Modern Vernaculars: The Utility of Place-Centric Design

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MODERN VERNACULARS
THE UTILITY OF PLACE-CENTRIC DESIGN
by
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To my loving father, Steven Rokahr. Your hands first taught me to love to build. Without your guidance and wisdom, I would not be the man I am today.

Thank You
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For the majority of human existence, vernacular evolution has been the primary means through which technology has progressed. Said progress is the result of a collective intellectual effort amongst generations of a specific people. The resulting vernacular artifacts are highly refined domestic objects of utility, reflective of the cultural practices and place centric stimuli from which they derived. Despite their modest appearances, the value of these vernacular objects in the greater scheme of human progress is undeniable. Given the value of their contribution, it is discerning that vernacular evolution has all but ceased in the developed world. The following thesis calls to question the abandonment of vernacular evolution and strives to derive a modern vernacular based on the fusion of place centric vernacular principles and contemporary technological capacities.

As a departure point, geographic instances of place centric similarity to specified location shall be derived. From said instances, an array of vernacular precedents will be analyzed to determine formal logic, organization, material appropriation, and building technologies. Commonalities amongst these precedents shall then be extracted and formed into a series of vernacular principles from which new vernaculars can evolve.

Vernacular exploration will then proceed in both small and large scale design interventions. The resulting solutions shall combine individual designerly knowledge with place centric vernacular principles in order to forge new place centric vernacular compositions.

Upon completion of the design exercises, a reflective stance shall be taken as to the lasting value of approaching design in a vernacular manner.
Vernacular is a descriptive colloquial term of varying definition. As such, it is a term that has taken on a multiplicity of meanings in contemporary American culture. Before embarking on the following endeavor, it is first necessary to define the base definition of the term. Vernacular - derived from the Latin term vernāculus meaning domestic, native or indigenous - is defined as “native or peculiar to a particular country or locality.”

As such, it is a term that heavily reflects the idiosyncratic nature of a particular geographic location. Said idiosyncrasies are a derivative of two primary factors: culture and place.

Culture, in respect to vernacular, is equivocal to the life force from which vernacular objects are conceived. It is the additive labors of generations of cultural craftsmen that derive vernacular object typologies. Said objects are thus an embodiment of collective cultural intelligence as expressed in a physical artifact. Due to this embodiment, vernacular objects are living legends of cultural progress, influencing peoples far beyond the geographic boundaries from which they originated.

Place, being the second influencing factor, is an amalgamation of climate and ecologies. Place thus is a reflection of the specific meteorological phenomena, landforms, soil types, and vegetation patterns inherent within a specified boundary. It is only through the exact combination of each of these elements that place can be defined.

Together culture and place have given rise to an immeasurable quantity of place-centric vernacular objects. Said objects are inherently domestic, functional articles of utility created primarily by unskilled craftsman for specific purposes. Given their utilitarian nature, these objects focus little on appearance, and instead focus on their ability to execute a specific task. As time elapses, designs are refined to reflect the needs of current demands. It is through the continual evolution of these vernacular objects and aid they provide that society has been able to advance. However, in modern contexts, industrialized nations have forgone vernacular traditions in favor of industrialized processes.

To most Americans, vernacular objects currently hold little merit beyond that of folk art. For many, standardized industrial products and uniform global living conditions have replaced the need for individual design efforts, thus diminishing the role of vernacular objects in modern society. Further, cultural amalgamations have created sub cultures that focus less on the traditions of any one culture and more on the characteristics shared by all. As such, specific cultural traditions and thus the vernacular objects associated with them are fading into the past. Due to the presence of this phenomenon all around us, Americans would perceive that this is the norm across the world, when in fact, the opposite is true. According to Paul Oliver in his Atlas of Vernacular Architecture of the World, over 80% of the world is still developing and designing through vernacular means.¹ As such, one may question what the rest of the world knows that we don’t. Why have we so readily departed from our vernacular roots?

The answer to this question of course is a convoluted one with no direct causality. Instead it is likely that a series of events led to the gradual diminishing role of vernaculars in America. However, among the primary reasons apparent, three distinct factors likely played a pivotal role in the demise of vernacular architecture in America.

The first reason is due to a lack of adherence to locally derived vernaculars. Rather than embrace the vernacular traditions of the native people, early Americans brought with them culturally derived vernacular dwellings from their homelands. In most instances, said vernaculars were designed based on a series of dissimilar place characteristics. As such, the transplanted forms failed to respond to the new local stimuli and thus lost their utility in new lands. As additional people emigrated and vernacular forms began to borrow from one another, utility levels continued to decline until the title “vernacular” lost all sense of meaning.

Secondly, the standardization and mass production of industrialized materials drastically shifted the value system placed on material appropriation. Material appropriation, once a conscientious alignment of local resources and their respective propensities, became a matter of time, cost, and speed of construction. Value once placed on acquiring


LEFT the myth of vernacular decline
RIGHT western european vernacular migrations
the proper material was all but lost and replaced with the desire to derive new building typologies with the given catalog of industrialized materials.

Finally, the widespread development of fuel transportation networks drastically reduced the need to conserve fuel resources. Whereas the scarcity of fuel resources once demanded a degree of architectural independence and self performance, the abundance of fuel had an adverse effect. No longer burdened by the need for innate performance, architectural solutions quickly favored lightweight, inexpensive alternatives. The resulting built fabric manifest itself in a series of poorly designed architectural entities that relied almost entirely on fuel supplementation to maintain livable conditions.

Together the lasting ramifications of these factors have led to a shift in the role of the built environment. Unlike the vernacular built fabric of the past that utilized culturally-derived evolutionary forms to create a degree of innate performance, modern buildings rely on plug-in motifs, utilizing mechanical systems to supplement all necessary performative constraints. While the employment of the plug-in model has allowed humanity to inhabit the polar extremities of the earth, it has also lulled us into a false sense of security.

We live in the same world that has existed before us. The wind still blows, the snow still falls, and world still spins in a counter clockwise fashion around the sun. In those instances when mechanical means fail us, we are reminded of this fact. Each year, people perish as a result of overreliance on mechanical systems. This is especially true in climates considerably north or south of the equator. As one moves towards either pole, the world becomes more and more inhospitable to human occupation, and as a result, humans become increasingly reliant on the built environment. As such, it is irresponsible for architects as curators and guardians of the built environment to place such implicit faith in mechanical interventions that have failed in the past.
Rather than rely on the plug-in motifs of today, architects ought to reflect upon the embedded performative vernaculars of the past. This does not imply a return to primitive dwellings, but rather the creation of a modern vernacular architecture that draws from both the embodied cultural intelligence inherent in place derived vernacular solutions and the technological capabilities contemporary industry. It is in the spirit of this notion that I have dedicated the following thesis inquiry to:

**Can the fusion of modern practices & vernacular principles yield an innately performative vernacular architecture?**

It is this inquiry that serves as the basis for all further exploration found within this document. May this reflection of the past shine light on a brighter future.
PLACE CENTRIC FOCUS
DEFINING PLACE THROUGH CLIMATE & ECOLOGIES
Vernacular architecture can be said to be birthed of two primary influences, nature and culture. The latter of the two however is likely less a result of choice and more of necessity. Given the relatively isolated nature of primitive settlements, vernacular building traditions often arose within the internal knowledge structures of a given group of people. Modern interpretations of vernacular evolution however are not bound to said stringent intellectual pools. This does not insinuate that the information held within these pools is void, but rather that gains from looking at multiple vernacular traditions outweigh the individual efforts of any one society. For this reason, we will instead turn to the natural environment as the driving force for our inquiry.

The natural environment as referenced in this article relates primarily to ecological and climactic elements. Said elements, though well documented by various sources, fail to coexist in a singular format for consideration. Scalar difference, non-pertinent information, and limited data further reduce the current usability of said data. The following pages attempt to simplify the pertinent layers of information into a singular document. Once charted in their singularity each element will be overlaid on a global scale so as to reveal global similarities. Areas of similar ecological and climactic composition will then be identified from which focused vernacular research efforts can begin. By using numerous global influences derived from similar environmental profiles, we can hope to combine and hybridize the best found attributes of multiple cultures to inspire a globally informed place centered vernacular.

SOURCE INFORMATION
The following maps have been collected from three primary sources. The first series belong to German meteorologists and climatologists Wladimir Koppen and Rudolf Geiger. Initiated by Koppen and later refined by Geiger, the Koppen-Geiger Climate Classification system utilizes global temperature and precipitation data collected over the past hundred years to chart historic climate data in hopes of predicting future climatic evolution. The second source, directed by EPA geographer James Omernik, charts the ecological regions of the United States. Omernik’s maps identify specific physiological, geological, soil, vegetation and land use patterns across the United States. The final resource utilized comes from the US Forest Service under the guidance of geographer Robert G Bailey. Bailey’s maps identify vegetation, landform, climate and soil data on a global spectrum. Together these three sources serve as the foundation for environmental conditions and set the stage for future vernacular research efforts to occur.
Information displayed reflects data from the World Map of Koppen Geiger Climate Classification: 2076-2100. Due to its speculative nature, said data will serve as a secondary influence for climactic analysis in subsequent steps.

Dfa

Cfa
**D CLIMATE TYPE** | Are classified by areas where the average temperature of the warmest summer month is greater than 50 degrees farenheit and the coldest month lies beneath 27 degrees farenheit. This region is characterized by its severe winter weather an known for snowstorms, strong winds and bitter cold arctic air masses.

**Dfa-** climates are classified as “humid continental with hot summers”. Additionally they are noted for year round precipitation. The highest monthly average temperature in the summer rises above 50 degrees farenheit. Weather patterns are influenced by mid latitude cyclones and can be severe in nature. Annual precipitation rates are between 20 and 45 inches. Drastic temperature changes occur from season to season fueling severe weather year round.

**Dfb-** climates are classified as “humid continental with mild summers”. Like Dfa climates, Dfb climate zones receive year round precipitation. The average temperature of the coldest month is less than 27 degrees farenheit. In the summer, the average temperature of the warmest month is above 50 degrees farenheit but does not reach beyond 72 degrees farenheit. Continental Polar and Arctic air masses bring clear skies and extremely low temperatures. Like Dfa climates, temperature variations between seasons are extreme in nature.

**C CLIMATE TYPE** | Are classified as “moist mid latitude climates with mild winters.” Generally speaking these areas have warm humid summers and mild winters. C type climates typically lie between 30 degrees and 50 degrees latitude and are found on the coasts of continents. Mid latitude cyclones provide winter weather patterns and summers are supplied with precipitation via convective thunderstorms.

**Cfa-** climates are classified as “humid subtropical.” The average temperature of the warmest summer month is above 72 degrees farenheit and the average temperature of the coldest winter month is below 64 degrees farenheit but does not sink below 27 degrees farenheit. Rainfall is spread evenly throughout the entire year. Summer climates are typically hot and muggy with severe thunderstorms. Precipitation rates run between 28 and 98 inches annually.

** Despite the encroachment of the Cfa climate type, climatic preference will be given to D type climates as the C climates that are likely to move northward in the 100 year projection will still be on the cold end of the C spectrum.

Information displayed reflects data from the Level IV Ecoregions of New Mexico maps compiled by James Omernik. Detailed information concerning ecoregions can be found at epa.gov.
Information displayed reflects data from the Ecoregions of the United States by Robert G. Bailey. Said data will serve as the primary source of ecological information in subsequent steps.
212 | LAURENTIAN MIXED FOREST PROVINCE

**Landform**
mostly low lying topo with rolling hills and surface depressions. Lakes, poorly drained depressions, moraninic hills, drumlins, eskers, outwash plains, and other glacial features. Elevation ranges from sea level to 2400 ft.

**Climate**
average annual temperature ranges between 35 and 50 degrees farenheit. Winter seasons are long with short growing seasons in the summer, only 100 to 140 frost free days in duration. Snow covers the ground the majority of the winter. Annual precipitation is moderate between 24 to 45 inches and comes primarily in the summer months.

**Vegetation**
ilies between the boreal forest and the broadleaf deciduous forest zones. Consists primarily of coniferous species (white pine, eastern hemlock) and deciduous species (yellow birch, sugar maple, american beech). Undergrowth is primarily deciduous. Frequently regenerated by lightning fires.

**Soil**
large variances in soil include peat, muck, marl, clay, silt, sand, gravel, and boulders. Spodosols are dominant along waterfronts with inceptisols and alfisols farther inland. Soils are deficient in calcium, potassium, and magnesium and are generally acidic in nature.

222 | EASTERN BROADLEAF FOREST PROVINCE - CONTINENTAL

**Landform**
most topography is low lying rolling hills with portions of flat terrain. Topography lies between 80 ft and 1650 ft above sea level. Low rolling hills, dissected plateaus, and basins can be found.

**Climate**
average annual temperature ranges between 40 and 65 degrees farenheit. Summers are hot with frequent tornadic activity. Precipitation rates fluctuate between 40 to 50 inches and accumulate primarily in the summer months.

**Vegetation**
dominated by broadleaf deciduous forest (white oak, red oak, black oak, bitternut hickory, shagbark hickory, sugar maple, american basswood, american beech). Understory species include dogwood, sassafras, hophornbeam and evergreen shrubs. Prairie grasses cover large spans of open rolling hills.

**Soil**
soil composition ranges from alfisols in the north to ultisols in the south. Mollisols can be found further inland.

PRAIRIE PARKLAND PROVINCE - TEMPERATE

**Landform**
alternating presence of prairie and deciduous forest. Mostly covered in rolling plains with the presence of steep bluffs at river valleys. Large sections of relatively flat land occur. Elevations range from 300 to 2000 ft above sea level.

**Climate**
average annual temperature ranges between 40 and 60 degrees farenheit. Drastic shifts in seasonal temperature can be found. Frost free growing season spans between 120 and 235 days depending on latitude. Average annual precipitation lies between 20 and 40 inches and accumulates primarily in the warmer months.

**Vegetation**
categorized as forest-steppe. Landscape is an alternating system of praries, groves, and deciduous woodlands. Tall grasslands dominate the landscape including varieties such as big bluestem, little bluestem, switchgrass, and indian grass. Upland forests are dominated by oak and hickory forest similar to those found in the Eastern Broadleaf Forest. In some areas cottonwood, black willow, and american elm trees exist.

**Soil**
mollisols are the dominant species throughout the region with alfisol pockets found around river valleys.

Information displayed reflects data from the Ecoregions of the Continents by Robert G. Bailey. Said data will serve as the primary source of ecological information in subsequent steps.
The information displayed is an overlay of the Koppen-Geiger and Baiely Maps of the World. Areas denoted primary utilize current climactic data and will serve as the basis for vernacular precedent research; those listed secondary utilize speculative climate data and will serve as supplemental resources to primary areas.
VERNACULAR PRECEDENTS
QUANTIFYING VERNACULAR BUILDING TRADITIONS
Centrally located around kitchen living room spaces fish tail joints unique to area with halved joints, large chimney is in middle room, roof elements are made of thatch or wood shingles, seams are filled with pitch, cossed wooden sticks are at the face of either side of the gable; wooden plugs stabilize walls in the hall, use of brick primarily due to lack of wood, also why it is timber frame rather than log.
VERNACULAR PRECEDENTS | INTRODUCTION

DISSECTING VERNACULAR ATTRIBUTES
As identified in the previous chapter, there is a select distribution of global sites that share common place denominators found within Milwaukee, Wisconsin. From the Koppen-Bailey composite map, one can identify eighteen countries that fall within the same climactic and ecological specificity. From the countries identified, over fifty cultural groups can be identified from which unique vernacular building traditions have evolved.

To quantify the value of these building traditions it is necessary to dissect the various facets that influence their design. The three categories of focus include form & organization, material appropriation, and building technology. Throughout the following pages, each vernacular type will be dissected in each of the three lenses to create a quantifiable measurement of vernacular value. Once all types have been dissected, best practices can be isolated and replicated in whole or in principle in contemporary vernacular hybrids.

FORM & ORGANIZATION
Vernacular buildings types are largely derived from organizational principles. Within most domestic buildings found throughout the region, programatic organization is largely based on proximity to heat. In severe climates, the retention of heat via layered tempered space is critical in maximizing fuel efficiency and effectiveness. To increase critical heat exposure, building programs are wrapped about the hearth in concentric circles both vertically and latterally. As a result, building form is largely guided by the number and location of programatic functions that require direct heat exposure. Form and organization are also directly affected by external climactic stimuli. To reduce cold infiltration, buildings often adapt formally to minimize external envelope exposure to prevailing arctic winds. The following types are indicitive of the previously mentioned principles and are discussed in singularity as to their pros and cons.

CONTAINED HOUSEBARN

Contained housebarn types aggregate housing and agricultural needs together under one primary structure. Passages between the two uses are often permitted via vestibule and almost always occur internally.

COURTYARD HOUSEBARN

Courtyard housebarn types utilize built mass as a means of segregating space. Despite the close proximity of mixed uses, domestic and agricultural functions rarely enter one another, instead forming an internal barrier to the outside world. Said structures are often supplemented by the use of fences.


1. all purpose room  
2. passage  
3. hearth  
4. storage  
5. sleeping chamber  
6. covered porch  
7. kitchen  
8. living room  
9. pantry  
10. livestock  
11. threshing  
12. hayloft  
13. barn  
14. bath house  
15. courtyard  
16. work bay
Hall type dwellings are amongst the most common survival shelters found throughout the world. Birthed out of necessity for basic shelter, said dwellings are relatively small and crudely assembled. Typically hall types stand as the first occupiable space erected on any parcel of land and are often expanded upon post ground cultivation. Despite their modest appearance, hall dwellings within this climate region are extremely resource efficient and focus on the retention of heat.

### CULTURAL ORIGIN
- numerous (found world wide)

### TYPE CHARACTERISTICS

#### uni-structure
All enclosure elements are made of a continuous material creating a singular envelope. Internal space is dictated by the shape and size of overarching structure.

#### cube & cap
Occupiable space is created the erection of vertical walls; enclosures are contained via gabled cap.

#### semi-duggout
Partial level excavations serve as the living plane for inhabitants. Additional structure is erected on top of our out of the duggout. earthen walls aid in the retention of heat.

#### ground up
Enclosures are erected on grade with little site manipulation. Lack of connection to site allows for higher degree of nomadic life.

### FORM

Hall designs are driven around the hearth. As extreme temperature lows are the primary environmental concern, all living functions are placed in direct proximity to the hearth. Further utilization of heat can be gained through lofting spaces above the hearth.

Due to the lack of interior partitions, all functions are held within the same volume. As such, programs relate to each other equally.
**RESIDENTIAL TYPES | PASSAGE & HALL**

**CULTURAL ORIGIN**
- Central Russia
- Northern Baltic countries

**TYPE CHARACTERISTICS**
Hall & passage type dwellings are a variation to the Hall type. While the primary living space stays the same, the storage and dirty functions are removed from the primary space. The addition of the front passage allows for greater protection from external elements and creates a thermal barrier and wind lock. While these dwellings are simple in form and arrangement, their spatial and heat efficiency has allowed them to maintain their viability even in modern contexts.

**FORM**
- **rectangle & cap:** Occupiable space is created the erection of vertical walls; enclosures are contained via gabled cap. Roof gables face the short side of the rectangle.
- **ground up:** Enclosures are erected on grade with little site manipulation.
- **ground up with cellar:** Enclosures are erected on grade with a semi duggout cellar space beneath for food storage.
- **partial embankment:** Enclosures are partially embedded into a hill so as to create a walkout cellar or storage room.

**ORGANIZATION**
Hall & passage designs are driven around the hearth. Unlike the hall type though, heated and non-heated spaces are separated based on function. The addition of a passage and store room at the building entrance greatly reduces air infiltration into the tempered environment and therefore reduces heat loss.

**PROS**
- Controlled distribution of heat to functions
- Subterranean cellar draws from cooling power of earth
- Use of passage reduces heat loss and air infiltration
- Lack of chimney maintains internal heat

**CONS**
- Compact nature of dwelling limits internal activities and number of occupants
- Internal smoke accumulation reduces health standards
- Roof volume is relatively unused / wasted space

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CULTURAL ORIGIN
- romania
- northern midwest
- northeastern great lakes
- quebec

TYPE CHARACTERISTICS
Hall & parlor dwellings are a common variation to the hall type. Split between two equal parts, the hall & parlor type is unique in its separation of public and private space. One side is utilized for daily work and cooking functions while the other becomes a lounge and resting chamber. Entrances are typically through the hall side, though some instances have entries into the parlor as well. In many cases, a covered porch adorns the front allowing for protected outside work space.

PROS
- dual hearth allows a higher degree of control of direct heat
- lofting of programmatic functions takes advantage of limited space and maximizes heat access
- covered porches increase usable area without drawing from heat resources
- separation of private and public functions creates a more desirable living condition

CONS
- mixing of clean and dirty functions
- lack of site design misses potential for geothermal benefits
- direct external access to heated spaces allows for loss of heat and wind infiltration
- multiple external entrances allow for greater heat loss

FORM
rectangle & cap: Occupable space is created the erection of vertical walls; enclosures are contained via gabled cap. Roof gables face the short side of the rectangle. The optional addition of the covered porch allows for protected external space.

GROUND UP: Enclosures are erected on grade with little site manipulation.

FUNCTIONS are split into public and private. Privatized functions can be either heated or non-heated depending on the addition of a second hearth space. In favorable climates, the addition of a protected outdoor space allows some less sanitary work functions to be relocated outdoors.

Hall & parlor designs can have either a single or double hearth. Like other building types, the hearth is still the driving primary force, though the addition of a second hearth or stove allows for greater flexibility in organization and use making this a very versatile housing type.
RESIDENTIAL TYPES | HALL & MULTI CHAMBER

CULTURAL ORIGIN
- poland
- czech republic
- romania
- latvia
- central canada

TYPE CHARACTERISTICS
Hall & multi chamber dwellings are some of the most sophisticated hall type dwellings in this region. Typically composed of 3 volumes side by side, the hall & multi chamber plan is a series of specialized rooms wrapped around the kitchen. As the central focus, the kitchen is composed in a manner such that heat is able to radiate through adjacent internal walls supplying warm air to the surrounding spaces. It is common in many of these dwelling types to see the use of the attic space for storage as well as an adorning front porch created by overhanging the primary roof system in front of the dwelling.

PROS
- spatial planning around the kitchen allows for lost heat from the kitchen to warm adjacent spaces
- use of a vestibule reduces heat loss and air infiltration
- utilization of attic space takes advantage of otherwise wasted space
- steep roof pitches decrease taxing snow loads

CONS
- tall roof volumes allow heat to collect in peaks rather than stay at human level
- a singular central heating source may allow internal spaces to become cold due to separation distances
- use of singular roof volume for cap and porch may cause areas for air to leak into the structure

FORM
rectangle & overhang cap: Occupiable space is created the erection of vertical walls; the cap projects beyond the enclosure walls to create an outdoor workspace. Roof pitches drastically increase in pitch due to environmental stimuli.

ground up: Enclosures are erected on grade with little site manipulation.

ORGANIZATION
Hall & multi chamber designs focus on utilizing heat transmission from the kitchen to warm adjacent spaces. Internal walls are made of materials that allow heat to be store and radiate into adjacent rooms. The use of a vestibule space as a transitory space aids heat retention.

Specialization of room function leads to more individual volumes. Rooms are still closely attached through the kitchen and vestibule space. As only heat source, proximity to the centrally located kitchen becomes the primary organizational force.

FORM

ORGANIZATION

VERNACULAR TYPES | 35
CULTURAL ORIGIN
- Midwest surrounding Great Lakes

TYPE CHARACTERISTICS
Multi story dwellings are rarely built in one phase. Typically growing from the \textit{I} configuration, multi story houses can take on a number of perpendicular arrangements and internal layouts. Common amongst most types is the presence of a centralized staircase that connects the lower public realm to the upper private realm. Multi story houses are typically found on wealthy farmsteads where large families and hired hands require larger living conditions.

PROS
- Centralized staircase allows vertical circulation with minimal wasted spaces
- Centralized staircases act as vents drawing warm air from the first floor to upper floors
- Separation of private and public functions creates a more desirable living condition
- Increased square footage allows higher occupancy numbers

CONS
- Large volume of space requires a considerable amount of fuel to heat
- Location of only a singular hearth often leaves cold spots within the house
- Lack of focus about hearth creates less efficient heat distribution
- Greater wall area above ground increases building's exposure to cold northly winds

FORM
\textbf{I configuration:} Two equally sized rectilinear volumes are stacked atop each other and capped with a gabled roof element.
\textbf{L configuration:} Two equally sized rectilinear stacked volumes are abutted by a square volume on the bottom level; gabled roofs faces sit perpendicular to one another.
\textbf{T configuration:} Two equally sized rectilinear stacked volumes are abutted by a centered square volume on the bottom level; gabled roofs faces sit perpendicular to one another.

ORGANIZATION

Multi story buildings typically revolve around a centralized stairwell. As the central driving force, the stairwell separates the lower public functions from the upper private functions.

Private functions located on the ground floor saddle about the central staircase. Daily life is still focused around the hearth though it is no longer the center of the house. Private functions are located upstairs and lack direct access to heat; instead they depend on the transfer of heat up the stairwell.
**MIXED USE TYPES | CONTAINED HOUSEBARN**

**CULTURAL ORIGIN**
- belarus
- estonia
- poland
- finland

**TYPE CHARACTERISTICS**
Contained housebarn types mix agricultural functions and domestic living conditions under one roof. Stretching distances of more than 100 feet, contained housebarns are amongst the largest singular structure vernacular buildings within this category. In nearly all instances, domestic functions are split from agricultural operations via a central passage. Aside from basic living spaces, housebarns typically contain livestock bays, threshing floors, grain storage facilities, and other food storage spaces.

**FORM**

**CULTURAL ORIGIN**
- belarus
- estonia
- poland
- finland

**TYPE CHARACTERISTICS**
- housing functions in a large singular building minimizes exposure to external elements
- heat from agricultural functions can aid in heating dwellings and vice versa
- use of a vestibule reduces heat loss, air infiltration, and cross contamination
- quick passage from one use to another
- steep roof pitches decrease taxing snow loads

**PROS**
- mix of domestic and agricultural functions can lead to unsanitary living conditions
- large interior volume demands large fuel resources to heat

**CONS**

**ORGANIZATION**

**rectangle & cap:** Occupiable space is created the erection of vertical walls; enclosures are contained via gabled cap. Roof gables face the short side of the rectangle. Steep roof pitches aid in minimizing snow loads.

**ground up:** Enclosures are erected on grade with little site manipulation.

**MISSION**

**ORGANIZATION**

**MODEL**

**MISSION**

**ORGANIZATION**

Despite their cohabitation in a single building, domestic functions are largely separate from agricultural functions. The dividing passage space acts as a thermal and sanitation lock, minimizing cold infiltration from outdoors and maximizing access between functions. Close proximity between domestic and agricultural functions allows for back and forth heat transfer between the two uses as necessary.
MIXED USE TYPES | COURTYARD HOUSEBARN

CULTURAL ORIGIN
- southern russia
- belarus
- kazakhstan

TYPE CHARACTERISTICS
Courtyard housebarns are an attempt to utilize agricultural outbuildings to form a monitorable interior courtyard. Unlike contained housebarns, the domestic and agricultural functions lack internal connections. Instead, all functions are focused around the centralized courtyard creating a controlled outdoor environment from which all functions can be accessed. Courtyard housebarns vary greatly in size and shape depending on the need for supplemental outbuildings. Fences often complete the courtyard enclosure.

PROS
- building walls create a protected micro climate that mitigate external stimuli
- external access to agricultural functions maintain higher levels of sanitation
- courtyard formation creates a controlled outdoor room as usable space
- simplified domestic living conditions creates higher efficiency of heat transfer

CONS
- long narrow volumes expose large spans of walls to cold northly winds
- courtyard access of multiple functions may lead to internal congestion

FORM

parallel bar: Two equally sized rectilinear volumes are located parallel to one another separated by a distance to create an internal courtyard.

L configuration: Two equally sized rectilinear volumes are connected at the hip to create an internal courtyard.

U configuration: Two equally sized rectilinear volumes are located parallel to one another and are connected at one end by an enclosed volume; the residual space creates a courtyard.

ORGANIZATION

Courtyard housebarns focus primarily around the creation of a controlled internally yard. Domestic functions mirror logic principles of passage & hall arrangements. Agricultural functions focus around the storage and processing of grain for livestock.

Domestic functions focus on the heated all purpose room. Agricultural functions are organized so as to separate livestock from grain, while maintaining minimal distances for fodder transfer.

ground up: Enclosures are erected on grade with little site manipulation.
MATERIAL AVAILABILITY
Material availability has a large impact on vernacular building culture. As means are typically limited to one's ecological surroundings, buildings are assembled with the best resources held readily available. Only in rare instances are scarce or hard to obtain materials utilized as they lie beyond the practical limitations of vernacular resourcefulness. Yet, despite limited means, vernacular craftsmen are often able to achieve high levels of architectural performance, in some cases even greater than that of contemporary buildings. This phenomenon is largely due to a rooted understanding of material properties and propensities.

MATERIAL PROPERTIES & PERFORMANCE
In order to maximize limited means, vernacular craftsmen have meticulously studied the materials in which they have to operate. Density, strength, workability, flaws, dimensions, shortcomings, insulation value, and heat retention are but a few of an expansive list of properties understood by local craftsmen. To reach similar degrees of building performance it is first necessary to equip ourselves with a similar knowledge set as to the specificities found innate within raw material resources. Only by understanding each material in its singularity can we hope to combine them in an efficient and meaningful way. The following pages identify the four primary building materials found of prevalence throughout the region of focus. Information is tailored toward the performative qualities inherent to each material and the variety that can be found within subspecies. Though the following resources are by no means the only pool from which we can currently draw influence, it establishes a regional pallet from which design can begin. If proven ineffective or insufficient, then additional man-made resources can be applied.
VERNACULAR MATERIALS | TIMBER

GENERAL INFORMATION
Timber is amongst the most prevalent vernacular building materials used worldwide. Found in nearly every climate zone people can inhabit, timber has long been the primary medium of vernacular construction due to its high strength to weight ratio, global prevalence, infinite renewability, ease of workability, and aesthetic properties. As both a tensile and compressive member, the construction possibilities of wood materials are seemingly as endless as the cultures that utilize it. Comprised of hundreds of species, timber families can be categorized into two primary groups, angiosperms and gymnosperms. Angiosperms, also referred to as broadleaf or hardwood species, are classified for their fruit distributing seeds released from flowering species. Hardwoods receive their structural rigidity from a complex system of support, conduction, and storage vessels. Relatively speaking, hardwoods are more durable than softwoods due to vessel complexity, longer growth periods and tighter annual ring patterns. Gymnosperms, also referred to as conifers or softwoods, are classified as such due to their seeds being contained within cones. Softwood species, unlike hardwoods, are comprised of only one vessel type creating a uniform grain that aids in elasticity.

LIMITATIONS
Due to its organic nature, timber is prone to compositional variability. Referred to as flaws, timber members are subject to knots, splits, checks and warps. Though by no means condemning, said flaws effect the usable length and width of timber units as they are refined into usable lumber. Further contorting, known as seasoning, can occur during the processing of timber into dimensional lumber. Beyond compositional flaws, timber is also prone to disease, rot, and insects, all of which are exacerbated by the presence of moisture. The primary defense against said agents is the use of dry timber and additional efforts to maintain its dehumidification including ventilation. After market products can also be applied to further resist deterioration.

SPECIES PERFORMANCE
Regardless of family, all wood is anisotropic, meaning that its inherent qualities are directly influenced by the direction and pattern of their grain. As such, wood cannot be talked about as a generalized building material in terms of performance and thus must be talked about as to the specific attributes and qualities offered by each species. The following chart traces the performative attributes found in various timber varieties in the greater Milwaukee region.

HARDWOODS
- quaking aspen
- black maple
- sugar maple
- red maple
- silver maple
- paper birch
- red oak

SOFTWOODS
- jack pine
- red pine
- white pine
- white spruce
- black spruce
- balsam fir

### Vernacular Materials | Timber

<table>
<thead>
<tr>
<th>Tree Type</th>
<th>Height (ft)</th>
<th>Diameter (ft)</th>
<th>Workability</th>
<th>Rot Resistance</th>
<th>Allergies &amp; Toxicity</th>
<th>Thermal Conductivity (W/mK)</th>
<th>Specific Heat (kJ/kgK)</th>
<th>R-Value (BTU/in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardwood</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aspen (quaking)</td>
<td>65 - 100</td>
<td>6 - 9</td>
<td>Easy hand &amp; machine</td>
<td>Non-durable &amp; insect prone</td>
<td>None</td>
<td>.12</td>
<td>1.6</td>
<td>1.2</td>
</tr>
<tr>
<td>Hard Maple (black, sugar)</td>
<td>80 - 115</td>
<td>2 - 3</td>
<td>Moderately easy hand &amp; machine</td>
<td>Non-durable to perishable &amp; insect prone</td>
<td>Skin irritation, itch nose, asthma</td>
<td>.16 - .18</td>
<td>1.6</td>
<td>.81 - .88</td>
</tr>
<tr>
<td>Soft Maple (red, silver)</td>
<td>65 - 115</td>
<td>2 - 3</td>
<td>Moderately easy hand &amp; machine</td>
<td>Non-durable to perishable</td>
<td>Skin irritation, itch nose, asthma</td>
<td>.14 - .15</td>
<td>1.6</td>
<td>.93 - 1</td>
</tr>
<tr>
<td>Birch (paper)</td>
<td>65 - 100</td>
<td>2 - 3</td>
<td>Easy hand &amp; machine</td>
<td>Perishable &amp; insect prone</td>
<td>Sensitizer</td>
<td>.19</td>
<td>1.6</td>
<td>.81</td>
</tr>
<tr>
<td>Oak (red)</td>
<td>80 - 115</td>
<td>3 - 6</td>
<td>Easy hand &amp; machine</td>
<td>Slightly durable</td>
<td>Sensitizer</td>
<td>.17 - .18</td>
<td>1.6</td>
<td>.82 - .85</td>
</tr>
<tr>
<td>Softwood</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pine (jack, red)</td>
<td>50 - 100</td>
<td>1 - 3</td>
<td>Easy hand &amp; machine</td>
<td>Moderate</td>
<td>Skin irritation &amp; asthma</td>
<td>.13</td>
<td>1.6</td>
<td>1.1</td>
</tr>
<tr>
<td>Pine (white)</td>
<td>100 - 150</td>
<td>3 - 5</td>
<td>Easy hand &amp; machine</td>
<td>Moderate</td>
<td>Skin irritation &amp; asthma</td>
<td>.12</td>
<td>1.6</td>
<td>1.2</td>
</tr>
<tr>
<td>Spruce (white)</td>
<td>110</td>
<td>2 - 3</td>
<td>Easy hand &amp; machine</td>
<td>Slightly durable</td>
<td>Sensitizer</td>
<td>.11</td>
<td>1.6</td>
<td>1.3</td>
</tr>
<tr>
<td>Spruce (black)</td>
<td>30 - 50</td>
<td>1 - 1.5</td>
<td>Easy hand &amp; machine</td>
<td>Slightly durable</td>
<td>Sensitizer</td>
<td>.11</td>
<td>1.6</td>
<td>1.3</td>
</tr>
<tr>
<td>Fir (balsam)</td>
<td>40 - 65</td>
<td>1 - 2</td>
<td>Easy hand &amp; machine</td>
<td>Non-durable to perishable &amp; insect prone</td>
<td>Skin irritation</td>
<td>.11</td>
<td>1.6</td>
<td>1.3</td>
</tr>
</tbody>
</table>

GENERAL INFORMATION
Earthen materials are amongst the most prevalent building materials found throughout the world. With widespread availability, ease of use, and unrivaled economy, earth remains a vital building material even in modern contexts. Earthen matter, or soil, is primarily composed of eroded stone. Within the eroded material are four primary components: silt, sand, clay, and gravel. Nearly every classification of soil can be described as a ratio of these four earthen materials. In addition to mineral particles form stone, soil is also largely composed of decaying organic matter. The presence or lack there of organic material can greatly affect the performative qualities of soils and drastically alter their behavioral characteristics.

UTILITY
The constructibility of soil depends largely on the ratio of sand to silt to clay. Ideally, structurally sound soils typically contain sixty percent sand and gravel. In addition, twenty to thirty percent of the soil should be composed of clay so as to bind the sand particulates together. Silt, with no structural, durability, or cohesive values, does little to aid in the composition of structurally sound soils and thus should be kept to a minimum. Within the composition, it is also important to regulate the plasticity of the clay being used as a binding agent. Clays with high plasticities drastically expand when exposed to moisture and thus run the risk of separating the sand particulates causing structural failures. Thus, lighter tone low plastic clays are preferred for earthen construction. Most soils within the greater Milwaukee region fall into the silty loam categorization (50-80% silt & 20-50% sand) thus making them relatively ineffective as a structural material. Despite this fact, there are still many thermal qualities desirable of soil which maintain their validity as a composite material.

SOIL TYPES
Within the greater Milwaukee region their are two primary soil orders that exist in accordance with the USDA soil taxonomy classification. The first are alfisols. Alfisols, named as such due to their high content of aluminum and iron, are commonplace in landscapes dominated by hardwood forests. Due to their enriched clay subsoils, alfisols maintain their fertility with relative ease and thus are ideal for agricultural and forestry means. The second classification of soils are spodosols. Spodosols are comprised of a complex mixture of humus, iron, and aluminum and occur primarily under coniferous forests. Despite their supporting of forests, spodosols are relatively low in fertility and must be supplemented by lime in order to produce agriculturally.

LIMITATIONS
Water penetration is the primary vulnerability in earthen structures. As water penetrates soil compositions, cohesive bonds break and the structure collapses under its own weight. For this reason, soil should not be an exposed stereotomic material in moist climates. Further, soil has no tensile strength, depending entirely on compressive forces to maintain its composition. Given the previous considerations, it is advised that soil be used only as a composite material in larger assemblies or as a thermal mass in terrain formations outside the building envelope.

LOCAL SOIL VARIETIES

### Vernacular Materials | Earth

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Thermal Conductivity (W / mK)</th>
<th>Specific Heat (kJ / kgK)</th>
<th>R-Value (BTU / in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>.15 - 1.8</td>
<td>.86</td>
<td>.9613 - .0801</td>
</tr>
<tr>
<td>Clay Soil</td>
<td>.25</td>
<td>.89</td>
<td>.5768</td>
</tr>
<tr>
<td>Sand</td>
<td>.15 - .25</td>
<td>.83</td>
<td>.9613 - .5768</td>
</tr>
<tr>
<td>Sandy Soil</td>
<td>.3</td>
<td>.8</td>
<td>.4806</td>
</tr>
<tr>
<td>Peat Soil</td>
<td>.06</td>
<td>1.92</td>
<td>2.4033</td>
</tr>
</tbody>
</table>

GENERAL INFORMATION
Stone, due to its inorganic nature, is amongst the most reliable and durable vernacular building materials. Unlike other vernacular materials that must be harvested from living organisms, stone is typically collected from riverbeds, fields, and geologic formation fringes. As a foraging material, stone’s use is dependent on its ability to be readily obtained and transported to the desired location. For this reason, most stone assemblies are the resultant of aggregations of thousands of manageable stone units. Assemblies can be erected either through the strategic organization of dry lain units or bonded with the aid of mortar. The finish quality of stone assemblies is directly influenced by the overall strength of the stone and thus the general workability of the material.

GEOLOGIC CLASSIFICATIONS
Rocks fall under three primary geologic classifications: igneous, sedimentary, and metamorphic. Igneous rocks are formed from the cooling of surface magma from deep within the earth’s crust. Sedimentary rocks are formed in beds and are the resultant of stone sediments being compressed by water and ice, typically through glacial movement. Metamorphic rocks are a combination of several stone varieties and oils that have been exposed to immense heat and pressure. Of the three geological types, sedimentary rocks are the most common found in the greater Milwaukee area due to the prevalence of water bodies and the passing of glaciers in the last ice period. Within this category, dolomite, limestone, sandstone and shale are of greatest supply.

LIMITATIONS
Despite stone’s immense strength and durability, it is limited in its capacity to span lengths. As a compressive member only, stone is only capable of spanning arcs if arranged in a vaulted manner. Lack of resources and skill sets to do so often limit the usability of stone in vernacular contexts to foundation walls, floors and hearths, relying instead on the aid of timber to span roofs and create enclosures. Additionally, the prevalence and ease of workability of lumber in the region of focus further discriminates against stone as a primary building material.

LOCAL STONE VARIETIES
- dolomite
- sandstone
- limestone
- shale
<table>
<thead>
<tr>
<th>STONE TYPE</th>
<th>MINERAL COMPOSITION</th>
<th>COLOR</th>
<th>THERMAL CONDUCTIVITY (W / mK)</th>
<th>SPECIFIC HEAT (kJ / kgK)</th>
<th>R-VALUE (BTU / in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOLOMITE</td>
<td>calcium magnisum carbonate CaMg(CO₃)₂</td>
<td>white, gray, pink</td>
<td>3.46 - 3.96</td>
<td>.9</td>
<td>.0416 - .0364</td>
</tr>
<tr>
<td>SANDSTONE</td>
<td>quartz &amp; feldspar mix</td>
<td>tan, brown, yellow, red, gray, pink, white</td>
<td>3.02 - 3.86</td>
<td>.92</td>
<td>.0477 - .0374</td>
</tr>
<tr>
<td>LIMESTONE</td>
<td>calcium carbonate CaCO₃</td>
<td>white</td>
<td>2.5 - 2.76</td>
<td>.908</td>
<td>.0576 - .0522</td>
</tr>
<tr>
<td>SHALE</td>
<td>mud, clay, quartz, calcite mix</td>
<td>gray</td>
<td>.73 - 1.09</td>
<td>1.046 - 1.381</td>
<td>.1975 - .1322</td>
</tr>
</tbody>
</table>

GENERAL INFORMATION
Due to their widespread availability, rapid growth periods, and high insulation value, grasses have been utilized in numerous vernacular building traditions. Belonging to the botanical family monocotyledons, grasses are classified as being flowering plants with a singular stem. Within said classification fall numerous varieties of agricultural, prairie, and aquatic fibrous plants. As such, the possibilities for harvesting grass materials are endless. In many cultures, grass stalks are simply a byproduct of grain production, and thus are ideal for re-purposing in the built environment. In others, specific varieties are cultivated and meticulously harvested for their architectural potential.

UTILITY
Given the diversity of the botanical classification, grasses vary widely in performative yields. Variations in fibrous composition, stalk diameter, and length all effect the vernacular utility of grasses. Methodology of harvesting also plays a crucial role in the usability of said materials. Strongest in their natural unbent form, careful harvesting of grasses are crucial in maximizing their effective lifespan. Grasses harvested with thrashing equipment, primarily those grown for their oats and grain, are less desirable for building construction as the stalks are often bent and damaged during harvesting; despite their diminished structural properties, mechanically harvested grasses still make great insulators. Density of infill, largely a resultant of bundling or thatching technique, also plays a large role in the utility of grasses and should be taken into account when selecting the method of aggregation.

LIMITATIONS
As with most other organic materials, water penetration is the largest threat to grass assembly degradation. Aside from rot, which occurs most frequently from the saturation of thatched assemblies, moisture also encourages the growth of fungi. In addition to breaking down the cellular structure of the grass, fungi attract birds and rodents which feed on and utilize it as a nesting material. For this reason, grass assemblies work best when covered by a less vulnerable material such as clay or stone.

LOCAL SPECIES
The following grass species are readily available in the greater Milwaukee region.

<table>
<thead>
<tr>
<th>oat</th>
<th>wheat</th>
<th>rye</th>
<th>bent grass</th>
<th>timothy grass</th>
<th>reed</th>
<th>cattail</th>
</tr>
</thead>
</table>

### Vernacular Materials | Grass

<table>
<thead>
<tr>
<th>Grass Type</th>
<th>Location Availability</th>
<th>Thermal Conductivity (W / mK)</th>
<th>Specific Heat (kJ / kgK)</th>
<th>R-Value (BTU / in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oat</td>
<td>Agricultural</td>
<td>.0640 - .0929</td>
<td>1.277</td>
<td>2.253 - 1.552</td>
</tr>
<tr>
<td>Wheat</td>
<td>Agricultural</td>
<td>.1281 - .1604</td>
<td>1.549 - 2.14</td>
<td>1.125 - .9</td>
</tr>
<tr>
<td>Rye</td>
<td>Agricultural</td>
<td>.0389</td>
<td>2.035</td>
<td>3.7069</td>
</tr>
<tr>
<td>Bent Grass</td>
<td>Agricultural / prairie</td>
<td>.0345</td>
<td>1.901</td>
<td>4.1797</td>
</tr>
<tr>
<td>Timothy Grass</td>
<td>Agricultural / prairie</td>
<td>.0717</td>
<td>1.443</td>
<td>2.0111</td>
</tr>
<tr>
<td>Reed</td>
<td>Wetland</td>
<td>.082</td>
<td>1.23</td>
<td>1.7585</td>
</tr>
<tr>
<td>Cattail</td>
<td>Wetland</td>
<td>.057</td>
<td>NA</td>
<td>2.5298</td>
</tr>
</tbody>
</table>

CULTURAL EVOLUTION
Building technique is largely a derivative of culture. As the lasting body that carries vernacular tradition, culture has allowed vernacular craftsmen to pass their craft to subsequent generations. As each new set of hands contributes to the body of cultural work, the trade adapts to adopt best use practices. Alterations are made gradually over hundreds of years, continually improving on old models thus producing a refined methodology from which we can draw upon. By studying said practices, we can hope to engender our own responses and add to the collective movement of vernacular progress.

BUILDING TRADITION OVERVIEW
The following pages outline the most frequently utilized building techniques found throughout the region of focus. The data itself is a reflection of an amalgamation of cultural building processes and thus is an attempt to quantify similarities rather than highlight individuality. By isolating similarities across cultures one can begin to validate and identify universal design decisions. Said decisions can then serve as a basis from which modern inspiration can take root. If desired, cultural technique specifics can be resurrected from data sets and studied in isolation.
GROUND PREPARATION
Most vernacular construction begins with the manipulation of the ground plane. Within the region of focus, very few sites are simply ready to receive buildings and thus may be manicured in one of many ways. Many vernacular projects, such as the duggouts and partially embedded structures, begin with site excavation. Usually 3 to 4 feet of earth is removed creating a negative volume slightly larger than the building itself. Once the desired depth is met, the excavated surface is leveled and tamped hard with poles. Ox blood, clay, or lime may be used to aid in the hardening of the earthen surface, depending on the degree of finish required.

STONE PERIMETER FOOTINGS
Many buildings throughout the region of focus utilize at least one running layer of stone as a footing. Stone choices range between dolomite, sandstone, limestone, and fieldstone. Foundations can either be lain with manicured stone or irregular fieldstone. Typically similar height stones are lain in running stretcher bonds, sometimes two or more rows wide, with header rows tying the various layers together.

PILE FOOTINGS
Pile footings are used to establish a level building plane above the ground from which construction can begin. Piles first require excavation so the pole can be set beneath ground. Once dug to the proper depth, a large stone is typically lain at the bottom to prevent the pole from sinking. Once the pole is is in the ground, sand or dirt are infilled and tamped solid. To prevent rot, the bottom of the pole may be coved in pitch or tar.

SILL
In instances where site excavation is not an option, sills are often used to establish a level building plane. Made of long squared timbers, sills sit directly on the site and are leveled using dirt mounds or stone pillars. Once established, the sill acts as the base plate for all subsequent vertical structure.

TIMBER AS MASS
Stereotomic horizontal log construction is the primary building method employed within the greater Milwaukee place focus. Using 20 to 30 foot sections of softwood timber, logs are stacked in an alternating thick to thin pattern to create a level singular mass wall. When selecting members, trees of uniform diameter are preferred to those that taper as uniform sections aid in the ease of stacking. Timber sections, typically between 10 to 16 inches in diameter, are either hewn flat on all sides or left round and notched with a scribe indentation on the bottom so that round logs will rest atop one another. Members are then stacked atop one another on hewn or scribed faces and overlapped on the end joints utilizing one of many cultural notching techniques. Crevices between logs are sealed through a process known as “chinking.” To increase air tightness, wooden pegs are inserted perpendicular to timbers to serve as an anchor for additional treatment. Mixtures of moss, straw, clay, pitch, and plaster are then applied to the pegs creating an airtight seal from the external environment. Building interiors may be further coated with clay and plaster mixtures to aid in the retention and radiation of internal hearth heat.

PROS
- Timber is amongst the most prevalent building materials found within the region
- Wood is extremely workable allowing for max flexibility in construction
- Stereotomic timber construction serves as structure, skin, and insulation simultaneously
- Horizontal log wall assemblies can reach R-values well over 12 before the addition of chinking material
- Horizontal log construction if well maintained can last tens if not hundreds of years

CONS
- Limitations of vernacular tooling can create gaps between log masses allowing for air infiltration
- Horizontal log construction demands high volumes of straight timber which may difficult to obtain
- Timber is vulnerable to rot, insects, and fires thus it must be carefully maintained to insure its longevity

TIMBER AS FRAME
At its core, timber framing is based on the post and the lintel. Posts are vertical timber columns while lintels are spanning beams that run between posts. Members are connected to one another using one of thousands of cultural joinery techniques. In attempt to create more sophisticated structural arrangements, post and lintel techniques are combined in assemblies known as bents. Bents are structural frameworks that utilize at least two posts, a horizontal tie beam (lintel), and two opposing rafters. Additional interior members are used to aid in the rigidity of bents depending on size and span. Once assembled, bents are spaced 12 to 16 feet apart from one another in parallel fashion. Purlins and plates are attached to connect bents thus forming bays. Most vernacular dwellings are made of 4 bents in succession creating a series of 3 adjacent bays. If desired, additional bents and bays can be appropriated to elongate internal volumes. As a structurally rigid frame with few internal supports, post and timber bents allow for a wide degree of flexibility, both in terms of layout and cladding systems utilized.

PROS
- Timber framing uses only a fraction of the timber found in horizontal log framing
- Timber frames are structurally rigid bodies allowing for flexibility and interchangeability in skinning elements
- Most bent timber frames have only two interior columns allowing for maximum internal layout flexibility
- Timber joinery techniques allow craftsman to combine short timber members into larger units minimizing waste of material
- If properly maintained, timber frames can last centuries

CONS
- As a separate frame and skin system, thermal resistance effectiveness is reliant on proper sealing between skin and structural elements
- Timber is vulnerable to rot, insects, and fires thus it must be carefully maintained to insure its longevity

STANDARDIZED LUMBER FRAMING

Balloon framing was birthed in the 1830’s as a result of readily available standardized lumber and cheap mass produced nails. Quickly this methodology replaced post and timber framing as balloon framed buildings could be erected for less cost at greater ease. Balloon framing utilizes standard 2x6 lumber to rise the entire height of the building. Wall assemblies utilize a bottom sill with vertical studs rising every 16 inches on center. Walls are capped with a double top plate and are reinforced with double studs on end points and at each opening in the assembly. Floors are spanned between vertical members utilizing 2x8 boards stood vertically. The ground floor rests atop the bottom sill while additional upper floors are nailed in place between studs at desired heights. Roofs are typically gable faced utilizing rafters and purlins to create a peaked cap. Upon erection, numerous materials can be appropriated to complete the enclosure, allowing flexibility in performance and expression. Despite the benefits of balloon framing, this technique would eventually kill vernacular traditions throughout America as its ease and economy quickly outweighed traditional building values in an expanding western frontier.

PROS
- Standardized lumber is economically priced and widely available
- Utilization of smaller timber units allows for smaller trees to be utilized
- Balloon framing is very fast, erecting full buildings in as little as a week
- Numerous cladding systems can be applied to the structure
- Balloon framed buildings require far less skill to erect, making it a desirable standardized building technique

CONS
- Thin walls result in lower assembly thermal resistance values
- Timber is vulnerable to rot, insects, and fires thus it must be carefully maintained to insure its longevity
- largely only utilizes the properties of one species of tree

WATTLE & DAUB INFILL

Though used as an independent building material in many countries, wattle and daub is used primarily as a wall infill method throughout the region of focus. Between timber bents and internal posts lie an interweaving of wattle. Wattle is term used to describe a series of woven rods and twigs. In wattle construction, small rods or saplings are used as vertical supports. Wood fragments or twigs are then woven between vertical elements to create a mesh wall. From the mesh base, a thick layer of daub is applied to create an airtight envelope. Daub may be comprised of many things but is usually a combination of clay, mud, and straw or any other grass-like material. Several coats of daub are applied in succession, allowing each to dry before the next is applied. A similar wattle technique can be found throughout this region utilizing small logs instead of wattle weaving. During said process, small log ends are stacked atop one another until the wall volume is filled. Once filled, a thick coat of daub is used to infill cracks and bind the log remnants together.

PROS
- Wattle infill serves as an excellent thermal barrier providing R-values in the mid to upper teens
- Wattle & daub construction has a high specific heat value thus serving as a heat retention vessel within the dwelling
- Wattle is a non flammable coating aiding in the fire protection of otherwise vulnerable structures
- Wattle & daub rarely requires additional tree harvesting as assemblies are made of small structurally insignificant members and timber framing byproducts
- Wattle & daub is easily repairable and can be reapplied with little effort

CONS
- due to its unfired nature, daub mixtures can erode when exposed to water and must be maintained regularly to ensure longevity
- as an infill technique, wattle & daub is only structurally as rigid as its reinforcement to the primary structure

BRICK & STONE INFILL

With the exception of foundations and cellars, brick and stone are not widely used as a stereotomic structure throughout most of the region of focus. The lack of masonry construction is largely in part to the widespread prevalence of timber as a readily available building material. Instead, masonry elements are primarily used as aggregate infill between post and timber frame systems. More often brick than stone, masonry units are stacked in running bonds two rows deep to provide thermal mass to the dwelling. Overall wall depth depends on the brick dimension customs of the culture in question. Units are bonded together using a mixture of earth, sand, lime, and burnt shell. In most cases, an additional layer of clay, daub, or plaster is applied to the internal face of the wall.

PROS
- Bricks comprised of clay and straw have high specific heat values and retain internal heat well
- Due to the common nature of brick ingredients, bricks can easily manufactured at nearly all sites
- Masonry components are by nature fire proof thus reducing the likelihood of the wood structure beneath to ignite
- Masonry walls are extremely durable and can last centuries if properly maintained

CONS
- Clay and stone materials have relatively low thermal resistance values and thus must be used carefully in wall assemblies
- Bricks are air permeable and may allow drafts to infiltrate the exterior envelope

EARTH INFILL & THERMAL REINFORCEMENT

Despite its modest appearance and humble status, earth is amongst the most important building materials found throughout the region of focus. Whether used as an excavated shelter, a walling material, a binding agent, a wall coating, or an external insulating mass, earth can be found in nearly every facet of the building process. Within our narrowed focus, earth is primarily used as either a rammed wall infill or as external thermal reinforcement. Earthen rammed walls are formed in voids between post and timber frame structures. To accomplish said task, boards are lain between vertical timber supports and are reinforced with backing poles. A mixture of earth, straw, rock, clay, and timber fragments are then lain in layers and tamped solid between form work. Once lower levels are tamped, framework can be moved up the wall to continue to process. Upon completion, clay or lime plaster is applied in layers to seal walls from external elements. In addition to serving as an infill agent, external earth mounding can provide additional thermal resistance to any variety of building techniques. Mounded and sloped against structures, earthen masses can be used as artificial hills to increase air tightness, aerodynamics, and thermal resistance.

PROS
- Earthen mass is amongst the cheapest building materials available
- Depending on organic composition, earthen walls and mounds can supply immense thermal resistance to structures
- Earthen mounding along windward faces can increase aerodynamic efficiency and in doing so decrease infiltration of cold arctic winds
- Earth is a 100% recyclable building material

CONS
- Earthen structures are prone to degradation from moisture exposure
- Earth construction can only be used as a stereotomic mass and has tendencies to topple when stacked too high
- If improperly compacted, rammed earth construction can slump or recede from timber frame supports leaving large gaps in wall construction

THATCHED ROOFING

Thatching is amongst the oldest building traditions employed in Northern European countries. Though a number of techniques exist, the most common involve bundling armfuls of straw or reed in a conical form. The cone shape is a result of the narrowing end of the grass root being bound together with twine or another member of grass. Each bundle, roughly one foot in length, is hammered into place between batons at a uniform depth using a leggett. Units are then stitched to the batten system and secured in place with thread or twine. Bundles are first placed at the bottom of the structure and are layered atop one another as builders approach the top. Overall depths range between 1 to 3 feet depending on cultural tradition. During the thatching process, it is critical that bundles lay uniformly atop one another with significant overlap so that rain and snow can quickly run off the surface.

SOD ROOFS

Similar to thatched roof assemblies are sod roofs. Sod by itself has no structural capacity and thus must be laid over a substructure. Typically sub structures are comprised of a baton network covered with bark sheets and tree branches. Once the sub structure is set, two layers of sod are applied to the roof system, the first upside down and the second right side up. Sod units are held in place as a mass with wooden toe kicks at the perimeter of the roof.

PROS
- If properly maintained, thatched roof systems can last up to 100 years.
- Grasses are an incredible insulator allowing roof R values to reach well over 30
- Thatching material is often a readily available byproduct of grain farming thus making it economical and easy to obtain
- Sod & thatch roof assemblies can be easily replaced if need be

CONS
- Grass is extremely flammable when dry
- Improperly lain roofs can leak or rot if water is not allowed to freely flow off the surface
- Insects, fungus, small shrubs and birds may attack both sod and thatch structures

CLAPBOARD SIDING
Clapboard is a common siding material found throughout many northern latitude forested areas. Given the ubiquity of lumber resources, clapboard is an economic and readily available choice for sealing otherwise vulnerable substructures. In addition to all the previously stated wall infill methods, clapboard is a likely outer coating and weather sealant. Boards are cleft in a radial pattern to produce slightly thinner profiles near the heartwood and wider profiles near the bark. Typically this process is done via axe though some cultures use double handed saws to split timber lengthwise. Once manufactured, clapboard is applied in rows starting at the bottom of the superstructure. From this point additional rows are lain atop under layers with a couple inches of overlap to ensure rain runoff.

TIMBER SHINGLES
Timber shingles are produced almost identically to clapboard planks. Utilizing an axe, boards are cleft in a radial manner to produce flat wooden shingles. The primary difference between the two products is length. Due to decreased size, timber shingles are often easier and faster to manufacture than clapboard panels. Like clapboard, shingles are lain in rows with the above row overlapping the layer beneath. The primary difference is necessity to offset shingle rows to prevent water from penetrating cracks. Shingles can either be used as a roofing material or a wall covering.

PROS
- Cedar, the most common choice for producing clapboard and shingles, is naturally water and insect resistant due to oils in the wood
- Cedar shingle roofs can last between 30 and 50 years
- Clapboard and shingles are easily manufactured and can make use of short members left over from horizontal log or timber framing

CONS
- Timber products are naturally prone to fire and decay and must be treated appropriately to insure their longevity
- Clapboard and shingle envelopes have very little insulation value by themselves and must be used in tandem with other infill methods to reach desired R values
- Timber shingles can be blown off roofs easily if improperly fastened

ENDURING VALUE
THE LEGACY OF VERNACULAR TRADITIONS
INTRODUCTION | THE LEGACY OF VERNACULAR TRADITIONS

ENDURING VALUE
Vernacular building traditions hold far more value than their modest appearances imply. As a collective, buildings conceived with similar place attributes embody a certain design intelligence that can only be acquired through generations of rooted trial and error. Despite geographic distancing, the presence of similar stimuli can derive similar building approaches and design principles across numerous vernacular traditions. It is the widespread multiplicity and repetition of these design principles that indicate their enduring value.

Enduring value drives far beneath the surface of tectonic realization and cultural symbolism. It instead uncovers larger overarching design principles that have evolved over time in response to local stimuli. Thus it is the presence of these overarching principles that give rise to true vernaculars. While design intricacies can become outdated with the passing evolution of society and technology, design principles of enduring value hold their validity as they are rooted in place and not the changing tides of social evolution. As such, modern vernaculars should adhere to these principles as a departure point and guiding influence.

The following section outlines the various vernacular principles of enduring value found within the region of focus. Though these principles serve as a firm foundation from which to depart, they are by no means comprehensive of the full demands placed on modern architecture. Further, one should not presuppose this list to be a rigid set of design standards, but rather a reference point from which a series of design alternatives can arise.
VERNACULAR PRINCIPLES | IDENTIFICATION OF PRINCIPLES

I. HEARTH
CONCENTRIC FOCUS

II. THERMAL SPACE
PLANNING

III. MAXIMIZED ENVELOPE
PERFORMANCE

IV. INTELLIGENT FORM

V. EXPLOITATION OF
LOCAL RESOURCES

VI. EMBRACE THE
EARTH
I. HEARTH CONCENTRIC FOCUS

Within northern latitude environments, heat is considered a most precious resource. It is the presence of said resource that allows humans to inhabit environments well beyond our natural physical limitation. As such, heat production and retention is of primary importance and supersedes all other design criteria. In accordance to this principle, heat producing elements, or “hearths,” are the first elements to be situated in the design. Said elements fall into one of two categories, direct and indirect hearths.

Direct hearths are those elements which radiate heat as their primary function. Contemporary models of direct hearths include furnaces, water heaters, radiators, fireplaces, ovens, ranges, and other small electric appliances directed toward heat production. In contrast, indirect hearths are those that create heat as a byproduct of another function or that retain residual heat from other processes. Said elements include dishwashers, sinks, showers, laundry appliances, most personal electronics, solariums, thermal mass walls, and occupants. These elements, though marginal in their direct thermal output, combine to create considerable thermal gains. Said gains, if harnessed correctly hold the potential to serve and potentially suffice all heat requirements needed.

II. THERMAL SPACE PLANNING

Due to the presence of severe arctic winds and deadly subzero temperatures, vernacular dwellings within the region plan space in accordance to proximity to heat. As the lifeblood of northern climates, the hearth typically plays a central role in this organizational process. In order to determine proximity to heart elements, functional spaces are weighed as to their relative need for heat access. Upon gathering this information, spaces are wrapped around the central hearth in concentric rings with those requiring direct heat access toward the center and those with little or no need for heat bordering the outside. In doing so, the layers of program shield the central hearth from external elements and create a series of tempered spaces tailored toward function.

Thermal space planning must also consider the influence of indirect hearths as well as direct. Passive gains from appliances and solar access can be used as multi nodal centers of distributed heat. By understanding the periods of heat production of said elements, one can distribute said objects in a manner so as to create variable thermal ranges. Said variation can be used to maximize and direct heat flow toward desired areas when thermal comfort is required.

III. MAXIMIZED ENVELOPE PERFORMANCE

Northern latitude environments require design diligence in envelope design. As the primary defense against external elements, the building envelope becomes the performative entity that insures a degree of stability for interior environments. Said stability not only aids in the retention of heat during winter months, but also deters unwanted gains in the summer months.

Envelopes can be categorized as one three types: insulating, thermal mass, or breathable. Insulating walls are typically wood framed and are filled with any number of organic fibrous based materials. When layered in appropriate depths, said walls can act as super insulating bodies, drastically diminishing the effects of external temperature shifts. Thermal mass walls are those utilized to retain heat. Typically said walls either lie adjacent to direct hearth components or situate themselves so as to maximize solar gains. The proper design of said elements allows for the storage and steady release of solar radiation. Breathable walls are the last category. Said components can either be partially disassembled or operable. The addition of this wall type when strategically placed can aid in dissipating unwanted heat and directing heat flow toward areas of desire.
IV. INTELLIGENT FORM

At a fundamental level, vernacular building form is a mediation between technical ability, material availability and climatic stimuli. Due to technical and material limitations, the majority of vernacular dwellings utilize normative orthogonal forms and basic space framing techniques to create enclosure. Despite their lack of formal complexity, these dwellings still embody elements of design intelligence.

Buildings with intelligent form respond to local climatic stimuli, both macro and micro, to either shield or obtain energy. Diverting wind, harnessing solar gains, ventilating, and collecting precipitation are all common functions of intelligent form.

In addition to directly responding to micro climates, building envelope manipulations can be used to reduce surface area to wall ratios. The reduction of said ratio, by using internal buffer spaces and aggregating internal functions, can drastically reduce internal heat loads. Said reduction in turn reduces the overall need for mechanical intervention, and when paired with thermal planning efforts can alleviate the need for mechanical intervention altogether.

V. EXPLOITATION OF LOCAL RESOURCES

As a product of social isolation and the lack of technological aid, vernacular craftsman throughout northern latitudes relied on individual resourcefulness and local resources for survival. As resource gathering and production were both time and labor intensive, material appropriation was heavily contemplated and scrutinized. Said mentality lead to the development of an intimate knowledge of local material properties. With this knowledge in hand, craftsmen were able to utilize natural material properties and propensities to create desired performative results.

In modern contexts, local resource exploitation is a relative term. With the advent of industrialized processes and transportation networks, resources can now be transported greater distances in greater quantity. This however does not suggest that availability is synonymous with appropriacy. Appropriacy is a question of necessity and stewardship. As such, one should strongly consider the performative merit of local materials prior to specifying those of foreign origin.

In contrast to historic scenarios, local resources may include both natural materials (timber, earth, stone, grass, water, etc) and synthetic materials (corrugated steel, composite lumber, slag, foundry sand, technological components, etc.). The exact availability of each will depend on the particular locality in question.

VI. EMBRACE THE EARTH

Embracing the earth refers a building’s response and embrace of the specific idiosyncrasies found on site. Said peculiarities may be in the form of topographic manipulation, site vegetation, wind breaks, water availability, solar exposure, and annual climatic variation. Embracing the specific character of the site will aid in passively mitigating undesirable climatic stimuli.

In addition the benefits of the previously mentioned surface level conditions, buildings also greatly benefit from the conditions residing at a subterranean level. By embedding or mounding earth around the building, designers can use the natural insulation values inherent to the earth. In the Milwaukee region, soil maintains a constant ground temperature of 47 degrees Fahrenheit beneath the frost level. Given such, designers can mitigate thermal peaks and dips by submerging facade elements beneath this point.
SMALL SCALE APPLICATION

Given the identification of the six vernacular principles and the analytical data provided to support their merit, field application is the next logical step in testing. Given the widespread abundance of single family housing found amongst the vernacular precedents, a similar intervention makes the most sense as point of departure. To serve as a basis for this exploration the following question was posed: *When applied to single family housing typologies, can vernacular principles yield innately performative dwellings?*

The following pages attempt to outline the design processes, reasoning, and realization of one potential vernacular intervention. Though the solution posed is by no means comprehensive of contemporary vernacular potential, it is one field application of the vernacular principles identified to the idiosyncrasies of a specific site condition. Though similar solutions could arise in different lots, the idiosyncrasies of the site in question should always be used as a driving force to properly weigh the relative utility and hierarchy of each vernacular principle.
Sitting just south of the city center, Bay View is a turn of the century first tear suburb of Milwaukee. With the majority of housing stock approaching its centennial birthday, Bay View is an ideal neighborhood to embrace architectural reform. Unlike modern suburbs, Bay View is comprised of long narrow lots with tight building setbacks. The resulting field condition creates a fabric similar to that of row housing while still allowing for stand alone operations to occur.

Due to its proximity to the river delta, Bay View is comprised of a series of steep housing embankments with adjacent road valleys lying between. Said topographic variation provides an ideal scenario for passive geothermal insulating. In addition, the density and marginal setbacks of the neighborhood create natural wind breaks, subduing cold polar winds that tear across much of the rest of the city.

Given the peculiarities of the micro context and the age of the current building stock, Bay View serves as an ideal pallet from which the small scale intervention can be explored. Within this context, 312 Rosedale Avenue will serve as the specific site in question.
In order to take advantage of residual heat resources within the home, new approaches to spatial organization must be considered. The above listed options explore the programmatic clusterings of hearth concentric planning. Programs are organized into one of two primary zones: climate controlled or flux zones. Climate controlled zones contain all programmatic elements that are highly occupied, require heat, or produce heat. Said zones are to be encapsulated by thick insulation walls to prevent internal heat loss. Programs that lie beyond the climate controlled zones are considered flux zones. Flux zones are either temporary use, require no heat, or facilitate non human program. Said zones are sheathed in lesser insulating walls, which aid in maintaining internal temperature but do not have the added financial burden present in thick insulating walls.

For the purpose of this intervention, the Split Node plan was determined to be an ideal solution. Due to its linear segregation of daytime and nighttime program, the split node plan offers diurnal temperature variation possibilities and increases the solar potential for both programmatic clusters.
i. separation of daytime & nighttime program

ii. provide gap between program uses for solar mass wall

iii. stack nighttime program to maximize solar access

iv. depress program to utilize site as thermal buffer

v. create thermal buffer space to further insulate heated program

vi. modify buffer space to further insulate heated program and allow for maximum solar access
5' 10' 20'

1. entry / mud room
2. living room
3. kitchen
4. bathroom
5. laundry / utilities
6. dining room
7. hallway
8. bedroom
9. garage / storage
The following diagrams depict the application of six identified vernacular principles as they relate to the specific intervention.
The following hearth concentric design elements follow two basic heat flow strategies. The first revolves around the utilization of solar gain and heat retention via thermal mass. Said masses are directly attached to the southern face of both programmatic clusters providing direct solar gains to the adjoining spaces. The second system, a hot water retention cycle, works in tandem with the thermal mass walls. In addition to the heat provided via waste gray water, the system collects additional heat from the solar mass walls through conduction and carries said heat further into internal volumes via in floor heating coils.
The primary notion of thermal space planning occurs with the separation of daytime and nighttime uses. Said separation allows for temperature variation throughout daily heat cycles, allowing non used spaces to thermally fluctuate when sitting empty. To further increase the performance of the daytime and nighttime volumes, thermal buffer spaces are used to shield thermally controlled spaces from exterior conditions.

- SEPARATION OF DAYTIME / NIGHTTIME USES
- SEGREGATION OF HOT & COLD SPACES
- USE OF SPARSE OCCUPANCY THERMAL BUFFER SPACES
- SOLAR ORIENTATION
- MULTI NODAL HEARTH ARRANGEMENT
Building envelope decisions are first based on the need to maintain heat in designated areas. For those areas requiring heat regulation, super insulated walls provide thermal protection from btu gains and losses. Further thermal support is given to these areas through the addition of heat via solar thermal mass walls. To prevent overheating, operable windows and building overhangs are employed.
Formally, there are a number of features that add design intelligence to the proposed design. The first is through a reduction in exposed surface area on both thermally controlled spaces. By minimizing external facing walls with thermal buffer spaces, one can drastically reduce temperature differentials through wall assemblies and in doing so increase thermal performance. Secondly, compact designs reduce internal volumes and in doing so, decrease heat demand. Lastly, southern atrium alignment and the use of shared light systems work together to provide desired thermal gains and prevent unwanted thermal losses.
Local materials are used throughout the entirety of the project. Super insulated walls utilize natural wood and grass varieties to achieve desired insulation values. Thermal mass walls are comprised of a combination of natural materials (limestone, sandstone) and man made byproducts (slag, foundry sand) in order to create high absorption rates. Lastly, heat regulation systems utilize the natural cooling power of the adjacent river and local groundwater to mitigate heat when necessary.
The building design embraces a number of idiosyncratic features present on the site. The first design alignment is to that of the surrounding context. Given the narrow lot configurations present, the building acts as a unit in a series of row houses, and in doing so, deflects the majority of swiftly passing northerly winds. The second and primary use of the site involves the utilization of the ground as a thermal insulator. By submerging portions of the building well into the ground, thermal differentials between wall assemblies are reduced resulting in lessened thermal strain on the interior environment. The final site design element is the utilization of annual snowfall as variable insulation. By facing the slope of the roof toward the north and employing a series of snow fences, the building acts as a snow drift, collecting snow from the passing winds. As a result, the accumulated snow (12 to 36 inches in depth) can provide an additional 10 to 30 R to the assembly.
LARGE SCALE INTERVENTION
SYMBIOTIC VERNACULAR CONFIGURATIONS
**LARGE SCALE APPLICATION**

Principles are not bound by scale. As such, it is necessary to test the previously identified vernacular principles at multiple scales and scopes in order to affirm their validity. Given the relative success of the previous stand alone vernacular operation, it would stand to reason that an aggregate vernacular strategy would yield similar if not superior results. By aggregating multiple programmatic uses under one roof, one can begin to design symbiotic relationships between diverse use types. If paired for their performative potential, said programmatic juxtapositions hold the potential to out perform their standalone counterparts. To serve as the basis for the exploration of this possibility the following question was asked: *Can mixed use buildings guided by vernacular principles yield innately performative symbiotic relationships?*

The following pages attempt to outline the design processes, reasoning, and realization of one potential vernacular intervention. Though the solution posed is by no means comprehensive of contemporary vernacular potential, it is one field application of the vernacular principles identified to the idiosyncrasies of a specific site condition. Though similar solutions could arise in different lots, the idiosyncrasies of the site in question should always be used as a driving force to properly weigh the relative utility and hierarchy of each vernacular principle.
At the heart of Milwaukee is the Kilbourn District. Adjoining the Riverwalk, Kilbourn is a bustling pedestrian neighborhood notorious for its entertainment venues. One of said venues is the Old World 3rd Street German Bar District. Home to numerous Germanic food and drink establishments, the 3rd Street District draws locals and tourists alike from near and far away. Though much of the district is fully developed, one vacant parking lot remains adjacent to the famous Usinger Sausage Factory.

Given the size of the vacant lot, its southern adjacency to the Pere Marquette Park, its presence on both State and 3rd Street, and its frontage on the Milwaukee River, said lot serves as a perfect venue for aggregate vernacular interventions. Said intervention should utilize a series of programmatic elements consistent with that of the character of the street. Additionally, the proposed solution should maintain relative height and width proportions of adjoining historic buildings and maintain the character of the Riverwalk skyline.
Given their sparse occupation and minimal thermal generation, one bedroom apartments are heat dependent. Said dependency suggests their pairing with another heat generating program type.

Due to high occupancy heat gains, gastro pubs are only slightly heat dependent. Depending on the volume of food produced and the size of the cooking operation, pubs should require only minimal thermal supplementation.

With high occupancy loads and large cooking operations, restaurants produce excessive amounts of waste heat. As such, these programmatic types are ideal partners for heat dependent use types.

Though breweries themselves maintain internal temperatures similar to unheated warehouses, the byproducts of the brewing process produce consistent heat generation. Excess heat from fermentation and other brewing processes can be harnessed and used in adjacent programs.
i. identification of symbiotic programmatic relationships

ii. determination of programmatic proximity based on desired thermal ranges

iii. placement of brewery & support functions on site

iv. shift in brewery position; alignment of food service elements to 3rd & State St.

v. placement of one bedroom apartments over heat producing programs

vi. creation of solar atrium, thermal mass walls and thermal buffers
1 bar
2 brew hall
3 kitchen
4 dining entry
5 dining room
6 outdoor patio
7 beer garden
8 brew tour lounge
9 mill room
10 brew station
11 fermentation tanks
12 kegging station
13 loading area
14 freight elevator
15 brewhall
16 brew lab
17 boiler / pump room
18 brew lab
19 living room
20 bedroom
21 laundry / closet
22 brewing hall
23 brewery
24 fermentation hall
25 storage
26 lab
27 craft hall
28 kitchen
29 living room
30 bedroom
31 laundry / closet
32 brewery
33 fermentation hall
34 storage
35 lab
36 craft hall
37 kitchen
38 living room
39 bedroom
40 laundry / closet
41 brewery
42 fermentation hall
43 storage
44 lab
45 craft hall
46 kitchen
47 living room
48 bedroom
49 laundry / closet
The following diagrams depict the application of six identified vernacular principles as they relate to the specific intervention.
The following hearth concentric design elements follow three basic heat flow strategies. The first revolves around the utilization of solar gain and heat retention via thermal mass. The second employs stack effect heating by situating heat intensive programs directly above those that produce heat in excess. The last utilizes excess heat created during the fermentation process to heat adjacent apartment units. In said process, glycol pumps take excess heat from the fermentation tanks in the brew house and transfer it into apartment floor slabs via in-floor heating coil. The remaining excess heat is then expelled in the river through exposed loop coils; from this point, cooled glycol returns to the tanks and aids in maintaining required internal fermentation temperatures.
As the most thermally dependent programmatic use type, thermal space planning within the scheme revolves around providing adequate heat resources to the apartment units. To accomplish this task, units are submerged into the larger building form utilizing all other programmatic elements as thermal buffers. Heat is then supplemented to each of the units through solar gains, stack effect heating, and fermentation heat exchange.
Building envelope decisions are first based on the need to maintain heat in designated areas. For those areas requiring heat regulation, super insulated walls provide thermal protection from btu gains and losses. Further thermal support is given to these areas through the addition of heat via solar thermal mass walls. To prevent overheating, operable curtain walls and bi-fold glass doors create cross-draft air currents to rid internal volumes of excess heat.
Formally, there are a number of features that add design intelligence to the proposed design. The first is through a reduction in exposed surface area to apartment units. By minimizing external facing walls with thermal buffer spaces, one can drastically reduce temperature differentials through wall assemblies and in doing so increase thermal performance. Secondly, formal alignments with surrounding built context allow the building to shield itself from cold northern winds. Lastly, southern atrium alignment and shading devices allow for regulated thermal control of heat gains.
Local materials are used throughout the entirety of the project. Super insulated walls utilize natural wood and grass varieties to achieve desired insulation values. Thermal mass walls are comprised of a combination of natural materials (limestone, sandstone) and man made byproducts (slag, foundry sand) in order to create high absorption rates. Lastly, heat regulation systems utilize the natural cooling power of the adjacent river and local groundwater to mitigate heat when necessary.
The building design embraces a number of idiosyncratic features present on the site. The primary use involves the alignment of the atrium spaces to the southern extent of the site. Further solar control is provided by site vegetation which allows solar protection via foliage during the summer months and solar gains via foliage senescence in the fall and winter. Another site specific design feature is the utilization of operable walls. Said operability allows for utilization of passive southern breezes and lake effect cooling during summer months. Lastly, the building utilizes the natural cooling potential of the both the adjacent Milwaukee river and subterranean ground temperatures.
INTROSPECTIVE ANALYSIS
IMPLICATIONS OF VERNACULAR METHODOLOGIES
How does one measure the absolute success of a subjective product? This is a troubling question for all speculative work in the architectural profession. As architectural designs are only representations of a built medium, they rely on fabrication as the ultimate test of their validity. However, in the event that fabrication is not plausible, how does one proceed in determining success? In this event, one must rely solely on the quality and thoroughness of the design logic presented and the relative adherence of the proposed solutions to said logic. In this light, I reflect on the proposed thesis statement in question.

**Can the fusion of modern practices & vernacular principles yield an innately performative vernacular architecture?**

The affirmation of the preceding question is based on a threefold reflection of the work previously relayed in this document.

The first indication of success can be equated to the identification of performative vernacular principles across multiple cultural boundaries. Vernacular building traditions are often developed in isolation as a result of geographic distancing. Cultural segregation and limited travel further limit the crosspollination of vernacular building methodologies. As such, the presence of reoccurring performative characteristics among disjointed cultures of similar place identity indicates the validity of design decisions. The refinement of these reoccurrences into vernacular principles followed by the application of said principles to modern vernacular interventions further supports the affirmation of the thesis question in inquiry.
The second indication of success comes from the statistical backing of vernacular principles with empirical data. By measuring the generative heat potential found in contemporary building waste cycles and utilizing said data as a baseline for wall assembly performance, I was able to set a definitive goal for envelope performance. Further studies on btu heat gains and losses through specific wall assemblies based on local meteorological data affirmed the plausibility of maintaining internal temperatures via waste heat generation alone. Given this fact and an embedded twenty five percent margin of error, one can safely assume that modern vernacular architecture should be able to perform innately to a degree without need of direct mechanical intervention.

The last indication of success comes from the application of the determined vernacular principles to interventions of scalar variety. Principles are not bound to scalar limitation. As such, in order to serve as a basis for place-centric vernacular evolution, the derived vernacular principles must accommodate multiple programmatic uses. The two proposed solutions and the supporting sectional explanations of their adherence to the identified vernacular principles stand as logical reasoning as to the scalability of the principles in question.

Thus, given the identification of performative vernacular principles across multiple cultural boundaries, the statistical backing of said vernacular principles, and the application of said principles to buildings of scalar variety, I believe it is reasonable to assume to following:

The creation of a modern vernacular influenced by contemporary capabilities and place-centric vernacular principles has the potential to perform innately to a degree.
It is important to keep in mind that the vernacular principles identified during this thesis exploration only apply to areas of similar place composition to that of Milwaukee, WI. Areas of dissimilar place composition will require a re-application of the first three processes identified in this document. Only by re-defining the boundaries of place similarity via climate & ecologies and re-performing the synthesis of place centric vernacular precedents can a new set of vernacular principles be derived. Once synthesized, the new principles can then serve as a basis from which other place centric modern vernaculars can evolve.
The question remains, why should architects reconceive of design in a vernacular manner? In closing, I would like to leave you with a few personal thoughts on the potential implications of viewing the built environment through vernacular means.

The development of place centric vernacular architecture holds the potential to increase the quality of architectural stock through specialization and regional specificity. As architects, we attempt be experts on a multiplicity of topics. In reality, there is a limitation as to the knowledge we can possess and the competency to which we can design the world. Reducing the field of ones architectural inquiry to an area of limited regional specificity should allow for increased mastery of a specified subject matter. By committing one’s life understanding the idiosyncrasies of one’s immediate surroundings and learning to design to these specificities, architects can drastically increase the quality of their immediate architectural stock, and through multiplicity, increase the quality of built fabric on a global spectrum.

The development of an “innately” performative regional vernacular could provide a reduction in architectural dependence on mechanical systems and fuel networks. Though buildings are unlikely to ever be void of mechanical intervention entirely, the goal of reducing their dependence upon said technologies is of noble pursuit. The two primary benefits of reduced dependence can both be equated to means of sustainability. The first is through a simple reduction in fuel usage. By incrementally reducing the overall dependence of buildings on fuel networks and moving towards passive means of thermal regulation, architects can make a significant impact in efforts to decrease mankind’s negative influence on the earth. The second benefit is in relation to the sustenance of human life. Humans are reliant upon shelter for survival. By increasing the ability of one’s shelter to perform innately, architects can aid in providing stable living conditions to people around the world.
The development of regional vernaculars fueled by local material resources has the capacity of increase environmental stewardship while simultaneously developing local industries to support said practices. Environmental stewardship benefits from the concept of in-sight, in-mind. By living amongst the material resources being harvested, individuals are likely to feel more responsible for their personal impact on the environment around them. In addition, the harvesting of adjacent materials to fuel local building industries has the potential to create jobs, both for the harvesting and manufacturing of said materials and for the upkeep and regeneration of the depleted resources.

The development of a place centric urban fabric has the potential to re-cultivate lost notions of regional identity. Due to the widespread intervention of modern architecture, many American cities have lost the initial architectural identity inherent to them. The re-emergence of a distinguishable architectural character based on place centric design holds the potential to restore identities to these communities. Said identity could aid in instilling a sense of pride and belonging in local communities.

The final and perhaps greatest result of reconceiving of design in a vernacular way can be attributed to the continuation and advancement of collective cultural design efforts for the benefit of future generations. Vernacular progress is not made by the efforts of one, but through the incremental efforts of many. By studying cultural vernaculars in multiplicity based on place centric criteria and aggregating the progress of multiple peoples, architects have the capacity to compound the collective design efforts of millions. The resulting vernacular solutions, with the addition of professionally derived knowledge, breathe new life and vitality into vernacular designs and continue their viability for future generations.


