Getting Safety on Track

Expanding Edmonton’s LRT Design Guidelines to Improve

Women’s Perceptions of Safety at Transit Stations

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EXECUTIVE SUMMARY

People base their travel choices on their perceptions of personal safety in environments such as transit stations. Women are more likely to perceive public spaces as threatening and they use public transit more than men, to access fundamental needs such as employment, childcare, education and healthcare. Effective design can reduce crime and fear by creating defensible spaces that assert ownership, and offer opportunities for natural surveillance. This is the underlying concept of Crime Prevention Through Environmental Design (CPTED).

Creating transit stations that make users feel safe could potentially increase use of public transit among women, particularly at off-peak hours. Identifying elements that affect women’s feelings of safety in suburban (non-central) surface LRT stations in Edmonton can guide future station development, and reduce experiences of fear in existing stations for a safer and more inclusive transit system.

The aim of this study is to determine how the City of Edmonton can better address women’s safety in suburban (non-central) surface LRT stations through expanding their existing design guidelines to incorporate both CPTED guidelines as well as additional elements addressed by the safety audit checklist provided in the City of Edmonton’s Safety Audit Guide for Crime Prevention (2000). The main questions guiding research are:

1. In what ways do the City of Edmonton’s existing LRT Design Guidelines for Edmonton Transit System (ETS) incorporate CPTED guidelines, if at all?
2. What are the similarities and differences between the CPTED guidelines and the criteria that enhance safety in public spaces as noted in the Safety Audit Guide for Crime Prevention developed by the City of Edmonton, which is based on the Metropolitan Action Committee on Violence Against Women and Children (METRAC) Women’s Safety Audit Guide?
3. How can the City of Edmonton’s LRT Design Guidelines be expanded to enhance women’s safety at above-ground suburban light-rail transit stations?
The research involved a review of the published literature on gendered fear of crime in public spaces, the relationship of the built environment to perceptions of safety, and situational crime prevention. This was followed by a document review of the City of Edmonton’s LRT Design Guidelines for Edmonton Transit System (ETS) (2011), as well as CPTED guidelines from the existing literature. A safety audit was undertaken using the a slightly modified version of the Checklist of Safety Audit for Crime Prevention in the City of Edmonton’s Safety Audit Guide for Crime Prevention (2000).

The key CPTED principles of natural surveillance, territorial definition, compatible building placement, and building form formed the broad framework under which the specific concerns addressed by the safety audit were classified. The findings of the safety audits conducted at Clareview and Century Park stations showed that there had been some, but not full, integration of CPTED principles in the design and upkeep of these stations.

The newer Century Park station benefitted from the transparency resulting from the extensive use of glass in the building, and offered better natural surveillance opportunities than the older Clareview station which used concrete and had no windows on the lower level. Century Park was also noticeably better-maintained than Clareview, where signs of vandalism, disrepair, and poor maintenance contributed to feelings of insecurity. Both stations were fairly isolated at night, due to lack of activity-generating land uses in the immediate area of the station. The findings of the safety audit emphasize the importance of natural surveillance and territorial definition (maintenance and defensibility of space) in creating feelings of safety in transit users.

Recommendations were formulated based on the findings of the safety audits:

**Conduct safety audits at all LRT stations.** The results of these safety audits could then inform the design of future LRT stations in the expanding network, and provide a CPTED framework that is better tailored to the specific opportunities and challenges of the Edmonton transit system.

**Expand safety audits to include other ‘vulnerable’ groups, such as children, those with disabilities, and senior citizens.** This would help to broaden the CPTED framework that
informs LRT station design by incorporating the specific concerns of these groups, and lead to more inclusive design.

**Emphasize transparency in station design.** Natural surveillance is strongly emphasized in the CPTED literature as one of the key elements in reducing both crime and the fear of crime. The use of glass at Century Park station greatly improved levels of natural surveillance, and contributed to feelings of security relative to Clareview station which used concrete and had no windows on the lower level.

**Integrate a variety of land uses into and immediately around the station.** Most of the surrounding land uses of the two stations such as retail/commercial, residential or services were too far removed to be within a short enough eye or ear distance in case a passenger was in distress at the station. In order to attract increased activity and traffic to LRT stations and their immediate vicinity during operating hours, compatible uses such as retail and services could be integrated into the station or into the parking lots by the stations. This would serve the dual purposes of increasing natural surveillance and providing convenient access to retail or services to transit users.

**Install real-time displays of train arrival and other information at all LRT stations.** Older existing stations should be retrofitted with this technology, and future stations should continue to use these displays as well. This is a relatively inexpensive, yet highly visible way to improve feelings of security and satisfaction among LRT passengers.

**Carry out regular and adequate maintenance and repair of all LRT stations, particularly those in less central locations.** While proper care of the surroundings is important at all stations, disrepair, poor maintenance, and signs of vandalism can have a greater effect on passengers in more isolated stations in non-central areas. Clean stations in good condition can contribute greatly to feelings of security even in isolated areas as they indicate that due care and attention are being paid to these spaces.

Efforts to improve perceptions of transit safety, particularly in light of recent highly-publicized transit-related violent crimes, could move the city closer to achieving its goal of increased transit ridership.
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1. Introduction

1.1. Background

People’s travel choices are influenced by their perceptions of personal safety in environments such as transit stations (Lynch & Atkins, 1988). Research has found that women are more likely to perceive public spaces as threatening (Yavuz & Welch, 2010). Women use public transit more than men, to access fundamental needs such as employment, childcare, education and healthcare, and without effective strategies to reduce their fear, transit authorities put women at a serious disadvantage and also risk economic losses (Yavuz & Welch, 2010). Effective design can reduce crime and fear by creating defensible spaces that assert ownership, and offer opportunities for natural surveillance (Loukaitou-Sideris, 1999). This is the underlying concept of Crime Prevention Through Environmental Design (CPTED).

Women are more likely than men to change their travel behaviour to avoid risk of crime, and to have journeys involving multiple stops (Bell, 1998). Women are also less likely to own cars than men, meaning that many women depend on public transit in spite of high levels of fear (Bell, 1998). Creating transit stations that make users feel safe could potentially increase use of public transit among women, particularly at off-peak hours. Identifying elements that affect women’s feelings of safety in above-ground suburban transit stations in Edmonton can guide future station development, and reduce experiences of fear in existing stations for a safer and more inclusive transit system.

Creating transit stations that make users feel safe could potentially increase use of public transit among women, particularly at off-peak hours. Identifying elements that affect fear in transit stations in Edmonton can guide future station development, and reduce experiences of fear in existing stations for a safer and more inclusive transit system.
1.2. Research Objective

The aim of this study is to determine how the City of Edmonton can better address women’s safety in suburban (non-central) surface LRT stations through expanding their existing design guidelines to incorporate both CPTED guidelines as well as additional elements addressed by the safety audit checklist provided in the City of Edmonton’s Safety Audit Guide for Crime Prevention (2000). While this safety audit checklist is intended to be used by all community members, it is based on the Metropolitan Action Committee on Violence Against Women and Children (METRAC) Women’s Safety Audit Guide, which is targeted specifically towards women.

1. In what ways do the City of Edmonton’s existing LRT Design Guidelines for Edmonton Transit System (ETS) incorporate CPTED guidelines, if at all?

2. What are the similarities and differences between the CPTED guidelines and the criteria that enhance safety in public spaces as noted in the Safety Audit Guide for Crime Prevention developed by the City of Edmonton, which is based on the Metropolitan Action Committee on Violence Against Women and Children (METRAC) Women’s Safety Audit Guide?

3. How can the City of Edmonton’s LRT Design Guidelines (2011) be expanded to enhance women’s safety at suburban (non-central) surface light-rail transit stations?

The rationale behind using the term ‘expand’ rather than ‘amend’ in regard to the existing LRT Design Guidelines is to make explicit that the objective is to add to the existing guidelines so that future LRT design may be more sensitive to women’s perceptions of safety. The objective is not to change or remove any of the existing guidelines, and it would be unfair to suggest that the existing guidelines would be ineffective in improving perceptions of safety at LRT stations.
1.3. Scope of research

This study focuses on Clareview and Century Park LRT stations, using these as existing representative examples of surface LRT stations that are located in suburban (non-central) areas of the city. The City of Edmonton (2013) classifies Clareview and Century Park LRT stations as surface stations, differentiating them from underground stations. In their research on Los Angeles transit stations, Loukaitou-Sideris, Liggett, & Iseki (2002) use the term ‘street-level stations’ in their research to differentiate these from underground LRT stations. This report, however, uses the term surface stations as the study focuses on LRT stations in Edmonton, and the recommendations from the research are intended for the design of future surface LRT stations in Edmonton.

The study uses CPTED guidelines and the City of Edmonton’s Safety Audit Guide for Crime Prevention (2000) to provide recommendations on expanding the City of Edmonton’s LRT Design Guidelines (2011) to enhance women’s safety in suburban (non-central) surface LRT stations. CPTED guidelines are widely accepted design principles, supported by research, and are part of a comprehensive approach to crime prevention. The City of Edmonton’s Safety Audit Guide for Crime Prevention (2000) was modeled after the Metropolitan Action Committee on Violence Against Women and Children (METRAC) Women’s Safety Audit Guide, which places special emphasis on women’s perceptions of safety, and it is intended specifically to guide safety audits in Edmonton public spaces including transit stations. These characteristics made the Safety Audit Guide particularly suited to this study.

Direct observation is used to identify the land uses and traffic levels in the surrounding area at different times. The built environment is also assessed to determine the extent of natural and artificial surveillance and the defensibility of surrounding spaces. This will also help to determine the extent to which existing design guidelines have been implemented at these stations. Although safety audits by users will not be conducted as part of this research study, the researcher will conduct a safety audit using the checklist provided in the City of Edmonton’s Safety Audit Guide for Crime Prevention (2000) at both stations to determine any gaps in safety-oriented design.
1.4. Relevance of the Study

One of the ten strategic goals of the City of Edmonton’s Transportation Master Plan, The Way We Move (2009), is for public and active transportation modes to be the preferred choice for the public over other less efficient modes such as the automobile. With regard to this broader goal, the LRT-specific objective is to expand the existing network throughout the city, and to increase both ridership and transit mode-split. While increasing passenger safety at LRT stations is not explicitly stated as a strategic action towards this objective, as explained above, research has shown that this is a significant factor in determining levels of ridership, particularly in the case of women transit users. This report explores the issue of perceptions of safety in LRT stations in Edmonton, with a focus on women. The results of this study may help the City of Edmonton to expand on existing LRT Design Guidelines and aid in the design of future LRT stations that address any gaps raised in this report.
Furthermore, according to *The Way We Move* (2009), the proposed expansion is to consist of largely surface LRT stations, as these require less infrastructure investment, can be better integrated into their surroundings, have better pedestrian connectivity, and have fewer accessibility barriers. Surface stations also mean that more frequent, smaller-scale LRT stops can be developed along routes to better serve users. As a result, this report focuses on two existing non-central (suburban) surface LRT stations at the north and south terminus of the existing LRT line.
In addition, highly-publicized crimes such as the beating death of a 29-year-old man on an LRT vehicle arriving at Clareview station (CBC News, December 31, 2012), can sometimes increase fear of crime in transit spaces in the public. Addressing issues related to the physical environment that relate to fear of crime in these stations can help to encourage ridership, particularly in light of such events.

1.5. Precedents

This study was primarily inspired by Loukaitou-Sideris’ 1999 study, *Hot spots of bus stop crime: The importance of environmental attributes* which identified the environmental attributes that contributed to commuters’ feelings of security at ten bus stops in Los Angeles using direct observation, mapping, interviews, and surveys. The methodology is based on two previous Masters reports from the School of Urban and Regional Planning, *Creating a safe and vibrant downtown Guelph: Determining elements of the built environment that will enhance women’s feelings of safety* (2011) by Tara Spears, and *Comparing the design of two Yaletown open spaces: An evaluation of design elements and the physical environment* (2010) by Andrew Sherstone.

1.6. Report Outline

This report is organized into five chapters. Chapter 1 introduces the topic of study, and provides context for the research conducted in this report. Chapter 2 provides an in-depth review of published research on the topics of transit safety, gendered perceptions of safety, and the relationship between the built environment and fear of crime. Chapter 3 illustrates the methodology used to conduct this research, and Chapter 4 consists of the findings and resulting discussion. The final Chapter 5 lays out the strengths and weaknesses in the design of each station, from the perspective of women’s perceptions of safety in these spaces, and concludes with recommendations for further action and research.
2. Literature Review

2.1. Fear of crime

Fear of crime can be defined in multiple ways, depending on the focus of the research being conducted. For the purposes of this research report, fear of crime is defined as the variety of emotional and practical responses that individuals and communities use to mitigate risk of crime (Pain, 2001). The advantage of this definition is that it frames fear of crime as a social problem, emphasizing the negative impacts of people’s fear of crime on their daily lives, leading to reduced quality of life and in a broader sense, social inequality (Pain, 2001). Fear of crime can create and reinforce both social exclusion and social control, an example of which is the feminist view that sexual violence against women is often used as a justification for forms of paternalistic social control of women (Pain, 2001). Fear of crime can also reinforce social and economic marginalization of those groups that feel the need to respond to high levels of fear through self-imposed behavioural and spatial restrictions that can, in turn, have effects on employment opportunities, social activities, personal freedom, and overall quality of life (Pain, 2001). Fear of crime can also lead to social exclusion and control of the ‘feared’, such as young men, young adults and children, ethnic minorities, and so on, who can be both feared and fearful (Pain, 2001).

2.2. The gender paradox of fear

In the large body of research that studies how fear of crime can shape both urban design and policy, there has been much work done on the social differences in how that fear is both constructed and experienced (Pain, 2001). There is little consensus on both the role of social identities such as gender, age, and race in experiencing fear of crime, or policy solutions to address this fear in public urban settings (Pain, 2001). However, findings from this area of research have been somewhat consistent in suggesting that perceived risk of crime is not directly related to actual risk of victimization, and that women experience higher levels of fear of crime than men (Pain, 2001). This has come to be known as the gender paradox of fear, because while
women, on average, report experiencing more fear of crime than men, the actual victimization rates for men have often been found to be higher than those for women (Pain, 2001).

Several explanations have been put forward by researchers to explain the gender paradox of fear. The physical vulnerability hypothesis, supported by some research findings, suggests that the greater fear of crime in women results from their perceived vulnerability, which could be a result of frequent experiences of various forms of harassment as well as the socially constructed idea that women are less able to defend themselves from attack than men (Pain, 2001; Stanko, 1995; Rader & Haynes, 2011). The shadow of sexual assault hypothesis, which has been backed by significant empirical evidence, suggests that women’s greater fear of crime stems from a focus on sexual assault (Rader & Haynes, 2011). However, Rader & Haynes (2011) argue that these hypotheses do not explain how these notions of vulnerability or focus on risk of sexual assault came to be, which they explain using Akers’ social learning theory. Formal and informal learning through teachers, parents, and other social contacts lead to the socially learned behaviours and gender-based conceptions that may help to explain the origins of the gender paradox of fear.

2.3. Fear and the public-private dualism

Research has found that women are more likely to perceive public spaces as threatening (Yavuz & Welch, 2010). Women fear sexual violence or assault by strangers the most, although the incidences of these crimes are relatively rare in comparison to the prevalence of domestic violence against women (Valentine, 2001). This apparent gap between perception and reality can be attributed to the widely held ideology of the public realm as spaces of fear and insecurity and the private realm as spaces of safety and security (Pain, 2001). However, it is also true that many women experience relatively minor harassment in public spaces, which may be viewed as precursor incidents to more serious forms of aggression and violence (Valentine, 2001). Media also plays a role in framing public space as dangerous by disproportionately reporting and publicizing violent crimes that occur in these areas (Valentine, 2001; Cowen, Siciliano, &
Smith, 2010). In some of these cases, both police officials and the media have implied that women are partly responsible for the violent acts carried out against them because they put themselves in vulnerable positions in public places, for instance, alone at night on a street (Valentine, 2001). This type of ‘blaming the victim’ response further propagates the public-private dualism, whereby the public realm is associated with men, and private space with women, and reinforces existing social and economic inequalities with the justification of protecting women from external danger (Cowen, Siciliano, & Smith, 2010).

While women’s perceived risk in public spaces may not accurately reflect the actual risk of violence, this fear does lead women to adopt concrete strategies to minimize risk (Cowen, Siciliano, & Smith, 2010). Women respond to perceived risk to personal safety by adopting spatial and temporal avoidance strategies, such as steering clear of public spaces and public transportation late at night, or avoiding certain areas or modes of transport altogether. For instance, a 1976 transit safety audit conducted by the Toronto Transit Commission, in response to concerns from METRAC and the Metro Toronto Police Force, found that women perceived the subway system as unsafe in spite of a very low crime rate and many either avoided it altogether, or at night (as referenced in Schulz & Gilbert, 2003, p.554). They may also adopt environmental response strategies in public places, such as fast walking, or carrying pepper spray to protect themselves (Valentine, 2001). However, these avoidance strategies are not always reasonable or practical for all women, such as those working night shifts, low-income women, or even for those who want to change the existing discourse on women and the public realm (Valentine, 2001). Although these strategies are generally adopted by women, or other ‘vulnerable’ populations such as the elderly, ethnic minorities, people with disabilities, lesbians and gay men, surveys have suggested that fear of crime is increasing across all sectors of the population including men, who have traditionally been viewed as perpetrators, rather than victims, of crime (Valentine, 2001). Although Canada’s national crime rate reached a thirty-year low in 2007, the political discourse and media reports suggested that Canadians’ fear of crime was at an all-time high (Cowen, Siciliano, & Smith, 2010). As a result, urban residents respond to this sense of insecurity by creating a symbolic shield of privacy while in the public domain, by minimizing contact
with strangers (Loftland, 1973). This leads to reduced quality of public life in the city, as people avoid public spaces as much as possible, choosing to use private cars rather than public transit, or shopping in malls rather than on the street (Loftland, 1973). Ultimately, this results in fewer eyes on the street, and reinforcing the perception of risk and fear of crime in public spaces.

It is important to acknowledge that fear of crime amongst women is rational, even if it may not always be accurately reflected by actual risk of victimization (Smith, 2008). This enables researchers to take their concerns seriously, and to see them as comparison shoppers making rational choices and decisions regarding travel on a regular basis (Smith, 2008). This approach can also help policy- and decision-makers to focus on the environmental cues that contribute to women’s perceptions of risk and fear of crime in transit settings, which can then be altered to minimize concerns (Smith, 2008). It must be noted that it may not always be possible to fully alleviate concerns regarding personal security, as these may partly be based on previous life experience and socially learned conceptions of vulnerability (Smith, 2008). Also, as women commuters’ fears are rational, it follows that crime-prevention or fear-reduction measures that cause undue alarm or imply helplessness on the part of the commuter may cause more anxiety than feelings of safety (Smith, 2008).

2.4. Women’s perceptions of risk and fear of crime in transit spaces

People’s travel choices are influenced by their perceptions of personal safety in environments such as transit stations (Lynch & Atkins, 1988). Personal security concerns can affect transit ridership, as evidenced by a UK study that found that the number of trips could increase by ten percent, largely during off-peak times, if passengers felt more secure (Crime Concern & Transport and Travel Research, 1997). Another study in New York City found that one in ten respondents had avoided using the subway in the previous week due to personal security concerns (Audits and Surveys Worldwide, 1996). Women form a large proportion of this potential ridership for transit because, as discussed previously, they appear to have greater concerns regarding personal safety in public settings than men (Smith, 2008). Women are more likely than men to change
their travel behaviour to avoid risk of crime, and to have journeys involving multiple stops, termed trip-linking (Bell, 1998; Smith, 2008). Women also use public transit more than men, to access fundamental needs such as employment, childcare, education and healthcare, and are often ‘transit captive’ with limited or no access to other forms of transportation such as cars (Bell, 1998; Smith, 2008). Without effective strategies to reduce their fear, transit authorities put women at a serious disadvantage and also risk economic losses (Yavuz & Welch, 2010).

It is important to note that feelings of insecurity generally vary at different points of a journey, which has led to researchers adopting the whole journey approach developed by Crime Concern in the UK (Crime Concern & Transport and Travel Research, 1997; Smith, 2008). A whole journey approach considers the entire process of travelling from the origin to the destination as well as the return trip, and takes into consideration the possibility that transit riders may use other modes of transport such as walking, cycling, or driving at other points of their journey (Smith, 2008). Crime Concern (1997) found that the decision to make a trip was based on the potential passenger’s perception of the level of danger of the most dangerous portion of the journey. An Audits and Survey Worldwide (1996) survey found that waiting on the subway platform for the train elicited the most concern for personal safety in respondents, over being on the train or getting to the subway station. However, other studies have found that reactions to different points in the journey in terms of fear can vary among users based on factors such as their frequency of transit use, which highlights the importance of surveying a broad spectrum of women users to fully understand their experiences of fear during transit journeys (Smith, 2008).

Transit stations may cause fear in women, but they do also attract real crime. In large transit systems in big cities such as Toronto or New York, transit stations attract large crowds and disorder during rush hour, which may create opportunities for crimes like pickpocketing and purse-snatching, while transit stations in relatively smaller cities can attract more serious crime such as assault, homicide, or robbery, due to desolation, low surveillance, and more concealed areas, particularly during off-peak hours (Felson, et al., 1990; Clarke, Belanger, & Eastman, 1996). Most crime occurs at the station rather than on the train itself, and the rates of crime have been found to be correlated with
levels of neighbourhood crime (DeGeneste & Sullivan, 1994). While rail transit crime has been studied fairly extensively, not much attention has been paid to the effects of the spatial environment of transit stations on crime, such as surrounding land use and the built environment, barring a few studies (Loukaitou-Sideris, Liggett, & Isekis, 2002). This is particularly important to examine in the case of at-grade rail transit stations as they are directly interacting with their immediate environment, unlike underground stations (Loukaitou-Sideris, Liggett, & Isekis, 2002). Most research has been conducted on heavy rail systems and underground stations, with little focus on light rail transit which is increasing in popularity in North America (Loukaitou-Sideris, Liggett, & Isekis, 2002). Light rail transit stations often have park-and-ride facilities attached to them, which adds a further dimension, the personal safety of the passenger as well as the security of their property in the parking lots (Loukaitou-Sideris, Liggett, & Isekis, 2002).

2.5. Environmental elements and fear of crime in LRT stations

Effective design can reduce crime and fear by creating defensible spaces that assert ownership, and offer opportunities for natural surveillance (Loukaitou-Sideris, 1999). This is the underlying concept of Crime Prevention Through Environmental Design (CPTED). Platform design may play a role in the defensibility of light rail transit (LRT) stations depending on the neighbourhood context. Surface station platforms can provide a great opportunity for natural surveillance in a busy neighbourhood with lots of street life, but can also offer an easy escape route for criminals. On the other hand, underground platforms may limit possibilities for natural surveillance, and can create opportunities for entrapment, but they can also make it more difficult for criminals to escape (Felson, et al., 1990). Certain surrounding land uses such as schools, bars, liquor stores, pawn shops, and abandoned buildings around transit stations tend to attract crime (Block & Block, 1995, 2000).

Social and physical incivilities, defined as “low-level breaches of community standards that signal the erosion of conventionally accepted norms and values” (LaGrange, Ferraro, & Supancic, 1992, p.312), include abandoned buildings and vacant unkempt lots, broken windows, trash, litter, graffiti, and disruptive social behaviours such as loitering, public intoxication, and minor criminal offenses (LaGrange, Ferraro, &
Supancic, 1992). Wilson & Kelling’s (1985) ‘broken windows’ theory introduced the idea that minor infractions of physical and social standards of a community can create fear of crime in people, but Hunter (1978) was the first to explain that incivilities may have a greater effect on fear than direct experience of serious crime, because these infractions are more commonplace in people’s daily lives and signal a threat to social order. Several studies have found a direct correlation between incivilities and fear of crime (LaGrange, Ferraro, & Supancic, 1992). Interestingly, one study by LaGrange, Ferraro, & Supancic (1992) found that incivilities were more strongly correlated with perception of risk rather than fear of crime, the former being defined as the increased awareness of the potential for crime, and the latter being defined as the emotional response to this awareness.

Several other environmental elements have been found to play a role in both passenger experiences of fear of crime as well as actual incidence rates of crimes in LRT stations. Loukaitou-Sideris, Liggett, & Isekis (2002) found in their study of the Green Line light rail system in Los Angeles that underground stations with little opportunity for natural surveillance had higher incidence of crime. They also found that the presence of liquor stores in the vicinity of Greenline LRT stations had a high correlation with the incidence of ‘less serious’ or ‘Type 2’ crime, mainly vandalism, at these stations. They also found that the upkeep and maintenance of the surrounding environment of surface stations was very important for passenger safety, and less so for underground stations. Since many of the stations on this line had park-and-ride lots, the incidence of crime was found to be lower in smaller, well-lit parking lots that were well-integrated into the surrounding built environment. The researchers recommended integrating convenience stores and ticket machines into these lots so as to increase natural surveillance.

Possible entrapment and concealment areas, where the possibility of refuge for the criminal is high, and the prospect (or visibility) of individuals are low, often create high levels of fear in commuters (Fisher & Nasar, 1992). Lack of good lighting has been found to correlate with both incidence of crime and fear of crime for passengers at rail transit stations, particularly women (Loukaitou-Sideris, 1999; Wallace, Rodriguez, White, & Levine, 1999). Frequent and on-time service play a large role in perceptions of risk in an
LRT station, as these minimize uncertainty for waiting passengers who feel more in control of their environment (Yavuz & Welch, 2010). Women do not find security cameras as reassuring as men do in terms of reducing fear, based on previous experience, the lack of certainty of immediate response to crime, and low levels of confidence that the cameras were constantly being monitored (Trench, Oc, & Tiesdell, 1992; Yavuz & Welch, 2010).

2.6. Situational crime prevention

In order to make LRT stations more inclusive spaces for women, there needs to be both a reduction in fear of crime as well as measures to prevent crime from occurring. Situational crime prevention includes a set of techniques and individual measures that reduce the likelihood of a crime by altering the interactions between the individuals and their environment (Clarke, 1992). This approach is particularly well-suited to an environment like an LRT station where large numbers of people congregate at different times in a variety of settings, because it is tailored to the context in which crime prevention measures are required (Smith, 2008). Situational crime prevention techniques are classified into five main types (Smith, 2008):

- Increasing the effort needed to carry out a crime
- Increasing the probability of detection and apprehension of criminals
- Decreasing the net reward of carrying out a crime
- Decrease or remove situational incitements to commit crime
- Remove situational opportunities that make it easier to commit crime

Each of these five categories is comprised of five specific techniques, for example, target hardening, screening exists, controlling access to facilities, and so on (Smith, 2008).

It is important for policy-makers and planners to focus on both reducing fear of crime as well as preventing crime, in order to create safer, more inclusive transit spaces. Women experience greater fear than men in public spaces, and are also dependent on transit for a wide variety of essential activities. Environmental elements, such as design features and platform type, as well as surrounding land uses and condition, have an effect on
crime and fear of crime, particularly in women. Not much research has been focused on studying fear of crime in light rail transit stations, even though they are becoming increasingly common in North American cities. There is also a need to reconcile station security and design features with situation-specific crime prevention and fear reduction strategies, because uniform, one-size-fits-all solutions are much less likely to succeed than context-sensitive strategies in reducing fear of crime in women.
3. Methodology

3.1. Introduction

A qualitative methods approach was selected to determine issues of safety relating to the built environment of above-ground LRT stations in Edmonton. This chapter describes the methods used to address the research questions outlined in Chapter 2, including considerations of generalizability, reliability, and validity. It also presents the criteria used to conduct a safety audit of two above-ground suburban Edmonton LRT stations (Southgate and Clareview), using the Checklist of Safety Audit for Crime Prevention in the City of Edmonton’s Safety Audit Guide for Crime Prevention (2000). The chapter concludes with a discussion of the strengths and limitations associated with the chosen research protocol.

3.2. Literature Review

A review of literature on the gendered nature of fear of crime, safety in transit spaces, and the relationship between components of the built environment and perceptions of safety was conducted in order to establish an understanding of the topic and to provide context for the research. The literature review highlighted the work of Dr. Anastasia Loukaitou-Sideris on the environmental attributes of transit crime.

The literature review provided a basis for conducting research into how design guidelines for Edmonton LRT stations can be expanded with a view to enhancing women’s safety at these stations. In addition, it provided an initial overview of Crime Prevention Through Environmental Design (CPTED), which is based on the concept that effective design can reduce crime and fear by creating defensible spaces that assert ownership, and offer opportunities for natural surveillance. The environmental attributes that contribute to feelings of safety/fear are further discussed in Section 3.4.1 of this chapter. The review of literature also informed the recommendations to further enhance women’s safety in Edmonton LRT stations through situational crime prevention.
3.3. Document Review

A review of the City of Edmonton’s LRT Design Guidelines for Edmonton Transit System (ETS) (2011), as well as CPTED guidelines from the existing literature was undertaken to determine the extent to which CPTED principles have been incorporated into the LRT Design Guidelines. In addition, the City of Edmonton’s Safety Audit Guide for Crime Prevention was also reviewed to determine the extent to which this safety audit guide incorporated CPTED principles. The results were used to provide recommendations to the City of Edmonton on expanding their existing LRT design guidelines with a view to enhancing women’s safety in above-ground suburban LRT stations.

3.4. Safety Audit and Additional Observations

Safety audits of the built environment and safety features of the Southgate and Clareview LRT stations in Edmonton were conducted using a minimally modified version of the Checklist of Safety Audit for Crime Prevention in the City of Edmonton’s Safety Audit Guide for Crime Prevention (2000) (see Appendix A). The safety audits were conducted by the researcher, to determine the extent to which the elements from this document have been addressed in the design of these stations. Photographs were taken to supplement the findings of the safety audits. The safety audit criteria are discussed in Table 3.1.

Additionally, direct observations of the built environment and safety features of the stations were also conducted to determine the extent to which the LRT Design Guidelines for ETS have been implemented in these stations, as well as to determine whether any additional CPTED principles have been addressed in the design of these stations.
### 3.4.1. Safety Audit Criteria

Table 3.1 lists the criteria used in conducting safety audits of the Century Park and Clareview LRT stations.

**Table 3.1. Criteria used in the safety audit conducted at Clareview and Century Park LRT stations in Edmonton, AB.**

<table>
<thead>
<tr>
<th>Safety Audit Criteria</th>
<th>Elements</th>
</tr>
</thead>
</table>
| Lighting              | • Brightness and illumination  
                       | • Ability to identify a face 25 m away  
                       | • Consistency  
                       | • Obstructions  
                       | • Upkeep and maintenance |
| Signage               | • Identification signs  
                       | • Directional signs and maps  
                       | • Emergency assistance signage  
                       | • Accessibility signage  
                       | • Hours of operation |
| Sightlines            | • Clear sightlines (indoors and outdoors)  
                       | • Presence of hiding places  
                       | • Barriers to clear sightlines (opaque materials, snow/bushes/trees, blind corners, vehicles) |
| Isolation – Eye distance | • Number of people likely to be around in the early morning, during the day, in the evening, and late at night (after 10 pm)  
                        | • Surveillance systems |
| Isolation – Ear distance | • Nearest person to hear a call for help  
<pre><code>                    | • Nearest emergency service (alarm, security personnel, crisis telephone, |
</code></pre>
<table>
<thead>
<tr>
<th>Category</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>etc.) and associated signage</td>
<td>Frequency of area patrols</td>
</tr>
<tr>
<td><strong>Movement predictors</strong></td>
<td>Ease in predicting people’s movements</td>
</tr>
<tr>
<td></td>
<td>Availability of alternative routes</td>
</tr>
<tr>
<td></td>
<td>Clear sightlines to end of the path</td>
</tr>
<tr>
<td></td>
<td>Presence of hiding places</td>
</tr>
<tr>
<td><strong>Possible entrapment sites</strong></td>
<td>Presence of empty rooms</td>
</tr>
<tr>
<td></td>
<td>Presence of small, well-defined indoor areas such as stairwells,</td>
</tr>
<tr>
<td></td>
<td>recessed doorways, unlocked closets, or elevators</td>
</tr>
<tr>
<td></td>
<td>Presence of small, confined outdoor areas away from clear view such as</td>
</tr>
<tr>
<td></td>
<td>unlocked sheds, alleys, construction sites, or recessed doorways</td>
</tr>
<tr>
<td><strong>Escape routes</strong></td>
<td>Ease of escape to safety</td>
</tr>
<tr>
<td></td>
<td>Ease with which an offender could disappear</td>
</tr>
<tr>
<td><strong>Nearby land uses</strong></td>
<td>Surrounding uses</td>
</tr>
<tr>
<td></td>
<td>Ease of identifying ownership</td>
</tr>
<tr>
<td></td>
<td>Maintenance</td>
</tr>
<tr>
<td></td>
<td>Changing land uses</td>
</tr>
<tr>
<td><strong>Factors that make the place more welcoming</strong></td>
<td>Upkeep and maintenance</td>
</tr>
<tr>
<td></td>
<td>Feeling of abandonment of the place</td>
</tr>
<tr>
<td></td>
<td>Presence of graffiti</td>
</tr>
<tr>
<td></td>
<td>Vandalism</td>
</tr>
<tr>
<td></td>
<td>Materials, tones, textures, colours that affect perceptions of safety</td>
</tr>
<tr>
<td><strong>Maintenance</strong></td>
<td>Presence of litter</td>
</tr>
<tr>
<td></td>
<td>Need for major repairs</td>
</tr>
</tbody>
</table>
3.5. Strengths and Limitations of Research Design

The research protocol used in this study had specific strengths but was also subject to certain limitations. In order to mitigate bias, the research methodology used in this study involved drawing information from multiple sources using multiple methods, that is, document and literature review, a safety audit, and direct observations to determine whether design guidelines in documents had been implemented in the LRT stations. This helped to address construct validity through data triangulation. Expert interviews designed to help validate the recommendations resulting from the research could have strengthened the construct validity of this research project, but were not conducted due to time constraints. In addition, as the safety audit was conducted only by the (female) researcher due to time constraints, the study is subject to bias. Future studies of this nature may benefit from safety audits conducted by a sample of women commuters using the LRT stations to address the issue of bias.

The methods used in this project have previously been used in a Queen’s University Masters report on Creating a Safe and Vibrant Downtown Guelph: Determining Elements of the Built Environment that will Enhance Women’s Feelings of Safety (Tara Spears, 2012) as well as a 1999 research study by Dr. Anastasia Loukaitou-Sideris that identified the environmental attributes that contributed to commuters' feelings of security at ten bus stops in Los Angeles. This strengthens the external validity of the
research, however, the study could have further benefitted from key informant interviews to validate the recommendations.

The safety audits were conducted during the evening as the City of Edmonton’s Safety Audit Guide for Crime Prevention (2000) recommends that the audits be conducted after dark. The rationale behind this is twofold – one reason is that this is the only way to determine any issues with lighting, which is one of the most important features contributing to feelings of safety, and the second reason is that people generally feel most isolated and unsafe after dark. The audits were conducted in Edmonton, and if time and access had not been constraints, multiple audits could have been conducted at different times of day, during weekdays and weekends, and during different times of year to test for variations in results.

The findings of this study may be generalizable to the theoretical proposition that environmental elements can affect fear of crime in public spaces. A limitation of this study is that it focuses solely on women, and because transit stations are also used by men, children, those with disabilities, and other ‘vulnerable’ populations, their safety concerns also need to be addressed before design guidelines can be expanded to enhance safety in LRT stations.
4. Findings and Analysis

4.1. Introduction

4.1.1. Purpose

The purpose of this chapter is to present the findings from conducting safety audits of two surface suburban Edmonton LRT stations (Century Park and Clareview), using the City of Edmonton’s Safety Audit Guide for Crime Prevention (2000), as well as from the review of relevant sections of the City of Edmonton’s LRT Design Guidelines (2011). The results based on the evaluative criteria from Chapter 3 were compiled, organized, and examined and are presented in the following sections, and are informed by the literature and document review, direct observations, mapping, and photography.

4.2. Document Review

4.2.1. Principles to Reduce Crime and Enhance Safety

One of the most important contributors to the field of Crime Prevention Through Environmental Design (CPTED) has been Oscar Newman, who developed four major principles to reduce crime through deliberate design in his book, Defensible Space: Crime Prevention Through Urban Design (1972). According to Newman (1972), the four main physical elements that contribute to a more secure environment are:

Territorial definition – asserting ownership through clear proprietary markings and proper care of a space

Natural surveillance – creating opportunities for ‘eyes on the street’, that is, for informal observation of a space

Building form – avoiding designs that communicate the isolation and vulnerability of those using the space

Compatible building placement – locating buildings or other structures next to non-threatening, compatible land uses
In addition to these four principles, natural access control has also emerged as a key element of CPTED. This involves methods to only allow entry to those with permission. This section examines whether these CPTED principles have been integrated into the City of Edmonton’s Safety Audit Guide for Crime Prevention (2000) and LRT Design Guidelines (2011) used in this study.


The safety audit checklist used in this study addresses all the principal elements of CPTED. **Territorial definition** is addressed in the safety audit checklist through questions regarding clear signage (Part 3), signs of vandalism, graffiti, care, or abandonment of a space (Part 11), and maintenance of the space (Part 12). **Natural surveillance** is given great importance in the safety audit checklist as evidenced by the emphasis placed on adequate, consistent lighting (Part 2), clear, unobstructed sightlines (Part 4), the level of isolation based on both eye and ear distance (Parts 5 and 6), and even nearby land uses (Part 10) as they influence the level of activity in the surrounding area. **Building form** is emphasized through questions regarding isolation (Parts 5 and 6), the ability to predict movement within the space (Part 7), possible entrapment sites (Part 8), and escape routes (Part 9). Parts 7, 8, and 9 also focus on the element of **natural access control**. Finally, the section on nearby land uses (Part 10) addresses concerns regarding **compatible building placement**.

4.2.3. City of Edmonton LRT Design Guidelines (2011)

Section 16 of the LRT Design Guidelines sets out principles, guidelines, and required safety and security measures in LRT facilities. Guidelines for transit facilities (16.2.2) include clear sightlines, avoidance of entrapment areas, reducing isolation, clear signage and information, adequate lighting, maintenance, formal surveillance, and patrols. These address the elements of **territorial definition, natural surveillance, building form, and natural access control**. Section 16.4.6 expressly requires that “LRT property should be well maintained to create a perception of responsible ownership and the provision of a safe and secure environment” (p.16.10). The issue of **compatible building placement** is briefly discussed in regards to reducing isolation, and section 16.4.4.3 encourages a mix of land uses to increase activity, natural surveillance, and contact.
However, the issue of land use compatibility with regards to specific types of uses (such as liquor stores or schools) is not addressed in the guidelines.

4.3. Context for the Safety Audit

Two LRT stations in Edmonton, Alberta were the locations of the safety audits.

4.3.1. Clareview LRT Station

Clareview LRT station is located on 48 Street and 139 Avenue in Northeast Edmonton (see Appendix B), and it is the current north terminus of the LRT line. The station has transit centres and park-and-ride facilities on both sides of the tracks, which also run parallel to CN Railway tracks. It was opened in April 1981, and major renovations were undertaken in March 2001 which included a covered station platform, a pedestrian underpass connecting the station to the bus terminals, and wheelchair ramps at entrances to the station.

![Figure 2. Map showing the location of Clareview station in Edmonton, AB.](image-url)
4.3.2. Century Park LRT Station

Century Park LRT Station is located on 111 Street and 23 Avenue in South Edmonton (see Appendix B), and it is the current south terminus of the LRT line. It was opened in April 2010, and is named for the Century Park transit oriented development built on the site of the former Heritage Mall. The LRT station is connected to the Century Park Transit Centre and the transit oriented development through a grade-separated pedway. The station is equipped with park-and-ride and kiss-and-ride facilities, as well as LRT carpool parking.

![Map showing the location of Century Park station in Edmonton, AB.](image)

4.3.3. Rationale for Choice of Stations

Both Clareview and Century Park LRT stations were built prior to 2011, which was the year that the City of Edmonton’s LRT Design Guidelines were published. The reasons for choosing these two stations as the subject of this research were threefold:

1) Century Park is one of the two newest operational LRT stations in Edmonton, built in 2010. Further expansion is currently planned, but at the time the study was conducted, Century Park station was best-suited to examine the extent to which safety-conscious design of LRT stations has evolved in Edmonton since Clareview was built in 1981.
2) The research objective was not to examine whether the guidelines have been implemented in the design of these two stations. Rather, the objective was to use the results of the safety audits conducted at these two stations to inform recommendations on expanding the existing LRT Design Guidelines (2011).

3) There is a perception that areas in north Edmonton have relatively higher crime levels as compared to areas in south Edmonton. Examining the effect of these perceived levels of crime around each station (Clareview in north Edmonton and Century Park in south Edmonton) may be useful to better understand how it affects women’s perceptions of safety at transit stations in these neighbourhoods.

4.4. Safety Audit Findings

Natural Surveillance

4.4.1. Lighting

Lack of adequate lighting has been found to correlate with both the incidence of crime and fear of crime in rail transit stations, particularly among women (Loukaitou-Sideris, 1999; Wallace, Rodriguez, White, & Levine, 1999). General impressions of the lighting were good at both Century Park and Clareview stations (see Figures 2 and 3).

Figure 4. Well-lit interior of Century Park LRT station at night. (Photo by Radhika Brown)

Figure 5. Well-lit interior of Clareview LRT station at night. (Photo by Radhika Brown)
While it was not possible to determine whether the lights had instant-on capability, or if the power source was uninterruptible from direct observations, the lighting was more consistent at the Century Park LRT station compared to the Clareview LRT station. One of the lights at Clareview station was not functional, and there was no contact information provided around the station regarding whom to call if the lights are out, broken, or not turned on. Century Park station had consistent and fully functioning lighting throughout the station, but once again, did not have maintenance contact information.

4.4.2. Sightlines

The Century Park LRT station building is highly transparent due to the substantial use of glass in the building, and all portions of this surface station are above ground. As a result, it offers many opportunities for natural surveillance. The station has clear sightlines throughout the interior and in the surrounding area, with two exceptions. It was not easy to see what was up ahead when going up or down the stairs or escalators in the interior of the station (see Figure 4). In addition, it was difficult to see around the corners of the upper-level pedway leading outside from the station, and the central structure on the second floor (see Figure 2).
There is significantly less use of glass as a building material at the Clareview LRT station. Once again, there are clear sightlines in and around the station with two exceptions. It was difficult to see the exits from the bottom of the stairs leading up to them (see Figure 5), and it is difficult to see around the corners of the central elevator structure on the lower level (see Figure 3). Although the tracks and platform are at ground level, Clareview station also has an underground portion, both of which make natural surveillance more difficult.
4.4.3. Isolation

4.4.3.1. Eye Distance

At the time of the audit, the areas around both Century Park and Clareview LRT stations felt isolated, as there were very few users and there were no other land uses close enough to the stations for people to see a person in distress.

Both Clareview and Century Park have security cameras throughout the stations. Security cameras were found on the platforms, by elevators, stairs, or at other grade changes, at pedway entrances at Century Park station, and at the underground level at Clareview station. No security cameras were visible at the Century Park LRT station washrooms, but Access Control is enforced according to signs at the entrance to the washrooms (see Figure 7). Users must push a Call button to be allowed access into the
washrooms by ETS Security. The Access Control signs were also provided in Braille for the visually impaired. Security cameras were not visible at some of the exits/entrances to/from the Clareview LRT station, including exits leading up and out of the underground portion of the station to the street.

Figure 9. Washroom Access Control and emergency phone at Century Park LRT station. (Photo by Radhika Brown)

4.4.3.2. Ear Distance

At the time of the audits, the nearest person to hear a call for help was around 25 feet away at Clareview station, but only around 10 feet away at Century Park station. The nearest emergency service in both cases was an emergency phone (see Figures 7 and 8), which was around 25-35 feet away at both stations.
At the time of the audit, the Century Park station appeared to be patrolled as evidenced by the presence of a Peace Officer vehicle. While there was no evidence of patrols at the Clareview station at the time of the safety audit, this does not necessarily suggest that it is not patrolled. In both cases, it was not possible to determine the frequency of patrols, but the Peace Officers appeared to have arrived at the Century Park station before the safety audit, and were present when the audit ended.
Compatible Building Placement

4.4.4. Nearby Land Uses

Clareview LRT station had mainly residential condominiums and streets, in addition to the park-and-ride facilities and the bus terminals, in its immediate surroundings. Neighbouring land uses are further removed from the immediate vicinity of the station due to the LRT tracks running parallel to an additional set of old CN Railway tracks in this part of Edmonton. This creates a sense of isolation, in spite of the presence of big box retail approximately 500 metres southeast of the station. The Clareview Town Centre, a movie theatre complex, bars and restaurants, and the Edmonton North East Smart Centre are also all within 400-700 m walking distance from the station. Northeast of the station is the large Ebbers Industrial area.
A map of the area indicates that there are three liquor stores within a 700 m radius, and five within a 1.2 km radius of the station. There are seven schools within a 1.6 km radius of the station. The Northeast Community Health Centre is located 1-2 blocks northwest of the station, and neighbours an Edmonton Police Service office. However, these were not immediately visible from the station, particularly at night. The station is located in the vicinity of three major arterials – 50 Street, Manning Drive, and 137 Avenue. The land uses around the station do not appear to be undergoing major changes. It is relatively easy to identify the ownership of the surrounding land uses, but there are also many vacant, dark areas. Stores are not generally within eye distance of the station. There is a convenience store within the LRT station, but it was not open at night when the audit was undertaken.

The Century Park LRT station is located adjacent to the Century Park transit-oriented development that was built on the former Heritage Mall site. It is connected to this development and the Century Park Transit Centre via a grade-separated pedway. There is a commercial area located immediately south of the station, with stores, restaurants and bars, offices, and other services. There is a liquor store within 170 m, and another within 450 m of the station. There are four schools within a 1.5 km radius of the station. The station has a large parking lot as part of its park-and-ride facility, and there was busy traffic around the station even at night as it is located on a major arterial road (111 Street). Other land uses in the immediate vicinity of the station include residential houses and streets. It was relatively easy to determine ownership of surrounding land uses, which were also relatively closer to the station. The land use in the area is changing as new developments continue to be built.

**Territorial Definition**

### 4.4.5. Signage

Both Clareview and Century Park stations had maps and adequate directional signage, and clearly identified entrances and exits (see Figure 10). Written signs were accompanied by easy to understand symbols to reduce wayfinding barriers. Signs also identified the different streets that the exits led to, facilitating easy wayfinding for transit users. All entrances are accessible and clearly marked. Barrier-free facilities were also
clearly identified, and there were signs that provided contact information in case emergency assistance was needed. The operating hours of the station buildings were also provided at entrances and exits.

Figure 12. Maps, clear directional signage, and posted operating hours at Century Park station. (Photo by Radhika Brown)

An additional element of informational signage at the Century Park LRT station was in the form of real-time information displays of expected train arrival times on both tracks (see Figure 11). This feature is not currently available at the older Clareview station.
4.6. Incivilities and Defensibility of Space

Social and physical incivilities are defined as “low-level breaches of community standards that signal the erosion of conventionally accepted norms and values” (LaGrange, Ferraro, & Supancic, 1992, p.312), include abandoned buildings and vacant unkempt lots, broken windows, trash, litter, graffiti, and disruptive social behaviours such as loitering, public intoxication, and minor criminal offenses (LaGrange, Ferraro, & Supancic, 1992).

4.6.1. Maintenance

The Century Park LRT station was very well-maintained, and had several waste receptacles provided throughout the area which appeared to have prevented any littering. There was no apparent need for any major repairs (see Figure 2 for example). The maintenance conditions at Clareview were substantially different, with cigarette stubs littered throughout the station, empty shopping carts, pillows, and blankets left lying around, and puddles of water collecting in parts of the station (see Figures 3, 12, and 13 for examples).
Figure 14. Water puddles collecting at Clareview station, one of the signs of poor upkeep. (Photo by Radhika Brown)

Figure 15. Empty shopping carts were found around Clareview station, another sign of poor maintenance. (Photo by Radhika Brown)
4.4.6.2. Factors that Make the Place More Welcoming

These are factors that determine whether or not the station is used or abused by people (City of Edmonton, 2000). The Century Park LRT station was clean, well-maintained, and had clear wayfinding and other signage throughout the area. There was no graffiti, or racist/sexist slogans, signs, or images on the walls, and there were no signs of vandalism. Overall, the station clearly asserted ownership and proper care.

On the other hand, Clareview station had very few people around, and the convenience store was closed at night. There were no graffiti or racist/sexist images on the walls, but there were signs of vandalism around the station and blankets and pillows had been left behind on the benches in the underground portion of the station (see Figure 3). Additionally, there were no people at all in the underground portion of the station, and there were no windows, which together created a feeling of insecurity.

Building Form

4.4.7. Entrapment and Escape

Surface station platforms can provide a great opportunity for natural surveillance in a busy neighbourhood with lots of street life, but can also offer an easy escape route for criminals. On the other hand, underground areas of stations may limit possibilities for natural surveillance, and can create opportunities for entrapment, but they can also make it more difficult for criminals to escape (Felson, et al., 1990).

4.4.7.1. Movement Predictors

At both Century Park and Clareview stations, people’s routes and movements were somewhat obvious and easy to predict. There were generally no alternative well-lit, frequently travelled routes or paths. While there are multiple exits at both stations, there are limited routes leading to these exits. At Clareview, it was difficult to see what was at the other end of the path, particularly walking up from the lower level to the exits that were located at the top of stairs. On the other hand, at Century Park station, it was easy to see what was at the other end of pedways and paths, in part due to the substantial use of glass that increased the transparency of the structure.
4.4.7.2. Possible Entrapment Sites

There were no empty, unlocked rooms at either station that could be used as potential entrapment areas. However, at Clareview station there were small, well-defined spaces that included two stairwells and the elevator, and recessed doorways, alcoves for sand boxes, and piled snow created confined areas where one would be hidden from view. While Century Park also had an elevator, there were no potential entrapment sites in the station exterior.

4.4.7.3. Escape Routes

An offender would find it very easy to disappear at Clareview station, and relatively easy to do so at Century Park station. In both cases, it would be very difficult for a victim or potential victim to escape an attacker and find help since the area surrounding the stations is quite isolated at night.

4.4.8. Neighbourhood Crime

The Social Concerns section of the safety audit was modified for the purposes of this report to focus on the City of Edmonton’s 2010 Neighbourhood Indicators (Know Your Neighbourhood, 2010) for the communities surrounding the two stations. The Neighbourhood Indicators include health and wellness, personal and community safety, unemployment, education, and the condition of the physical environment, in relation to the city average. These indicators are based on 2006 Statistics Canada Census data, and show the incidence of property crime, violent crime, and juvenile offenses in a neighbourhood relative to the city average. This information was used to better understand the correlation between the level of each type of crime in an area, and its effects on perceived safety. The Edmonton Police Service’s Neighbourhood Crime Map was also used in order to quantify the specific types of crime (for example, assault, sexual assault, break-and-enter, robbery, and so on) committed in the neighbourhoods immediately surrounding the two LRT stations in the span of 60 days. This information was relevant because the incidence of certain crimes such as sexual assault in an area may affect women’s perceptions of safety more than other crimes. A limitation of the EPS Crime Map was that the data was for a short period of time, and
may not have been representative of any patterns of crime in each neighbourhood. In addition, both the Neighbourhood Indicator and Crime Map data only reflect reported crimes, and may not accurately reflect the relative incidence of different types of crime in an area. For example, victims in some cases may be more reluctant to report certain types of violent crime, such as sexual assault, compared to property crime. However, these data sources were the best available source of information for the purposes of this study as they allow an examination of the relative levels of different types of crime in a neighbourhood, and possible correlations to perceptions of safety.

DeGeneste & Sullivan (1994) found that most crime occurs at the station rather than on the train itself, and that the rates of crime are correlated with levels of neighbourhood crime. Neighbourhood crime levels are particularly important to examine in the case of surface rail transit stations as they are directly interacting with their immediate environment, unlike underground stations (Loukaitou-Sideris, Liggett, & Isekis, 2002).

In the case of Clareview station, the neighbourhood immediately adjacent to it is Clareview Campus. Neighbourhood crime indicators for this area show that the incidence of property crime (624, compared to a city average of 153.24), violent crime (41, compared to a city average of 19.13), and offenses by juveniles (147, compared to a city average of 16.91) are all substantially higher than the city average. While this general crime data is important to note, in the case of women’s perceptions of safety in and around LRT stations, it is also useful to determine the types of crime that are being committed in these areas. For example, incidences of assault (including sexual assault), robberies, and homicides are more likely to influence safety perceptions in women in public places than vehicle thefts or breaking and entering. Using the Edmonton Police Service’s (EPS) Neighbourhood Crime Map, five assaults and a robbery were found to have been committed in Clareview Campus in the last 60 days (as of May 8, 2013), in addition to multiple vehicle thefts and a break-and-enter.

The Century Park LRT station is bordered on either side by the Blue Quill neighbourhood to the west and the Ermineskin neighbourhood to the east. Blue Quill’s Neighbourhood Indicators (2010) show that the incidence of property crimes (138) and juvenile offenses (12) are both lower than the city averages of 153.24 and 16.91, respectively. However,
the incidence of violent crime (22) is slightly higher than the city average (19.13). On the other hand, Ermineskin has a much higher incidence of property crime (203) than the city average of 153.24, but similar levels of violent crime (20) as the city average (19.13). Juvenile offenses in Ermineskin are also low (7) compared to the city average (16.91). In the past 60 days (as of May 8, 2013), according to the EPS Neighbourhood Crime Map, there have been nine vehicle-related thefts and two break-and-enters in Ermineskin. Blue Quill had four vehicle-related thefts, two break-and-enters, one assault related to one of the break-and-enters, and one sexual assault in the same time period.

4.5. Analysis

Natural Surveillance

4.5.1. Lighting

The largely adequate lighting provided at both LRT stations may be related to the emphasis on lighting as a critical security feature in the City’s LRT Design Guidelines (2011) for contractors. Lighting standards and guidelines have been addressed in Chapters 10, 11, and 16 of the guidelines. The LRT Design Guidelines (2011) require adequate and uniform light levels to prevent shadows, high enough levels of nighttime lighting to enable natural surveillance, ample lighting in vulnerable areas, and no spotlights as these would leave surrounding areas dark (Section 16.4.2.7). The guidelines also call for proper illumination of pedestrian walkways, ramps, crossings, stairways, seating and fare collection areas, platform edges, bus-loading areas, parking areas, and wayfinding signage (Section 10.2.7).

Consistent, diffuse lighting with minimal glare is also required in LRT stations, particularly for good quality security camera images (Section 10.2.7). The ability of the lights to turn on instantly and an uninterruptable power source are both important for immediate recovery after a power outage (Sections 10.2.7 and 11.10.3). In addition, a white light source is required for better visibility of true colours of objects (Section 11.10.3).

According to the City of Edmonton’s In Transit newsletter (April 2012), ETS has installed long-lasting and energy-efficient LED lighting at a few other transit stations, which may
reduce the need for maintenance although lighting levels would remain roughly the same. There was adequate lighting within both stations to identify a face at a distance of 25 metres (75 feet), and there was no obstruction of lighting by trees, bushes or other structures in the outdoor areas immediately surrounding the stations. The lighting also adequately illuminated pedestrian walkways and sidewalks at nighttime.

Section 11.10.4 of the LRT Design Guidelines (2011) provides required minimum illumination levels for specific areas of the station interior and exterior, the trackway and the tunnel. Illumination levels higher than these minimum levels are recommended for areas with circulation of people such as corridors, pedways, ticketing areas, and entrances. Enclosed spaces with limited escape routes such as service rooms (500 lux), elevators (400 lux), and washrooms (300 lux) have the highest minimum required illumination levels, whereas open spaces around the station such as surface parking lots (25 lux), passenger drop-off points (25 lux), and transit shelter islands (20 lux) have the lowest required minimum illumination levels. Although these levels were determined through the Edmonton Transit System’s experience operating LRT stations, research also supports similar illumination levels for urban open areas such as parking lots. Boyce, Eklund, Hamilton, & Bruno (2000) found that an illuminance of approximately 30 lux for exterior lighting in urban areas provided people walking through the area at night with similar perceptions of safety as during the day.

4.5.2. Sightlines

Possible entrapment and concealment areas often create high levels of fear in commuters (Fisher & Nasar, 1992). The LRT Design Guidelines (2011) heavily emphasize the need for clear sightlines. They require that sightlines should not be obstructed by sharp corners, walls, earth berms, fences, bushes, garbage cans, signs, or pillars (Section 16.2.3.1).

The lack of clear sightlines going up and down the stairs and escalators, as well as around certain corners at the Century Park LRT Station created potential hiding places and reduced feelings of security in the station, particularly at night when the audit was undertaken. These issues could be addressed by using security mirrors to see around corners and up or down stairs, having angled corners, or using transparent materials like
glass for the central structure or at the pedway corners. The *LRT Design Guidelines* (2011) also encourage the use of see-through structures, and open perimeter edges. They also state that “where grade separations and landscape screens may be required for functional or aesthetic reasons, they should be assessed against the potential for risk to personal safety” (Section 16.2.3.1, p. 16.3).

At the Clareview LRT station, the lack of transparency, the underground portion of the station, and some obstructed sightlines created feelings of insecurity at the station, particularly at night when the audit was undertaken. In their study of the Green Line light rail system in Los Angeles, Loukaitou-Sideris, Liggett, & Iseki (2002) found that underground stations with little opportunity for natural surveillance had higher incidence of crime. This makes it even more important for Clareview station to increase natural surveillance opportunities through other measures such as the use of security mirrors, angled corners, and the use of transparent materials like glass throughout the station, and particularly at blind corners.

**4.5.3. Isolation**

**4.5.3.1. Eye Distance**

Assessing isolation in terms of eye distance helps to determine how far other people are from the location, and if they would be able to see a person in distress at the station (City of Edmonton, 2000). Both LRT stations were isolated at the time the audit was undertaken. The audit was deliberately conducted at night as this is the time when people feel most isolated. In the early morning and in the evening, particularly during rush hour, these stations are more likely to be busy, with some traffic during the day. However, beyond these assumptions, it is not easy to predict when people will be around at either station.

Monitoring and surveillance systems are included in the City of Edmonton’s Safety Audit Guide (2000) as part of the Isolation – Eye Distance checklist. Section 16.4.1.2 of the *LRT Design Guidelines* (2000) requires camera coverage of security-sensitive areas such as elevators and escalators, all platform areas, fare equipment, all entrance doors, pedway, walkway and stairwell entrances on all levels, washroom entrances, and at
emergency telephones. While both stations had easily visible security cameras at most of these locations, security cameras were not visible at some of the exits/entrances to/from the Clareview LRT station, including exits that led up and out to the street from the underground portion. The absence of security cameras at these locations, that also did not offer opportunities for natural surveillance, created feelings of insecurity in these areas.

It is relevant to note that research has found that women do not find security cameras as reassuring as men do in terms of reducing fear. This was based on their previous experience, the lack of certainty of immediate response to crime, and low levels of confidence that the cameras were constantly being monitored (Trench, Oc, & Tiesdell, 1992; Yavuz & Welch, 2010).

The LRT Design Guidelines (2000) address location criteria for cameras: they should have clear, unobstructed views, they should not be directed at bright lights, and exterior cameras should be positioned at a height that is sufficient to prevent direct viewing of the horizon (Section 8.9.2.2.). A visual audit was insufficient to determine whether these criteria had been fulfilled in the placement of the cameras, and further detailed examination may prove useful.

4.5.3.2. Ear Distance

Assessing isolation in terms of ear distance helps to determine whether a station user could be heard in case of an emergency (City of Edmonton, 2000).

While it was not readily apparent whether and how often Clareview station was patrolled, the presence of Peace Officers at Century Park during the audit contributed to feelings of safety for the researcher. Research has found that police or community patrols, as well as the presence of uniformed staff, at transit stations increases feelings of safety among riders due to the instant availability of information and help, as well as formal surveillance (Crime Concern, 2002; Loukaitou-Sideris, 1999; Reed et al., 2000; Schulz & Gilbert, 1996). In fact, passengers have reported increased fear of crime when police or staff are not visible or available at transit stations (Cozens, et al., 2004; Transit Cooperative Research Program, 2003). There have been mixed results regarding
gender differences in reactions to these types of safety measures. Loukaitou-Sideris & Fink (2009) found that women preferred the presence of staff or patrols over technological solutions like security cameras, while Reed, et al. (2000) and Wallace, et al. (1999) found no significant differences in preferences between men and women.

4.5.4. Overall Design

The extensive use of glass in the Century Park station creates several opportunities for natural surveillance, and increases natural lighting of the interior during the day. Clear, well-positioned wayfinding signage and the intuitive layout enable easy navigation, even if transit riders are unfamiliar with this station. There are two levels to this surface station, at and above ground level, increasing natural surveillance. There are a few blind corners created by the central elevator structure, and the top of stairs and escalators are not fully visible from the bottom, both of which create potential concealment areas. There are multiple entry points, which are well-defined and visible. While this reduces chances of entrapment, it may also provide more escape routes for offenders. The public areas are monitored by security cameras, which may not contribute heavily to feelings of safety among women riders. The overall design of the Century Park LRT station is generally very good in terms of creating feelings of security.

The lack of windows in the lower level of the Clareview LRT station makes natural surveillance of this area difficult. There are multiple entry/exit points, which may reduce chances of entrapment, but may also provide more escape routes for offenders. Some of the exits lead up and out to the street from an underground portion, which creates potential concealment areas at the top or bottom of stairs. These exits are not readily visible, and there were no security cameras immediately outside the exits, both of which reduce the visual protection of these spaces and can create feelings of insecurity. In addition, there are a few blind corners created by the central elevator structure on the lower level, and by the exits. The station is not too spread out, but there are two bus terminals around the station which can be confusing for transit riders unfamiliar with the station. Overall, the design of Clareview station can be improved upon in terms of increasing natural surveillance opportunities, and reducing potential concealment areas.
Compatible Building Placement

4.5.5. Nearby Land Uses

Surrounding land uses are particularly important to examine in the case of at-grade rail transit stations as they directly interact with their immediate environment, unlike underground stations (Loukaitou-Sideris, Liggett, & Isekis, 2002). Certain surrounding land uses such as schools, bars, liquor stores, pawn shops, and abandoned buildings around transit stations tend to attract crime (Block & Block, 1995, 2000). Both stations have bars, liquor stores, and schools in their vicinity, which may increase the risk of crime according to Block & Block (1995, 2000).

At Clareview, the visual and physical separation of many of the nearby land uses such as arterial roads, big box retail, a movie theatre complex, restaurants, a town centre, and a smart centre from the station by two sets of train tracks also contribute to a sense of isolation. The general impression of the surrounding area is also adversely affected by the many vacant, dark areas, and the lack of stores within eye distance of the station. Century Park station, on the other hand, was relatively more closely surrounded by retail, commercial, and residential uses and was also adjacent to a busy arterial road (111 Street). It was relatively easy to determine ownership of surrounding land uses and new developments continue to be built around the station, which contributes to feelings of security in the station by reducing the number of vacant lots in the surrounding area.

Clareview and Century Park have park-and-ride facilities attached to them, which adds a further dimension to the personal safety of the passenger as well as the security of their property in the parking lots. Loukaitou-Sideris, Liggett, & Isekis (2002) found in their study of the Green Line light rail system in Los Angeles that at stations with park-and-ride lots, the incidence of crime was found to be lower in smaller, well-lit parking lots that were well-integrated into the surrounding built environment. The researchers also recommended integrating convenience stores and ticket machines into these lots so as to increase natural surveillance. Both Clareview and Century Park had relatively large park-and-ride lots, but they were reasonably well-lit. It should be noted that while the lower level of the Clareview station had a convenience store, it was closed at night.
If convenience stores are integrated into station park-and-rides, they must operate during station hours to provide effective natural surveillance.

**Territorial Definition**

**4.5.6. Signage**

The *LRT Design Guidelines* (2011) address signage in Section 15.3.3.8. High contrast wayfinding signage is required, and lighted visual information signals must accompany audible signals. In addition, barrier-free entrances, washrooms, elevators, and other facilities must be clearly marked with the universal symbol for accessibility to enable those with disabilities to locate them easily. The guidelines are also specific in their requirements regarding the size and placement of signs identifying doors and openings leading to and from public areas and walkways. Section 16.4.2.9 further acknowledges that clear, well-designed, strategically located, and easy to understand signage is essential to feelings of security in stations. The signage in both stations adequately fulfilled these requirements.

The operating hours of the station buildings provided at entrances and exits of both stations would prevent passengers from waiting at stations at hours when transit is not in service, and enable law enforcement to investigate any activity in the stations outside the posted hours of operation.

The real-time information displays of expected train arrival times at Century Park station, which is not currently available at the older Clareview station, also added to feelings of security by enabling better planning of trips. Zhang, Shen, & Clifton (2008) examined traveler responses to real-time transit information using the University of Maryland’s ShuttleTrac system. They found that the use of the real-time travel information system significantly increased feelings of security among riders, and contributed to their overall satisfaction with the bus service. Other studies have also suggested that real-time transit information is an inexpensive way of promoting a mode-shift to public transportation as riders feel a greater sense of control over their trip. This sense of control, in turn, contributes to increased feelings of safety in a transit station environment (Dziekan &

4.5.7. Incivilities and Defensibility of Space

Defensible spaces that assert ownership can reduce crime and fear (Loukaitou-Sideris, 1999). The Century Park LRT station clearly asserted ownership and proper care. On the other hand, Clareview station was isolated, with signs of vandalism and disrepair. Wilson & Kelling’s (1985) ‘broken windows’ theory introduced the idea that minor infractions of physical and social standards of a community can create fear of crime in people and Hunter (1978) explained that incivilities may have a greater effect on fear than direct experience of serious crime, because these infractions are more commonplace in people’s daily lives and signal a threat to social order. Several studies have found a direct correlation between incivilities and fear of crime (LaGrange, Ferraro, & Supancic, 1992). This was borne out in the increased sense of fear created by the incivilities readily apparent at the Clareview LRT station, signalling a lack of order and care.

Loukaitou-Sideris, Liggett, & Isekis (2002) also found in their study of the Green Line light rail system in Los Angeles that the upkeep and maintenance of the surrounding environment of ‘street level stations’ (p.136), as opposed to underground stations, was very important for passenger safety. The Century Park LRT station was very well-maintained, and there was no apparent need for any major repairs. On the other hand, Clareview station created feelings of insecurity through poor maintenance and repair. Renovating the station to include more windows and glass, re-doing the floors or installing proper drainage to prevent puddles, as well as re-painting the interior would likely make it appear better cared for. This, in turn, could improve feelings of safety at Clareview station significantly.

Building Form

4.5.8. Entrapment and Escape

Surface stations platforms can provide a great opportunity for natural surveillance in a busy neighbourhood with lots of street life, but can also offer an easy escape route for criminals. On the other hand, underground areas of stations may limit possibilities for
natural surveillance, and can create opportunities for entrapment, but they can also make it more difficult for criminals to escape (Felson, et al., 1990).

Both stations appear to have been designed in a way that allows relatively easy prediction of movement, and the design also limits escape routes for any transit riders who may feel threatened while allowing relatively easy escape opportunities for offenders. There were no empty, unlocked rooms at either station that could be used as potential entrapment areas. However, at Clareview station there were small, well-defined spaces that created confined areas where one would be hidden from view.

The LRT Design Guidelines (2011) explain that features such as pedestrian underpasses (at Clareview), escalators and staircases (at both stations) create predictable routes which offer no escape alternatives to transit users, and make it easy for an attacker to predict their path. These routes are of particular concern when they terminate in potential entrapment spots, as in the case of the exits at Clareview station with ramps and staircases leading up to the street. This design creates potential entrapment spots, particularly in the winter when large amounts of snow can obstruct sightlines. The guidelines suggest the use of activity generators in these areas, as well as installing appropriate emergency hardware. As mentioned earlier, the Clareview station has a convenience store in the underpass, but it is not open at night when it would likely be most beneficial in terms of improving feelings of security.

4.5.9. Neighbourhood Crime

DeGeneste & Sullivan (1994) found that most crime occurs at the station rather than on the train itself, and that the rates of crime are correlated with levels of neighbourhood crime. Neighbourhood crime levels are particularly important to examine in the case of surface rail transit stations as they are directly interacting with their immediate environment, unlike underground stations (Loukaitou-Sideris, Liggett, & Isekis, 2002).

This crime-related data for the neighbourhoods surrounding the two LRT stations suggests that the incidence of violent crime and juvenile offenses are much higher around Clareview station. The results from the EPS Neighbourhood Crime Map also support this, as there were five assaults and a robbery in the Clareview Campus
neighbourhood compared to no assaults in Ermineskin, and two assaults in Blue Quill (one of which was related to a break-and-enter). These findings do not necessarily conclusively prove that the area around Clareview station is any less safe than the area around Century Park station. However, as this study deals with the perception of safety among women, which is not the same as actual risk of crime, it is reasonable to assume that these reported statistics could influence the perception of risk in women transit users at Clareview relative to Century Park.

4.6. Safety Audit Summary

The main areas of concern raised by the safety audits were obstructed sightlines, predictable routes and potential entrapment spots, isolation, and the separation from nearby land uses. Clareview station is largely made of concrete, which limits opportunities for natural surveillance. This issue was exacerbated by the installment of a pedestrian underpass in the station in 2001, which creates routes that make it easy for an attacker to predict pedestrian movements. It also results in exits that are below ground level, and thus not clearly visible, particularly in the winter when snow further obstructs sightlines. While the Century Park station was more transparent and offered significantly more opportunities for natural surveillance, it did still have stairs, escalators and a few blind corners that resulted in obstructed sightlines. A positive feature at Century Park was the use of transit arrival systems that informed passengers of the arrival times of the trains. This offers transit riders a sense of control over their travel, which adds to feelings of security.

While there was ample evidence of security cameras at both stations, this appears to not have deterred vandalism at Clareview station. There were also abandoned shopping carts and blankets, puddles, and littered cigarette stubs in the underpass which made the station appear ill-maintained and uncared for. Century Park, on the other hand, clearly asserted ownership as it was very well-maintained, with several waste receptacles provided throughout the station. The land uses surrounding both stations were somewhat similar, with a few liquor stores and schools within walking distance of the stations. These are land uses that have been shown to be correlated with a higher incidence of crime at transit stations. A major difference was that the land
uses neighbouring Clareview station were farther away from the station due to the CN Railway tracks that run parallel to the LRT tracks.

As research has found that rates of crime at transit stations are correlated with rates of crime in the surrounding neighbourhood, Neighbourhood Indicators were used to gather data regarding the levels and types of crime in the neighbourhoods in the immediate vicinity of the stations. Clareview Campus, adjacent to Clareview station, was found to have much higher than average rates of violent crime and juvenile offenses, compared to Blue Quill and Ermineskin that neighbour Century Park station. There was also a higher proportion of assaults in the last 60 days in Clareview Campus compared to higher levels of theft in Blue Quill and Ermineskin, according to the EPS Neighbourhood Crime Map. Overall, the concerns mentioned above with respect to Clareview station resulted in greater feelings of insecurity at this station than at Century Park.
5. Recommendations & Conclusions

5.1. Strengths and Weaknesses in Station Design

The relative strengths and weaknesses of the built environment of Clareview and Century Park LRT stations from a CPTED perspective are illustrated in Table 5.1. While the design of both stations show some regard to CPTED principles, there is room for further integration of these principles into the design of both existing and future LRT stations as discussed in the Section 5.2.

Table 5.2. Strengths and weaknesses in station environmental design from a safety audit of Clareview and Century Park LRT Stations in Edmonton, AB

<table>
<thead>
<tr>
<th>Environmental Element</th>
<th>CENTURY PARK STATION</th>
<th>CLAREVIEW STATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strengths</td>
<td>Weaknesses</td>
</tr>
<tr>
<td><strong>NATURAL SURVEILLANCE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Lighting</strong></td>
<td>Consistent and functional</td>
<td>No maintenance information</td>
</tr>
<tr>
<td><strong>Sightlines</strong></td>
<td>Transparent building material (glass)</td>
<td>A few blind spots</td>
</tr>
<tr>
<td><strong>Isolation – Eye Distance</strong></td>
<td>Security cameras</td>
<td>Fairly isolated at night</td>
</tr>
<tr>
<td><strong>Isolation – Ear Distance</strong></td>
<td>Only 10 feet to nearest person</td>
<td>Fairly isolated at night</td>
</tr>
</tbody>
</table>
## COMPATIBLE BUILDING PLACEMENT

<table>
<thead>
<tr>
<th>Nearby Land Uses</th>
<th>Adjacent residential, commercial/retail, arterial road</th>
<th>Liquor stores and schools nearby</th>
<th>Residential, three major arterials</th>
<th>Liquor stores and schools nearby</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Easily identifiable ownership of surrounding land uses</td>
<td>Large park-and-ride and parking lots</td>
<td>Easily identifiable ownership of surrounding land uses (except vacant lots)</td>
<td>Surrounding retail/commercial separated from station by two sets of tracks</td>
</tr>
<tr>
<td></td>
<td>Continuing new development (fewer vacant lots)</td>
<td></td>
<td></td>
<td>Many vacant lots</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Large park-and-ride and parking lots</td>
</tr>
</tbody>
</table>

## TERRITORIAL DEFINITION

<table>
<thead>
<tr>
<th>Signage</th>
<th>Maps and clear directional signage</th>
<th>Maps and clear directional signage</th>
<th>No real-time display of train arrival times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signage</td>
<td>Clearly identified entrances and exits</td>
<td>Clearly identified entrances and exits</td>
<td></td>
</tr>
<tr>
<td>Signage</td>
<td>Symbols with written signs</td>
<td>Symbols with written signs</td>
<td></td>
</tr>
<tr>
<td>Signage</td>
<td>Emergency contact information</td>
<td>Emergency contact information</td>
<td></td>
</tr>
<tr>
<td>Signage</td>
<td>Clearly posted operating hours</td>
<td>Clearly posted operating hours</td>
<td></td>
</tr>
<tr>
<td>Signage</td>
<td>Real-time displays of train arrival times</td>
<td>Real-time displays of train arrival times</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Incivilities and Defensibility of Space</th>
<th>Well-maintained</th>
<th>No graffiti</th>
<th>Not well-maintained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incivilities and Defensibility of Space</td>
<td>Lots of waste receptacles</td>
<td>No graffiti (cigarette stubs, pillows and blankets, empty shopping carts)</td>
<td></td>
</tr>
<tr>
<td>Incivilities and Defensibility of Space</td>
<td>No apparent need for repairs</td>
<td>No graffiti</td>
<td>Some need for repairs (puddle of water collecting in the station, broken light)</td>
</tr>
<tr>
<td>Incivilities and Defensibility of Space</td>
<td>No graffiti, sexist/racist/violent imagery, or signs of vandalism</td>
<td>No graffiti</td>
<td>Signs of vandalism</td>
</tr>
</tbody>
</table>
### 5.2. Recommendations

The following are recommendations that may be useful for City of Edmonton staff, including planners and designers and are based on the research informing this study. As previously stated, although the two stations were built prior to 2011, which was the year that the LRT Design Guidelines were published, the reasons for choosing these two stations as the subject of this research were threefold:

1) Century Park is one of the two newest operational LRT stations in Edmonton, built in 2010. Further expansion is currently planned, but at the time the study was conducted, Century Park station was best-suited to examine the extent to which safety-conscious design of LRT stations has evolved in Edmonton since Clareview was built in 1981.

2) The research objective was not to examine whether the guidelines have been implemented in the design of these two stations. Rather, the objective was to use the results of the safety audits conducted at these two stations to inform recommendations on expanding the existing LRT Design Guidelines (2011).

3) There is a perception that areas in north Edmonton have relatively higher crime levels as compared to areas in south Edmonton. Examining the effect of these perceived levels of crime around each station (Clareview in north Edmonton and Century Park in south Edmonton) may be useful to better understand how it affects women’s perceptions of safety at transit stations in these neighbourhoods.
In addition, it is important to note that it is not the intention of this report to suggest that one station is superior to the other in terms of design. The rationale behind examining the safety audit findings at the stations side-by-side was to examine the extent to which safety-conscious design of LRT stations in Edmonton had evolved between the first station (Clareview) that was built in 1981 and the newest station (Century Park) that was built in 2010. While these recommendations are intended to inform the design of future surface LRT stations in Edmonton, it is important to note that only two surface stations were studied as part of this research and further safety audits at other surface stations may need to be conducted before the results and recommendations are fully generalizable to all surface stations in Edmonton.

5.2.1. Recommendations to expand LRT Design Guidelines (2011)

Conduct safety audits at all LRT stations. The results of these safety audits could then inform the design of future LRT stations in the expanding network by adding to the existing LRT Design Guidelines (2011), and provide a CPTED framework that is better tailored to the specific opportunities and challenges of the Edmonton transit system. However, caution should be exercised while conducting safety audits so as not to create the perception that these transit stations are unsafe environments. This can be achieved through proper communication of the goals and objectives of these audits to the public.

Expand safety audits to include other ‘vulnerable’ groups, such as children, those with disabilities, and senior citizens. This would help to broaden the CPTED framework that informs the LRT Design Guidelines (2011) by incorporating the specific concerns of these groups, and lead to more inclusive design.

Emphasize transparency in station design in the LRT Design Guidelines. Natural surveillance is strongly emphasized in the CPTED literature as one of the key elements in reducing both crime and the fear of crime. The use of glass at Century Park station greatly improved levels of natural surveillance, and contributed to feelings of security relative to Clareview station which used concrete and had no windows on the lower level.
Emphasize integration of a variety of land uses into and immediately around the station in the LRT Design Guidelines. Both Clareview and Century Park stations were fairly isolated at night, when passengers generally would experience higher fear of crime. Most of the surrounding land uses of the two stations such as retail/commercial, residential or services were too far removed to be within a short enough eye or ear distance in case a passenger was in distress at the station. In order to attract increased activity and traffic to LRT stations and their immediate vicinity during operating hours, compatible uses such as retail and services could be integrated into the station or into the parking lots by the stations. This would serve the dual purposes of increasing natural surveillance and providing convenient access to retail or services to transit users. Although Section 16.4.4.3 of the LRT Design Guidelines (2011) briefly mention the use of activity generators, there are no specifics provided on what type of uses are compatible with these stations and/or reduce fear of crime or crime itself. Research has shown that certain surrounding land uses such as bars, liquor stores, and pawn shops around transit stations tend to attract crime (Block & Block, 1995, 2000) so these types of uses should be avoided if possible.

Require the installation of real-time displays of train arrival and other information at all LRT stations in the LRT Design Guidelines. Real-time information displays have been shown to significantly increase feelings of security among riders, and contribute to their overall satisfaction by providing a sense of control over their trip (Zhang, Shen, & Clifton, 2008). Older existing stations should be retrofitted with this technology, and future stations should continue to use these displays as well. This is a relatively inexpensive, yet highly visible, way to improve feelings of security and satisfaction among LRT passengers.

5.2.2. Additional Recommendation

Carry out regular and adequate maintenance and repair of all LRT stations, particularly those in less central locations. While proper care of the surroundings is important at all stations, disrepair, poor maintenance, and signs of vandalism can have a greater effect on passengers in more isolated stations in non-central areas. These types of incivilities have been shown to increase fear of crime in people more than direct experience of
crime itself (Hunter, 1978). Clean stations in good condition can contribute greatly to feelings of security even in isolated areas as they indicate that due care and attention are being paid to these spaces.

5.3. Areas of Further Research

The scope of this report was limited due to time constraints as well as the inherent limitations of reports. Further research in this area could benefit from safety audits being conducted by a sample of women that could then be generalized to the larger population. The safety audits could also be conducted by those from other ‘vulnerable’ groups (including women who may also fall into one of these groups) in order to address any specific concerns that these groups may have regarding LRT station safety. As the general public uses these stations, it may also be beneficial to conduct audits using a random sample of all transit riders, rather than limiting it to a certain group or groups.

Further research could also be conducted on the extent of the effect of safety perceptions on transit ridership in Edmonton among women, or the general public. This would be helpful in determining the level of attention that this issue merits in improving transit mode-split and ridership as part of the Transportation Master Plan’s strategic goals and objectives.

5.4. Conclusion

The aim of this report was to determine how the City of Edmonton can better address women’s safety in suburban (non-central) surface LRT stations by expanding their existing design guidelines to incorporate both CPTED guidelines and additional elements addressed by the safety audit checklist provided in the City of Edmonton’s Safety Audit Guide for Crime Prevention (2000). A literature review was conducted that encompassed the gendered fear of crime, the relationship between the built environment and fear of crime, and situational crime prevention. The key CPTED principles of natural surveillance, territorial definition, compatible building placement, and building form formed the broad framework under which the specific concerns
addressed by the Safety Audit Guide for Crime Prevention (2000) were classified. The findings of the safety audits conducted at Clareview and Century Park stations showed that there had been some, but not full, integration of CPTED principles in the design and upkeep of these stations.

The newer Century Park station benefitted from the transparency resulting from the extensive use of glass in the building, and offered better natural surveillance opportunities than the older Clareview station which used concrete and had no windows on the lower level. Century Park was also noticeably better-maintained than Clareview, where signs of vandalism, disrepair, and poor maintenance contributed to feelings of insecurity. Both stations were fairly isolated at night, due to lack of activity-generating land uses in the immediate area of the station. The findings of the safety audit emphasize the importance of natural surveillance and territorial definition (maintenance and defensibility of space) in creating feelings of safety in transit users.

While recommendations for action as well as further research are detailed above, a key conclusion of this study was that safety audits should be conducted at all LRT stations to improve feelings of security for transit riders by addressing their concerns, and also to inform future station design in Edmonton’s expanding LRT network. Efforts to improve perceptions of transit safety, particularly in light of recent highly-publicized transit-related violent crimes, could move the city closer to achieving its goal of increased transit ridership.
Bibliography


APPENDIX A – Safety Audit Checklist
A CHECKLIST OF SAFETY AUDIT FOR CRIME PREVENTION

☐ OUTDOORS  ☐ INDOORS
GENERAL AREA: ______________________________________
SPECIFIC LOCATION: __________________________________
DATE: _______________________________________________
DAY: _________________________________________________
TIME: ________________________________________________
AUDITED BY: __________________________________________

REASONS FOR AUDITING THE AREA:
________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________

Tips on taking notes:
• Regardless of how sharp your memory is, you will not remember everything. Therefore it is important to take good notes. Our experience shows that using a checklist and writing notes on it will make it easier to organize your ideas and suggestions later on.
• Write down any questions that you have (even if you don’t have the time to find the answers).
• Sometimes a place is so poorly designed that there aren’t any real solutions beyond a temporary bandaid. It is still important to note the problem. Identifying and naming a problem is the beginning of changing your surroundings and the way new buildings and spaces are designed.
• Take notes on everything, including your comments on the process of the Audit itself.
• Look over your notes a day or two later to see if they still make sense. Would someone who wasn’t on the Audit understand what you mean? If not, try to make your notes clearer.

1. General Impressions

a] Describe your first initial reactions to the site:
________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________

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2. Lighting [good lighting allows you to see the area and what's happening in it]

a) What is your impression of the lighting?
   □ very poor □ poor □ too dark
   □ satisfactory □ good □ too bright
   □ very good

b) Is the lighting consistent throughout the space?
   □ yes □ no

c) Are any lights out?________________________

d) If so, how many?_________________________

e) What proportion of lights are out?____________
   [e.g. Maybe only two bulbs in your hallway are
   burned out, but if there are only three bulbs to start
   with, then a more powerful way to say this is that
   two-thirds of the lights are out.]

f) Are you able to see and identify a face 25 metres
   (75 feet) away?
   ____________________________
   ____________________________

g) Do you know where/whom to call if lights are out,
   broken, not yet turned on, etc.?
   □ yes □ no

h) Outdoors: Is the lighting obscured by trees or
   bushes? □ yes □ no

i) How well does the lighting illuminate pedestrian
   walkways and sidewalks?
   □ very poor □ poor □ satisfactory
   □ good □ very good

3. Signage [good signage lets you know where you
   are, what resources are available, and helps you develop
   some familiarity with the location]

a) Is there a sign (i.e. room no., building name)
   identifying where you are? □ yes □ no

b) If no, are there directional signs or maps nearby
   which can help you identify where you are?
   □ yes □ no

c) Are there signs which show you where to get
emergency assistance if needed?
□ yes □ no

d) Are there signs which direct you to wheelchair access? □ yes □ no

e) Do exit doors identify where they exit to?
□ yes □ no

f) Is there information posted describing the hours the building is legitimately open?
□ yes □ no

g) What is your impression of the overall signage?
□ very poor □ poor □ satisfactory
□ good □ very good

4. Sightlines [clear sightlines are important as they let you see, without interference, what lies ahead]

a) Can you clearly see what is up ahead?
□ yes □ no

b) If no, the reasons may be:
Indoors: □ sharp corners □ walls
□ pillars
□ others________________________
Outdoors: □ bushes □ fences
□ hill
□ others________________________

c) Are there places someone could be hiding?
□ yes □ no

d) If yes, where?_________________________

e) What would make it easier to see? e.g.:
□ transparent materials like glass
□ vehicles moved □ angled corners
□ security mirrors □ trimmed bushes
□ snow cleared
Other comments?
________________________________________
________________________________________

5. Isolation -- Eye Distance [this lets you assess how far away things are from the location and if someone would see you if you were in trouble]
a] At the time of your Audit, did the area feel isolated?
□ yes □ no

b] How many people are likely to be around?
   • In the early morning:
     □ none □ few □ several □ many
   • During the day:
     □ none □ a few □ several □ many
   • In the evening:
     □ none □ a few □ several □ many
   • Late at night (after 10 pm):
     □ none □ a few □ several □ many

c] Is it easy to predict when people will be around?
□ yes □ no

d] Is there a monitor or surveillance system?
□ yes □ no □ don’t know

e] Other comments?
________________________________________
________________________________________
________________________________________

6. Isolation -- Ear Distance [lets you assess if you could be heard in an emergency]

a] How far away is the nearest person to hear a call for help?___________________________

b] How far away is the nearest emergency service such as an alarm, security personnel, crisis telephone?___________________ □ don’t know

c] Can you see a telephone, or a sign directing you to emergency assistance? □ yes □ no

d] Is the area patrolled?
□ yes □ no □ don’t know

e] If yes, how frequently?
□ every hour
□ once per afternoon/evening
□ don’t know
Other comments?
________________________________________

7. Movement Predictors [a predictable or unchangeable route or path; this allows you to assess whether or not you can determine the way or direction people will move]
a] How easy is it to predict people’s movements? (e.g. their routes)
□ very easy □ somewhat obvious □ no way of knowing

b] Is there an alternative well-lit route or path available?
□ yes □ no □ don’t know

c] Is there an alternative frequently travelled route or path available?
□ yes □ no □ don’t know

d] Can you tell what is at the other end of the path, tunnel, or walk? □ yes □ no

e] Are there corners, alcoves, or bushes where someone could hide and wait for you?
□ yes □ no

f] Other comments?
_________________________________________
_________________________________________
_________________________________________

8. Possible Entrapment Sites [lets you assess whether or not there are locations which are of special concern]

Indoors:
a] Are there empty rooms that should be locked?
□ yes □ no

b] Are there small, well-defined areas? e.g.:
□ stairwells
□ recessed doorways or lockers
□ unlocked closets
□ elevators
□ others:_______________________________

Outdoors:
c] Are there small, confined areas where you would be hidden from view? e.g.:
□ unlocked equipment or utility shed
□ alley or lane
□ recessed doorway
□ construction site
□ others:_____________________________

9. Escape Routes [lets you assess whether or not there are ways to escape should there be an incident]
a] How easy would it be for an offender to disappear?
☐ very easy ☐ quite easy ☐ don’t know

b] How difficult would it be for you to escape to safety if you had to?
☐ very difficult ☐ quite difficult ☐ don’t know

10. Nearby Land Uses [lets you assess the impact of how the land is used as it relates to your comfort and safety]

a] What is the surrounding or nearby land used for?
☐ stores ☐ offices
☐ restaurants ☐ factories
☐ heavily treed/wooded area ☐ busy traffic
☐ parking lots ☐ river bank
☐ residential houses and streets
☐ don’t know
☐ other: ____________________________________________________________

b] Can you identify who owns or maintains nearby land? ☐ yes ☐ no

c] What are your impressions of nearby land use?
☐ very poor ☐ poor ☐ satisfactory
☐ good ☐ very good

d] Is the land use in the area changing?
________________________________________
________________________________________

11. Factors That Make the Place More Human [these questions let you assess whether or not the location is used or abused by people]

a] Does the place feel cared for?
☐ yes ☐ no
b] Does the place feel abandoned? □ yes □ no

c] What gives you that feeling?
________________________________________
________________________________________
________________________________________

d] Is there graffiti on the walls? □ yes □ no

e] In your opinion, are there racist or sexist slogans/signs/images on the walls? □ yes □ no

f] Are there signs of vandalism? □ yes □ no

g] Would other materials, tones, textures or colours improve your sense of safety? □ yes □ no

h] Other comments?
________________________________________
________________________________________
________________________________________

12. Maintenance [these questions help you tell if the area is well looked after and well used by people]

a] What are your impressions of maintenance? □ very poor □ poor □ satisfactory □ good □ very good

b] Is there litter lying around? □ yes □ no

c] Is there need for major repair? □ yes □ no

d] Do you know to whom maintenance concerns should be reported? □ yes □ no

e] From your experience, how long do repairs generally take? □ yes □ no

13. Overall Design [lets you express your overall feeling after you have looked at the site in detail]

a] Describe your impressions of the overall design:
□ very poor □ poor □ satisfactory □ good □ very good
b] If you weren’t familiar with the place, would it be easy to find your way around? □ yes □ no

c] Is the entry visible and well defined? □ yes □ no

d] Are public areas visually protected? □ yes □ no

e] Does the place make sense? □ yes □ no

f] Is the place too spread out? □ yes □ no

g] Are there a confusing number of levels? □ yes □ no

h] Other comments?
________________________________________
________________________________________

14. Social Concerns [replaced by Neighbourhood Crime]