ESC102H1

Request for Proposal

Improving Access Control in Low-Income Apartments in Downtown Toronto Using Entry Systems

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T301206

**Abstract**  
The purpose of this document is to request proposals for improving access control within Toronto Community Housing (TCH) mid and high-rise apartment buildings in the Kensington-Chinatown, University, and Bay Corridor districts.  
Toronto Community Housing is the largest social housing provider in Canada and the second largest in North America. It is home to approximately 164,000 low and moderate-income tenants housed in 2,215 buildings [1]. Due to the positive correlations between poverty, building height and poverty [2] [3], TCH tenants are four times as likely to be murder victims compared with the rest of Toronto population [4]. Surveys conducted by TCH reflect tenants’ concerns regarding security as well [5].  
Current building access controls consist of tenant entry systems in forms of either keys, magnetic stripe cards or radio frequency identification (RFID) cards.  These buildings also provide support for intercom devices in case of visitors. Emergency response personnel typically gain access through the use of a master key, but Toronto EMS has reported building access as the number one barrier to reaching patients [6].  
Any proposed design must consider the relevant stakeholders and consult their interest in this project. The relevant stakeholders are residents, TCH, City of Toronto, emergency response personnel, Toronto Police Services and surrounding neighborhood.  
The proposed designs must address three high-level objectives: allow access to wanted personnel, deter access to unwanted personnel, and notify security personnel in the event of an intrusion. In addition, the proposal must consider user safety, economy, accessibility and durability. Ultimately, the proposed design must improve the security of the community as outlined above by improving the access control of apartments.  
**References**  
**[1]**  
**[2]**  
**[3]**  
**[4]**  
**[5]**  
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**1. Introduction**

***1.1 Overview***

The Request for Proposal (RFP) addresses the need for improved security measures to eliminate the danger of intruders into residential buildings in the University, Bay Corridor and Kensington-Chinatown district located in the 52nd division of the Toronto Police.

Current systems are ineffective at advanced access control, as they are not strict enough to completely restrict undesired personnel from entering the building, but stringent enough to cause delays in emergency systems, namely EMS, in times of need for quick access. This RFP inquires for a system that will reduce the number of break-ins and assaults caused by intruders while increasing the ease of access from desired personnel. Security is an imperative element of a residential apartment that greatly influences the quality of life of its denizens. Improper or weak security measures in buildings threaten the safety of all the residents as it fails to prevent the infiltration of dangerous intruders.

There are heavy consequences associated with such an event, with the main one being the threatening of personal safety. Without security measures in place, intruders are free to assault individuals and steal property. On the materialistic side of the situation, the state of their belongings affects their emotions and thus their state of well-being [1] because of the history and experiences with the objects. Moreover, with the effect of robbery being equivalent to losing $35,000 to $52,250 [2], major psychological impacts on victims can stem from a single incident, damaging their mental health and impacting the flow of their lives.

***1.2 Definitions***

**Access Control**

The process of selectively restricting of access to a place or resource.

**Apartment**

A room or set of rooms fitted especially with housekeeping facilities and usually leased as a dwelling [9].

**Community**

A community is defined by the US National Library of Medicine as a group of people with diverse characteristics who are linked by social ties, share common perspectives, and engage in joint action in geographical locations or settings[4].  Our community of apartment dwellers in the TCH is unified by the geographical location, the low income status, and the common perspective on the problem of security

**High rise**

A high-rise building is a structure whose architectural height is between 35 and 100 meters. A structure is automatically listed as a high-rise when it has a minimum of 12 floors, whether or not the height is known[7]. If it has fewer than 40 floors and the height is unknown, it is also classified automatically as a high-rise.

**Need**

A need is defined by the University of Illinois as a requirement that an entity requires to live[3]. We defined the entity to be our community, which will require certain things to live, or interchangeably, sustain itself.

**Mid rise**

Buildings approximately 5 to 11 stories high[8].

**Personal Safety**

The definition consists of the amalgamation of two parts: Personal and Safety

*Personal*: This encompasses the individual in question as well as his/her belongings.  Belongings are identified as entities that are an extension of the person

*Safety***:**  The level of risk of exposure to hazards, which are in this situation, intruders

**Personnel**

**Desired Personnel**

These people consist of members of the community, including residents, staff, and emergency workers.

**Undesired**: Non-members of the community that pose a risk of negatively impacting the personal safety of members of the community.

**Quality of Life**

One’s quality of life is described by his or her well-being. Well-being is gauged by the following[5]. (Defined on page 843 of the cited document)

|  |  |
| --- | --- |
| Competence | Feeling senses of accomplishment |
| Emotional stability | State of being calm and peaceful |
| Engagement | Enjoyment of learning new things |
| Meaning | Feeling that doing things is valuable and worthwhile |
| Optimism | Optimistic about the future |
| Positive emotion | Happiness and contentedness |
| Positive relationships | Prevalence of caring people surrounding an individual |
| Resilience | Ability to recover from negative situations |
| Self esteem | Level of positive feelings toward oneself |
| Vitality | Amount of energy within oneself |

**Security**

The magnitude of the barrier protecting and maintaining personal safety

**Technicalities of words suggesting imperativeness or optionality**

Listed below are definitions distinguishing the differences between must and should, which are taken from the Internet Engineering Task Force (IETF) and correspond to standard definitions used in legal documents.

|  |  |
| --- | --- |
| Must | This word, or the terms "REQUIRED" or "SHALL", mean that the definition is an absolute requirement of the specification[6]. |
| Must Not | This phrase, or the phrase “SHALL NOT”, means that the definition is an absolute prohibition of the specification[6].  Contrary to must, the subject being asked for absolutely cannot be included in order to fulfill the premise |
| Should | This word, or the adjective "RECOMMENDED", mean that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.[6] |
| Should not | This phrase, or the phrase "NOT RECOMMENDED" mean that there may exist valid reasons in particular circumstances when the particular behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label [6] |

**2. Framing the Problem**

This section will discuss the community identified, its needs, and discuss the formulated problems statement as well as the stakeholders involved.

***2.1 Delineating the Community***

The community consists of the tenants of high-rise apartments belonging to the Toronto Community Housing Corporation (TCHC) in the Kensington-Chinatown, University, and Bay Corridor districts. These districts are bounded by Bloor St. on the north, Spadina Ave. on the west, Yonge St., on the east, and on the south, it is bounded by Front street east of University Ave., Queen St. west of University Ave [10].  The community includes both low-income and medium income residents in need of affordable housing [11] [12]. More specifically, the apartments in question are located at 341 Bloor St., 111 Chestnut St., 25 Elm St., 127 St. Patrick St., and 248 Simcoe St. [13] with these communities experiencing a major amount of crime: in break and enters in 2011 alone, they rank 2nd, 8th, and 10th out of the 140 districts of Toronto [10]. Toronto as a whole had 2,906 apartment break-ins reported in 2011[31].

***2.2 Identifying the Needs***  
Access control in low-income high-rise apartments is a major issue affecting the quality of life of tenants. This can be broken down into two sections:  
        A. Access to buildings by undesired personnel  
        B. Access to buildings by wanted personnel

**A.**     **Access to buildings by undesired personnel**

Firstly, access to buildings by unwanted personnel disturbs and damages a positive quality of life. In a 2010 survey conducted by the City of Toronto on affordable housing, one of the major issues besides the presence of more housing was security and safety in one’s home [15]. Another survey conducted by TCH in 2012 indicated that tenants perceived that safety and security of their residences was an area which needed improvement, with 65% of 1108 participants mentioning this issue. [16] These wishes echo the increased probability of crime in community housing: TCH tenants are four times more likely to be murder victims in comparison to the rest of Toronto’s population [17]. All of these factors caused tenants to be unsatisfied with their building, lowering their happiness in relation with their living quarters.

On a general level, there are numerous studies as to the negative effect of break-ins on happiness, a quality of life factor. One study cites that a burglary drops happiness by 0.14 on a 5 point scale, while another has residents rating crime as one of the major contributions to negative mental well-being, and safety being a high contribution to positive mental well-being [2] [18].  In all cases, residents regard safety against unwanted intruders as a large part of their well-being.

**B.**     **Access to buildings by wanted personnel**

Secondly, access to buildings by needed personnel is also a major factor in positive quality of life. More specifically, the ability for emergency services to respond to medical emergencies in a timely manner is meant to improve the health of the community [19]. Studies show that fast response times are heavily correlated to survival in medical crises [20] [21], where response times under 4 minutes had noticeable survival benefits [22]. However, in a case study of 40 apartment buildings, access control comprised 67.6% of the access barriers [21]. The effects of this can be seen in a case study of Singapore, another metropolitan area, where high-rises increased EMS response time twofold [23]. In each case, improved access control would be able to greatly benefit the quality of life by decreasing EMS response time.

**2.3 Description and specifics of the problem**  
In order to approach this problem, this RFP proposes the following problem statement:  
“Improve apartment entry systems to facilitate access control in Toronto Community Housing mid and high-rise apartments in the Kensington-Chinatown, Bay Corridor, and University districts.”  
  
The choice of community and geography has been explained earlier in this section. However, note that the improvement areas are left to the design team, so that the scope of the problem is not beyond the target audience of this RFP. Some problem details will be discussed in the following sections.  
A: Unintended Access by Undesired Personnel  
One of the easiest methods of getting into an apartment is simply by following a tenant in. Due to the method of allowing access i.e. opening the door for a period of time, it is quite easy for an outsider to enter. As a result, police as well as various apartment associations warn tenants of this danger [24] [25]. The authors themselves were able to gain access to the interior of several TCH buildings during investigation of access systems using this method, witnessing several residents willing to open the door for them. This is a user error issue that should be considered in the solution.  
B: Unintended Hindrance of Wanted Personnel  
        As has been discussed in section 2.3, the response time of EMS in apartment buildings is hindered by a variety of factors, one of which is access control. [21]. The issue of EMS response time in high-rise apartments is largely attributed to elevators; however, access control is also a common factor, more specifically, the lack of an entry code for EMS [21]. In one case study, it caused a minimum of 30s of delay in response time, with a median of 1.8 minutes in tandem with other factors[26]. This factor, in tandem with elevator wait times in high rise buildings, is a huge factor in long EMS response time.  
  
***2.4 Stakeholders***  
The proposed problem and its resolution will affect many stakeholders; many of which are closely related either geographically or through other proprietary factors. The following list of stakeholders are ranked from most affected to least affected based on the following factors:

1. Degree of physical interaction with target locations:  
   Here we consider the people who physically interact with the issues dealt with by this design problem on a regular basis.
2. Monetary and other proprietary factors  
   Here we deal with materialistic factors, such as money spent on the issue, amount of resources wasted or lost due to deficiencies, etc.
3. Indirect economic and social factors  
   Here we consider the population who are affected through indirect and submerged ways through social and economical mediums.

**2.2.1 Residents**The crimes committed within these apartments directly impact the safety of the residences in the apartments.  A survey done by the Toronto Community Housing organization shows building safety and security is the second highest in the category of "Very Dissatisfied".  [16] Aside from the notion of safety of the residents, the implementation of a more secure entrance will also affect them economically.  The implementation of surveillance devices are expensive, but yet at the same time “the equipment seemed to do little to alleviate anxiety about crime.” [27] The implementation of a better physical crime-prevention method is needed.    
**2.2.2 Building Management and Rental Control**Rent control is responsible for regulating rents and prevent unreasonable price increases, installing additional security measures cost a lot of money, and if residents refuse to pay, additional security measures cannot be installed.  The funds may develop into further legal and relationship issues with the tenants due to the rent increase.[27]The damages done by criminals due to unauthorized entry is a large monetary and proprietary impact to the owners and managers of these apartments.  An improved system to further reduce unauthorized access beyond the existing system can drastically reduce these damages.  
**2.2.3 Toronto Police Service**The police services of Toronto exist for the purpose of keeping the city a safe.  They are dedicated to solving and preventing crimes.  [5]  Improvements to access control systems will significantly improve the ease of zoning procedures and reduce crime rates in general to reduce the amount of work the police forces need to spend due to insufficient access control.  
**2.2.4 Toronto Community Housing and the City Council**The City Council is responsible for organizing and allocating funds for community wide projects.   The city council currently spends more than $24 million and $1,175 on health, safety, and repairing goods.  [28] Improvements or worth replacements to the current access control and security systems will help to lower the budget needed from the city.  Closely tied to the issue along with the City Council is the organization Toronto Community Housing, who is responsible for providing services and affordable housing to the residents of the city. [29]      
**2.2.5 Emergency Accesses Personnel**Professional personnel who require immediate or emergency access to these apartment buildings may be limited by existing entry security systems due to the inabilities of existing designs to accommodate and distinguish between more than the residents and strangers.  In a case study of 40 apartments, inefficiency and poor design of access control comprised of 67.6% of the access barriers. [21] Improvements to the existing system to provide easier access to these emergency services where fast response time is critical will be of utmost importance.[21]  
  
**2.2.6 Surrounding neighborhood**The issue of high crime-rates and its solutions affect the neighborhood around the targeted apartments on economical and social levels.  Locations near high crime-rate apartments also begin to experience an increase in crime-rate.[31]  Not only does this endanger the surrounding neighborhoods, it severely impacts the economy of the area and give the place a bad name.  This is a conflicting notion that causes a negative cycle.  Rent must rise due to the need of increased security measures; tenants who cannot afford a higher rent will have to move out, but people who are able to pay for the increased rent may not want to move in due to the already existing high crime-rate. [27] A better way to stop unauthorized entry is needed soon to end this vicious cycle.

**3 Engineering Design Philosophy**

Our engineering design philosophy lies primarily in maintaining the quality of life of the members of the community of apartment buildings: the residents and staff. We stress that security, safety and cost is of the utmost importance to the members of the community. As a secondary accessory to psychologically maintaining the agreeable quality of life of individuals, we marked the importance of fluid entrance and egress of desired personnel.

**4. Reference Design**  
Typical apartment access control systems consist of a tenant entry system and a visitor entry system, both of which are vitally important in maintaining the quality of life of the community.  
There are three common access methods for tenants: key, magnetic stripe card, and radio frequency identification card (RFID). Keys have slowly been replaced by magnetic cards due to their ease of use, and currently magnetic cards are slowly being phased out in favour of RFID[32]. In the five apartments within our community, four of them uses RFID entry system. Not only do RFIDs act at a distance, they are technically more difficult to duplicate and thus present a safer means for residents to gain access to their buildings. The principle behind RFID is very simple: an integrated circuit containing a transponder is embedded within the card, which when placed in close proximity to the card reader, responds to signals emitted by the reader and in turn sends out specific identification information. The information is processed, compared with known values and the electromagnetic lock on the door is automatically unlocked. Apartments typically use a type of RFID called Active Reader Passive Tag system, where the tag (or transponder) is a passive element that is not connected to a power source. Instead, its powers come from the electromagnetic signals the reader sends out, which is why it must be placed in close proximity to the reader for the transponder to function properly. However, these systems have an inherent security fault that enables tag cloning. Many have shown that it is very easy to create your own portable reader and simply placing it a few inches from the RFID cards would be enough to trick them into sending their identification information [33], [34], [35]. This poses a serious security concern that must be addressed.  
Visitor access controls are virtually all implemented by an intercom system similar to that of a telephone directory, where the visitor would be able to browse and call the owner via telephone, where authorization would be granted in the form of a pressed telephone key, which will unlock the door for the visitor. However, this system is vastly outdated, having been in use since the 1950s [37]. A variety of simple hacks have been proposed that will grant building access to any person, compromising the security of these buildings [38].  In addition, tenants have raised privacy concerns due to the fact that the building directory contains names all tenants with their address and/or telephone number, which they may not wish to share with others [39]. In reality, many visitors inevitably choose to simply wait outside the lobby until a tenant is either entering or exiting the building. There is no security measure against visitors entering the building this way and it renders the visitor entry system ineffective.  
Despite the obsolescence of keys, this type of access is still retained in most cases for emergency response personnel. However, as outlined in Section 2.3 this method is extremely ineffective, often leading to grave consequences. Unlike firefighters, EMS personnel do not have access to a master key, and this often causes unnecessary delays in life-or-death situations.   
**High-level Objectives**  
The objectives are three-fold:

1.      Grant easy access to those that should have access to the building, such as tenants, visitors and emergency response personnel

2.      Reduce the likelihood and vulnerability of an intrusion, by decreasing the real or apparent opportunities, and increasing the perceived risk of apprehension and penalty

3.      In the case of an intrusion, detect and notify security personnel and minimize damage.

**Detailed Objectives, Criteria and Constraints**

|  |  |  |
| --- | --- | --- |
|  | Criteria | Constraints |
| Number of intrusions within community of apartments | ·         Annual Statistics Report by Toronto Police Service and TCHC Statistics [40] (metric: number of intrusions and crimes, lower is preferred) | Must be lower than current levels |
| Access times | ·         Average time spent per tenant and visitor from arriving at building to opening of door (metric: time, lower is preferred)  ·         Toronto Emergency Medical Services response time interval and time to first defibrillation [21] (metric: time, lower is preferred) | Must be lower than current levels |
| System installation | ·         Amount of time required for installation (metric: time, lower is preferred)  ·         Amount of money spent on installation, including labour and parts (metric: amount in CAD, lower is preferred) | Must be modular, must not require rewiring building [41] |
| Durability of system | ·         Number of system maintenance or malfunctions per fiscal year         Resistance to vandalism  ·         May implement a redundancy system (metric: presence) | Must be lower than current levels Must comply with EN 62262 [42] |
| Minimize costs | ·         Amount of money spent on purchasing and operating the system (metric: amount in CAD, lower is preferred) | Must not exceed TCHC annual budgets |
| Ensure safety of users | ·         Compliance with applicable codes and standards (metric: compliance) | Must comply with applicable codes and standards, including but not limited to ISO/TR 10476:1990 and the Ontario Building Code [43] [44] |
| Tenant perceived security level | ·         Mean response computed through 4-point system under the question “Perceptions of Overall Safety” in the annual Toronto Community Housing Tenant Survey [16] (metric: percentage of response) | Must be higher than current level |
| Accessibility | ·         Compliance with City of Toronto Accessibility Design Guidelines [45] (metric: compliance) | Must comply with City of Toronto Accessibility Design Guidelines |

Appendix A: Information about specific buildings

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Complex Name | Address | Tenant Security \* | Apartment Info | Relevant Picture |
| Senator David A. Croll Apartments | 341 Bloor St. W, Toronto, Ontario, M5S 1W8 | RFID + Voice Buzzer System | Floors: 18 above ground, 3 below ground  Constructed in:  1968[46] | Overall Picture:  Figure A1  Security System Pictures:  Figures A2 - A3 |
| 111 Chestnut Street | 111 Chestnut Street, Toronto, Ontario, M5G 2J1 | RFID + Voice Buzzer System | Floors: 15  Constructed in 1987[47] | Overall Picture:  Figure A4  Security System Pictures: Figure A5 |
| 25 Elm Street | 25 Elm Street., Toronto, Ontario, M5G 2G5 | RFID + Voice Buzzer System | Floors: 16  Constructed in 1985[48] | Overall Picture:  Figure  A6  Security System Pictures: Figures A7 – A8 |
| Simcoe – St. Patrick Apartments. | 127 St. Patrick Street,Toronto, Ontario, M5T 2C1 | RFID + Voice Buzzer System | Floors: 13  Constructed in 1991[49] | Overall Pictures:  Figure A9 –A11  Security System Pictures: Figures A12 – A13 |
|  | 248 Simcoe Street, Toronto, Ontario, M5T 3B9 | RFID + Voice Buzzer System | Floors: 13  Constructed in 1991[49] |  |
| 22 McCaul Street | 22 McCaul Street, Toronto, Ontario, M5T 3C2 | RFID + VoiceBuzzer System | Floors: 11  Constructed in 1991[50] | Overall Pictures:  Figures A14 – A15  Security System Pictures: Figures A16 |
| \* - Security Type determined by on-site inspection |  |  |  |  |

Captions for figures:

Figure A1: The main entrance of Senator David A. Croll Apartments

Figure A2: The secure entrance door for Senator David A. Croll Apartments, with the buzzer system on the left.

Figure A3: The RFID detector for Senator David A. Croll Apartments

Figure A4: An overview of 111 Chestnut St. (http://www.torontohousing.ca/tchc/webfm\_send/3048)

Figure A5: The buzzer system for 111 Chestnut St.

Figure A6: An overview of 25 Elm St. (<http://www.torontohousing.ca/tchc/webfm_send/1285>)

Figure A7: The buzzer system for 25 Elm St.

Figure A8: The RFID detector for 8 Elm St.

Figure A9: An overview of the Simcoe – St. Patrick Apartment Complex, Simcoe St. view

Figure A10: The entrance to the Simcoe – St. Patrick Apartment Complex at 248 Simcoe St.

Figure A11: The entrance to the Simcoe – St. Patrick Apartment Complex at 127 St. Patrick St.

Figure A12: The buzzer system of Simcoe – St. Patrick Apartment Complex, identical for both entrances

Figure A13: The RFID system of Simcoe – St. Patrick Apartment Complex, identical for both entrances

Figure A14: An overview of 22 McCaul St.

Figure A15: The entrance to 22 McCaul St.

Figure A16: The buzzer and RFID system of 22 McCaul St.

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