scheme

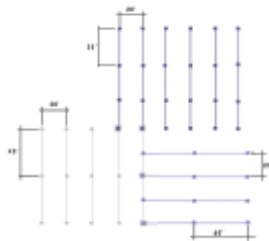
Structure

Type: Steel

The Research Center uses a steel structural system comprised of three major zones, where the tower has its own zone. Zone 2 runs perpendicular to zones 1 and 3 due to large lecture halls on the ground floor that require larger spans.



Structural Zones
NTS



Structural Grid
NTS

HVAC

The HVAC consists of two major shafts and one major branch along the service "corridor". The base has a separate system to cut back on energy required for 100% air intake in the laboratory tower.

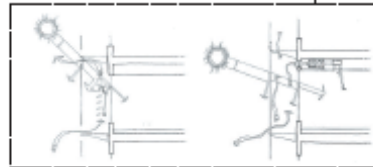


Second floor HVAC
NTS



Section showing HVAC

The roof facade of the greenhouse areas is double skinned, where the air pocket minimizes summer heat gain and maximizes passive heating in the winter. This facade helps regulate the temperatures in the greenhouses.

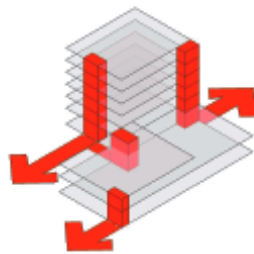


Egress

Each floor above the ground level has two means of fire-rated egress. The second floor (shown) has four due to an additional wing. All upper floors follow the same egress plan for the laboratory tower section.



Second floor evacuation plan
NTS

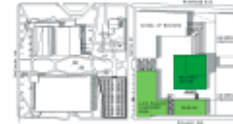


Egress Towers

A third proposal

LIFE SCIENCE RESEARCH CENTER

bridging discovery and education



Life Science Complex

The research center is part of a building life science education complex on the southeast corner of Ball State University. The complex features three primary life science research centers: Research Center, Administration, and Education. The research center is a multi-story building, research center building, research center building, research center building, research center building, research center building.



Sub-Grade Connections

The research center shares an underground parking with the local life science building and the research center. These parking areas primarily in various areas, with a loading dock along Auburn Ave. Further the research center for supplies and research center delivery shared along both exterior loading.

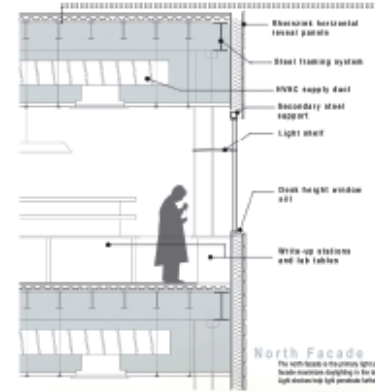


Programmatic Layering

The research center consists of four programmatic layers of 40,000 sq ft each, and a 100,000 sq ft parking garage. The research center also has public outdoor and shopping. Retail spaces are also located between retail spaces and the laboratory, with a loading dock along Auburn Ave. Further the research center for supplies and research center delivery shared along both exterior loading.



Ground Floor Plan



North Facade

The north facade is a primary signature for the laboratory tower. The facade features a combination of glass and solid panels. Light transmittance is high for the glass panels and low for the solid panels.



Second Floor Plan



SECTION A

Sustainability Daylighting

The most significant sustainable principle addressed is daylighting. Daylighting not only reduces the need for electric lighting, but also increases the level of productivity and enjoyment in the building spaces.

With the use of an atrium (lightwell), 100% of offices and labs have either direct or indirect access to daylight.



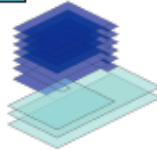
- Programmed space with direct access to daylight
- Programmed space with indirect access to daylight

Sustainability Separate HVAC

The laboratory lower requires 100% fresh air intake for every cycle. The lower area is served by an HVAC system following this requirement, whereas the base uses a separate system that allows for recirculated, eliminating unnecessary energy spent in filtering and circulating fresh air.

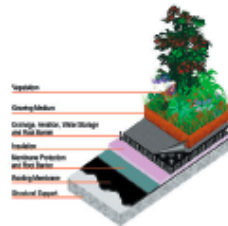


- Primary air circulation system (100% fresh air intake)
- Secondary air circulation system



Sustainability Green Roof

The laboratory lower requires 100% fresh air intake for every cycle. The lower area is served by an HVAC system following this requirement, whereas the base uses a separate system that allows for recirculated, eliminating unnecessary energy spent in filtering and circulating fresh air.



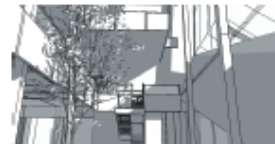
- Vegetation
- Drainage, Irrigation, Water Storage and Root Barrier
- Insulation
- Membrane Protection and Root Barrier
- Structural Deck

Snapshots through Site

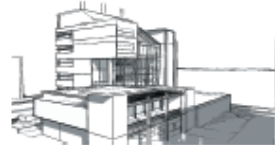


View from 'Grand Stair'

View from North entrance to the Quad.



Inside the atrium



From the Science classroom building.

Facade + Materials



The facade consists of an interplay between the materials brick and rhinotank. The base is composed mainly of brick, whereas the tower is mainly of rhinotank. The brick addresses references to history and tradition, whereas rhinotank addresses ingenuity and change.



North Elevation (SITE)

East Elevation (SITE)

South Passageway

Northeast Plaza

Interior Atrium



Third-Fourth Floors



Fifth Floor



Sixth Floor



SECTION B

Conclusions

Quality of student work

Students become impatient



At an open building workshop
I taught at the University of Pretoria

Students do not easily accept the idea that designing constraints for others to use is challenging and creative.



At an open building workshop I taught at National Taiwan University of Science and Technology

Students understand constraints or rules as things to be pushed to find their limits, rather than to find out what they offer and enable.

The question arose about making **“good” constraints**. I have my own ideas and convey them, but also believe students need to be free to establish their own, always recognizing that others they work with or for may have different values.



It's important to find ways to give students opportunities to both **make and use** constraints. That is, to be both leaders and followers.....and to know when to do both...



Because students will find that they cannot always impose their own values on others, they need methods - design methods - that enable them to help others reach agreement. A design is, after all, what is agreed should be built. Exercises are a teaching method in support of that.

Thank you!