

Aesthetics in Hardscape Design:

A study of perception, preference, and application in Bosco Plaza

by

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ABSTRACT

Hardscape design is an essential aspect of public space, especially for urban plazas, which typically consist of paved open areas for circulation, gathering, and sitting. A successful public space relies on multiple factors including aesthetics. Yet with near limitless possibilities for hardscape design, little is known on what aesthetic attributes people prefer, and if the aesthetics of hardscape influence perceptions of attractiveness, safety, welcoming, comfort, and interest in a public space. This project aims to generate knowledge about aesthetic preferences for select attributes of hardscape design, specifically color, pattern, frame, edge, and size, and how hardscape designs may influence perceptions of public space. To accomplish this goal, Bosco Plaza, a large public space on the campus of Kansas State University, was selected as the study site. The research consists of three main components. First, a preference survey was issued to students and faculty in the College of Architecture, Planning, and Design at K-State, to assess what aesthetic attributes of hardscape designs were most preferred, using Likert-scale questions. The survey findings, along with results from a site analysis, helped inform a comprehensive redesign of Bosco Plaza, which included six alternative concepts for its hardscape design. The hardscape design concepts were modeled and rendered digitally to create images for the second survey, where participants were asked to express their perceptions of attractiveness, safety, welcoming, comfort, and interest for each. Overall findings reveal that while successful hardscape designs rely upon many factors, hardscape designs which implement a diversity of colors and a randomness of patterns are most aesthetically preferred. Additionally, it was found that more attractive hardscapes also positively impact perceptions of safety, welcoming, comfort, and interest in public space.

AESTHETICS IN HARDSCAPE DESIGN

A Study of Perception, Preference, and Application in Bosco Plaza

MILES DOUGLAS UPDIKE

LANDSCAPE ARCHITECTURE MASTER'S REPORT | 2020

The left side of the page features a complex, abstract pattern of thin red lines on a dark grey background. The lines form various geometric shapes, including rectangles, triangles, and irregular polygons, some of which are nested or overlapping. The overall effect is a dense, layered composition that suggests architectural or urban design elements.

ABSTRACT

Hardscape design is an essential aspect of public space, especially for urban plazas, which typically consist of paved open areas for circulation, gathering, and sitting. A successful public space relies on multiple factors including aesthetics. Yet with near limitless possibilities for hardscape design, little is known on what aesthetic attributes people prefer, and if the aesthetics of hardscape influence perceptions of attractiveness, safety, welcoming, comfort, and interest in a public space.

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You helped make this project a reality.

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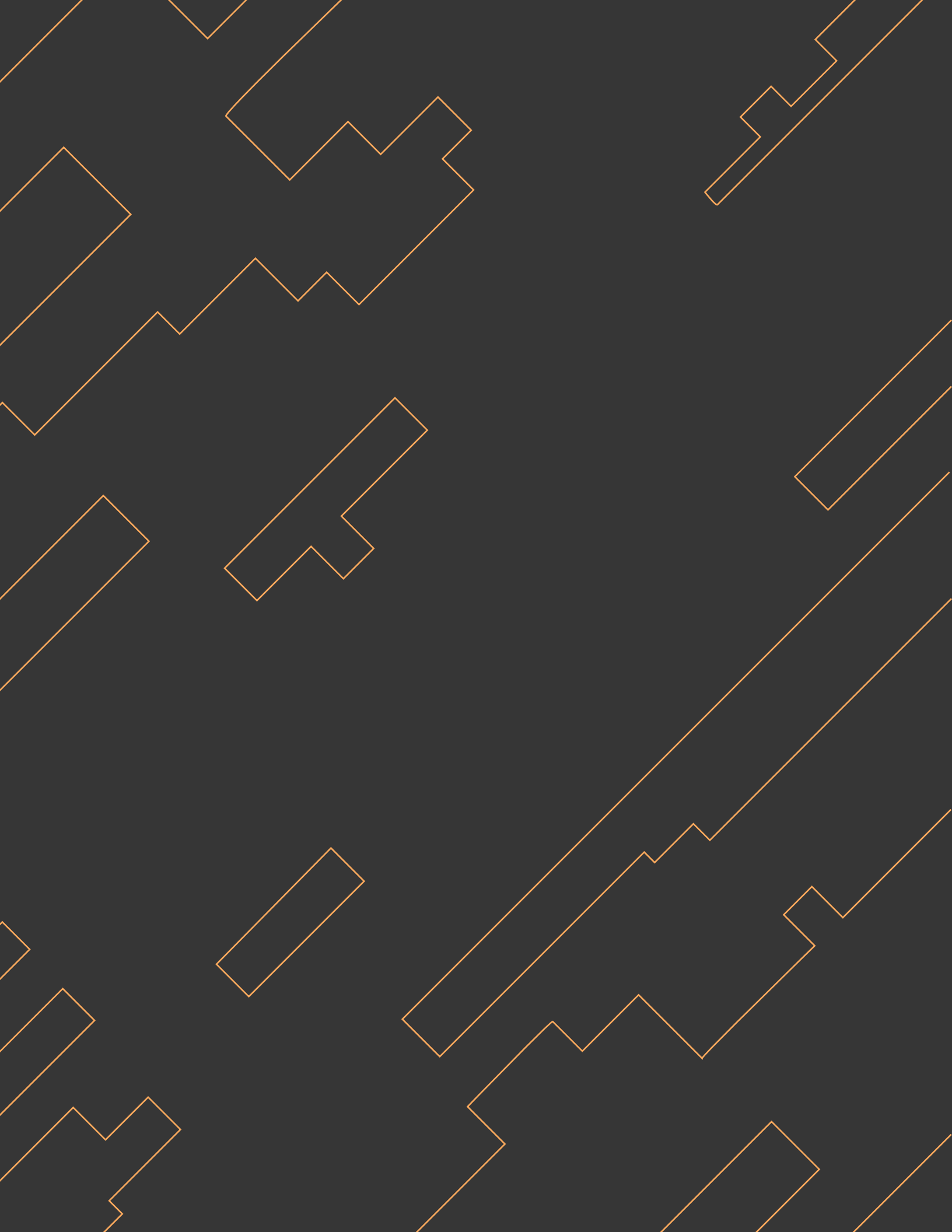
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INTRODUCTION

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chapter one



INTRODUCTION

PROBLEM STATEMENT + DILEMMA

Hardscape is an essential component of urban public space, especially plazas. Plazas typically consist of an open hardscape area, used for circulation, gathering, or sitting. Features may include trees, planters, site furnishings, and structures. Materials used in plazas must be durable and maintainable. Considerations for cost and sustainability are also paramount.

Because hardscape is the dominant feature of most plazas, aesthetic qualities are especially important for designers to consider. Yet with near limitless design possibilities for hardscape design, little is known on what aesthetic attributes people prefer, and if the aesthetics of hardscape influence perceptions of attractiveness, safety, welcoming, comfort, and interest in a public space.

BOSCO PLAZA

Bosco Plaza, a public plaza space on the campus of Kansas State University in Manhattan, Kansas, was selected as the primary study site for the research. The space was selected for many reasons. The plaza has the potential to be a defining outdoor space for the university, extensively implements hardscape, and is ideally located on campus. The space's potential areas for improvement, such as its lack of amenities and deteriorating hardscape, were also deciding factors. Ultimately, each of these variables make Bosco Plaza an ideal site in which to conduct this research and apply its findings.

RELEVANCE TO CONTEMPORARY LANDSCAPE ARCHITECTURE

The disciplines of landscape architecture, architecture, and urban design have made strides to ensure that the decisions made during the design process result in an aesthetically pleasing product that is also ecologically and budgetarily responsible. These three criteria often drive the decision-making process behind material selection and design, but in terms of hardscape, very little is known about what is aesthetically preferred. The research presented in this report focuses on the aesthetics of hardscape design. As the use and valuation of unit paver hardscapes continues to gain prominence in the fields of design and construction, it will also become increasingly important to understand how to better design these hardscapes in ways that result in better public spaces. While other design elements, such as trees, planters, and site furnishings are essential, hardscape design is also a key aspect of creating of a successful public space. Extensive information exists on the role that trees and other forms of vegetation play in quality spaces, but little research has been done on how hardscape design influences the perception, preference, and experience of a public space.

This research is relevant to contemporary landscape architecture in that many project sites include a hardscape component, requiring designers to focus on the design, material selection, and implementation of hardscape. While sustainability rating systems such as LEED and SITES have placed a priority on the material selection process, these systems focus more on environmental and human health impacts, and do not consider design aesthetics. Yet, it has been well argued that aesthetics are an essential component of sustainable design (DeKay, 2012). Acknowledging this gap in knowledge about aesthetic preferences of hardscape and their impacts on perception, the project strives to discover more about how hardscapes can be designed and implemented in a more aesthetically pleasing

manner. Learning more about how hardscape design can positively impact perception and experience can, in turn, help designers in their ventures to design successful and aesthetically pleasing public spaces.

PROJECT GOALS + OBJECTIVES

This project aims to gain a stronger understanding of aesthetic preferences for different attributes of hardscape design, specifically: color, pattern, frame, edging, and size. Through a preference survey of these attributes, the project strives to learn more about what paving design strategies are aesthetically preferred in public space. Using this knowledge, in addition to site analyses and information obtained through intercept survey, the project proposes a comprehensive redesign of Bosco Plaza, a public space on the campus of Kansas State University. Renderings of this redesign, displaying six different hardscape design concepts informed by survey results, are then used to learn more about how hardscape can impact feelings of attractiveness, safety, welcoming, comfort, and interest, which are qualities of a successful public space.

Overall Goal: The project intends to gain more information about visual aesthetic preferences of hardscape design, apply this information to a specific public space, and assess if a hardscape design can impact user experience and perceptions.

Goal I: Learn more about how Bosco Plaza is used and perceived by members of the Kansas State University community.

Objective I: Distribute intercept surveys to occupants of Bosco Plaza asking how they use the space, what aspects of the space they enjoy, and what aspects of the space they would like to see improved.

Goal II: Learn more about visual aesthetic preferences of hardscape design components (color, pattern, frame, edge, and size).

Objective II: Distribute a preference survey to members of Kansas State University’s College of Architecture, Planning, and Design. The preference survey will break down hardscape design into specific components (color, pattern, frame, edge, and size) to better evaluate visual aesthetic preferences of design strategies within each component.

Goal III: Learn more about how hardscape design impacts perceptions of safety, welcoming, comfort, and interest in Bosco Plaza.

Objective III: Using results from the intercept survey in Bosco Plaza and the Hardscape Design Preference Survey, the project will provide a redesign of Bosco Plaza with six different hardscape design strategies. Images from this redesign, showing each respective hardscape strategy, will then be used in a second preference survey. This survey will strive to evaluate the potential impacts of hardscape design on perceptions of safety, welcoming, comfort, and interest in Bosco Plaza.

RESEARCH QUESTIONS

What attributes of hardscape design are most aesthetically preferred?

Does hardscape design impact feelings of safety, welcoming, comfort, and interest in a public plaza space?

How can Bosco Plaza be redesigned to become a more attractive and engaging public space?

PROJECT WORKFLOW

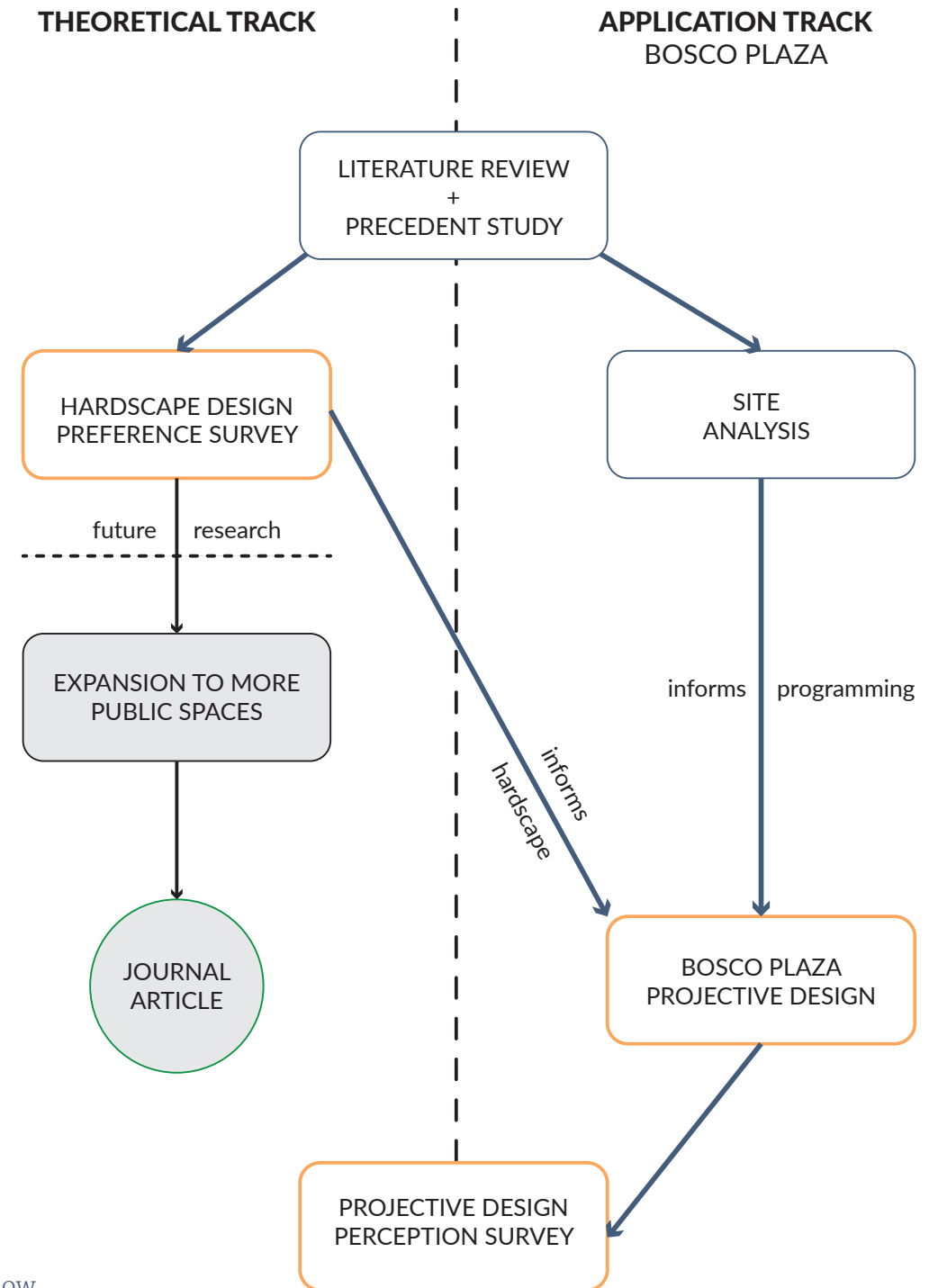


Figure 1.1
Project Workflow

BACKGROUND

2

chapter two



BACKGROUND

SUCCESSFUL PUBLIC SPACE

Public space is a vital component of any urban environment. It provides refuge in busy cities and a place for people to build meaning in their lives through interaction. Public spaces give people the chance to create community, socialize, and relieve stress through relaxation and entertainment (Humphreys, 2010). These spaces are also important for youth. Public space provides young people with the chance to observe and participate in the culture of their society. In public space, young people can interact with and contribute to their community all while learning more about themselves and developing their own personal social identity (Malone, 2002). The dividing line between private and public space, essentially the determinant of where people can and cannot go, is a driving force behind a city's social culture. Public spaces are places for people to demonstrate politically and engage economically. Quality networks of public space help fight the development of fragmentation in cities and promote social tolerance. They are a key piece of a city's infrastructure (Madanipour, 1999).

Designers of public space undoubtedly want to create places that are successful, but what makes some spaces more successful than others? The Project for Public Spaces, PPS, analyzed thousands of public spaces across the world in search of defining characteristics of successful public space. The group found that, in general, successful public spaces are accessible, sociable, active, comfortable, and have a good image ("What Makes a Successful Place?," n.d.). Accessible spaces are mindful of those with disabilities in terms of accessible ramps, handrails, and slopes, but they are also accessible in terms of visibility and proximity. Spaces with strong traits of accessibility can be seen from the outside, often from a distance. They provide walkways

to important places that people want to go and are well-connected to contextual elements like surrounding buildings and transit stops. Sociable spaces are quite easy to identify. Places with high levels of sociability are often characterized by groups of people spending extended amounts of time in the space. Sociable spaces are also often used as meeting places for communities to interact with one another. Active spaces show similar characteristics. These spaces are often also used for groups of people to meet one another. They are occupied throughout the day and provide a variety of things for people of all ages to do. Successful public spaces are also comfortable and present themselves well. In order to achieve this, a place should make a strong first impression in terms of perceptions of safety and cleanliness. Additionally, seating options within the space should be numerous and diverse (“What Makes a Successful Place?,” n.d.). Simply put, there should be enough places to sit and people should have the choice of being in the sun or the shade. While designing great public spaces considers characteristics unique to a site, the Project for Public Spaces says the general criteria of accessibility, activity, aesthetics, and comfort should always be taken into consideration when striving to create a successful place.

WHAT MAKES A GREAT PLACE?

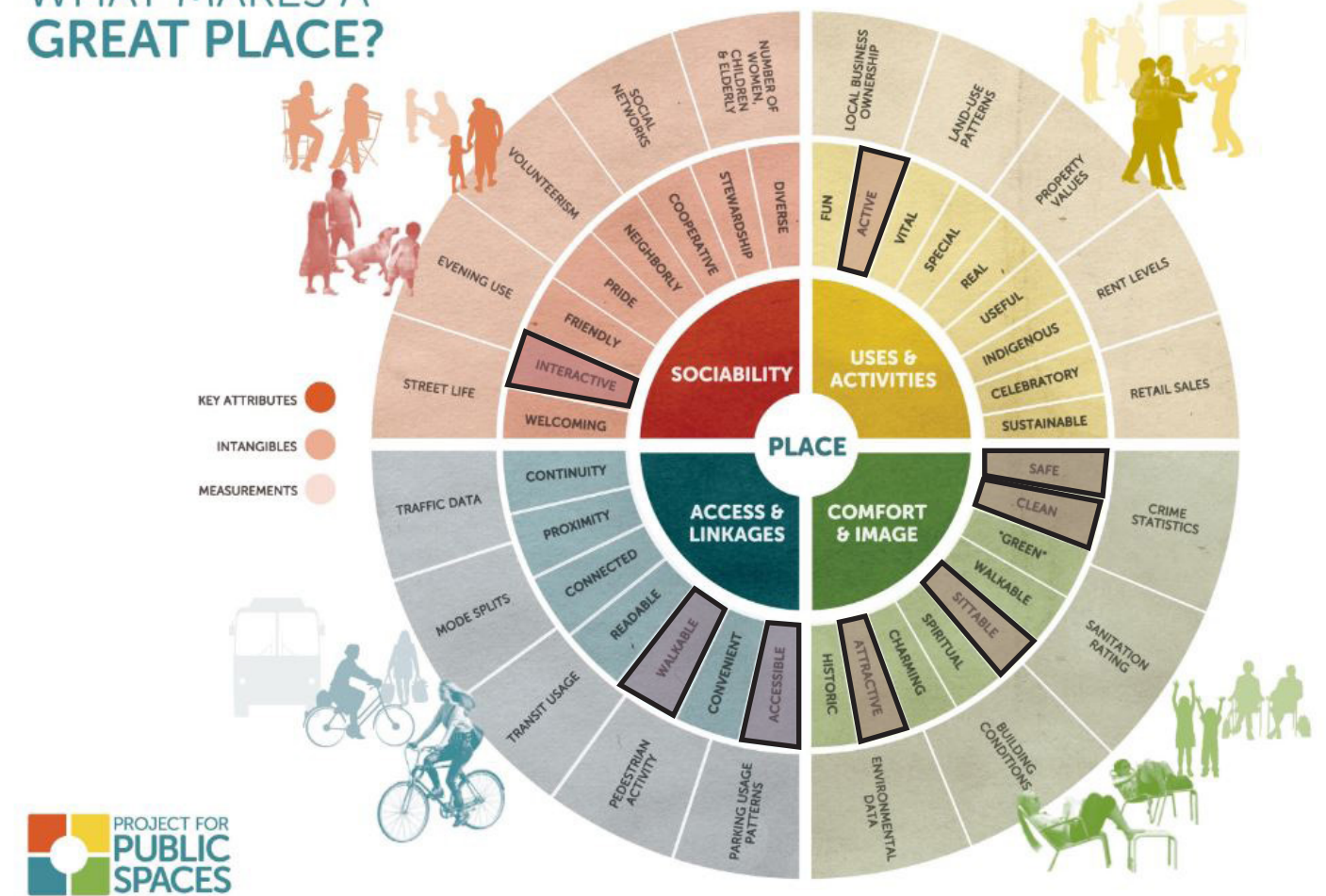


Figure 2.1
 Pillars of Successful Public Space
 (Adapted from Project for Public Spaces)

HARDSCAPE DESIGN

A successful public space relies upon multiple factors, including aesthetics. An important aesthetic consideration for the design of public space, especially plazas, is hardscape. Hardscape refers to the solid, hard elements used in landscape design, often found on the ground plane surface. Hardscape could be composed of brick, stone, poured in place concrete, concrete unit pavers, and asphalt. Choice of material, and subsequent hardscape design, can be a function of intended site use, context, needs for durability, material availability, cost, concept/meaning, and/or sustainability.

There are notable hardscape designs worldwide, which have striking and memorable qualities. Piazza San Marco and Piazza del Campidoglio in Italy, the Esplanade in Rio de Janeiro, and the Schouwburgplein in Rotterdam are all successful public spaces that are well-defined and recognized by their hardscapes.

Unit Pavers

Unit pavers are an increasingly popular choice for the hardscape of public plazas. As compared to poured in place concrete, unit pavers are tolerant of frost and earthquakes, they are easy to repair, and they can be installed in permeable systems, where water can infiltrate into a gravel base below. One of their greatest advantages comes from their ability to be assembled in nuanced patterns (“County Materials,” n.d.).

First produced in the 1940’s, the concrete unit paver was initially produced and implemented in Holland. With the country being situated below sea level, poured in place concrete roads are especially susceptible to cracking due to the shifting and sinking ground. The unit paver helped combat this issue because it allowed for movement and flexibility on the ground plane. These early unit pavers were shaped like bricks, sized at 4” x 8”, and to this day are still referred to as Holland stones. Concrete

pavers, like the ones developed in Holland, were not produced in North America until 1973 when a Canadian manufacturer began producing them. Concrete pavers were then introduced to the United States shortly after. While these early unit pavers were made with concrete, today’s unit pavers can be made with different types of materials: clay, stone, brick, or concrete (The History of the Interlocking Paver,” n.d.). While initially used to create roads, pavers are used today in a variety of applications. Unit pavers can be found in driveways, walkways, private patios, and public plazas across the world.

In North America, the hardscape industry has seen considerable growth, expanding from approximately 80 million square feet in 1980 to 755 million square feet in 2005. Today, over 1,000 concrete unit pavers are produced daily throughout the world, resulting in over 7 billion square feet of concrete pavers being implemented (“Interlocking Concrete Pavement Institute”, 2014).

Unit pavers were considered as the focus of the research because of their growing popularity, their positive impacts on the environment, and their ease of maintenance. Primarily, however, unit pavers were selected because of the artistic flexibility they give designers. With seemingly endless possibilities, unit pavers provide designers the opportunity to create highly aesthetic and inspiring hardscapes in public space.

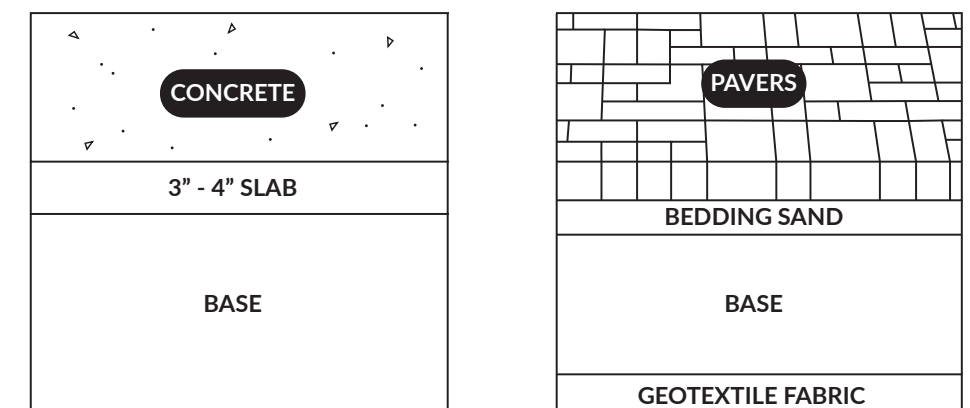


Figure 2.2 Poured Concrete vs. Unit Paver System
Adapted from InstallItDirect

ATTRIBUTE SELECTION

Five significant aesthetic attributes of hardscape design were identified through literature review and personal observations of design examples, including those presented in the book *Patios, Driveways, and Plazas: The Pattern Language of Concrete Pavers* (Smith, 2002). These attributes are color, pattern, frame, edge, and size. With the goal of gaining a stronger understanding of how perceptions are formed and influenced by these attributes, many relevant sources of literature were studied. The research then applies concepts from this literature to preference and perception studies of hardscape design.

Color

Color is the result of three main variables: hue, saturation, and brightness. Hue is the perceived color of an object. Levels of saturation influence the intensity of a color or hue, going from gray tones to highly vivid tones. Levels of brightness depend on the amounts of black and white in hues, making hues darker or lighter. Each of these variables can impact aesthetic preference. Levels of hue, saturation, and brightness can have an impact on a color's measure of aesthetic preference. Studies have shown that while color preference has often been considered to be a matter of subjectivity, the perception of color is more objective. Preferences for colors with higher levels of brightness and saturation have been found to increase, regardless of culture or gender (Camgoz et. al, 2002). However, this does not mean that culture and gender do not impact overall color preference in any way. For example, research has found that men are more likely to prefer colors of high saturation than women (Palmer et. al, 2013). Additionally, people from Asian countries, such as Japan and South Korea, were more likely to prefer white and other whitish colors than people from the United States and Australia (Palmer et. al, 2013). Hue also plays a role in determining preferences for pairs of colors. Researchers have found that color pair preference increases for colors deemed more harmonious. Harmony of color is seen as a function of hue, resulting in higher preferences for color pairs most similar in hue (Schloss and Palmer, 2010). Color preference is also impacted by the object on which the color is applied. Research had found that most people prefer luxury sedans in achromatic colors like black, gray, and white. People associate these cars with seriousness and sophistication, and these colors represent those qualities. Comparatively, most people preferred Volkswagen Beetles, a non-luxury car, in bright, saturated colors that better represent the car's playful and fun reputation. The results here show that sociocultural conventions can influence color preference (Schloss et. al, 2013).

There is an extensive body of knowledge focused on color theory (Camgoz et. al, 2002; Palmer et. al, 2013; Schloss and Palmer, 2010). Although very little pertains specifically to outdoor spaces, findings from previous studies on color's impact on perception can be informative to hardscape design. For example, a recent survey testing color preferences of 32 different color swatches revealed that blues and cyans are nearly universally preferred compared to browns and olives (Palmer et. al, 2010). Humans tend to associate blue hues with cleanliness and nature, while browns and olives are often associated with decaying and dirty material (Palmer et. al, 2010). These general color preferences stem from a biological foundation, opposed to a foundation of personal preference (Granger, 1952). In Palmer's 2013 study, adults in Western countries were shown to generally prefer cool colors like blues and greens to warmer colors like reds and yellows (Palmer et. al, 2013). Color can be used to emphasize a cultural connection and be implemented to evoke certain emotions (Maspoli, 2010). These perceptual responses to color are often tied to cultural and social influences. Studies focused on sculptural art pieces have revealed that the perception of color can be impacted and even limited by intellectual training and societal norms (Rose-Greenland, 2016). Most studies on color are conducted in highly controlled, indoor environments with little consideration for external elements like weather, time of day, and context. Much of the research performed on the topic of color theory is done in isolation, with little consideration for contextual elements (Palmer et. al, 2010; Schloss and Palmer, 2010). In this way, findings are not directly applicable to outdoor spaces, but it is evident that the application of color does have a real influence on perception and preference. This impact cannot be ignored in the design of public hardscapes.

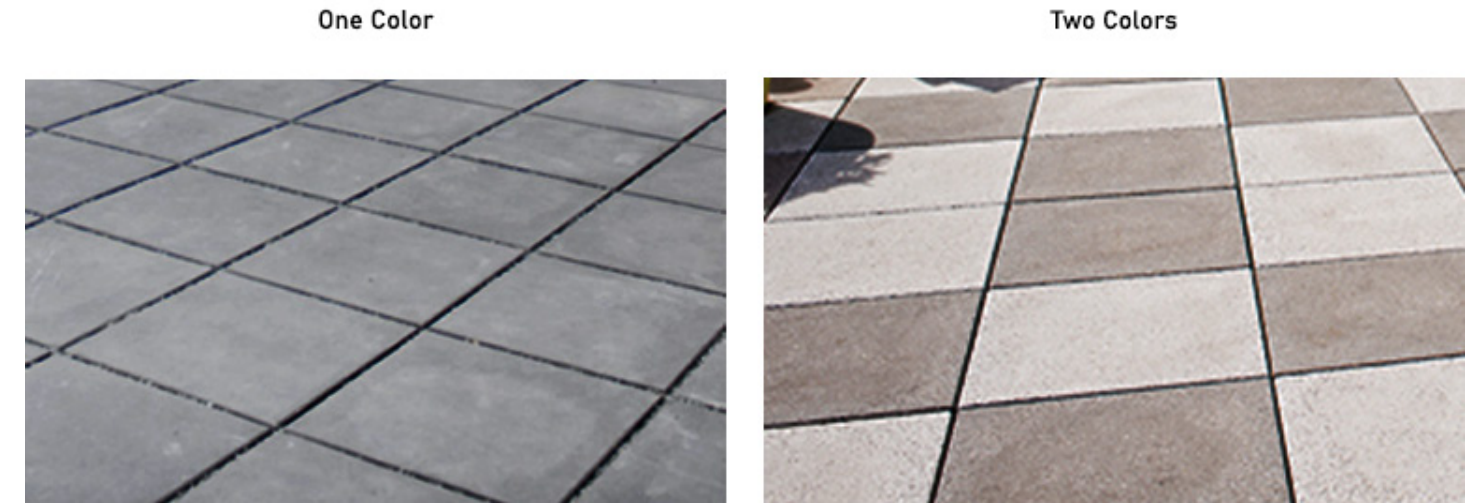


Figure 2.3

EX: One Color vs. Two Color Comparison

Image Credits: Mutual Materials and Hanover Pavers

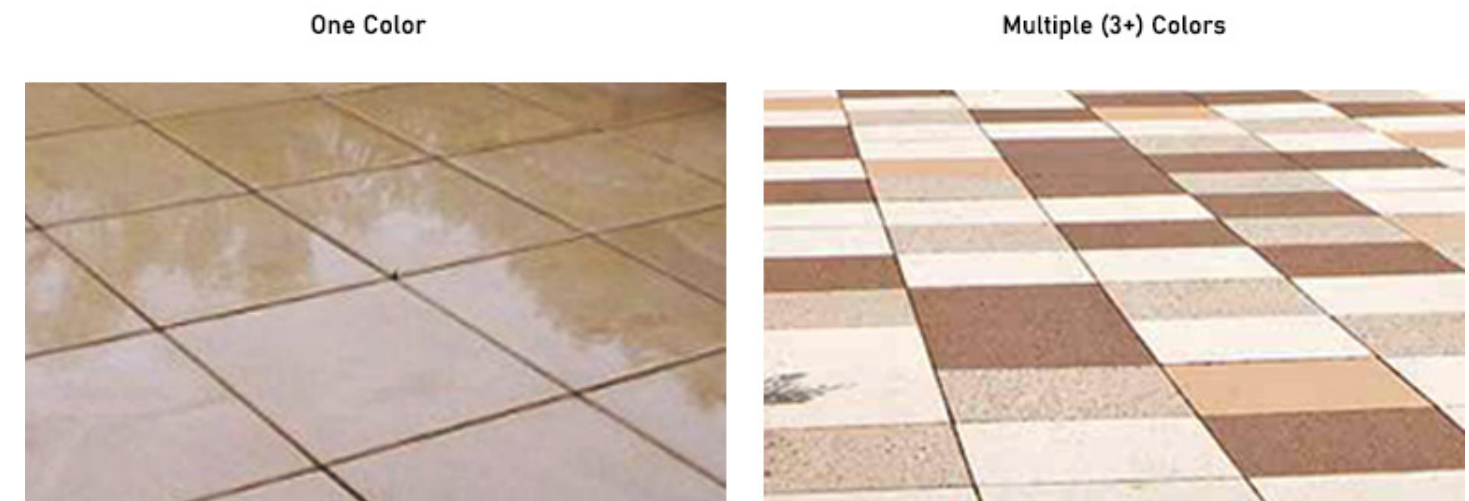


Figure 2.4

EX: One Color vs. Three+ Color Comparison

Image Credits: Belgard and Hanover Pavers

Pattern

Pattern can be defined as a repetition of elements in a predictable manner. In hardscape design, patterns can be seen primarily through block layouts and application of color. Pattern plays a role in aesthetic preference as well. More specifically, symmetry has an impact on perceived beauty. Humans are born with a sense of geometry, and past studies have shown that even a slight deviation from symmetry reduces perceived attractiveness of forms (Dresp-Langley, 2016). This recognition and preference for symmetry begins at four months of age and is established by the first full year of life. In addition, even non-humans such as honeybees show preference for flowers with radial symmetry (Evans et. al, 2012). Additionally, people tend to prefer patterns and images composed of horizontal and vertical lines, opposed lines arranged in a more oblique fashion (Latto et. al, 2000). Pattern preferences can be influenced by personality as well. Research has shown that people who consider themselves to be creative prefer more randomly assorted and chaotic patterns than those who consider themselves to be more scientific-minded (Aks and Sprott, 1996). Friedenborg's 2019 research has found that in terms of aesthetic preference of orderly and random patterns, "beauty is in the eye of the beholder". Some people prefer more ordered patterns, while others prefer patterns in a more randomized fashion. In this research, personality again was shown to be an accurate predictor of what patterns people preferred. Survey participants who tested highly as extroverts were also more likely to prefer random patterns (Friedenborg, 2019). Coburn's research in the field of architecture has found that most people tend to prefer designs incorporating patterns evocative of nature over more synthetic forms. These naturalistic patterns may even provide cognitive function improvements and psychological enhancements for the people viewing these scenes (Coburn et. al, 2019). Studies focused on levels of simplicity and complexity also confirm this preference for natural forms and patterns, as the most preferred scenes depicted patterns highly similar to patterns found in natural objects (Aks and Sprott, 1996).

In terms of patterns used in unit pavers, there are a handful of common block layout strategies. Herringbone, running bond, basket weave, and stack bond are commonly used paver layout strategies. While these paver layouts contribute to the aesthetic quality of a space, certain layouts also serve a utility. For instance, herringbone's interlocking layout remains strongly in place compared to a running bond layout, where pavers may become displaced by heavy traffic in certain directions. Stack bond layouts, while providing a symmetrical aesthetic that may be desirable in certain cases, may also experience displacement as pavers are not laid in a staggered manner. The basket weave layout provides designers with artistic flexibility as there are several variations of this pattern. Because of the interlocking design, basket weave layouts are also structurally strong and display fewer cases of paver separation than stack and running bond layouts.

Understanding aesthetic preference of patterns and applications of color can help in the design of attractive hardscapes in that patterning is one of the primary ways a designer can create a unique space. Learning more about what people prefer in terms of pattern could provide a stronger basis of justification for hardscape design decisions.

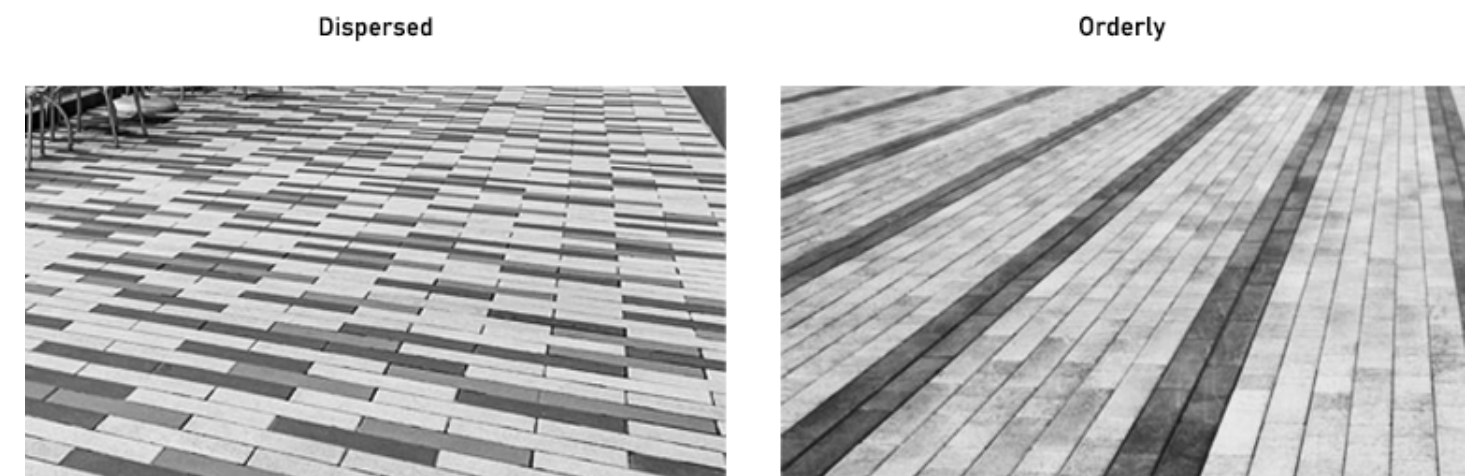


Figure 2.5

EX: Dispersed vs. Orderly Image Credits: Unilock

Edge/Frame/Size

Other major attributes of hardscape design include edge, frame, and size. In a hardscape design, edging pavers are used on the outer edges of a hardscape. Laid in courses and colors that may contrast the entire hardscape or blend in, edging pavers are often used to restrain hardscape layouts structurally and define areas visually. Where edging pavers are found on the edges of a hardscape, framing pavers are found within the hardscape design. In similar fashion to edging pavers, they may be laid in different courses and colors to contrast the primary hardscape design strategy. Framing pavers also define and break the space up into visually smaller areas. Pavers can also come in different sizes and scales. Designers employ various strategies of paver sizes in hardscape designs.

In terms of aesthetic preference for edge, frame, and size of elements within a space, there is very little research that appears to be directly applicable to hardscape design. However, these aspects are highly variable in hardscape design and likely influence perceptions. Research in other fields, particularly in art and landscape preference, may be applicable. In a survey based on visual preference of natural landscape scenes, for example, there was no correlation found between preference for certain landscapes and the corresponding scales of their elements in respect to people (Tveit, 2007). Because such studies are focused more on scenery, it is difficult to understand applicability to hardscape. Thus, measures of complexity and how it impacts preference should be considered. Research has shown that in a preference survey of abstract art, preferences were generally higher for art pieces with higher levels of complexity (Osborne and Farley, 1970). Another survey found similar results. While increasing complexity initially resulted in higher preference levels, these preference levels eventually plateaued and decreased (Vitz, 1966). This would imply that there is an ‘ideal’, or largely preferred level of complexity. Preference for complex images, however, has been found to be dependent upon the individual. Research has shown that people

more familiar and exposed to complex images are more likely to prefer simplicity. The inverse was found to be true as well, with participants more familiarized with simple images preferring complexity (Tinio and Leder, 2009). In terms of framing and edge treatment, most of the existing research focuses more intently on the content’s relationship to the frame, rather than the frame itself. Research has found that content more centrally located within a frame results in a higher rating of aesthetic preference. As content moved further from the central location, preference levels decreased. The next highest locations for content were found at the horizontal and vertical axes, with locations along the diagonal axes rating lowest (Kovacs and Julesz, 1994). Research focusing on balanced compositions and line thickness may also be applicable in these categories. An early survey of balance found that when thinner lines were located along the edges of an image, the composition was more balanced and therefore, more aesthetically preferred. In the same survey, compositions utilizing thicker lines were considered more balanced when they were placed in the center of the image (Bullough, 1907).

While prior research was not performed directly with hardscape design, the results and findings based on preferences of balance, size, framing, and complexity can still be tested and applied to creating more aesthetic hardscapes.



Figure 2.6 EX: Smaller vs. Larger Pavers

Image Credits: Unilock

MATERIALITY AND PERCEPTION

Perception of space can vary from one person to another. A public plaza paved with concrete may make one person feel uneasy, while making another person feel at home. Social and spatial aspects of a place have varying impacts on how places are perceived, and materiality plays a role in that perception as well. For example, a wooden bench with smoothly curved edges may be perceived as being more inviting than a metal chair built with sharp right angles (Cotter, et. al, 2017). In this case, materiality is the driving force behind creating this positive or negative view, but perception is often driven by an amalgamation of materiality and contextual components (Frers et. al, 2007). Additionally, materiality impacts perception in that it can influence and encourage interaction. Interaction with material can lead to a positive or negative result in someone's mind, but this results in the formation of a perception regardless. Dynamic materiality that provokes interaction, whether that be physical or mental, helps to generate experiences (Reinhardt and Jakovich, 2009). Based on past research primarily performed in the fields of industrial and product design, we do know that material characteristics influence perception. We know that in indoor environments, the application of wooden materials reduces psychological stress responses in comparison to environments without wood materials (Burnard and Kutnar, 2015). In addition, we also have begun to learn more about how color and texture affect how we view materials. Material perception of warmth can be heavily impacted by the application of warmer colors and rougher textures (Wastiels et. al, 2012). In a similar survey, perceptions of warmth and pleasantness were evaluated based on color and material type. Following a survey, it was found that color and material were well-connected to perceptions of warmth, but little connection was made to perceptions of pleasantness (Fenko et. al, 2010).

Different materials, due to their inherent qualities, may evoke different responses of aesthetic preference. This knowledge can be applied to hardscape design in that there are countless variations of materiality and implementation strategies that can be used in hardscape. When carefully considered, these variations can be used by designers to create more aesthetically pleasing public spaces.

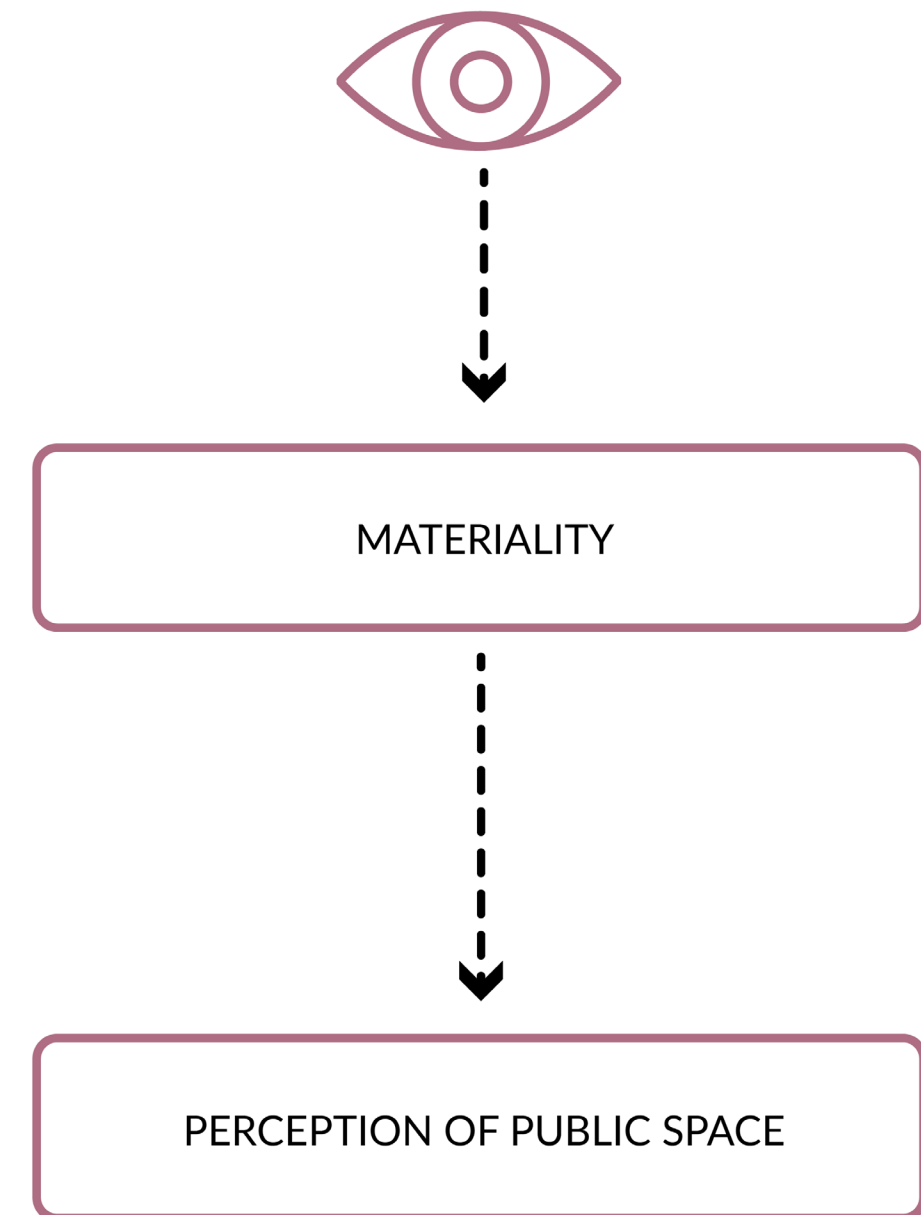


Figure 2.7
Materiality and Perception

STUDY SITE | BOSCO PLAZA

Bosco Plaza is a public plaza space on the campus of Kansas State University in Manhattan, Kansas. The site measures approximately 50,000 square feet and is located north of the Kansas State Student Union and south of Seaton Hall. Along the western portion of the plaza is a vehicular drop-off area, an ADA accessible ramp, a partially covered seating area, and a water feature. The eastern portion of the plaza provides a small vehicular drop-off and a lawn space. While there is some vegetation at the edges, the plaza is predominantly hardscape and is primarily used as pass-through space for circulation. However, the space also supports gathering for special events like concerts, festivals, public art, farmers' markets, and food trucks.

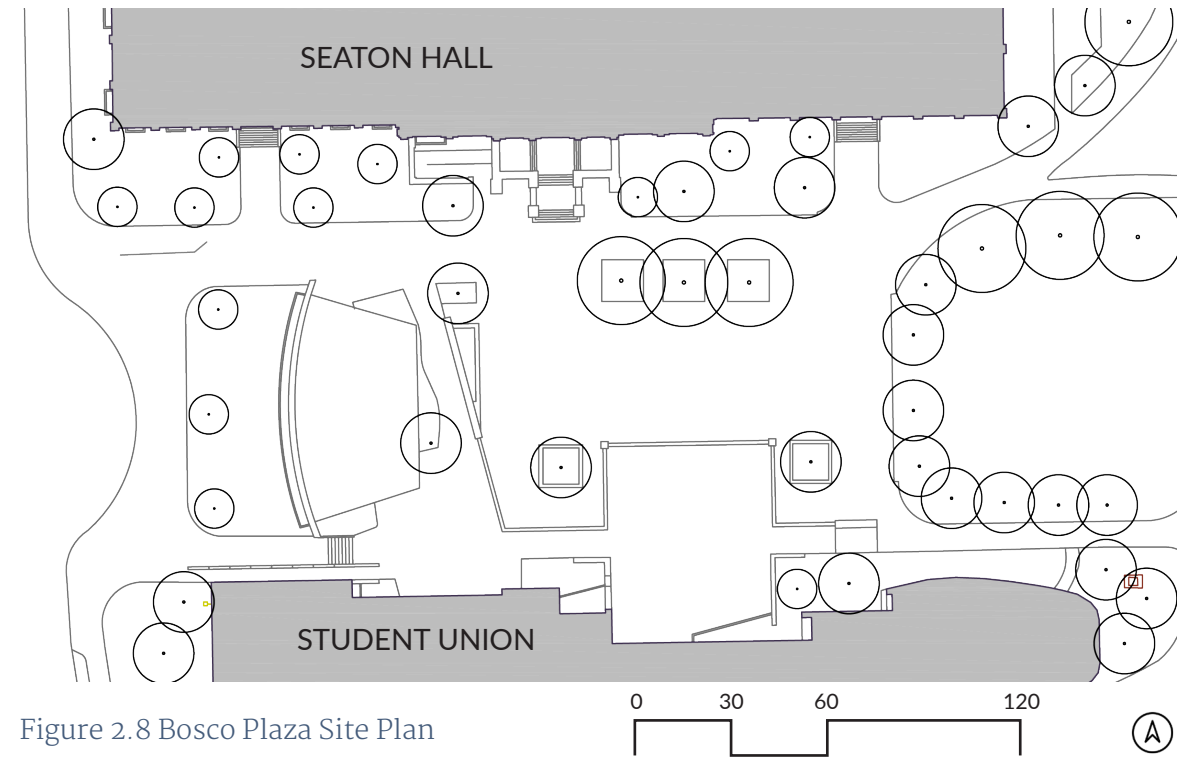


Figure 2.8 Bosco Plaza Site Plan



Figure 2.9 Bosco Plaza Context

STUDY SITE | BOSCO PLAZA

Bosco Plaza was chosen as the study site for this project because of its potential as a successful public space in the future. In its present state, the plaza's recognizable failings present many opportunities for the project to implement improvements. As the central public space on campus and with its proximity to major campus buildings, the plaza has the potential to be a defining outdoor space for the university. In its present design, however, the plaza lacks a distinct identity. In terms of its physical components, Bosco Plaza has room to improve as well. The hardscape, composed of poured concrete, is uninspiring and deteriorating. Other elements, such as shade structures, seating options, and the water feature, are dated and unattractive. Accessibility in the plaza could also be improved, as accessibility to the student union is limited. Each of these factors make Bosco Plaza an ideal site in which to conduct this research and apply the findings.



Figure 2.10 View looking west across Bosco Plaza (Updike, 2019)



Figure 2.11 Bosco Plaza view looking southeast toward Student Union (Updike, 2019)

RESEARCH STRATEGY

3

chapter three

RESEARCH STRATEGY

OVERVIEW

This project uses a mixed-methods approach to understand aesthetic preferences of common hardscape design strategies, and to assess if those strategies, when applied to a redesign of Bosco Plaza, influence perceptions of attractiveness, safety, welcoming, comfort, and interest in a public space. Specific methods include: a precedent study, a site analysis with an intercept survey, a preference survey, a projective design, and a perception survey.

The project is comprised of three primary components (highlighted in orange in Figure 3.1): the hardscape design preference survey, the bosco plaza projective design, and the projective design perception survey. The results of the hardscape design preference survey helped to inform the hardscapes implemented in the projective design and findings from site analyses informed programming decisions. The projective design was then used as a base in which to implement six hardscape design concepts in the projective design perception survey. Ultimately, each of these components works together to gain a stronger understanding of what hardscape attributes are most preferred and how hardscape impacts perceptions of public space.

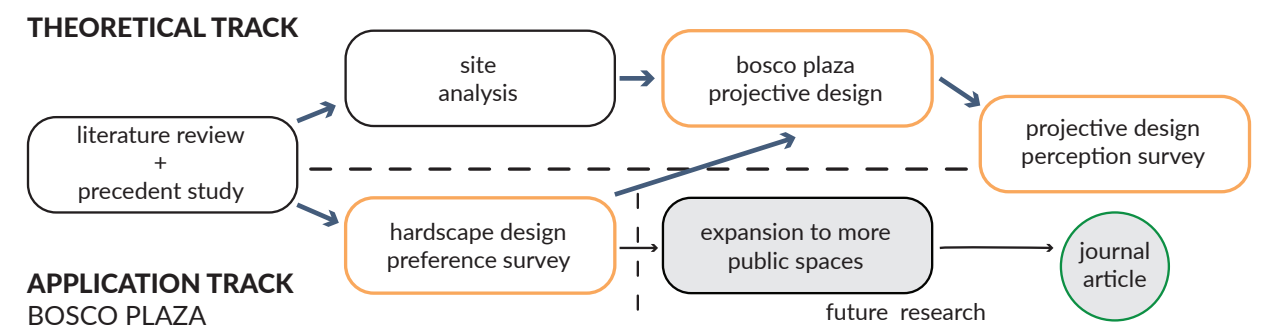


Figure 3.1 Project Workflow Tracks

PRECEDENT STUDY

To gain an understanding for how the aesthetic attributes of color, pattern, frame, edge, and size can be used in different hardscape design applications, a selection of eight design precedents were examined. Precedents selected were all plazas that utilized unit pavers located in high-traffic public locations, many of which are on university campuses similar to Bosco Plaza. Precedents included: Bienen School of Music, Bristol Community College, Brown University, Colorado Esplanade, Cleveland State University Center for Innovation in Medical Professionals, North Gateway Plaza, Rutgers School of Business, and The Yard at Rutgers University.

For each, the overall square footage, project designer, and location was documented. Then, the hardscape design for each precedent was analyzed for the number of colors used, the type of patterning of used, the use of framing pavers, the use of edging pavers, and by the size of its pavers. While not every precedent included an application of all five aesthetic attributes (color, pattern, frame, edge, and size), this collection of precedents illustrates a range of examples of unit pavers in public spaces.

SITE ANALYSIS

To document and assess the existing conditions of Bosco Plaza, a site analysis was conducted. The analysis consisted of onsite observations, via assessment from Gehl Institute including the: People Moving Count, Stationary Activity Mapping, the Social Space Survey, the Place Inventory, and Twelve Quality Criteria and a user intercept survey.

People Moving Count

To capture a sense of how many people pass through Bosco Plaza on a given day, the Gehl's People Moving Count tool was used. An imaginary line was projected across Bosco Plaza and the number of people that crossed the line during a set amount of time were tallied, as well as their mode of transit (e.g. walking, biking). This tool was used in October of 2019 starting at 11:20 AM. This time was selected as it is a common time for courses to end on campus, leading to a high number of people moving through Bosco Plaza.

Stationary Activity Mapping

To better understand how people use Bosco Plaza when spending extended amounts of time in the space, the Stationary Activity Mapping tool was used. On a Wednesday in October of 2019, the research observer moved through the space once per hour, marking on a map where people are spending time, how many people there are, and what they are doing. In addition, age and gender of occupants are estimated to gauge how inclusive and welcoming the space is. This particular day was selected for its good weather conditions, which encouraged people to spend extended periods of time in the space. This tool was helpful in providing new programming ideas in projective redesigns of the plaza.

Social Space Survey

The Social Space Survey was used to learn more about the defining spatial characteristics of Bosco Plaza and what gives the site a feeling of welcoming and how it encourages social interaction. Notes were taken on seating options, views, access points, activity spaces, night lighting, and other elements that encourage people to spend time in the space. Additional notes were taken on elements present that might hinder people from socializing, such as physical barriers, off-limits areas, or steep slopes. Thirdly, the survey includes a section for sketching the patterns of the space. Taking note of and sketching elements that attract people, elements that bring people closer together, and elements that allow people to disperse away from main focal points gives the observer a chance to visualize the dynamics and driving forces that define the public space. For Bosco Plaza, this tool was helpful in identifying who uses the space and how specific elements helped shape their experiences.

Place Inventory

The Place Inventory tool was used to gain a stronger understanding of the physical components of Bosco Plaza. Using a base map of the plaza, notes were taken focusing on the presence of the following: seating, vegetation, shade/shelter, bike parking, trash receptacles, lighting, play areas, water features, public art, walking/wheelchair obstacles, physical boundaries, and street crossings. Each of these components are then noted on a base map using various symbols provided by the Gehl Institute. For Bosco Plaza, the tool was used to identify the locations and quantities of waste receptacles, light fixtures, and seating options.

Twelve Quality Criteria

The Twelve Quality Criteria tool was used to provide an evaluation of the experience within Bosco Plaza. This tool focuses on the themes of protection, comfort, and enjoyment for occupants of a space. The protection section of the survey asked the observer to rank the space in terms of protection from vehicles, other people (lighting and overall perception/reputation), and unpleasant sensory experiences like noise, dust, and poor weather. The comfort section is the most in-depth section of the survey. Here, the observer is rated the space on its options for the following: mobility, sitting, seeing, conversating, playing, and standing. Finally, the tool employs its enjoyment section. In this section, the observer noted the scale of the space amongst its surrounding context, the opportunities people have to enjoy positive weather aspects, and the overall aesthetic experience of the space. For Bosco Plaza, the Twelve Quality Criteria tool was helpful in identifying positive and negative qualities of the space. Understanding these qualities was important in understanding where the plaza could be improved.

INTERCEPT SURVEY QUESTIONNAIRE

The second piece of the site analysis for Bosco Plaza included an intercept survey questionnaire. The intent of the survey was to gain an understanding of passersby's opinions and perceptions of the plaza. The survey was designed to take approximately two minutes to complete to ensure participant interest. Survey participants were asked demographic questions to give an idea of who uses the space. In addition, participants were asked about the things they liked and disliked about Bosco Plaza, how often they visited the space, and how they thought Bosco Plaza could be improved.

Participants were asked to optionally leave their contact information if they were willing to participate in a follow-up survey (the hardscape design perception survey). The intercept survey was administered to occupants of Bosco Plaza during the months of November and December 2019, and January 2020. During 30-minute sessions, passersby were approached and asked if they would like to participate. Thirty survey questionnaires were completed.

HARDSCAPE DESIGN PREFERENCE SURVEY

Survey Overview and Introduction

The purpose of this survey was to learn which aesthetic attributes of hardscape designs with pavers are most preferred. Literature review helped identify the five common aesthetic attributes: color, pattern, edge, frame, and size. Using paired image comparison, Likert-scale ranking, and open-ended questions, the survey sought to discover how these aesthetic attributes are perceived and preferred in hardscape designs with pavers. In image comparison questions, participants were shown two images of hardscape designs with different

aesthetic and asked to select the design strategy they most aesthetically preferred (e.g., one color vs. two colors). In Likert-scale questions, participants were shown multiple images of hardscape designs with a single aesthetic attribute (e.g., orderly patterning) and asked to rank their preference on a scale of one to five, with one being the lowest preference and five being the highest. For each of these Likert-scale questions, participants were also asked, in an open-ended question, to explain why they made their choices. The survey contained a total of 73 questions.

Survey Sample & Recruitment

The target population for survey participants were students and faculty in the College of Architecture, Planning, and Design at Kansas State University (CAPD), which includes the programs of: Architecture, Environmental Design, Interior Architecture and Product Design, Landscape Architecture, and Regional and Community Planning. This population was selected because of their specific exposure to design education. It was assumed that with exposure to design, participants would be more likely to understand and able to articulate what they preferred aesthetically, than participants with no specific design education.

Participants were recruited through an announcement in an email newsletter to all (600+) members in the CAPD. The announcement included a brief overview of the study's purpose and a link for participants to self-enroll and take the survey.

Demographics

Participants were asked to provide their name, gender, and an email address so they could be contacted about participating in a follow-up survey. They were also asked to identify themselves as either a student or faculty member, the discipline they are affiliated with in the CAPD, and their level of educational or teaching experience.

Variables

Variables assessed included:

Color, Pattern, Edge, Frame, and Size.

Color Factors:

One Color, Two Colors, Three+ Colors

Pattern Factors:

Orderly, Dispersed

Edge Factors:

Designs Using Edging Pavers, Designs Not Using Edging Pavers

Edging Pavers Contrasting Other Pavers

Edging Pavers Not Contrasting Other Pavers

Frame Factors:

Designs with No Framing Pavers

Single-Row Pavers

Multi-Row Pavers

Size Factors:

Smaller Pavers, Larger Pavers

Color

Questions in this section of the survey were designed to assess preference for the number of colors used in a hardscape design, specifically applications of one color, two colors, and three or more colors. The format included paired image comparison, Likert-scale, and open-ended questions.

Participants were given six questions of paired images and asked to select their preferred option. Images were of existing plazas with pavers, cropped to eliminate context, and presented in grayscale so the actual colors were not distracting. Factor permutations included (2) one color vs. three+ colors; (2) three+ colors vs. two colors; and (2) one color vs. two colors.

Each of these comparison questions utilized two images. For example, in one question, an image showing an application of one paver color was placed next to a hardscape design showing an application of three or more paver colors. The survey participants were then asked to choose their preferred design between these two images. In order to obtain more reliable data, each of these categories were tested twice against one another. The survey went as follows: One Color vs. Three+ Colors, Three+ Colors vs. Two Colors, One Color vs. Two Colors, Two Colors vs. One Color, Three+ Colors vs. Two Colors, and Three+ vs. One Color.

Likert-scale ranking questions followed this color comparison section. Here, each of the categories (one color, two colors, three-plus colors) were represented by four images. Participants were then asked to rate their aesthetic preference of each design strategy on a five-point Likert-scale, ranging from 'strongly like' to 'strongly dislike'. In an open-ended question, participants were then asked to describe why they answered the Likert-scale questions the way they did. To conclude this section, one question presented four images of Bosco Plaza that focused specifically on the use of color in its hardscape design. Participants were asked to rate the images on a Likert-scale and asked to describe their reasoning for their choice.

Pattern (Application of Color)

Questions in this section were designed to assess preference for pattern, specifically orderly and dispersed patterns created by different applications of color. Focused intently on pattern in terms of application of color, this section did not assess preference for paver layout/orientation. The format included paired image comparison, Likert-scale, and open-ended questions.

Following the same format as the questions in the color section, the questions pertaining to pattern include six

paired comparison images, where participants were asked to select their preferred design strategy. In this section, images representing orderly patterns of color were compared against images of dispersed applications of color. Following these comparison questions, participants were shown (1) image displaying a design with an orderly pattern application of color and (1) image with a dispersed pattern application of color. For each of the images, participants were asked to rank their preference on the five-point Likert-scale from ‘strongly like’ to ‘strongly dislike’ and explain their response in a corresponding open-ended question.

Paver Edging

Questions in this section were designed to assess preference for types of edging paver strategies in hardscape design. The four factors tested were: designs using edging pavers, designs not using edging pavers, designs with edging pavers that contrasted in color to other pavers, and designs with edging pavers that did not contrast in color to other pavers. The format included paired image comparison, Likert-scale, and open-ended questions.

To begin, images of designs utilizing edging pavers and designs not using edging pavers were compared against one another. In this section, participants were asked to select their preferred design strategy in two questions. Following this, images of designs with edging pavers with contrasting paver color were compared against designs with edging pavers with non-contrasting paver color. Again, participants were asked to select their preferred design strategies in two questions. Participants were then asked about each of the four factors and to answer preference on a five-point Likert-scale from ‘strongly like’ to ‘strongly dislike’. In a corresponding open-ended question, participants were asked to explain why they responded in the way they did.

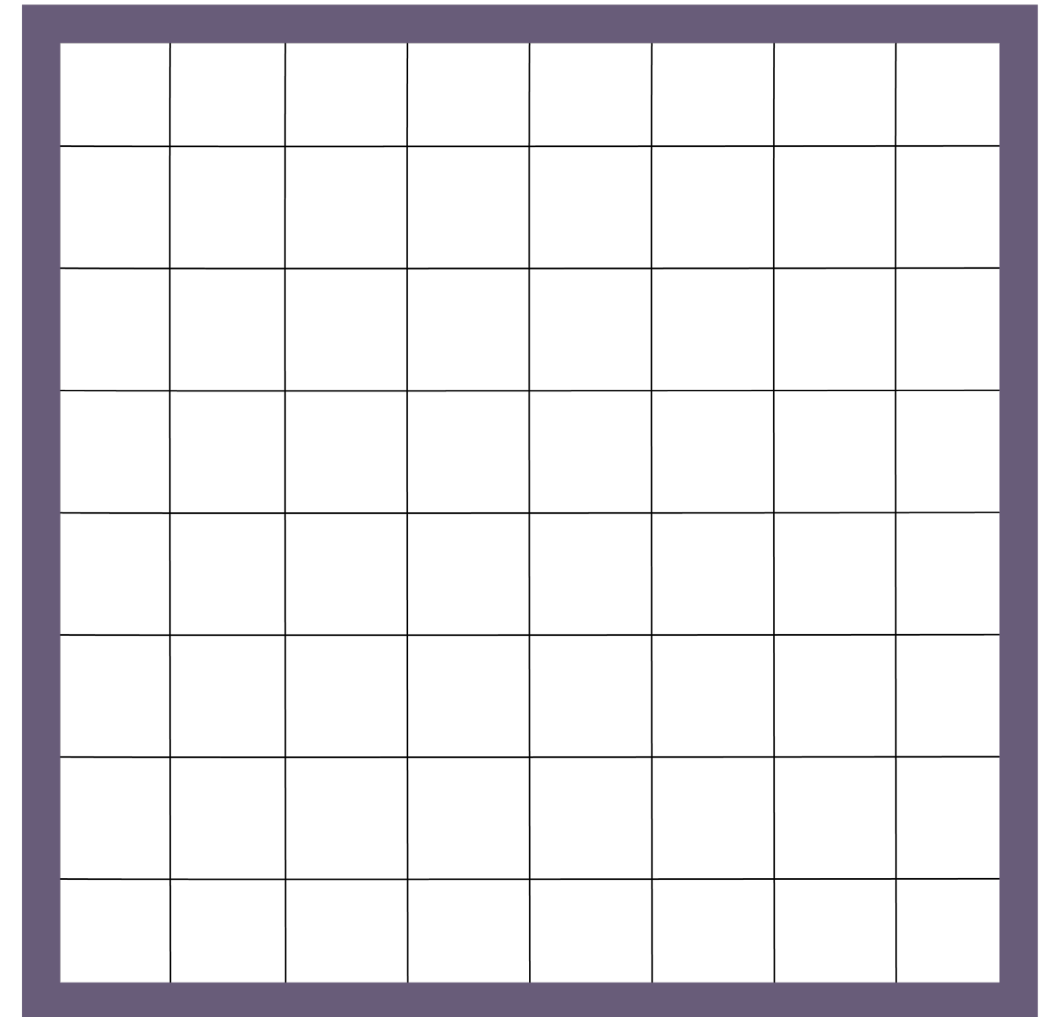


Figure 3.2
Edging Paver Diagram: Edging pavers in purple.

Framing

Questions in this section were designed to assess preference for application of framing paver strategies in hardscape design. In the frame section, three factors were tested: designs with frames composed of multiple rows of pavers, single rows of pavers, and designs not utilizing frames were used. The format included paired image comparison, Likert-scale, and open-ended questions.

Each of the three framing factors were tested against one another in two questions of paired images, resulting in a total of six questions. The survey went as follows: (Single-Row Frame vs. Multi-Row Frame, Single Row Frame vs. No Frame, No Frame vs. Multi-Row Frame, No Frame vs. Multi-Row Frame, No Frame vs. Single-Row Frame, Multi-Row Frame vs. Single-Row Frame). Following the comparison questions, one five-point Likert-scale question, with response options ranging from 'strongly like' to 'strongly dislike' was asked about each of these categories (no frame, single-row frame, multi-row frame). Participants were also asked in corresponding open-ended questions to explain the reasoning for their responses.

Paver Size

Questions in this section were designed to assess preference for paver size in hardscape design. In this section, two factors were tested: designs with smaller pavers and designs with larger pavers. The format included paired image comparison, Likert-scale, and open-ended questions.

In the image comparison section, participants were asked to choose their preferred strategy of paver size between designs displaying smaller pavers and larger pavers. The survey asked a total of four comparison questions. Following this portion, one five-point Likert-scale question was asked for designs with smaller pavers and one was asked for designs with larger pavers. Participants were also asked to in corresponding open-ended questions to explain their reasoning for their responses.

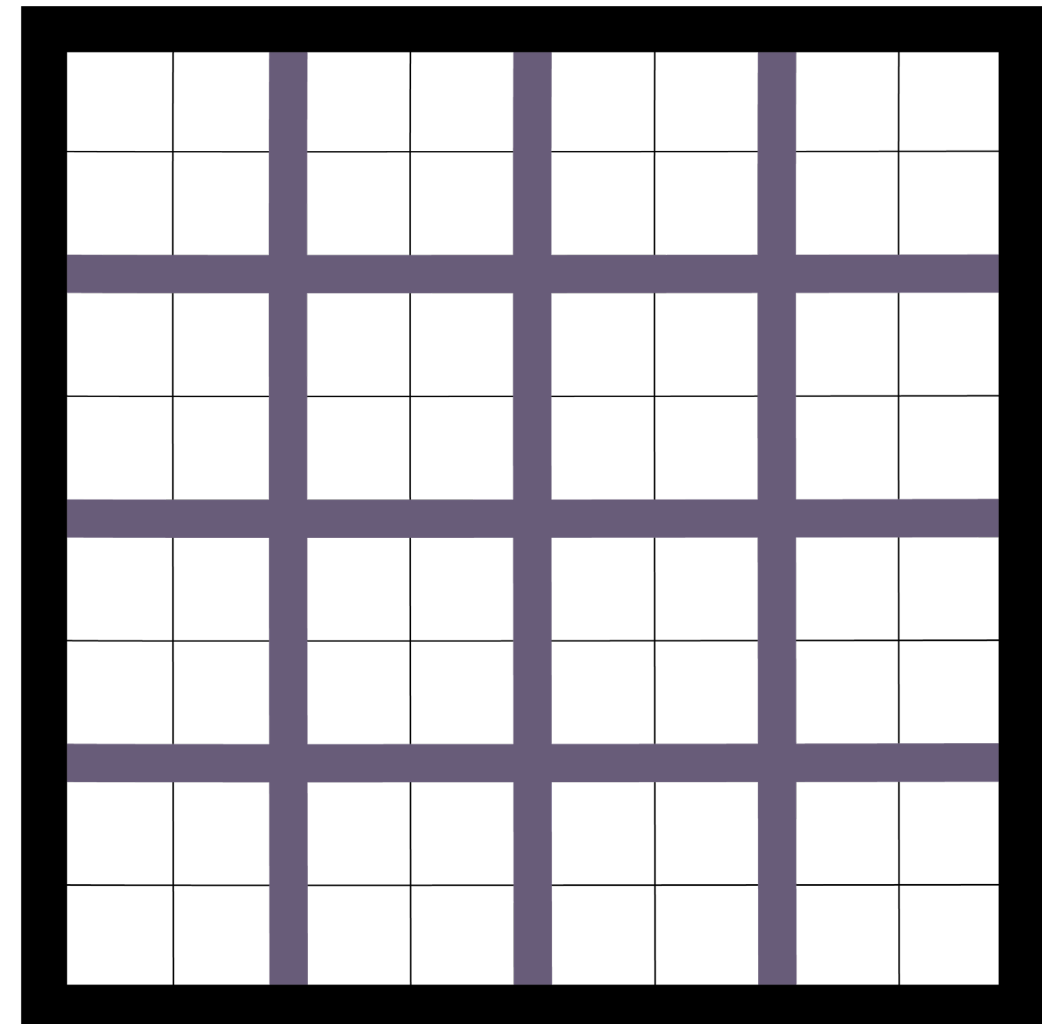


Figure 3.3
Framing Diagram: Framing pavers in purple.

Block Layout

This section, composed of one question, was designed to assess preference for paver layout in hardscape design. The block layout section displayed six standard paver layouts: Herringbone at 90 degrees, Herringbone at 45 degrees, Stretcher Bond at 90 degrees, Stretcher Bond at 45 degrees, Stack Bond, and Basket Weave. In this question, participants were asked to rank order their aesthetic preference of the six designs with one being their most preferred and six being their least preferred.

Bosco Plaza's Existing Hardscape Design

This section was designed to assess preference for Bosco Plaza's existing hardscape design. The format included a Likert-scale question and an open-ended question. Four images of Bosco Plaza's existing hardscape design were shown at once. Participants were asked to rate their aesthetic preference of the hardscape design on a five-point Likert-scale, from 'strongly like' to 'strongly dislike', and to describe the reasoning for their choice in an open-ended question.

PROJECTIVE DESIGN

The purpose of creating a projective design of Bosco Plaza is two-fold. First, a redesign of the plaza space reveals how Bosco Plaza can become a vibrant public space through the adjustment of its current design elements and the implementation of new design amenities. Second, the projective design allows for further exploration into how hardscape design impacts perceptions of public space. Using knowledge and concepts gleaned from previous research, observation, and primarily- analysis of the results from the Hardscape Design Preference Survey- six design concepts of Bosco Plaza's hardscape were completed. These hardscape design concepts were modeled using Rhino and rendered using Lumion, to generate images with a high sense of realism. Each of the six hardscape design concept were rendered from three consistent views and shown in a consistent order in the survey.

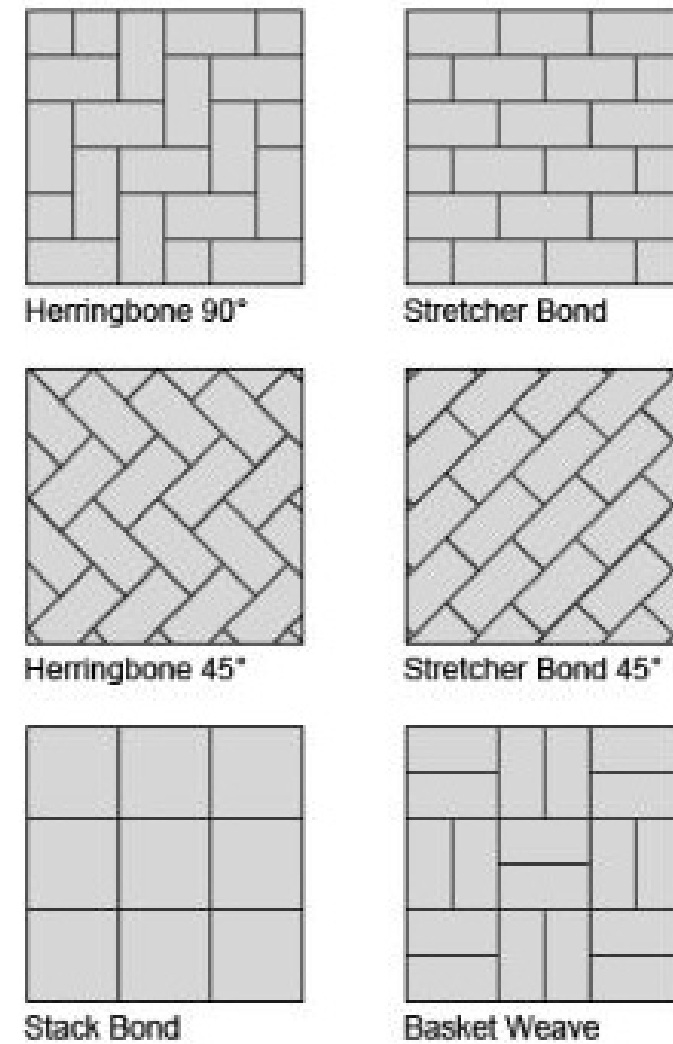


Figure 3.4 Block Layouts
(Pacific Brick Paving, 2020)

PROJECTIVE DESIGN PERCEPTION SURVEY

Following the redesign of Bosco Plaza and development of six hardscape design concepts, a second survey was developed. The purpose of this survey was to learn more about how attributes of hardscape design influence perceptions of attractiveness, safety, welcoming, comfort, and interest in public space.

Participants were recruited by contacting participants from the initial Hardscape Design Preference Survey. The Projective Design Perception Survey was distributed by an emailed link to a Qualtrics online survey. Participants were enrolled by clicking on the link and taking the survey.

Participants were asked to optionally provide their name, email, and gender. Similar to the Hardscape Design Preference Survey, participants were also asked to list their status as a student or faculty of the CAPD, their discipline within the college, and their level or educational or teaching experience.

In the survey, participants were first shown a site plan drawing and images of Bosco Plaza in its current state to orient them and familiarize themselves within the space. Following this, participants were shown three images of each of the six Bosco Plaza hardscape design concepts. These three images, which remained at the same viewpoint for each hardscape design concept, showed Bosco Plaza looking from the northwest at a bird's eye angle first. The second view, taken at eye-level, looked across the plaza from the east. Finally, again taken from eye-level, the third viewpoint was taken looking from the southwest.

After all six of the hardscape design concepts were shown, participants were surveyed on multiple components of their perception of the space. Participants were first asked to rank order their preference of the six hardscape design concepts in terms of attractiveness. Following this question, participants were asked to rank order (with 1 being most preferred, and 6 being least preferred) their feelings of: safety, welcoming, comfort, and interest.

The survey then focused on attributes of hardscape design. Participants were asked to rank order the six hardscape design concepts in terms of their use of color, pattern, framing, edge, and paver size. The survey concluded by asking participants to select their overall most preferred hardscape design concept and to explain their reasoning in a corresponding open-ended question.

FINDINGS

4

chapter four



FINDINGS

OVERVIEW

The findings section will report the results of the Bosco Plaza site analyses, the intercept survey, and the Hardscape Design Preference Survey. Findings from the final survey, the Projective Design Perception Survey, will be reported in Chapter Five.

SITE ANALYSIS

People Moving Count

The People Moving Count provided an understanding the frequency and intensity of Bosco Plaza's occupancy. In (6) ten-minute observation sessions, it was found that most people in the plaza walk through the space. Wheelchairs, bicycles, and skateboards were documented as modes of transportation, but not observed as frequently. Weather did not seem to impact the amount of people moving through space. Time of day seemed to have the greatest impact on the amount of people in the space. Pedestrian flow increased significantly during the university's 'passing periods'; that is, in the moments before and after classes convene. While classes were in session, pedestrian traffic tapered off noticeably, but some occupancy was still noted.

Stationary Activity Mapping

The Stationary Activity Mapping helped reveal that stationary activities in Bosco Plaza are primarily concentrated along the peripheries of the space. Much of the observed stationary socializing occurred at the entrance to the Student Union on the southern edge of the space. Additionally, the shaded seating area on the western edge of the plaza attracted people to sit, eat, and talk for extended periods of time. The middle of plaza is mainly for circulation except in the case of an event, such as a concert. When events are occurring at the plaza, they typically take place in the middle of the space. This encourages people to stand, socialize, and spend more time in Bosco Plaza than they typically would.

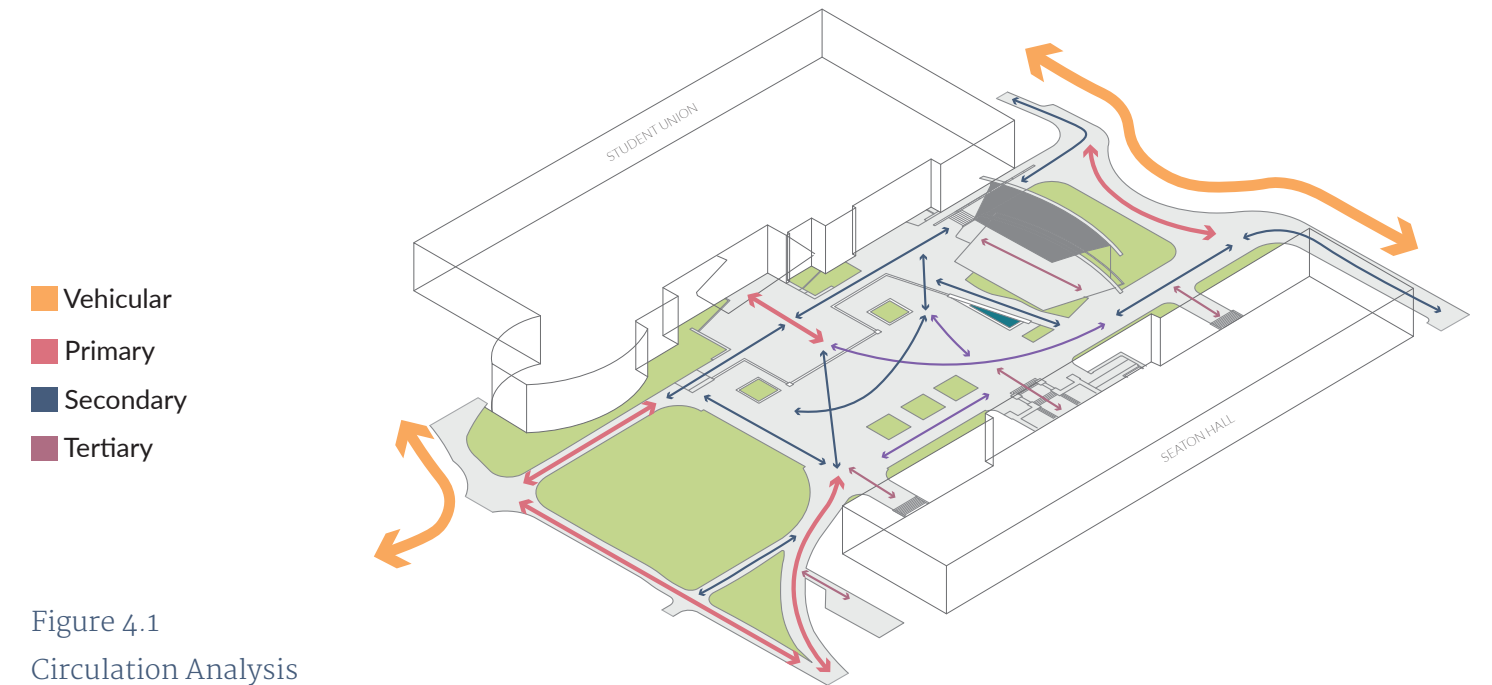


Figure 4.1
Circulation Analysis

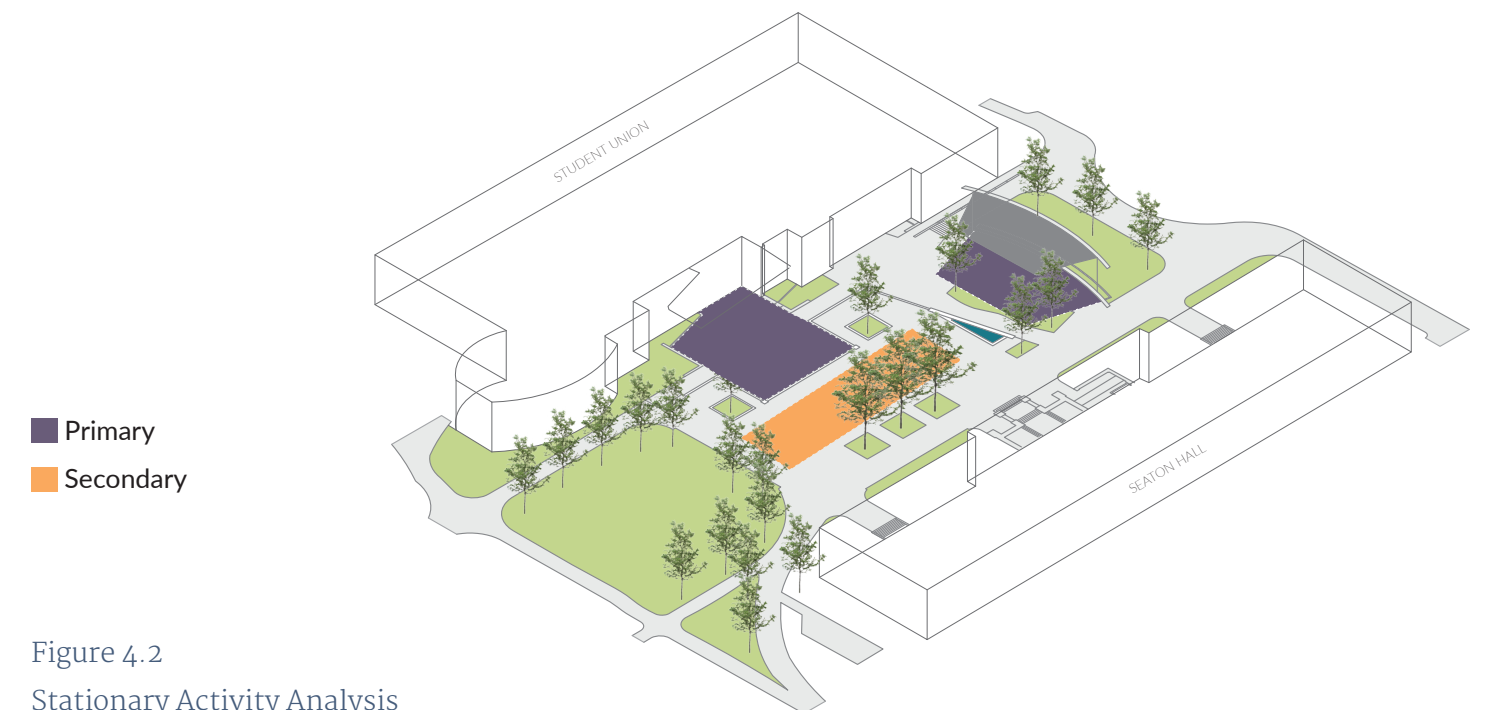


Figure 4.2
Stationary Activity Analysis

Place Inventory

The Place Inventory tool revealed that Bosco Plaza does provide shade and shelter in certain areas. The plaza also gives occupants opportunities to sit and socialize, with protection from nearby roadways, and accessible walkways. The space could, however, improve its use of vegetation, night lighting, and its overall aesthetic attractiveness.

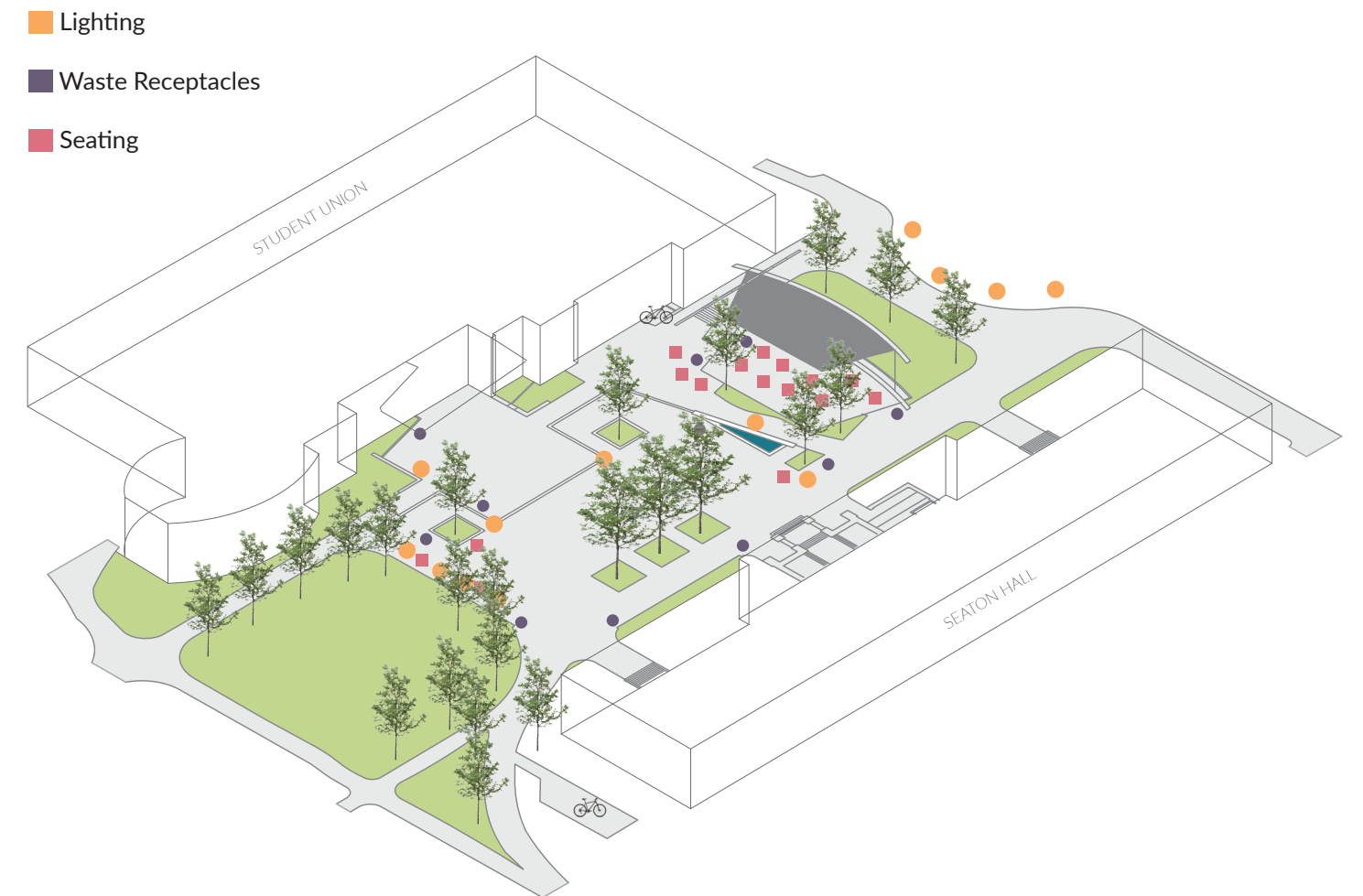


Figure 4.3
Place Inventory

Social Space Survey

Overall, the plaza is composed primarily of an open lawn space, an open plaza space, and a shaded seating area. Vegetation separates the lawn and the plaza, and a water feature is the primary divider between the plaza and the seating area. Following the Inventory section of the Social Space Survey, it was found that while the space is lacking in certain areas, Bosco Plaza does provide some positive components that encourage interaction. For example, the plaza is large enough for markets and demonstrations and equipped with tables for eating and relaxing. Bosco Plaza also provides views of Anderson Hall and Ahearn Fieldhouse at its eastern and western ends respectively. Entering and exiting the plaza is made easy with clearly defined entrances. The plaza does, however, have areas that it could be improved. Bosco Plaza has a small green space, but it is not easily accessible as it is blocked by vegetation, benches, and trash receptacles. Providing easier and clearer access to this green space would diversify the types of programs implemented in the plaza.

While there is plenty of seating in the form of benches and chairs, opportunities for seating are rather formal. There are limited opportunities for occupants of the space to sit comfortably on steps or on lawn. In terms of accessibility, Bosco Plaza could be improved. Much of the plaza is relatively flat and people with limited mobility appeared to navigate the space easily, but the green space on the eastern side of the hardscape is difficult to access and small steps divide the space in an unmeaningful way.

Additionally, it was observed that the plaza is diverse in terms of ethnicity and gender. It can be assumed that a reason for this dynamic is the plaza's location on a university campus. Because of this, occupants were also observed to be homogeneous in terms of age. Most people observed within the space were adults, likely members of the university community, passing through.



Figure 4.4
Social Space Survey

Twelve Quality Criteria

Under the Twelve Quality Criteria, Bosco Plaza tested well. In the category of Protection, the plaza provides protection against vehicular traffic. The eastern side of the plaza is well screened from a vehicular roundabout and drop-off through vegetation and distance, while the western side of plaza screens a drop-off with bollards and grade change. In general, the plaza is kept clean and provides shelter from sun and rain, rainfall, but the plaza faces issues with stormwater drainage. In events of moderate to heavy rainfall, there are often areas of standing water in the plaza. In terms of protection, Bosco Plaza needs better night lighting. Even though it is primarily occupied during the day, the campus remains open throughout the night. In terms of Comfort, Bosco Plaza provides multiple options for seating that give occupants views of the campus.

Additionally, the plaza provides opportunities to be active, socialize, and simply stand and linger. In terms of mobility, the plaza is equipped with accessible ramps and is evenly sloped without any intense inclines. While the space is equipped with these ramps, it could be difficult for first-time visitors to immediately locate the ramps. In the category of Enjoyment, Bosco Plaza is well-scaled. The space and the surrounding buildings are at a human scale, and occupants of the space can be related to as people from anywhere in the site. In terms of protection from climatic elements, the plaza provides some shade structures at the entrance to the Kansas State Student Union on the southern side and the seating area on the western side of the plaza. Aesthetically, the plaza leaves some things to be desired, the paving design is uninspiring, and its surface is worn down, and there are opportunities for more vegetation. While the water feature located near the center of the space provides an auditory element, its appearance could be revisited as well.

- Above Average
- Average
- Poor

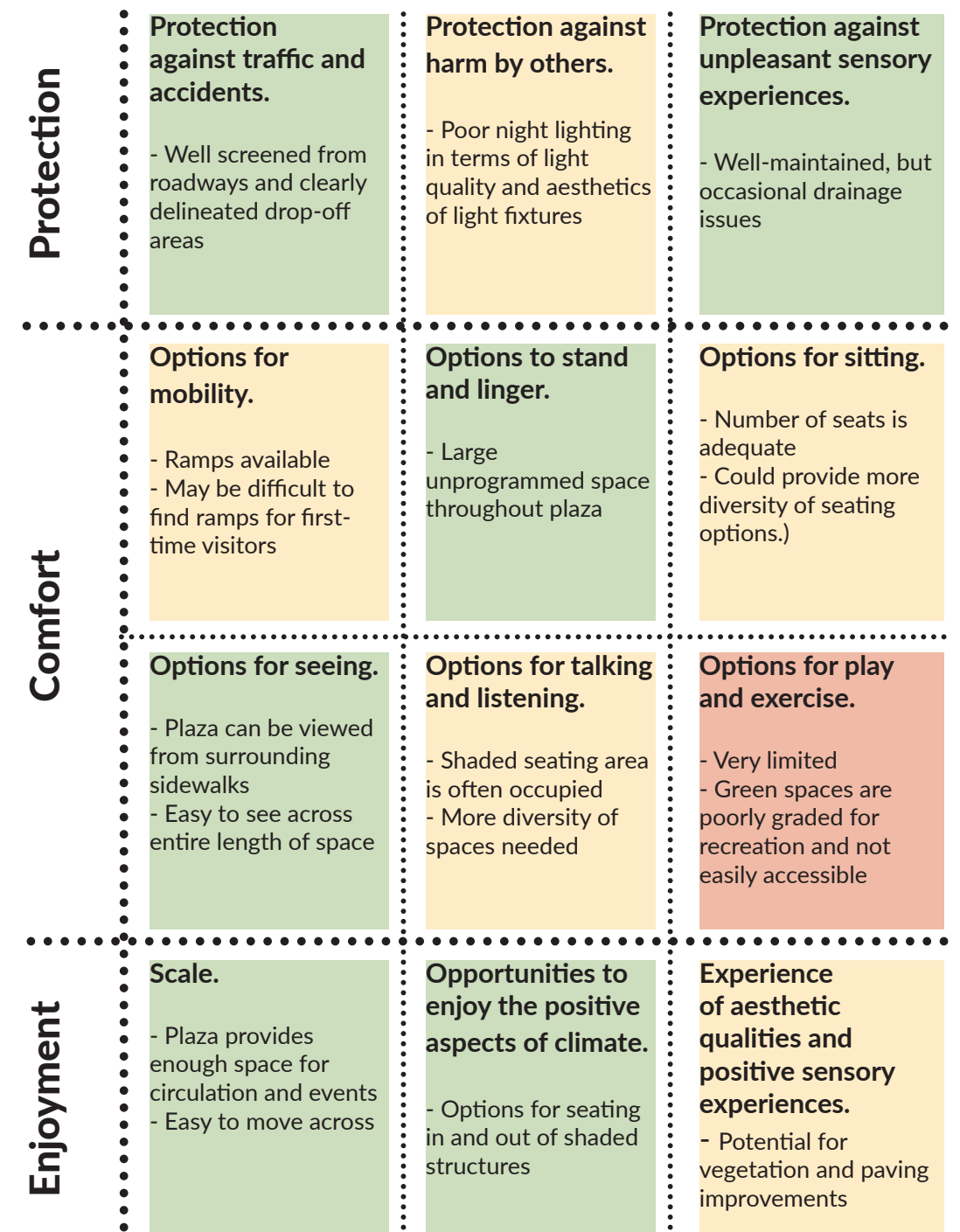


Figure 4.5 Twelve Quality Criteria applied to Bosco Plaza (Adapted from Gehl Institute)

Vegetation Analysis

Bosco Plaza is comprised of two lawn spaces, located on the western and eastern edges of the site. Each of these lawn spaces, however, are rarely occupied. The western lawn space is adjacent to a vehicular drop-off area and does not encourage or support recreational activities. Similarly, the eastern lawn space does not provide a good space for recreation in that it is inaccessible due to dense plantings and dipping topography. These dense plantings, primarily composed of shrubs and small trees like crabapples, are found along many of the edges of the plaza. While these plantings provide color and fragrance at certain times of the year, this planting strategy could be revisited to better compliment circulation patterns and social gathering spaces in the site.

The plaza is home to numerous healthy and mature trees that provide quality shade and character. Three large oaks located along the northeast sidewalk and three lacebark elms located in the middle of the plaza provide these qualities, and it would be highly recommended to preserve them.



Figure 4.6 Vegetation at eastern edge of Bosco Plaza. (Updike, 2020)

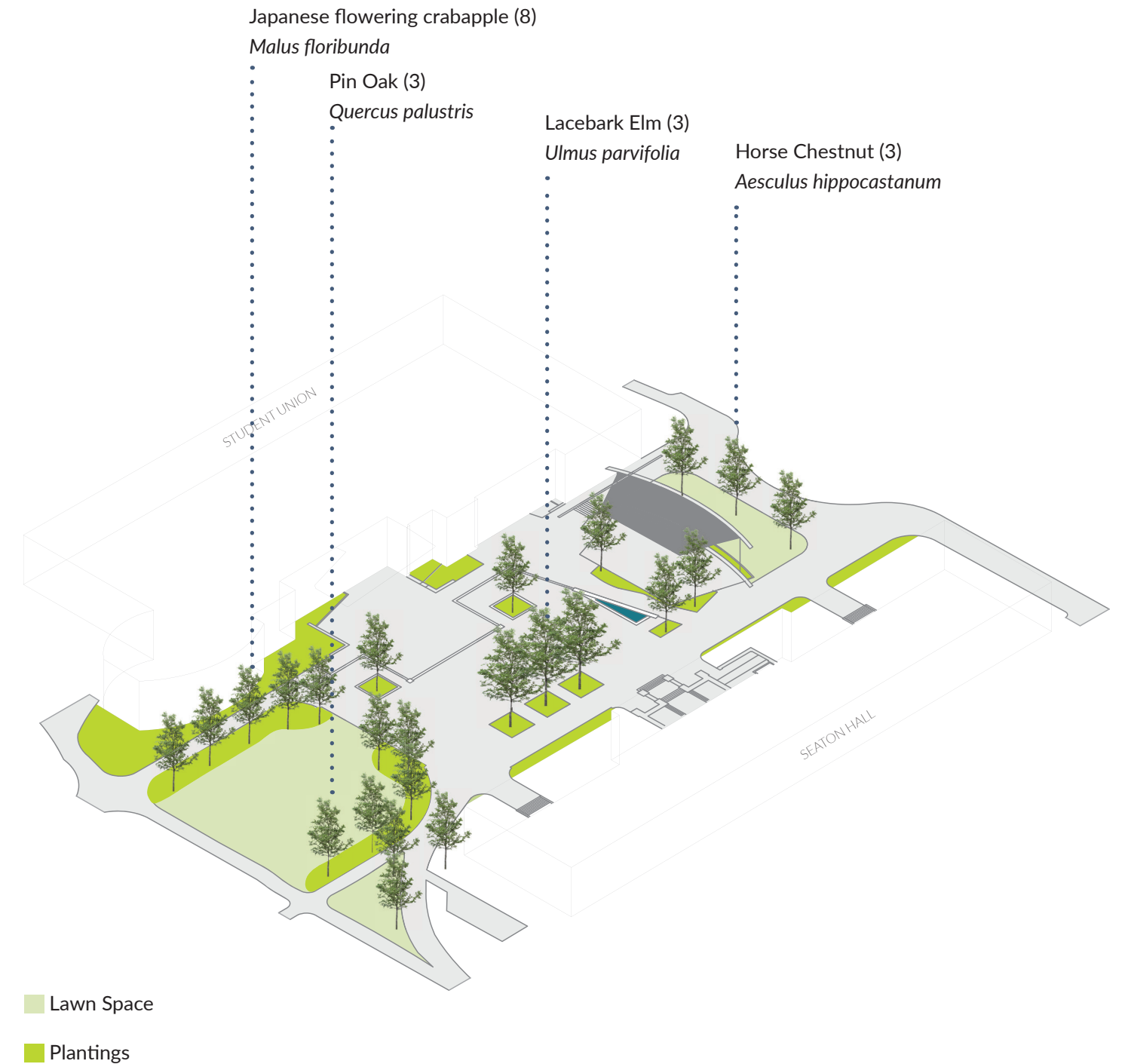


Figure 4.7
 Vegetation Analysis

Plaza Topography Inventory

Topographically, Bosco Plaza is split into two sections. The upper section provides access to the Student Union and the lower section provides access to a majority of the open plaza space, Seaton Hall, and access points to the surrounding campus buildings.

The plaza is split by steps, making the upper level approximately one foot higher than the lower level. The water feature also works with these steps, further dividing the space. Three ramps are present in the plaza, each providing ADA access throughout the space.



Figure 4.8
Levels of Bosco Plaza

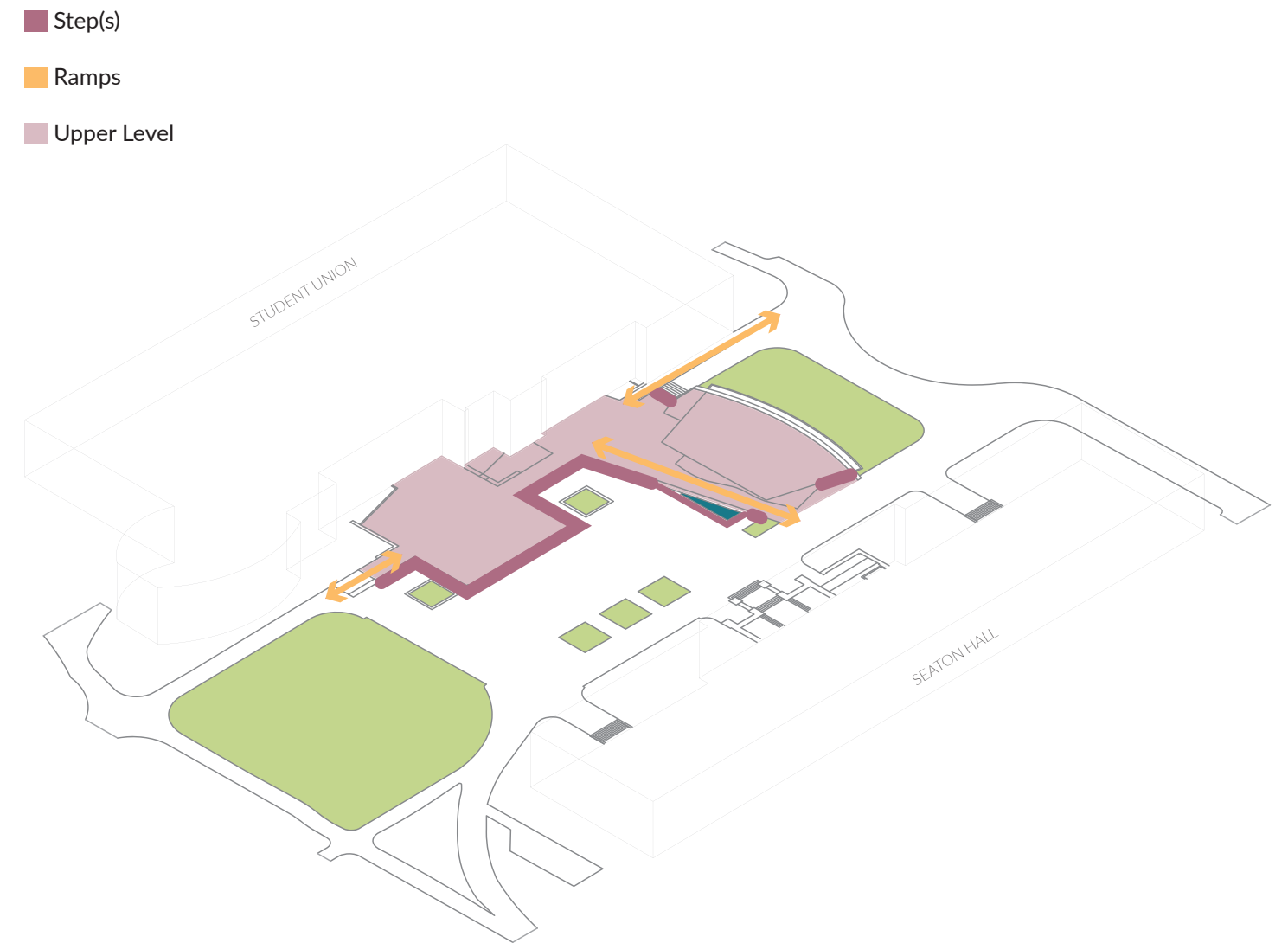


Figure 4.9
Topography Analysis

Plaza Amenity Inventory

Within Bosco Plaza, a handful of amenities are currently in place. Perhaps most evident of these amenities is a concrete water feature. Additionally, a large white clock tower is placed near the water feature. Two concrete planters provide seating near the Student Union, in addition to a shade structure equipped with tables and chairs on the western edge of the space.



Figure 4.10
Bosco Plaza Water Feature (Updike, 2020)



Figure 4.11
Amenity Inventory

BOSCO PLAZA INTERCEPT SURVEY

The Bosco Plaza intercept survey, completed in the Fall of 2019, sought to capture users' perception of the site, identify users' preferred features and identify design aspects/features that could be used in a redesign.

Overall, the findings from the intercept survey helped to confirm many findings from the site analysis. Mainly that the site is used primarily as a passing through space with dated features and lackluster programming, but with tremendous potential for improvement.

Demographics

Thirty completed surveys were collected. Out of these thirty respondents, the average age was 24.5 years old. Seventeen of the respondents were male and thirteen female. 73% of respondents reported visiting the plaza on a daily basis, although just 20% reported spending more than ten total minutes there per week; showing that Bosco Plaza, while used frequently, is primarily used a pass-through space.

Current Perceptions

Questions pertaining to user perception used a Likert-type scale, where 1 was the lowest rating and 5 was the highest rating. For each question, responses were averaged to give an overall score. Perceptions of attractiveness (2.77), interest (2.5), and comfort (2.93), were lower than levels of safety (4.0), cleanliness (4.13), and feelings of welcoming (3.27). Negative scores are likely based on deteriorating, dated, and uninspiring features of the plaza's pavement and lack of distinct areas. The positive scores likely resulted from the plaza's openness, allowing for ease of access, clear sight lines, and ease of maintenance. needed improvements to the pavement (40%), public art (57%), and shaded areas (57%).

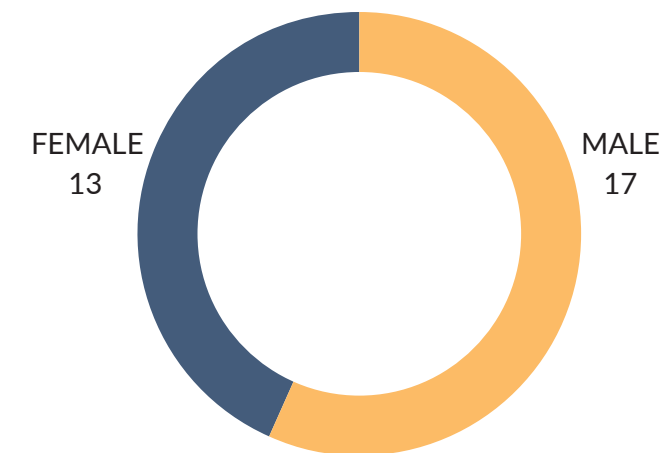


Figure 4.12 Intercept Survey Gender

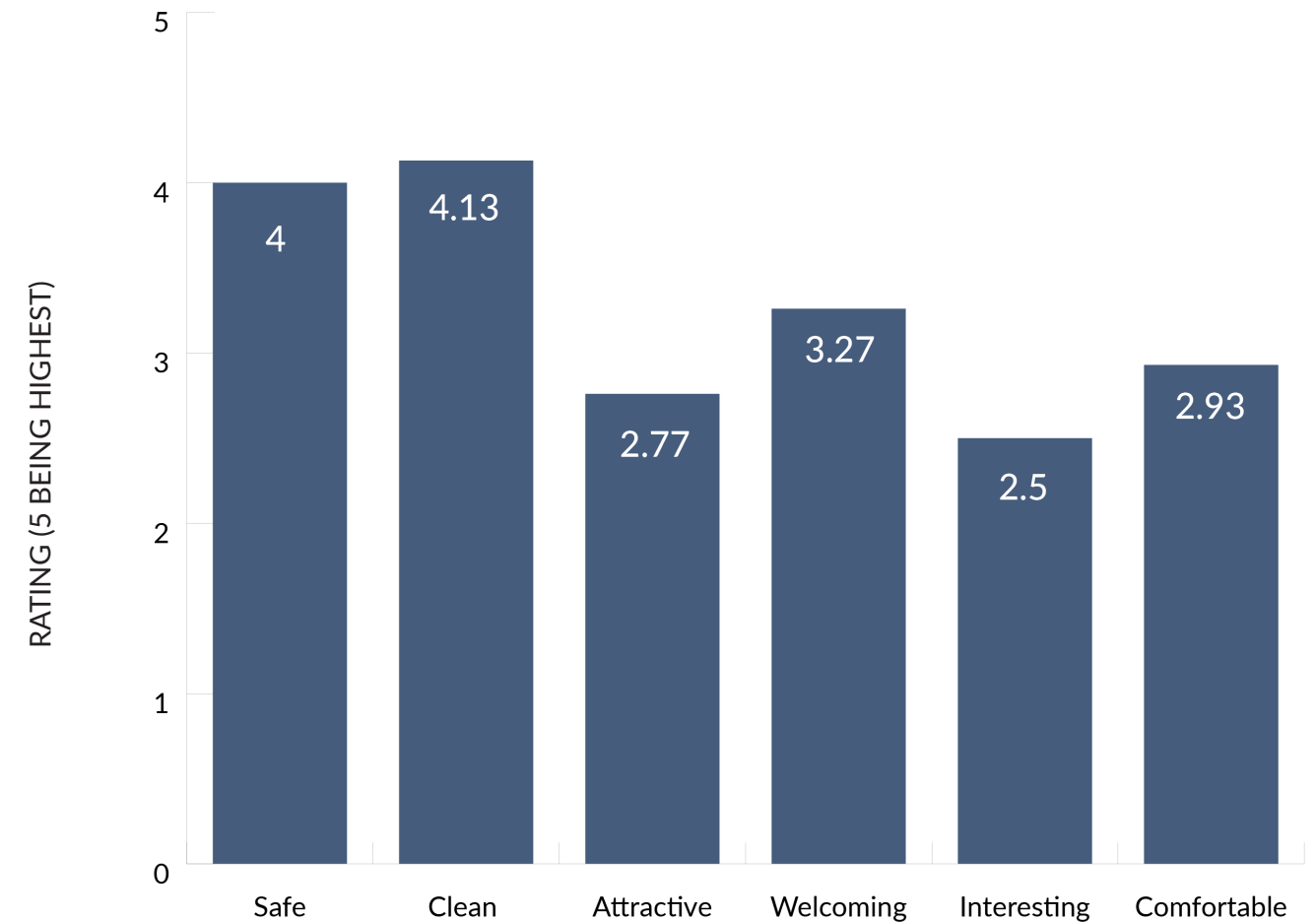


Figure 4.13 Bosco Plaza Perception Inventory

Current Uses

Given a list of activities to choose from, respondents were first asked to select to report each of the ways they use the plaza. Many of the respondents reported using Bosco Plaza as a place to socialize (53%), eat (63%), and attend events (40%). The plaza was found to be a much less popular space for shopping (10%) and recreation (7%).

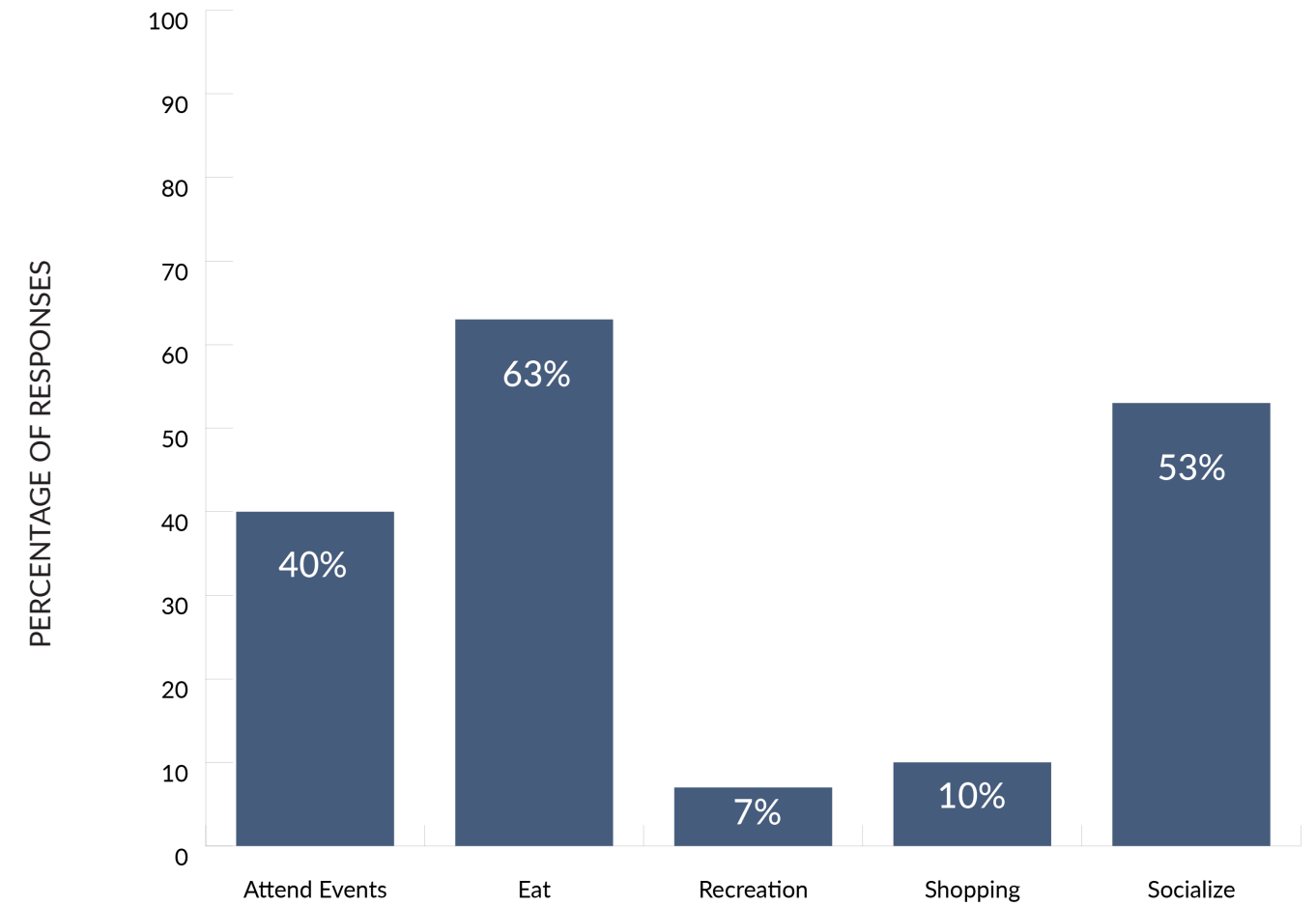


Figure 4.14 Current Uses of Bosco Plaza

Enjoyable Features of Current Bosco Plaza

Participants were then asked to select site features that they enjoyed in the plaza. The features listed were: activity spaces, green areas, lighting, pavement, public art, seating, shade areas, and the water feature. Just one of these site features was cited as an enjoyable feature by more than half of the respondents: the water feature (53%). Less than ten percent of respondents said that they enjoyed the plaza's pavement (7%), public art (3%), and seating options (7%). No respondents (0%) indicated that the light fixtures were enjoyable.

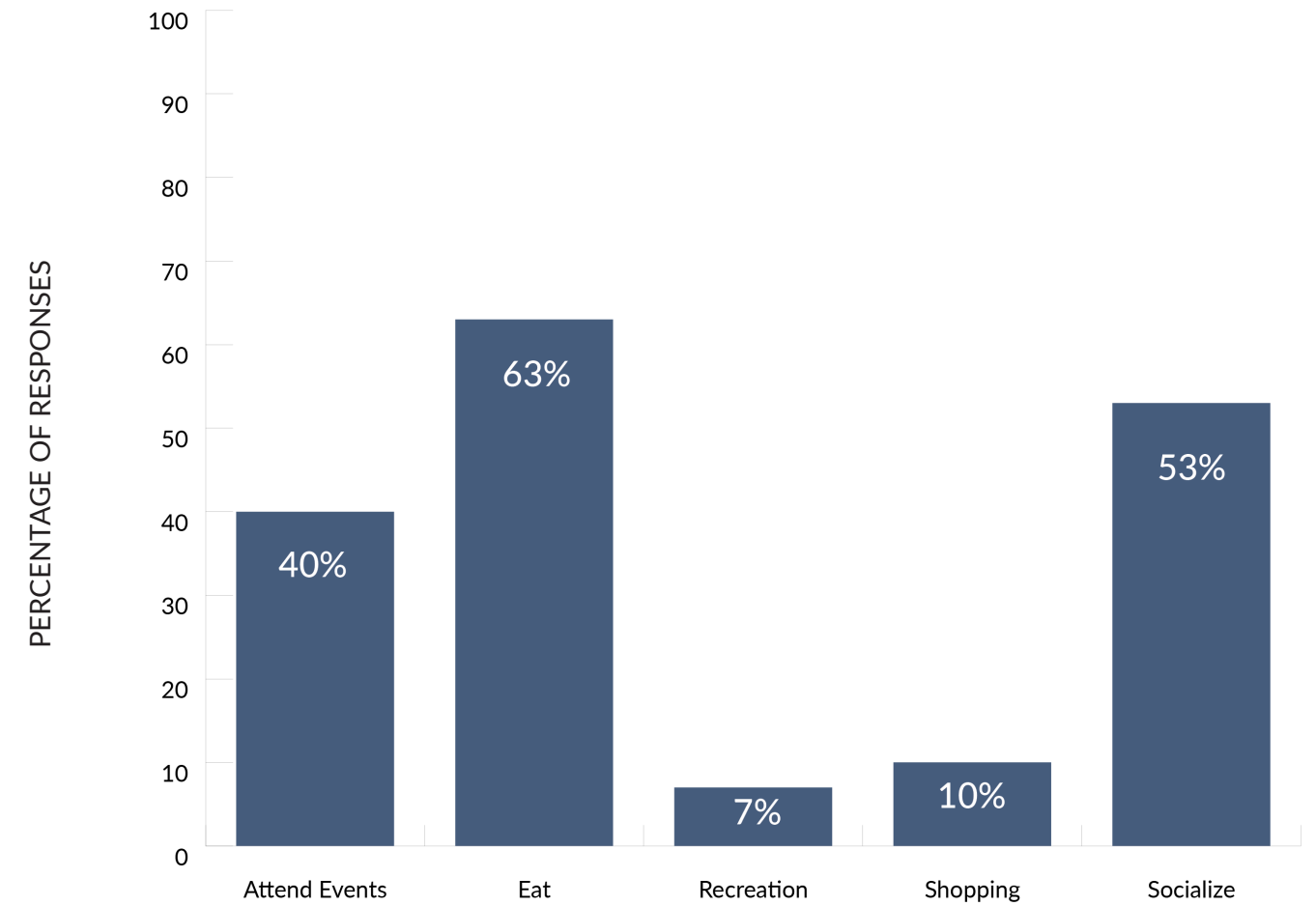


Figure 4.15 Bosco Plaza Features Inventory

Ways to Improve Bosco Plaza

In responses about improving the plaza, respondents indicated a need for better green areas (83%), lighting (73%), and seating options (77%). About half the respondents indicated needed improvements to the pavement (40%), public art (57%), and shaded areas (57%).

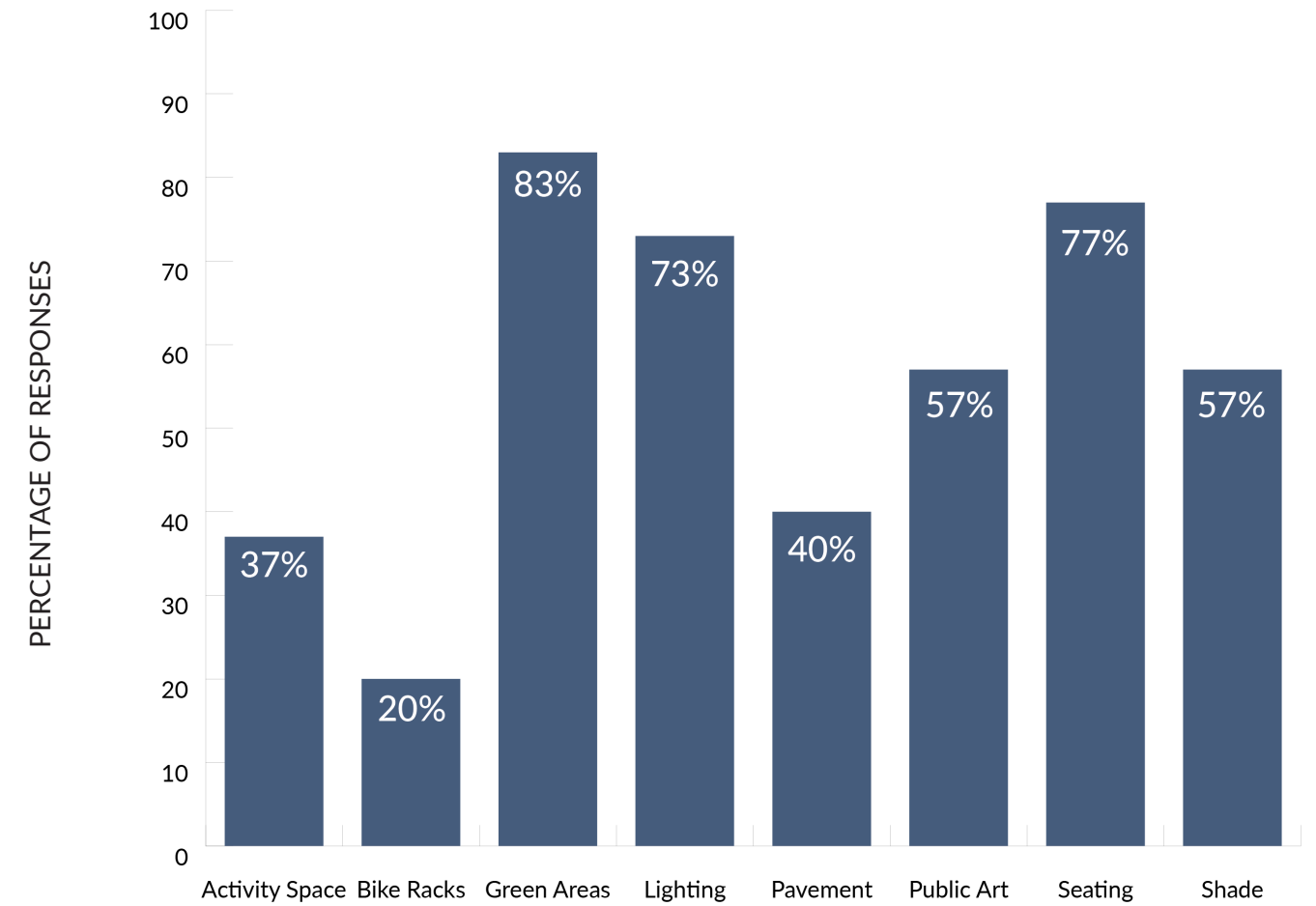


Figure 4.16 Bosco Plaza Desired Improvements

BOSCO EVALUATION

Following the assessment of Bosco Plaza as a public space through observation and survey, a comprehensive evaluation of its overall strengths and weaknesses were compiled. These comprehensive evaluations were then used to identify design qualities and factors that occupants of the space feel are important and well represented in Bosco Plaza, as well as design qualities and factors that are not well represented in Bosco Plaza that may improve the space. These qualities, those identified as being missing or lacking from Bosco Plaza's current design, were then considered in the proposed redesign of Bosco Plaza.

STRENGTHS SUMMARY

While Bosco Plaza would clearly benefit from changes to specific features, the space does have positive aspects, as identified through the site analysis and intercept survey. Bosco Plaza's high level of openness is beneficial in that it allows users unobstructed space to move freely and it does not restrict visibility across the site. With approximately 42,000 square feet of unprogrammed space, the plaza allows for a flexibility of uses. This openness may be why the plaza rated highly in terms of perceptions of safety and cleanliness, as indicated in the intercept survey. Another strength of Bosco Plaza is its context within campus. It is bookended by vehicular drop-offs at each end and spans between the Student Union and Seaton Hall, home to the College of Architecture, Planning, and Design and other units. This location provides a unique opportunity for the university to create a high performing, beautiful public space that can be experienced daily by many campus members and visitors.

Another strength of Bosco Plaza is its context. The space is located between what is likely the university's most frequently occupied building, the Student Union, and the university's design college, Seaton Hall. This location provides the university with a distinct opportunity to provide a high performing, beautiful public space that can be experienced by a large amount of people and possibly even influenced by its own design students. The way that most people currently move through Bosco Plaza is also a strength. The space restricts vehicular traffic, aside from deliveries and special events, and prioritizes pedestrian circulation as the primary mode of movement. In turn, this allows the space to be safer, more flexible, and more communal than a space with a strong emphasis on vehicular circulation. Along this line of thinking is another strength, the space's relationship to human scale. The plaza is large enough to accommodate a wide variety of special events but is not so large that passing through it is a physically strenuous activity. The elements surrounding the space, namely the built structures, are sized at a scale that does not overshadow or visually distort the plaza. Finally, it is evident that spaces in the plaza that have been programmed are frequently occupied. While dependent on weather, the shaded seating area on the plaza's western edge is a popular space for students and faculty to gather, socialize, and eat lunch. Other seating options, like benches and concrete planter boxes, are often used as well. How the plaza is used is largely determined by special events programming, and when given an opportunity, people use the space.

WEAKNESSES SUMMARY

The primary weaknesses of Bosco Plaza were revealed through the site analysis and responses from the intercept survey. It is clear that the space is primarily viewed as a transition space, rather than a destination space. Given its location near two major university buildings, Bosco Plaza's current design fails to create an environment that encourages people to spend time in, day to day.

WEAKNESSES SUMMARY (continued)

In terms of individual features, Bosco Plaza is lacking in several areas. The green space on the eastern edge of the plaza is underdeveloped, poorly graded for recreation activities, and not easily accessible due to the dense plantings that surround it. Lighting in the space is also poor. Several survey participants noted the low quality and power of night lighting, with the overall visual aesthetics of the bollards leaving something to be desired. In addition, seating options in the plaza are limited. While chairs and tables are provided, there is little diversity in terms of size and aesthetics, as these elements are fixed in place. A few additional benches are also provided but seldom used. The plaza's vast amount of unprogrammed space can be a strength, but it can also cause the space to appear uninspiring. Finally, two components of the plaza that may warrant removal and/or an upgrade are the pavement and the water feature. In their current states, the pavement and the water feature are not aesthetically pleasing and do not contribute to a unique sense of identity within the space. The pavement is crumbling in many spots and has smooth finish, causing it to be slippery when wet. Perhaps most significant is a lack of clear and direct accessibility to the Student Union's main doors. Ramps on the eastern and western sides of the plaza provide access to these doors, but these access points are narrow and infrequently used compared to the more centrally located steps. Because of their location, most occupants of site are required to use these stairs as they make their way to and from the union. These steps physically divide the plaza, do not effectively provide unique experiences within the space, and are unnecessary from a grading standpoint. In summary, Bosco Plaza could greatly improve by addressing its current seating, circulation, amenities, accessibility, vegetation, and hardscape.

PRECEDENT STUDIES

A selection of eight design precedents were examined in order to gain an understanding for how the aesthetic attributes of color, pattern, frame, edge, and size can be used in different hardscape design applications. These precedents were selected for their relevance to Bosco Plaza in that each utilized unit pavers and are located in high-traffic public locations. Each of the precedents utilize their respective hardscapes as a key design element in the space. For many precedents, hardscape defines the space and helps to create a distinct sense of place, something the Bosco Plaza’s current hardscape fails to accomplish.

Project Name Designer	Bienen School of Music Hoerr Schaudt	Bristol Community College Sasaki Associates	Brown University :melk	Colorado Esplanade PWP	CSU Center for Innovation in Medical Professionals Behnke	North Gateway Plaza University of Toronto Mississauga	Rutgers School of Business Ten Arquitectos	The Yard at Rutgers Let It Grow	Bosco Plaza
SQUARE FOOTAGE	34,000	50,600	12,000	80,000	32,000	15,000	25,000	30,000	42,000
PROJECT TYPE	Campus	Campus	Campus	Commercial	Campus	Campus	Campus	Campus	Campus
NUMBER OF COLORS	3	2	4	2	3	3	3	3	4
PATTERN	Dispersed	Orderly	Disperse	Orderly	Orderly	Dispersed	Dispersed	Dispersed	Orderly
EDGE	Contrast	None	No Contrast	None	Concrete Band	None	None	None	None
FRAME	None	Single Row	None	None	None	None	None	None	Single Row
PAVER SIZE	Smaller	Larger	Smaller	Smaller	Smaller	Smaller	Smaller	Smaller	Larger

Figure 4.17 Precedents Overview



Figure 4.18 Bienen School of Music (Unilock)

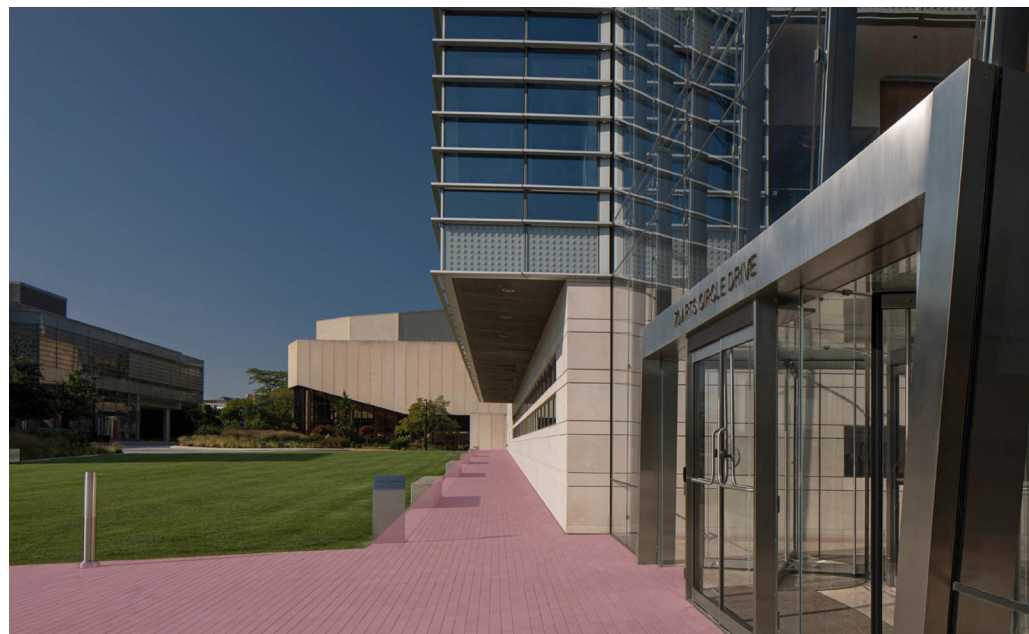


Figure 4.19 Bienen Hardscape Highlight (Unilock)

Bienen School of Music | Northwestern

Hoerr Schaudt | Evanston, IL

Designed by Hoerr Schaudt, the 34,000 square foot hardscape at the Bienen School of Music is a good example of how hardscape can be used to compliment surrounding contextual features such as built structures and the natural landscape. In this project, golden-colored pavers blend the gray buildings with the green landscape, blurring the line between interior and exterior space. This precedent's paving strategy incorporates three colors in a dispersed pattern of smaller sized pavers, contrasting edge pavers, and no framing pavers.

COLOR	3
PATTERN	Dispersed
EDGE	Contrasting
FRAME	None
PAVER SIZE	Smaller

Figure 4.20 Bienen Attribute Inventory



Figure 4.21 Bristol Community College (Unilock)

Bristol Community College

Sasaki Associates | Fall River, MA

Designed by Sasaki, the 50,600 square foot project at Bristol Community College is a strong representation of hardscape being used to mesh indoor and outdoor spaces. The outdoor entrance to the building continues seamlessly through the building and out the back exit of the building, providing a uniform and connected experience from outside to inside. Additionally, the hardscape connects to Fall River, Massachusetts’ milling history in that the hardscape pattern is designed to represent the textiles that were once made there. This precedent’s paving strategy incorporates two colors in an orderly pattern of larger sized pavers, no edge pavers, and one row of framing pavers.

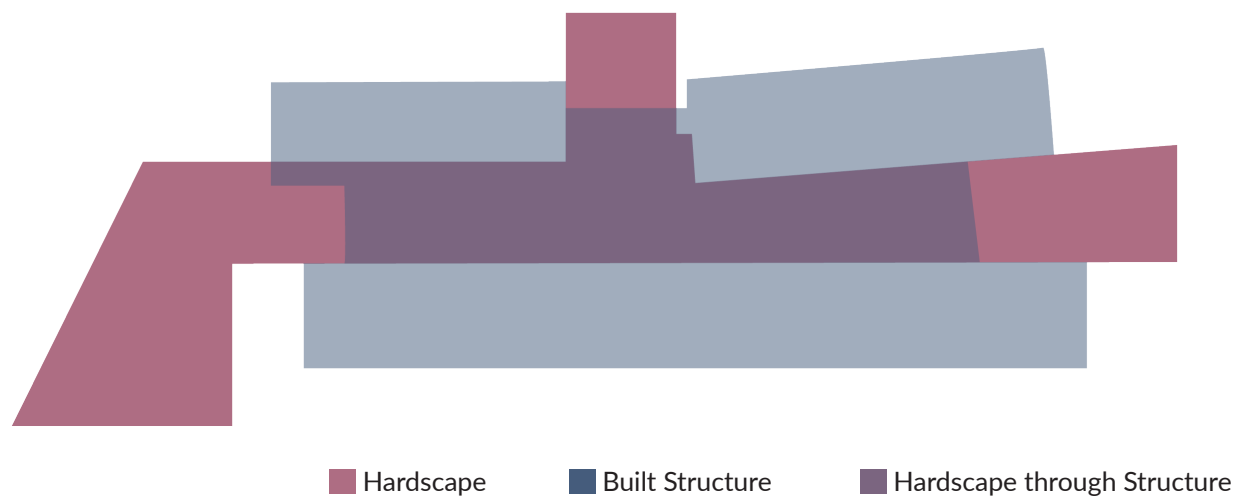


Figure 4.22 Indoor-Outdoor Interaction

COLOR	2
PATTERN	Orderly
EDGE	None
FRAME	Single Row
PAVER SIZE	Larger

Figure 4.23 Bristol CC Attribute Inventory

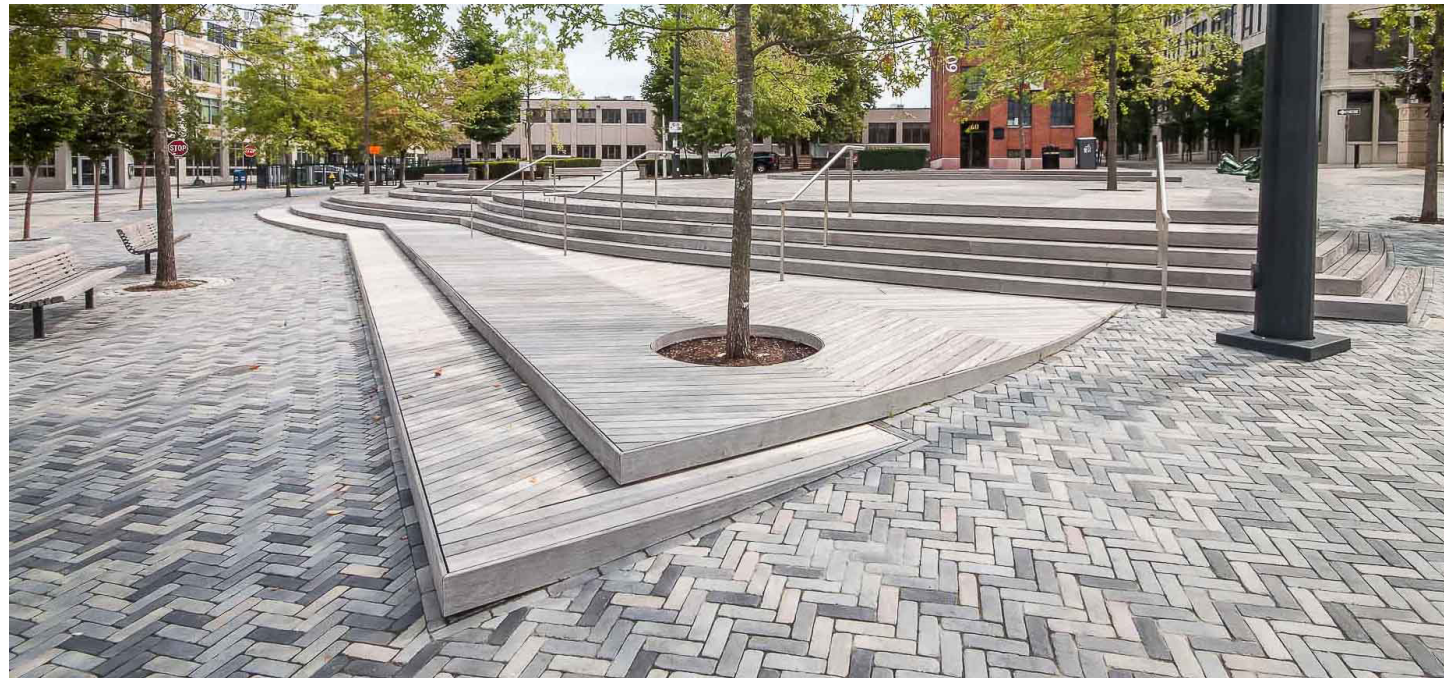


Figure 4.24 Brown University (Unilock)

Brown University

!melk | Providence, RI

Designed by !melk in conjunction with Unilock, the hardscape at Brown University was implemented as a way to connect with the history of Providence’s Jewelry District. After discovering that the Jewelry District was once lined with cobblestones, the designers at !melk strove to implement a hardscape with similar characteristics in this 12,000 square foot area. While cobblestones themselves are not compliant with accessibility standards, unit pavers that resemble the aesthetics of cobblestone are. Designers at !melk and professionals at Unilock worked together to develop an accessible hardscape with historical aesthetic qualities. This collaboration even resulted in a new paver color, ‘Melk Blue’. This precedent is a strong example of how hardscape can be used to connect to a place’s historical and cultural context. This precedent’s paving strategy incorporates a total of four colors in a dispersed pattern of smaller sized pavers, edge pavers without contrast, and no framing pavers.

COLOR	4
PATTERN	Dispersed
EDGE	Without Contrast
FRAME	None
PAVER SIZE	Smaller

Figure 4.25 Brown Attribute Inventory



Figure 4.26 Colorado Esplanade Aerial
(PWP Landscape Architecture, 2020)



Figure 4.27 Colorado Esplanade Movement Zones
(Adapted from PWP Landscape Architecture, 2020)

Colorado Esplanade

PWP | Santa Monica, CA

Designed by Peter Walker’s firm, PWP Landscape Architecture, the hardscape at The Colorado Esplanade in Santa Monica, California is composed of pedestrian walkway areas, bikeways, and vehicular passages. To ensure safety and clear delineation between these three areas, PWP implemented custom rippled-concrete unit pavers in the pedestrian walk areas. These unit pavers, organized in an orderly pattern of black and white, elevate the walkway about the bikeway and roadway that provides a safer walking experience for users of the 80,000 square foot site. Additionally, the distinct pattern of the pavers creates a unique and recognizable identity while orienting people within the space. This precedent’s paving strategy incorporates two colors in an orderly pattern of smaller sized pavers, no edge pavers, and no framing pavers.

COLOR	3
PATTERN	Dispersed
EDGE	Contrasting
FRAME	None
PAVER SIZE	Smaller

Figure 4.28 Colorado Esplanade Attribute Inventory



Figure 4.29 Cleveland State University (Unilock)

Cleveland State University Center for Innovation in Medical Professionals

Behnke Landscape Architecture | Cleveland, OH

Designed by Behnke Landscape Architecture, the hardscape at Cleveland State University is an example of unit pavers being implemented for environmental and aesthetic reasons. The unit pavers at this 32,000 square foot project were selected for their high levels of reflectivity to reduce urban heat island effect and installed with permeable spacers to allow water to return to the soil. This precedent's paving strategy incorporates three colors in an orderly pattern of smaller sized pavers, a poured concrete band in place of edge pavers, and no framing pavers.

COLOR	3
PATTERN	Orderly
EDGE	Concrete Band
FRAME	None
PAVER SIZE	Smaller

Figure 4.30 CSU Attribute Inventory



Figure 4.31 North Gateway Plaza (Unilock)

North Gateway Plaza

University of Toronto Mississauga | Mississauga, ON

The hardscape at the 15,000 square foot North Gateway Plaza at the University of Toronto’s Mississauga Campus is an example of hardscapes using color and pattern to connect to a place’s identity. In this design, three colors of pavers are laid in a dispersed pattern to create an abstract representation of the random movements of users within this busy plaza. This precedent’s paving strategy does not incorporate edge pavers or framing pavers.

COLOR	3
PATTERN	Dispersed
EDGE	None
FRAME	None
PAVER SIZE	Smaller

Figure 4.32 North Gateway Attribute Inventory



Figure 4.33 Rutgers School of Business (Unilock)

Rutgers School of Business

TEN Arquitectos | New Brunswick, NJ

Designed by TEN Arquitectos, the hardscape at the Rutgers School of Business is a clear representation of hardscape and built structures working holistically. In this 25,000 square foot project, the multi-colored rectangular unit pavers are implemented to imitate the shape and reflectivity of the nearby building that is heavily outfitted with glass windows. This precedent's paving strategy incorporates three colors in a dispersed pattern of smaller sized pavers, no edge pavers, and no framing pavers.

COLOR	3
PATTERN	Dispersed
EDGE	None
FRAME	None
PAVER SIZE	Smaller

Figure 4.34 Rutgers Attribute Inventory



Figure 4.35 The Yard at Rutgers University (Unilock)

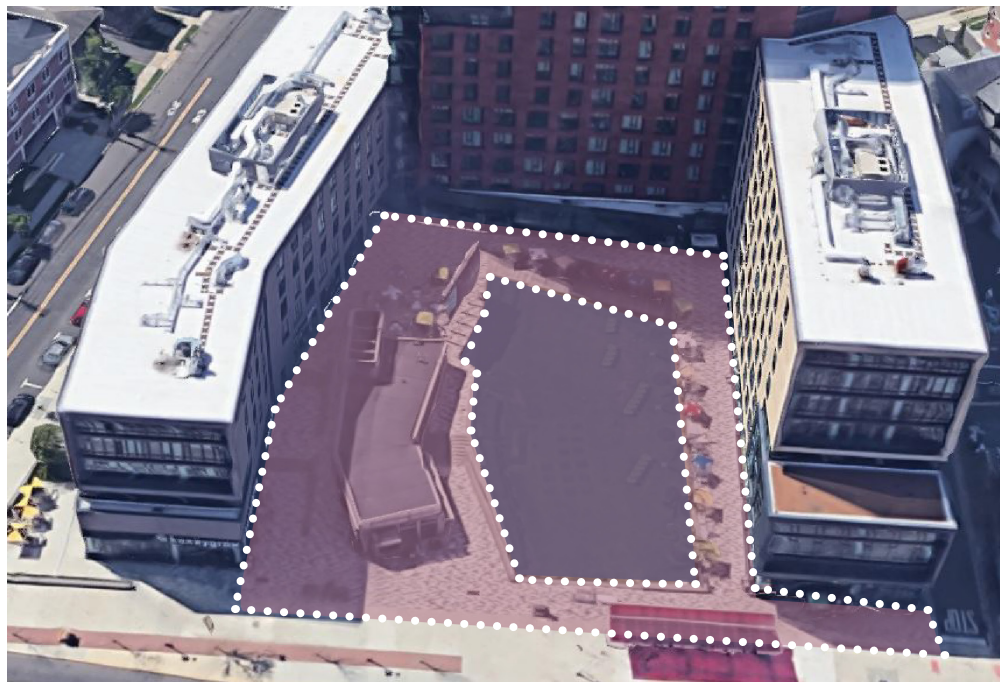


Figure 4.36 The Yard Spatial Zones (Photo from Google Earth)

The Yard at Rutgers University

Let it Grow | New Brunswick, NJ

Designed by Let it Grow, The Yard at Rutgers University utilizes multiple colors of pavers organized in a dispersed pattern. While the use of unit pavers in this project creates a unique experience in the site, the project was selected primarily for its relevance to Kansas State University’s Bosco Plaza. Like Bosco Plaza, The Yard serves as a gathering space for many Rutgers University students and faculty. In the project, much of the space is composed of 25,000 square feet of programmable green space, with roughly 5,000 square feet of hardscape. This area is home to morning yoga classes, sporting events, and entertainment like live music. When looking to redesign Bosco Plaza, The Yard at Rutgers proved to be a valuable precedent. This precedent’s paving strategy incorporates three colors in a dispersed pattern of smaller sized pavers, no edge pavers, and no framing pavers.

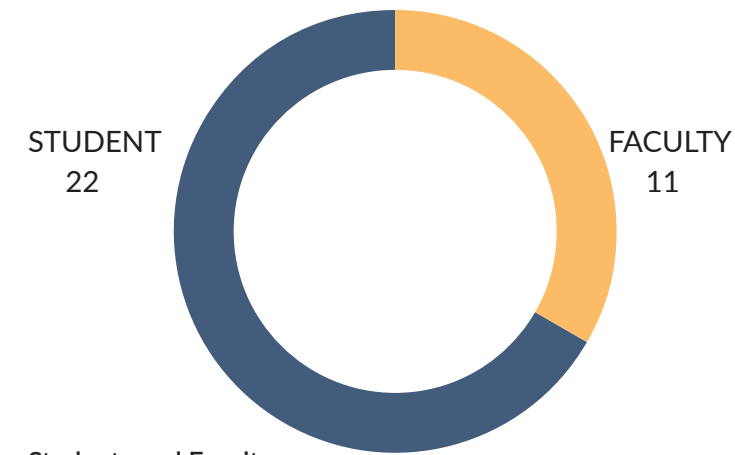
COLOR	3
PATTERN	Dispersed
EDGE	None
FRAME	None
PAVER SIZE	Smaller

Figure 4.37 The Yard Attribute Inventory

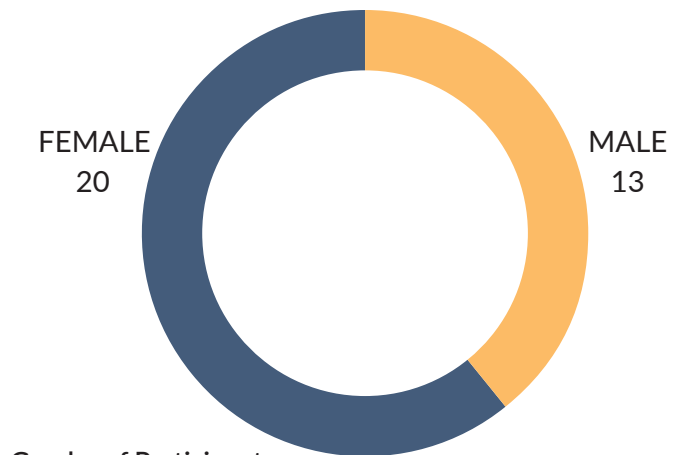
HARDSCAPE DESIGN PREFERENCE SURVEY

Demographics

The Hardscape Design Preference Survey, conducted through Qualtrics, was completed by 33 members of Kansas State University's CAPD. Among the respondents, 22 identified as students and 11 as faculty members, with 20 responses from females and 13 responses from males. Each discipline within the CAPD was represented, with five from Architecture, seven from Interior Architecture and Product Design, 17 from Landscape Architecture, and four from Regional and Community Planning. Participants ranged from 2nd year to 5th year students and faculty experience ranged from one year to over 20 years. See Figures 4.38 - 4.42 for a summary of these demographics.



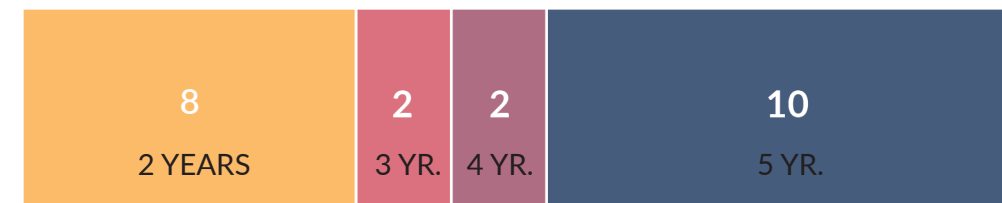
Students and Faculty
Figure 4.38



Gender of Participants
Figure 4.39



CAPD Disciplines
Figure 4.40 CAPD Disciplines



Student Experience
Figure 4.41 Student Experience



Faculty Experience
Figure 4.42 Faculty Experience

Color Comparison

Results from the questions pertaining to preference of the number of colors in a hardscape design were highly inconclusive. In comparison questions, no clear favorite amongst paving designs showing one color, two colors, and three or more colors emerged.

In one color vs. two color questions, 52% of respondents preferred design with two colors. In one color vs. three+ color questions, 51% of respondents preferred designs with one color. In two color vs. 3+ color questions, 53% of respondents preferred designs with 3+ color. These results were taken by averaging preference responses from two questions in each category.



Figure 4.43
One Color vs. Two Colors

One Color vs. Two Colors

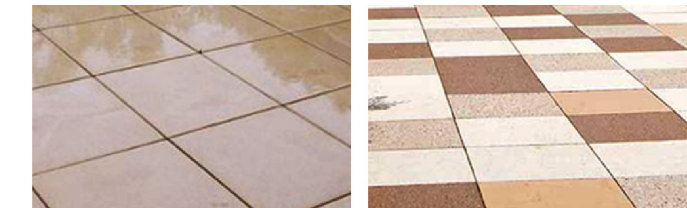


Figure 4.44
One Color vs. 3+ Colors

One Color vs. 3+ Colors

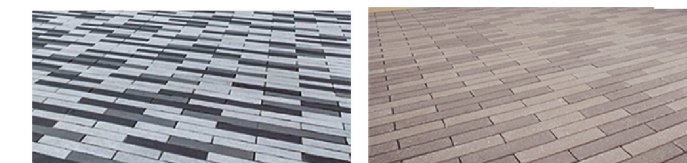


Figure 4.45
Two Colors vs. 3+ Colors

Two Colors vs. 3+ Colors

Likert-Scale: Color Preference

Likert-scale results among each of these categories were also inconclusive. Based on a five-point Likert-scale, 60% of survey participants responded positively (responses above neutral) to designs with one color (average score: 2.36). 57% of participants responded positively to designs with two colors (average score: 2.52) and 54% responded positively to designs with three or more colors (average score: 2.61).

Possible Reasoning for Findings

With results for each being relatively similar in comparison questions and Likert-scale questions, it is evident that there was not a clearly preferred strategy in terms of numbers of colors used. These results imply that the numbers of colors used is not a sole determinant of preference of hardscape designs, but rather an attribute to be used in conjunction with other design strategies.

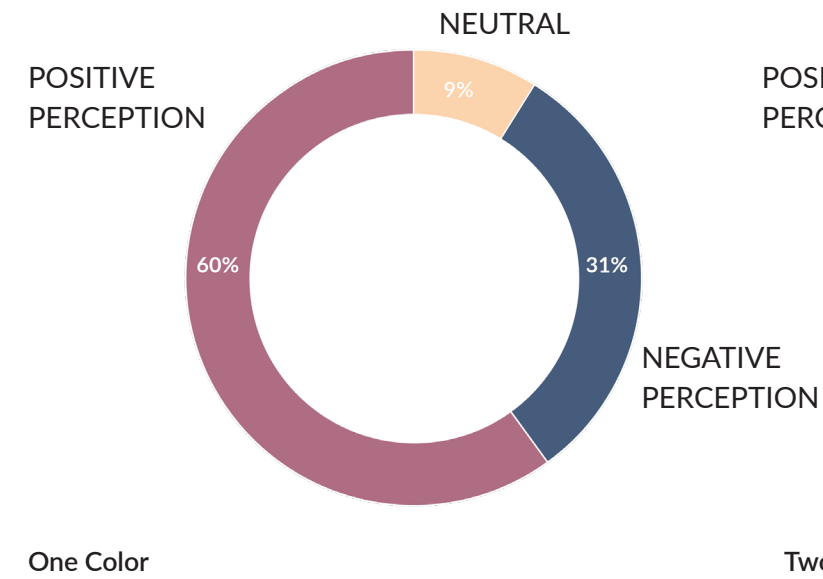


Figure 4.46 Likert: One Color

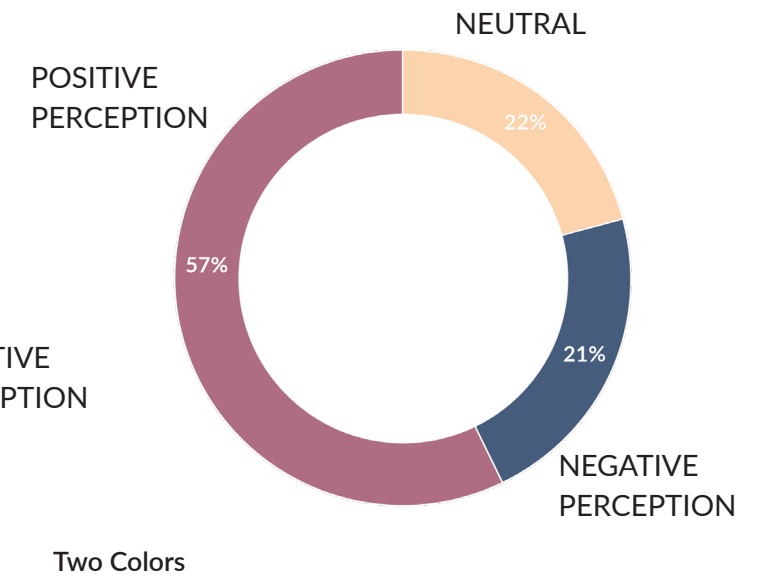


Figure 4.47 Likert: Two Colors

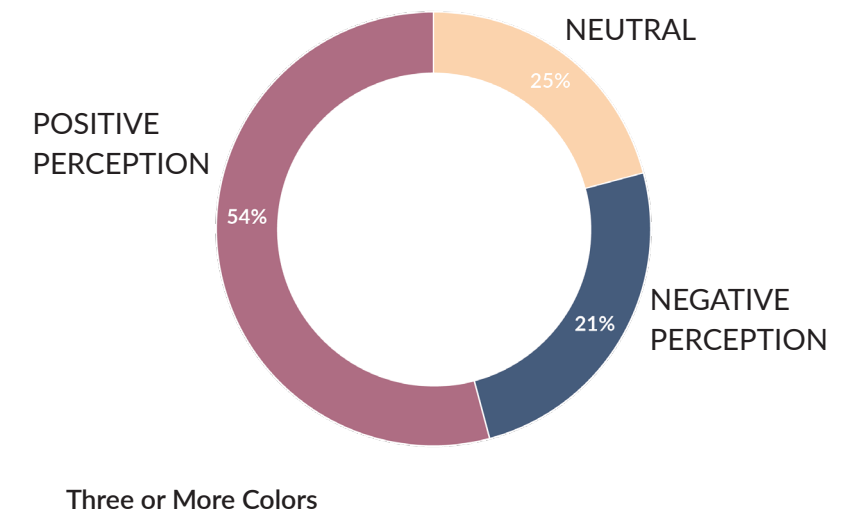
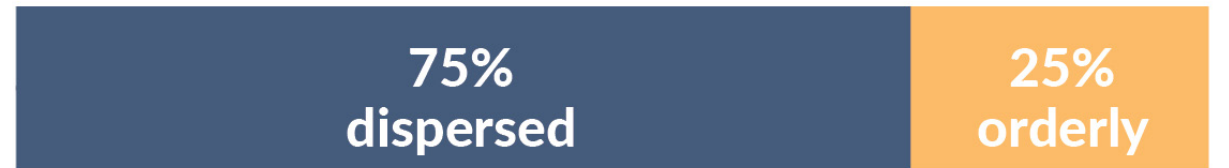
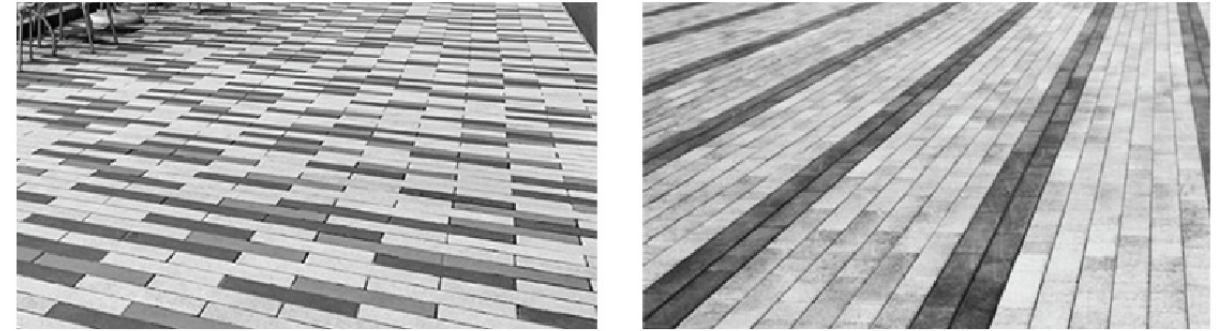


Figure 4.48 Likert: 3+ Colors

Pattern Comparison

Results from the pattern (application of color) section of the survey showed stronger favorability for dispersed patterning over orderly patterning. In comparison questions, designs with dispersed patterns were clearly favored over designs with orderly patterns, with respondents preferring dispersed applications of color 75% of the time. Scores were obtained by averaging preference data from the six questions comparing designs with orderly and dispersed patterning.



Orderly Patterns vs. Dispersed Patterns

Figure 4.49
Pattern Preferences

Likert-Scale: Pattern Preference

Responses to the Likert-scale questions corresponded with findings from the comparison questions, revealing dispersed applications of color to be more favored. Dispersed patterns were positively received by 85% of survey participants (average score: 1.82), while orderly patterns were positively received by 46% of participants (average score: 2.58).

Possible Reasoning for Findings

With dispersed patterning being favored over orderly patterning, it is important to keep the survey population in mind. With prior research studies finding that creative people tend to prefer more random patterning, the fact that the survey focused on design educators and students may have had an impact on dispersed patterning being more favored.

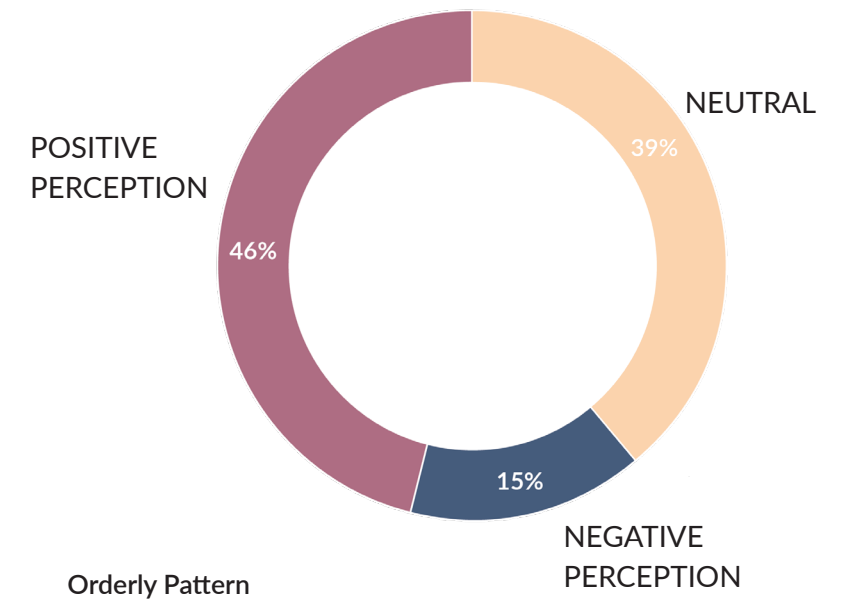


Figure 4.50
Likert: Orderly Patterns

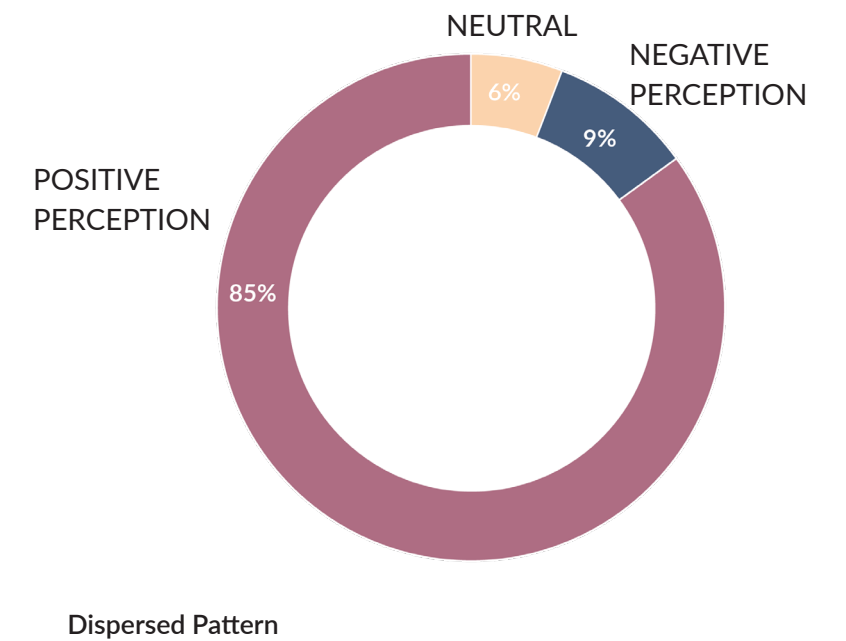


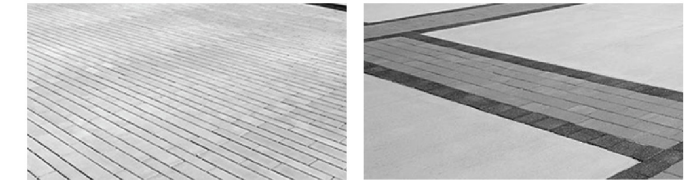
Figure 4.51
Likert: Dispersed Patterns

Framing Comparison

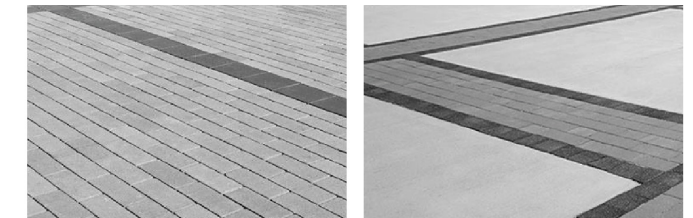
Two questions were asked for each of the categories and results were obtained by averaging response data. In terms of framing strategy, designs that did not use framing were favored over designs that used both single-row frames and multi-row frames. In no frame vs. single-row frame questions, designs without frames were favored 58% of the time. In no frame vs. multi-row frame questions, designs without frames were favored 65% of the time. Between the two strategies that use framing, however, neither strategy is conclusively more favored than the other. 52% of responses favored single-row frame designs compared to 48% of responses favoring multi-row frames.



No Frame vs. Single-Row Frame



No Frame vs. Multi-Row Frame



Single-Row Frame vs. Multi-Row Frame

Figure 4.52
No Frame vs. Single-Row

Figure 4.53
No Frame vs. Multi-Row

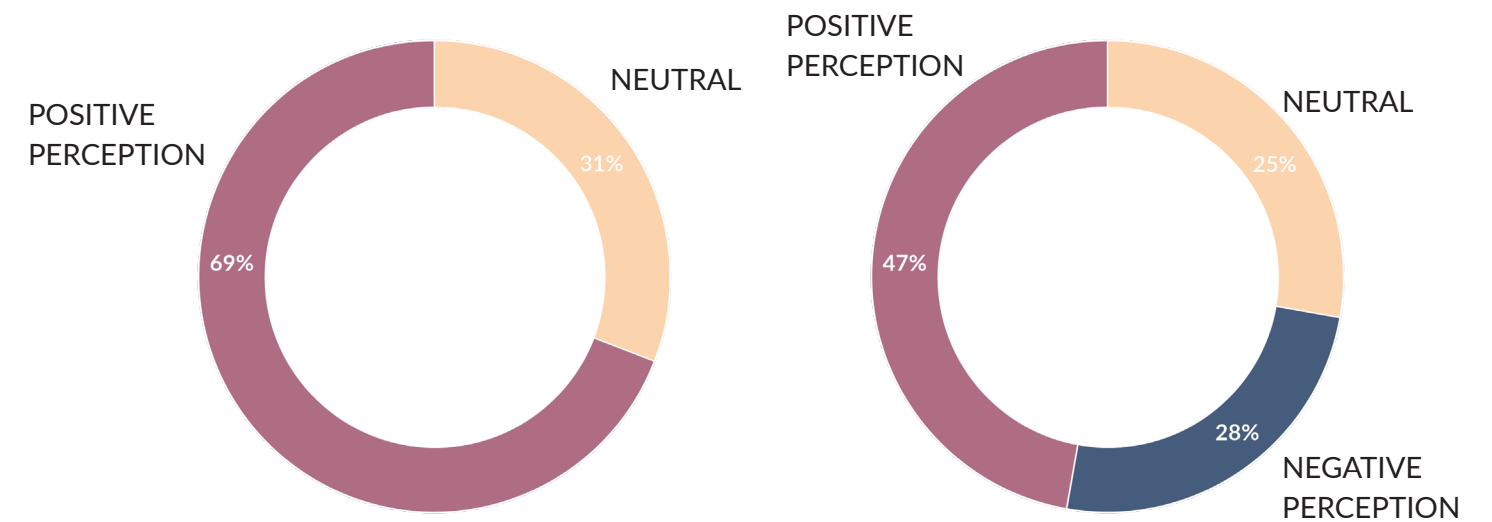
Figure 4.54
Single-Row vs. Multi-Row

Likert-Scale: Framing Preference

Results from the Likert-scale questions illustrate similar sentiments as the comparison questions. No-frame designs were viewed positively by 69% of the participants (average score: 2.09). Both single (average score: 2.84) and multi-row frame designs (average score: 2.63) were seen less favorably, with each being viewed positively by 47% of the participants.

Possible Reasoning for Findings

With no-frame designs being more favored than single-row and multi-row frame designs, it is again important to remember the survey’s target population: design educators and students. Designs without frames tend to be less orderly and allow for randomness, a design strategy that creative people (like the survey population) would likely gravitate to more.



No Frame

Figure 4.55 Likert: No Frame

Single-Row Frame

Figure 4.56 Likert: Single-Row

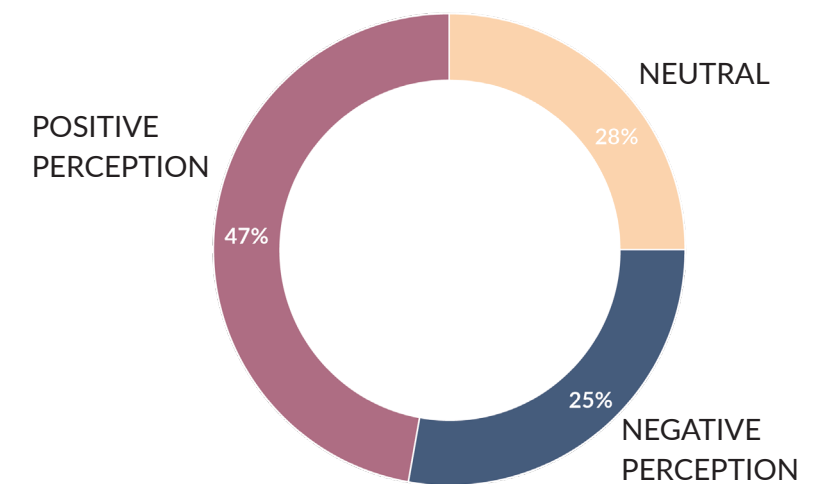


Figure 4.57

Likert: Multi-Row

Multi-Row Frame

Edge Comparison

Results from the edging paver strategy section of the survey suggest that people prefer the use of edging pavers over no edging pavers. Scores from the two questions for each of the categories were averaged. In comparison questions, designs with edging pavers were favored 64% of the time over designs without edging pavers. Additionally, when edging pavers are used, the results suggest that most people prefer the edging pavers to be of the same color and character as the adjacent field of pavers, as opposed to being in contrasting character, which makes them stand out more. Designs with non-contrasting edging pavers were preferred 62% of the time over designs with contrasting edging pavers.

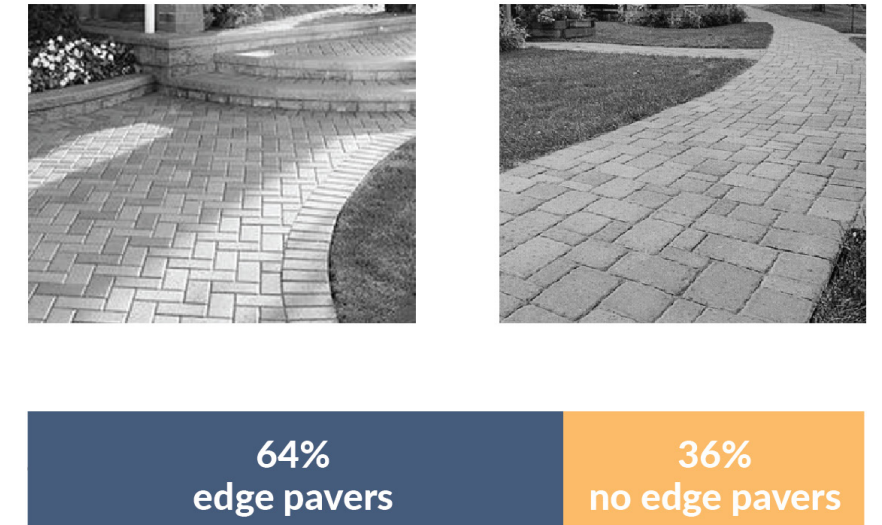


Figure 4.58
Edge vs. No Edge

Edge Pavers vs. No Edge Pavers

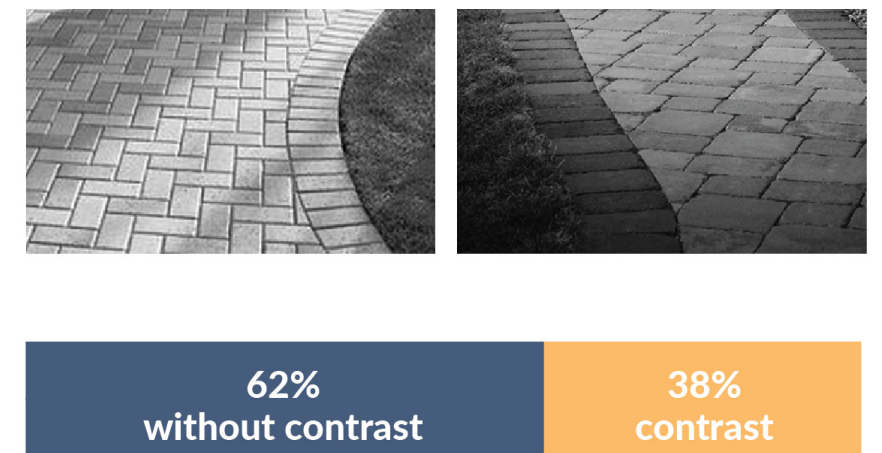


Figure 4.59
Contrast Edge vs. No Contrast

Contrasting Edge Pavers vs. Non-Contrasting Edge Pavers

Likert-Scale: Edge Preference

Likert results reflected similarly to results from comparison questions. Designs with edging pavers were perceived positively by 69% of respondents (average score: 2.12) and designs without edging pavers were perceived positively by 57% of respondents (average score: 2.39).

Possible Reasoning for Findings

With designs using no contrast edge pavers being the most preferred strategy, the idea of unpredictability and randomness in design comes to the forefront again. Edge pavers help to visually contain a hardscape and give the design a sense of ‘completeness’, something that people with design exposure would likely appreciate. However, using edge pavers that contrast the rest of the hardscape likely creates a design that is too orderly for many. Implementing edge pavers that blend with the entire hardscape allows for more unpredictability in a design, while still providing the sense of a finished hardscape.

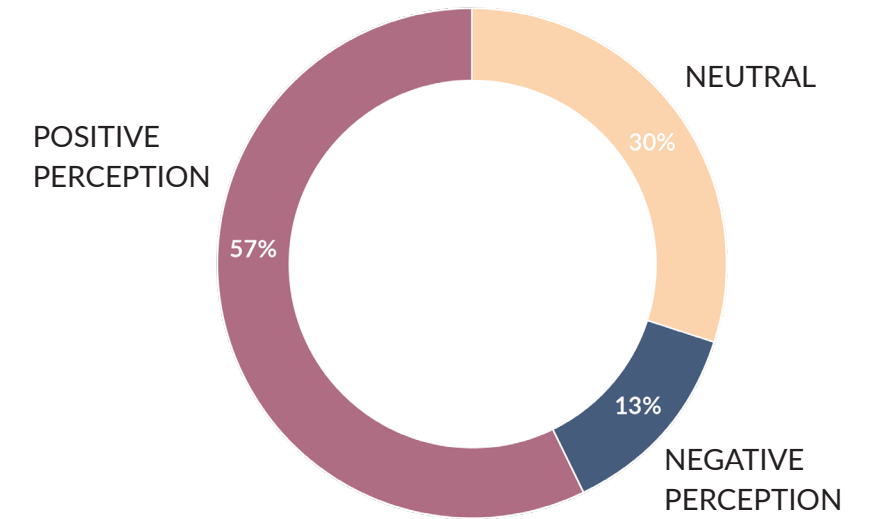


Figure 4.60
Likert: No Edge

No Edge Pavers

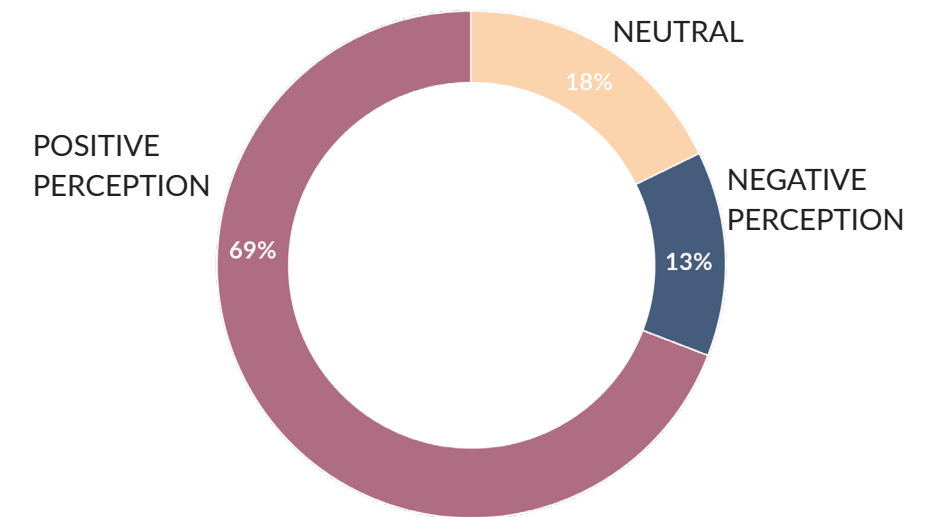
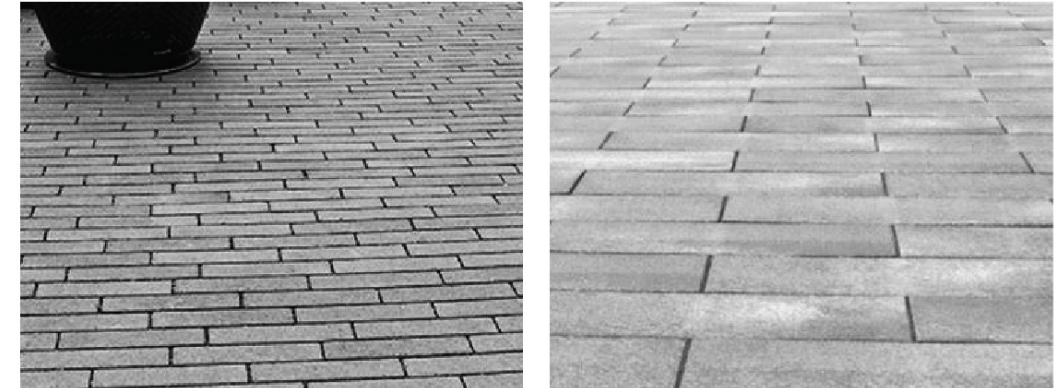


Figure 4.61
Likert: Edge

Edge Pavers

Paver Size Comparison

Results from the size portion of the survey were largely inconclusive in both the comparison questions. Larger pavers were slightly more preferred than smaller pavers. Using results obtained by averaging responses from four questions comparing large and small paver sizes, 56% of responses favored larger pavers.



Smaller Pavers vs. Larger Pavers

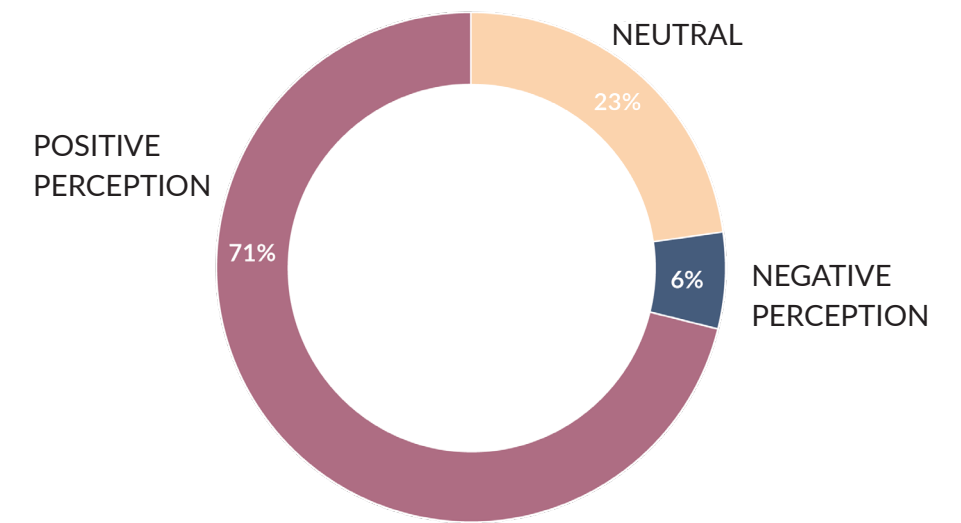
Figure 4.62 Smaller Pavers vs. Larger Pavers

Likert-Scale: Paver Size

Interestingly, in the Likert-scale questions, smaller pavers were more positively received. 71% of respondents reported positive perceptions of designs with smaller pavers (average score: 2.13), while 61% of respondents responded positively to larger pavers (average score: 2.42). These results differ from the results of the comparison questions, where larger pavers were found to be more preferred.

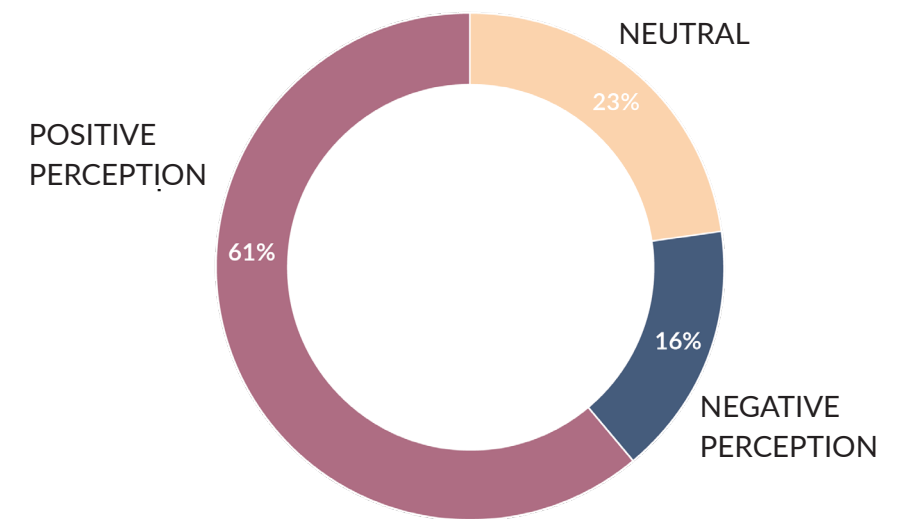
Possible Reasoning for Findings

With paver size results being highly variable, it is evident that paver size cannot be viewed as an individual attribute when determining hardscape design preference. For example, context can play a role in paver size preference. Paver sizes would likely be seen differently depending on the sizes of spaces in which they are implemented. Paver size itself is not influential enough to determine preference on its own, but rather must be incorporated with other attributes to create an aesthetic hardscape.



Smaller Pavers

Figure 4.63
Likert: Smaller Pavers



Larger Pavers

Figure 4.64
Likert: Larger Pavers

Block Layout Preference

While there are many strategies of paver layout, these six block layout strategies are commonly used in hardscape design. When analyzing these results, it is important to understand that these layouts were presented alone and without context.

The block layout section asked participants to rank order the following layout strategies from one (most preferred) to six (least preferred): herringbone 45 degrees, herringbone 90 degrees, stretcher bond 45 degrees, stretcher bond 90 degrees, stack bond, and basket weave. Responses revealed a preference for the herringbone layout, with a slight preference for pavers laid in an arrangement at 90 degrees over those laid at 45 degrees. Herringbone at 90 degrees averaged 2.48, and herringbone at 45 degrees averaged 2.68. The stretcher bond layout at 45 degrees averaged 3.19, and stretcher bond at 90 degrees averaged 3.32. Stack bond averaged 4.39. The basket weave patterning was clearly the least preferred strategy out of the six options, with an average of 4.94. See Figure 4.65 for a summary of this data.

These results likely correspond with the trend that has been found in other attributes: a certain level of randomness is preferred over strict order. With herringbone layouts, the pavers are set in a pattern, but also create a hardscape that looks more complex than stretcher or stack bond pavers.

Bosco Plaza's current layout of poured-in-place concrete utilizes large squares of patterned and colored pavement. The layout is not representative of any of the layouts tested here. Revisiting and redesigning the paver layout in the plaza could help contribute to a more vibrant and distinct hardscape.

(1 being most preferred and 6 least preferred.)

BLOCK LAYOUT	AVERAGE RANKING
Herringbone 90	2.48
Herringbone 45	2.68
Stretcher Bond 45	3.19
Stretcher Bond	3.22
Stack Bond	4.39
Basket Weave	5.00

Figure 4.65

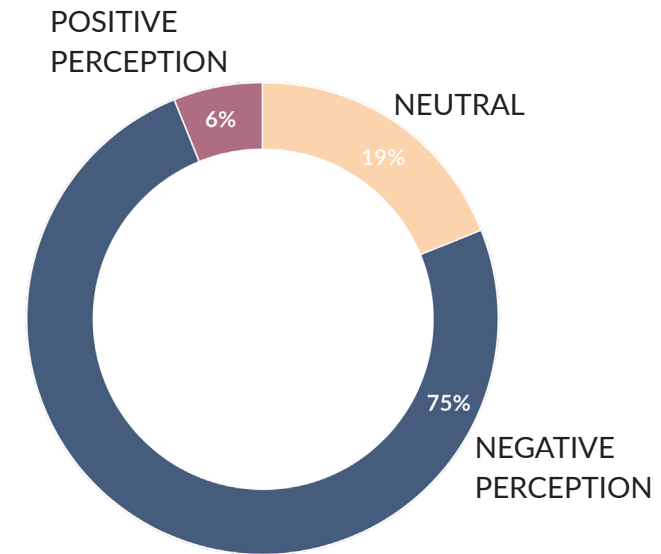
Block Layout Preference

Bosco Plaza’s Existing Hardscape Design

When asked to report an overall perception of Bosco Plaza’s paving strategy, survey participants responded with largely negative perceptions. In the Likert-scale questions, just 6% of participants reported that they felt positively about the space’s paving strategy (average score: 3.90), with 75% of respondents holding a negative perception (responses below a neutral grade). Likert-scale results based on the individual attributes of Bosco Plaza (color, edge, and size), also showed negative results. 12% of respondents reported positive perception of the plaza’s paving color (average score: 3.61). 34% of respondents reported positive perception of the plaza’s edging paver strategy (average score: 3.12). 25% of respondents reported positive perception of the plaza’s paver size strategy (average score: 3.16).

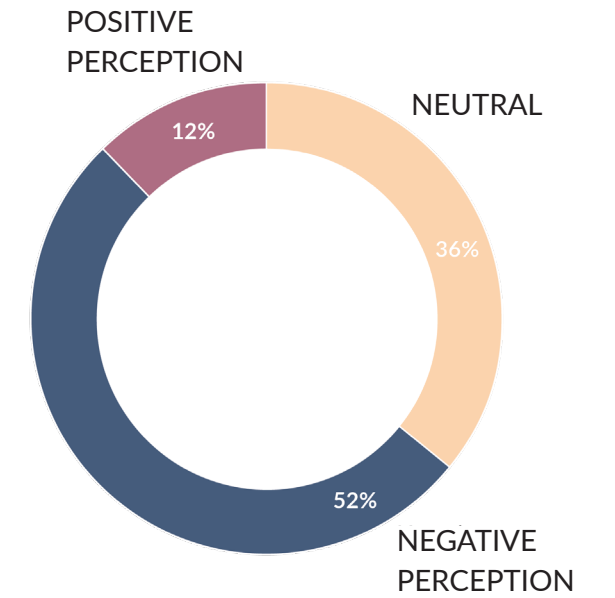
There are many reasons Bosco Plaza’s hardscape is perceived negatively. The paving itself is worn and deteriorating. The colors used on the concrete are faded and the patterning is highly ordered. The concrete is divided in large ‘blocks’, simulating large square unit pavers. Ultimately, the hardscape in Bosco Plaza is highly weathered and aesthetically uninspiring.

Bosco Plaza’s individual attributes of color, edge, and size do not contribute to an interesting hardscape. Improvements to these attributes could revitalize the hardscape, helping to make Bosco Plaza a more enjoyable and beautiful public space.



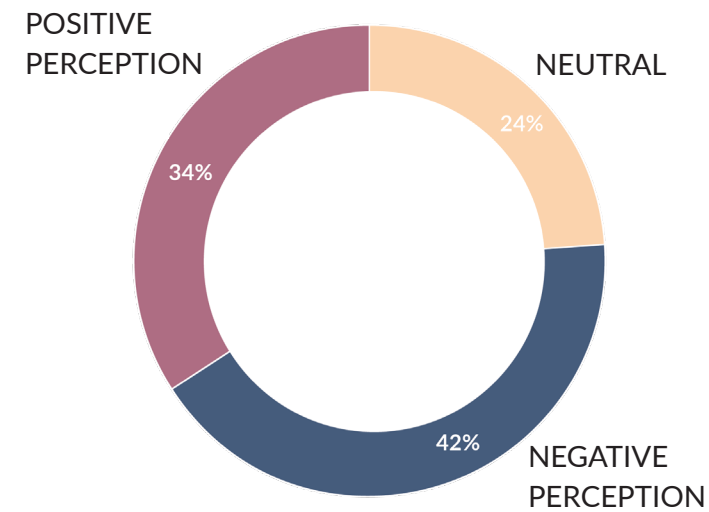
Overall Perception of Bosco Plaza Paving Strategy

Figure 4.66 Bosco Paving: Overall Perception



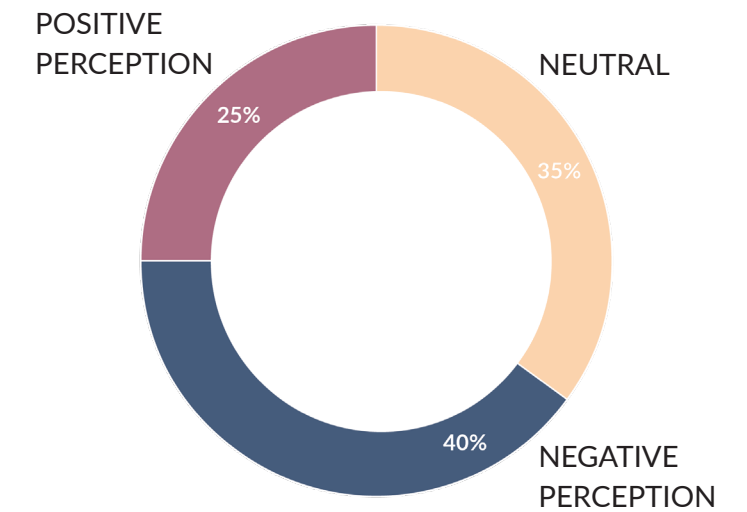
Bosco Plaza Paving Color Strategy

Figure 4.67 Bosco Paving: Color Perception



Bosco Plaza Edge Paver Strategy

Figure 4.68 Bosco Paving: Edge Perception



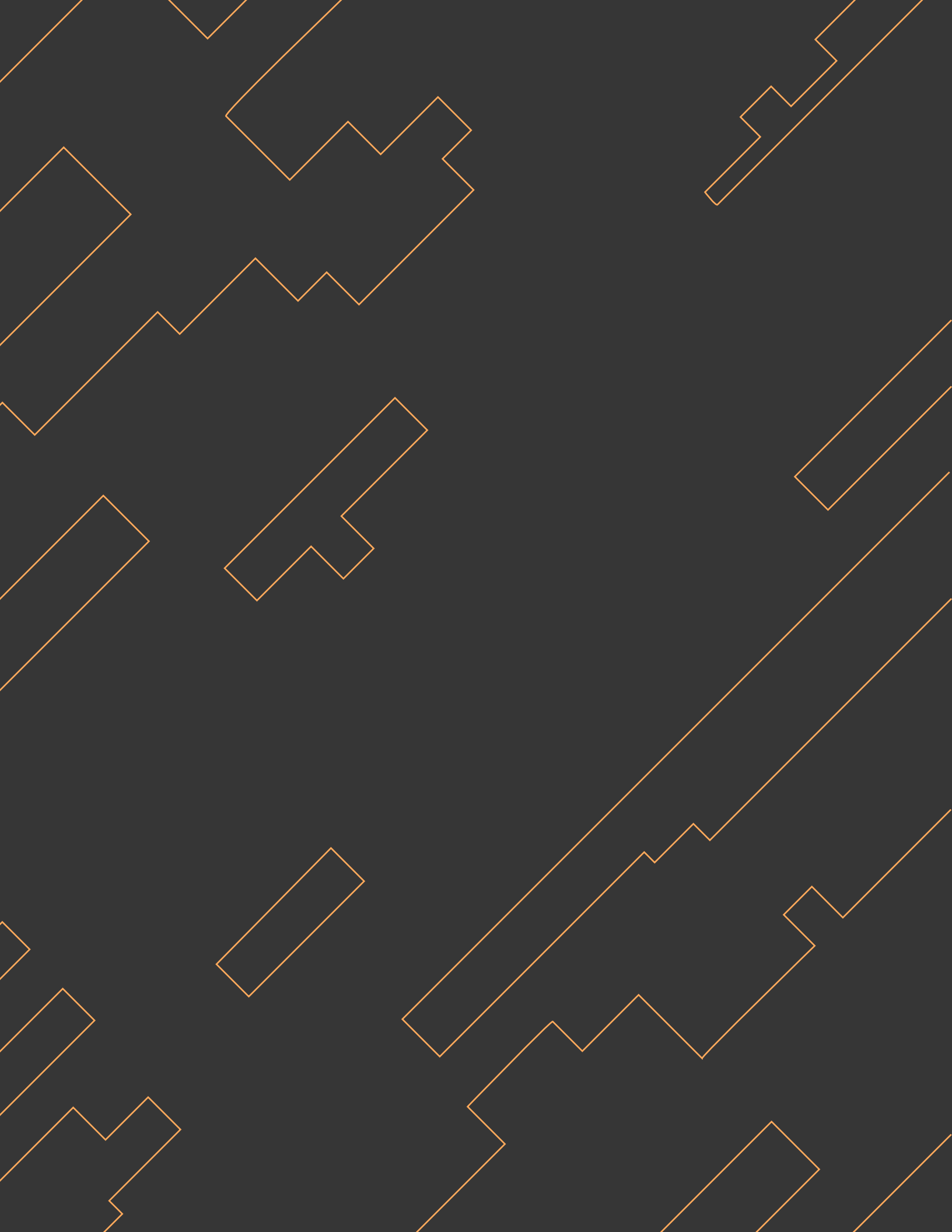
Bosco Plaza Paver Size Strategy

Figure 4.69 Bosco Paving: Paver Size Perception

BOSCO PLAZA REDESIGN

5

chapter five



BOSCO PLAZA REDESIGN

DESIGN VISION

The redesign proposal for Bosco Plaza was informed by the literature review of qualities for a successful public space, a site analysis with an intercept survey, precedent studies, and findings from the Hardscape Design Preference Survey. Ultimately, the redesign strives to create more usable and engaging public space on the Kansas State University campus.

To accomplish this goal, and to provide stronger activity spaces, the redesign utilizes the eastern lawn space as an area for temporary tents, a portable video screen, food trucks, and a performance stage. The redesign also makes the space more cohesive and accessible through the removal of existing steps and the implementation of a ramp into the Student Union. In areas where steps are implemented, steps were extended out to allow for seating opportunities. The redesign diversifies seating and shade opportunities through the addition of a new shade structure, a bosque with cafe-style seating, and a bosque with multiple seating options and close connection to the eastern lawn space. Each of these design moves were made with the intent of retaining the plaza's ease of movement, while solidifying the plaza's place on campus as a highly aesthetic and comfortable gathering space for the university community.

DESIGN GOALS + OBJECTIVES

- **Goal:** Facilitate greater social interaction for the K-State Community.

- **Goal:** Create a more aesthetically pleasing Bosco Plaza.

Objective: Improve aesthetics of paving design

Objective: Implement more vegetation and preserve quality vegetation

- **Goal:** Make Bosco Plaza more multifunctional and give the space a stronger sense of place.

Objective: Preserve sense of true ‘pedestrian plaza’

Objective: Diversify programs of use

Objective: Diversify seating options

Objective: Utilize west green space

Objective: Preserve shaded seating area

Objective: Provide more programmed spaces

- **Goal:** Enhance accessibility in Bosco Plaza.

Objective: Preserve current ease of access from vehicular drop-offs

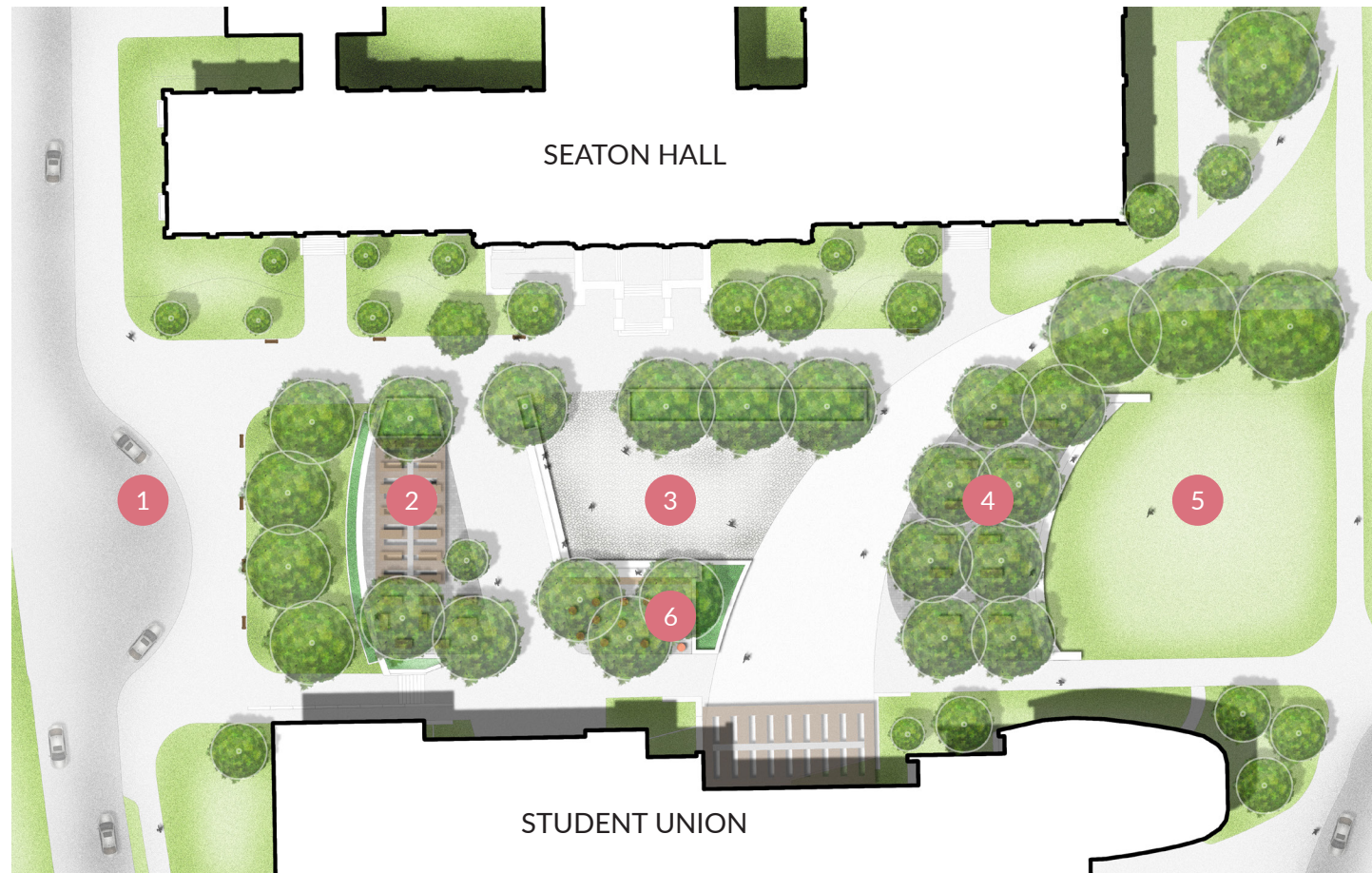
Objective: Preserve visual access to Seaton Hall and Student Union

Objective: Implement ramp/remove steps as main access to Student Union

DESIGN: heart of campus

The redesign proposes a removal of the existing water feature and the implementation of a new paving strategy inspired by the circulation patterns of the space. Additionally, the redesign provides a wider range of seating options. On the eastern edge of the site, the large oak trees will be retained, but the lower canopy trees will be removed to create a more accessible lawn space. Stepped seating and a shaded seating area created by a bosque of trees will work with existing topography to encourage more interaction with this green area. The redesign envisions this green space becoming a welcoming space capable of hosting events with tents, portable television screens, and a concert stage. The central area of the redesign also provides stepped seating that allows for further diversity of seating and a clearer delineation between transition spaces and spaces that encourage more stationary use. Along this line of thinking comes the redesign’s implementation of shaded café style seating just adjacent to the Student Union. This area will be programmed with movable seating that more directly corresponds to the nearby Radina’s coffee shop. The final major piece of the redesign involves a rethinking of the shaded seating area on the western edge of the site. The redesign proposes that the materiality of the shade structure be altered to focus more on the use of natural materials. The structure’s overall size will be reduced and an additional bosque of trees will be added to provide a greater variety of shade sources. Within this space, sizes of seating options will be greatly diversified, with table and chair options ranging from serving two to ten people.

SITE PLAN



- 1. Vehicle Drop-Off
- 2. Shaded Seating
- 3. Open Plaza Space
- 4. Bosque Seating
- 5. Lawn Space
- 6. Bosque with Cafe Seating

Figure 5.1
Bosco Plaza Redesign Site Plan

- New Ramp into Student Union
- Bosque Bar
- Seating Step

Figure 5.2
Topography Changes

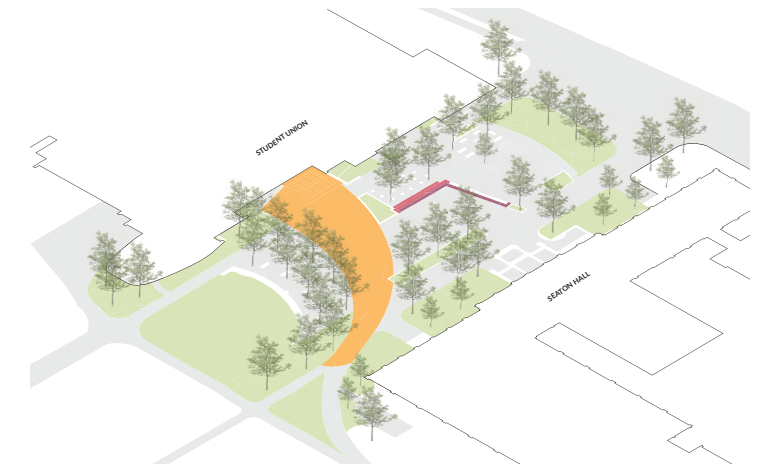


Figure 5.3
Redesign Circulation



Figure 5.4
Redesign Social Spaces



EVENTS | tents + stage

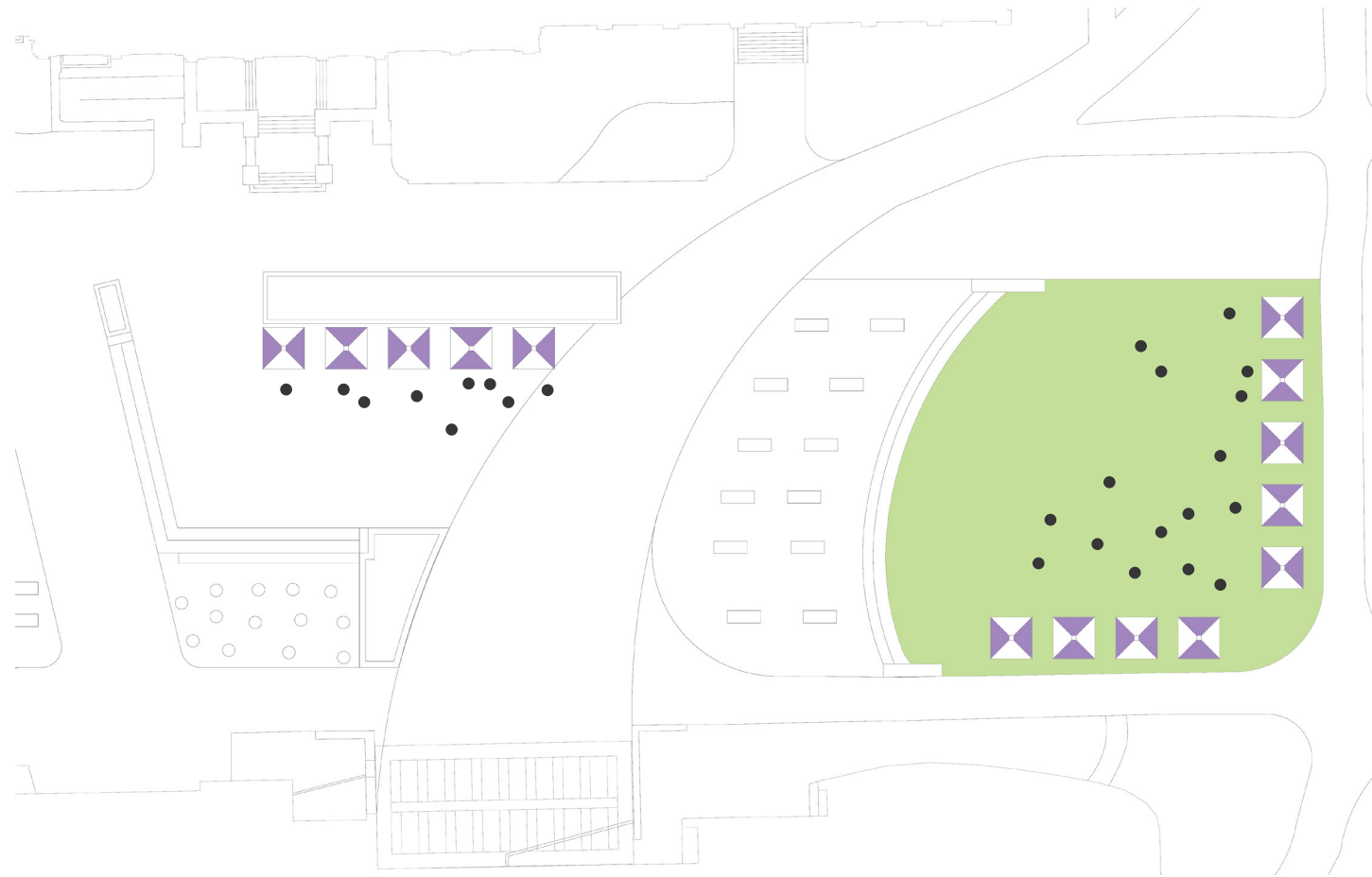


Figure 5.5
Tent Event Setup



Figure 5.6
Stage Event Setup

EVENTS | portable screen + food trucks

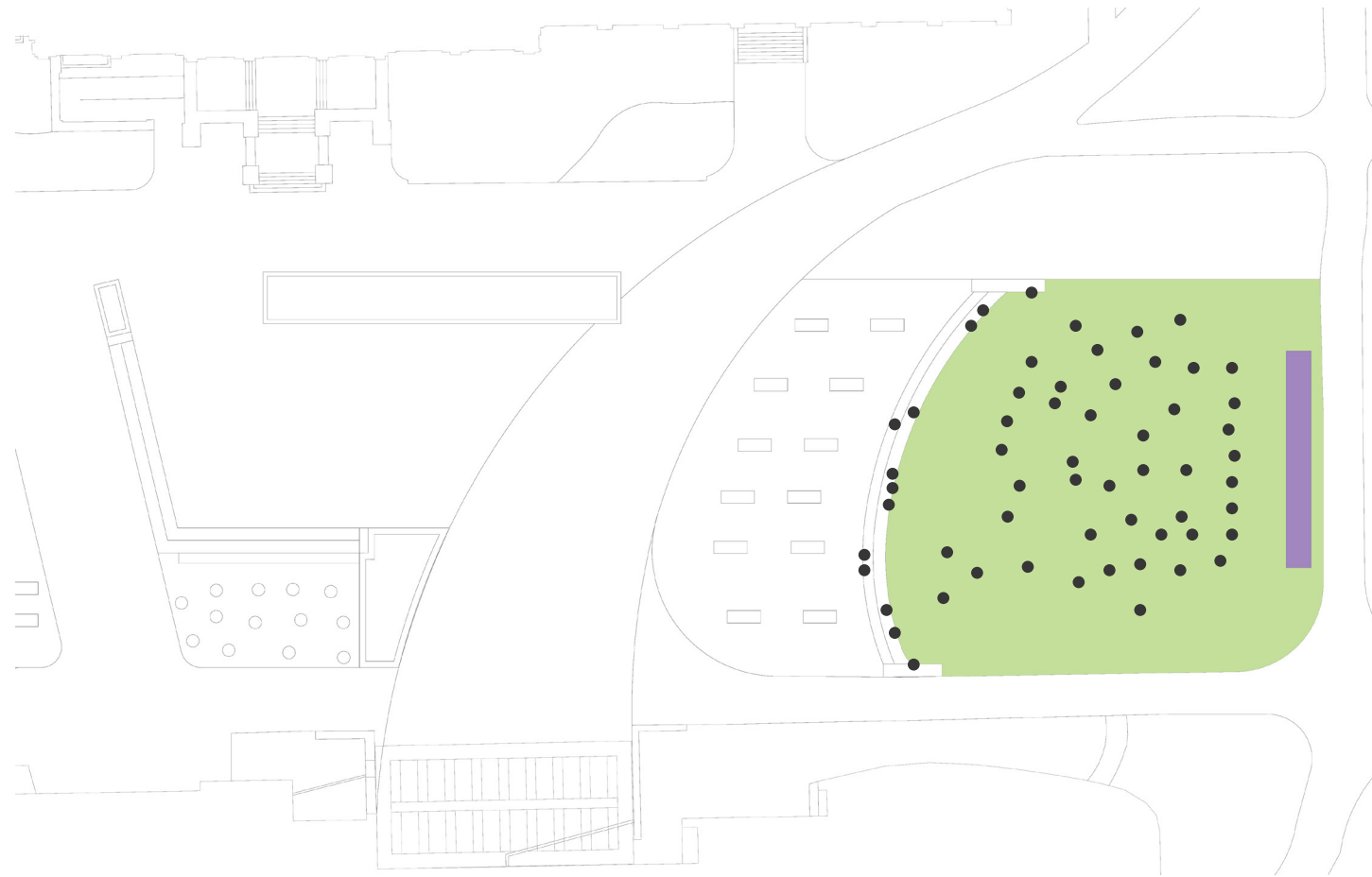


Figure 5.7
Screen Event Setup

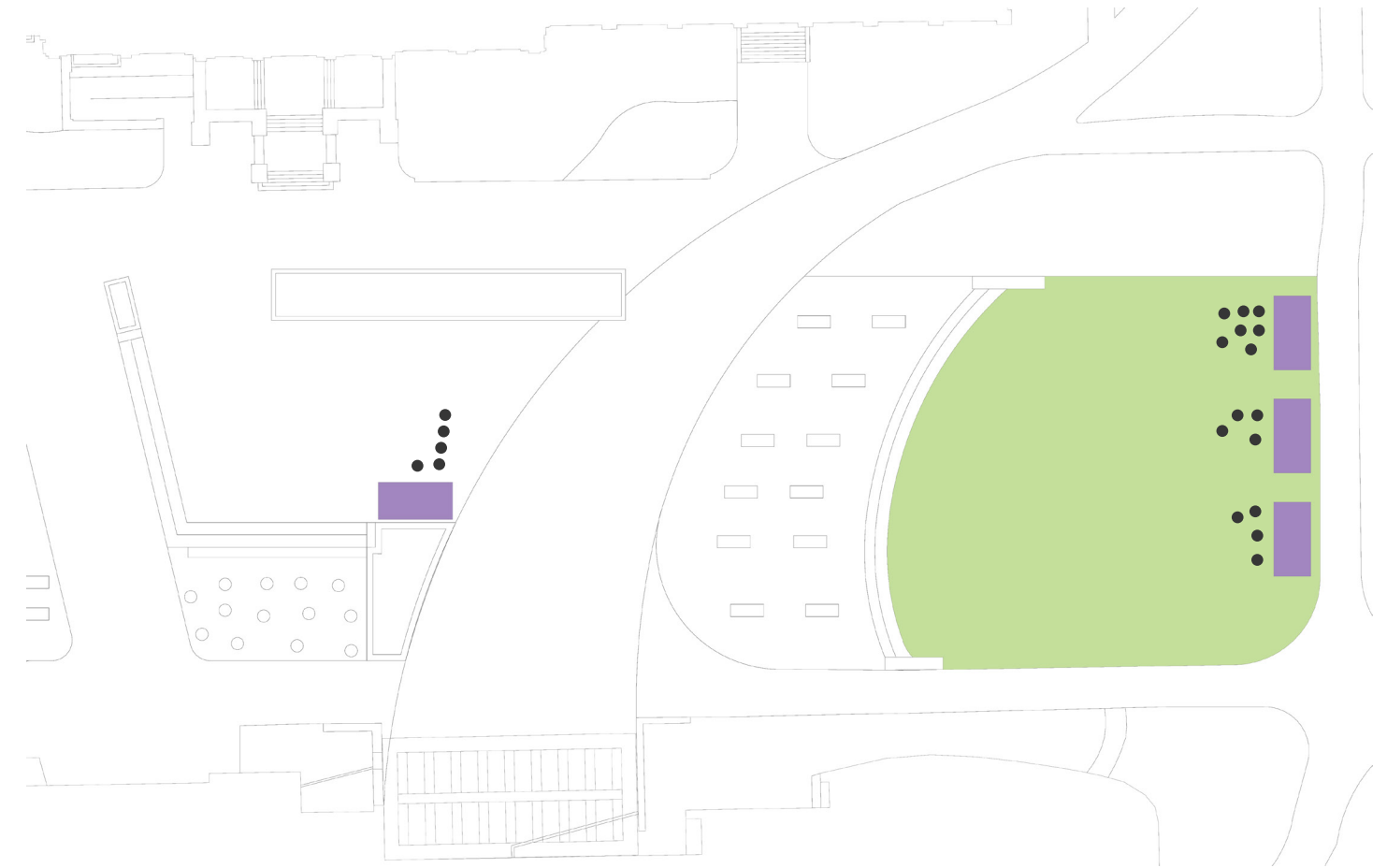


Figure 5.8
Truck Event Setup

PERSPECTIVES | plaza



Figure 5.9
Looking southwest into Bosco Plaza in its current state. (Updike, 2020)



Figure 5.10
New pathway will accommodate the majority of pedestrian traffic flowing between main campus and the Student Union - rendered with hardscape design concept 4.



PERSPECTIVES | plaza



Figure 5.11
Open plaza space retains freedom of movement while extended steps and cafe bosque provide diversified seating options - rendered with hardscape design concept 1.



Figure 5.12
Bar style seating in cafe bosque creates new seating options while encouraging people to spend extended time in the plaza - rendered with hardscape design concept 3.



PERSPECTIVES | plaza



Figure 5.13
Removal of steps and implementation of ramp creates free flow of movement across the plaza into the Student Union - rendered with hardscape design concept 2.



Figure 5.14
Extended steps provide new and informal seating options while retaining freedom of movement across the plaza - rendered with hardscape design concept 5.



PERSPECTIVES | shaded seating



Figure 5.15
Redesign of shaded seating area provides diversity of seating and shade options – rendered with hardscape design concept 6.



Figure 5.16
Redesign of shaded seating area provides new seating and shade options with close connection to the open plaza space – rendered with hardscape design concept 6.



PERSPECTIVES | café bosque



Figure 5.17
The cafe bosque provides a space with movable and informal seating options, natural shade, and a close connection to the coffee shop inside the Student Union.



Figure 5.18
The cafe bosque provides natural shade and a slight sense of seclusion in Bosco Plaza.



PERSPECTIVES | lawn + bosque



Figure 5.19
The eastern lawn space provides a recreational area with diverse seating options for the university community.

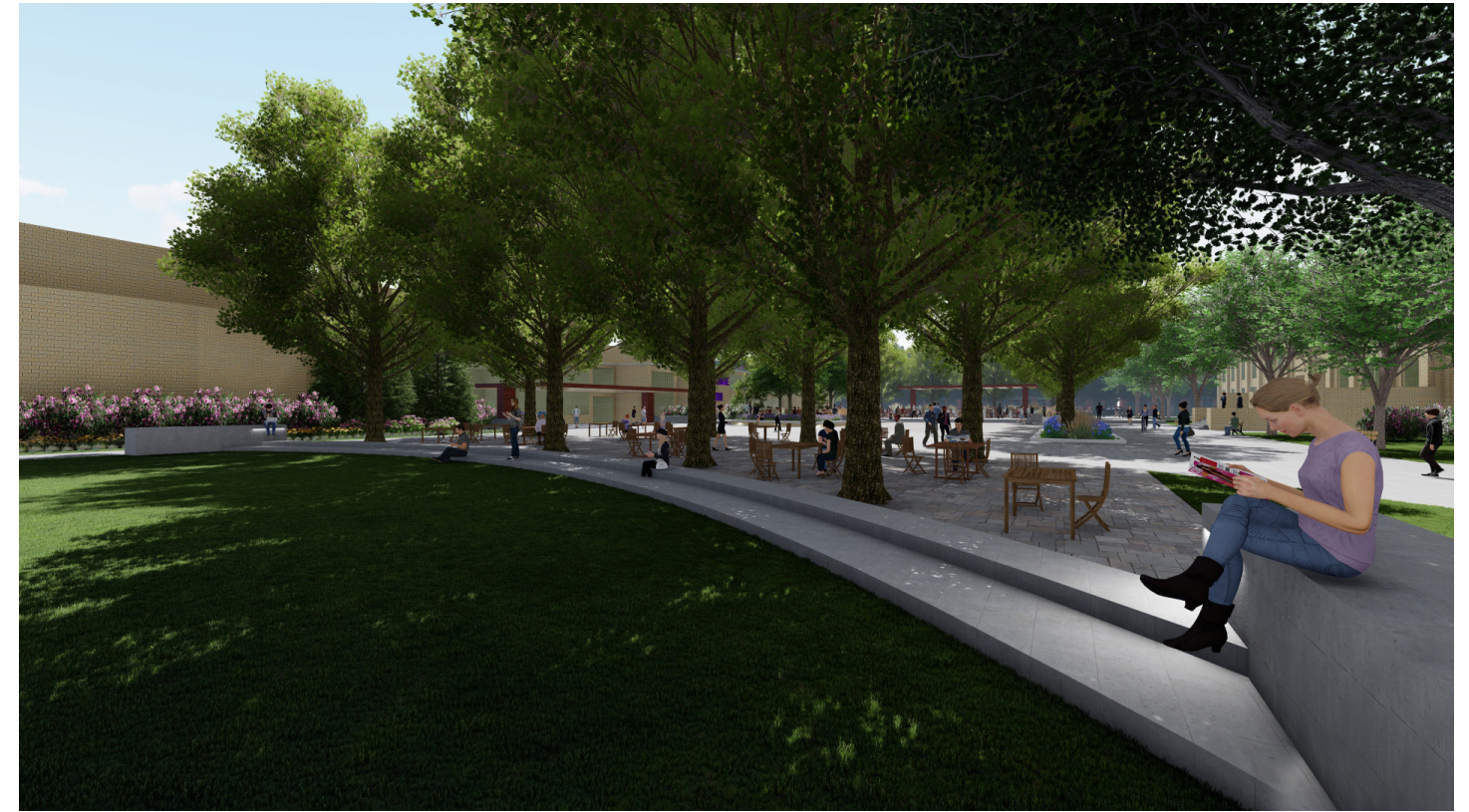


Figure 5.20
The lawn bosque provides an area in Bosco Plaza with close connection to the open plaza space and the lawn space.





PROJECTIVE DESIGN PERCEPTION SURVEY

OVERVIEW

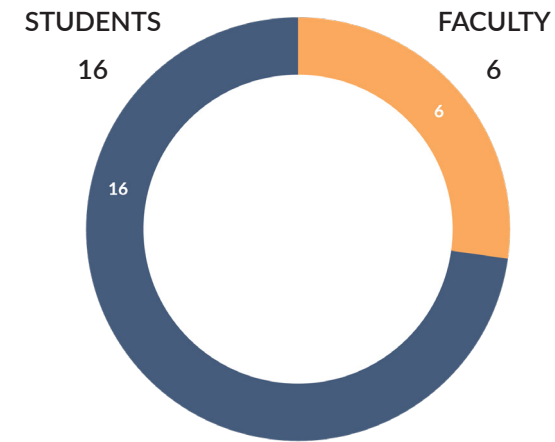
Following the projective redesign of Bosco Plaza, a survey striving to understand hardscape design's influence on perception of public space was conducted. In the survey, six hardscape design concepts, each varying in their uses of hardscape design attributes (color, pattern, frame, edge, and paver size), were implemented within the projective redesign. The survey asked to participants to rank order these six design concepts in terms of perceptions of aesthetic quality, safety, welcoming, comfort, and interest. Participants were also asked to rank order the six hardscape design concepts in terms of their use of color, pattern, frame, edge, and paver size.

Concept 1 strove to implement design factors that were identified through research as being highly aesthetically preferred (no contrast edging, no framing, dispersed patterning, larger pavers, and three colors). Each of the components that tested the highly in the initial preference survey were implemented in this design. In Concept 2, each of the components from the first design remained the same, but the size of the pavers was reduced (no contrast edging, no framing, dispersed patterning, smaller pavers, and three colors). The third and fourth design concepts focused on numbers of colors. The third design used two colors (no contrast edging, no framing, dispersed patterning, smaller pavers, and two colors). The fourth design used just one consistent color (no contrast edging, no framing, dispersed patterning, smaller pavers, one color). The fifth and sixth design concepts tested framing and patterning. The fifth design implemented a single row frame (no contrast edging, single-row frame, orderly patterning, smaller pavers, two colors). The sixth design concept implemented multi-row frames (no contrast edging, multi-row frame, orderly patterning, smaller pavers, two colors).

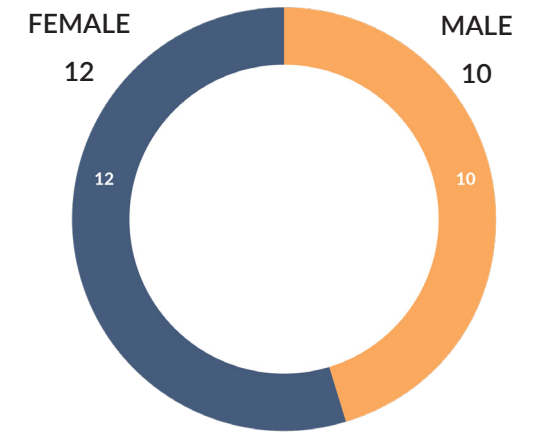
PROJECTIVE DESIGN PERCEPTION SURVEY

Demographics

The Projective Design Perception Survey, conducted through Qualtrics, was completed by 22 members of Kansas State University’s CAPD. Among the respondents, 16 identified as students and 6 as faculty members, with 12 responses from females and 10 responses from males. Each discipline within the CAPD was represented, with three from Architecture, three from Interior Architecture and Product Design, 12 from Landscape Architecture, and four from Regional and Community Planning. Participants ranged from 2nd year to 5th year students and faculty experience ranged from one year to 20 years. See Figures 5.21 – 5.25 for a summary of these demographics.



Students and Faculty
Figure 5.21

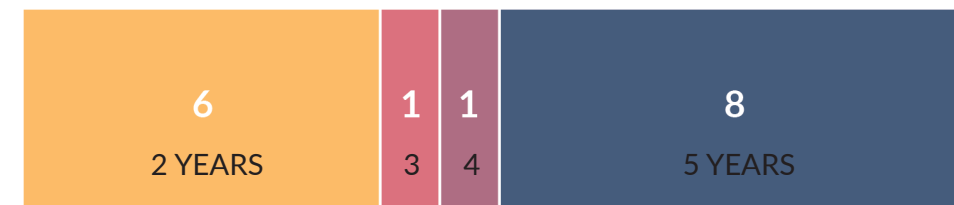


Gender of Participants
Figure 5.22



CAPD Disciplines

Figure 5.23 Perception Survey: CAPD Disciplines



Student Experience

Figure 5.24 Perception Survey: Student Experience



Faculty Experience

Figure 5.25 Perception Survey: Faculty Experience

PROJECTIVE DESIGN PERCEPTION SURVEY

HARDSCAPE DESIGN CONCEPT 1

The first hardscape design concept incorporated the aesthetic attributes found to be the most aesthetically pleasing from the Hardscape Preference Survey.

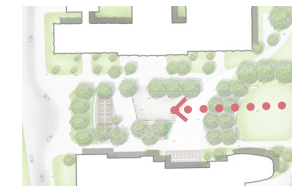
COLOR	3
PATTERN	Dispersed
EDGE	None
FRAME	None
PAVER SIZE	Larger

Figure 5.26 Hardscape Design Concept 1

Figure 5.27
Design 1
View 1



Figure 5.28
Design 1
View 2



PROJECTIVE DESIGN PERCEPTION SURVEY

HARDSCAPE DESIGN CONCEPT 2

In the second hardscape design concept, the aesthetic attributes of color, framing, edge, and pattern remained unchanged from concept 1. However, to test the potential influence of paver size, the dimensions of the unit pavers were reduced.

COLOR	3
PATTERN	Dispersed
EDGE	None
FRAME	None
PAVER SIZE	Smaller

Figure 5.29 Hardscape Design Concept 2

Figure 5.30
Design 2
View 1



Figure 5.31
Design 2
View 2



PROJECTIVE DESIGN PERCEPTION SURVEY

HARDSCAPE DESIGN CONCEPT 3

To test the potential influence from the number of colors within in a design, concepts 3 and 4 differ in number of colors but remain the same for the other four attributes. Concept 3 uses two colors, in cool tones.

COLOR	2
PATTERN	Dispersed
EDGE	None
FRAME	None
PAVER SIZE	Smaller

Figure 5.32 Hardscape Design Concept 3

Figure 5.33
Design 3
View 1



Figure 5.34
Design 3
View 2



PROJECTIVE DESIGN PERCEPTION SURVEY

HARDSCAPE DESIGN CONCEPT 4

To test the potential influence from the number of colors within in a design, concepts 3 and 4 differ in number of colors but remain the same for the other four attributes. Concept 4 uses one color, in cool tone.

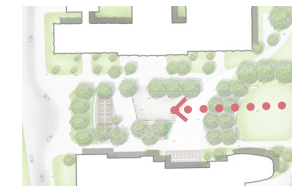
COLOR	1
PATTERN	None
EDGE	None
FRAME	None
PAVER SIZE	Smaller

Figure 5.35 Hardscape Design Concept 4

Figure 5.36
Design 4
View 1



Figure 5.37
Design 4
View 2



PROJECTIVE DESIGN PERCEPTION SURVEY

HARDSCAPE DESIGN CONCEPT 5

Concepts 5 and 6 tested framing and patterning. Concept 5 implemented a single row frame and orderly patterning through use of multi-row alternating color bands.

COLOR	2
PATTERN	Orderly
EDGE	No Contrast
FRAME	Single Row
PAVER SIZE	Smaller

Figure 5.38 Hardscape Design Concept 5

Figure 5.39
Design 5
View 1



Figure 5.40
Design 5
View 2



PROJECTIVE DESIGN PERCEPTION SURVEY

HARDSCAPE DESIGN CONCEPT 6

Concepts 5 and 6 tested framing and patterning. Concept 6 implemented a multi-row frame and orderly patterning through multi-row alternating bands. The overall visual effect differs from concept 5, in that the white framing pavers are widened to create a multi-row frame.

COLOR	2
PATTERN	Orderly
EDGE	No Contrast
FRAME	Multi Row
PAVER SIZE	Smaller

Figure 5.41 Hardscape Design Concept 3

Figure 5.42
Design 6
View 1



Figure 5.43
Design 6
View 2



Aesthetic Perception

When asked to rank order the six hardscape design concepts in terms of attractiveness, respondents reported perceptions of attractiveness that were high for designs 1 (average rank: 1.95), 2 (2.16), and 3 (2.68). Designs 6 (4.58), 5 (4.63), and 4 (5.00) were clearly less favored.

This distinct dividing line between Designs 1-3 and Designs 4-6 likely exists for a handful of reasons. Designs 1-3 were more diverse in their uses of numbers of colors and patterning strategies. Additionally, Designs 1-3 did not use framing pavers, another form of orderly design.

Ranking Scale: 1 (most preferred) to 6 (least preferred)

DESIGN	AVERAGE RANKING
DESIGN 1	1.95
DESIGN 2	2.16
DESIGN 3	2.68
DESIGN 6	4.58
DESIGN 5	4.63
DESIGN 4	5.00

Figure 5.44 Aesthetic Perception

Perception of Safety

When asked to rank order the six hardscape design concepts in terms of safety, respondents reported perceptions of safety that were high for designs 1 (average rank: 2.05), 2 (2.26), and 3 (3.05). Designs 5 (4.32), 4 (4.63), and 6 (4.68) were less favored.

Perceptions of safety in the plaza correlated closely with aesthetic perception, implying that more attractive spaces are also seen as being safer.

Ranking Scale: 1 (most preferred) to 6 (least preferred)

DESIGN	AVERAGE RANKING
DESIGN 1	2.05
DESIGN 2	2.26
DESIGN 3	3.05
DESIGN 5	4.32
DESIGN 4	4.63
DESIGN 6	4.68

Figure 5.45 Perception of Safety

Perception of Welcoming

When asked to rank order the six hardscape design concepts in terms of feeling of welcoming, respondents reported perceptions of welcoming that were high for designs 1 (average rank: 2.05), 2 (2.05), and 3 (2.68). Designs 5 (4.32), 4 (4.58), and 6 (5.32) were clearly less favored.

Perceptions of welcoming in the plaza correlated closely with aesthetic perception, implying that more attractive spaces are also seen as being more welcoming.

Ranking Scale: 1 (most preferred) to 6 (least preferred)

DESIGN	AVERAGE RANKING
DESIGN 1	2.05
DESIGN 2	2.05
DESIGN 3	2.68
DESIGN 5	4.32
DESIGN 4	4.58
DESIGN 6	5.32

Figure 5.46 Perception of Welcoming

Perception of Comfort

When asked to rank order the six hardscape design concepts in terms of comfort, respondents reported perceptions of comfort that were high for designs 1 (average rank: 1.95), 2 (2.05), and 3 (2.68). Designs 5 (4.47), 6 (4.63), and 4 (5.21) were clearly less favored.

Perceptions of comfort in the plaza correlated closely with aesthetic perception, implying that more attractive spaces are also seen as being more comfortable.

Ranking Scale: 1 (most preferred) to 6 (least preferred)

DESIGN	AVERAGE RANKING
DESIGN 1	1.95
DESIGN 2	2.05
DESIGN 3	2.68
DESIGN 5	4.47
DESIGN 6	4.63
DESIGN 4	5.21

Figure 5.47 Perception of Comfort

Perception of Interest

When asked to rank order the six hardscape design concepts in terms of interest in the space, respondents reported perceptions of interest that were high for designs 2 (average rank: 1.89), 1 (2.11), and 3 (2.84). Designs 5 (4.37), 6 (4.37), and 4 (5.42) were clearly less favored.

Perceptions of interest in the plaza correlated closely with aesthetic perception, implying that more attractive spaces are also seen as being more interesting.

Ranking Scale: 1 (most preferred) to 6 (least preferred)

DESIGN	AVERAGE RANKING
DESIGN 2	1.89
DESIGN 1	2.11
DESIGN 3	2.84
DESIGN 5	4.37
DESIGN 6	4.37
DESIGN 4	5.42

Figure 5.48 Perception of Interest

Use of Color

When asked to rank order the six hardscape design concepts in terms of use of number of colors, respondents reported preferences that were high for designs 1 (average rank: 1.84), 2 (2.00), and 3 (2.84). Designs 5 (4.63), 6 (4.68), and 4 (5.00) were less favored.

Designs 1–3 were clearly more favored in their use of numbers of colors, while Design 4, a design in which just one consistent color was used, was the least preferred. This survey population, comprised of design students and educators, may have an influence on these results. People with design education exposure could prefer more diversity in terms of color use. Interestingly, Designs 5 and 6 utilized two colors and were orderly patterned. These designs still ranked poorly, implying that while number of colors used is important, perhaps the strategy of application of color is more influential in preference.

Ranking Scale: 1 (most preferred) to 6 (least preferred)

DESIGN	AVERAGE RANKING
DESIGN 1	1.84
DESIGN 2	2.00
DESIGN 3	2.84
DESIGN 5	4.63
DESIGN 6	4.68
DESIGN 4	5.00

Figure 5.49 Use of Color

Use of Pattern

When asked to rank order the six hardscape design concepts in terms of pattern use, respondents reported preferences that were high for designs 1 (average rank: 1.74), 2 (2.16), and 3 (3.00). Designs 6 (4.47), 5 (4.58), and 4 (5.05) were less favored.

Designs using more dispersed applications of color/patterning were clearly more favored than more designs using applications with more orderly patterning. The population of design educators and students likely influenced these results, as research shows that creative people prefer more chaotic and unpredictable patterns.

Ranking Scale: 1 (most preferred) to 6 (least preferred)

DESIGN	AVERAGE RANKING
DESIGN 1	1.74
DESIGN 2	2.16
DESIGN 3	3.00
DESIGN 6	4.47
DESIGN 5	4.58
DESIGN 4	5.05

Figure 5.50 Use of Pattern

Use of Framing

When asked to rank order the six hardscape design concepts in terms of framing use, respondents reported preferences that were high for designs 1 (average rank: 2.16), 2 (2.16), and 3 (2.74). Designs 5 (4.26), 6 (4.42), and 4 (5.26) were clearly less favored.

The use of framing pavers often results in more orderly designs. As the results of the survey show, the survey population here clearly prefers more dispersed patterning and a level of unpredictability in hardscape designs.

Ranking Scale: 1 (most preferred) to 6 (least preferred)

DESIGN	AVERAGE RANKING
DESIGN 1	2.16
DESIGN 2	2.16
DESIGN 3	2.74
DESIGN 5	4.26
DESIGN 4	4.42
DESIGN 6	5.26

Figure 5.51 Use of Framing

Use of Edge

When asked to rank order the six hardscape design concepts in terms of use of edge pavers, respondents reported preferences that were high for designs 2 (average rank: 2.32), 1 (2.37), and 3 (2.42). Designs 5 (4.16), 6 (4.63), and 4 (5.11) were clearly less favored.

Results in this section of the survey correlated largely with the numbers of colors used and the patterning strategy, opposed to each design's edge paver strategy. These results would imply that edge paver strategy is not a highly influential attribute of hardscape design compared to color, pattern, and framing.

Ranking Scale: 1 (most preferred) to 6 (least preferred)

DESIGN	AVERAGE RANKING
DESIGN 2	2.32
DESIGN 1	2.37
DESIGN 3	2.42
DESIGN 5	4.16
DESIGN 6	4.63
DESIGN 4	5.11

Figure 5.52 Use of Edge

Use of Paver Size

When asked to rank order the six hardscape design concepts in terms of paver size, respondents reported preferences that were high for designs 1 (average rank: 1.89), 2 (2.26), and 3 (2.74). Designs 6 (4.53), 5 (4.53), and 4 (5.11) were clearly less favored.

Results in this section of the survey correlated largely with the numbers of colors used and the patterning strategy, opposed to each design's paver size. These results would imply that preference of paver size is an attribute of hardscape design that relies upon other attributes like color and pattern.

Ranking Scale: 1 (most preferred) to 6 (least preferred)

DESIGN	AVERAGE RANKING
DESIGN 1	1.89
DESIGN 2	2.26
DESIGN 3	2.74
DESIGN 6	4.53
DESIGN 5	4.53
DESIGN 4	5.11

Figure 5.53 Use of Paver Size

Overall Preference

When asked to rank order the six hardscape design concepts in terms of overall preference, respondents reported Designs 1, 2, and 3 to be clear favorites. In fact, Designs 4, 5, and 6 did not receive a single vote. Design 1 was the overall most preferred (52.36%), Design 2 second most (36.84%), and Design 3 was third most preferred (10.53%).

Possible Reasoning for Findings

Aesthetic preferences and perceptions of the public space ranked very similarly throughout the survey, with Designs 1, 2, and 3 clearly being preferred over Designs 4, 5, and 6 in every category. The designs which scored higher each exhibited similar attributes. They each displayed no contrast edging, no framing, dispersed patterning, and multiple colors. The less favored designs displayed at least one of the following attributes: one color, single-row framing, multi-row framing, or orderly patterning.

Design 4, the only design using just one consistent color, was clearly the least preferred. Designs 5 and 6, the only designs using orderly patterning and framing, also were consistently ranked lowly. Participants of the survey preferred designs with multiple colors and less predictability in terms of pattern and framing.

These results suggest that randomness and diversity in terms of colors and patterning are more preferred than predictability in design. The survey population of design educators and students likely influenced these results, as past research indicates that creative people tend to prefer more 'chaos' in design. Hardscapes that rated highly in terms of aesthetics were also perceived more positively. This is a logical correlation, as more attractive spaces are more likely to be occupied.

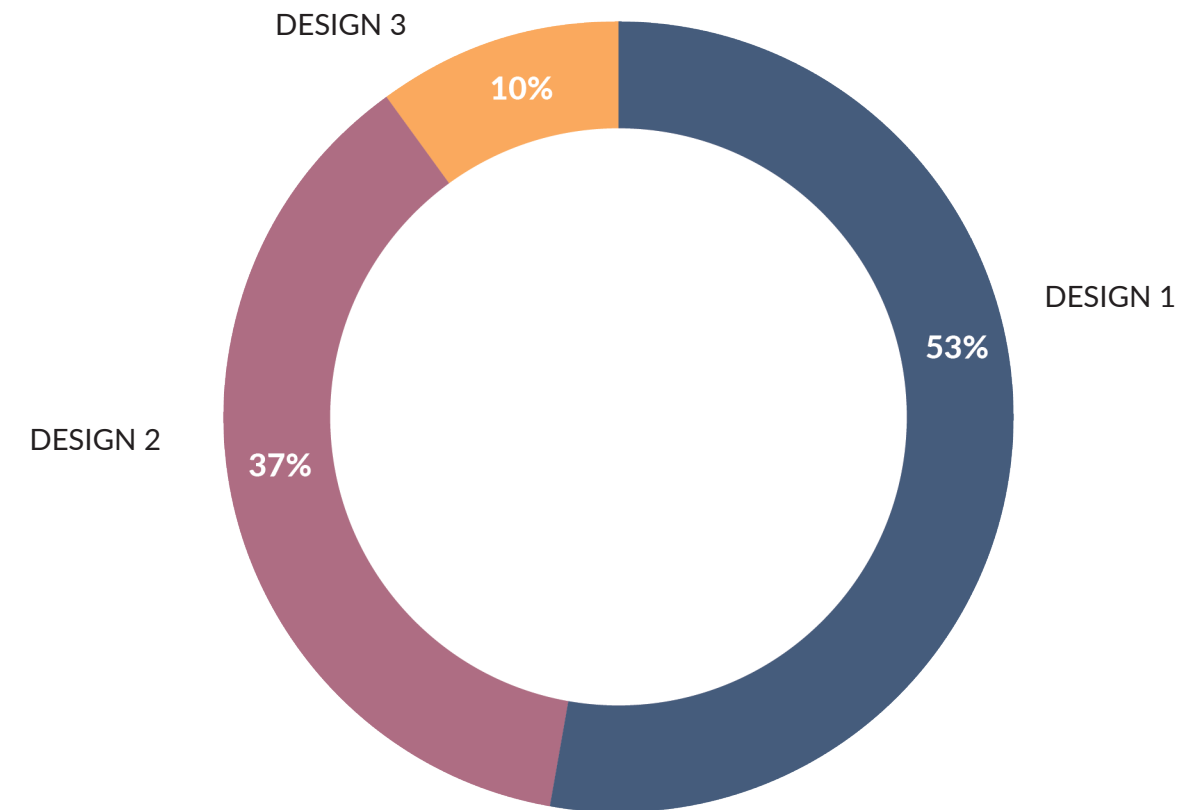


Figure 5.54 Overall Preference

CONCLUSION

6

chapter six



CONCLUSION

SUMMARY OF PROJECT + FINDINGS

The purpose of this research was three-fold: to learn what aesthetic attributes of hardscape design are most aesthetically preferred, to create a well-informed design proposal for Bosco Plaza, and to assess hardscape design's influence on perceptions of attractiveness, safety, welcoming, comfort, and interest in public space.

The preference survey sought to learn more about aesthetic preferences of the attributes of color, pattern, framing, edge, and size of hardscape design with unit pavers. In terms of preference for the number of colors used in a design, the findings were inconclusive. Preferences for designs with one, two, and three or more colors each scored relatively the same. These results lead the research to conclude that while color is surely an important aspect of paving design, its use must be coupled with other strategies to create a highly aesthetic design. However, the same can be said for attributes of paving design that did produce conclusive results. For example, designs that implemented dispersed patterns of color were clearly favored over designs that used orderly patterns. While this information could be useful to a designer, none of these attributes should be viewed individually. Each of these attributes (color, pattern, framing, edge, and size) work together to create one harmonious design, and while the results of these individual studies could inform design decisions, hardscape design should still be viewed as a task with many aspects dependent on one another.

The site analysis research found that Bosco Plaza is largely perceived by the university community as a space to pass through, as opposed to a space to spend time in. Additionally, the plaza received poor ratings in terms of aesthetics in an

intercept survey. To address this, the redesigns strove to provide distinctly programmed spaces with additional vegetation and a more engaging hardscape. Specifically, the projective redesign of Bosco Plaza implemented recreational lawn space, clearer central access to the Student Union, more diverse vegetation and seating options, and decreased unprogrammed space while retaining vital circulation patterns and the feel of a pedestrian plaza.

The Projective Design Perception Survey took what was learned from the Hardscape Design Preference Survey and tested hardscape attribute's influence on perceptions of public space. The results of the perception survey revealed that aesthetic preferences and perceptions of safety, comfort, welcoming, and interest were related. While further testing would be needed to confirm this, these results show that attractive spaces are more likely to be occupied. Specifically, the hardscape designs that ranked highest each used multiple colors and dispersed patterning, while hardscape designs that ranked lower were more orderly or used just one color. From these results, it is evident that hardscape designs which use a diversity of colors and a level of unpredictability are more inspiring and inviting than those that do not. This information could help to inform hardscape design decisions in public spaces that want to encourage interaction.

Ultimately, the project's main takeaways for designers are:

- 1) Hardscape design relies on several design attributes. Aesthetically preferred hardscapes utilize each attribute harmoniously.
- 2) Diversity in color use and patterning in hardscape design tends to be more favored.
- 3) Hardscape is a key component of a successful public space.
- 4) Hardscape design decisions impact perceptions of safety, comfort, welcoming, and interest in public spaces.

RESEARCH LIMITATIONS

Time & Sample Size

The research was limited primarily by time. Each portion of the project would have undoubtedly benefited from more time to perfect certain aspects. Because of time limitations, each survey targeted just thirty participants, but with additional time, more survey participants could be included, and the data could reach statistical significance in relation to population size. Despite a smaller sample size, the research attempted to capture diverse perspectives. For the intercept survey, the broader campus community was included. For the Hardscape Design Preference Survey and the Hardscape Redesign Perception Survey, participants came only from within the CAPD. This strategy was intentional, assuming those with design education would be able to better articulate their aesthetic rationale. However, to be more inclusive, and possibly garner different results, these surveys could have targeted the broader campus community, too.

Variables

The preference survey was also limited in terms of the number of variables that could be reasonably tested. In hardscape design, and specifically that with unit pavers, there are many different materials available in a seemingly endless assortment of colors, textures, and finishes. Faced with this limitation, the research strove to focus on common aesthetic attributes that could be easily explained, displayed, and tested against one another. Specific materials, textures, and finishes were not examined as variables in this study.

Use of Images in Preference Surveys

The preference and perception surveys used images as a basis for participants to respond to. Levels of brightness and contrast of each image were adjusted in Photoshop to ensure that differences in image quality did not impact a participant's response. Contextual elements like buildings, vegetation, and people were removed from the images as well. Perceptions in real environments can be influenced by many factors, such as surrounding structures with unique design styles and materials. Perceptions could also be influenced by real-world lighting conditions and actual materials, two aspects that were not tested in the research. While the image comparisons strove to test for aesthetic preferences of color, pattern, frame, edge, and size, other aspects in the images, like context, cleanliness, and image quality could have subconsciously influenced a participant's choice. The research attempted to provide images and simulate environments that would eliminate these contextual elements.

Assessing levels of preference is not a simple task. For example, when a survey participant is asked to choose their favorite hardscape design between two images, it can be difficult to understand why they came to that conclusion from the researcher's point of view. Recognizing this, the research strove to provide images that would clearly only test for the desired variables. Aesthetic preference is also composed of all five senses. Primarily limited by software capabilities, this research focused only on the sense of vision. Future research, which will be discussed in the following section, could potentially involve more or all senses.

FUTURE RESEARCH

Research focused on visual perception of hardscapes and their components is an ongoing process. In terms of research on this topic, multiple aspects could be extrapolated upon and/or added. Perception and aesthetics are topics composed of many variables that were not each addressed in-depth in this research project. For example, future research could focus more intently on demographic and cultural elements and how that may influence a distinct preference in paving design. Various cultures and areas of the world may prefer certain designs more than another. Additionally, physiological components of perception were not addressed in this research. Future research may focus on physiological aspects such as blood pressure and eye dilation during perception studies to gain a better understanding of how people are perceiving spaces. In terms of methodology, future research may benefit by using different or additional software than what was utilized in this project. While it was used in this research, further exploration of parametric paving software using Grasshopper may be useful in future research endeavors. Future research may also look more intently at other senses in addition to the sense of vision. The senses of touch, hearing, smell, and possibly even taste could be incorporated in research on the topic of measuring aesthetic preference in public space.

APPENDIX



appendix

APPENDIX A | BIBLIOGRAPHY

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APPENDIX B | IMAGE REFERENCES

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APPENDIX C | IMAGE PERMISSION

Special thanks to several unit paver manufacturers (Unilock, Belgard, and Hanover) for granting permission to use images from their respective company websites. All images used in the report have been used with permissions.

APPENDIX D | IRB APPROVAL

TO: Dr. Jessica Canfield
Landscape Architecture/Regional and Community Planning
2103 Seaton Hall

Proposal Number: 9934

FROM: Rick Scheidt, Chair 
Committee on Research Involving Human Subjects

DATE: 10/31/2019

RE: Proposal Entitled, "Material Selection and Sense of Place in Public Space"

The Committee on Research Involving Human Subjects / Institutional Review Board (IRB) for Kansas State University has reviewed the proposal identified above and has determined that it is EXEMPT from further IRB review. This exemption applies only to the proposal - as written - and currently on file with the IRB. Any change potentially affecting human subjects must be approved by the IRB prior to implementation and may disqualify the proposal from exemption.

Based upon information provided to the IRB, this activity is exempt under the criteria set forth in the Federal Policy for the Protection of Human Subjects, **45 CFR §46.101, paragraph b, category: 2, subsection: ii.**

Certain research is exempt from the requirements of HHS/OHRP regulations. A determination that research is exempt does not imply that investigators have no ethical responsibilities to subjects in such research; it means only that the regulatory requirements related to IRB review, informed consent, and assurance of compliance do not apply to the research.

Any unanticipated problems involving risk to subjects or to others must be reported immediately to the Chair of the Committee on Research Involving Human Subjects, the University Research Compliance Office, and if the subjects are KSU students, to the Director of the Student Health Center.

APPENDIX D | IRB APPROVAL

TO: Dr. Jessica Canfield
Landscape Architecture/Regional and Community Planning
2103 Seaton Hall

Proposal Number: 10057

FROM: Rick Scheidt, Chair 
Committee on Research Involving Human Subjects

DATE: 02/10/2020

RE: Proposal Entitled, "Aesthetics of Hardscape Design in Public Space"

The Committee on Research Involving Human Subjects / Institutional Review Board (IRB) for Kansas State University has reviewed the proposal identified above and has determined that it is EXEMPT from further IRB review. This exemption applies only to the proposal - as written - and currently on file with the IRB. Any change potentially affecting human subjects must be approved by the IRB prior to implementation and may disqualify the proposal from exemption.

Based upon information provided to the IRB, this activity is exempt under the criteria set forth in the Federal Policy for the Protection of Human Subjects, **45 CFR §46.101, paragraph b, category: 2, subsection: ii.**

Certain research is exempt from the requirements of HHS/OHRP regulations. A determination that research is exempt does not imply that investigators have no ethical responsibilities to subjects in such research; it means only that the regulatory requirements related to IRB review, informed consent, and assurance of compliance do not apply to the research.

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