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Bus and Bus Stop Designs Related to Perceptions of Crime

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Table of Contents

Executive Summary

Though buses, such as this streamlined or "GM new look" bus [1], incorporated high elements of design, the bus was still referred to by some as the "loser cruiser"[2]. Unlike the streetcar, train, car and airplane, the bus never had a Renaissance period but instead was viewed as a utilitarian means of transportation.

Mass transit is a sustainable solution to traffic congestion, pollution and sprawl, and yet citizens often prefer to drive their cars. The bus has sometimes been the transportation means of last resort but it can be more affordable to provide and can operate with greater flexibility than alternatives such as light rail. One of the many reasons people have been unwilling to forgo their cars is they perceive the bus to be unsafe related to crime. Measures have been taken to provide technologies such as surveillance cameras to detect crime but some riders have not felt safer with the presence of such measures. Therefore, research was conducted to determine the bus stop and bus designs that could lessen the perception of crime based on the aesthetic or architectural features of the bus stop and bus.

This design investigation does not imply that there is a high incidence of crime on buses or that only a segment of the population rides buses. Prior research indicated that people who ride buses do not normally encounter crime and therefore are not apprehensive [3]. That prior research did suggest that some people who do not ride buses perceive an element of crime and therefore are hesitant to ride buses. To encourage more people to take mass transit, the bus and bus stop designs could suggest to non-riders that the bus is safe related to crime. Second, those individuals who regularly ride the buses might appreciate any design improvements that could enhance their bus riding experience.

The Federal Transit Administration, in 1997, started a Bus Rapid Transit (BRT) Program to investigate high volume, high quality and high speed buses on dedicated routes. The BRT was conceived as an innovative, integrated, well-defined system and an incremental development alternative to more capital-intensive rail transit. In 2000, the

Federal Transit Administration sponsored a Transit Bus Summit in cooperation with bus manufacturers, systems suppliers and transit agencies to discuss: 1) procurement, 2) lack of standardization; and 3) deployment of new technology. In addition to improved technology, the BRT Consortium identified the image of the buses as a component to success. As one element related to the bus image, this research was conducted using picture preference surveys and focus groups to determine the bus and bus stop designs that might enable people to feel safer related to perceptions of crime and personal security.

Bus stop that is perceived to be less safe

A field of research called Crime Prevention Through Environmental Design (CPTED) was undertaken in relation to bus and bus stop designs to determine spaces that might make people feel safer. Though crime cannot be prevented, perceptions of crime can be lessened with an environment that responds to the needs of humans. In specific environments, people are less fearful and their quality of life is improved. As an example of the application of CPTED in relation to bus and bus stop designs, humans have an evolutionary response of "fight or flight" [4]. Women, who are less strong, who might have to care for young, and who then might not be able to fight or flee, will "tend and befriend" [5] or seek friendships with people around them as a form of self preservation. A *bus stop* could feel safer and, more likely, be safer if it provided more than one exit to allow for flight. The bus stop could also foster interaction between people by the placement of benches, information or enhancements. Routine maintenance could make the bus stop feel safer, suggesting that another person cares for and is occasionally in attendance at the stop. By contrast, the stop could appear less safe if it had garbage, graffiti, multiple old posters, residue of tape from posters or cloudy and dirty appearing plexiglass from cleaning solvents used in removing poster tape residue.

To further elaborate on the relationship between Crime Prevention Through Environmental Design (CPTED) and bus stops, humans are information processors and, as such, seek information about their environment. A form of coping in an uncertain world is being in control and that entails, among other things, having information. Especially in situations of uncertainty, people prefer environments that "make sense" or that are coherent and legible [6]. Perception of crime at a bus stop might be lessened if the stop makes sense by looking like a safe small home. Legibility or knowledge about

the stop and bus could be provided with a bus stop name and information about the bus operation. By contrast to the bus stop "house" with its association of safety, a person might be fearful at a bus stop that is an unusual work of art because it does not make sense visually and does not provide necessary information or legibility.

Bus with wrap advertising

Bus with long clear glass windows

A bus with long clear glass windows provides a view of the passengers, the color in their clothes to their elbows and the profile of their faces. The color of their clothing suggests fun inside the bus rather than if the windows had stopped level with their necks, showing monochromatic hair and skin color. The bus riders and pedestrians can provide "eyes on the street" for informal surveillance [7], similar to walking by a coffee shop compared to passing warehouses or parking garage walls.

The *bus* might be less fearful to board if it is possible to see in the window to provide information about the occupants before boarding. A bus that has painted or darkly tinted windows means the person boarding is not able to anticipate who is on the bus and

determine where they might want to sit. This information about the bus occupants is necessary for establishing territorial boundaries for safety because people prefer to keep a certain distance between themselves and others. At night, through the windows of a darkly tinted bus and with interior fluorescent lighting with green/blue tube coverings, the passengers as seen from the sidewalk might appear green and ghoulish and thus fearful. The opposite reaction might occur when looking from a sidewalk through clear glass windows at patrons in a restaurant who are flatteringly lit with incandescent lighting. This same flattering lighting once existed inside the old streetcars that also had clear glass windows. The occupants of the restaurant and old streetcar appear safe and, if the person decides to enter, the perception of crime is less than compared to looking at passengers through the darkly tinted window of a bus. The problem is compounded if the windows are painted with ads making it impossible to see into the bus before boarding. New streetcars are being designed with long clear glass windows that could perhaps be duplicated in new buses or as part of a retrofit of existing buses.

For this research on bus and bus stop designs related to perceptions of crime, two methodologies were employed. The first, Phase I, involved surveys (314) conducted on 4 bus lines in Detroit and Ann Arbor. The second, Phase II, involved picture preference surveys and follow-up focus groups discussions about the pictures. The participants (168) in 15 focus groups were located in 4 cities including Ann Arbor and Detroit and, for external validity, Burlington, Vermont and Washington, D.C. The populations included people who ride the bus, might ride the bus and who never ride the bus. The participants were shown 70 slides in categories of bus stop, front, back, amount of advertising, color, windows, doors and seats and ranked their preference related to perceptions of crime from –3 or Unsafe to +3 or Safe. In addition to the quantitative ranking of the slides, qualitative data was obtained from the participant's perceptions of the slides. A literature review summarized the history of the bus, environment and behavior, crime and effects of crime on buses. Social bridges, a new concept in the built environment that fosters connection between strangers, was introduced. Future research was outlined in the conclusions.

The results demonstrate that the participants preferred a bus stop with a name that looks like a house, has a pitched room and has at least one side fully opened. For the bus front, the participants preferred long clear glass, the ability to see the driver, no solid partition behind the driver and the capability to see out the back of the bus. The bus backs that were preferred had a clear glass window and no advertising. Concerning advertising, the participants preferred no advertising on the buses. Color was less of a factor related to crime but subjects did strongly prefer clear glass windows to darkly tinted windows or wrap advertising painted windows. For doors, the participants felt safest with a wide door but did not want an overly wide door. In the interior, seats that were not overly colored were preferred since the space then wasn't confusing and cluttered. Participants also preferred seats over the front wheel wells allowing them to sit closer to the driver.

Bus Design Compilation Table- Literature Review, Observations, Surveys, Focus Groups
The below are general parameters as gleaned from the research. 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 – vertical window bars
- 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 and perhaps map of area

Benches

- Keep in mind mothers, children and 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 you 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. Phase II Chart #3 cont.

Windows

- Long, clear but not too much glass (fishbowl)
- Down to seated passenger's elbow or mid shoulder/elbow
- Able to be understandably open 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

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

Seats/ Interior

Seats

- 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.

Interior

- Chrome stanchions
- Light through windows and flattering interior lighting
- Visibly wide aisles
- No overhead advertising
- Clear view out back

Chapter 1 – Introduction to Bus and Bus Stop Design Research Related to Perceptions of Crime

Mass transit is one of the most cited solutions to traffic congestion, pollution and sprawl by proponents such as Peter Calthorpe [1], Jane Holtz Kay [2], Robert Cervero [3], and Peter Newman and Jeffrey Kenworthy [4]. Cevero, Newman and Kenworthy agree that rail/light rail and the bus are the mass transit options but due to land acquisition costs versus numbers of passengers served, the bus is more affordable than rail/light rail to reach all neighborhoods. These proponents of mass transit, though, do not describe what a bus and bus stop should look like and determine if people will ride the bus. Kay suggested the bus has been labeled "loser cruiser" [5] and Frank Rowsome, author of 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" [6]. Perhaps the authors believe the mass transit manufacturers and providers have the financial resources to analyze the aesthetic elements related to environment and behavior of a bus and bus stop.

According to industry insiders (AATA; APTA; CCTA; DDOT; FTA, GILLIG; MBTA; Nova BUS; SMART; personal interviews), the transit industry cannot afford extensive bus research about aesthetics because, unlike the automobile manufacturers who have large quantities against which to amortize their research, the bus manufacturers only sell a few buses (approx. 5,000 annually as suggested by individuals with Gillig Corporation). 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 manufacturers 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.

In 1997, the Federal Transit Administration (FTA) initiated the Bus Rapid Transit (BRT) program to foster an innovative, integrated and incremental mass transit alternative to more capital-intensive rail transit. The BRT is proposed to be higher in volume, speed and design than traditional buses and resemble light rail but with greater flexibility. A BRT Consortium of transit organizations, manufacturers and providers was formed to assist in the exploration of new technologies and design components. FTA has sponsored a variety of activities designed to enhance BRT knowledge, including a scanning tour in Europe, a mission to Curitiba, Brazil, the preparation of white papers and the hosting of meetings across the country. On October 19, 2000 the Federal Transit Administration sponsored a Transit Bus Summit to which the bus manufacturers, systems suppliers, transit agencies and Federal Government officials were invited to discuss current issues related to transit. Three primary factors were identified: 1) procurement; 2) lack of standardization; and 3) deployment of new technology, as outlined in the Transit Bus Summit Proceeding Report. Through the BRT, the Federal Transit Administration is addressing these three issues in a cooperative effort with the bus manufacturers, systems suppliers and transit agencies. As an additional component of this effort, FTA is also

working with partners within the bus industry to explore bus transit designs in order to visually "brand name" BRT. In 2001, FTA, Weststart, and supporting sponsors within the bus industry held the Bus Rapid Transit and the American Community design competition to generate drawings and technologies related to buses and bus stops. The outcome was 50 high design and extremely innovative submissions from professionals and college students from around the world, as judged by an expert panel of individuals affiliated with the transit industry [7].

This study investigates bus and bus stop designs and one of the reasons people choose not to ride the bus: the perception of crime [8]. The aim of this research was to produce information that could be given to bus manufacturers and providers to assist in designing buses and bus stops. Perhaps with the improved appearance of mass transit vehicles and facilities, people might be more willing to ride the bus, therefore reducing traffic congestion, pollution and sprawl. The goal was not a specific bus design for a subset of the population, (e.g. lower income, women or seniors), but a range of preferred features so that buses and bus stops could fit contextually within cities or rural communities and appeal to existing and potential riders. Therefore, the perceptions were sought from: 1) those who ride the buses, 2) those who might ride the buses but choose not to and 3) those who will never ride the buses but who might form an impression about, and possibly negatively stigmatize, the riders based on the bus appearance. While this third non-bus riding population might never ride the bus, as voters, they could decide to support tax appropriations for public buses. Also, the non-bus riders, who sometimes have misconceptions about crime on buses, might opt to ride a newly designed bus if the outward appearance suggests safety associated with personal security. Those who presently ride the bus, and who know safety from crime is not a critical issue, could still benefit from a bus and bus stop that had design features based on environment and behavior.

Chapter 2 presents the Phase I research that involved surveys distributed on buses in Detroit and Ann Arbor. This chapter includes the research questions and hypotheses, descriptive statistics, methods and, for Phase I, the results. Also in Chapter 2, the selection of the population and methodology for Phase I and II are explained in detail.

Chapter 3 of this document offers the results of the main body of the research, a picture preference survey with focus group discussions related to 70 photographs of buses and bus stops and their relation to perceptions of crime. This pictorial and graph section is offered before the literature review because some readers may not have time to delve into the more academic explanation and analysis of the research. Due to space limitations, not all 70 photographs are included in the text but the photographs selected should reflect the perceptions of the participants in the focus group discussions. The picture preference survey is called Phase II because it followed the Phase I research that involved surveys in the field given to bus riders on buses to determine the bus and bus stop appearance and their perceptions related to crime.

Chapter 4 provides a brief history of the design of buses and related mass transportation modes. The history explains how some design elements of present day buses were borrowed from prior means of mass transportation. The history section also helps in the analysis of peoples' reactions to certain bus or bus stop features.

Chapter 5 summarizes the literature on environmental and behavior. Crime Prevention through Environmental Design (CPTED) or features in the environment that can lessen the perception of crime are outlined. Human's preference for certain environments and information about those environments are listed. This material in Chapter 5 and the additional literature review in Chapter 6 are referenced in Chapter 3 as an explanation about people's reaction to environments and the relationship of bus and bus stop designs to crime.

Chapter 6 details crime and effects of crime on bus usage. Case study research and statistics outline the necessity of buses and bus stops that lessen the perception and incidence of crime. Design suggestions are offered by the various researchers to improve the design of bus and bus stops related to crime and these design suggestions corroborate the findings in the picture preference surveys (Chapter 3).

Chapter 7 includes a new concept called Social Bridges. Social bridges are a way to foster interaction between strangers and the implications are described with specific recommendations for incorporating the concept in bus and bus stop designs.

Chapter 8 offers innovative design considerations in addition to conclusions.

Before beginning the explanation about the research, a brief overview of the work might help clarify the results. In preparation for doing the research, bus manufacturers, transit providers and federal transit agency individuals were interviewed to enable the author to understand the issues and to provide guidance about conducting the research. On occasion, these individuals offered anecdotes and information that was then included as part of the research.

For Phase I, in-the-field (on location) surveys (314 in total), observations and personal interviews were conducted on 4 different bus lines in Ann Arbor (Ann Arbor Transportation Authority and University of Michigan buses) and Detroit (SMART and DDOT buses). Information was obtained to determine the demographics of these riders and the environments that made them feel personally safer related to crime. The four subject groups were different in their perceived relationships between some of the physical design elements of the bus stop and the bus. For example, the Detroit inner city respondents expressed stronger concern regarding the seat covering material because of the greater likelihood that the seats could be stained or wet. On the other hand, riders of the Ann Arbor bus in a small city and college environment expressed less concern related to seat coverings.

Phase I research was somewhat inconclusive because the participants were not fully aware of all the bus and bus stop designs. Those surveyed may have only ridden one style of bus their entire lives. Therefore, Phase II, or the picture preference survey, introduced the range of buses and bus stop designs currently available. Phase I research method helped frame the methodology for Phase II by demonstrating the limitations of in-the-field (on location) surveys related to bus and bus stop appearances. Some of the conclusions from Phase I research corroborated the findings in Phase II research. As an example, the bus color did not play a significant role in the perception of crime in either Phase I or Phase II.

This bus and bus stop design research investigates the full effect of crime that includes both actual victimization and the fear of being victimized [9]. While lessening the perception of crime should increase ridership, it is not a guarantee. In a study conducted in 1974 in Milwaukee, Wisconsin, personal safety on a bus was not as critical a concern as other service options. Therefore, improvements to security were not determined to increase ridership [10]. However, in a study conducted in 1986 in Los Angeles, an association was established between ridership and crime. This study also revealed an under-representation in transit crime statistics since many crimes went unreported [11]. Increasing ridership is not always an issue since some cities such as New York, San Francisco and Chicago do have certain buses, especially at rush hour and connected to a subway, that regularly reach full capacity loading standards of 65 passengers [12]. Other cities, though, have buses that are available and not filled to capacity while adjacent travel lanes are congested with automobiles carrying a single occupant.

Crime Prevention Through Environmental Design (CPTED) and defensible space principles suggest that design features could lessen crime and also reduce the fear of crime [13]. If the bus stop and bus could be designed to affordably employ CPTED principles, ridership might increase in certain circumstances and quality of life could improve as fear of crime would be lessened. Increasing bus ridership could then lessen congestion and pollution as car drivers and passengers opt to ride public transit in the cities that might have low ridership. CPTED principles, when applied to buses, have primarily focused on technological advances and deterrent measures such as security cameras, call boxes and plain clothes or uniformed police or the elimination of graffiti, scratchiti (scratching on the glass window and leaving a permanent mark) and other signs of physical abuse [14].

An example of a design feature that was intended to deter criminal behavior but that was not well received by the riders occurred in Nottingham, England where closed circuit televisions were installed at pedestrian subways. While the cameras might help later in identifying a perpetrator, the cameras were strongly rejected by all women who did not feel sufficiently secure in the knowledge that someone somewhere was watching them [15]. More acceptable design features were identified in a crime-related bus study conducted in west central Los Angeles in which the subjects indicated a preference for clear glass over tinted windows [16]; clear glass would afford a view into the bus before boarding and a clearer view out. Therefore, in order to increase safety and the perceptions of safety on buses, both security measures and features related to aesthetics should be considered in the designs. In cities that already meet bus capacities, bus ridership might not increase but those who ride the buses could feel personally safer. By applying the CPTED associated with Jane Jacob's principles of "more eyes on the street" [17], the public sphere is safer from crime and visible riders looking out make the street and sidewalk feel more social.

Buses purchased in the United States are primarily purchased at low bid. There are procurement allowances to spend money in addition to low bid but these are technologically rather than aesthetically based. Research might help justify the additional expense to build bus stops and buses that address crime perceptions and aesthetic issues. Even if sufficient evidence cannot be found to warrant increased

spending, bus manufacturers could incorporate the research findings in their new bus and bus stop designs, thus increasing perceptions of safety with bus and bus stops that are purchased at low bid. Finally, the findings could be used to improve buses presently in the system, lessening perceptions of crime and making these older buses resemble in appearance any newly purchased buses, thus visually unifying the bus system.

Chapter 2 - Research Design

Against the backdrop of knowledge related to environment and behavior and crime, this study was conceived to determine perceptions of personal safety related to crime for bus and bus stop designs. While prior studies had identified the issue of crime and ridership, the specific bus and bus stop design elements that could lessen perceptions of crime had not been as rigorously analyzed. An empirical inquiry using multiple research strategies was employed on separate case study communities, principally Ann Arbor, Michigan (a small city) and Detroit, Michigan (a large metropolitan city), resulting in both quantitative and qualitative data. The descriptive quantitative data involves the drawing of inferences from measures of central tendency in levels of perception relating to the bus and bus stop. Additional qualitative data involves observations and interviews plus open-ended individual and focus group discussions that corroborate the tendencies in the quantitative data. The triangulation of methodologies, or a complementary purposes model, was used to assess plausibility of threats to validity [1].

The research is based on the 'positive' theory [2] in which the impact on the user/observer, or research related to human behavior, directs the design. The converse is the 'normative' theory in which the designer determines what he/she believes the design ought to be. That design might be studied for usefulness after it has been built. A researcher employs the positive theory as he or she studies the environment and makes predictions based on phenomenology, or the study of objects or events as they appear in experience. An artist or architect might employ the normative theory and design based on personally directed aesthetic objectives.

The research was divided into Phase I and Phase II. The Phase I research focused on the perceptions related to crime of those who ride the bus. The Phase II research topic was the appearance of the bus, focusing on the perceptions of those who ride the bus, those who might ride the bus but who choose not to, and those who would never ride the bus but who form an impression about bus riders. In Phase I, surveys were distributed on the two different bus systems in Ann Arbor and two in Detroit totaling four bus systems. The purpose of the Phase I research was 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. This research was conducted on four bus systems in two cities. Of the four bus systems, three were public facilities and the fourth was the more private University of Michigan line. The University of Michigan bus riding population was surveyed for comparison within Phase I but the University riders would not be included in the cross comparison analysis with Phase II. A University operated bus system serves only a small segment of the population and is not representative of the public bus operations.

Phase II also involved case study research in Ann Arbor and Detroit but additionally, for externally validity, Burlington, Vermont and Washington, D. C. Phase II employed picture preference surveys in which slides of various bus stops and bus fronts, backs, sides and interiors were shown to pre-selected focus groups to again determine levels of

perception related to personal safety and crime. Immediately following the showing of the slides, focus group discussions were conducted with the participants discussing the slides resulting in both quantitative and qualitative data. In the analysis of the data, history/theory methodology assisted in the explanation of the designs of the buses and bus stops. For simplification in understanding, Phase I and Phase II will be described and analyzed separately but combined in the discussion of Phase II (Chapter3) and in the conclusion (Chapter 8).

Phase I: Research Question

The primary research question is, "Do certain bus stop and bus designs lessen the perceptions of crime?" This first methodology involved in-the-field (on location) surveys conducted on 4 bus systems with 4 distinct populations, 2 in Detroit and 2 in Ann Arbor, and observations plus individual interviews conducted at these bus stops and/or on the buses or related to the bus system. Phase I determined means of demographics and levels of perception of safety of the riders on the 4 different bus systems and, for some of the questions, analysis of variance was used to determine whether the differences between the 4 groups were significant.

Phase I: Hypothesis

The four participant groups were different in demographics, analysis of the bus stop environment and the perceived level of safety related to the bus design as determined by a comparison of means.

Phase I: Descriptive Statistics

The results of the research in Phase I are shown in **Phase I Chart #1.** Each of the questions 1 through 19 is listed with the means for each question under the respective 4 bus systems column headings: Ann Arbor Transportation Authority (AATA), University of Michigan student buses in Ann Arbor (U of M), SMART buses in Detroit and DDOT buses also in Detroit. In order to examine the difference between the means of the 4 groups in some of the questions, one-way analyses of variance, ANOVA, were employed to test for statistical significance at a $p < .05$ level. The last column shows the level of significance for the determination of difference in the means where the significance could be statistically determined. Questions 1, 2, 3, 16, 17, and 19 related to the wide variety of neighborhoods the bus drove through, thus the questions are less sensitive to clustering. Questions 4 through 15 could not be quantified because the responses from the 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 various participants on that bus would have been affected by that factor. The dependent variables of questions 4 through 15 are therefore probably correlated and the ANOVA technique does not take into account the correlation, the mutual relationship. In the questions where ANOVA could have statistical significance (1, 2, 3, 16,17 and 19) some questions were answered approximately the same by the 4 different bus user groups in the 2 different communities, as indicated with the asterisk, while others showed differences in the responses. Some of this could be attributable to higher levels of perception of crime in the Detroit bus environments. The other differences, in questions 6 through 15, can be more loosely examined by comparing means.

In Situ Bus Stop and Bus Surveys **Related to perceptions of crime** **Phase I Chart #1** Question n=314	**Group A** Mean AATA Ann A n=97	**Group B** Mean U of M Ann A n=115	**GroupC** Mean SMART Detroit n=50	**Group D** Mean DDOT Detroit n=52	Sig P<.05 *=diff betwn grps
1.How far did you walk to get to the bus stop? 1=1block 5=5 blocks	2.48	2.04	2.67	1.94	.004 *
2. Did you find the route to the bus stop pleasant? 1= not pleasant 4 = very pleasant	2.59	2.76	2.53	2.56	.226
3. Did you feel safe walking to the bus stop? 1= didn't feel safe 4= felt very safe	3.26	3.59	3.08	2.90	.000 *
4. Does your bus stop have a building or shelter? 1= yes 2= no	1.59	1.45	1.75	1.73	
5. Did you feel safe standing at the bus stop? 1= didn't feel safe 4= felt very safe	3.06	3.57	3.02	2.77	
6. BEFORE getting on, did you like the COLORS of the bus? 1= didn't find appealing 4= found very appealing	2.30	2.52	2.47	2.37	
7. BEFORE getting on, did the outside appearance of the bus SHAPE make you feel safe? 1= didn't feel safe 4= felt very safe	2.97	3.06	2.81	3.02	
8. BEFORE getting on, did the outside appearance of the bus WINDOWS make you feel safe? 1= didn't feel safe 4= felt very safe	3.10	3.02	2.96	2.86	
9. BEFORE getting on, did the color of the bus WINDOWS make you feel safe? 1= didn't feel safe 4-= felt very safe	3.11	3.03	2.87	2.80	
10. INSIDE the bus, did the bus ENTRANCE make you feel safe? 1= didn't feel safe 4= felt very safe	3.02	3.09	2.86	3.10	
11. INSIDE the bus, did the METHOD OF PAYMENT make you feel safe? 1= didn't feel safe 4= felt very safe	3.28	3.54	3.07	3.04	
12. INSIDE the bus, did the SEATING ARRANGEMENT make you feel safe? 1= didn't feel safe 4 = felt very safe	2.94	3.24	2.88	3.07	
13. INSIDE the bus, did the SEAT COVERING make you feel safe? 1= didn't feel safe 4= felt very safe	2.92	3.14	2.83	2.72	
14. INSIDE the bus, did your VIEW OUT THE WINDOW make you feel safe? 1= didn't feel safe 4= felt very safe	3.08	3.27	3.00	2.81	
15. INSIDE the bus, did the COLOR OF THE GLASS WINDOWS make you feel safe? 1= didn't feel safe 4= felt very safe	2.95	3.18	2.88	2.91	
16. Sex 1= male 2 = female	1.49	1.49	1.47	1.62	.442
17. Age 1= 8-15 2=16-18 3=19-22 4=23-40 5=31-40 6=41-50 7=50-60 8=61-70 9=71-older	4.32	3.64	4.49	4.57	.002 *
18. Ethnicity 1=Caucasian 2=African American 3= Latino 4= Asian American 5= Other #Adjacent number is the actual count and not the mean	1=35# 2=32 3=3 4=3 5=9	1=54# 2=12 3=5 4=22 5=16	1=5# 2=37 3=0 4=1 5=1	1=8# 2=28 3=1 4=0 5=4	
19. Income 1= 0-12,000 2=13,000-20,000 3=21,000-30,000 4=31,000-50,000 5=51,000-more	2.31	1.96	2.32	2.07	.260

Phase I: Method

The main purpose of the Phase I survey was to gather demographic information about the bus riding populations in the two communities, Ann Arbor and Detroit and relate it to perceptions of crime. The survey was going to be intrusive if it only asked for information related to personal matters such as age, income, or ethnicity. Therefore, in addition to the demographic questions, generic and easily answered questions were asked first, such as the distance they walked to a bus stop. The second purpose of the surveys was to gauge methodology in determining perceptions concerning the bus design components and personal safety related to crime. This was an opportunity to ask straightforward survey questions in-the-field (on location) about perceptions regarding crime and the physical environment and, by the participant's response, determine if this method was more conclusive than the proposed Phase II research methodology, a picture preference survey.

In the Phase I research, the perceptions would be sought from the bus riding population and include all ages, races, and income levels, and not a demographic split such as the perceptions of only older low income females. Therefore, in the two communities of Ann Arbor and Detroit, all available major bus systems were surveyed. In Ann Arbor, the major bus line is the Ann Arbor Transportation Authority that travels also to Ypsilanti, a community to the east. The University of Michigan buses, also in Ann Arbor, transport for free the students, faculty and guests between the commuter parking lots, housing blocks and north and central campus areas. The Detroit buses include DDOT, which principally runs within Detroit and carries inner city residents and SMART, primarily a commuter bus that runs between the suburbs and downtown in Detroit.

Before conducting the research in Detroit, several issues had to be addressed. Detroit is near a variety of universities, specifically the University of Michigan, a research institution. The subjects in Detroit are often surveyed as class assignments with few visible results and subjects in Detroit can sometimes be resentful about filling out another survey. Therefore, before passing out the surveys, the author asked individuals knowledgeable about the issues and the bus riding population in Detroit how the author should introduce herself and the research and additionally, the logistics of passing out the surveys in the lower income neighborhoods. It was suggested that an explanation be given about being with the University of Michigan, that the research was to make the bus a better environment and that the results would be used [3]. Jane Morgan, an African American female and long time resident of Detroit felt that, because the author was not a resident of the city, culturally different from most of the bus riders, working alone, and didn't know the city, having a companion to bridge the cultural gap might make passing out the surveys on the buses in Detroit easier and more comfortable for the passengers. Although advance permission from the bus provider had been obtained, an explanation about the research should be given to the bus driver so that he or she did not perceive that their job performance was being surveyed. The driver would then also understand the activity being conducted on the bus. Since some of the people boarding the bus might not be able to read English because they were non-English speaking or could not see easily due to lack of glasses or age, the type was to be bold and large and the text simple. The heading in the survey should explain that the research was voluntary and for the

University of Michigan. The survey would be accompanied with a clipboard and pencil to make completion easier on the moving bus [4]. When the survey was passed out, the participants were told that the survey asked their perceptions about safety related to crime because sometimes they perceived the association with safety related to accidents or collisions.

The sampling design consisted of surveys distributed purposively in Ann Arbor on two bus services and Detroit on two bus services from January until July 1999 during midday to eliminate different safety perceptions due to darkness. The days were midweek except for one when surveys were additionally sought on Saturday on the Ann Arbor Transportation Authority buses to include a mall shopping loop. For the two bus companies in Detroit, DDOT and SMART, the author met someone from the bus companies to accompany her on the trip. The surveys were handed out at the bus stop and then, as the bus proceeded on the route, continually passed out on the bus. A random sampling attempt was made by trying to give the survey to every third passenger entering the bus but, on certain routes, there were few passengers boarding and, on others, there were multiple passengers boarding simultaneously. Since some people, such as teenagers, tended to board and immediately move to the back of the bus, surveys would be carried back to them and then retrieved before they departed. The participants did not have to fill out the demographic information if, for example, they didn't wish to reveal their income. A few surveys were not completed because riders had arrived at their stop. Therefore, not all of the survey forms have demographic information. Except in a few cases of people not wanting to be socially engaged, the riders were very willing to fill out the survey and only expressed dismay when they learned they couldn't address unrelated complaints such as buses not arriving on time. A few of the participants expressed a desire to fill out the survey but couldn't read or didn't have their glasses. Therefore, the questions were verbally asked and responses checked on the survey. The survey was intended only to be written but participants, on occasion, volunteered related information that was then written down by the author. Any information the participants volunteered was considered an unstructured interview.

Phase I: Results and Discussion

As indicated in **Phase I Chart #1**, the major findings demonstrated that the participants in Ann Arbor and principally, the University of Michigan, perceived their bus environment to be the safest related to crime with the DDOT participants feeling the least safe. The differences between the means of these 4 groups are indicated in the column to the right with a statistical significance at $p<.05$ for questions 1, 2, 3, 16, 17 and 19. In question 1, the suburban SMART participants walked the farthest while the inner city DDOT riders walked the least. The participants judged the pleasantness of the walk, question 2, to the bus stop to be similar across the 4 groups. In the 3rd question, the perception of the safety of the University of Michigan stop and the AATA stop is evident with the highest and second highest means. The U of M riders and Ann Arbor residents were less apt to have a bus shelter, question 4, but they felt safest. That factor could be due to the safer environment and co-bus riders in Ann Arbor and not necessarily related to the existence of the bus shelter. The correlation of other environmental factors at a bus stop is corroborated in the research of Loukaitou-Sideris [5] who demonstrated that

adjacency of blind alleys, liquor stores, or nightclubs lowered the perceptions of perceived safety of the riders.

The responses to questions 2, 6, 7, 8, 9, 10, 15, 16 and 19 demonstrated that there was little difference between the means across the 4 groups. While this does not definitively address the issue of design suggestions for safety related to crime and the bus appearance, those questions will be more clearly answered with the picture preference survey, Phase II. In questions 11, 12, 13 and 14, the University of Michigan riders indicated the highest perception of safety. These responses can be explained by the higher degree of safety from crime in the University of Michigan environment with its familiar composition of students and faculty. The students on the University of Michigan buses do not have to pay, question 11, thus they would not have regarded opening a wallet and exposing money as a fearful situation. The students would care less where they sat, question 12, since they were with fellow students and they would be far less apt to experience ripped or stained seats, question 13, compared to the Detroit buses which experience higher traffic with a different clientele. Looking out the window, question 14, from the University of Michigan and Ann Arbor buses would make the rider feel safer based on the college town versus city environment. The windows on the University of Michigan buses are clearer glass, question 15, than the windows of the AATA, SMART or DDOT buses but that may or may not have been a contributing factor.

The riders surveyed were similar in gender as indicated in question 16. The rider composition was predominantly Caucasian on the University of Michigan buses, equal in proportion of Caucasian and African American individuals on the AATA buses and higher in proportion of African American individuals on the SMART and DDOT buses. The income levels, question 19, indicate the low income of the University of Michigan students and the next level of income of the inner city Detroit riders.

What the responses to questions 6, 7, 8, 9, 10 do show is that the four bus participant groups agreed in their determination of safety related to a design feature. The responses could also mean that the participants agreed the bus color, outside appearance of the windows or the shape of the bus had nothing to do with safety. This methodology demonstrated that by asking a direct question in-the-field (on location), only very general perceptions could be determined about that bus and bus stop. The in-the-field survey could be conducted in multiple instances but it would take a tremendous amount of time to ride on all of the varieties of buses and stand at the wide range of bus stops to gather design perspectives in the field. Even then, a comparison between buses would be difficult due to the clustering effect on one bus. The participants in-the-field, without having experienced many other bus designs for comparison, were also only able to give their perception based on limited knowledge. They did not ride the wide range of buses available across the world but instead only knew the few varieties offered by their bus provider. The colors selected by the bus providers were often similar from bus to bus to maintain a company image. In the field, there are many distracting factors making it difficult for a subject to focus on a specific design element. Some participants might just be contented that their bus arrived and they might care little about how it looked. Perhaps the questions could have been phrased differently, with far more variation, but this was not the methodology upon which to solely base design suggestions.

Between distributing, waiting for, or collecting the surveys, observations were written and interviews conducted. The participants interviewed were approached as volunteers to determine their perception related to the bus design and crime and they volunteered their verbal comments unsolicited. For example, some of the people who needed assistance in filling out the survey wanted to offer more information about the bus. The observations and interviews were not systematically structured during the bus riding period since the survey distribution and collection was the primary objective. The substantive conclusions would be drawn from the research in Phase II but the riding sample population provided worthwhile qualitative data that would prove useful in the analysis of the picture preference survey results. As an example, the older women who were riding the buses alone pointed to where they liked to sit which was nearest the bus driver.

Phase I: Group Observations and Interviews

- Ann Arbor (AATA) Observations and Interviews

The observations and interviews on the AATA buses identified the ergonomic problem that the transversal twin seats facing forward didn't provide sufficient leg room. Therefore, someone sitting inside against the window might feel more trapped than necessary due to this lack of leg room. Someone commented, "The passenger in the seat behind squeezed me on the neck." In the transversal seats, the passenger behind is close to the person ahead, meaning the person sitting at right angles to the window is vulnerable to attack from behind. In a longitudinal seat, the passenger's back of the head faces the window, and thus no one is behind.

The best seat on the AATA low floor bus was said by a variety of participants to be the one in the middle of the bus facing the back door because then you could get out easily. This suggests that the seats near the door are considered more desirable. On the new low floor buses, the front wheel well covers are high with no seats over the wheel well covers and the first two longitudinal seats are for handicapped seating, meaning there are fewer preferred seats near the front door on the low floor buses. For the fight or flight reflex [6], this would suggest it would be more difficult to quickly depart a bus, with the exception of the few seats near the back door. While it is advantageous for a thief to take longer to get off, it also means a victim is less able to flee quickly or chase after the purse or gold chain snatcher.

An older woman on the AATA low floor was sitting as near to the bus driver as possible in a seat on the same side as the entrance door, placing her diagonally to the bus driver. If she had been seated on the same side as the bus driver, she would have been unable to be seen by the bus driver or converse with him because there is a solid screen behind the bus driver. Also, even though she was far back and seated behind the wheel well covers and chrome bars attached to the wheel well covers, from this seat she could still moderately see out the front window. She said that was her favorite seat suggesting that to exert control and cope in the uncertain bus environment, she employs a "ritual" of sitting in the same familiar seat [7]. Additionally, she is as near as possible to the bus driver enabling her to tend and befriend or seek companionship for protection [8]. She explained her regular choice of seat by adding, "You never know when you need to make a mad dash out. This is the closest door." In the new low floor bus, the closest door for an elderly woman that enables her to sit nearest the driver was a further distance away

than in the regular floor buses that had seats over the wheel well covers. From this vantage, she watched the adolescent groups board the bus. She said, “Some get in who don’t pay. He (the driver) doesn’t know it but I do.” From this seat, she would witness the vagrancy of the adolescents not paying and feel more vulnerable herself, even though she wasn’t personally violated [9].

In the AATA low floor bus, the back seats are up two steps and in this “U” shaped seating configuration a passenger commented, “You can talk to people back here.” While it was a domain taken over by the kids and spatially separated from the seniors who preferred to sit nearer to the driver, if someone was seated within the “U” and not part of the social unit, they might feel alienated in the milieu. In a related interview with Jon Fricker, Professor of Transportation Engineering [10] he stated, “People talk more on the bus than on the metro.” This could be due to the fact that the riders are more apt to be known since the route is more limited or perhaps attributable to the smaller size of the bus interior and the seating configurations.

Jerry Trotter, Manager-Bus Programs with the American Public Transit Association [11], explained in a related interview that, “This conversation and collegiality was fostered on some buses in Washington, D.C. At Christmas, some of the drivers decorated their buses, dressed in Christmas attire and played Christmas carols.” People let other buses pass in anticipation of catching the fun bus because on this bus they joined in singing the carols. While the practice had to be halted due to church and state issues and some of the passengers might not have appreciated the carol singing or the decorations on a public facility, the potential for a friendly atmosphere on a bus, as compared to the metro or subway, was demonstrated. The friendly atmosphere was due in part to the interior space of the bus but also the facilitation by the bus driver.

Parents with young children on the AATA buses as well as the SMART and DDOT buses tended to take the transversal seats and put their child beside the window. This also provided them with a protected place to put packages, bags or strollers. On the front section of the low floor bus, the children couldn’t see out the windows unless they crouched on the seat. The children tended to prefer to look out the windows rather than look inward at the passengers. When young children were seated in the longitudinal “U” seats in the back, they turned around on the seats to look out. Their parents would put out a protective arm to make sure the child was balanced on the seat. On the transversal seats, it was easier to protect a child from others and also to keep the child from falling.

The majority of the AATA buses are low floor, painted white with a blue line on the bottom of the bus and the logo. Except for a few buses with wrap around advertising, the AATA buses have no exterior advertising. The windows are fairly darkly tinted and on the low floor buses, staggered with lower windows in the front. On some of the buses, a rear window exists but in others the back is solid.

On January 25, 1999 in Ann Arbor, the roads had been covered with snow and the day was grey with more snow falling. The windows on the AATA bus were extremely dirty due to the road conditions, a problem later remedied with wheel guards [12]. Perhaps due to these darkened windows or behavior, the passengers were looking forward instead of out. With the large interior front wheel wells, the chrome grab bars over the wheel wells, the solid wall behind the driver and the dirty windows, the bus felt

very confining. Coupled with a draft that kept entering the bus when the door was opened, the ride was not pleasant. Passengers sitting near the door were subjected to the cold and more slush on the floor than further back in the bus. The author was on an unfamiliar bus taking an unfamiliar route and, having completed the surveys, had to disembark. Through the dirty windows, it was difficult to discern landmarks. Sitting in the longitudinal seat behind the solid wall that is behind the driver, the passing street scenes were only visible by completely turning around. The windows opposite and further in the back were partially covered with passengers in addition to being dirty. The only clear window was the one in the front that had been cleaned by the windshield wipers and that view could only be seen at an angle from the seat behind the driver. It was difficult to have a reassuring glance outside and the author felt fear about missing the stop.

- Ann Arbor (University of Michigan) Observations and Interviews

The surveys for the University of Michigan buses were passed out in March on a sunny Friday afternoon. The students were extremely willing to fill out the surveys, perhaps due to the time of week, the weather or because they were familiar with surveys and their value. Two different buses were ridden because one went out of service necessitating a transfer to another. The students were more engaged in conversations with each other than on the public buses in Ann Arbor. Also, the students wrote additional comments on the survey that proved revealing. A student added that she felt safe walking to the bus because it was during the day. When asked about perceptions of safety and the outside of the windows one student wrote, "Dirty." Under method of payment, many students wrote not applicable (N/A) since the University of Michigan buses are free. Adjacent to questions 6 through 10 one student wrote, "I really don't care, as long as I get home." On the back of a survey one student wrote, "Bus wait too long. Made me feel unsafe."

More surveys were conducted on the University of Michigan buses on Wednesday, June 17th during the middle of the day. It was noted that because the riding population is homogenous, the students and faculty sit anywhere. Certain people might habitually sit in specific seats, but this was impossible to determine on the random trips. Passengers enter the bus through whichever door allows them quicker access since at one door there might be a line while at another there is no line. With no payment, the students can enter either door and not have to be adjacent to a fare box. Seating distribution seemed to be evenly spaced on a bus with few passengers, thus passengers did not sit near someone if other vacant seats were available. On the survey, only one student wrote a comment, "The truth is: most of these topics are completely unrelated to safety in my mind."

The bus drivers on the University of Michigan buses sometimes are students, as evidenced by their age, clothing and adjacent school backpack, or sometimes are regular drivers, as evidenced by their age and on occasion, the wearing of a uniform. The student drivers wear casual clothing, bring a tape deck with music of their choice and one student used to hang a stuffed animal near the driver's seat. It is possible to see that the driver is enjoying the beat in the music, thus the driver appears to be a human being. The drivers also sometimes wear University of Michigan logo clothes, thus making them part of the bus riding contingent.

All of the University of Michigan buses were painted grey from the bottom of the bus to under the windows. From the windows up, blue with a yellow element reflects the University of Michigan school colors; discrete lettering and a University of Michigan logo are on the side and back. Due to the dominance of the grey and blue, the combination makes the buses look as if they are intended to carry prisoners. The seats are blue plastic and the solid back wall is covered in a simulated wood plastic. Except for advertising overhead inside the bus to reflect University related activities, there is no advertising on the bus. The windows are relatively clear, in a horizontal band but start at a person's neck.

- Detroit (SMART) Observations and Interviews

The buses for SMART (Suburban Mobility Authority for Regional Transportation) operate between the suburbs and downtown Detroit. According to Dave Sanders with SMART [13], "To the people who ride the bus, they don't feel unsafe. The people who don't ride might perceive the bus as not safe." This corroborates the research of Benjamin, et al., [14], Ingalls et al., [15], and Levine and Wachs [16] and would suggest that the outward appearance of the bus should convey personal safety to the nonbus riding population. Sanders explained that the SMART buses have air conditioning but that the windows don't open. Sometimes in the summer the air conditioning is broken, making the ride unpleasant since the windows can't provide necessary ventilation.

Observing the passengers boarding the bus, it was noted that the passengers engaged in rather lengthy conversations with the bus driver before boarding, asking for information about the bus route. While this information could be made available at the bus stop on a sign, without a bus stop building and just a post, this information is only available from the driver. In some cities, such as New York, the bus route information is posted on the side of the metal bus stop post. The problem with the information exchange between the bus driver and the potential passenger is it considerably slows down the bus. If the door is wide enough to allow for boarding passengers and a verbal exchange between someone standing outside and the bus driver, that would speed up the boarding process. The SMART buses had traditional narrow doors with several steps up.

One of the SMART buses had wrap around advertising and, from the interior, the passing scenery was smeared in appearance. The view outside was troubling because the author kept trying to focus on the landscape with no success. All of the people on the bus were additionally affected because a passenger boarded who had just been in a car accident, totaling her car. The bus is an intimate space and conversations were easily overheard, especially when said in a loud voice. The woman was agitated because she was now without a car, having to ride the bus to her destination, and burdened with other financial matters. In the bus with a blurred view, it was harder to mentally escape to the outside. Instead, the feeling was that the confined interior was shared with the unhappy woman.

One of the subjects wrote on the survey adjacent to question #9 about window color and feelings of safety, "What does color have to do with safety?" Further in the form this person wrote about the seats, "Too dirty." Next to question #14 about the view out the window the subject added, "Again, how does my view and my safety relate?" On question #15 about the color of the glass from the inside she stated, "See question #9."

Others repeated her impression of the survey and wondered what the color, glass, windows, or shape had to do with perceptions of safety.

- Detroit (DDOT) Observations and Interviews

The Detroit DDOT surveys were passed out throughout the day April 9th on various buses through a variety of neighborhoods on main roads. The seats on one of the buses were new, black, green and yellow velvet nap and included the logo of DDOT. For this new seat design, the fabric is glued to the backing and if a knife is run through the fabric, the slit appears to close and disappear in the tall nap. If, in contrast, a seat is foam covered with vinyl, it can be cut with a knife and have to be completely replaced because the surface is cut and the interior foam exposed. These nap seats also could be easily washed down and dried. The seats were relatively new and regretfully appeared old, having taken on the worn stained sheen of an old person's suit as the nap lay flat and stains were evident in the fabric.

Another bus had a green pattern with foam seat, a black fleck linoleum floor and a black solid wall in the back. Though high in design, the effect was dark and there was no inclination to walk to the back of the bus. Alexander, et al., determined that people walk towards light and suggested building spaces that use light as a draw [17]. Bus drivers have stated that one of the problems with people boarding buses is they don't automatically move to the back of the bus but instead linger in the front. If the back of the bus is black and windowless, there would be little that would compel a boarding passenger to walk towards the back. The Volvo drivers had stated in a survey that one of their difficulties was in getting passengers to move to the back of the bus [18].

The only complaint about the survey was that the participants wanted different content in the questions. One passenger stated, "The high school kids are on this bus and the kids are rude and the bus driver is rude. You are asking the wrong questions." Another stated, "Next time do a different survey." The impression conveyed was that the riders appeared to have concerns that were greater than the appearance of the bus. They did not perceive that with an improved appearance, the behavior of the students could possibly change.

None of the buses was low floor but each of the buses did have a lift to accommodate persons in wheelchairs. In a follow-up interview with DDOT's Robert Vander Voort [19], he stated that in the Detroit buses, there can often be as many people standing as there are seated. He explained that for the procurement process, they try to incorporate components that are manufactured in Michigan in the specifications. He demonstrated the complexity of details involved in writing the specifications by producing the foot high stack of paperwork for the buses they design. In some years, they order 100 new buses that must meet strict regulations and, while a bus could last 12 years, the engine might need to be replaced 3 to 4 times. In a typical year, 1000 accidents to the buses will be reported, but often accidents happen to the buses that go unnoticed by the driver and are not reported. There is, therefore, a lot of damage to the body of the bus. He admitted that within the specification documents, with demanding maintenance and a tight budget, aesthetics were a very minor consideration.

Phase II: Research Question

The primary research question is: Do certain bus stop and bus designs lessen the perceptions of crime? The second methodology to address the question was a picture preference survey using 70 slides that had been culled from 400. Only buses that have been in production or are presently in production were included, thus excluding proposed or futuristic buses. The slides were categorized into stop, front, back, amount of advertising, color, windows, doors, and seats. For each category, the range of design options was included to fully represent, for example, bus backs, but to not overly represent a category with unnecessary repetitions.

Phase II: Hypothesis

The means for each of the slides within categories (bus stops, bus fronts, etc.) were dissimilar, suggesting there was a variation between perceptions related to safety discerned in the pictures.

Phase II Descriptive Statistics

The positive and negative cumulative responses to each of the slides are demonstrated in the bar graphs for the 8 slide categories in **Phase II Chart #1. (See Chapter 3)** The **Phase II Chart #2** shows the test of significance of difference of means for each slide in the respective categories. The bar graph indicates the number of each slide and the mean based on the –3 to +3 scale. All of the slides in each category are grouped together in one graph to visually demonstrate the differences of means between each slide. For the bus stops, slide #15 was perceived as providing the least safe environment related to crime whereas slide #2 was the safest of the group. The related chart **Phase II Chart #2** shows the levels of significance, indicating differences in the means in all groups except for color.

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 as indicated in **Phase II Chart #2** was significant at a $p < .001$.

Slide Category	**Stop**	**Front**	**Back**	Amt Adverts	**Color**	Windows	**Doors**	**Seats**
Sig P <.001	.000	.000	.000	.000	.298	.000	.000	.000

Phase II Chart #2

Phase II: Method

As already explained, Phase II would determine the perceptions of those who ride the bus, those who might ride the bus but who choose not to, and those who would never ride the bus but who form an impression about bus riders based on the appearance of the bus. Therefore, the slides had to be shown to a wide cross section of the populations in Ann Arbor and Detroit. For external validity, the slides were also shown to subjects in Burlington, Vermont and Washington, D.C. Burlington was selected because Vermont was determined to be one of the safest states in the nation [20]. Washington, D.C. was

chosen because of the availability of welfare-to-work mothers who were residents of Marshall Heights. Marshall Heights in Ward 7 includes one of the oldest African American neighborhoods in the United States and has the second highest percentage of female-headed households, the second highest unemployment rates in the city and the highest percentage of households receiving public assistance [21].

Because funding did not exist to pay the participants for viewing the slides, opportunities were sought in which groups of volunteers would already be in existence. Calls were made to the governmental offices in Ann Arbor, Detroit and Burlington to create lists of potential organizations. These included religious affiliations, libraries, senior and youth groups, social services, schools, welfare facilities, recreation centers, homeless shelters, bridge groups and clubs. Lists of nonprofit organizations were also requested and emails sent out to residents of specific neighborhoods.

Care was taken to, in addition to general populations, interview individuals from minority and lower income populations who ride the bus because, specifically in Detroit, they live in or travel through areas with higher rates of crime and they might have more knowledge about uncomfortable situations. This research was being conducted to determine the bus environments that would make all people feel safest related to personal security. By asking people in areas where perceptions of personal security might be perceived to be less, perhaps more could be learned about bus designs to assist everyone. The responses from these participants demonstrated that they have tremendous perceptions about crime. When the author was astounded by the insights of the participants concerning bus design and personal safety, one of the supervisors at a shelter commented, “These people live the life.” Since these groups don’t have social clubs like the Birmingham bridge group, places were identified where they might already be assembled. It was determined that lower income individuals who do ride the buses and who might be familiar with areas of crime, congregate in certain homeless shelters in places such as Detroit, Ann Arbor and Burlington, Vermont. The population staying in the shelters is considered homeless by association with a shelter, but sometimes or often they have jobs and, on occasion, they have a car. They don’t, for a variety of reasons, have a place to sleep that night. The individuals at the way station shelter in Burlington, Vermont were attending a meeting in the middle of the day and weren’t necessarily without a home. To be allowed into the shelters in which the surveys were conducted, the guests could not be intoxicated, on drugs or badly behaved. There are homeless people who sleep on the sidewalks, who in many cases don’t hold jobs and who perhaps don’t ride buses but they weren’t given the surveys. That population can’t and sometimes prefers not to enter certain shelters where the surveys were conducted. In Detroit, these individuals were standing on the sidewalks outside the Cass Corridor Methodist Church and were not therefore given the survey that was distributed only to people inside the church.

Using these lists, specific groups were then contacted with the intention of finding similar groups in each of the cities. When contacting each of the organizations, a minimum of six people was requested, a manageable number for the follow-up group discussions. Though the modest focus group sizes were requested, in some instances volunteer groups were larger in size such as the high school with 23 students per class. Therefore, people already showing up for a luncheon, activity, class, or to spend the night

became the accepted sample population to view the slides. Since the author was continuing to conduct the research alone, personal safety was a contributing factor in subject selection. The homeless gathered to spend the night in inner city Detroit in a church but were dispersed during the day, making nighttime the preferable period to show the slides. Though the participants within the church were safe because they wouldn't be allowed admittance if they were under any influence, the individuals who would sometimes stand outside the church might not abide by the same regulations. The research was then somewhat restricted according to where the author could drive alone at night and the groups with which the author could meet. In Detroit, someone from the church met the author at her car, thus allowing safe access to the subjects spending the night in the church. Phase II therefore was purposive, meaning the sampling populations were selected as opposed to random, and with stratified sampling, meaning a range of different populations were included based on ethnicity, gender and incomes. The individuals who were within that group and willing to stay and view the slides were the given population. In a few of the shelters, men were the primary population but some women also filled out the survey. In total, 15 focus groups or 168 subjects viewed the slides and participated in the follow-up discussion during a period that lasted from October 1999 until July 14, 2000.

Phase II: Groups that Viewed the Slides

- Ann Arbor Housing Commission n=6 A mixed group of seniors at the Ann Arbor Lower Income Senior Housing apartment complex who came for lunch and volunteered to stay to view the slides.
- Ann Arbor Neutral Zone n=15 Teens at a Teen Center in Ann Arbor who were attending an evening board meeting and therefore tended to be leaders amongst teens.
- Ann Arbor Pioneer High School n=23 Teens comprised of an attentive mix of high school students who were also learning about conducting surveys as part of their class.
- Ann Arbor Pioneer High School n=23 Teens comprised of a wide cross section of the population and who, as part of class, volunteered to view the slides.
- Ann Arbor Senior Citizen Center n=8 Caucasian seniors who arrived by car in a high income section of Ann Arbor to enjoy a lunch with other seniors at the Senior Citizen Center.
- Ann Arbor Lions Club n=7 Middle aged Caucasian individuals who were members of a local club and willing to volunteer to see the slides before their regular meeting started in the evening.
- Ann Arbor Homeless Shelter n=9 Mixed age gentlemen, mostly of African American descent, who would spend the night in the homeless shelter.
- Detroit Birmingham Area Senior Men's Club n=9 A lunch meeting of Caucasian senior men in the wealthy section north of the center of Detroit and consisting of the men who volunteered to stay after the lunch to see the slides.

- Birmingham Area Seniors (BASCC) n=6 A mixed gender group of middle aged Caucasian bridge players in the wealthy section of Birmingham who completed the survey after playing bridge in the afternoon.
- Butzel Family Center n=12 Staff people and other volunteers in this Detroit inner city predominantly African American center who volunteered to view the slides during the day.
- Cass Corridor Methodist Church Bible Study Group n=6 Inner city Detroit evening Bible study group comprised of predominantly African American people of various ages who viewed the slides before their meeting.
- Cass Corridor Homeless Shelter n=16 The homeless men who are invited to sleep on mattresses in the large room adjacent to the Cass Corridor Methodist Church volunteered to judge the slides. The population was predominantly African American. There were a few women in attendance with their children because they came for a meal.
- Burlington, Vermont Senior Citizen Center n=8 Following lunch, some of the seniors volunteered to look at the slides of buses. They were Caucasian, older and some were slightly disabled due to limitations in hearing, walking or writing.
- Burlington, Vermont Homeless Shelter n=17 Homeless men and women of various ethnic backgrounds who were in the shelter in the middle of the day for a meeting and volunteered to see the slides after their short meeting.
- Washington, D.C. Marshall Heights Welfare to Work mothers n=3 Six welfare-to-work mothers were anticipated to be in attendance but at the last minute, they were called to other tasks. The three remaining mothers who were of various backgrounds offered very worthwhile insights and therefore, their comments were included.

In each of the focus group discussions, it was explained to the participants that first they would view the slides and individually fill out the 7 point Likert scaled survey related to their perceptions of safety. Safety was explained as having to do with crime and not having to do with collisions with cars. Crime was specifically defined as purse snatching, pick pocketing, getting beaten and additionally, loud language, unpleasant body language or bumping. After the forms had been filled out, the participants kept their surveys and the slides were shown again. The participants referred to their own completed form to indicate how they voted and they also reacted to something someone else said. While they spoke, their comments were written down. In many of the locations, it would have been impossible to have a tape recorder. As an example, at the Cass Corridor Methodist Church the homeless men were eager to shout comments and there was an echo in the cavernous room. In the Senior Citizen Center in Burlington, some of the women were quiet and it was hard to hear their perceptions.

A bus is a public form of transportation and its appearance is perceived by those who ride the bus, those who might ride the bus and those who will never ride the. These 3 populations were approximately represented in the 15 focus groups. In other words, there was an attempt to have an equal subject grouping of 1/3 bus riders, 1/3 potential bus

riders and 1/3 people who would never ride the bus. This was not reflective of the general population that has a large percentage that would never ride a bus. The mean on each slide for the collective "all cases" 15 focus groups would be validated if the mean from a specific focus group, such as the homeless, had been similar on Slide #66. Focus groups then with similar characteristics were combined for use in this comparison of means across groups. The responses to the homeless shelters in Ann Arbor, Detroit and Burlington were grouped together, but there is a likelihood that a staff person might have filled out a form and that person would not have been as low in income. All of the volunteer participants were not required to fill out the demographic last section on the survey and, therefore, it would have been difficult from that demographic information to determine only people making a certain income or even being of a specific gender or age. This determination was possible based on an observation of the group since, as another example, slides were shown at the three homeless shelters in Ann Arbor, Detroit, and Burlington and men with the intention of spending the nights were predominantly in attendance. Therefore, to compare to the A) "all cases" graphs, more graphs were also created for B) "predominantly female," C) "predominantly seniors," D) "predominantly homeless," and E) "Vermont – homeless and seniors." Additional checks were made of the demographic information that had been supplied in each of these categories to assure that the populations were, for example, predominantly male. Using these additional 32 graphs, or 8 graphs for each of the 4 subset categories (B, C, D, E), it was discernible that, while there was some variation in the minimum and maximum means and greater variation in the more neutrally determined slides (a factor also of fewer numbers of subjects), the groups generally had similar perceptions to the same slides. The A) "all cases" main group had similar perceptions related to crime as B) "predominantly female," C) "predominantly seniors," D) "predominantly homeless," and E) "Vermont – homeless and seniors." The verbal comments or qualitative statements by members of all of the groups corroborated quantitative results from the groups. The objective of this research is to show inclinations for perceptions related to safety in one environment compared to another. Individual buses cannot be built for specific populations or singular contexts and, therefore, a bus with wide acceptance and general applicability is the goal. The minimum and maximum preferences can prove of value in designing better buses and bus stops.

After the participants had seen the slides and ranked them quantitatively according to personal safety, they were shown the slides a second time and entered into a qualitative discussion about the slides. In this discussion, they referred to their completed sheet and additionally reacted to each other's comments. Their discussion with their peers might have changed their initial reaction to a slide but they most often confessed to the change in the discussion or stayed with their initial vote. These discussion points have been recorded "per group-per slide" but also combined as "all groups-per slide." Due to space limitations within the text, all 32 graphs cannot be shown. What are shown in the body of the text are the 8 graphs with pictures for the most preferred and least preferred slides with a few additional slides. The discussion for each slide is the cumulative response of all groups. The elements in the preferred and non-preferred slides are cross-compared for further illustration.

As already indicated, the results to the Phase II picture preference survey and discussion are presented in Chapter 3 for those who might have to skim the document. The more academic discussion detailing the literature review and a bus associated concept titled social bridges can be found in Chapters 4, 5, 6, and 7.

Chapter 3 - Phase II Picture Preference Survey Results

In order to determine perception of crime related to bus and bus stop appearance, picture preference surveys with follow-up discussions were conducted. The Phase I research that involved surveys about crime perceptions and that were distributed on buses had been somewhat inconclusive because participants had perhaps not experienced the full range of bus and bus stop designs. The participants might also have been distracted by being in the out-of-doors, in the company of many people, or more concerned about the arrival of their bus. Therefore, a Phase II picture preference survey was created that used 70 slides, culled from 400 slides taken a) in the United States and Europe, b) from bus catalogues requested and received from bus companies, and c) from one history book on buses. These 400 slides were divided into 8 categories of bus stop, front, back, amount of advertising, color, windows, doors, and seats. The selection of slides from 400 to 70 was an expert determination made by the author with the assistance of Linda Groat, Professor of Architecture at the University of Michigan and Advisor to the project. Since the bus stop and the entire bus were under study, the time to view the slides was designed with the willingness and attention span of the volunteer participants in mind. The bus stop and the bus were both studied since they interrelate on perceptions of crime and could be designed as a seamless unit for transportation. The final selection of slides for each category was therefore based on including the cross section of features that exist in present-day buses and a reasonable time to view the slides. The result was 6 to 15 slides for each of the 8 categories (bus stop, front, back, amount of advertising, color, windows, doors, and seats) with slides ranging from one extreme to the other. Thus, the bus front designs ranged from reproduction trolley bus fronts to modern full glass fronts, totaling 7 bus front slides.

These 70 slides were then shown to 15 focus groups, totaling 168 participants of different genders, ages, ethnic backgrounds, incomes and geographic regions. These groups, such as a Lions Club, school classes, bible study meetings and bridge groups were already gathering for other purposes and willing to view and rank the slides. Immediately after scoring the slides, the focus groups were shown the slides again during which time they offered explanations for their scoring plus discussed their perceptions of the slides. Their discussions were written at the time instead of being tape recorded and later transcribed. Because these groups were not purposefully assembled focus groups in a controlled room but, on occasion, larger groups in a room with poor acoustics, writing their comments immediately was the most effective way to collect the data.

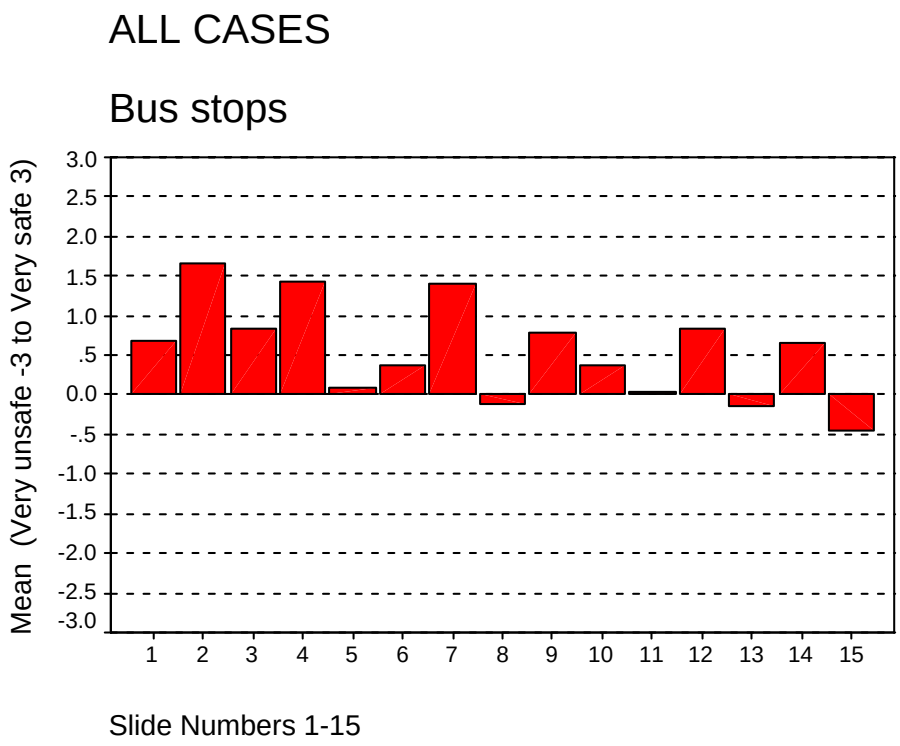
The focus groups that viewed the slides were located in Ann Arbor (a small college city) and Detroit, Michigan (a large metropolitan city). For external validity, or the degree to which the findings can be generalized to other locations, the picture preference survey was also conducted in Burlington, Vermont (a rural city in a low crime state) and in the Marshall Heights Ward 7 area of Washington, D.C.(comprised of the city's highest percentage of African American residents and the highest percentage of households receiving public assistance.)

The participants were asked to rank on a 7 point scale of –3 for Very Unsafe to +3 for Very Safe, how they perceived safety related to crime in the picture. The means (averages) were determined for all of the responses to the 70 slides and depicted in 8 category graphs. These 8 graphs show the comparison between positive (+) and negative (-) responses to the slides in that category. Except for color, these bar graphs demonstrate variation (or differences) between perceptions related to personal safety, see **Phase II Chart # 2** in Chapter 2. In the color graph, the means (averages) were about the same, suggesting that color wasn't a significant factor related to the perception of crime. See **Phase II Chart #3** in the Executive Summary for a summation of the literature review, observations, surveys, and focus group discussions related to the 8 bus and bus stop components of bus stop, front, back, amount of advertising, color, windows, doors, and seats.

To check for validity or if individual groups had similar responses to the cumulative or "all cases" group, additional graphs were created. With each heading below are the bar graphs from "all cases" that were created for the 8 categories of bus stop, front, back, amount of advertising, color, windows, doors, and seats to show the means (averages) in the quantitative response to a particular slide. As a cross check, 32 more graphs were created for 4 subsets of the population with 8 graphs for each group. These subsets included "predominantly female," "predominantly seniors," "predominantly homeless," and "Vermont-homeless and seniors." Due to space limitations, these additional charts are not shown but only the "all cases" bar graphs are shown. General conclusions about the 4 other groups are included in the discussions. Based on the lower number of participants in the subset groups, there was variation in the major and minor means (averages) across groups and contrast in the more neutrally determined slides but the general perceptions of all the groups were similar. The "predominantly female," "predominantly seniors," "predominantly homeless," and "Vermont-homeless and seniors" groups perceived crime similarly to the "all cases" groups. As an example, 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. This perception was corroborated by the qualitative group discussions.

The following are the 8 categories with slides that represent the most and least preferred elements. Beside each slide is a positive or negative sign (+ or -) that reflects both the quantitative value assigned to the slide by the participants (as shown in the graph) and the qualitative value based on the focus group discussions about each slide. In some cases, a slide might have both a positive and a negative sign within the brackets. This suggests the slide received a positive score in the ranking but, in the discussion, the participants didn't like the slide because they identified elements related to crime.

Bus Stop Design **Stops bar chart**



Slide #2 (+) Stop

Slide #2 was the most preferred bus stop in relation to personal safety from crime. The qualities mentioned in the cumulative focus group discussions included brick or masonry (won't get blown away), open, no bushes, architecture, and the Saint Michael's College bus stop name on the roof. A featured preferred by some but not by others included the glass wall in the back. Some preferred to have an open back while others

liked the "U" shaped protection. Prospect, being able to see a distance, and refuge, having some protection, are both desirable features [1], thus explaining the appeal of both open and closed spaces. Additionally, opportunities for "fight or flight" (escape) [2], or multiples ways to flee are preferred related to crime. Some people want to know in advance that they can run and to also determine which way they would run if they sense trouble. They might prefer to not have a back wall so they can get away easily. For females, who might be less able to fight or flee especially if they are caring for children, they have a predisposition to "tend and befriend" [3] or seek friendships with people around them. This would suggest they prefer an intimate room in which to converse, explaining why they prefer a back wall. They want the protection from the wall but also, like the men, they don't want to be captured against the wall without a means of escape. Concerns have been addressed related to older shelters that had a single small entranceway with only the one door for escape. Someone could stand in the one doorway, blocking the one exit while a person inside the stop was victimized. Some stops with two doors allowed a similar pattern of crime as two people blocked the 2 exits while the people inside the stop were victimized. New stops, rather than having a single narrow door, instead, have opened walls or multiple doors. To allow for people in wheelchairs full access, some stops have doorways in the rear in addition to multiple openings in the front [4]. Therefore, a "U" stop with an open front, a stop with an open front and open back or a stop with no sides are preferable related to crime.

Slide #15 (-) Stop *(Photo Courtesy of WalkBoston)*

Slide #15, though it didn't have side walls, was the least preferred bus stop with a participant suggesting "set ups there" or the possibility of being mugged. The participants felt vulnerable to people walking behind them and they also didn't like the blind alley entranceways. This corroborated the crime perception research of Loukaitou-Sideris [5] 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. Levine and Wachs [6] found that if a sidewalk was overly crowded there was more purse snatching, jewelry stealing or pick pocketing. If there was a separation between the

crowds and the bus passengers, the passengers felt safer. While a tremendous amount of money had been spent on the bus stop features in Slide #15, some felt it looked like construction was taking place. This might have been suggested in the open rafters, rough cut stone or varying textures and materials. The large numbers of shadows cast by the open rafters and clear roof made the space confusing. Others thought it didn't resemble a bus stop and there was too much clutter.

If the bus stop doesn't look like a bus stop, it doesn't "make sense." Humans are information processors and want information about their environment. If they are under stress, as perhaps might be the case when in the public realm, they cope by gaining control. To feel in control, they seek information [7]. A bus stop that looks like a safe building or home, has a name, features a bus schedule, perhaps includes a map and is well lit, gives them the necessary information to feel in control of their environment and themselves. They feel less vulnerable related to crime because they know where they are based on a stop that resembles a bus stop and has a name, schedule and map.

If the bus stop was confusing and it exhibited too much complexity or "involvement." the person might not feel safe related to crime. Humans do want some level of involvement, such as mystery, so they don't get bored in a bland world. But they don't want too much complexity, especially in a world that is already bombarding them with stimuli. If there is too much complexity or stimuli, it can overly tax directed attention or their thinking process. People prefer environments with legibility or spaces that can be read [8]. The participants preferred stops that looked like simple houses with pitched roofs because they felt safe in houses and knew what they were.

In analyzing the details of some of the other preferred bus stops, common features dominated across the slides. **Slide #3** featured clear glass all the way around the "U" shaped stop with no advertising on any side. The open end of this glass sided stop faced the sidewalk though and some subjects worried that someone passing by on the sidewalk side would reach in. The subjects preferred to have the opening in a "U" face the street. The bus stop did include a logo and lettering that stated it was a bus stop.

Slide #3 (+ -) Stop *(Photo courtesy of WalkBoston)*

Other preferred bus stops included **Slide #4**, in Portland, Oregon, which included an open back, no advertising and an expensive convoluted glass roof. **Slides #7, #9 #14** were liked and they also featured no advertising and, more prominently, a roof that made the stop resemble a small house, as in Slide #2.

Slide #4 (+) Stop
(Photo Courtesy of WalkBoston)

Slide #7 (+) Stop

Slide #9 (+) Stop

Slide # 14 (+) Stop

Slide #8 (- +) Stop
(Photo Courtesy of Regional Transportation Authority, Corpus Christi and FTA)

In the general qualities at bus stops that were somewhat less preferred, **Slide *# 8*** was a work of art red sundial that moved to shade those waiting for the bus. While attractive, the majority of the participants didn't react positively to it because they didn't understand it. It didn't "make sense" to them. Participants said they wanted the bus stop to indicate to them that it was a place to stand and be safe while waiting for the bus. Since most of the participants were from a colder climate of Michigan or Vermont, they might not have understood the need to be out of the sun.

Some bus stops have been designed as artistic extremes to be viewed as high art by the passing motorist. These bus stops have been less functional for the bus passengers. In historic Aachen, Germany, a bus stop designed by the architect Peter Eisenman is said to look like an out-of-context crippled crab. Benches, at the end of the structure, were one of the few provisions for the waiting passengers. Wire glass, appearing as an additional provision, filled in gaps in the roof to keep out rain. Commissioned by French street furniture and bus stop designer JCDecaux, the stop was intended for New York City but the request was tabled [9]. While the sundial Slide #8 far more closely resembles a bus stop than an crustacean and is merely protecting the waiting passengers from the sun, bus stops should first consider the needs of the passengers and second, the aesthetic needs of the passing car occupants. Slide #8 does show a handsome fence, as opposed to a chain link or graffiti covered fence. The attractive garbage can suggests the area could be kept clean by riders, fostering ownership, and a courtesy is extended by the bus company. With no sides at the stop, multiple flyers couldn't be affixed to plexiglass panels, graffiti couldn't be painted on walls or residue couldn't remain from tape. The fact that the bus stop appears maintained and there are ways to keep it clean, suggests less prevalence of crime.

Slide #5 (+ -) Stop

Slide #6 (+ -) Stop

Slide # 11 (+ -) Stop

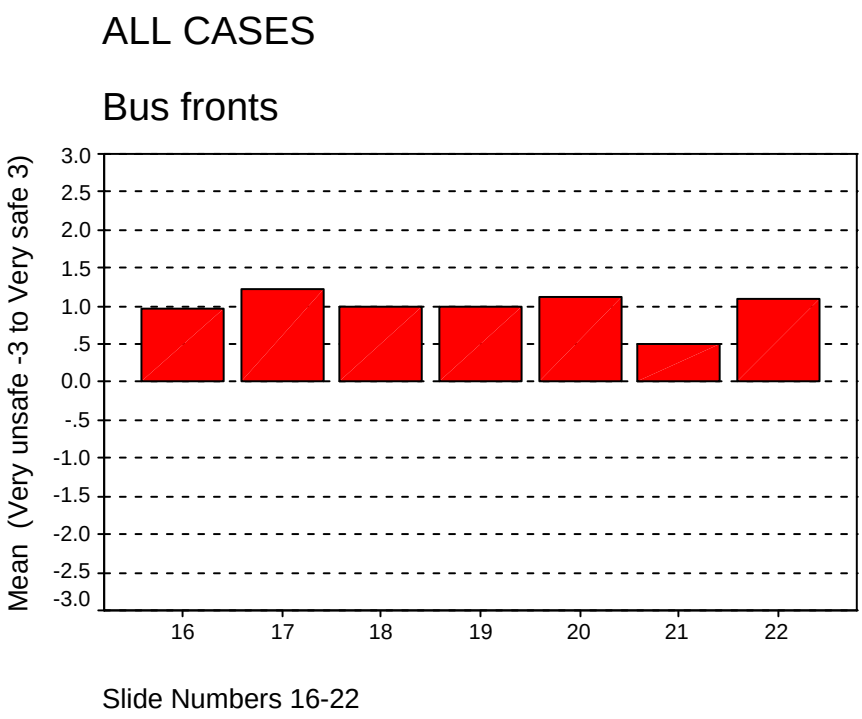
Slide # 13 (- +) Stop *(Photo Courtesy of Anastasia Loukaitou-Sideris, UCLA)*

Slide #5 and **#6** had nearby trees and some participants were worried that someone could "jam you up" or attack you and drag you to the bushes. The danger associated with dense vegetation is corroborated in research by Kaplan and Talbot [10], Kuo, Bacaicoa and Sullivan [11], and Nasar and Sullivan [12]. People, particularly those who live in cities, are more apprehensive about dense vegetation because someone could be hiding. Some bus stops, such as **Slide #11** were traditional stops with little maintenance

suggesting a crime element [13]. **Slide #13** was a very typical strip development city stop adjacent to a parking lot with no shelter, a bench, newspaper stands and a shopping cart nearby. The Burlington, Vermont seniors, who live in one of the safest states in the nation [14], did not express concern about the types of people at the stop while this was a concern to the minority subjects in Detroit. Participants also suggested a passenger could be dragged to a car in the parking lot while others felt safer with the adjacent cars.

None of the bus stops related visually to the bus design, as suggested by Adrian Forty in her book Objects of Desire [15]. She had studied the redesign of the complex transportation system in London the 1940's and demonstrated that a cohesive design, logo, and mapping visually integrated the buses and the subways. If the bus stop resembled the color, shape, or texture of the bus, the bus system could then appear to be seamless, as an above ground subway system. Even in the absence of the bus, an organized bus system would be evident with the presence of the design-coordinated bus stop. What could be learned from the responses to the bus stop slides is that participants didn't prefer advertising, preferred clear glass panels if there are panels, and preferred a visible name for the stop, suggesting the lettering could be the same style on the bus and the stop. The participants also preferred a bus stop that in some way resembled a house or a building and had a solid pitched roof.

Bus Fronts **Front Bar Chart**



The most preferred front, **Slide #17,** was perceived to feel safe by the majority of the participancts because "the more glass the better." The one concern raised was that the window was too dark. participants also felt safe because "they can see you." This would suggest that this bus front was preferred because people inside the bus could see you, corroborating the "more eyes on the street" safety from vigilance identified by Jacobs [16]. Jane Jacobs suggested that city streets are safer if there are people who can be watchful as opposed to a street with no pedestrians or people watching from windows.

Slide # 17 (+) Front

Slide #21 (-) Front

The least preferred front was **Slide #21** and the responses included, "worst, dark, 70's, old, windows not big enough, need brighter colors, hiding a mugger, entrapment, driver not visible, and looks like a prison bus." This response also relates to Jacob's "eyes on the street" principle since, through the small dark window, the bus driver and the passengers would not be visible. In the segmented population of the "predominantly homeless," this was given a negative score. The "Vermont – homeless and seniors" were less apprehensive about the appearance, suggesting perhaps that inner city residents prefer clear sight lines.

Slide # 16 (+) Front

In cross comparing the other preferred bus fronts, **Slide #16**, a trolley front with clear glass windows, was said to look friendly. The predominantly female population was somewhat fearful of this trolley front in the quantitative written survey, perhaps because they didn't quite understand the picture of an historic trolley, but their comments in the group discussion were more positive. When the group explained the picture, they were more at ease in that environment. Therefore, when the bus front didn't "make sense" [17] they expressed concern until they understood. The broad yellow band line could also be interpreted as a frown.

Slide #19, a preferred front, featured a bus window that smiled with a bottom curve to the glass. The facial quality to the bus front, or anthropomorphizing and giving an animal or human element to an inanimate object, was also incorporated on the front of the newly designed New York City subway [18]. People specifically prefer a face that is symmetrical, comprised of female qualities including a small chin and full lips and babyfaced with large eyes displaying honesty [19]. Slide #19 was preferred the most amongst the "predominantly female" and "predominantly senior" respondents. In the discussion, a positive comment was made that in this bus and others with a window in the back (#16) from the outside, "You can see everything from the beginning all the way to the back." This is possible because of the clear glass window in the back. If the back wall were solid, your eye would not be provided the opportunity to see through and out the other end of the bus. The window in the back of the bus makes

Slide #19 (+) Front
"Smile"

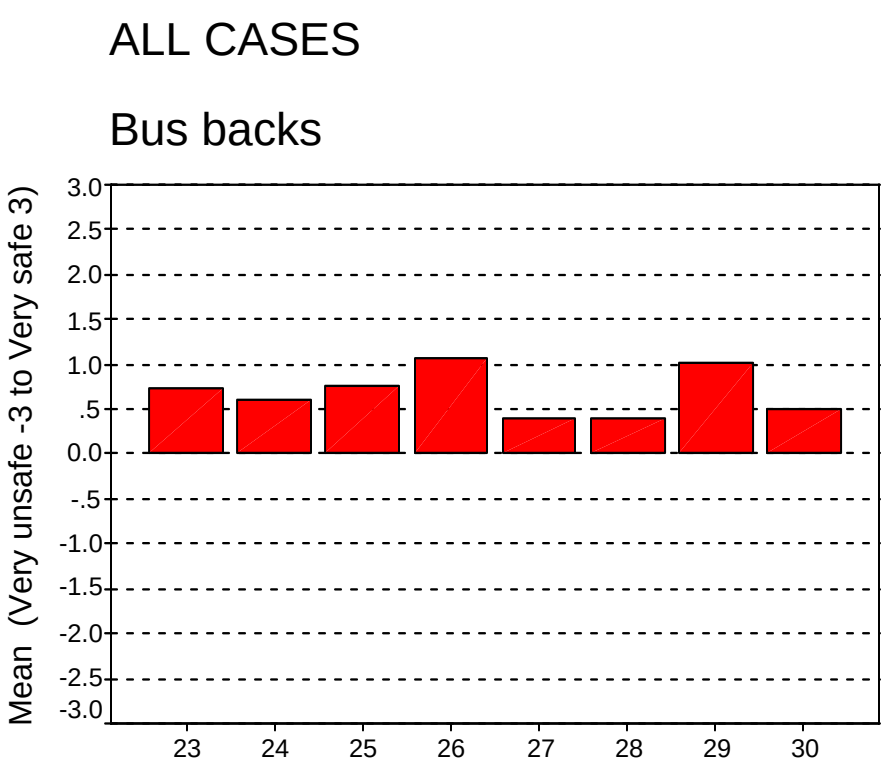
the bus appear to have more light, even from the outside. Concerning the same issue, one of the participants stated a preference for clear plexiglass behind the driver to allow additional sight lines into the bus. With the solid wall behind the driver, the view inside becomes more impenetrable and less preferred.

Slide #20 (+) Front
(Photo Courtesy of Gillig)

Slide #22 (+) Front

Slides # 20 and #22, which received scores similar to Slide #17, featured large clear glass windows. The only differences between 20, 22 and the most preferred 17 was Slide #17 lacked a center mullion bar dividing the front window into two segments and the window was longer. This would suggest that the more glass on the front and the clearer glass, the more preferred the bus. In the Slide of #22, there was a reflection on the glass and several of the groups expressed concern about the glare reflecting off the glass, making it impossible to see inside. Some participant also didn't understand the bike rack on the front. With the windshield wipers and the bike rack, they thought the bus front looked too cluttered and confusing. This would suggest that perhaps bike racks should be painted a color that closely resembles the bus color. The preferred front bus window was a clear, long, symmetrical, and with an engaging countenance and warm appearance.

Bus Backs **Back Bar Chart**



Slide #26 (+) Back

The most preferred bus back was **Slide #26** that featured a large expanse of glass from side to side. In the comments some of the participants did raise a concern that the window was dark or tinted, saying, "Don't like tinted – I like long windows." From the inside, if the back of the bus had a clear glass window, that light coming in would be apparent from the inside. Applying Alexander's theory [20], preference for spaces with light to

which one is drawn, the boarding passengers who tend to not move to the back of the bus might gravitate more naturally to the back because of the natural light. The study conducted by the Volvo Bus Corporation [21 explained that the bus drivers sought physical incentives for the passengers to willingly move to the back of the bus. A window at the back of the bus might be a magnet that draws the passengers to the back without a verbal suggestion from the bus driver.

Slide #27 (- +) Back

Slide # 27 was the least liked back slide in "all cases" and also in the "predominantly homeless" and "Vermont-homeless and seniors" focus groups. The comments associated with the slide were far more explicit than the reasons why subjects liked Slide #26. One low income woman did state that she liked the painted back window because she prefers the privacy, being able to hide behind the window with no one seeing her. A low income participant conversely felt "locked up in the bus" with the painted back window. Low income populations sometimes are familiar with older windows in old homes in which the sash is painted shut, making a heavily painted window impossible to open. Another participant stated, "People like to look out the back window – lighter buses give you a feeling of openness." Another participant stated, "Can see nothing in the back and what if somebody falls."

Slide #23 (+ -) Back

General comments about the slides referenced **Slide #23**, a painted back window with wrap advertising. Some groups felt it was unsafe and one person commented, "I like to think that you can see inside. You never know what your are going into?" The principles in Crime Prevention Through Environmental Design (CPTED) [22], Newman's "Defensible Space" [23] and Jacob's "eyes on

the street" [24] suggest that a painted back window would not allow for necessary surveillance nor security [25]. People like to keep a space around themselves and from that space, want to see others. With solid walls, people are not able to see in or out and use the information to feel safer.

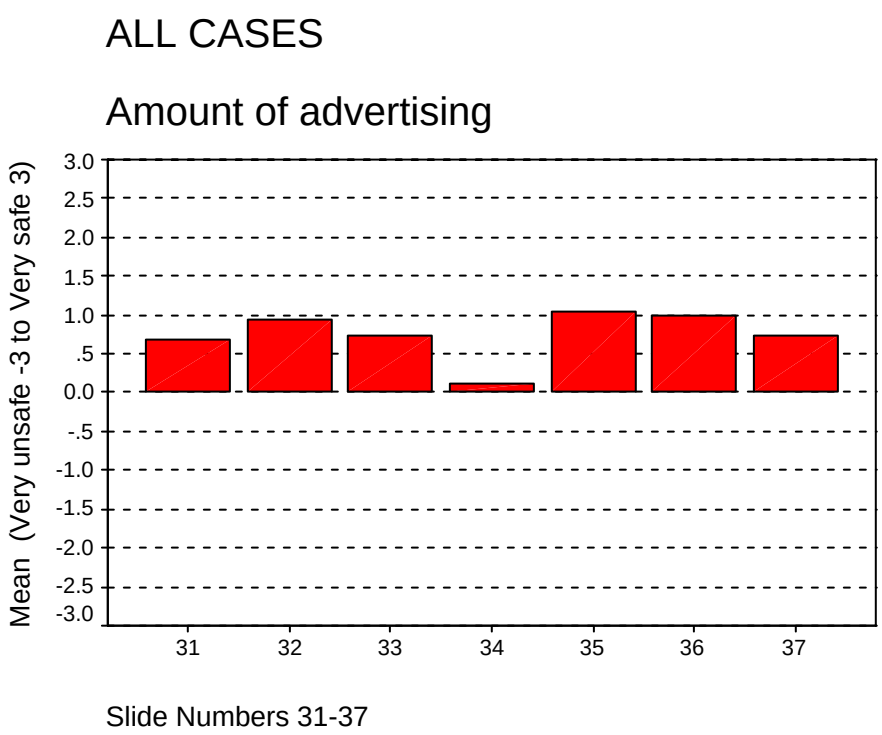
Slide #28 (- +) Back

Slide #29 (+ -) Back

Slide #30 (- +) Back

Slide #28 showed a trolley bus with a back platform and some were concerned that someone could jump aboard. A clear-glassed Mercedes bus was shown in **Slide #29** and many participants reacted positively because of the Mercedes logo. **Slide #30** showed the back of a bus with a darkly tinted narrow window and an abundance of graphics. A participant stated, "I don't like buses with all that graffiti on it. I can't see in that window." People from the Burlington Homeless shelter stated that, "lots of crime happens in the back." The group elaborated by saying, "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." In discussions about other slides, the homeless in Ann Arbor expressed this feeling of not being safe in the back of the bus, especially if the window didn't exist, was painted over or was tinted. In the back of the bus they are furthest away from the bus driver and want at least for people in the cars behind the bus to see them. It has been determined that the back of the bus was the location of increased crime, especially life-threatening incidents, and therefore this space deserved more design analysis [26]. Also, with a clear window in the back of the bus, the people in the cars behind the bus can see the activity inside the bus and are less impatient as they see passengers board the bus. With a solid bus back, the drivers in the car behind the bus are facing a solid wall. For a multitude of reasons, a clear window in the rear of the bus was preferred related to crime.

Amount of Advertising on Buses **Advertising Bar Chart**



Slide Numbers 31-37

The clear windowed Mercedes bus in **Slide # 35** was the favorite in regards to amount of advertising because there was no advertising on the side but instead a modest graphic and some lettering. The bus did not resemble a typical bus with advertising panels. Some thought there was too much going on in the bus but others stated positively, "No advertising." They stated that to them the bus looked clean, cute, safe, and happy with lots of light coming in. This would suggest preferred coherence and legibility, desirable for making sense and understanding [27]. The bus graphic was also not cartoon-like, thus denigrating the adult passengers.

Slide #35 (+) Amount of Advertising

The bus that was least liked for amount of advertising, **Slide #34,** had a vinyl wrap ad meaning the windows were painted. The negative opinion was unanimous across all groups in degree with it being the most disliked slide. Though this could have also been a reaction to the style and content of the ad, the focus group discussion clarified the survey response. In the discussion, the participants stated, "Not cover windows, unsafe, can't see inside, can't see out." More specifically they suggested, "I can't see if anyone is being killed or attacked." Another person suggested the bus looked like a cardboard box. Someone stated that because you couldn't see inside, it was a, "Good bus for hijacking." The participants expressed negative reactions to dark, dirty, or painted over windows because they could were not able to see in or out. Similar reactions related to dark, dirty, or painted bus windows were discussed by ENTRA [28], Levine and Wachs [29], Patterson [30], and Ringe [31].

Concerning the wrap around advertising in Slide #34, some participants had reactions as passengers in a car. They confessed that they noticed a bus with the wrap around advertising and didn't notice the other buses. Some said the bus was a distraction as seen from the car and that it was, "Like a big billboard, a rolling coffin." Some stated that they didn't care if the bus was painted, "Color doesn't mean anything to me – clean and on time."

Slide #34 (-) Amount of Advertising

Insights were revealed during the discussion about the advertising. **Slide #32** was photographed in Spain and included a wide advertising panel on the side. The passengers were clearly visible in profile down to their elbows through clear glass windows. A husband and wife in the higher income senior center were talking about the sign and he commented he didn't like any of the people on the bus because he couldn't read the advertising on the side. This suggested that advertising on a bus is similar to putting a bumper sticker on a car and it reflects on the unwitting passengers. Related to slide #32, a homeless person said you could always tell the poor person's bus by the advertising. He was referring to the fact that a certain type of advertising, such as spousal abuse counseling, cooperation between races, or a law firm that advertises assistance with

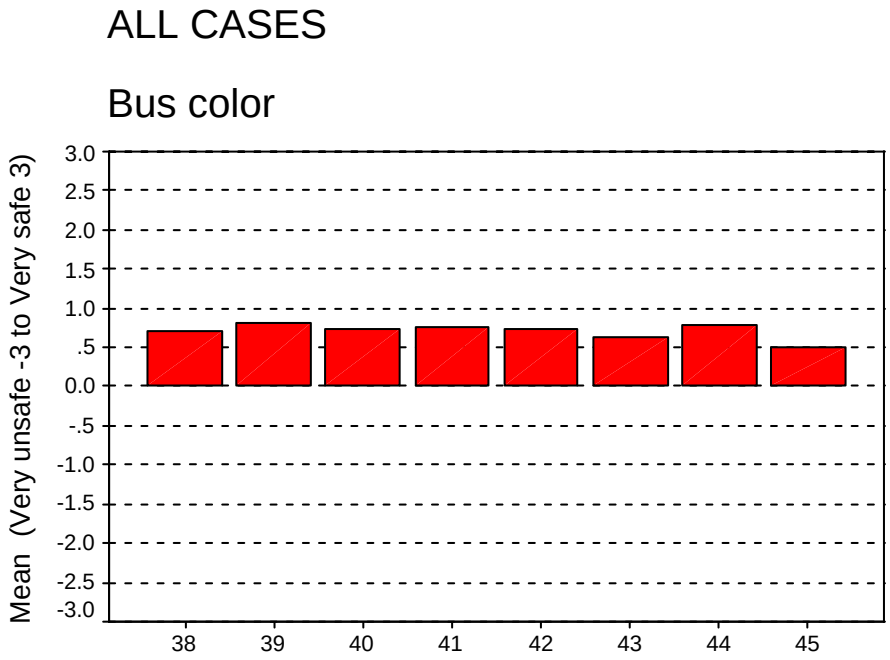
lawsuits, is targeted to lower income populations. Some participants even noticed advertising placed in the clear glass back window, **Slide #37**, and because they had already expressed a preference for a clear glass window, didn't like the ads blocking up the window.

Advertising on the buses, especially when it covered the windows, was not preferred by participants who considered themselves passengers on the bus. Participants who considered themselves pedestrians also preferred no advertising on the windows because then people on the buses could see them and they could see the people on the buses, as in sidewalks feeling safer with adjacent restaurants. Advertising on the buses suggested graffiti making the bus riders feel less safe related to crime. Participants who considered themselves riders also did not like the association made between the advertising and themselves. Some said the ads suggested they were riding on a low income or minority bus and thus more apt to be associated with crime. Besides security, people also want identity [32], personal dignity, a feeling of self worth and a degree of fairness dealt them by society, thus allowing hope [33]. By placing citizens in moving billboards, the outside viewing population might gain by the advertising and the revenue from the advertising helps offset the cost of the fare but there is also a price paid in lessened safety, dignity, self worth or a feeling of fairness for the passenger. Other ways could perhaps be found to offset the price of the bus ticket.

Slide #32 (+ -) Amount of Advertising

Slide # 37 (+ -) Amount of Advertising

Bus Color **Color Bar Chart**



Slide Numbers 38-45

Of all the series of slides, the 8 slides of the color of various buses revealed the least difference in means. All bus colors were viewed favorably and were not considered a factor in crime perception. Other factors, such as windows and their opacity, advertising or stops, appeared to have more to do with perceptions of crime. Though modest in difference, **Slide #44** was orange and preferred because it reminded people of a safe school bus. Others reacted negatively to that same slide, thinking the color unattractive, though crime wasn't mentioned.

Slide #44 (+) Color

Slide #45 showed another orange bus (though the bus is gold according to the city that provides the buses) but this time the participants reacted not to the orange color but to the lines painted on the windows and the dark tint of the windows. They worried that you couldn't see into the bus though that might have been due to the angle of the photograph. Some said, "Orange isn't associated with happy – orange is caution, slow, bring up the guard." Since both slides showed orange buses, the differences of the painted lines and the darkly tinted windows could have been the contributing factors related to perception of crime. Some didn't prefer the other orange bus because of the advertising and ads in the windows. Therefore, the bus color is subjective and a matter of taste while advertising (graffiti-like or inability to see in or out) and window tint or painting on the windows (the inability to see in or out), are more related to perceptions of crime.

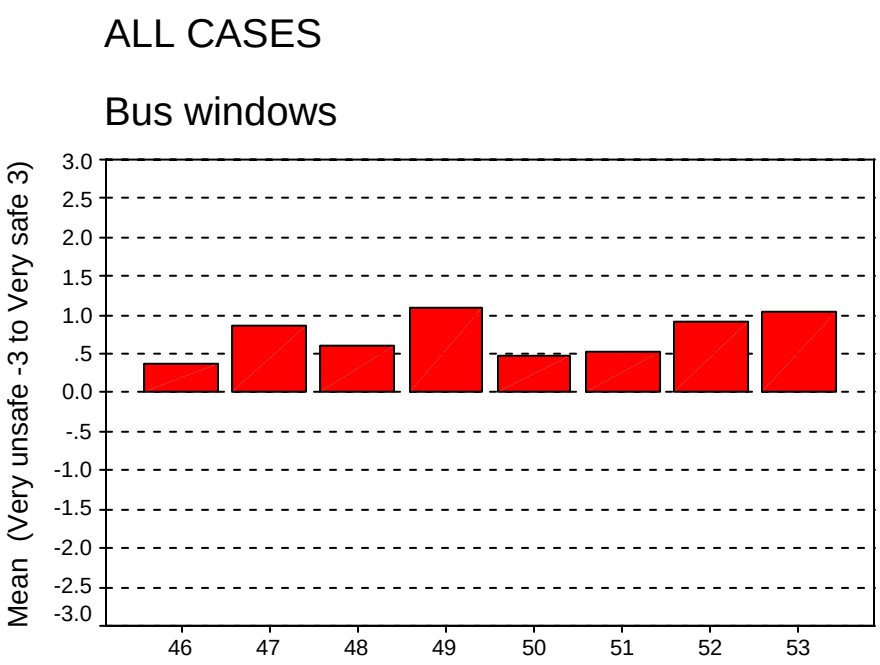
Slide #45 (- +) Color *(Photo Courtesy of Pittsburgh Port Authority)*

Slide #38 included a purple bus with a large logo for a local radio station painted on the side. While one group of younger people liked the purple bus and the radio, another group found the purple bus to be, "Trashy, too dark, too much stuff going on." A past bus driver suggested that with the radio station logo on the side and the purple color, the boarding students might feel they could be louder and dominate the space because the bus was for them.

Slide #38 (- +) Color

The participants spoke about the clear glass windows versus tinted even though they were to address the color of the bus. If the bus color or design was complicated due to advertising, stripes or paint schemes, it was less preferred. Adjectives related to bus color included, "Junky, messy, prison bus, ugly, or lame." The safest designs related to perceptions of crime were the simplest with no advertising or elaborate graphics.

Bus Windows **Windows Bar Chart**



Slide # 49 (+) Windows

Slides #49 and #53 were the most preferred and are both shown to demonstrate the similarities. Slide #49 is manufactured in the United States by Nova BUS, was photographed in the plant parking lot and therefore, is absent advertising or logos. The comments were similar for #49 and #53, taken in Erlangen, Germany, with participants stating they preferred being able to see inside but also, "See clear through." They added that people could see you and you could see others through the big windows. Even

though the participants were instructed to look only at the windows, they liked the color scheme on both #49 and #53. Reactions included, "WOW, nice and bright." Some of the participants making the comments about being able to see were older and therefore, would prefer the ability to see easily. Someone cautioned that since the windows were so low, if a window was opened in the summertime, someone could come along and reach in. Slide #53, as in #49, was preferred due to the expanses of clear glass, the fact that you could see through the bus and the lack of apparent advertising.

Slide #53 (+) Windows

The slide least preferred related to crime was **Slide #46**, suggesting that having too much clear glass, or a fish bowl effect, can have a negative effect. Participants said, "Too much glass." Someone else stated, "Could get assassinated – windows are humongous." They could also have been reacting to the oddities in an out-of-date photograph of an English bus with the dated attire and sideburns on the passenger entering on

Slide # 46 (-) Windows
From "British Buses Since 1945"
John Creighton, Blandford Press.
Attempts at tracing the copyright holder of "British Buses Since 1945" were unsuccessful (per last publisher in England)

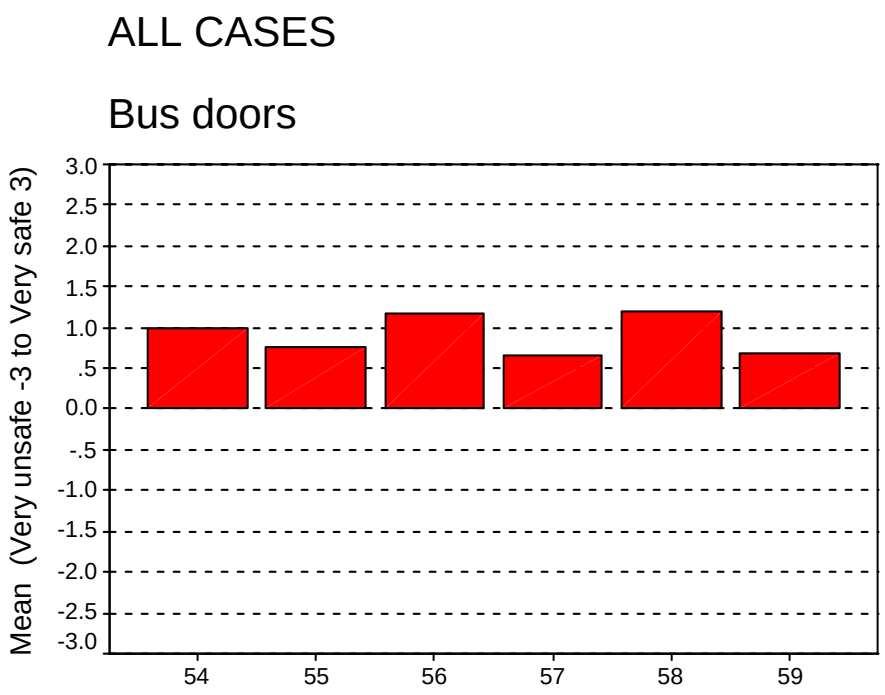
the other side. The reason for including this slide was to show an expansive mass of clear glass and determine if participants felt there was an extreme. Someone stated, “People throw bricks – rocks – metro windows shot,” suggesting that this bus offered too much prospect and not enough refuge [34].

Slide # 50 (-) Windows

Slide #50 was not preferred by the other segmented populations though it was preferred by the “predominantly female” group of participants. This bus was the one with darkly tinted horizontal windows in the front and back that had been likened to a prison bus. On the bus was a gaily colored logo with recreators and some characterized the square white bus by stating, “Looked like a freezer.” Others disliked the small darkly tinted windows. This reaction to the tinted windows and the earlier negative reaction to the painted windows could also suggest that buses were not preferred that offered too much refuge and not enough prospect [35]. People want to be able to see out and they want to have at least some protection. Thus a balance has to be found between having a certain amount of clear glass to see into and out of a bus and a certain amount of metal or protection to not feel fully exposed.

Windows that conveyed the greatest feelings of safety from crime for passengers, people on the sidewalk and people in cars were clear glass and long. The windows were not to be so large that they made the riders feel as if they were in a glass bubble waving to a constituency along a parade route. It is possible to have clear glass windows and air conditioning since a film can be placed on the glass that repels the sun’s rays. Mullion bars or dividers between windows could allow for each passenger to have identity within the window frame and a sense of privacy. Windows that can be easily opened for air and escape are preferred.

Bus Doors **Door Bar Chart**



Slide Numbers 54-59

Slides #58 and #56 were liked equally and because they are very similar in design, only **Slide #58** is shown because it received more positive dialogue. This door is doubly wide with a bar in the center and bars on the sides for assistance in entering. Some were worried that someone could reach in the wide door and steal a purse. Others were concerned that with the bar, the width wasn't sufficient to allow passage for a large person. As in #56, they liked the grab bars, or "banister" for stability. A senior gentleman said that when you become older, the ability to escape crime becomes more important than participation since you can't fight due to age. In this case, you look for opportunities to remove yourself from the scene. He stated, "Openness and visibility are important – more open the aisles, the safer."

Slide #58 (+) Door

Slide #57 (-) Door

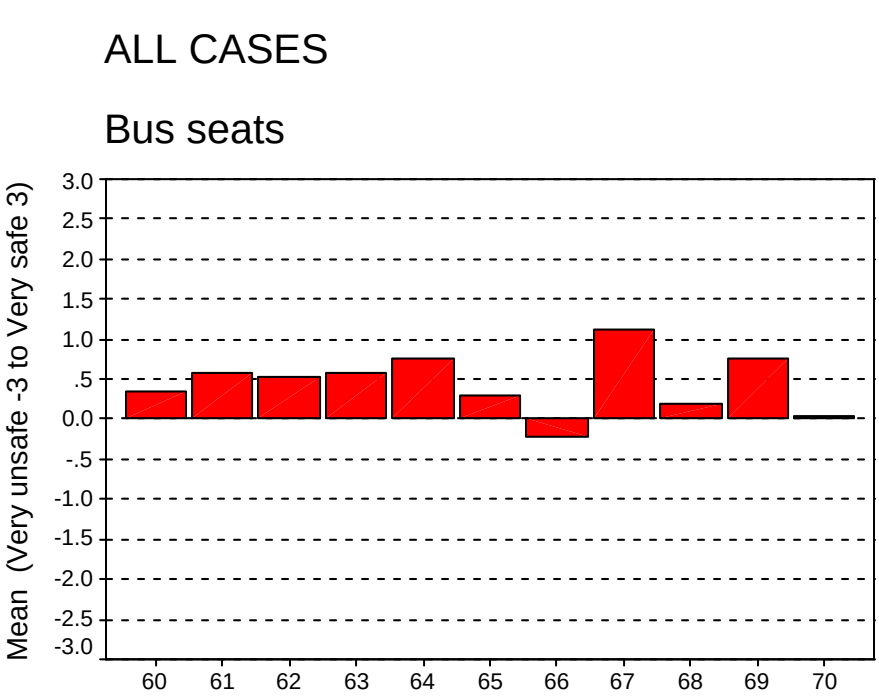
Participant didn't prefer **Slide #57** related to crime because, by contrast to the doors in #56 and #58, these doors were too narrow. Additionally, participants were worried that the doors might close on them or, "Slide and smash you." They felt sympathetic to the older person who had to step up too high to reach the first step between a door didn't seem to open sufficiently wide to allow easy access. Pedestrians, who would be walking past the bus, would view this uninviting bus door and perhaps form a negative association, thus a sharp contrast to their impression of a store with welcoming doors. The nonbus rider wouldn't want to ride the bus and might have a lesser opinion of people who do ride the bus, based on the first impression of the door.

Slide #59 (- +) Door

Slide #59 showed a double wide back door with no center bar and while some people liked the door, others had a negative reaction. The absent bar in the middle meant you weren't slowed down going in the door but you also had no supporting bar on which to lean. Inside the door was a mother with a toddler and a baby in a carriage. Participants were sympathetic that she could easily get her stroller on and off but concerned that someone might jump on the bus, take the baby and quickly flee. As in the extremes with windows, of having too much prospect or too much refuge, it is also possible to have too narrow and too wide a door.

Doors therefore should be wide but not too wide to allow for someone to jump onboard and then flee. One color should be chosen for grab bars and stair edges to simplify the view and lessen confusion, thus making people feel less vulnerable and fearful upon boarding. The door should be welcoming with a homelike inviting quality instead of technical mechanistic elements.

Bus Seats **Seats Bar Chart**



Slide Numbers 60-70

Slide # 67 (+) Seats

The seats that were the most preferred, **Slide #67**, were red upholstered, foam filled longitudinal seats (parallel to and situated just below the windows) with ample leg room and no passengers. Participants reacted by saying, "Lavish, cushions, silence, beautiful, everyone is sitting on same couch, and love seats." They were concerned though that with the expanse of longitudinal seating, there would be less opportunity for privacy. People prefer opportunities for solitude, intimacy, anonymity and reserve (guarding against

intrusions) [36] and in these longitudinal seats, there would be less opportunity for privacy.

In crowded situations, people often adopt a fixed body position and maintain an invisible bubble around themselves that they don't necessarily want to have invaded by strangers [37]. In the field of proxemics [38], it was identified that people of various nationalities have different allowable distances between themselves or bubbles of space, further complicating the issue of crowding. In sociofugal spaces and behavior, people purposefully keep a distance and in sociopetal, people come together [39]. An example of a sociofugal space is a row of fixed hard benches in a bus station where total strangers would sit an optimal distance apart to maintain their territorial bubble. An example of a sociopetal space is a Paris café table with movable chairs where friends purposefully gather their seats close to one another. Research related to mass transportation showed people have a preference for riders similar to themselves [40] and touching behavior was studied on crowded subways in which people from a different ethnic group or gender pull their elbows into their laps in crowded situations, avoiding tactile contact [41]. While William Whyte's [42] identification of the preference for moveable seating could not be actualized on a bus, the seating configuration could ideally be sufficiently varied to allow for both separation from strangers and interaction with friends. The red foamed longitudinal seating, though preferred, would not allow for various seating arrangements and levels of preferred isolation or intimacy. Strangers might want sociofugal separation from one another while friends would want sociopetal spaces for intimate conversations. Though conversations could take place across the aisle, these would not be possible if there were numerous standing passengers. On a crowded bus with many people standing, the preferred view of forward, backward and to both sides is not possible. These multiple directional views sometimes are necessary in order to see street signs or landmarks that might be quickly passed.

Slide #66 (-) Seats

Slide #66 was the least preferred by all of the groups with the strongest reactions caused by participants who imagined they were occupants on the bus. Because of the way the passengers are seated, with their bags, strollers and carts, the participants stated, "Seats are smushed, crowded." The space was considered, "Too jammed up, too hard to get around." It would be difficult to get out of the way and the baby carriage was making the space seem even more congested. The seats were perceived to be small and the aisle too narrow. This bus interior includes a seat fabric with 5 colors in a small busy print, an orange ticket box, yellow buttons for stops and a small red button inside the yellow button, a yellow stripe at a step's edge, a grey floor and black bars. While this color scheme might not appear too busy, when coupled with passenger's clothes and their necessary

packages or strollers, the space becomes too complex. With this much complexity, the passenger can't "make sense" [43] and the space is not preferred. Though consideration could be given to the people in the picture, who, to an American eye might appear from another country, the people are smiling and not fearful. There are even groceries and children in the picture. The fact that the one man's knees are in the aisle, suggests that the space was not designed ergonomically to accommodate passengers. A person wishing to anticipate fight, flight or escape [44] would see few immediate options. This slide demonstrates, when designing interiors, consideration should be given to how the space would look when empty but equally important, how personal safety is perceived when the space is full of people, packages and carriages.

Slide #68, less preferred, displayed a typical turquoise plastic seat interior, chrome stanchions, a solid back wall and no passengers and people felt this interior was, "Urban plastic feeling – big city feel – everyone is supposed to steal money." They also found it uninviting, uncomfortable, cold, dark and with small aisles. This picture was shot on a bus at night and the windows are therefore dark.

Slide # 68 (- +) Seats

Slide #64, preferred, had similar blue plastic seating with the major difference between Slide #68 and Slide #64 being the amount of light inside. Slide #64 had the advantage of sunlight pouring into the space but additionally, the side windows were longer and there was a back window. Therefore, since buses have to be ridden at night and virtually the same interior is preferred in one picture and not approved in another, consideration should be given to night time interior lighting that will not just be functional in terms of visibility but also appealing. This appeal should be aimed at lighting the interior spaces but also the lighting on the passengers. These passengers need to be made to look appealing, and thus not threatening, which isn't achievable with blue/green covered fluorescent luminaries. Another difference between the two slides, not related to lighting, is the presence of advertising. The preferred picture featured no interior advertising while the non-

Slide #64 (+) Seats

preferred picture included overhead advertising. An additional comparison is the presence of a back window. The preferred picture had a clear glass window in the back while the non preferred bus interior had a solid back wall.

Slide #60 (- +) Seats

Slide #60, though marginally preferred, provided some worthwhile comments in the focus group discussions. This bus, photographed in Europe, features futuristic light grey plastic shell seats with no padding. On the back of each seat is a darker handle for stability and the stanchions are bright red. In the transversal seats (perpendicular to the windows) for two, the two plastic shells are separated with a space between. While this would provide for separation and isolation from the adjacent passenger (Westin, 1967), a participant commented, "Someone could put their hand through the seat and take my bag." Therefore, a transversal seat that allowed some sense of separation but no opportunity for someone from behind to surreptitiously invade the space would be preferred.

The participants found reproduction trolleys to be, "Quaint, old fashioned, and not comfortable." They responded to the concerns about crime only in relation to a difficulty in flight or escape between the narrow seats. A trolley with an historic interior, walls of wood and narrow seats, **Slide #65** elicited responses that included, "Too narrow, safe, clear, and can see." The subjects acknowledged the clear glass windows and appreciated the ability to see. Their primary concern was related to the lack of comfort on the seats but seat comfort was less related to crime. The participants did seem to react positively to the interior due to the historic nature, feeling safer in an environment that had homelike qualities.

Slide #65 (- +) Seats

Slide #69, not shown, was preferred the most by the "predominantly female," "predominantly seniors," and "predominantly homeless" populations. It featured reupholstered and padded seats in addition to long clear glass windows and a window in the back. There were no passengers in the photograph and the transversal empty seats in the all-grey interior were very legible and easily understood [45]. By contrast, Slide #70 featured a multi-colored interior with a blue floor, blue seats with white plastic and a maze of red stanchions and bars. While some liked the individual transversal seats that offered a view out the window, others stated, "You couldn't stay with a companion." Some liked the multiple grab bars, even suggesting that they could hold onto a little person. Because the stanchions were bright red, in contrast to the blue floor, blue seats and white plastic, the space appeared busy. There were no riders on the bus and yet the subjects expressed confusion stating, "Jungle gym, too many red bars, too much stuff, blocking view." The homeless, as they had in the past, expressed concern about the distance from the driver and specifically, the inability for the driver to see them in the back due to the stanchions and partitions. The two back corners were hidden from view and the back of the bus has been described as the place where the most crime takes place. According to Levine and Wachs [46], more life-threatening incidents occur in the back of the bus, suggesting that barriers to visibility do exacerbate an existing problem.

The most preferred seat environments were comfortable seats in plain colors with wide aisles, no overly modern interiors, and possibly historic or home-like in design. Plain chrome stanchions appeared in the preferred pictures, suggesting when the space was too colorful and then filled with people, the space became confusing and fearful. People wanted clear sight lines to the back of the bus, preferring to see into the back corners and also out the back of the bus. A mixture of transversal and longitudinal seats were deemed safer related to crime. There should not be a space between seats for someone to reach through and take a purse.

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

To better understand perceptions related to current buses and bus stops, the history of the design of buses and bus stops provides a theoretical framework for analysis [1]. Additionally, an understanding of the historical context of bus and bus stop design offers ontological insights, based on the study of human nature, and epistemological findings, based on what we know and how we learn [2]. This foundation serves as a basis for the design interpretations of present buses and bus stops as revealed by the in-the-field (on location) surveys and the picture preference surveys, or surveys in which subjects state their preference for certain pictures compared to others.

Stagecoach, Omnibus, Train, Interurban, Streetcar, and Bus

Mass transit developed sequentially, based on evolving technology. Mass transit also developed contemporaneously as manufacturers of the stagecoach, omnibus, train, interurban, streetcar, PCC, car, trackless trolley and bus borrowed design principles from the each other in an iterative process of copying and perfecting. Economics, population density and the availability of roads or tracks meant the various transportation systems developed differently in various areas of the country. In the northeast prior to World War I, there were fewer buses due to narrow and poor quality roads while there was an abundance of transit railroad options [3].

The first form of overland mass transportation was the stagecoach that traveled from city to city on dirt roads and which, in more elaborate Victorian examples, borrowed on the design principles of the house with openings to see out, padded seats and curtains. The city omnibus, also pulled by horses, featured a driver on top and a back center door. The seats were lengthwise or longitudinal and ran parallel to the bank of window openings with passengers facing inwards. This is in contrast to seats that were transversal, also called banquet, and at right angles to the windows. During the winter in New York City, the omnibus was replaced with sleighs when necessary since roads were not plowed sometimes for weeks [4]. Following the stagecoach but not completely supplanting it, was the train that had its transcontinental spike driven in 1869. Built primarily to carry passengers and freight, the trains also included many of the design amenities of the home like the stagecoaches and the omnibus.

Due to uneven cobblestone roads, the free roaming horse-drawn omnibus was eventually replaced in 1832 with horse-drawn omnibus/streetcars that ran more smoothly on metal tracks laid in the center of the roadway [5]. Starting in 1873, cable cars also began to replace horsecars on heavily traveled lines or in places where grades were too steep for horescars. These cable cars, like the horse drawn omnibus/streetcar, were not impeded by snow as were the carriage horse drawn omnibus. Operating costs for cable cars were much lower than horsecars but capital costs were significantly higher. The cost of operating a horsecar in Chicago between 1880 and 1890 was twenty-five cents per mile compared with twelve cents for a cable car. On the other hand, the construction costs for building and equipping a cable car system could go as high as $200,000 (in 1888 dollars) per mile in Washington, D.C. but the costs were as low as a few thousand dollars per mile for a horsecar system [6]. Cable cars wasted energy because only 10%

of the energy put into a cable system was actually used to move cars with the other 90% being spent in friction moving cable [7]. With the invention in the late 1880's of the horseless carriage, or car, the expanded and heavier capacity truck chassis provided the frame, wheels and machinery for carrying even more passengers. The truck chassis was eventually replaced with a motor-bus chassis since the truck chassis proved too high, necessitating more stairs to reach the bus interior, thus slowing down loading and unloading [8].

Photo A *(Photo Courtesy of the Motor Bus Society)*

The first buses resembled long cars (**see Photo A)**, similar in concept to the modern day stretch limousine, but sometimes with multiple doors. The passengers entered the bus as if they were climbing into the back seat of a car, in a crouched head down position. Once seated, each passenger would be individually framed in a window they would face at right angles, thus, as in a car, being able to look ahead and to the outside. The window was low and passengers could comfortably rest an arm on the sill, meaning they were visible from the top of their head to near their elbow. If the window was closed, passengers were visible through the clear glass unless they chose to close the curtains that framed the window. A few of the early buses more closely resembled the streetcars or trains with a single front door through which a passenger would step, climb an additional stair or two, walk down a center aisle and be seated adjacent to a window. The engines of the early low car-like buses and the upright walk on train-like buses projected from the front with the driver sitting behind, as in traditional car design.

These early 1900's buses were often painted one color but with a differently colored horizontal band, called the belt line, under the windows in which the complete lettering for the company name, as "Edwards Motor Transit Co. Inc.," would be painted. Later bus models advertised the full company name with a band across the top while much later

buses eliminated the long name but kept the band. Buses were often painted in two tones with the top half being a different color than the bottom and a differently colored belt line under the windows wrapping all the way around the bus and separating the two colors [9]. Streetcars and buses continued to have the belt line painted around the side, to suggest visually that the bus or streetcar was low and long [10]. This two toned and belt lined paint scheme became the signature appearance for buses and was in marked contrast to coloring on buildings or cars, neither of which featured a belt line and few of which included a different colored top and bottom.

At the same time the car was being developed, the electric street railway or streetcar was being refined. Borrowing on principles of the horse-drawn streetcar and an individual train coach, the streetcar traveled along the street on dedicated tracks with overhead lines that provided power. In a few instances, power was supplied from inside a former cable conduit between the rails eliminating overhead wires [11]. These streetcars included one or several side doors, long clear glass windows that opened and either longitudinal seats or transversal benches, meaning the passengers were visible from the tops their heads to between their shoulders and elbows. In the cases of the longitudinal seats, their backs were turned to the streets. The front and the back of the streetcars were similar in that they featured clear glass all the way around. **(See Photo B)**

**The Orange Milan streetcars,
built between 1926 to 1928 and originally of American design,
were brought over from Milan, Italy and now run on the
Market Street F Line in San Francisco. (Photo B)**

Interior of St. Charles Streetcar with curtain. (Photo C)

Originally, there was no blockage between the streetcar operator and the passengers but due to glare on the window from the interior lights, a partition was added on later models, thus visually separating the operator from the passengers [12]. The historic streetcars in New Orleans featured a curtain that could be pulled around the driver, creating a Wizard of Oz effect that deflected light from the passenger section of the streetcar. **(Photo C)**

In the early 1900's, the interurban, very similar in design to the streetcar, ran between cities and sometimes on tracks of the railroad, stopping only in major hubs and traveling at greater speeds than the streetcar. The interurban could be as heavy and large as steam railroad cars but, in design, it resembled the streetcar. Both the streetcar and the interurban traveled sometimes on isolated tree canopied corridors on or between suburban edges connecting outlying communities [13]. In New Orleans, one of the few remaining American streetcar cities along with Houston and Galveston, Texas to adopt this policy, turf or grass was put over the tracks and allowed to grow adjacent to the track creating a green corridor for the streetcar. The grassed and treed streetcar park environment is still in existence along the St. Charles streetcar line in New Orleans. (**Photo D**) Other cities planted trees and shrubs adjacent to the streetcar corridor but the track was not covered in turf.

New Orleans Streetcar on St. Charles Street (Photo D)

Prior to the Great Depression of the 1930's, the population was served by the car, interurban, streetcar, train and long distance and city transit buses. The buses then resembled multiple door cars or center aisles trains. The street railway industry was concerned because cars and buses were competing successfully for riders. Unlike the cars and buses that had governmentally subsidized roads for travel, the streetcar owners had private investments in the streetcars, tracks, power lines, electric utilities, associated buildings and land holdings and their numbers of riders were declining. In 1929, some of the streetcars in use were 20 years out of date and most cars were not capable of competing with the more modern and comfortable buses that ran ahead picking up passengers waiting for the streetcar. The car builders fabricated the body and trucks but mounted sub-contracted parts manufactured by others including door opening mechanisms, signs, motors, braking equipment, heaters, ventilators, and registers [14].

In response to the impending demise of the streetcar, the Electric Railway President's Conference Committee was assembled in 1931 to create a state-of-the art streetcar. Comprised of executives, researchers and the streetcar manufacturers and operators, the committee studied the existing streetcar design to establish a baseline of operations. With that knowledge, experiments were conducted to improve performance and appeal of the streetcar and standardize the components. The first PCC, short for President's Conference Car, arrived in 1936. The scientific research and subsequent improvements continued after the delivery of this first car because the Electric Railway President's Conference Committee had obtained patents for each of the inventions. Whenever a component of theirs was used, a royalty was paid that supported further research. Featuring modern streamlining, riding comfort, multiple "blinker" doors that speeded loading and unloading and lights directed onto the newspaper of a seated passenger as just a few of the innovations, the PCC was a success. The interior of the PCC was also a work of art with vertical serpentine chrome bar stanchions that curved down from the ceiling and then underneath the seats to allow for toe room. Warm lighting reflected off of the shiny cream colored arched ceiling and walls, flattering the appearance of the occupants. Subsequent improvements included power ventilation and, in a few experimental cars, air conditioning. Standee windows were also introduced which allowed a standing passenger to have a view of the street instead of leaning over to determine landmarks for location [15]. **(See Bus Photo G)**

Even with these successes, the PCC was not able to compete with the buses' comfort and freedom from a dedicated track. In the 1950's, the PCC went out of business in most cities. Interest in the PCC has revived as witnessed by the success of the PCC and Milan streetcars that run on the F line on Market Street in San Francisco. In New Orleans, restored streetcars still run on the tree corridor St. Charles line. Streetcars also used to run on Canal Street in New Orleans but in this dedicated corridor, the streetcars were replaced with buses. Due to preference for the streetcar, in the near future Canal Street will have its buses replaced with reproduction streetcars designed to reflect the original New Orleans streetcars.

Though the streetcar temporarily lost its popularity and was replaced with the bus, the bus never had the advantage of the collective revolutionary thinking as directed by the Electric Railway President's Conference Committee. The triumvirate of researchers,

streetcar providers and streetcar operators, collectively reinvented the streetcar by improving and standardizing operations and appearance. **(Photo E)**

Red and cream PCC on the F Line in San Francisco (Photo E)

It is difficult to identify the present day preference for the PCC over the bus since the PCC's also contain the element of history, making the factor analysis complex. Experience has shown that given a choice between bus or light rail, which is the modern replacement for the PCC, the public chooses light rail [16]. This might be due to the increased speed of light rail on the dedicated track or the negative association of the bus diesel smell. But also, riders might prefer light rail due to the appearance. While light rail is seen as more appealing, it is more costly than the bus, less flexible in route and sometimes has the added cost of land acquisition for the right-of-way.

While the PCC was being developed, the bus was going through parallel transformations. In 1926, the first box style bus was developed by Frank and William Fageol and featured two engines underneath the bus, thus mimicking the body and engine configuration of the streetcars [17]. **(Photo F)** This bus is nearly identical in outward appearance to the present day buses, suggesting that the present day buses have not been significantly redesigned since 1926. Featuring long clear glass windows horizontally set equally all the way around the bus, two-toned paint, a painted band or belt line under the windows, and blinker doors in the front near the driver, this modern bus was a stark contrast to the multiple-door front engine buses of the time. In 1938, the same Fageol brothers combined two buses with a flexible coupling, providing seating for fifty-eight passengers and creating the first articulated bus [18].

Fageol 1926 Bus (Photo F)
(Photo Courtesy of the Motor Bus Society)

Windows

Standee windows (Photo G) [19]

Streamlined windows (Photo H) [19]

In the late 1930's and early 40's, the bus adopted the streamlining found in the PCC, the airplane and the dirigible. **(Photos G and H)** Windows became much smaller, revealing only the person's head as in airplane windows and, in some models, canted forward to connote fast movement. The reduction in size of the windows occurred on the long distance buses but was copied in some transit buses. Air conditioning was featured on the long distance buses and, due to road dust possibly entering and the need to control the cooling, some models were designed with windows that didn't open. The interiors

offered plush reclining seats and even wings as on a wingback chair, overhead storage and curtains [20]. Passengers on long trips sometimes ate or slept, thus perhaps the smaller window was designed for privacy. Also, on long trips the passengers would be traveling at fast speeds on highways and not be part of community street fabric, as in the more open PCC's or Milan streetcars. The long distance and inner city transit buses still retained windows in the backs of the buses though, over time, these windows had grown smaller. The standee windows **(Photo G)**, first introduced on the PCC's, were installed in the buses in 1940 and enabled standing passengers to view the passing landmarks and street signs [21. The further importance of the standee windows or later tall windows, was the ability to see in multiple directions including out the left, right, front and back of the streetcar or bus. This enabled passengers to be fully cognizant at all times of the surrounding passing landscape instead of only having a partial oblique view. Blockages to a full view can occur with a wall behind the driver, short windows, bars over wheel wells, solid rear walls, solid partitions near doors and wide panels between the windows.

The New Orleans streetcar featured clear glass windows that provide a view of the passengers (windows opened in photograph), the color in their clothes to their elbows and the profile of their faces. The passengers in transversal seats could make eye contact with people on the sidewalks. The passengers also are framed individually within each window, giving them personal identity as in a car. (Photo I)

The early buses and streetcars had windows with crisp right angle corners meaning there were rectangular vertical mullions, or metal spacers, between the windows. The double hung windows also were individually placed so that each person in each seat had identity and was framed in a window. **(Photos A, B and I)** After World War II, changes occurred in PCC windows with simultaneous changes in bus window design. The picture window was introduced framing several people in the same window and often the backs of the people would only be visible since the seats against the window were longitudinal.

The windows also had radius corners and the resulting mullion between these larger picture windows would be flanged on the top and bottom as it flared out at the curves. The placement of this mullion didn't necessarily correspond with the person inside. **(Photo H)** This design element of windows with curved radius corners is not present in early streetcars, buses, or PCC's but instead evident in later buses, PCC's, trains, airplanes, ships and some light rails. Automobiles, with the exception of the bottom corner of a back window, typically have windows with crisp edges. With exceptions such as Palladian windows or a few architecturally designed high rise apartments or office buildings, most houses or buildings have windows with right angles corners. In another differentiation, the early windows on streetcars, early PCC's and buses, as in houses, were also understandable in operation and could be opened or closed by the passenger seated adjacent to the window. The windows on the newer transit buses were fixed and could not be opened, thus relying solely on air conditioning that could sometimes malfunction, rendering the passenger captive and unable to control his or her own temperature.

The need for comfortable interior temperatures was reflected in the further design of the windows. After the introduction of air conditioning, the window glass was tinted to prevent additional heat gain from sunlight entering the bus. This darkened glass meant the passengers were no longer easily visible from the street and they looked out through dark glass at a darker streetscape. Tinted glass was available in grey, green or blue tints, similar to varying hues present in sunglasses, and the tints allowed varying percentages of light transmittance. Technology now exists to have clear glass and cool interiors through the use of a low-e glass coating that is applied to the outside of the glass. Developed by PPG, the product is 20 to 25% more expensive but the result is virtually clear glass [22]. If very moderate tinting was selected, a preference could be determined to see which tint allowed the most appealing coloration of the landscape. This tinting could be tested with the interior lighting to see which combination most flatters the image of the passengers, as seen from the outside and inside at night.

The windows on the front of the streetcar and the bus continued to evolve, borrowing, as before, design principles from each other. Early streetcars featured three or later two tall vertical windows with the operator in either the center window or to the right. **(Photo B and D)** Later PCC's and buses' windows narrowed to a horizontal opening with a mullion bar in the center. The front windows were eventually canted inwards at the top to eliminate the glare of the interior lights for the driver's benefit. This inward slope of the window meant the blinker or folding doors at the fronts couldn't open. Therefore, later PCC's and buses had what could appear to be a partial eyelid close over the window on the left, thus replacing part of the canted glass window with vertical metal. Eventually later buses had the center mullion, or metal spacer, eliminated that divided the front window in half; the result was one long horizontal window from the left to the right side of the bus. Much later buses had long and wide square windshields on the entire bus front. Some buses had a lowered section of glass on the passenger boarding side resulting in a front that was asymmetrical. **(Photo J)**

The windows on the back of the early streetcars were clear glass **(Photo B)** and subsequent bus designs also featured clear glass. This window in clear glass meant the people inside the bus would more willingly walk toward the back of the bus because they

were walking towards light. The back window also provided a view out if the riders turned around or were standing. Finally, the long clear window in the back of the bus enabled people in cars behind the bus to see inside and even through the bus instead of seeing a solid wall. The occupants in the cars behind the buses might have been more patient with a stopped bus because they could see the passengers inside boarding or disembarking and understand the reason for the delay. **(Photo K)**

The tilted window reduced inside glare for the driver. The metal on the left was to accommodate the door. (Photo J) [23]

Back of streamlined bus (Photo K) [23]

Lighting and Seating

Though fluorescent lighting and darkly tinted windows were later revolutions, both had appearance impacts on the bus interior and the bus occupants, especially as seen at night. The early PCC streetcars and buses had incandescent light bulbs, recessed and covered with a glass globe that cast the light on the newspaper of the seat occupant and created a pool of light focused on the person. The windows were clear and with the yellow interior lighting, the occupants' appearance was flattered as seen from the inside and outside. Later PCCs had ice-cube tray lighting meaning the interior no longer had individual pools of light but overall lighting. Since yellow light caused a problem of reflection for the driver, tubes of green or blue were put over longitudinal fluorescent bulbs; fluorescent bulbs were deemed more energy efficient. Window tinting was necessary at the time since it cut down on expenses for air conditioning. Coupled with the tinted windows at night, passengers appear to have a greenish cast with the combination of window tinting and blue/green fluorescent longitudinal luminaries. As mentioned, windows now can be made with an integral film that reflects rays allowing the glass to be clear and the bus to remain cool with the air conditioning.

In addition to the window coloring and interior lighting, the placement and view of the passengers in relationship to the windows additionally alters the bus appearance and outward appeal. Passengers either sit in longitudinal seats with their backs to the windows or in transversal seats facing the street at right angles. In longitudinal seats, the passengers make no eye contact with pedestrians or people in cars **(Photo L)**.In the transversal seats, the passenger can look out on the street and inside. On some buses, in both longitudinal and transversal seats, the passengers' heads are the only part visible through the bus window. At night because only skin and hair coloring are visible, the bus interior lacks color that is normally introduced with the riders' clothing. In combination with the tinted windows and fluorescent lighting, this modest color of skin and hair is further dampened, making the interior of the bus doubling lacking in color from the outside; if passengers are standing, their clothes' colors are evident. Longer windows, as those on the older PCCs or new streetcars in Portland, Oregon, project down to at least midway between the shoulder and the waist, allow for clothing and therefore color to be apparent from the outside **(Photos M and N)**. This more complete view of an occupant in an interior space is evident in coffee shops and restaurants as seen from the sidewalk. Restaurants and coffee shops are warmly lit and flattering to the occupants, thus entreating people to enter.

Passengers' backs in longitudinal seating (Photo L)

The new Portland, Oregon streetcars from the Czech Republic offer long clear glass windows, transversal seating and historic interpretive signs inside. (Photos M and N)

Bus Shape

The outside shape of the bus was altered based primarily on the location of the engine. When the engine was in the front, it projected under a hood as in a traditional car. Behind the hood, the windshield rose for the driver and a top projected horizontally backward over the passengers' seats. In some instances, the bus top was raised considerably as riders walked up steps to a center aisle between seats. Unlike this early bus, the streetcar had engines underneath the body placing the driver in front of the wheels. Each streetcar had two "trucks" each with 4 wheels, thus totaling 8 wheels, accomplishable since the streetcar always rode on level track. Metal skirting on the streetcars covered the space from the body to close to the ground and, in some instances, covered the wheels. In the bus designed by the Fageol Brothers in 1926 that copied the box shape of the streetcar and included two engines under the body, four large rubber tires were fully exposed and without skirting. This exposure aids in cooling brakes but is additionally necessary on the front tires since they have to radiate out of the wheel well in a turn. Therefore, though the 1926 bus copied the engine placement, square shape and windows of the streetcar, the visible large wheels always identify it as a bus. Some of the recent trolley buses have covered wheels in both the front and back with a horizontal band of low skirting. A few of the recent trolley buses also have duplicated the early streetcar roof clerestory, or a raised section in the roof, with a band of multiple horizontal windows that, on the original streetcars, increased interior light and ventilation.

The bus shape is additionally dictated in appearance due to street conformity and the ergonomics of the passengers. The bus can only be as wide as a travel lane will allow. Articulated buses increase the bus length but some streets and neighborhoods cannot easily accommodate the longer buses. The outward height is dictated by the standing requirements of the passengers as they walk down the aisles and the tire size coupled with the engine location. Some engines have been placed in the rear of the bus along with the air conditioners. Low floor buses have eliminated steps at the entrance but the large wheel wells are evident in the inside; the low floor has not altered the outward shape of the bus though some windows are longer. The square shape of the bus is determined primarily by starting in the top right corner on the boarding side of the bus. At this juncture, the doors that are near the driver have to be able to open. In the old PCCs, this corner had the canted window partially cut back to allow for the blinker doors. Therefore, the bus appearance is directed by the street dimensions, that are costly to change, and ergonomics of the passengers, that are impossible to change. The additional shape dictates are the tires and door placement, both of which could be reconsidered. The door placement could be rethought by simultaneously studying the method or absence of payment on the bus.

The Angle and View of the Bus

The outward appearance of the bus is dictated contextually by the setting in which the bus travels. Buses presented in history books and promotional catalogues are often photographed or drawn in a ¾ view that shows the front and the passenger door side. While the street side of the bus is very similar in design to the passenger side, the backside can be different in comparison to the side or front. This perspective though is less often photographed or rendered. In addition, buses and their interiors are depicted in

isolation on a piece of paper in good light, and once built, they become surrounded by foot and automotive traffic, their interiors fill with people, packages and strollers and the light and weather conditions become less than originally projected. Day turns to night, it rains or snows and the roads become covered with salt. Therefore, to fully understand the history of the bus and its appearance, the angle and the percentage of the bus that is visible and the varying conditions through which the bus is seen should be taken into consideration.

Before city streets became overrun with cars and trucks, streetcars and buses were visible transportation elements. The cars that existed were somewhat lower than the present day higher sport utilities and the trucks were not the long and wide view-blocking tractor trailers. Also, there was less tinted glass in the windows of cars meaning the street gave the appearance of being more transparent. Today, looking down a street at the bus front with cars and trucks ahead, at most the top half to one third of a bus is readily visible. For a passenger waiting at a bus stop, this is the first impression of the bus and the one that will give the visual cues for appeal and identification. For a pedestrian and non bus rider crossing the street, the oncoming bus face also makes an impression. The full front of the bus might be evident if the bus is the first vehicle in a line of traffic or if seen obliquely through other cars. If the side windows of the bus are darkly tinted or painted and no back window exists, the tall bus will block off the view of the street, essentially resembling a wall.

From the sidewalk if there are no pedestrians, the bus is seen as originally presented on the drawing board with a full view of the side. If pedestrians crowd the street, the part of the bus that is visible is the top and the bus passengers' faces, shoulders and arms if the windows are clear. A quick determination can then be made of the crowding inside the bus and the types of occupants. The view of the lower side of the bus is divided as seen through the pedestrians or passengers waiting to board. If there are trees at the stop or if there is a bus shelter, again, only a partial view of sections of the bus are visible. When the passenger is preparing to board, he or she only has a very close up view of the bus, specifically aimed at the door and the interior just inside the door. If there is a wait to board while passengers ahead pay, a passenger might look at the bus windows again, if transparent, to see who is inside and anticipate where to sit. With an oblique view inside the bus, the first impression of the interior of the bus is the location of the space behind the driver. On most low floor buses, this space behind the driver has a cover over the wheel, chrome grab bars and sometimes locked holding boxes for the driver's supplies. Traditional step-up buses and a few low floor buses have placed a seat over this wheel well behind the driver, meaning the first view of the interior of the bus is of a seat. Whether or not this seat is occupied, the bus then provides a scene more closely resembling a living room, a view that was evident in the early PCCs and older buses. The person waiting to board the bus feels invited in to have a seat.

The outside back of the bus, the less often rendered or photographed perspective, comprises the main impression many car occupants have of modern buses. A bus ahead of a car often moves with the car thus staying within sight for a longer period of time. As seen from behind, a bus can stop mid street for passengers, being visible for an even longer period of time by the car occupants who are stopped behind the bus and unable to pull into the passing lane. Sitting directly behind the bus in traffic, a car driver or

passenger can see the full view of the bus back. If the bus is further ahead in traffic, only the top half of the bus is evident above the cars.

The back of the bus is viewed also by the riders standing at the bus stop who view the bus stopped or as it pulls away. If the bus has no windows, there is no indication if the bus is full or empty. If the bus back has no number or name to indicate the route, the prospective riders also are unable to determine if they missed their bus.

The engine of the streetcar and early bus were underneath and, with no air conditioning, the rear allowed for ample window space. In the buses presently manufactured, the engine and air conditioning units might be located in the rear though air conditioning units are also often located on the bus roof. Exhaust pipes in modern buses sometimes are placed high near the back in order to expel exhaust away from the sidewalk. A downside is the visible evidence of the exhaust-associated residue on the top back and side of the bus. If the bus has no window or a painted over window, from this angle it also resembles a solid wall, similar to a tractor- trailer. Some presently operating buses have windows in the backs, as did the streetcars and early buses, thus humanizing the bus by making the occupants visible.

The bus is experienced in ideal conditions of little traffic, full daylight, comfortable temperatures, a few pedestrians, little ambient noise and a relaxed level of passengers. The bus can also be experienced in congested delivery truck and honking car traffic, after nightfall, during a snowstorm, near overly crowded sidewalks, adjacent to construction, within zones of repeated crime and with harried passengers. Though nighttime contains negative elements, daytime is not always a guarantee of satisfactory conditions. The bus could also be experienced during high heat and humidity, in full midday sun, with crying children and with passengers carrying too many packages or strollers. The bus should be designed in association with the most negative conditions because if it can function under lesser circumstances, it will also function when conditions are ideal.

Bus manufacturers and providers have worked to address these lesser conditions. Suburban Mobility Authority for Regional Transportation (SMART) is a commuter bus that runs from the suburbs of Detroit into the city with outlying commuter parking lots. Riders wait in their cars in inclement weather, and during dark winter Michigan mornings the riders have been known to miss their bus thinking instead that a truck was approaching. It was noted that school buses now have flashing blue lights on the top to signal that a school bus is approaching [24]. Universal signs, symbols or standards for urban transit buses could be developed to address these lesser conditions and be understood by travelers interchangeably in all cities. While adjacent car traffic, ambient noise and weather could not be controlled, bus design could be similar and easily legible. Someone in a wheelchair boarding an unfamiliar bus during a snowstorm could understand the necessary mechanics and get inside the bus quickly.

Advertising on Buses and Streetcars

Beyond self-promotion of the company name and city destinations, buses and streetcars in the United States from the early 1900's did not as a rule have advertising on the outside. Advertising on the exterior of a streetcar or bus was more popular in Europe than in the United States [25]. The London Transport in the 1930's developed a strict

policy that allowed advertising inside the underground tunnels but only within specifically sized frames and at predetermined locations. Avant-garde art advertisements proclaimed the virtues of the integrated London Transport system, thus allowing but controlling the advertising compositions [26]. Exceptions in the United States included streetcar providers who also had extensive holdings related to their lines or electricity. A streetcar might sport a sign saying, "Baseball Tonight" or "Dance at Electric Park" because the streetcar franchise owner wanted riders to travel to their real estate investments, some of which were park related.

The later prototype PCC's displayed streamlined multiple chrome horizontal bars as a design element, eliminating locations for advertising. The original buses and streetcars were not intended by the early designers to carry advertisements because the ads would break the carefully crafted lines of the body and the artistically selected color scheme. Photographs, from the 1940's and later, show streetcars and buses with advertising on the exterior that is not related to the provider [27]. Later streetcars had a clear space where ads were placed between the painted belt line and the painted skirting. Buses and streetcars typically had frames to carry advertisements, thus dictating the size of the advertisement.

Wrap around advertising in which the entire bus, including the windows, is painted, has become a recent revenue generating practice. A plastic screen is applied to the windows, the bus painted and the screen from the windows removed. What remains on the windows is similar to a comic book with small pin dots of color. While it is possible to make out images of the landscape from inside the bus, it is difficult to read street signs or decipher details. From certain interior angles, the reflective light inside gives the impression of being inside a prism. At night, especially when it is raining, it is difficult to see anything outside the windows except lights. From the exterior both day and night, the bus is a large billboard with no passengers visible.

Stations and Stops

In 1893 to celebrate the 400th Anniversary of Columbus' discovery of America, a world's fair was held in Chicago with Daniel Burnham as the director. Rather than copy the metal and glass temporary structures of past international exhibitions, the design theme embraced classical architecture. Burham intentionally juxtaposed his vision of grand order and simplicity against the chaos and slum conditions present in the industrialized cities, made especially disorderly by the influx of immigrants with no place to live. Across the nation, related demands for uniformity were being met with national time zones and railroad track gauge standardization [28]. Out of this fair, the City Beautiful movement was begun that was, through comprehensive planning and monumental city building, also intended to aesthetically impact the mass transportation system of the nation. Following the principles of the City Beautiful movement, in 1904 a subway stretch was completed in New York City with additional sections added after experiencing high patronage. The subway stations for this line were to contrast the poverty, crime and disorder in the city. From the bathroom piping to the power sub-station, every detail was to incorporate good design. The architectural firm of Heins and LaFarge was hired to design the stations and they incorporated ironwork and mosaics made by immigrant craftsmen. These artisans created varying symbols for the individual

stations that helped in identification and beautification of the individual stops [29]. One of the noteworthy public structures from the City Beautiful movement was Pennsylvania Station (1903-1919), built in New York City and now demolished. Using the classical architecture style of the Chicago Columbian Exposition, Burnham designed the Union Railroad Station (1903-1907) in Washington, D.C., now restored to expanded use. Though the emphasis was to be on public structures, private investors also adopted the City Beautiful Movement's national call for unity and beauty in New York City by building Grand Central Station, completed in 1913 [30].

The stops for mass transit varied from elaborate stations for trains, interurbans and sometimes streetcars to a nameless street curb for a streetcar or a bus. Train stations had names that were clearly visible upon entering the station whereas bus stops were sometimes only identifiable to the rider who lived in the neighborhood. Streetcar stations, while sometimes only a single building, did sometimes have a shingle hanging from the eaves to identify the stop. Bus stops for long distance buses served as community hubs and often included restaurants in addition to comfortable waiting rooms [31]. For transit buses, a storeowner might place a bench adjacent to the store front for comfort but also to perhaps attract customers into the store; in other instances, the bench included advertising for a business not proximate to the bus stop.

The trains, interurbans, streetcars and buses did not always have an architectural or visual relationship with their stops. Though New York City subway entrances had a unique appearance to make them noticeable and these subway stops were frequently surface transit hubs, bus stops could be a central location on a street corner with no marker. In the 1930's though, London's public transportation system determined to cosmetically unify the disparate collection of separate underground lines and private bus providers. Frank Pick had become the Chief-Executive Officer of the newly formed London Passenger Transport Board and under his leadership, the underground lines were consolidated and the bus lines purchased, creating one unified London Transport. At issue was how to make this amalgamation of mismatched pieces look like a seamless, efficient, modern and desirable transportation option. Architect Charles Holden helped bring visual order to the collection of underground stations, buses, bus stops, benches, publicity and even litter-bins, by making the pieces look like the property of one supervisory body. This was accomplished by giving all elements a visual relationship. In other words, the bus and the bus stop would appear as one design coordinated unit, a unified whole that visually demonstrated a carefully managed transportation system [32].

Mood

The mood or ambiance of a bus should matter little since it is merely a means of conveyance from one place to another. Stop location, frequency of buses, promptness and speed should matter more. Given no alternative, the bus will be the chosen form of transportation but given the alternative of the car, the mood of a bus will matter significantly. The private car owner controls the car's stop location (the garage), frequency and promptness (leave at will) and speed (barring uncontrollable traffic problems) in addition to controlling the mood of the car.

The early subways were predicted to pack people like sardines with perspiration for oil and have them hanging from the straps like smoked hams [33]. After the introduction

of the New York City subways, separate cars were requested for women so that they wouldn't be subjected to jostling and improper sexual contact in the packed cars [34]. These separated gender cars operated for a short while but, eventually, these segregated cars were eliminated and men and women returned to riding the same cars. In 1863, the first London subway cars were being built and there was concern about how people would feel being underground. To distract the attention of the passengers, the cars included plush upholstery, carpeted floors, polished hardwood paneled walls, and mirrors to make the passenger feel as if he or she was above ground in an elegant private home. Passengers eventually became pleased to just have an expedient means of transportation but the element of taste in those early subways has lingered. The London underground cars are still the most luxurious of any in the world [35]. In a study related to Swedish trains titled, "Public transportation fears and risks," the interiors were described as being intentionally home-like as in an apartment or an elevator. Houses are considered safe and a train that resembles a house will, by association, be considered safe. The article qualified the argument by admitting that homes, though considered safe, aren't necessarily so and suggested that safety on trains should be overemphasized to meet people's expectations [36].

While mood might matter less than timeliness or location, a handsome bus interior could help offset a possible mood domination by one or a few passengers, resulting in gains for all passengers. As a case in point, a Ph.D. Psychology student at the University of Michigan had the option of riding her bicycle to school or riding the bus. She chose the bicycle for physiological reasons but also psychological reasons. In analyzing her reasoning, she explained that the bus she would take to school passed by a low income area. On occasion, individuals boarded who were not completely mentally stable and spoke harshly, uttered to themselves or stood unusually instead of sitting. She was very understanding of their behavior, especially given her field of study, but admitted that subliminally she would become troubled by their dominance on the bus, making it harder to focus on the lectures when she arrived at school. Her apprehension might have been associated with the fear of crime as it related to the unpredictability of the passenger. This observation of the one student was related to a study conducted by Lufthansa in which one of the five most important benefits of personal car travel, compared to bus travel, was not having to put up with unpleasant people [36]. Though someone who is mentally unstable shouldn't be considered unpleasant because their condition might not be of their own making, interiors could be commanding and provide comfortable cohabitation for all occupants.

The bus mood also is a launch for the business day or decompression for the end of the day. In another conversation, a professional in marketing with a Ph.D. in Sociology admitted that he chose to drive his car because when he arrived at work he felt more productive. By contrast, when he took the bus out of duty to the environment, he felt less capable when he arrived at work and perceived himself as having a lesser sense of ego and significance. In this lessened state, he feared that he was producing less good quality work. In a study titled, "An Investigation of the Effects of Traveling on Later Decision-Making," a Watson-Glaser test was conducted to show the effects of a bus journey on subsequent intellectual behavior. The results showed that the subject's test scores changed based on several variables though no further details were identified in the report

[38]. In a study that looked at the reinforcement theory of transit ridership, the positive and negative responses for transit users were listed. In the long list under 'Punishing' was "low prestige." This negative association with the bus could perhaps be offset by an improved appearance of the bus. With higher prestige and related feelings of self-worth, productivity at work might increase. Under 'Reinforcing' reasons for taking the bus, only two reasons were given, "freedom from car ownership" and "making friends"[39]. Perhaps by providing an ambiance in the close quarters of the bus that would foster friendship, self confidence could be improved and work productivity rise.

The two anecdotes from people who opted to use means of transportation other than the bus, though not systematically obtained, do illustrate the importance of mood. While the bicycle and the car were options for the two subjects, some people have no choice but to ride the bus and they should be able to arrive at work feeling productive. Society hopes that everyone works to the maximum of his or her capabilities and therefore a bus should be designed as a public service to not lessen, but stabilize, and even enhance a person's mood.

Chapter 5 - Environment and Behavior

As information processors, humans prefer certain environments because these places or circumstances provide them with assurances of longevity and satisfaction. People seek cognitive clarity, for the downside is directed attention fatigue that occurs when directed attention, or focused thinking, is overly taxed. People also seek mental engagement because the brain capacity and output can improve by building models and expanding cognitive maps. Environments that are most preferred provide opportunities for 1) *making sense* and 2) *involvement*. The environments that allow a person to make sense have properties of 1A) coherence, meaning the features hang together in an orderly way and 1B) legibility, suggesting the elements can be read and understood. If the world only displayed elements that made sense, after comprehension, the person might eventually become bored. Therefore, a preferred environment also displays involvement. This environment of involvement ideally contains elements of 2A) complexity and 2B) mystery that both encourage mental processing or exploration. To complement involvement, making sense is still necessary because with only complexity or mystery, the subject could become overwhelmed by stimuli and feel lost [1].

The urban environment can be divided into legible edges, paths, nodes, landmarks and districts for greater understanding [2]. From an evolutionary perspective, people prefer environments that offer prospect and refuge [3]. With prospect, or a view across the landscape, the extended sight provides the opportunity to see landscape components, predators and food while refuge is preferred as an area of protection from the predators.

The difficulty in relation to crime is both the victim and the perpetrator seek prospect and refuge making these environments preferable to both [4]. While the preferred condition for a potential victim is prospect and refuge, on occasion a perpetrator can invade that space. To avoid or leave a crime scene, a third design component in relationship to fear is the option for escape. In this model of “prospect, refuge and escape,” fear of crime was highest in places where the perpetrator could gain refuge and the potential victim had low prospect and few escape opportunities [5]. From the “rational choice” perspective, the offender will determine the chances of committing the act and also the chances of escape [6]. The offender has to make an escape but after the crime is committed; the potential victim prefers environments that provide clear prospect and immediate opportunities for escape if danger is perceived. With this psychological state of fear, the victim is under stress that elicits the physiological syndrome referred to as fight or flight [7]. A recent gender specific contention related to stress suggests an individual male may fight or flee, while the female will “tend and befriend” [8]. Since females have had to protect their young and a social group affords more protection, the female’s instinct has been to seek assistance from others in times of stress. In a prior gender specific study related to space and crowding [9], groups of males and females were put in varying sizes of rooms for several hours. The females put in the smaller rooms became more cooperative stating that they liked each other more and the people in the small room were friendlier than in the large room. The males preferred the larger rooms and displayed less cooperation in the small rooms. The mixed gender groups were no different based on the size of the room. Other studies duplicated this gender pattern

while a few others were diametrically opposed. Therefore, a more gender inclusive environment for potential victims related to prospect and refuge would preferably provide opportunities for both fight or flight or "prospect, refuge and escape" but also opportunities for befriending and thus an environment of "prospect, refuge and befriend."

Jacobs' "eyes on the street" [10], Newman's "Defensible Space" [11] and Jeffrey's "Crime Prevention Through Environmental Design" [12] provided social and design guidelines for preferred environments. Jacob's "eyes on the street" or informal surveillance conducted by neighbors and storeowners, suggests that the responsibility lies with the citizens and their participation. Newman's defensible space and Jeffrey's CPTED were more prescribed and bureaucratic than Jacob's casual watchfulness by neighbors but overlapping both positions, the publicly funded and zoned domain of sidewalks, streets, storefronts and transportation could be physically transformed to foster more "eyes." To deter crime and increase socializing, design solutions related both to the propensities of humans, or watchfulness, and flexibility in the built environment, in different sidewalks and transportation, could be combined to benefit the public.

In addition to security, which besides safety from crime can include shelter, food and water, humans also seek identity and stimulation [13]. These three inborn satisfactions of identify, stimulation, and security have also been described by Ardrey in their opposites of anonymity, boredom, and anxiety. Identity, Ardrey believes, is the ultimate motive and humans would be more content with fame than fortune. Since fortune can be associated with fame, identity might be exhibited through power, money, glory, or personal possessions. Identity can also be associated with ideas, giving, morality, ethics or intelligence that in turn, can be associated with fame. People want to maintain their identity and this achievement is more difficult in public spaces. It is possible to have fame, power, glory, possessions, associations or intelligence reflected in a car, but not as possible to have identity reflected in a bus. (**See Bizzaro Cartoon**).

Stimulation, or heightened interest at being shown something new and challenging, could be achieved through involvement or specifically, complexity and mystery [14]. If the environment has new features or is mysterious, people prefer the variety because it contains elements to learn. While stimulation is preferred, an abundance of stimulation could cause a person to feel overwhelmed, not a desired state of mind especially if continued for any length of time. Therefore, in a city environment, while it is stimulating to have advertising mixed with people, cars, buildings, street signs, sounds, and smells, the bombardment of stimuli can be overwhelming, causing the person to become anxious.

Related or added to the list of satisfactions of security, identity and stimulation [15], are eleven concerns or desires of people. Besides 1) survival, 2) security, 3) order (related to Ardrey's security), and 4) enlarging the range or the quality of satisfactions (related to Ardrey's stimulation), are the needs for 5) hope, 6) choices, 7) freedom, 8) identity with the need for personal dignity and 9) a feeling of self worth. Also, humans want 10) to be reflected in a value system to which they can commit and 11) a degree of fairness dealt them by society thus allowing them to feel hope. These human desires were found to be universal [16].

A large population can lead to overcrowding which is different from abundant opportunities for socializing. If crowding does occur, four principles have been identified. 1) Crowding could lead to social disorganization. 2) The most dominant individuals will be least impacted. 3) Social and biological factors could cushion the individual who might be impacted. 4) The consequences of the social disorganization could make the weakest most susceptible in general to disease [17]. In a fair society, all people including the weakest (4), should have public spaces that provide a sense of identity, dignity, self worth, and inclusion.

Though people should have available to them opportunities for socializing, within the context of an unfamiliar crowd or even a friendly social gathering, people should also be afforded opportunities for isolation. Within isolation, there are four basic states of privacy. 1) Solitude occurs when a person feels separated from others and does not feel observed. 2) Intimacy is a closed circle of two or a few people that can be achieved with complete isolation or at the minimum, with some physical separation. 3) Anonymity is when a person is in a public sphere but because he or she is not a known celebrity, they can be more relaxed knowing they do not have to fulfill a role. 4) Reserve is afforded an individual to guard against intrusions and indicated by the subject through verbal messages or markers [18]. People should be able to socialize but also be isolated and designs of the public domain should allow for both preferences.

People tolerate crowding and close body proximity more willingly if they are with people similar to themselves. In research related to preference for riding a city bus, students were given two descriptions of potential riders; the first description was of riders similar to themselves and the second was of riders dissimilar to themselves but instead similar to the demographic of a typical bus rider. When the description of the bus rider was similar to a description of a typical student, the students indicated they would be more likely to ride the bus [19]. In a related study concerning passengers on a subway and their willing body proximity, tactile avoidance or an unwillingness to touch was observed when the subjects sat near persons different from themselves. In close quarters,

blacks and whites were apt to hold their elbows in front of them whereas, if there was room, they held their elbows at their sides. When men and women sat adjacent to one another, they too displayed less touching and pulled their elbows into their laps. The crowded conditions were not so crowded that the passengers had to hold their elbows forward in order to allow ample seating room for everyone [20]. Therefore, crowding and the stress it can induce is dependant on the riders. The various populations a public space can attract need not be a deterrent against taking public transportation. In accounts of the early New York subways, the writers who tended to be wealthy and educated indicated a preference for the rich "melting pot" environment. The subways were one of the few places where people of all backgrounds mingled and, except for complaints from women of men spitting and smoking, there were gains to be made from the association with other classes [21].

If a close quartered environment means a person is touching another person and they do not wish for the contact, the person can enter into a state of stress. Stress could be all consuming but, through evolution, the human has learned coping strategies that can better guarantee a longer life. Coping is a problem that is under control, at least for the short term until it must be resolved. In the interim, coping strategies ease the stress, allowing the person to have more cognitive clarity and thus be better able to make sense of the situation. Three strategies can be employed that involve 1) control, 2) ritual and 3) interpretation [22].

Control might relate to the environment, behavior or information and the person may choose to maintain status quo or seek change. By being in command or having control of a situation, the person does not feel helpless and therefore vulnerable. If an optimal gain cannot be achieved, more modest means of control are exerted.

Ritual also allows the person to not feel helpless as they replay a familiar custom of a group or the individual. A ritual is a repeated pattern of action and the outcome is independent of the correctness. A person might routinely choose a front seat location in a public bus as a ritual. The need for ritual helps explain the anxiety a rider might feel when the rider isn't able to sit in the same place. If this ritual is broken because the seat is taken, other means of coping might need to be employed.

The third means is interpretation in which the individual might internally or externally tell a story that explains the outcome. This explanation can be specifically causal or related to fate. By mentally or verbally describing the situation, the person is better able to frame, understand and thus cope with the situation. If blame needs to be ascribed, it can be self-blame or directed towards others. Either message means interpretation has helped resolve the unknowns that were the cause of the stress as the person attempts to identify whose fault it was. If a favorite bus seat is not available, the person could blame him or herself for not having arrived early enough at the bus stop to be the first in line and get the preferred seat. The person might also blame the bus company when they find someone else sitting in their favorite seat on a crowded bus. The need to use interpretation as coping mechanism might help explain why the person could be blaming the bus company.

The preferences discussed up until now have been primarily focused on *process* or the recognition of an object or a situation and the reaction to it as in making sense and

involvement [23]. Preference is also associated with *content* in the environment, the physical elements or things that are important to people. These content elements or categories of things in places to which people respond can be variously preferred based on factors such as evolution, geography, income or ethnicity. Places should additionally be evaluated by determining how each of a person's goals is met. The experience of place is unitary but the components of this experience can be broken into distinguishable parts that relate to the place. As an example, each person has a physical and social existence out of which is derived one experience based on that place. These places have a three-fold classification: 1) social, 2) spatial, and 3) relating to environmental services such as comfort or convenience. Using this multivariate approach, each facet of a place in regards to content should be evaluated [24].

From the general to the specific, people prefer individual environments that can be explained on the basis of the *content* in the environment and the resulting behavior. People are social animals and therefore seek environments other people inhabit [25]. The preferred places that serve the gathering needs of people include activity nodes, promenades, streets, a network of paths and cars, small public squares, public outdoor rooms, and even stair seats [26]. In addition, there can be a necessary social "third place" between home and work where people could decompress and talk about home or work. Termed by Oldenburg as "Great Good Places," these locations included general stores, coffee shops, beer halls, tea rooms and beauty parlors and they have sadly disappeared from present day life [27]. There are benefits to social encounters that happen by serendipity even mid cross walk [28]. City life, with multiple opportunities to encounter friends on the sidewalk or when taking mass transportation, suggests that socializing in the public venue should be fostered.

Under conditions of crowding, if variables such as heat, air, odor, cleanliness, discomfort and poverty could be controlled, high density was not stressful [29]. In these conditions, people have coping mechanisms that help them perceive the crowding as tolerable. People mentally project an invisible bubble of space around themselves for self-preservation [30]. People adopt fixed and frozen body positions in crowded situations such as the subway so as not to touch a stranger [31]. When riding in elevators or streetcars, people tend to hold themselves in and not have body contact [32]. This separation from others can be further characterized as "proxemic" patterns or different body distances that people of various nationalities adopt [33]. To one nationality, crowding or standing close in conversation may be translated as friendliness. This same distance could be interpreted as a personal affront by another nationality. These spaces and human interaction have been described as "sociopetal" and "sociofugal." Sociopetal spaces allow people to converse and interact as in a Parisian sidewalk café with movable chairs. Sociofugal spaces, as in fixed stretches of horizontal benches in train stations, discourage conversation since, at most, two people can converse and even then, not satisfactorily [34]. These variations in space requirements were observed and catalogued, demonstrating that people prefer seats in which they can converse at right angles and thus see one another. For comfort, a person will opt to have a seat and yet, even if tired, the subject is selective [35]. While fixed and adjacent seats are tolerated in a music hall, in the open space of a sidewalk or plaza, people prefer to have more space between them

[36]. Therefore, people will tolerate crowds and given certain physical conditions, they will adapt to the space or make the space work for their purposes.

People also have a tendency to gravitate towards light, specifically sunlight. In dark spaces, people will walk towards the light as if aiming for a beacon. Since people gravitate towards the light, the placement of light can help direct traffic [37]. If specific seating or movement towards that seating is deemed important, lighting could encourage the flow in that direction without having to verbally or in a written fashion give directions for that movement of traffic. In a survey conducted by Volvo, one of the concerns of the drivers was the unwillingness of the passengers to move to the back of the bus upon boarding. The drivers suggested new colors and lighting for the rear as an enticement [38]. In situations where people are bombarded with stimuli, informational signs are not often read because the brain is actively engaged in absorbing all of the elements in the environment. While a sign could be placed to tell the passengers to move to the rear of the bus, environmental invitations that encourage behavior without written instruction are more often heeded. If a window is visible in the back, passengers will be apt to walk to the light.

A preference for certain elements related to *content* in the environment was identified in research that determined a disparity between architects and non-architects. Non-architects wanted the building to identify its purpose through the architecture and when shown a building with little relationship to its use, the non-architects often asked the question, “What is it?”[39]. Other research related to architects suggested that architects preferred “high” architecture whereas the non-architects preferred the popular. The architects found clarity in angularity and white whereas the non-architects associated with framed windows and central entryways [40]. This suggests that the lay population might have a different preference for a bus design than architects who might prefer “high art” in the design.

From an evolutionary perspective, trees and grasslands, also environmental *content* elements, are preferred suggesting that bus stops with trees or grass would also be preferred design elements [41]. Culturally, trees’ type, shape, density and maintenance are perceived differently based on context. In a study conducted in inner-city Detroit, subjects preferred high densities of trees but only if the trees were widely spaced allowing for increased visibility [42]. In a related study in inner-city Chicago using photo simulation, the tree density, tree placement and levels of grass were manipulated and shown to residents of Chicago's’ Robert Taylor Homes. Higher tree density and maintained grass increased the sense of safety and preference but again, the trees had to allow for some visibility [43]. For increased feelings of safety, dense understory vegetation has proven to lessen feelings of safety [44]. Trees that have been limbed up, or had their lower branches removed allowing for visibility for a seated or standing individual, are perceived as safer. Therefore, at bus stops, trees and grass could be incorporated but the tree or scrub growth shouldn’t be so dense that someone could hide and the grass should be maintained, suggesting a safer area due to evidence of care.

Another *content* preference based on evolution is the ascribing of and attraction to specific human facial features that could be found, not only in people, but also in inanimate objects. People sometimes assign these facial qualities to inanimate objects by

perceiving a face in the object through probable lines; called anthropomorphism, a human will then assign human feelings to these animate or inanimate objects [45]. Though a person could assign either appealing, as in happy, and unappealing, as in mean, features in an inanimate object, humans additionally prefer a human face that displays certain qualities suggesting they might prefer the same features in the inanimate object. Evolutionary biologists have suggested a preference for facial symmetry due to its indication of genetic quality and health and thus a sign of a good mate [46]. Symmetry was also perceived to be associated with honesty, therefore, the expression of "crooked-faced" is associated with dishonesty. Conversely, babyfaceness and large eyes are associated with honesty, thus the expression, "wide-eyed" [47]. Male and female features are evident in the chin, jaw cheekbone and eyes. Masculine qualities can be identified in a larger chin width and chin length [48]. Due to testosterone, young males have an increased jaw and a projection in the central face between the brow and nose [49]. Females, as a result of high estrogen and lower androgen, have smaller chins and larger lips [50]. A smile can be found in the Nova bus front [51] and in the facial features on the recently designed New York City subway R142, though those characteristics were not assigned to a human. The architects for the subway chose to make the front of the subway resemble a friendly caterpillar with a black mask around the windows and red, smiling upwards around the lower lights [52].

Chapter 6 - Crime and the Effects of Crime on Buses

Crime Prevention Through Environmental Design (CPTED) [1] is a positivist approach, based on experience instead of what ought to be, that focuses on changes in the environment to lessen crime before the crime might be committed. The alternative is changing the human behavior of the criminal. The four components of CPTED include: 1) Territoriality, 2) Natural Surveillance, 3) Activity Support, and 4) Access Control [2]. Formulated in1969 by Oscar Newman, an architect and urban planner [3], these design principles were explained in Newman's book, Defensible Space [4]. His design suggestions of natural surveillance demonstrated why the low income high rise apartment projects such as Pruitt-Igoe in St. Louis, Missouri, built in 1955, were not considered safe environments by the residents. The CPTED architectural design alternatives applied to new buildings after the flaws of projects like Pruitt-Igoe were realized, resulted in increased feelings of home ownership and lessened crime. These design alterations included visible courtyards, fewer floors, owned front yards, and close neighbor zones. The design solutions work because of the "eyes on the street" principles identified by Jacobs [5] where citizens provide informal surveillance by their presence and ability to watch others.

Crime is measured in both the actual crimes committed but additionally the negative feelings associated with the crime or the perception of crime [6]. "Incivilities" or cues that suggest crime include both "social incivilities" and "physical incivilities" [7]. Social incivilities include lewd language, drunkenness, and prostitution while physical incivilities include broken windows, boarded up buildings, graffiti, and litter. Places may be in order and not display physical incivilities but still elicit feelings of fear. These places, or "hot spots of crime," could include among other negative features, dark alleys, hidden doorways, or thick bushes that provide the perpetrator with places for entrapment (barriers to escape) or concealment (blocked prospect) [8].

Perceptions or the reality of crime cannot be completely eliminated either by environmental changes or criminal behavior modification. Criminals can be categorized into three subgroups: *have-nots*, *can-nots* and *will-nots* [9]. The have-nots are individuals who might be temporarily homeless and who, most likely, will move back into mainstream life. The can-nots include the addicted and mentally ill, 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.

The bus stop is a waiting room in the out-of-doors and the bus a waiting room that stops, starts, and moves but in which the occupants principally are fixed in a sitting or standing position. The occupants of the bus and bus stop waiting room are potential victims of crime and are aware of the possibility of crime. The observers of the crime near the bus stop could be passers-by or fellow passengers and on the bus, fellow passengers, and the bus driver who primarily has his or her eyes focused on traffic. In a Detroit study [10], citizen perceptions about common transit concerns revealed that 53% felt unsafe at the bus stop while 35% felt unsafe from crime on the bus. The personal experiences with crime on transit in the Detroit study include being shoved 17%, verbally

hassled 10%, threatened with a weapon 4%, or fighting/stealing 5%. The percentages for less serious crimes that were "often" observed included smoking/drinking 22%, loud radios/rowdy/noisy 27%, swearing and foul language 38%, acts of vandalism 9%, intentional rudeness 13%, or threatening others 4%. The most important factors influencing the use of transit were crime 44%, scheduling 27%, fare 19%, and comfort 8% demonstrating that fear of crime was the most important consideration in determining use of public transit.

A study conducted in Merseyside [11], a community in England with a population of 1.4 million, showed that 27% of the population felt unsafe waiting for the bus and 6% felt unsafe during the bus journey. The factors that contributed to feeling unsafe on the bus included no-one else around 59%, drunks 51%, poor lighting 48%, drug takers 44%, overgrown bushes/trees 26%, lack of staff 25%, evidence of vandalism/graffiti 34%, and beggars 15%.

These figures suggest significant evidence of crime or its perception but according to other studies, crime at bus stops and on buses is underreported, suggesting the crime is worse. As identified in a study of 1,088 households in Los Angeles by Levine and Wachs, crimes committed on buses are observed and reported by the driver but 60% of the crimes were committed outside the bus and would most likely not be reported by the transit authority. Their study determined that 46% of the crimes occurred on the bus, 32% at the bus stop, and the others occurred on the way to or from the bus stop. There were an estimated 23,000 bus and bus-related crimes during 1983 in west central Los Angeles which is 25 to 30 times more than the crimes reported by the Southern California Rapid Transit District. Police in Los Angeles suggest that crime related to buses is a small percentage of crimes committed but Levine and Wachs determined that about 20 to 30% of the total crimes experienced by the central city population of LA were bus related. These crimes include riding on, waiting for, and walking to the bus [12].

Along a transit route in Milwaukee that had a high degree of transit crime and vandalism, a study was conducted to determine the degree that patronage is affected by crime [13]. In addition to other variables, the results were analyzed according to rates of use of the transit service. The study determined that personal security was not as important as convenience of routes, fares, travel time, and frequency of service. A variation existed between regular users of the transit and non-users with the non-users being more apprehensive about crime than the users. It was reasoned that the users had ridden the bus numerous times without incident and were therefore less fearful.

In a related study in Los Angeles, Levine and Wachs examined the relationship of personal security and bus ridership. They found amongst moderate to heavy bus users that women, elderly, Hispanic, and low-income populations were more likely to be victimized and were more likely to perceive buses as unsafe. If someone knew that someone else had been victimized, buses were perceived as less safe, even by people who had not been personally victimized [14]. As in the Milwaukee study, this second hand knowledge or perception of bus crime increases a potential rider's fear about riding buses, discouraging even more people from riding transit.

In a bus and crime study conducted in Greensboro, North Carolina concerning bus riders' and residents' (non-riders) fear of crime on buses, ridership levels, and

motivations for choice were determined. The residents (non-riders) and riders agreed on three primary problems related to personal safety that included obscene language, panhandling/begging, and disorderly conduct/drunkenness. Compared to the riders, two to four times more residents (non-riders) perceived problems relating to crime and personal safety in regards to buses [15]. In a related study concerning perception and incidence of crime on small public transit systems in the southeast, a contrast was found between the perceptions of transit users and non-users. The perceptions related to being unsafe waiting at a bus stop were 37% (residents/non-riders) compared to 8% (riders) and being unsafe in transferring at the Depot were 34.7% (residents/non-riders) compared to 9.5% (riders). The study recommends: 1) the creation of environments near transit service that provide a perception of safety, 2) educating people about the safety of public transit, and 3) developing economic incentives and system performance levels to entice people to experience the safety firsthand [16]

While there is a difference between non-riders' and riders' perceptions related to personal safety on bus transit and a difference between those who have experienced crime or heard of it second hand, there are also differences of perception related to gender, age and parental responsibilities. Women, seniors, and parents with young children felt less safe on bus transit as compared to other populations. Lynch and Atkins examined the risks and fears associated with harassment, anti-social behavior, and physical attack and travel in England. On the Southampton City buses, 1% of the women felt unsafe during the day using the bus while 22% felt unsafe at night. At the bus stop, 16% felt unsafe during the day while 35% felt unsafe at night [17]. Nighttime travel is regarded as less safe for women due to visibility and also lack of other people. Even in areas that are frequented due to the presence of nightclubs or bars, women are relatively safe because of surveillance by other people.

In a study titled "Transportation for Community-Based Health" conducted in Genesee County where Flint, Michigan is located, the bus riders who were parents with young children were most fearful when the student riders boarded. These parents not only had to carry or hold the hand of their children but they also had a stroller and numerous bags. Their children could become fussy or cry on the bus, making the transit ride significantly harder than if, like the other passengers, they were traveling alone. Older adults stated that the young riders get angry and that they are often obnoxious and rude. The senior riders were therefore reluctant to ride on the buses when students were traveling to and from school. Other older riders said they did not take the bus at all due to fear for their safety. The adolescents were concerned about safety but primarily regarding the walk to and from the bus stop [18].

A study conducted in Philadelphia determined transportation's relation to quality of life for seniors and the barriers in their use of public transportation. A questionnaire was given to eleven senior citizen centers geographically distributed throughout the city. Of the respondents, 77.3% were afraid waiting at the bus stop and 64.8% were afraid while riding on the bus. Fear was greatest in the evenings with 52.9% expressing concern and 17% were fearful during the afternoons. The afternoon daylight fear is attributable to the teenagers who get out of public school. Of the greatest risk, 56.4% were afraid of being robbed, 40.3% of pickpocket crimes, 16.1% of mugging/assaults, and of assault 9.7%.

Men were most afraid of being robbed while women were fearful of being around teenagers, waiting for the bus, and having trouble while boarding [19].

This same population of Philadelphia seniors expressed concerns about the physical qualities of the bus when 68.2% complained that the windows were dirty and they couldn't see out. The seniors wanted a sense of control over their lives and with the dirty windows and elderly problems with vision, they couldn't discern landmarks to gain bearings. Of even more concern, the dirty windows meant the seniors couldn't see potential danger on the bus before boarding or when disembarking at the bus stop [20]. This corroborates the finding of Levine and Wachs that respondents to a survey in Los Angeles preferred clear glass windows to tinted glass for offering safety from crime [21]. Though the differences were not large, the preference is explained with Jacob's "more eyes on the street" concept. In a focus group conducted in Toronto by GO Transit, a participant stated that she refused to use buses with painted advertisements, meaning the windows were painted over in wrap advertising, because she felt insecure and more closed in [22]. While it is possible to see through the dots in the film over the painted windows, the image of the out-of-doors is blurred. Thomas Jones with the Motor Bus Society wrote, "I recently rode in a bus in Sacramento, CA in which the advertising covering the window so reduced my view of the outside that I couldn't read the street signs leading up to where I wanted to get off " [23]. In an article written by a young adult rider on a painted inter-city bus, the author expressed dismay over the interior conditions and loss of her one comfort. With the small size of the seat, the garishness of the seat upholstery, and the unpleasant smell of disinfectant, her one solace remembered from youth had been looking out the bus window. Due to the painted windows, the sunny day looked dark and she could only make out trees. Details of the passing landscape were blurred. After the trip, she interviewed the advertising agent for the bus company who suggested that the screen was only visible if you were really close to the window but, as the author argued, in a bus people can't help but be really close to the window. The author interviewed one person who said it was as if women's hose had been stretched across the window. Another interviewee said that while the ad might be appealing to the people on the sidewalk, to the passenger inside the bus, during the daytime the outside appears fuzzy and at night during rain, the windows appear blackened [24]. Wrap around advertising blocks out the view of the street at night and, during the day, lessens the view of the street, intensifying the experience inside the bus. If people of unappealing character are in the bus, they are perceived to be more proximate since there is no visual escape to the outside.

The exterior view of the vinyl wrap ad has different value to the passenger versus the non-bus riding pedestrian and the advertiser. While the ad revenue does offset the cost of the ticket, the passenger has a compromised interior environment because they can't see outside as easily and passengers seem to be closer in the enclosed room. From the outside of a painted wrap bus, it is impossible to tell if there are occupants on the bus. Before boarding, the passenger is unable to determine who is riding the bus and pre-select a seat based on availability and proximity to the other people. For the advertising sponsor on the other hand, the wrap advertising is said to be a topic of conversation by those on the streets. After featuring a Dentyne Ice campaign one summer, Warner Lambert remarked that the wrap ad results were, "Incredible"[25].

Concerning the interior features of the bus, such as seats, windows, lighting, partitions, and doors, a better-designed interior might also lessen crime or the perceptions. The Levine and Wachs study suggested better passenger flow to the back of the bus would ease overcrowding in the front of the bus. Also, according to Levine and Wachs, the back of the bus deserves design attention because more life-threatening incidents of crime tended to occur in the back of the bus [26].

Certain preventative measures have been undertaken to lessen crime and the perception of crime, some of which have been successful and others that have been variously received. Though surveillance cameras have been proposed as one means to deter crime and assure mass transit passengers of the presence of security, this impersonal mechanism has not been fully accepted. In a study related to subways in Nottingham, England, women who were part of a University workshop unanimously agreed in the rejection of closed circuit television [27]. The presence of the surveillance camera suggests the existence of an element of crime, otherwise, the camera would not be needed. Natural and informal methods of surveillance, such as a proximate shop or vendor with the eyes of the proprietor and patrons, are preferable [28]. Emergency phones can provide a necessary safety link to either a police station or the bus line but pay phones near bus stops have, prior to the introduction of cell phones, increased undesirable activity due to calls being made for illicit behavior such as drug purchases.

Bus stop designs that have proven least safe are those with only one entrance/exit and four surrounding walls. The victim can become trapped inside the shelter and not have an available exit for fleeing. Enclosed bus stops with two exits have been an improvement over the single door but perpetrators in teams have blocked both doors. The best option is to have at least one side completely open. A bus shelter in Los Angeles that is closed on both ends but open otherwise, does not offer sufficient separation from passers-by [29]. A purse snatcher on a busy sidewalk could approach from behind and flee immediately. Conversely, a person cannot become trapped against a wall if the stop has only two sides. Glass or brick walls provide surfaces for graffiti or papers and tape, contributing to the broken windows theory of neglect. If tape residue is removed from the plastic partitions, the solvent can cause the plastic sheeting to become dull, contributing to the appearance of neglect. One design solution proposed in Houston was for a glass block shelter, thus providing for visibility, 80% of light transmitted in both directions, protection from the wind, and a surface that wouldn't cloud or yellow. The report did not mention if there were problems with graffiti or posters on the solid walls.

A bus stop can also be located against a building with an awning attached to the building. If the sidewalk is deep and pedestrians numerous, access can be exacerbated because the bus rider prefers to stand nearest to the curb and the approaching bus, especially in order to gain a good seat. The bus riders prefer to segregate themselves from the flow of pedestrian through traffic leaving the options of standing adjacent to the building away from the bus but under the awning or standing adjacent to the curb with no shelter.

Chapter 7 - Social Bridges

A bus has an advantage over a train or subway due to the intimacy of the smaller space and the existence of the bus driver. In the waiting room bus stops and buses, socializing could be fostered, thus increasing opportunities for "tend and befriend" [1] or a heightened feeling of safety due to proximity of known people. In a dissertation on preferred bicycle paths and the features at path destinations [2], the author identified a phenomenon and environmental concept called "Social Bridges." Social bridges are components in the environment that can facilitate courtesy, fraternization, and goodwill between two or more strangers. In an age of isolation with home offices, email, cell phones, tall backyard fences and entertainment-center cars, a supportive environment can return the front porch socializing taken away by the car and the computer. On a bicycle path, social bridges in the form of rocking chairs, swings and railings on the porch of a restored railroad station, facilitate conversations between strangers. A place that would be less apt to enable this interaction would be a large sun-baked parking lot where no one lingers.

In the built environment as found in the city, a social bridge would be a door that is opened for someone to pass through, either of a different gender or carrying packages. A thank you is exchanged and both proceed on with their day, better for the human interaction. An elevator is a social bridge for someone often holds open the door, pushes the button for the other person's floor, moves aside to give space for young children or exchanges pleasantries. In this shared minimal space, a woman recounted that she told a gentleman dressed for the day that he still had the dry cleaning tag on his pants. She admitted that she never would have offered this information if she had seen him in the larger public hotel lobby or on the sidewalk. Features that are not social bridges include an escalator, revolving door or an automatic door because the people continue through without the need for human interaction. Luggage and assisting someone in carrying it used to be a social bridge but now with airport regulations against handling by others, luggage is not a social bridge. Overhead bins in airplanes are still a social bridge as passengers help fellow passengers retrieve coats and bags, usually assisting someone who is too far away in the aisle from the bag, not tall enough to reach easily or not strong enough to bring down and then hold the bag in the crowded aisle.

Social bridges exist in four forms: Assist, Connect, Observe and In Absentia. The first, an "Assist" social bridge, is a supportive environment in which someone helps another person. Assist social bridges include, among other design components, a door, a curb cut, a coat, a watch with the time, a grocery checkout divider, an elevator, an emergency, or a seat on mass transit. A specific example of an assist social bridge environment is the seated rows of people at a baseball game and the cooperative passing down the row of money and passing back of hot dogs and drinks by willing strangers who, in subtle, ways acknowledge each other. Assist social bridges are not a forced obligation for one person to help the other or for one person to be obligated to accept and acknowledge the assistance of another person. Rather, an assist social bridge provides the opportunity to connect with another person if the person so chooses.

The second form is a “Connect” social bridge in which a stranger connects with another person through speech, eye contact or a smile and one person isn’t necessarily helped but a shared experience is mutually appreciated. Connect social bridges include elements such as a first snow, sports (informal and formal), babies or children, pets, airplane food, water’s edge, bathrooms, interpretive signs, the sugar/cream supply table at a coffee shop, maps, the smell of baking bread, views, lines, or ice cream cones. When two strangers watch a third activity, such as a street performer or sporting event and the strangers then connect or converse as old friends, this phenomenon is called triangulation [3]. The social bridge research looks at environmental elements, such as the space for the street performer or the design of the coffee sugar/cream table, that facilitate the triangulation between the strangers related to the performer or strangers related to the sugar/cream table.

For a benefit to be gained from an “Assist” or a “Connect” social bridge, the subject does not need to be one of the two or more active participants. There is a goodwill ripple effect beyond the two people engaged in the social bridge as others outside the activity watch the kindness. People from above who watch the dollar bills being passed down the row at a baseball game know they are going to feel at least modestly gratified with humanity seeing those strangers pass back the hot dogs, peanuts and drinks. This is an act of baseball culture but also one of comradeship. Therefore, the third variety is an “Observe” social bridge in which the public is witness to the deed, smile, or even warm eye glance between strangers. When a baggy attired adolescent offers a bus seat to an older woman in an assist social bridge, humanity is reaffirmed for all watching the deed. In a common scenario most bus riders have observed, a foreigner enters a bus and doesn’t have the correct change. The proper coins are immediately pulled out of pockets and purses as passengers help the visitor to their country pay for the bus ride. Those further in the back of the bus, who had change that wasn’t needed, still were witness to the good deed.

The fourth type of social bridge is “In Absentia.” In some cases, the design component introduced by the environment’s architect, designer, governmental agency or maintenance person is so noticeable that a connection can be felt to that person who is absent. At a bus stop, a carefully tended flower garden could exist beside the stop for those waiting. The flowers could be planted and maintained by a garden club, a rotary group or an individual but the presence of the garden tender is perceived as a gift to those who view the flowers. A bus stop might have night lit signs for easy identification, a TV monitor with all of the times for arriving buses, a roof for protection from rain, a bench for sitting, a rail for resting, and a design component of high taste. The presence of the bus providers, the city and the designers is so compelling demonstrated through the kindness extended in comfort and information that a social bridge connection to them is felt without their being there.

The concept of social bridges came about through reading the extensive literature on environment and behavior. Research about human coexistence has focused on crowding, crime on the streets and the feelings of vulnerability [4]. The next tier of research developed concepts for lessening the crime and its perceptions through “Defensible Spaces” [5], vigilance through “Eyes on the Street” [6] or maintained environments with “Fixing Broken Windows” [7]. Parallel research on individuals identified their need for

identity, security, stimulation [8], making sense, involvement and coping [9] plus prospect and refuge [10]. The individual and organizational human needs were also identified as physical, emotional, mental and spiritual [11]. Space sharing and enjoyment of friends' company was identified in body proximity, body language and seat placement [12]. A third place that would benefit humans and act as a buffer between work and home, called a "Great Good Place" and known locally once as the beer hall, corner soda shop and tea room, have disappeared, aren't apt to reappear and typically benefited existing friends [13]. All of these relate to the negatives in society, preferences for individuals, coping strategies or lost social places for pre-existing friends. Social bridges are an antidote to crime, overcrowding, road rage, office anger and unruly airplane passenger demeanor. They are more than a means to lessen perceptions of crime or increase interactions amongst friends. The positive social bridge components that exist or that can be introduced in the environment are meant to connect stranger to stranger, not with a forced civility but instead a chance engagement if one chooses.

Opportunities for social bridges on buses already exist or could be enhanced with additional design modifications or technology. If someone comes to a bus stop with a watch, someone without a watch can ask for the time. Technology has developed a way to check the computer to determine the time for the next bus and a desktop digital instrument, like a small clock, also identifies the time for the next bus. Some bus stops have overhead digital displays with the time for the next bus, but not all bus stops will have this capability. Therefore, a hand held digital instrument, similar in size to a watch, could be kept in a pocket or purse and the owner could offer to others at the bus stop, as an "Assist" social bridge, the estimated time of arrival for the bus.

At Dulles Airport, large Mobile Budd Lounges and Plane Mates resemble large buses and carry airline passengers between terminals much as a bus carries passengers to a destination. The interior, as on a bus, are utilitarian with seats, carpet, stanchions and windows but the view to the tarmac offers an airline world not often experienced by the average traveler. To foster conversations inside the Budd Lounges or Plane Mates, overhead interpretive display panels could be mounted around the outer perimeter of the bus room, similar to the panels in the Washington Monument, the Empire State Building or the Eiffel Tower. Various architecturally designed terminals and their location could be depicted and described, with the date for construction and the architect in bold text for easy reading. The planes and airport equipment could be described for parents to read to children, similar to a child's book on trucks. Adults could find the material informative much as adults find fascination with books on birds or architecture. The Mobile Lounge and Plane Mate's history and function could be described, dignifying and humanizing the space through knowledge shared by the airport. The airport then, instead of herding passengers between terminals, could become more engaging for travelers. Heuristics, or the discovery and thus ownership of information, could mean the passengers would feel a personal affinity to the airport and look kindly upon its gift of an education. Disney has entertained people, as "In Absentia" social bridges, by providing televisions for people to watch as they wait in line. These interpretive signs would be entertainment but also serve as a "Connect" social bridge or an "Observe" social bridge as people would be given the opener for conversation or at least eye contact. Similarly, these same interpretive signs could be placed on city buses. In this instance, founding city mothers and fathers could

be profiled adjacent to their photographs, or significant buildings passed on the route could be described with photographs and location markers. While buses often have overhead advertising to subsidize bus fares, the bus occupants in the Phase II research have indicated dissatisfaction with advertising. Donors could be found, as they are for commemorative memorials, to fund the placement of the interpretive information inside the buses. As an example, funds could be identified to create a history and photograph of Rosa Parks, especially since minorities are often underrepresented in public commemorations. This placement of informative interpretive signs, as seen in National Parks and better sections of a city, could improve the quality of the bus interior, especially if the signs replaced advertising. The signs would then be part of the supportive environment in the bus that fosters conversation amongst strangers through an honorable and educational means.

The bus stops could contain social bridge components to initiate a conversation such as maps of the area, interpretive signs, schedules or bus routes. On the buses could be areas where seniors are encouraged to sit together or where parents with young children are invited to sit, place packages, and store strollers. Perhaps some toys could be mounted on the wall for the children and the passengers could then enjoy watching the children play. A silent television might be mounted overhead with subtitles and display a channel such as CNN that would broadcast the latest information, thus instigating a conversation related to current events. If the television was too costly, perhaps the overhead bus digital print out that indicates the time for the next stop could additionally display sports scores, weather or headline news. Maybe space could be found to allow bicycles on board, thus enjoying the sharing of space by different people. With a social bridge, the accessibility sections could be made friendlier with placement, color, fabric and surrounding ambiance to bring those in wheelchairs into the social milieu instead of merely in compliance with Federal regulations.

Chapter 8 – Conclusions and Future Research

With the present call for mass transportation and a resistance of many people to abandon their automobiles, perhaps a revived City Beautiful Movement could lean on history and create a unified and handsome mass transportation system. This movement would perhaps best succeed if initiated by high profile leaders similar to the people instrumental in the City Beautiful Movement. Designers whose work was in evidence at the Columbian Exposition included the landscape architect for Central Park, Frederick Law Olmsted, the architect Daniel Burnham who designed Union Station in Washington, D.C., and other notable architects or firms such as McKim, Mead & White, Richard Morris Hunt and Daniel Chester French. Some might have reservations in calling for such a beautification movement in transit because, as was heard against the City Beautiful Movement, they might fear a taking away from individual freedoms and a control over private enterprise. With pollution becoming a worldwide issue, private and public interests could mutually address the environmental concerns but with a democratic policy. People could still have their cars but mass transit could be made a more appealing option. Mass transit manufacturers and providers could be assured they would still produce, sell and provide their own products but research would be conducted to assist them in their designs.

Research has shown that some cities, such as New York City, have ample riders of all income levels and the buses often reach full capacity with many standing passengers. In other cities or suburban communities where cars are more convenient, buses could still benefit the environment and traffic flow if more people were willing to ride. One of the reasons some people choose to not ride the bus is because of the perception of crime. Non-riders incorrectly perceive the bus to be a place for crime whereas the vast majority of riders do not experience crime on buses. If the goal is to attract the non-bus riders and one of the reasons non-bus riders might prefer their car is they fear crime on the buses, the bus and bus stop could physically convey the image of personal safety. The design components could advertise to the potential riding public that the bus was safe related to security and crime. Those who ride the bus and for whom crime was not an issue would also benefit from having an increased sense of personal security from the conscientious design. Their quality of life would be improved because they would perceive their bus environment to be extremely safe and social.

The picture preference survey revealed design modifications that could be immediately put into practice to make the buses more aesthetically appealing and personally safer related to crime but there might be associated costs. The individuals who participated in the research preferred buses without advertising but the ads generate revenue that helps to lower the price of the bus fare. This revenue could be generated through fund raising since global warming, city pollution and street congestion are causes worthy of campaigns. One option to generate funds would be subsidizing buses as a result of incentive zoning. Introduced in New York City in 1961, incentive zoning allowed more stories to be built on a tall building in exchange for the developer building plazas, shops, or amenities [1] and later zoning arrangements allowed for additional parking spaces as a tradeoff for more stories. The incentive zoning revenue could fund ad

free buses, thus perhaps attracting the employees in the new high-rise building to the bus. Instead of large advertising panels or wrap around advertising on the bus, discrete donor signs could be on the side near the door stating that the bus was brought to the population of that city ad free by a contribution from "said" benefactor. This practice is employed on park benches and in public buildings and could additionally be applied to civic spaces, the buses. City taxes are often levied to pay for a city's Main Street maintenance or revitalization, such as the planting of trees, the tending of flowers and the placement of handsome benches. Similar taxes could perhaps be considered to provide ad free buses, especially for buses that travel along the handsomely maintained Main Street that is the visual identification for the city. Sometimes cities have percentage fees tacked onto licenses or permits to pay for parks and a similar fee could be assigned specifically to enhance buses through the elimination of ads. Perhaps a company is polluting egregiously and their penalty could be a fee to remove ads from the buses, thus increasing the image of the buses, increasing ridership and lessening pollution and congestion. Fund raising campaigns, as held for art museums, could be initiated to create attractive city buses that bore no advertisements as part of a local 'livable communities' initiative. In cities with billboard laws, it could be perceived as against the law to have billboard buses that travel throughout the city. These billboard buses could appear more incongruous when traveling on the handsomely planted, lighted, signed, and appointed Main Street. If commemorative plaques are placed inside the buses to educate the public about the history of founding city fathers or mothers, events or buildings, perhaps the local historical society could fund raise to allow for the inclusion of these historical signs. While these fund raising initiatives take time and energy, there are additional gains from orchestrating these campaigns. These fund raising initiatives allow the city population to personally own the bus system, similar to the ownership displayed in commemorative plaques inside a library, art center or hospital. Also, the fund raising activity could generate interest in the buses. Groups or organizations that typically fund raise for the arts or environmental issues could be approached to help in or oversee the campaign.

A larger issue than the removal of advertising through fund raising is the cost of the bus itself. Procurement of buses in the United States suggests that buses are to be purchased at low bid with the only prominent allowances being related to technology. In order for a city to purchase a bus at a price higher than low bid, allowances for aesthetics could be written into the procurement list of exceptions. This aesthetic procurement allowance concept is being discussed but two additional considerations in bus design could also be considered. If attractively designed buses are only available at an extremely high cost, the lower income communities will not be able to afford them, similar to the disparity in voting machine capabilities in communities in Florida. This could perpetuate an inequality that presently exists when wealthier regions can purchase new light rail and lower income communities have to continue to operate old buses, thus negatively impacting their community. Therefore, stylized design could be incorporated in both high and low end buses, similar to good form that is available in designer home products sold affordably in large chain stores. This would mean that handsome and personally-safer-from-crime buses could also be purchased at the lowest bid. Second, design suggestions should be offered to retrofit existing buses. A bus has a life span of 12 to 15 years and sometimes that life is extended even more with periodic replacement of the engine and

refurbishing. Paint, glass, doors, display signs, seat coverings, floor finishes, lighting and added technology could affordably update a bus to make it fit with the newly purchased buses in a fleet. The old bus could also be improved for another community so that no rider is saddled with a bus that is unattractive and less safe from crime.

To keep costs in check, existing bus components could be explored to see if the product already exists or if a slight modification could make that product better suited to achieve a handsome and personally safe bus. As an example, a supplier presently produces bus roof escape hatches in solid white plastic for approximately $200. That same supplier already produces a clear plastic hatch for $350 that is often installed in ambulances to flood the interior with light. The clear plastic hatch could be installed on the bus at a modest rise in cost and increase the light levels in the interior, a desired feature in the research related to perceptions of crime.

The goal of mass transit is to attract more riders, especially if it means another car is left at home. The research suggested that people are more comfortable with people similar to themselves, leaving their elbows at their sides and displaying fewer signs of territoriality. The differences in other passengers are not due necessarily to race but instead to income, education, gender, and age. The older women preferred to not sit near the high school students, college students preferred to ride with people of their same profile and women felt more comfortable sitting near other women. Women will "tend and befriend" especially if the people in the public sphere are similar to themselves in age and education level as evidenced by attire. People are fearful of crime, especially in public spaces, and less fearful of crime if they are with people similar to themselves. In some cities and especially suburban communities where the majority of the adult population drives a car, the largest group riding the bus tends to be the lower income population because they have no other means of transportation. The goal of mass transportation is to get the middle and ideally the higher income individuals to ride the buses as well. If people didn't have the tendency to feel more comfortable with people similar to themselves, the conundrum would be solved; everyone would ride the same bus.

One solution is to design a bus that visibly looks appealing and appears personally safe, rather like a good public fast food chain, but this still would not necessarily attract patrons from all income levels. The other option would be to design multiple buses with varying degrees of amenities, rather like the club cars on trains versus coach cars. One bus on a line could be higher in price than another bus and anyone could ride the more expensive bus if he or she chose to pay the higher cost, thus establishing equity based on fare. If to increase ridership of mass transit, this doubling up of bus systems was necessary, the only way this could be morally justified was if the lower fared bus was equally well designed for personal safety from crime. Though the appointments might be sparse and the seats not as padded, the design elements should be as considerate in the lower fared bus. Another option would be to offer a single well-designed bus on a line but have differently appointed seating areas. Presently, the area where the senior women would prefer to sit is the area nearest the bus driver because the senior women feel safest there and can see out the front window. This area on low floor buses has large wheel well boxes, chrome bars, storage areas for the driver, a wall behind the driver, the accessible seating and tie downs. If the front of the bus nearest the driver could be

outfitted to resemble a living room, solving the issue of the large wheel well inside the bus compartment, the high school students could proceed to the back of the bus and the senior woman and friends could have a seating area to call their own near the driver. Accessible seating could be made to aesthetically fit into this front room of conviviality and personal safety. The various groups could have selected seating on the one bus by the introduction of designed rooms.

Lettering style, amount of lettering and coloring can convey a perception related to crime. (Photo O) *(Photo courtesy of Anastasia Loukaitou-Sideris, UCLA)*

Moderate lettering style, amount of lettering and coloring could be copied on the bus to convey safety from crime. (PhotoP)

While a well-designed bus that serves the higher income neighborhoods could attract riders presently driving a car, the handsome bus in the lower income neighborhoods could have a multiplicative affect. The refined bus could also introduce a more moderate style, amount and color of lettering. **(Photos O and P)** The elegantly designed bus, that would reduce the perception of crime through its design, could spawn economic redevelopment not only through its passage into a lower income neighborhood, thus providing necessary affordable transportation, but also by its design that could then be mirrored in storefronts and businesses. The bus, in some cities, is an underutilized resource for community image and what once had a “loser cruiser” reputation could be redesigned as a visual public amenity in addition to being sustainable transportation.

Endnotes

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