One of the most daunting challenges an architect faces in the design process is making harmony of the myriad parts that make up a building. A small student apartment and stable building for an equestrian center was the subject of an investigation into the extent of the architect's mastery of a project. The parts and assemblies of the structure were studied in detail. This investigation showed that a building's beauty must run more than just "skin deep," and that an architect, in order to have a successful project, must consider even the most minute parts of the building, exercising as much design control as possible.
A Harmony of Parts

The Tao te Ching speaks of the concept of harmony resulting from the combination of opposite or dissimilar forces- yin and yang- to create all that exists, including architecture. If we consider a building to be a harmony of yin and yang, to be a whole made up of disparate elements, then we can begin to explore the myriad parts that make up that whole.

How far should the architect go when considering the parts of a building? When does the part end and the whole begin? An architect faces these questions with each design decision to be made... Should a column be emphasized or enclosed in a wall? Should a floor pattern be a visual treat or a background feature?

While each element in the building must work by itself (doors must be the proper sizes; stairs must reach the top), the architect must not forget how each part relates to its whole. A building's personality comes from its parts. What would Dulles Airport be with a flat roof? What would Unity Temple be with Doric columns?

For an investigation into the Parts and the Whole, a building was designed as one of a series of units. These units, each housing two students and two horses, are part of an equestrian center complex outside of Lexington, Virginia. The project grew into an examination of the pieces that create a building and an inquiry into how far an architect's design can reach into a building's most minute elements.
Thus when we view some well-proportioned dome
No single parts unequally surprise:
All comes united to the admiring eyes.

Pope, Essay on Criticism

The Tools
When creating a building, an architect is confronted with the challenge of designing a pleasant, workable place while also making harmony of the multitude of parts in the building. The fitting of each piece involves deliberation and consideration of many factors. Aesthetics, structural soundness, and building codes, for example, must all be taken into account. To accomplish a harmonious blend of all these influences, the architect uses various devices, "tools," to knit together these widely different ingredients. Among these tools are the uses of pattern, homogeneity, color, and emphasis. The objects shown here illustrate these concepts.

This collection of objects shall represent the various pieces of an unassembled building. The pieces seem disorganized and competing for visual attention. The introduction of a pattern might help bring order to these objects.

But a pattern does little to organize the objects because they are so dissimilar. What if the collection were of similar objects?

Even without a pattern or order, this collection has more visual impact than the other collection because of the similarity of the objects themselves—the homogeneity of their shape, color, and size. A pattern introduced here is an effective means of organization.

While a pattern of similar objects can be powerful in itself, it can also become a backdrop upon which to emphasize an entirely different object. In this subset of the original group, neither object is emphasized. Again, the objects seem to vie for visual attention.

By creating a pattern with one of the items and introducing the other, the picture changes. One object becomes emphasized by placing it on the pattern created by the other.

A similarity of color is one thing that holds this group of objects together. Color similarity can also homogenize the original assortment of dissimilar objects.
The original group of objects, when unified by color, can become a backdrop for something else.

Pattern, homogeneity, color and emphasis apply to the greater scale of architecture as well as the minute. For instance:

The masonry, windows and gently undulating walls of the Flatiron Building create a pattern, unifying all three elements into one effect.

A homogeneity of color, materials and scale in an Italian hilltown help many different structures blend together into a single effect.

In the elder days of Art, Builders wrought with the greatest care Each minute and unseen part, For the Gods see everywhere.

Richard Meier's use of monochrome, his signature white, makes the bold shapes of the Smith House even more dramatic.

The homogeneity of the city of Florence, Italy creates a backdrop that emphasizes a unique object—Brunelleschi's domed cathedral.

And in the absence of any of these devices, chaos ensues.

-Samuel Taylor Coleridge, Religious Musings
The Tao begot one.
One begot two.
Two begot three.
And three begot the ten thousand things.

The ten thousand things carry yin and embrace yang.
They achieve harmony by combining these forces.

-Tao te Ching, #42
A building is truly a conglomeration of the "ten thousand things," and few architects can hope to address every single one of the "things." The architect therefore, must attend to those parts that best carry out the design objectives. The architect must also avoid neglecting the other 9990 things and allowing them to perform in anonymity. Buildings consist of a multitude of parts and pieces, each serving a purpose and deserving a successful integration into the whole. No matter how tiny, every piece of a building has a supporting role. The devices discussed here—pattern, homogeneity, color and emphasis—are among the tools used in the design of a successfully integrated building, and were used in the design of the stable and student housing building.

The Site
The open, sloping site provided two existing pathways, one running north to south along the natural top of the slope and the other running east to west, bridging a stream between two ponds and continuing westward toward the Blue Ridge Mountains. This simple cross pattern can be found elsewhere in the project, most notably in the floor plan of the student housing building.

These existing pathways divide the site into quadrants, each of which is assigned a different function in the equestrian complex. The lower half of the slope (the western half of the site) is dedicated to the housing of students and horses. Boarding stables are located in the northwest quadrant. Parking is limited to the southwest quadrant where the road enters the complex. Therefore, parking is at the highest part of the site, screened from view by the lower areas with shrubbery. The indoor riding arena and administration facilities are located in the southeast quadrant. By keeping parking and the larger buildings of the complex at the highest part of the slope, the living and riding areas below them are afforded the lovely wide-open view of the Blue Ridge to the west, unblemished by cars or roads. The elimination of vehicles from the activity areas of the site also makes a much safer place for horses and riders.
The Building

Brick, wood, and steel are the primary materials used in the student housing buildings. Brick is the rawest material, coming directly from the earth with little more than a kiln firing. Because of this characteristic, the brick is used closest to the earth for the shelter of the animals. It has no structural responsibility. Wood is less easily identified with its original form, having been processed quite a bit from tree to lumber. Wood construction houses the people in their apartment above the stable. Steel, the most processed and refined material used here, occurs at the stress points—connections and floor suspenders.

Each accommodating just two students and two horses, the student housing and stable buildings are a deliberate departure from the traditional stable effect of long rows of stalls, and the parallel effect of long corridors of dormitory rooms. The smaller living quarters seek to provide a more intimate atmosphere where humans and animals can learn through continuous contact.
The student housing and stable building consists of two levels - the stable below and the apartment above. The stable is set upon a brick plinth at grade level. Surrounding the building are four pairs of brick bases that support four pairs of laminated wood bents. At left is one of these bents, attached to its base by means of a steel plate "tenon" sunk deep into the brick base and "pegged" with steel pins through the wood bent. The bents then rise over the building, meeting at the center of the roof.

Suspended from the wood bents is the platform that supports the upper floor student apartment. Suspending the floor rather than supporting it on columns permits the open workspaces below, thereby creating a safe and unobstructed environment for skittish horses.

The building's roof is divided into four large triangular sections and four small rectangular sections. The roofs are supported by laminated wood purlins spanning the spaces between the bents.
The second floor is hung from the bents by semi-circular steel hubs and steel cables (pictured at left). Of each pair of steel hubs, one hub spans a pair of bents while its mate is mounted on the underside of the upper level floor platform. The two hubs are then connected by a loop of steel cable. Two similar steel hub-and-cable assemblies form a cross at the center of the building and intersection of the wood bents. Not only a hanging mechanism, the hubs admit light and air at the upper level by acting as dormers. By hanging down and hugging the brick walls of the stable below, the hubs also act as lateral support for the second story.

Pictured above is a section through the steel hub. The steel cable runs in a channel around the circumference of the hub and is protected from the weather by a steel cover. The hub is held plumb on the bents by rigid steel rods that run back to the roof structure of the building and create the framework for the dormer.

These structural elements, intended from the beginning to be articulated and even celebrated, give the building a significant aspect of its personality and character. Color also works to emphasize the steel elements: the bright red of the steel stands out against the gray roofs and white bents and walls of the upper level.
Lower Level

The simple cross pattern created by the pathways on the site manifests itself again in the stable and apartment floor plans. Perpendicular swaths of space defined by the four pairs of bents make the cross. The outside corner spaces are then enclosed into a tartan-like pattern. This arrangement provides liveable floor plans for both horses and people with appropriately-sized and designated spaces.

The lower level includes two box stalls, accessible from both the brick-floored outdoor work area and the indoor workroom. Feed, hay and riding tack would be stored in the workroom.
Wall Section and Elevation

Wainscoting of red oak provides a resilient wall surface to prevent injury to a kicking horse. Use of any other wood in a stall is generally not a good idea, but horses dislike the taste of red oak and will not chew on it. The horses' stalls have clay over gravel floors for proper drainage. Ventilation, an important consideration in these close quarters, is provided by many openings in the brick walls at grade level. These vents allow air to move upward behind the wainscoting to enter the stall well above the floor, reducing the chances of low drafts. Pivoting windows direct air into the stalls and out through the void between the tops of the walls and the bottom of the floor platform above.

The wood construction of the upper level, lighter weight than the brick below, makes suspending the upper floor easier than if it were of brick. Walls are formed of pre-fabricated horizontal sandwich panels of rigid insulation with painted plywood on either side. Wood battens cover the joints between the panels. Electrical wiring runs horizontally between the panels.
The door used by the horses presented the most intriguing design possibilities with its width and need for both solid and "screened" panels. The door panels, one of solid red oak and the other a welded steel mesh to admit light and air, slide on tracks mounted on a laminated wood member across the door opening. The steel mesh panel carries an engrave-able nameplate at its center. The laminated wood member merely provides a straight surface for the door tracks to operate upon. The door opening is actually spanned by a segmental brick arch above the laminated "lintel." A fixed window under the arch admits light, and the visual "void" it creates below helps emphasize the role of the arch. Bullnose bricks incorporated into the brick floor outside the stalls act as guides to keep the doors sliding smoothly.
**Upper Level**

The upper level apartment includes indoor and outdoor living spaces, a small kitchen, two bedrooms and a bath. The indoor living area with its high, sloping ceiling features wrap-around corner windows that provide dramatic views of the Blue Ridge. Two lofts—one in a bedroom and one over the entry foyer—take advantage of the large volume of space under the roof to provide private space as well.

The horizontal wall panels create another pattern, larger than that of the brick walls below, so making the upper walls a single color, white, works to keep the larger pattern from overwhelming the small building.
A successful building's beauty runs more than "skin deep." A building's total visual and physical effect on the environment is a direct result of the depth to which the architect examined its parts and their roles. Buildings consist of a multitude of parts and pieces, each serving a purpose and deserving a thoughtful integration into the whole.

Though the character or personality of a building is usually established by a just a few of its parts (such as the articulated structure described here), the rest of its "ten thousand things" perform equally important roles, ideally carrying the building's character into its tiniest details. Frank Lloyd Wright specified that even the screw heads in the walls of the Usonian houses be turned sideways in keeping with the horizontal lines of the houses!

The parts discussed here- site and floor plans, laminated wood bents, steel hubs, walls, doors and windows- were by no means the only elements considered. They were those parts chosen to convey and develop this building's character and personality.
Conclusion

The combination of stable and student housing offered some unique challenges in its parts and in its basic design. Admittedly, suspending the second floor is not realistic, both from the financial point of view as well as the practical. But the concept provided unusual opportunities as a design exercise and a challenging study of the design tools discussed earlier.

The project's greatest successes are in those parts that received in-depth examination and design. Especially effective are the steel hubs and cable assemblies and the brick walls and stall doors. The reach of design extended into the individual bricks at the stall door and into the tiny reglets in the steel hub. The richness of design in these building elements comes from painstaking attention to the tiny details of each building part and illustrates the extent to which an architect can design a building.

Though modern products have made the architect's job easier by solving many of the "anonymous" parts of buildings (once hand-made doors and windows are now pre-fabricated and pre-hung), such conveniences still need to be used responsibly. What point is there in laboring over those few Important Parts if the design is then lost in the smaller parts? In this project, attending to the doors and windows instead of allowing them to remain anonymous gives them a place in the design and carries the building's integrity into the tiny details.

The parts of the student housing building were studied in a microcosm probably longer than they should have been. The parts became more independent than was optimal for a smooth blending into the whole. Integrating the fragments sooner into the macrocosm of the building would have made the transition easier. For example, the wall systems at both the lower and upper floors worked nicely when considered separately but could have related better to one another as parts of the same building.
Essential in the smallest details, teamwork is necessary at the larger scale of architecture as well. Due to its unusual appearance, the building described here may be more successful as a single unit rather than as one of a series. The buildings would work better together had they been studied from afar as a series earlier in the project.

Each separate piece of a building is crucial to the harmony of the final product. While it is the architect's prerogative what significance each part should have, the architect should never overlook the deceptively small parts of a project, nor should he be taken in by the superfluous or gratuitous. The architect needs also to be aware of the point when those parts need to join the whole. Whatever inspires its design and whatever the Important Parts are, a project should progress through its design process maintaining constant communication between its parts and their whole.

When the parts are lost, the whole is lost.

-Aristotle
Bibliography


Carver, Norman F. photograph in Italian Hilltowns. (Kalamazoo, Mi.: Documen Press, Ltd., 1979), p. 81.


Readings


The vita has been removed from the scanned document
It was missing a piece. And it was not happy.
So it set off in search of its missing piece.
And as it rolled
it sang this song-

I'm lookin' for my missin' piece
lookin' for my missin' piece
Hi-dee-ho, here I go,
lookin' for my missin' piece.

-Shel Silverstein,
The Missing Piece