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In the United States, urban transit busses are not used to the fullest of their capacity and one of the many reason is the perception of crime. This research asks riders and non-riders how they perceive the design components of bus and bus stop designs relating to crime. The investigation was conducted to help improve the riding experience of those who have to ride the bus, attract the non-rider to ride the bus and positively alter the attitude of the non-bus rider about the bus ride, thus perhaps also increasing ridership.

The case study research was conducted in a small city (Ann Arbor, MI) and a large metropolis (Detroit, MI) with additional research for external validity conducted in Burlington, Vermont and Washington, D.C. The research methodology includes interviews, site visits, observations, literature review, surveys of riders on buses, picture preference surveys and focus group discussions.

The results were derived primarily from the picture preference survey in which 70 slides of, front views, back views, wrap-around advertising, various colors, windows, doors, and seats of several buses and bus stops were shown to 168 subjects in 15 focus group. The slides were rated on a 7 point likert scale of –3 to +3 to indicate perception of crime.

The literature review relies on the principles of Crime Prevention Through Environment al Design (CPTED) that demonstrates certain design can reduce the perception of crime. The recommendations are practical and affordable design alternations offered with full cognizance of the difficulties in making these changes.

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BUS AND BUS STOP DESIGNS RELATED TO PERCEPTIONS OF CRIME

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Abstract

In the United States, urban transit buses are not used to the fullest of their capacity and one of the many reasons is the perception of crime. The objective of this research was to investigate how riders and non-riders of public transportation perceive the design components of bus and bus stop designs related to crime. The investigation was conducted to help improve the riding experience of those who have to ride the bus, attract the non-bus rider to the bus and positively alter the attitude of the non-bus rider about the bus rider, thus perhaps also increasing ridership.

The case study research was conducted in a small city (Ann Arbor, MI) and a large metropolis (Detroit, MI) with additional research for external validity conducted in Burlington, Vermont and Washington, D.C. The research methodology includes interviews, site visits, observations, literature review, surveys of riders on buses, picture preference surveys and focus group discussions.

The results were derived primarily from the picture preference survey in which 70 slides of bus stops, fronts, backs, advertising, color, windows, doors and seats were shown to 168 subjects in 15 focus groups. The slides were rated on a 7 point Likert scale of -3 to $+3$ to indicate perceptions of crime.

The literature review relies on the principles of Crime Prevention Through Environmental Design (CPTED) that demonstrates certain designs can reduce the perception of crime. The recommendations are practical and affordable design alterations offered with full cognizance of the difficulties in making these changes.

Overview

From September 1998 until December 2001, research was conducted on bus and bus stop designs related to perceptions of crime. The following is a summary of the 111 page document that is available through the National Technical Information Service (NTIS) Springfield, Virginia 22161 email orders@ntis.fedworld.gov. The research was sponsored by the Federal Transit Administration, Office of Research, Demonstration and Innovation, the Ann Arbor Transportation Authority and the Great Lakes Center for Truck and Transit Research. The work was carried out by Anne Lusk at, Taubman College of Architecture and Urban Planning, University of Michigan. The following Executive Summary presents a brief description of the contents and conclusions within each chapter.

Executive Summary

Transit buses can be a non-polluting alternative to traffic congestion and yet, due to a multitude of reasons, the majority of the population chooses the car. A segment of the population that does ride the bus might ride because they don't have a car or the bus is more affordable. Another segment of the population might ride the bus but, for reasons such as convenience, they opt to drive a car. A final segment of the population will perhaps never ride the bus but they still form impressions about the bus and bus riders based on the outward appearance of the bus and also perceive the bus as part of their city's image. The populations that ride, might ride or will never ride the bus could benefit from a well-designed bus and design coordinated bus stop. One of the reasons buses are not preferred by the populations that ride, might ride or won't ride buses is the perception of crime as it relates to personal security. If the perception of crime could be lessened, three benefits might accrue: 1) the people who ride buses might feel less fearful; 2) the people who don't ride the buses might be more inclined to ride; and 3) the people who will never ride the bus might view the bus and riders more favorably and they might be more willing to approve funds to subsidize the bus.

While buses and bus stops could be outfitted with surveillance cameras, prior research suggested that not all the riding public necessarily feels safe with such measures [1]. A field of research called Crime Prevention Through Environmental Design (CPTED) proposes that certain environments could lessen the perception of crime [2]. Though crime can never be prevented, a change in the design of an environment can make the person less concerned about personal security and crime. An example of CPTED is the understanding that people have a response to "fight or flight" [3]. They also have a response to "tend and befriend," [4] especially if they are women and less capable of fighting or fleeing. A well-design bus stop could have an entire wall opened or several doors instead of a single door. This would allow for multiple means of exiting in the event of pending harm, thus providing opportunities for fight or flight. The bus stop might also have benches for socializing and informational or interpretive signs that could foster conversation with others, thus encouraging tending and befriending. For territorial purposes, people also prefer to see an area before they enter. Boarding a bus with wrap around advertising or painted windows means the bus rider is not able to anticipate who might be inside or even determine a safe place to sit. With long, clear glass windows, the view inside of the seats and passengers is evident. At the same time, long, clear windows allow the passengers to see people on the sidewalk. This informal surveillance of pedestrians and passengers provides "more eyes on the street," [5] enabling a person to feel safer. This phenomenon is similar to feeling safe walking by restaurants or coffee shops with long, clear glass windows versus feeling less safe walking by warehouses or walled parking garages.

The research was conducted to determine the bus and bus stop environments in which the perception of crime at bus stops and on buses might be lessened. The premise of the investigation is not to suggest that there is a prevalence of crime on buses or that only people from certain segments of the population ride buses.

Research conducted earlier suggested that bus riders do not typically encounter crime but the research also suggested that people who do not ride the bus perceive an element of crime [6].

Therefore, the research was conducted to see if the bus and bus stop designs might be improved in appearance for those who ride the bus and, second, if the bus could outwardly suggest to non-riders that the bus was safe related to crime. If the appearance was improved, those who ride the bus might have a higher quality of life perceiving greater personal security and more people, who currently don't ride, might be willing to ride the bus.

This investigation was one of the components in the Bus Rapid Transit (BRT) initiative. The BRT was proposed in 1997 by the Federal Transit Administration to provide an integrated, well-defined and innovative system that could be developed incrementally and serve as an alternative to more expensive rail transit. In 2000, FTA sponsored a Transit Bus Summit with bus manufacturers, transit agencies and systems suppliers to discuss: 1) procurement, 2) lack of standardization, and 3) deployment of new technology. The BRT Consortium identified the bus image as one of the elements of success. In 2001, FTA, WestStart and bus industry sponsors held the Bus Rapid Transit and the American Community design competition to generate drawings and new technologies related to buses and bus stops. The result was 50 high design and innovative submissions from professionals and college students, judged by a panel of experts affiliated with the transit agency.

The research was undertaken in two parts: Phase I and Phase II. Phase I involved surveys (314 total participants) distributed on buses in Detroit (2 bus lines, DDOT and SMART) and Ann Arbor (2 bus lines, AATA and University of Michigan). The surveys asked the participants their perceptions about the bus design features in relation to crime including windows, seating and color. Phase I was somewhat inconclusive because many of the participants had only experienced one type of bus and therefore were unable to draw comparisons to other bus and bus stop design components. Phase I helped frame the methodology for Phase II which involved picture preference surveys shown to 15 focus groups in 4 cities including Ann Arbor and Detroit and, for external validity, Burlington, Vermont and Washington, D.C. These focus groups included people who ride the bus, people who might ride the bus and people who probably would never ride the bus. The focus groups were pre-existing gatherings of people who volunteered to view and rank the slides. A total of 400 slides was collected from across the world and culled, in an expert determination, to 70 slides. The slides were chosen due to factors such as viewing time and numbers of slides in each category to include the range of design options.

For example, 15 slides were shown of the various bus stops and 8 slides were shown of bus backs. The participants in the 15 focus groups (168 total participants) ranked their perceptions of crime from –3 for Unsafe to +3 for Safe. In an immediate follow-up focus group discussion, the participants stated why they felt safe or unsafe in the environment, resulting in both quantitative and qualitative data for each slide. A literature review on

the history of buses, environment and behavior, and crime and effects of crime helped explain the findings.

Chapter 1: Introduction

According to mass transit proponents Peter Calthorpe [7], Jane Holtz Kay [8], Robert Cevero [9] and Peter Newman and Jeffrey Kenworthy [10], transit would help solve pollution, sprawl and traffic congestion. These proponents of mass transit do not, though, describe what a bus might look like and determine if people would be willing to ride a bus. Kay identified that the bus was once considered the "loser cruiser" [11] and Frank Roswome, author of the Trolley Car Treasury wrote, "In behalf of buses there is no sentimental advocacy whatever (it is difficult to love a bus) but simply a listing of competitive advantages" [12].

Bus manufactures and bus providers suggested they did not have the financial resources to fully analyze aesthetics related to environment and behavior of the bus and bus stop. According to some in the bus industry (AATA; APTA; CCTA; DDOT: FTA; Gillig; MBTA; Nova BUS; SMART, personal interviews) [13], unlike the automobile manufacturers who have large quantities against which to amortize their research, the bus manufacturers only sell a few buses (approximately 5,000 annually as suggested by individuals with Gillig Corporation) [14]. The transit industry is additionally burdened by a myriad of special regulatory and unique technological issues; profit margins are kept low because of issues such as state and federal low-bid rules. Transit providers are similarly constrained by lack of resources, sometimes operating with no profit margins and typically requiring a subsidy to operate. Consequently, bus manufactures and transit providers find it very difficult to obtain the necessary funding to conduct behavioral research into bus aesthetics and its impact on riders, the general public and the industry. This research was to be offered to the bus providers and bus manufacturers and therefore was conducted with their participation and guidance.

Chapter 2: Research Design

This research was divided into Phase I and Phase II. For Phase I, surveys were distributed on four bus systems in Detroit and Ann Arbor to 1) gather demographic information about riders; 2) investigate research methodologies; and 3) determine and then compare levels of perceptions of individual characteristics of bus and bus stop design features related to personal safety and crime. Nineteen questions were posed and the surveys were distributed and immediately collected on the 4 bus systems in the 2 cities (314 surveys). In general, the participants felt safer in Ann Arbor than Detroit and felt safest riding the University of Michigan buses. In certain questions, one-way analyses of variance, ANOVA, were employed to test for statistical significance at a $p < .05$ level. All groups perceived the route to the bus stop the same on a scale of 1 for 'not pleasant' to 4 for 'very pleasant' (2.59, AATA; 2.76 U of M; 2.53 SMART; 2.56 DDOT). Waiting at the bus stop, the 4 groups perceived variations in safety with 1 'didn't feel safe' to 4 'felt very safe' (3.26 AATA; 3.59 U of M; 3.08 SMART; 2.90 DDOT). Questions 4 through 15 referred to the bus design and could not be tested for statistical significance because the responses from passengers on a given bus are not independent. If, for

example, the bus interior had been overly hot that day or smelled particularly bad, all of the responses from the participants on that bus would have been affected by that factor. The responses (means) could be visually compared across groups to determine tendencies.

The bus color, shape, seat covering, and seat arrangement made the participants feel less safe or perhaps mattered less. The window color, appearance and seeing through made the participants feel safer or perhaps mattered more.

Phase II, a picture preference survey, in which participants were shown 70 slides of bus environments, was less sensitive to the issue of clustering or, as in Phase I, the bus being too hot that day or having a smell. Pre-existing focus groups were shown the slides and asked to rank them (-3 to +3) based on their perception of personal safety related to crime. In total 15 focus groups (168 subjects) viewed the slides and participated in the follow-up discussion from October, 1999 to July, 2000. To test the significance of difference of means for each slide, allowing for the fact that the same person looked at all of the slides, a repeated measures analysis of variance for each of the graphs was conducted. For each analysis, except for that of "color," the test of significant differences between the slides in a category was significant at a $p < .001$. In other words, the participants agreed that in certain environments depicted in the slides they perceived an element of crime or threat to personal security whereas in the slides of bus colors, they felt little relationship to crime.

Chapter 3: Picture Preference Survey and Discussion – Phase II Results

Phase II, the Picture Preference Survey, resulted in more conclusive information regarding people's perceptions of personal security and bus and bus stop designs than Phase I, the surveys distributed on the buses. Rather than offer the Phase II findings at the end of the document, these results were moved to the front. Some readers may not have the time to delve into the more detailed discussions in the other chapters that cover the history of the bus, environment and behavior, and crime on transit.

The participants ranked the slides from Very Unsafe to Very Safe and the means (averages) were determined for the responses to the 70 slides. These results for "all cases" were depicted in 8 bar graphs for each of the categories that included bus stops, front, back, amount of advertising, color, windows, doors and seats. Except for color, these bar graphs demonstrated variation (differences) between perceptions related to personal safety. In other words, the color of the bus carried less significance in relation to perception of crime whereas the design and color of the windows mattered greatly. To check for validity, or if individual groups had similar responses to the cumulative "all cases" group, additional graphs were created for subsets of the participants. These included, "predominantly female," "predominantly seniors," predominantly homeless," and "Vermont-homeless and seniors." While there were variations in the middle ranges of preferences of the slides, there was consistency in the extreme positive and negative perceptions across all groups. In other words, the "all cases" and the "predominantly female," "predominantly seniors," "predominantly homeless," and "Vermont-homeless

and seniors" groups felt safer related to crime with clearer glass windows than with windows that were painted over with ads.

Since the research was determining perceptions of crime and people have various perceptions based on their past and where they live, a variety of people from different socio-economic backgrounds were included. These groups included Lions Club members, school classes, bible study meetings, bridge groups and homeless shelters.

The homeless shelters selected were affiliated with a church or with the city and only allowed individuals who were not intoxicated, not on drugs or not misbehaved. Many of the individuals at the homeless shelters were employed and also very familiar with buses. The homeless shelter individuals were extremely knowledgeable about perceptions of crime and offered very helpful information related to better designs for buses and bus stops. The inclusion of the homeless shelter individuals does not suggest that only people at homeless shelters ride buses. Rather, because the research was related to perceptions of crime, these populations were specifically sought due to their valuable advice. After a focus group discussion in a homeless shelter where very specific suggestions for bus designs were offered, the author remarked on their insights to a supervisor and he responded, "These people live the life."

The Bus Design Compilation Table Phase II Chart #3 at the end outlines the composite results from the literature review, observations, surveys and focus groups. The following information briefly covers the results of the Phase II picture preference survey quantitative ranking and qualitative group discussions.

Bus Stop

The most preferred bus stop was brick with a standing seam pitched metal roof, a large overhang, 3 sided-glass walls and a sign on top that read Saint Michael's College. There were no bushes adjacent to the bus stop but there was an open field of mown grass with a building apparent in the background. The participants liked this bus stop because it was made of brick or masonry (couldn't get blown away), open, no bushes, architecture, and the name on the roof. Some of the participants liked the solid glass wall in the back while others would have preferred an open back to the "U" enclosure.

The least liked bus stop contained an open metal frame roof that was suspended on two poles. The open rafters cast additional shadows on the side building, making the space additionally confusing to understand due to the myriad of lines. In addition to granite curbing, the sidewalk was made of brick pavers and the stop included concrete bollards. There were different types of benches with two benches being rough-cut stone slabs and the other a wooden bench with a back. Though all of the elements would have been expensive to purchase, when assembled, they did not form an understandable whole that translated easily into being a bus stop. The participants felt someone could get mugged at this stop, felt vulnerable to people walking behind and were suspicious of the adjacent blind alley. This corroborated the research of Loukaitou-Sideris [15] who looked at the backcloth of nearby buildings and activities. If a liquor store or dark alley was near a bus stop, the people at the bus stop felt less safe.

The participants preferred a stop that looked like a stop or "made sense" [16]. If it appeared to be a work of art, it was less preferred because it wasn't legible or coherent. The participants also preferred having information, as that provided by the name for the stop, because this information also offered legibility and understanding. Tall bushes or unkempt areas were not preferred. Someone could hide in the shrubbery as corroborated in research about dense vegetation and perceptions of safety [17]. The elements in the most preferred bus stops included similarities to a house with a pitched roof, no advertising, clear glass panels or no panels, an element of design, and a highly visible name.

Bus Fronts

Objects can be anthropomorphized or given human characteristics, especially related to facial features. People tend to prefer symmetry in faces, to show health, and also female qualities of a small chin, full lips and babyfaced features with large eyes, to display honesty [18]. This tendency to instill human qualities was evident in the participants' perceptions of certain bus fronts. One bus, with small, darkly tinted horizontal windows, a large "forehead," and heavy "jaw," elicited the participant's responses that included, "worst, dark, old, hiding a mugger, entrapment, driver not visible, and looks like a prison bus." The participants least liked the bus with the small darkly tinted windows and heavy expression.

One of the buses that participants preferred featured a bus front with a long clear glass window and even a smile line at the bottom. Participants stated, "You can see everything from the beginning all the way to the back." The additional sight lines were apparent because the back featured a window, allowing the inside of the bus to appear more open and less suspicious. Participants stated they wanted the bus driver to see them and for them to be able to see the bus driver. Some participants also stated that they preferred no solid partition behind the driver because that would allow them further viewing into the bus from the front. A few of the participants were confused by the picture of a bike rack on one bus front, suggesting that perhaps rather than black, the rack could be painted the same color as the bus in order to disappear when propped up.

Bus Backs

The bus back most preferred included a long and wide clear glass window. Some of the participants stated about the glass color, "Don't like tinted – I like long windows." Bus operators had spoken about the difficulty in getting passengers to move to the back of the bus [19]. People are drawn to light [20] so by placing a window at the back, the boarding passengers will be more likely to instinctively move to the back. Bus crime is often committed in the back of the bus, especially life-threatening incidents, because it is the furthest away from the bus driver [21]. By placing a window in the back, natural surveillance occurs.

The least liked slide was of a bus back with an air conditioning unit and an ad painted over the back. Some people felt "locked up" in the bus with the painted back and another

said, "People like to look out the back window – lighter buses give you a feeling of openness." One participant did not like the fact that people in cars behind the bus could not see into the bus with the painted back. He stated, "If I'm the car behind the bus, I can't see. If the driver can't see because they are too far away, I could be stabbed in the back of the bus and no one would know." With a solid bus back, the people in the cars behind the bus are always facing a solid wall. They might be less patient waiting for a stopped bus because they cannot see the activity inside to understand that people are either boarding or disembarking.

Amount of Advertising

A clear windowed Mercedes bus with only a modest graphic on the side was the most liked in relation to advertising. The participants stated positively about the bus, "No advertising" while others said it looked clean, safe, and happy with lots of light coming in. The graphic was also not cartoon-like and thus not denigrating to the passengers.

The slide that was least liked showed a bus with wrap around advertising and painted windows. Contrary to the calm acceptance of the liked Mercedes, the verbal reaction to the wrap ad bus was more pronounced and specific. Participants stated, "Not cover windows, unsafe, can't see inside, can't see out." They also suggested, "I can't see if anyone is being killed or attacked" with one person stating, "Good bus for hijacking." These comments about the buses with painted windows were made several years before events in the fall of 2001. Some stated that the bus looked, "like a big billboard, a rolling coffin." Others compared it to a cardboard box.

Another bus with long clear glass windows and an ad on the side had been photographed in Spain. One of the participants stated that he didn't like any of the passengers because he couldn't understand the sign. The sign was written in Spanish and suggests that the people riding in a bus can be associated with the advertising. One person stated that it is possible to tell a poorer person's bus by the type of advertising. Advertising is targeted to specific neighborhoods and ads, such as spousal abuse cautions or law firms that assist with lawsuits, are more likely to be on certain buses. People seek identity and a sense of dignity [22]. That identity can be found in a personal car of one's choosing but it also can be an association to the bus on which the person rides. The advertising on the bus can, in some instances, appear graffiti-like and therefore be associated with crime and that association can then also reflect on the passenger.

Bus Color

The bar graph representing the perception of the 8 slides of bus color showed little variation in preference. The most liked bus was orange with long, clear glass windows and some advertising on the side and in the back window. Due to the color, some people were reminded of a safe school bus. The other orange bus that was slightly less preferred related to personal security was also an orange bus but the windows were darkly tinted and lines were painted on the windows. The participants stated, "Orange isn't associated with happy – orange is caution, slow, bring up the guard."

Another bus that was less preferred featured a large purple logo on the side for a radio station. This bus was considered by some as, "Trashy, too dark, too much stuff going on." A past bus driver worried that boarding students might see the radio station logo and feel the bus was theirs, thus dominating the space. Other comments related to bus color were, "Junky, messy, prison bus, ugly, or lame." The safest designs related to perceptions of crime featured no advertising and instead simplicity and clear sight.

Bus Windows

Two buses, one produced in the Unites States and the other photographed in Germany, had similarities of long, clear glass windows. The participants stated their preference related to crime for these buses by saying, "See clear through" and "Wow, nice and bright." They added that people could see them and they could see others through the windows.

An English bus with virtually the top half in full glass was included to determine if there was an extreme of too much glass. The passenger boarding in this dated picture photographed in England was entering on the left side of the bus and he had long sideburns and a dated coat. The bus was also photographed at an angle from below, an angle that would not be apparent to a passenger unless they were sitting on the ground. Participants stated, "Too much glass" and others said, "Could get assassinated – windows are humongous." The bus resembled parade route buses for Presidents or the Pope. People prefer to have prospect, or the ability to see, and refuge, or the ability to have some protection from being seen [23]. The English bus offered no refuge that, historically in buses, has been offered in wider mullion bars between the windows and separate windows for each passenger.

The American bus that was not preferred had darkly tinted windows that were high, long and horizontal. Others characterized the bus in general by saying that the white rectangular bus with the small dark windows, "Looked like a freezer." The windows did not allow a person from the outside to see the people inside. Also, even if the glass had been clear, the placement of the mullion window dividers did not relate to the passengers. Older buses had individual windows for each passenger, allowing them a sense of personal identity inside the frame of their own window.

Bus Doors

Door widths that were preferred allowed for clear sight into the bus and ease in boarding. Some featured visible grab bars for assistance in stepping onto the bus. One elderly gentleman stated that as he became older, he didn't have the ability to fight. Therefore, he looked for opportunities to walk away from the scene. He stated, "Openness and visibility are important – more open the aisles, the better." He didn't want to feel trapped in a confined space that could occur with a narrow doorway.

There were some concerns about doors being too wide. One showed a wide door with a woman seated nearby with one toddler and another child in a stroller. Some of the participants were concerned that someone could take the baby and quickly flee.

Since a door is an invitation to enter, it should be welcoming and easy to understand. One door was very narrow and some worried that the door would close prematurely stating the door could, "Slide and smash you." Stores intentionally have welcoming doors to entreat patrons into the businesses and the bus could use this same element of design to invite people into a safe and welcoming environment.

Bus Seats

The seats that were most preferred related to perceptions of crime were plain red, foam filled and longitudinal (parallel to and situated just below the windows). The picture showed ample room for their legs and no passengers. Participants stated, "Lavish, cushions, silence, beautiful, everyone is sitting on same couch, love seats." Some expressed concern that with the longitudinal seating there would be less privacy. People prefer some element of privacy [24] and therefore like having the option of transversal seats that are at right angles to the window.

The seats that were the least liked had a busy print. The grab bars in the photo had orange and yellow buttons and boxes for tickets. The interior was crowded with passengers and people had little room for their legs, strollers or packages. This space appeared too busy and participants stated, "Seats are smushed, crowded, too jammed up, too hard to get around." In situations of danger, people prefer clear sight lines and simple interiors so the space "makes sense" [25]. When designing bus interiors, it could be remembered that bus interiors fill with color as people introduce their clothing, packages, strollers and bags, making the space appear complex. In two interior photographs that showed blue plastic seating, the preferred photograph was taken during the day with ample light. The less preferred photo was taken at night. Also, in the second and less liked photograph, there was overhead advertising making the space appear busier. Therefore, people preferred abundant light, clear sight lines and no appearance of clutter that can be evident in ads.

Chapter 4: History of the Design of Buses and Bus Stops

The history of the design of the bus is profiled through the stagecoach, omnibus, train interurban, and streetcar. Photographs and explanations about the evolution and borrowing of design elements between the modes of transportation are detailed. The early buses were like long cars with multiple doors and individual windows that framed passengers. The first bus that was designed, not as a bus on a truck chassis but as a bus for multiple passengers, was the Fageol 1926 Bus. The inventors copied the streetcars placing the engine underneath the bus and suspending the driver in front, beyond the wheels as in a streetcar [26]. The passengers in these early streetcars and buses were visible down to their elbows through clear glass windows that also opened for ventilation.

Sections in this chapter further describe bus elements including lighting and seating, bus shape, the angle and view of the bus, advertising on buses and streetcars, stations and stops and mood,

Chapter 5: Environment and Behavior

This chapter gives a detailed description of the various theories and explanations about why people might behave as they do based on an evolution. The discussions are specific to perceptions of crime but also to necessary socializing and isolation. The *process* a person might be going through, as in recognition of an object or determination of a situation, is described. Also explained is the *content* of the environment to which a person is responding.

This literature review assists in the understanding of why people perceive the bus and bus stop as they do, especially as the environment relates to perceptions of crime. The information corroborates the statements made by the participants in the focus groups and offers insights into why they might perceive the space as they do.

Chapter 6: Crime and the Effects of Crime on Buses

Though this research does not suggest that all buses have an element of crime, crime has occurred on buses and at bus stops, as evidenced by the case studies of crime on mass transit outlined in this chapter. There are also a variety of populations related to the crime that include the victims, or people who might encounter or perceive the crime, and the perpetrators who might commit the crimes. Among the victims, the research demonstrates that regular bus riders, because they do not encounter crime, are far less apt to associate crime with bus riding. The people who do not ride buses might perceive the element of crime due to stories they have heard about an act of crime that was committed on or near a bus. A single story can be made into a generality and passed from person to person, negatively associating crime with buses.

The perpetrator of the crime could be one of three criminal types: *have-nots, can-nots and will-nots* [27]. The have-nots are temporarily down on their luck and might be homeless for a short time. The can-nots include the addicted or mentally ill and they comprise the largest of the three groups. The will-nots are those who choose to live on the street and for whom criminal activity is a way of life. With these three populations in existence, there is a possibility that crime might be committed on mass transit. Crime Prevention Through Environmental Design involves 4 components: 1) Territoriality; 2) Natural Surveillance; 3) Activity Support; and 4) Access Control [28]. Crime cannot be prevented, thus CPTED is a misnomer, but perceptions can be lessened based on environments. A bus stop is a public waiting room and the bus is a public waiting room that happens to move. Both could have environments where the perception of crime is lessened. This is not to suggest that the passenger will become less vigilant about pending danger but rather that the passenger has as environment that makes the vigilance easier and it is harder for a perpetrator to commit the crime. A constant state of alert can lower quality of life and the improved bus environment is meant to increase quality of life.

Chapter 7: Social Bridges

A bus is an intimate environment where, unlike a train or subway, the bus driver is present. In this environment and at the bus stop, socializing could be fostered for those who wish to interact with others. This interaction could be as modest as a warm eye glance or a thank you but the positive connection to humanity could lead to a higher quality of life. The opposite would be if someone said something rude or made an inappropriate gesture and that negative word or image lingered with the recipient throughout the day. In research on environments about bicycle paths and destinations, the author identified a phenomenon and environmental concept called "Social Bridges" [29]. There are four types of social bridges: Assist, Connect, Observe and In Absentia.

An *assist social bridge* is a door that someone might hold open for someone else. The recipient of the kindness can acknowledge the gesture either with a thank you, eye glance or head nod. Other assist social bridges include a curb cut, coat, watch, grocery checkout divider, elevator, emergency or the offering of the correct change to someone on mass transit. An assist social bridge is not a forced obligation but rather an opportunity to connect with another person if the person so chooses. The environment can facilitate these positive connections.

A *connect social bridge* is when a stranger connects with another person through speech, eye contact or a smile. The person is not helped by the other, as in an assist social bridge, but they do relate based on the phenomenon. Examples of connect social bridges include first snow, sports, babies, pets, airplane food, water's edge, bathrooms, interpretive signs, the sugar/cream table at a coffee shop, maps, the smell of baking bread, views, lines or ice cream cones. When strangers watch a third activity and feel a connectivity to one another, that is called triangulation [30]. The third element in common might be a street performer or a baseball game and the two viewers converse as if they are best friends. A connect social bridge on a bus could be an overhead interpretive sign inside a bus that describes an historic building that will be passed on route.

A benefit can also be gained from the assist or connect social bridge by a third outside party. This person may be watching the exchange of conversation between strangers or the assistance that is offered. This is called an *observe social bridge*. If a teenager is seen offering his bus seat to an elderly woman, others on the bus witness humanity reaffirmed in the gesture. If someone watches a parent reading an interpretive sign in a bus to a child and then pointing out the building described, good parenting is observed and appreciated.

The fourth is an *in absentia social bridge*. In this case, the presence of the designer, caretaker, or governmental agency is so noticeable that a connection is felt to the person who is absent. An example could be a flower bed at a bus stop that might be maintained by a local garden club or church. Another example could be a bus stop with ample lighted signs at night, TV screens that offer the times of the buses, a roof for protection from the

rain, a bench for sitting, a rail for resting and a design component of high taste. All of needs of the waiting passenger would be accounted for and the presence of the designer and bus provider would be perceived through the considerate attention to detail.

Chapter 8: Future Research and Conclusions

The City Beautiful Movement, which spawned the building of Grand Central Station in New York City, was facilitated by high profile leaders including Daniel Burnham, the architect for Union Station in Washington, D. C., and Frederick Law Olmsted, the designer of Central Park. With pollution a worldwide issue, private and public interests could take on the image of the bus and provide an enhanced public amenity equal in appearance to public parks, theaters, and museums. These other public art related facilities do not have to resort to advertising to subsidize operations. Therefore, perhaps alternative means of offsetting the bus costs could be identified. Incentive zoning, in which developers additionally build public plazas, shops or parks as part of their approved buildings, could perhaps be used to offset the cost of mass transit. Fund-raisers that have historically been held for the arts or museums could be held to create a new city image through high design buses, additionally bringing high visibility and prestige to the bus. Sometimes city taxes are levied to pay for Main Street tree planting, bench placement, lighting or signage. These same taxes might be spent to provide enhanced and ad free buses, especially in cities that have billboard bans and where the buses run on the enhanced Main Street. A company that is polluting egregiously could have, as part of its penalty, the payment of subsidies to buses, thus perhaps removing ads and helping with the design in addition to providing non-polluting transportation. Small commemorative plaques could be put on the sides of buses if a specific donor contributed to have the bus run ad free. Plaques could also be placed inside the bus as interpretive signs about local heroes or history of the community.

In addition to identifying alternative sources for bus subsidies to provide ad free and higher design buses, the bus must be available equally to all communities. While a bus of a very sophisticated design could be created, not all communities could afford to purchase the bus or replace all of their existing fleet. Therefore, middle and low range high design buses might be developed. Additionally, design solutions might be offered that would show how existing buses could be retrofitted to merge in design with the new buses purchased for the fleet.

The research showed that not all people preferred to sit near one another on a bus; the older women felt safest sitting near the bus driver and the teenagers preferred to sit near the back. Knowing that different segments of the population prefer to have their own territorial spaces, perhaps the space nearer to the driver could be designed in one fashion, perhaps resembling a living room, and the space to the back designed in another, perhaps an informal conversation area. Other areas on a bus could be designed for children, even with amusements as part of the partition, similar to children's toys found in some airport waiting rooms.

Finally, the high design and affordability of the new and retrofitted buses might have a multiplicative affect in a lower income community. The elegant bus, that would reduce

the perception of crime through its design, could spawn economic redevelopment with a design that could then be mirrored in storefronts and businesses. The "loser cruiser" reputation could be considered history and the bus perceived, like a public building that moves, as a city's visual amenity in addition to being sustainable transportation.

Endnotes

[1] Trench, et al., 1992
[2] Jeffrey, 1971; Caylor, 1998; Newman, 1972
[3] Cannon, 1932
[4] Taylor, et al., 2000
[5] Jacobs, 1961
[6] Ingalls, et al, 1994; Levine & Wachs, 1986
[7] Calthorpe, 1993
[8] Kay, 1997
[9] Cevero, 1998
[10] Newman and Kenworthy, 1999
[11] Kay, 1997 p. 312
[12] Rowsome, 1956 p. 183
[13] AATA (1999), APTA (1999), CCTA, DDOT, FTA, GILLIG, MBTA, Nova Bus, SMART
[14] Gillig, 2001
[15] Loukaitou-Sideris, 1999
[16] Kaplan and Kaplan, 1982; Kaplan, S., 1987
[17] Kaplan and Talbot, 1988; Kuo, Bacaicoa and Sullivan,1998; Nasar and Sullivan, 1993
[18] Barber, 1995; Rhodes et. al., 1998; Symons, 1995; Thornhill & Gangestad, 1996; Watson & Thornhill, 1994; Zebrowitz, et al., 1996
[19] Volvo Bus Corporation, 1997
[20] Alexander, et al., 1977
[21] Levine & Wachs, 1986c
[22] Ardrey, 1970
[23] Appleton, 1975
[24] Westin, 1967
[25] Kaplan and Kaplan, 1982; Kaplan, S., 1987
[26] Miller, 1941
[27] Scheidegger, 1995
[28] Jeffrey, 1971; Caylor, 1998; Newman, 1972
[29] Lusk, 2002
[30] Whyte, 1980

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Bus Design Compilation Table- Literature Review, Observations, Surveys, Focus Groups
The below are general parameters as gleaned from the research.
Anne Lusk, Ph.D. – University of Michigan - for FTA   Phase II Chart #3

General

"Prospect" for all - ability to see – lots of light

- Abundant flattering light, day and night
- Feeling of openness
- "Eyes on Street" – can see out and see in
- Not a dense billboard on the street
- Transparent – can see into and through the bus
- Window in the back

"Refuge" for passengers

- Not a fish bowl
- Mullion bars location related to passenger
- Identity for each passenger – framed in window

"Make Sense" – clean lines

- Able to understand in context of street and city
- Relate in color or form to upscale buildings
- No beltline that distinguishes it as a bus
- Lettering color and style discrete
- No advertising

Bus Stop

Building

- Resemble a building with pitched roof and overhang
- No sides (only posts) or two or three sided
- Open, glass or clear (not smeared) plastic sides
- No advertising or flyers
- Brick or materials used in buildings- not metal
- **Low walls for sitting or leaning**
- Simple and clear details
- Not high art

Position

- Adjacent to street
- Facing street

Identification and signs

- Name for stop on roof
- Maps of bus route - perhaps map of area

Benches

- Keep in mind mothers/children/strollers
- Designed not for sleeping

Bus Front

- Long clear glass, no mullion in center
- No reflection from glass
- Friendly anthropomorphism – smile, wide eyes, small jaw, no brooding forehead, symmetric
- Ability to see driver and back clear window
- No wall behind driver so can see further in
- No prominent windshield wipers
- Solid paint or graphics relate to glass edges
- Less visible bumper
- Relationship between bumper and signboard
- Signboard behind glass or at least as wide as bus
- Bike rack – integrate so not dominate or appearing as an after-thought

Bus Back

- Untinted window – one third to one half of back tall and all the way across
- No ads
- Bus route/number on back
- Bumper dark or same color as bus
- Visual balance top and bottom with bottom heavier
- Small lettering or logo

Advertising

- No advertising
- If have to have advertising - only upscale, happy, nature related (dignity for passengers)

Colors

- Simple, clean, understandable
- Caution about associations – fire truck, school bus, white freezer, white toaster, prison bus
- Windows, tires, gaskets, signs, logos, lights = all add color
- Relate to surroundings and upscale environments
- Night and day considerations
- No colors or patterns to encourage noise from passengers
- No paint on windows
- No beltline that distinguishes it as a bus
- No bold red, white and blue
- Simplified logo

Bus Design Compilation Table- Literature Review, Observations, Surveys, Focus Group
The below are general parameters as gleaned from the research.
Anne Lusk, Ph.D. - University of Michigan – for FTA   **Phase II Chart #3**

Windows	**Seats/ Interior**
• Long, clear but not too much glass (fishbowl) • Down to seated passenger's elbow or mid shoulder/elbow • Able to be understandably opened for air and escape • If low floor bus, no operable windows down low • Not overly ornate • Crisp lines • Mullion bars location related to person • Low reaching vertical windows as opposed to high horizontal windows	<u>Seats</u> • Simple because interior will fill with people • Not too futuristic • Transversal and longitudinal • Seats over front wheel wells • Solid pair transversal seating with no separation for someone to reach through and steal bag • No wild fabric print – aim for simplicity • Bars on the back of seats for ease in movement • Allowance for larger people in seat design • Location for people with children, strollers, packages, etc.
Doors • Welcoming double wide (but not too wide) • Visible grab bars on side (not center for ease in accessibility, variously sized people, baby carriages, etc.) • Yellow (or color of choice) stripe on step edge (this is introducing a color – relate scale of step edge line to size of grab bar if in color) • Understandable door opening mechanism • No appearance of closing on the person	<u>Interior</u> • Chrome stanchions • Light through windows and flattering interior lighting • Visibly wide aisles • No overhead advertising • Clear view out back