

Walkability and Anti-Terrorism/Force Protection:
Understanding the relationship and how it can work on the United States Air Force's Main
Operating Bases

Andrew S Fenner

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Committee:

Daniel Abramson, Chair

Christopher Campbell

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University of Washington

Abstract

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Andrew Fenner

Chair of Supervisory Committee:
Associate Professor Daniel Abramson

United States Air Force bases are mandated to be both walkable as well as defensible (AT/FP, Anti-Terrorism/Force Protection). These two concepts are, however, often in conflict, with walkability being understood as needing density and proximity of buildings and AT/FP driving buildings apart. This issue is compounded by the need for resilience and fitness within the military force and protection of its people. This thesis focused on two research questions: how does walkability relate to anti-terrorism/force protection, and how is that relationship understood in the Air Force?

The thesis first investigated what comprised each concept through an in-depth literature review. Then, using resultant design principles, the two concepts were cross-examined to understand how they relate. Additionally, a series of interviews were completed with Subject Matter Experts (SMEs) at the Air Force headquarters level in the career fields of Planning, Engineering, and Anti-Terrorism. The interviews were then analyzed to reveal how they interpreted the two concepts and their relationship. These results were then compared with the findings of the literature review cross-examination.

Walkability and AT/FP do overlap across all respective principles. This was prominent with principles such as Vehicle Defense and Visual Interest. These results differed, however, from the results of the interviews where the SMEs viewed the concepts of Walkability and AT/FP more narrowly than the literature does, which coincided with a narrower view of their overlap. The most noted overlaps were that of Compact/Campus Development styles that provide positively for Walkability and AT/FP.

Remarks

First and foremost, I would like to thank my wife, Hattie Fenner, for her unwavering support throughout the process of this paper and the year-and-a-half master's program. She has been there to bounce off ideas and proofread more times than I can count, let alone supporting me as a husband and friend. I would also like to thank my parents, Peg and Greg Fenner, for pushing me to pursue my passions in the military and academically; I would not be where I am today without their guidance. I would also like to acknowledge those whom I have worked with and for professionally; Lt Col Jonathon Byrnes, Mr. Ian Taylor, Mr. Walt Graves, and Lt Col Brandon Sokora. They all pushed me to be the best I could be as well as supported my ambitions to pursue this master's degree, more than they know!

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Chapter 1: Introduction

In 2014, the Department of Defense (DoD) launched the Healthy Base Initiative (HBI) as part of Operation Live Well (OLW), an effort across all branches of the United States military, “to make ‘healthy living the easy choice and the norm for service members, retirees, DoD civilians, and their families.’”¹ However, one of the initiative’s key focus areas, active living, comes into direct conflict with one of the DoD’s most potent design guidelines: Anti-Terrorism/Force Protection (AT/FP). Since the Khobar Towers attack in Saudi Arabia on 25 June 1996, the Department of Defense has prioritized the defensive design of its installations over quality of life, sacrificing the walkability of its installations in order to create “safe” distances for its facilities from threats,



*Figure 1: Khobar Towers after attack. From Department of Defense Archive.
<https://archive.defense.gov/photos/newsphoto.aspx?newsphotoid=324>*

oftentimes over 100 feet between a building and the nearest road. There is no doubt the Khobar Towers attack was vicious, with terrorists using a massive truck bomb (see figure 1²), detonating next to a military residential complex, and killing 19 Air Force service members.³ The DOD’s

¹ “Healthy Base Initiative: Executive Summary.”

² Department of Defense, “Khobar Towers.”

³ Major Murrey, “Khobar Towers’ Aftermath: The Development of Force Protection.”

response, however, was focused heavily on physical defense, settling on a series of 17 Unified Facilities Criteria (UFC) publications on security.⁴ Between publications like *UFC 4-101-01 Minimum Antiterrorism Design for Buildings* and *UFC 4-020-01 DoD Security Engineering Facilities Planning Manual*, the DOD began to focus on hardening structures and creating distance between buildings and threats. One statement made in the *Planning Manual* drives this point home; “where land is available the least expensive way to provide protection against explosives is to maximize the standoff distance.”⁵ This single statement has driven bases to be less walkable by putting the focus on cost-effective defense over the benefits of connection.

Change, however, has come with HBI pushing better-designed bases as well as a critical modification of *UFC 4-101-01 Minimum Antiterrorism Design for Buildings* to reduce standoff distances from roads to buildings from a minimum of 82 feet to a new minimum of 20 feet today.⁶ This new focus and drastic change open an opportunity to redesign military installations for walkability. What remains to be seen is how walkability fits into AT/FP design, and what understanding exists of how to do so.

The push for healthier, walkable bases cannot be done lightly. While the new minimum distances allow for more walkability, anti-terrorism/force protection remains vital to facility design. What is missing is the understanding of walkability and its relationship to the DoD’s AT/FP standards. The two concepts are stated as “not mutually exclusive” within *UFC 4-020-01 DoD Security Engineering Facilities Planning Manual*; however, no explanation is given to how they can work

⁴ Department of Defense, “Unified Facilities Criteria (UFC).”

⁵ Department of Defense, “DoD Security Engineering Facilities Planning Manual.” 4-2.

⁶ Department of Defense, “DoD Minimum Antiterrorism Standards for Buildings.” 59.

together. AT/FP design is often at the forefront of considerations for new facilities, with walkability taking a back seat. Once the design is determined to be safe, aspects such as walkability are then examined to see how they fit in the design.

Additionally, communicating the relationship between walkable design and AT/FP design is difficult between those involved in facility and base planning. In the Air Force, Security Force's Anti-Terrorism Officers (ATOs) determine the threat level and focus on the base's security while the Civil Engineer's Community Planners are pushed to focus on compact development and sustainability. The two parties then often run into conflict without a transparent dialogue and shared understanding to move forward with.

In the past, the United States military has discussed walkability and anti-terrorism/force protection independently. *UFC 2-100-01 Installation Master Planning, with Change 1* requires compact development and sustainability without discussing how that is to relate to AT/FP standards. *UFC 4-020-01 DoD Security Engineering Facilities Planning Manual* requires facilities to be built with standoff distances that push buildings apart without discussing how that is to relate to compact development and sustainability.

The purpose of this thesis is to build a foundation of understanding of how walkability and anti-terrorism/force protection interact and then how that interaction is understood in the United States Air Force. The thesis is therefore centered around two research questions; how does walkability relate to anti-terrorism/force protection, and how is that relationship understood in the Air Force? To answer those questions, the thesis begins with a literature review of the principles of each walkability and base security, progressing to a comparative analysis of how the two intersect. Then an interview of functional Subject Matter Experts in Comprehensive

Planning, Security Engineering, and Anti-Terrorism/Force Protection is codified into themes.

The results of the interviews are compared to the results of the literature review to build a foundation for the relationship between walkability and AT/FP. The thesis provides a direction for further investigation on designing Air Force bases for the future by using this foundation.

Chapter 2: The Relevance of Walkability and Anti-Terrorism/Force Protection to Planning and How They Relate.

Introduction

Walkability and Anti-Terrorism/Force Protection (AT/FP) are not merely suggestions within the Department of Defense (DoD); they are required through multiple Unified Facility Criteria (UFC). *UFC 2-100-01 Installation Master Planning with Change 1* requires walkability while *UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings* and *UFC 4-020-01 Security Engineering Facilities Planning Manual* require AT/FP (see figure 2⁷). The problem, however, is that they do not discuss how to work together.

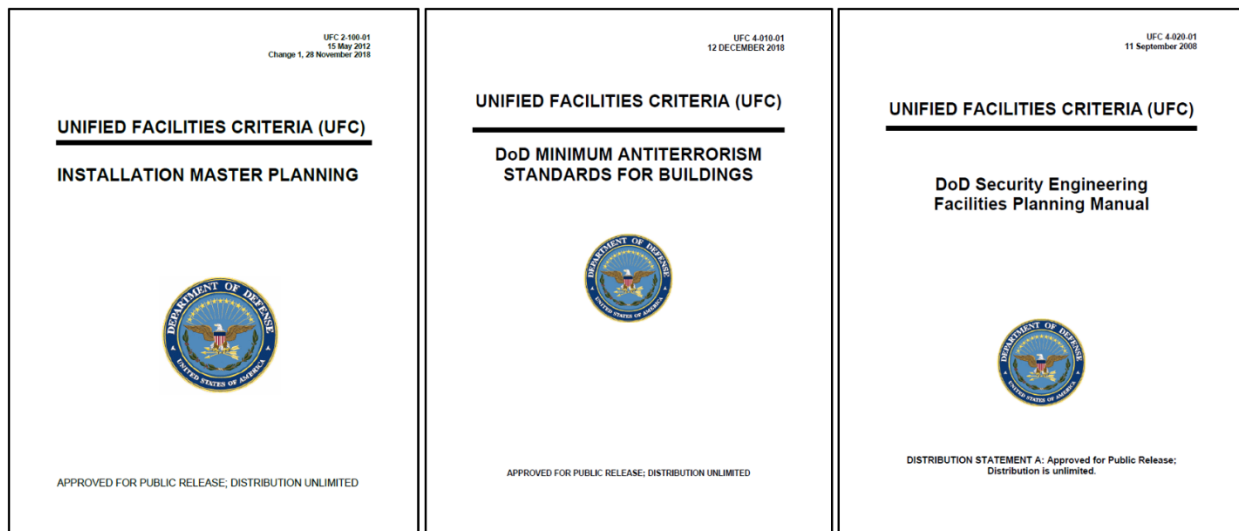


Figure 2: The UFCs associated with AT/FP and Walkability. From *Whole Building Design Guide*.
<https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc>

UFC 2-100-01 Installation Master Planning with Change 1 is intended for installation planners.

The purpose of the UFC is “to prescribe the DOD minimum requirements for master planning

⁷ Department of Defense, “Unified Facilities Criteria (UFC).”

processes and products in accordance with the DOD instruction.”⁸ In other words, this UFC provides the principles and guidance for planners to operate under and how to complete the process effectively. Within the guidance, the UFC discusses ‘anti-terrorism’ only five times; this is in comparison to discussing ‘walking’/‘pedestrian’ 64 times and ‘sustainable’ 37 times.⁹

UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings is for engineers and anti-terrorism personnel with the intent of “reduc[ing] collateral damage and the scope and severity of mass casualties in the event of a terrorist attack.”¹⁰ The purpose of this UFC is “to establish minimum engineering standards that incorporate antiterrorism (AT) based mitigating measures where no identified threat or level of protection has been determined...”¹¹ This UFC sets a baseline of anti-terrorism measures that are used to build a comprehensive defense. *UFC 4-020-01 Security Engineering Facilities Planning Manual* then determines if the standards supplied in this UFC are enough, or if more stringent standards are needed. Within the guidance, the UFC discusses ‘anti-terrorism’ 51 times; this is in comparison to discussing ‘walking’/‘pedestrian’ 15 times and ‘sustainable’ 1 time.¹²

UFC 4-020-01 Security Engineering Facilities Planning Manual is intended for installation planners and facility planning teams. The purpose of the UFC is “to develop appropriate, effective, unobtrusive, and economical protective designs to a level appropriate for project programming and to provide commanders with the information they need to allocate

⁸ Department of Defense, “Installation Master Planning with Change 1.” 1.

⁹ Department of Defense.

¹⁰ Department of Defense, “DoD Minimum Antiterrorism Standards for Buildings.” 1.

¹¹ Department of Defense. 1.

¹² Department of Defense.

resources.”¹³ The purpose of this UFC is “to support [the] planning of projects that include requirements for security and antiterrorism.”¹⁴ Within the guidance, the UFC discusses “anti-terrorism” 107 times; this is in comparison to discussing ‘walking’/‘pedestrian’ 2 times and ‘sustainable’ 5 times.¹⁵

Outside of the Department of Defense, this topic has been lightly discussed. There do exist articles loosely on the topic like *FiveThirtyEight*’s “How Anti-Terrorism Design Can Also Make Cities More Livable,” which discusses how anti-terrorism designs have been incorporated into the urban fabric through good design.¹⁶ There are also city and regional plans that discuss incorporating anti-terrorism into urban design like the DC Capital Region’s “The National Capital Urban Design and Security Plan,” which goes to great lengths to discuss anti-terrorism’s role, albeit locally to specific site plans in the United States Capitol.¹⁷ What exists on this topic now is either opinion pieces, local design, or separately focused on Walkability or AT/FP, but not a comprehensive approach.

More specifically to this thesis, an understanding of the governing documents within the Air Force and Department of Defense is essential. These documents lay the groundwork for what is required and encouraged on military installations and are therefore what truly matters to the built environment in these locations. This is where the background must begin to understand the

¹³ Department of Defense, “DoD Security Engineering Facilities Planning Manual.” 1-1.

¹⁴ Department of Defense. 1-1.

¹⁵ Department of Defense.

¹⁶ Barry-Jester, “How Anti-Terrorism Design Can Also Make Cities More Livable.”

¹⁷ The National Capital Planning Commission, “The National Capital Urban Design and Security Plan.”

relevance of Walkability and AT/FP within the Department of Defense and, more specifically, the Air Force.

The Department of Defense and Walkability

The importance of walkability to the DoD has been growing steadily over the last few years. The DoD updated the master planning UFC in 2012 and released results of the Healthy Base Initiative (HBI), a demonstration project part of the more extensive Operation Live Well, in 2015. The new UFC contains ten overall planning strategies, of which two are Sustainable Planning and Healthy Community Planning, both of which push for a more walkable environment.¹⁸ HBI contains multiple focus areas of which Active Living is one, an area that is profoundly attentive to the need for more walkable communities.

¹⁸ Department of Defense, "Installation Master Planning with Change 1." 5.

Healthy Base Initiative

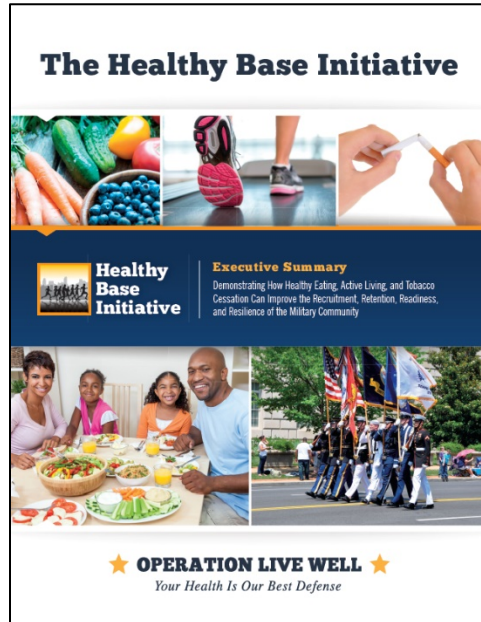


Figure 3: The Healthy Base Initiative. From MilitaryOneSource.
<https://download.militaryonesource.mil/12038/MOS/Reports/BPC-HBI-ExecutiveSummary.pdf>

As said earlier, the Healthy Base Initiative is part of the Department of Defense’s Operation Live Well (see figure 3¹⁹). It was a demonstration project meant to inform long-term policy generation.²⁰ The overall program was created to address the growing threat to what the DoD calls the four “R”s: Recruitment, Readiness, Resiliency, and Retention.²¹ Recruitment has become an issue as 27% of recruits do not meet the DoD’s weight standards. Readiness and Resiliency have been impacted by a large number of med-evacuations from Iraq and Afghanistan routinely from ankle sprains with overweight individuals posing a higher risk. On the back end of military careers, Retention is being impacted as the most significant number of involuntary

¹⁹ “Healthy Base Initiative: Executive Summary.” 1.

²⁰ “Healthy Base Initiative: Executive Summary.” 2.

²¹ “Healthy Base Initiative: Executive Summary.” 2.

separations are due to failed weight standards.²² To address these issues, HBI took on five programs: Healthy Eating, Active Living, Health and Wellness, Schools, and Tobacco.

The Active Living program focused on the difficulty of living an active lifestyle in the United States' military installations. The program comprised of 4 categories; the built environment, active transport, enhanced fitness facilities, and comprehensive programming with coaches. The built environment category used an assessment tool (survey to installation planners) to determine how the installation's built environment encouraged or discouraged physical activity.²³ The active transport category focused on how the existing built environment could be taken advantage of more for physical activity; for example, a program that encouraged stair-use in DoD buildings.²⁴ The last two categories explicitly focused on fitness center use by making the hours of operation more accessible and providing more coaching interventions.²⁵

The results of the Healthy Base Initiative revealed a need for better bases in the DoD, with the report saying, "To better market health and wellness programs, health and wellness goals need to be more closely tied to DoD's overall mission."²⁶ This reflection is critical as it shows the understanding that health and wellness cannot be a stand-alone program, much like walkability, but rather it must be associated and understood from a mission level viewpoint. The Active Living program officially revealed what most already know: our bases are not conducive to walkability. The report states that "Installation layouts are designed for the automobile,"²⁷ and,

²² "Healthy Base Initiative: Executive Summary." 2.

²³ "Healthy Base Initiative: Executive Summary." 6.

²⁴ "Healthy Base Initiative: Executive Summary." 7.

²⁵ "Healthy Base Initiative: Executive Summary." 7.

²⁶ "Healthy Base Initiative: Executive Summary." 17.

²⁷ "Healthy Base Initiative: Executive Summary." 20.

“...simply promoting physical activity will not, by itself, result in needed changes – the built environment needs to be addressed as well.”²⁸ HBI revealed and, more importantly, put in writing that a “band-aid” fix was not going to be enough to change the DoD’s installations, more comprehensive effort is needed. Additionally, the results noted that commanders needed more appropriate resources to accomplish the active living portions of their master plans, explicitly calling out the lack of funding for pedestrian and bike projects.²⁹ Lastly, the results noted the need for food, fitness, and active recreation to be better located on installations to better serve the local populations.³⁰

The Healthy Base Initiative was the first step for the Department of Defense to recognize what the force needs. It identified significant shortfalls in the built environment that will need to be addressed. This report, coupled with the UFC on master planning, will guide the DoD’s efforts towards walkability.

UFC 2-100-01 Installation Master Planning with Change 1

UFC 2-100-01 Installation Master Planning with Change 1 is the highest guidance that planners have in the Department of Defense and calls explicitly for walkability in its planning strategies. The UFC sets out ten total planning strategies, of which two pay particular attention to walkability: Sustainable Planning and Healthy Community Planning and Defensible Planning.³¹

²⁸ “Healthy Base Initiative: Executive Summary.” 21.

²⁹ “Healthy Base Initiative: Executive Summary.” 21.

³⁰ “Healthy Base Initiative: Executive Summary.” 22.

³¹ Department of Defense, “Installation Master Planning with Change 1.” 5.

Sustainable Planning in the Department of Defense is characterized as “lasting” development, with the UFC defining it as “meeting present mission requirements without compromising the ability of future generations to meet their needs.”³² This differs from traditional definitions of sustainability only in its addition to the ‘mission’. This is important, however, as the UFC makes it clear that the mission is central to the importance of sustainability. Therefore, the components of sustainable planning must put the mission first in order to be successful. For this thesis, a portion of the sustainable planning components will be discussed that have the most significant effects on planning in the built environment. The first of those components is compact development. The UFC describes this as a mixed-use development that encourages active transportation through higher densities and an integrated street network. This section does, however, note that the development should have “...minimal spacing between buildings while maintaining consideration of AT requirements...”³³ While this section notes the need for anti-terrorism defense, it does not state how that can be accommodated or what the effects of AT standards may be. The next two components are horizontal and vertical mixed-uses, horizontal referring to multiple buildings and vertical as applicable to a single facility. Horizontal mixed-use is emphasized as a “campus” style of development where compatible uses are combined into areas that are defined by a 10-minute walking radius.³⁴ Vertical mixed-use is emphasized as combining compatible uses into a single building; however, this may be difficult as funding for each tenant may come from different sources.³⁵ In either of these components, there are no references to how these can be achieved within AT/FP regulations. Another component

³² Department of Defense. 5.

³³ Department of Defense. 6.

³⁴ Department of Defense. 6.

³⁵ Department of Defense. 7.

mandated is connected transportation networks. This component consists of multi-modal requirements for roads, sidewalks, and bikeways. This component discusses strategies such as integrated walkways and bikeways (very similar to complete streets, although not explicitly called out), avoidance of cul-de-sacs, as well as integrating the installation access gates into the network.³⁶ Two additional components worth mentioning are multi-story construction and building orientation/configuration. Both are contributors toward walkability, and multi-story buildings are noted for their reduction in buffers for AT/FP.³⁷ This is due to each building needing standoff, and therefore if buildings are combined into multi-story facilities, there are fewer buildings that need it. The building orientation/configuration component did not mention AT/FP or walkability, even though it can affect both.

The Healthy Community Planning strategy directly speaks to the issues brought forth in the Healthy Base Initiative and is a strategy driven by an installation's health representatives.³⁸ Additionally, this strategy goes hand in hand with components of Sustainable Planning. Out of the plan's three components, two are specifically about pedestrians and bikes. One component is specific to the design characteristics that boost walkability, noted as "[h]igh connectivity, mixed land uses, and well-designed pedestrian and bicycle infrastructure..."³⁹ The second component calls for pedestrian and bicycle plans to create continuous networks that link origins and

³⁶ Department of Defense. 7.

³⁷ Department of Defense. 9.

³⁸ Department of Defense. 13.

³⁹ Department of Defense. 13.

destinations. It emphasizes the need for identifying key destinations and connecting them with safe pathways.⁴⁰

The Department of Defense and Anti-Terrorism/Force Protection

The Department of Defense relies on a series of Unified Facilities Criteria to govern how the branches carry out anti-terrorism/force protection design. Principal among them are *UFC 2-100-01 Installation Master Planning with Change 1*, *UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings*, and *UFC 4-020-01 Security Engineering Facilities Planning Manual*.⁴¹

The *Installation Master Planning* UFC speaks to the issue generically, the *Minimum Anti-terrorism Standards* speak to engineering, and the *Security Engineering Facilities Planning Manual* is a hybrid of the two.

UFC 2-100-01 Installation Master Planning with Change 1

UFC 2-100-01 Installation Master Planning with Change 1 contains planning strategies on Sustainable Planning and Healthy Community Planning, but it also delineates a specific strategy for Defensible Planning. The UFC, however, does remain vague on how to employ said defense. The UFC declares clearly that, “Military installations must be safe and secure in order to operate effectively and efficiently.”⁴² This emphatic statement is, however, backed up with little more than, “The master plan must incorporate UFC 4-010-01...” with an additional nod that these defensive measures, “may impact master plans.”⁴³

⁴⁰ Department of Defense. 13.

⁴¹ Department of Defense, “Unified Facilities Criteria (UFC).”

⁴² Department of Defense, “Installation Master Planning with Change 1.” 13.

⁴³ Department of Defense. 14.

The UFC does establish the responsibility of the Antiterrorism Officer (ATO) as the individual that creates the Design Basis Threat (DBT). This DBT is installation-specific and calls out the specific threats to that installation to be designed against when planning or completing facility design. Specific to planning, the UFC calls out, “The DBT may drive consolidation of parking areas, parking garages, pedestrian-only areas, and the consolidation or dispersal of critical assets.”⁴⁴ The implication of this statement on walkability is prodigious, yet not discussed in further detail. Finally, the defensible planning strategy ends with a recommendation for the Installation Planner to coordinate with the ATO early in the planning process to properly incorporate the anti-terrorism requirements for the installations. It notes that these requirements should be “incorporated into Master Plans while pursuing other planning goals (such as compact development and sustainable design) that may be spatially interrelated.”⁴⁵ This comment may be easier said than done.

The UFC additionally calls particular attention to a concept called Defensible Space/Crime Prevention Through Environmental Design (CPTED), a concept of three components that work to build physical security through design.⁴⁶ The discussion is focused upon the three components of CPTED: Natural Surveillance, Territorial Reinforcement, and Natural Access Control.⁴⁷ Natural Surveillance is defined as Jane Jacobs’s “Eyes on the Street” concept and focuses on providing ample windows to public areas. Territorial Reinforcement centers around defining a separation between public and private space with the UFC recommending to cluster facilities

⁴⁴ Department of Defense. 14.

⁴⁵ Department of Defense. 15.

⁴⁶ Department of Defense. 17.

⁴⁷ Department of Defense. 17.

together as they then can be “protected more efficiently than scattered buildings.”⁴⁸ Lastly, Natural Access Control is defined by using landscaping, fencing, and building orientation to provide extra levels of access through smart design. The UFC discusses making the right-of-way undoubtedly public to make clear where individuals should be and should not.⁴⁹

UFC 4-020-01 Security Engineering Facilities Planning Manual

UFC 4-020-01 Security Engineering Facilities Planning Manual is the connecting UFC between installation planners, engineers, and security specialists. It first establishes the recommended Planning Team as the needed professionals to create a comprehensive, defensive environment. The UFC recommends an installation’s experts in Anti-terrorism, Security, Logistics, and Engineering (both the planner and the project programmer).⁵⁰

With the Planning Team established, the UFC progresses on how to integrate security planning with other requirements. Other security regulations and explosive safety regulations are discussed as well as integrating with the DoD’s Component Standards. For example, the United States Central Command, which oversees all US forces in the Middle East.

⁴⁸ Department of Defense. 17.

⁴⁹ Department of Defense. 17.

⁵⁰ Department of Defense, “DoD Security Engineering Facilities Planning Manual.” 1-3,4.

Additionally, this section discusses the importance of coordination with Historic Preservation Standards and the Sustainable Planning strategy called out in the UFC on master planning.⁵¹ The section notes the difficulty between sustainability and security asserting, “Requirements for security and antiterrorism may pose challenges for sustainable design, but the two goals are not mutually exclusive...”⁵² This statement is, however, not backed up further. It might state they are not mutually exclusive, but there is no description of how that may be true.

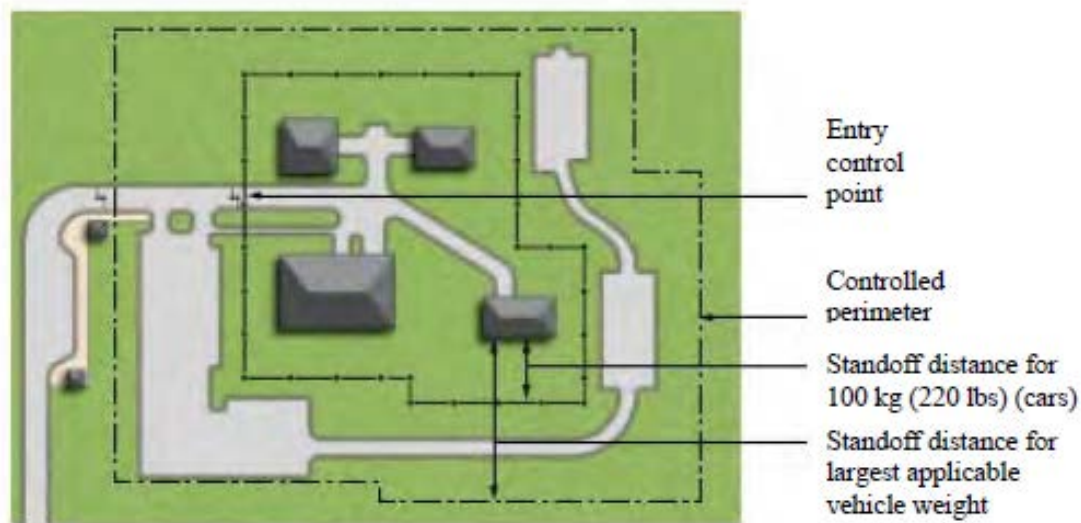


Figure 4: Standoff Distance. From UFC 4-020-01.

The UFC then progresses to an in-depth review of threats and the distinct design strategies for each. First discussed is the vehicle bomb threat, with the strategy being four-fold: standoff distance (see figure 4⁵³), building hardening, barriers, and manpower/procedures. These

⁵¹ Department of Defense. 1-4.

⁵² Department of Defense. 1-5.

⁵³ “UFC 4-020-01 DoD Security Engineering Facilities Planning Manual.” 4-7.

strategies generally have built environment planning impacts outside of manpower/procedures.⁵⁴

The next threat is that of hand-delivered bombs, where the strategy consists of providing “unobstructed space” exterior to the building to not provide anywhere to conceal a bomb (see

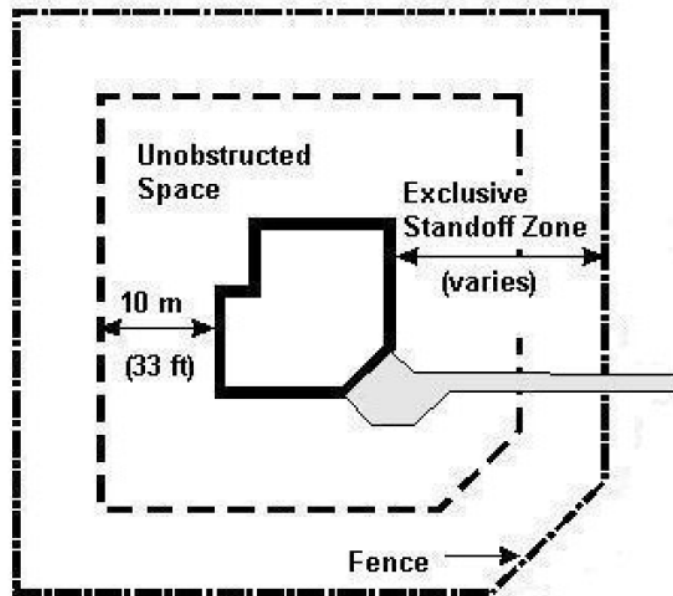


Figure 5: Unobstructed Space. From UFC 4-020-01.

figure 5⁵⁵).⁵⁶ This buffer adds a layer of defense for each facility but adds restrictions to how they can relate to the areas around them. The UFC then continues into combat-related threats like direct fire (bullets) and in-direct fire (mortars); however, these are considered out of scope for this thesis as they are generally not applicable to Main Operating Bases. The last threat that may apply to the planning field is that of forced entry. The UFC discusses the strategy as detecting the aggressors before they reach the building by using barriers.⁵⁷ These barriers can either reveal the

⁵⁴ Department of Defense, “DoD Security Engineering Facilities Planning Manual.” 4-2.

⁵⁵ “UFC 4-020-01 DoD Security Engineering Facilities Planning Manual.” 4-13.

⁵⁶ Department of Defense, “DoD Security Engineering Facilities Planning Manual.” 4-11.

⁵⁷ Department of Defense. 4-32.

aggressor (such as someone driving through landscaping, making them visible) or seek to slow the aggressor down/stop them (such as concrete curbing).

Lastly, the UFC discusses issues within Master Planning, focusing on land-use planning, site planning, vehicle access, entry control points, and vehicle circulation. The land-use discussion notes the issue of how “Open circulation and common spaces on an installation, which are desirable from a conventional design perspective, may be undesirable from an antiterrorism perspective.”⁵⁸ While this may be an issue on the surface, further investigation is needed. The section additionally notes positives as well, such as impassable landscaping being both a positive for anti-terrorism and good for the environment, and how clustering personnel and critical functions can provide more opportunities for standoff and smaller defended perimeters.⁵⁹ The issues of site planning are centered around the concept of dispersal. The UFC states, “While dispersal of buildings... reduces the risk that an attack on any location will impact others, such dispersal could have an isolating effect that reduces the effectiveness of existing security provisions, increases the complexity of the emergency response, and creates less defensible space.”⁶⁰ This section speaks to the issues even within security planning and how strategies can often be positive for one form of defense but hurt another. The last three issues all revolve around vehicles and creating standoff (see figure 6⁶¹). The UFC acknowledges a need for vehicle access but also notes that “Vehicle bomb threats are among the most severe terrorist threats that might be expected on an installation.”

⁵⁸ Department of Defense. 5-2.

⁵⁹ Department of Defense. 5-3.

⁶⁰ Department of Defense. 5-3,4.

⁶¹ “UFC 4-020-01 DoD Security Engineering Facilities Planning Manual.” 5-8.

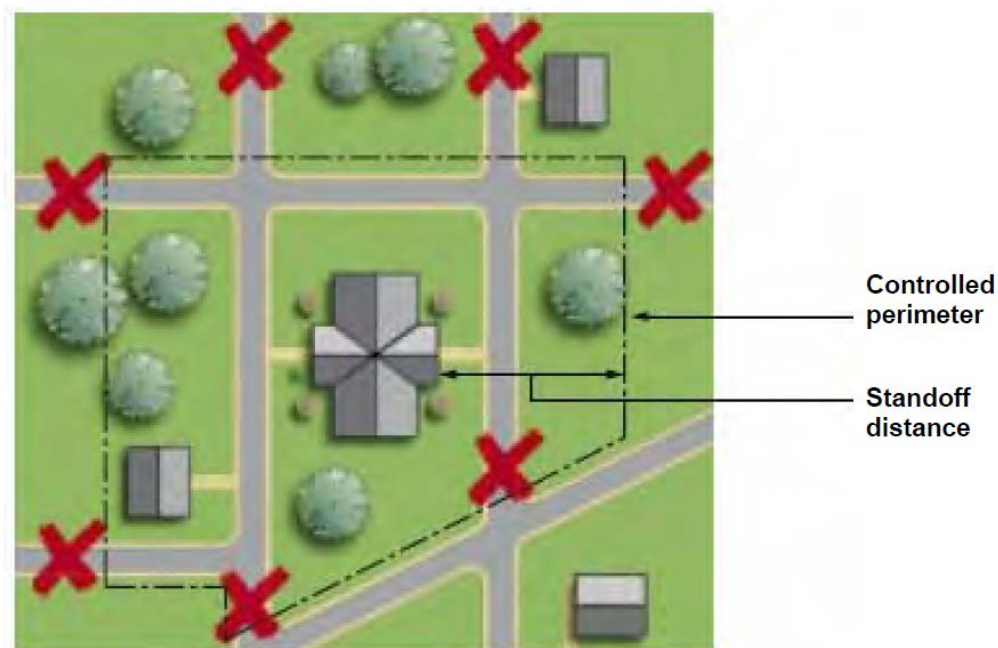


Figure 6: Creating Standoff by closing roads. From UFC 4-020-01.

Additionally, the Entry Control Points revolve around vehicle entry as the UFC does not even mention walkability as a factor. Lastly, with vehicle circulation needed among military installations, the UFC discusses the need to keep them away from facilities even though it can negatively impact traffic patterns. This section does not, however, ever mention the need for alternative transportation and how that can reduce the need for vehicle bomb impacts.

UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings

UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings is the primary document for anti-terrorism defense in the Department of Defense. It is important to note that this UFC only applies to inhabited buildings (11 or more personnel per building) and that all other buildings are exempt. The stated intent of this UFC is to “minimize mass casualties in inhabited DoD buildings. The easiest and most cost-effective way to achieve this is to incorporate

sufficient standoff distance to buildings.”⁶² This intent is clear, in order to save lives but also save money; bases must be spread out.

This UFC is oriented towards facility engineering but still is applicable and widely affects planning. In emphasizing the earlier stated intent, the UFC adds that its philosophy is to provide “comprehensive protection for every inhabited facility against the range of possible threats is cost prohibitive, but that appropriate protective measures can be provided for all DoD personnel at a reasonable cost.”⁶³ This is the second time cost-effectiveness is discussed as an overarching principle. This is important as standoff is primarily written as the only cost-effective solution.

Due to the UFC covering a broad range of threats, it focuses on five total design strategies: Prevent Building Collapse, Minimize Hazardous Flying Debris, Provide Effective Building Layout, Limit Airborne Contamination, and Provide Building Mass Notification.⁶⁴ The first three strategies have significant planning implications, while the last two are focused upon building design and are, therefore, out of the scope of this thesis. These design strategies are based on clearly stated assumptions, that the standards written in this UFC are a baseline to build upon.⁶⁵ The next assumption is that there are three main threats to design against external explosive threats (vehicle-borne IEDs (VBIEDs, personnel IEDs (PIEDs)), mail bombs, and weapons of mass destruction (chemical, biological, radiological weapons).⁶⁶ It is that assumption of threats

⁶² Department of Defense, “DoD Minimum Antiterrorism Standards for Buildings.” 15.

⁶³ Department of Defense. 13.

⁶⁴ Department of Defense. 14.

⁶⁵ Department of Defense. 15.

⁶⁶ Department of Defense. 15.

that drives the requirements of AT/FP in the Department of Defense. Those three threats (and namely the first threat) are what influences site and facility design the most.

The UFC is titled ‘Minimum Antiterrorism Standards’ as it progresses through a long list of standards ranging from standoff distance to architectural overhangs, but for this thesis, only standards that explicitly affect planning will be discussed. The first, and arguably the most impactful, standard is that of standoff distance. This standard has been drastically changed in the UFC’s latest December 2018 edition, however, which states “The previous version of Standard 1 established standoff distances to parking, roadways, and controlled perimeters that were based on building construction and occupancy. In this revision of Standard 1, standoff distances only apply to distances to installation perimeters for new construction and additions to existing buildings that are required to comply with these standards.”⁶⁷ This significant change reduces standoff to be only applicable to the installation’s perimeter (minimum of 20 feet) and removes any standoff requirements to an installation’s internal street network and parking. The second standard is that of unobstructed space. This standard establishes the requirement for a 33 foot ‘clear zone’ around all facilities (see figure 7⁶⁸) where “there are no obstructions or building features that might allow for concealment from observation of explosive devices with dimensions of no less than a 6 in.”⁶⁹ This buffer can still have objects within it like trees, benches, etc. however, they must be designed not to allow objects to be hidden. It is also important to note that the standard allows for parking to be within the clear zone as long as it can

⁶⁷ Department of Defense. 17.

⁶⁸ Department of Defense. 18.

⁶⁹ Department of Defense. 19.

be blocked off with bollards for higher Force Protection Conditions (FPCONs).⁷⁰ The UFC continues with 19 additional standards that are principally focused upon building construction and, therefore, not applicable to planning.

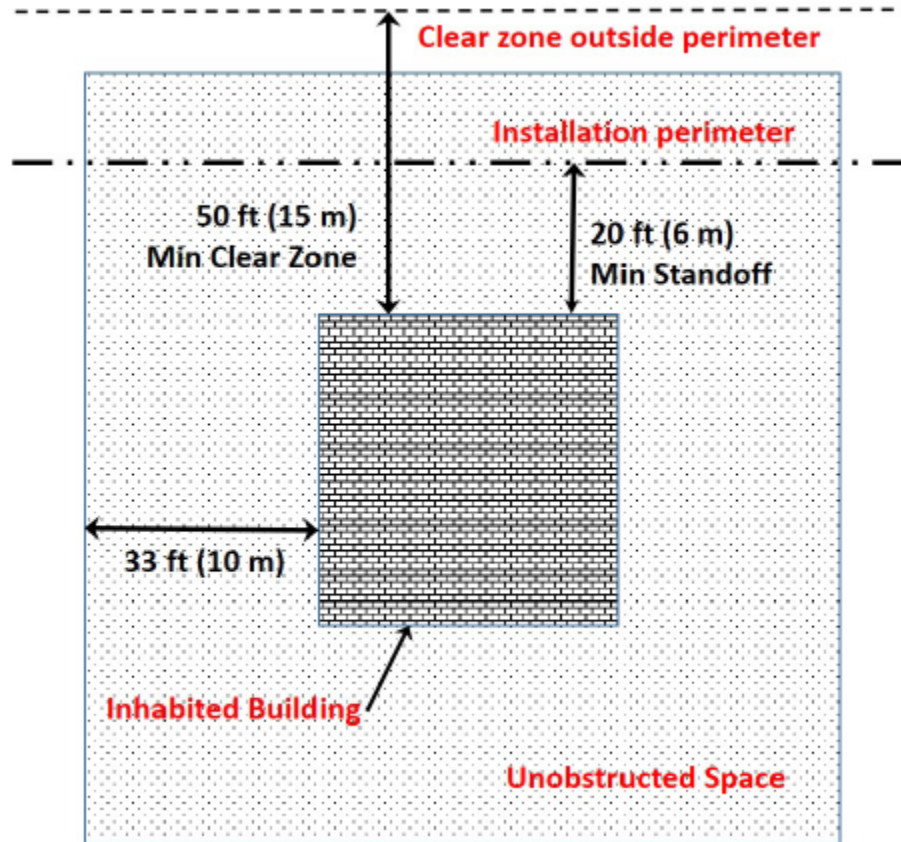


Figure 7: New standoff distance requirements. From UFC 4-010-01.

With such a long list of standards, the UFC switches its focus onto recommendations and best practices in applying those standards, an explicit acknowledgment of the difficulty in creating a comprehensive defensive design. The first recommendations are focused upon vehicle design and push a reduction in vehicle access points to an absolute minimum as well as reducing vehicle

⁷⁰ Department of Defense. 19.

speed.⁷¹ This is a clear nod to the threat assumptions that VBIEDs (Vehicle Borne Improvised Explosive Devices) are paramount to design against. Another recommendation is to not only provide a 33-foot clear zone around any facilities but to make sure all facilities have a 33-foot separation between each other. This is reasoned with the assumption that with more separation, any attack on a single facility can be minimized to that facility.⁷² The best practices section mainly focuses on vehicle defense. The UFC again recommends standoff distance as the most cost-effective method but also discusses practices such as using landscaping, curbing, and pavement making to establish stationary vehicle standoff as well as vehicle barriers to protect against vehicles in motion.⁷³ The best practices section leaves much to be desired as it has a narrow focus and just advocates to maximize protection, two things that may not be helpful as they are already well-known.

Walkability

Walkability Defined

It is essential to understand the definition and principles surrounding the term ‘walkability’.

While the word is often used, especially in the planning world, it can be interpreted in multiple ways and therefore contribute to multiple solutions. From a study published in the *Journal of Urbanism*, author Riat Hutubarat Lo defines walkability as the,

[p]resence of continuous and well-maintained sidewalks. Universal access characteristics.

Path directness and street network connectivity. Safety of at-grade crossing treatments.

⁷¹ Department of Defense. 35.

⁷² Department of Defense. 36.

⁷³ Department of Defense. 37.

Absence of heavy and high-speed traffic. Pedestrian separation or buffering from traffic.

Land-use density. Building and land-use diversity or mix. Street trees and landscaping.

Visual interest and a sense of place as defined under local conditions. Perceived or actual security.⁷⁴

While this definition is long, it is comprehensive and complete, boiling down to principles of continuity, pedestrian safety security, connectedness of places, and visual interest.

In another study titled “What is a Walkable Place? The Walkability Debate in Urban Design”, walkability is defined in three different uses. The first definition uses the term as a “means of making walkable environments”⁷⁵ and describes it with words like traversable, compact, safe, and physically enticing.⁷⁶ The second definition uses the term as the outcomes of walking. This use of walkability is described with results like lively and sociable, sustainable, and exercise inducing.⁷⁷ The last and third definition uses the term as a broad sense. This use endears the word to a positive association with terms like livability, development, better communities, and holistic improvements.⁷⁸

Principles of Walkability

The term walkability serves many purposes and definitions. By reviewing all of them, four encompassing principles are revealed that together comprise walkability. For walkability to be successful, there must be continuity of the pedestrian network, the pedestrian experience must be

⁷⁴ Lo, “Walkability: What Is It?” 153-154.

⁷⁵ Forsyth, “What Is a Walkable Place? The Walkability Debate in Urban Design.” 1.

⁷⁶ Forsyth. 3.

⁷⁷ Forsyth. 4.

⁷⁸ Forsyth. 4.

comfortable (both safe and secure), places must be connected, and the area needs to have visual interest. When these principles are combined, an authentic experience of walkability is achieved.

The first principle is that of Continuity of the Pedestrian Network. The Center for Active Design (CAD), a large non-profit organization that advocates for walkability, states that good design can “Encourage walking by maintaining a network of interconnected streets and sidewalks.”⁷⁹ This network encourages walking by providing means of connection for pedestrians without breaks in the sidewalks (see figure 8⁸⁰). A partial network may statistically look okay (think of a place that has 90% sidewalk coverage), but if the missing link is between housing and work/shopping, then



Figure 8: Abrupt ending to sidewalk network. From the Progressive Southside.

the entire network loses value dramatically. This is also true if the city blocks are too large as there will not be enough connection. CAD encourages through-block connections (see figure 9⁸¹)

⁷⁹ Bloomberg et al., “ACTIVE DESIGN GUIDELINES.” 37.

⁸⁰ “The Progressive Southside: Suddenly Ending Sidewalk.”

⁸¹ “Chophouse Row.”

for any blocks more substantial than 300 feet and necessitates connections with public sidewalks to complete the network.⁸² Additionally, to build confidence into a connected network, curb-cuts



Figure 9: Interior Block Crossing, Chophouse Row, Seattle. From: Graham Baba Architects
<http://grahambabaarchitects.com/chophouse-row>

must be kept to a minimum (see figure 10⁸³) to preserve pedestrian network integrity⁸⁴ and roundabouts must be used sparingly as they create difficult crossings for pedestrians.⁸⁵ This principle fundamentally boils down to pedestrian network equality with automobile networks;

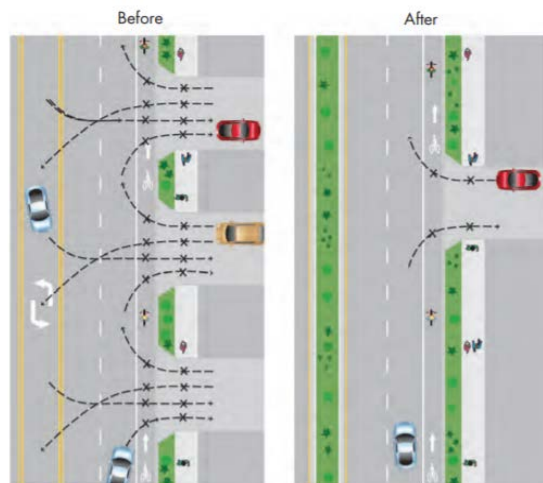


Figure 10: Before and after curb cut reduction. From Model Street Design Manual.
 Credit Michele Weisbart.
http://modelstreetdesignmanual.com/model_street_design_manual.pdf

⁸² Bloomberg et al., "ACTIVE DESIGN GUIDELINES." 37.

⁸³ Los Angeles County, "Model Street Design Manual." 4-12.

⁸⁴ Speck, *Walkable City Rules: 101 Steps to Making Better Places*. 192.

⁸⁵ Speck. 164.

when we build for cars, we should always build for pedestrians and, if done better, build for pedestrians even if not built for cars.

The second principle is that of Pedestrian Comfort, which can be categorized into safety and security. Too often, pedestrian infrastructure is built without attention paid to the pedestrian experience. Sidewalks are built right on the curb next to 45 mph speed limit roads, crosswalks must cross 5+ lanes to get to the other side, and at night dark sidewalks exist next to flood-lit roads.

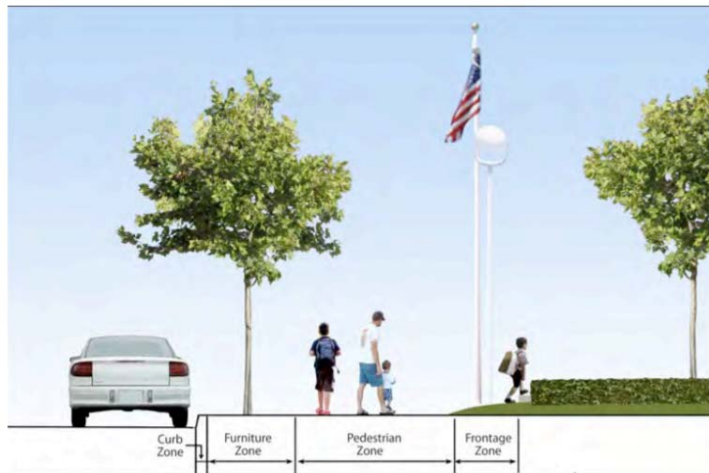


Figure 11: Sample separated pedestrian pathway. From *Model Street Design Manual*.
http://modelstreetdesignmanual.com/model_street_design_manual.pdf

One method to counteract these issues is that of dedicated pathways. Creating pathways that have a buffer or separation from moving vehicles has been shown to increase walking.⁸⁶ These separated pathways (see figure 11⁸⁷) give not only equality of connectedness as compared to vehicles but also equality of quality. The Center for Active Design states that these pathways, “create[] improved conditions for all users, especially those with impaired vision or hearing,”⁸⁸

⁸⁶ Bloomberg et al., “ACTIVE DESIGN GUIDELINES.” 40.

⁸⁷ Los Angeles County, “Model Street Design Manual.” 6-24.

⁸⁸ Bloomberg et al., “ACTIVE DESIGN GUIDELINES.” 40.

and therefore improve the quality of the pedestrian environment for all users. To create quality separation, physical barriers should be used to protect the pedestrian. This can be on-street parking and street trees as well as smaller landscape features such as benches (see figure 12⁸⁹),



Figure 12: Using benches as barriers in Times Square. From: Arch Paper <https://archpaper.com/2019/08/3d-printed-crash-benches-times-square/>

fixed trash cans, etc.⁹⁰ These buffers have a bonus of shading users and providing places to sit and gather. In conjunction with dedicated pathways, when these paths need to cross vehicle traffic, they necessitate enhanced crosswalks to preserve pedestrian safety. CAD recommends



Figure 13: Median Crosswalk. Credit: Bruce Landis. From: Federal Highway Administration

⁸⁹ “New 3D-Printed, Crash-Proof Benches Debut in Times Square.”

⁹⁰ Speck, *Walkable City Rules: 101 Steps to Making Better Places*. 186, 190.

the usage of medians (see figure 13⁹¹) and refuge islands,⁹² and the author of *Walkable City Rules*, Jeff Speck, encourages speed tables as they are best for slowing down vehicle speed.⁹³

An additional method for pedestrian safety is that of traffic calming, to some extent, touched on in the previous method. Traffic calming is solely focused on the speed of vehicles and reducing

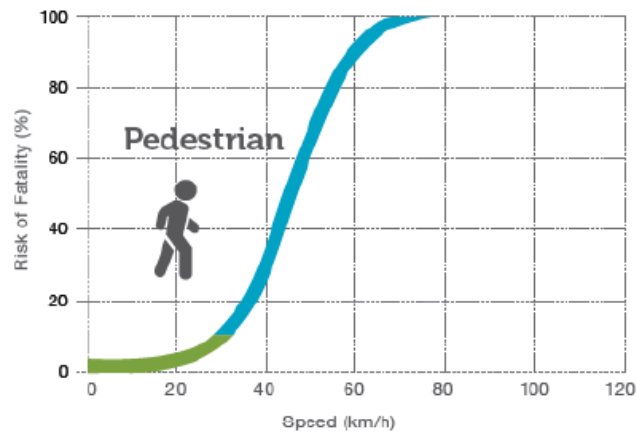


Figure 14: Pedestrian fatality rate as compared to vehicle speed. From "Narrower Lanes, Safer Streets."

those speeds to a safe margin (see figure 14⁹⁴). Both the CAD and Jeff Speck discuss the necessity of minimizing road sizes and lanes as a first step to traffic calming as extra lanes and width can encourage speeding.⁹⁵⁹⁶ In a study about the effects of narrower travel lanes in Toronto and Tokyo, the findings revealed that narrower lanes not only reduce traffic speeds and crashes but also have a positive effect on traffic volume down to a width of 3.0 meters (~10 feet).⁹⁷ The study even showed that the rate of pedestrian usage goes up as lane widths go down, fortifying the idea behind traffic calming. An additional measure to slow traffic can be to add

⁹¹ "Safety Benefits of Raised Medians and Pedestrian Refuge Areas - Safety | Federal Highway Administration."

⁹² Bloomberg et al., "ACTIVE DESIGN GUIDELINES." 40.

⁹³ Speck, *Walkable City Rules: 101 Steps to Making Better Places*. 174.

⁹⁴ Karim and Eng, "Narrower Lanes, Safer Streets." 8.

⁹⁵ Bloomberg et al., "ACTIVE DESIGN GUIDELINES." 38.

⁹⁶ Speck, *Walkable City Rules: 101 Steps to Making Better Places*. 106.

⁹⁷ Karim and Eng, "Narrower Lanes, Safer Streets." 10-12.

curb extensions at intersections, traffic medians, speed bumps, and avoiding slip lanes when possible.⁹⁸

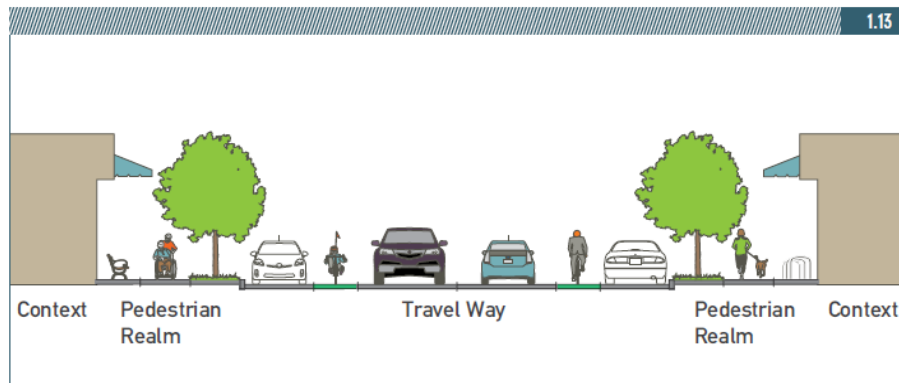


Figure 15: Sample Complete Street. From National Complete Streets Coalition.
<https://www.smartgrowthamerica.org/app/legacy/documents/cs/factsheets/cs-livable.pdf>

A third method for pedestrian safety is more a collection of previously mentioned methods, popularly known as Complete Streets (see figure 15⁹⁹). This concept, as described by Smart Growth America enhances, “...safe and affordable access for everyone...”¹⁰⁰ by valuing all modes of transport equally (pedestrians, bicycles, transit, and cars). The methodology is to provide separate right-of-ways to each form of transport, which boosts the safety and security of each one.

A method to improve pedestrian security, outside of specific anti-terrorism design, is that of exterior lighting. CAD states that “[r]ecent research has linked street lighting to increased path use. Pedestrian street lighting should be evenly spaced along the sidewalk, consistent in height,

⁹⁸ Bloomberg et al., “ACTIVE DESIGN GUIDELINES.” 38.

⁹⁹ National Complete Streets Coalition, “Complete Streets Help Create Livable Communities.” 16.

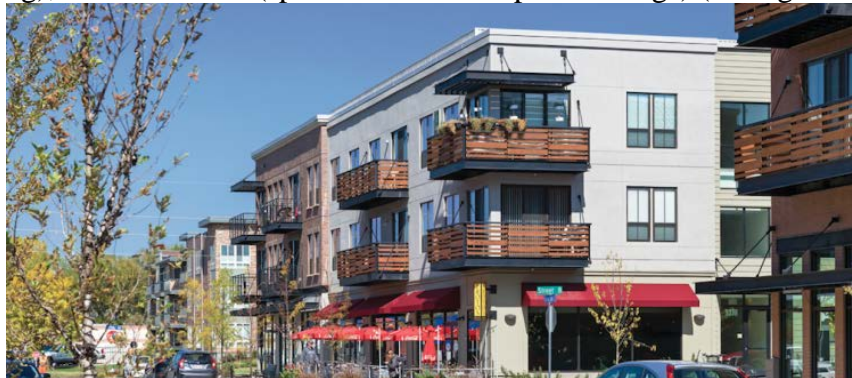
¹⁰⁰ National Complete Streets Coalition. 2.



*Figure 16: Good coverage of pedestrian lighting. From: Lighting Associates Inc.
<http://www.laihouston.com/index.php/portfolio/item/4-uptown-pedestrian-district>*

and offer adequate light coverage.”¹⁰¹ This lighting provides better sightlines to pedestrians and can boost the confidence of the most vulnerable like adolescent girls (see figure 16¹⁰²).¹⁰³ This lighting is therefore not only helpful for sightlines but for feelings of safety for all populations.

The third principle is that of Connectedness of Places, composing of mixed-use places, compact development, and intersection density. Mixed-use places can be both vertical mixed-use (within the same building), and horizontal (spread across multiple buildings) (see figure 17¹⁰⁴). A meta-



*Figure 17: Mixed-use development with Retail/Residential. From ProBuilder.
<https://www.probuilder.com/mixed-use-development-finds-better-blend>*

¹⁰¹ Bloomberg et al., “ACTIVE DESIGN GUIDELINES.” 40.

¹⁰² Admin, “Lighting Associates, INC. - Uptown Pedestrian District.”

¹⁰³ Bloomberg et al., “ACTIVE DESIGN GUIDELINES.” 32.

¹⁰⁴ “Mixed-Use Development Finds a Better Blend | Professional Builder.”

analysis study titled “Travel and the Built Environment” discussed how the balance between jobs and housing, intersection density, and distance to stores had the most significant effect on people choosing to walk, even more so than common associations like population density and distance to transit.¹⁰⁵ This implies that having a destination to able to walk to is critical. A neighborhood with 100% sidewalk coverage may be a moot point if there is no destination like a store to walk to. With this in mind, the Center for Active Design advocates for public places like parks to be located within 10 minutes of housing/work (see figure 18),¹⁰⁶ with Jeff Speck going further, pushing for parks to be distributed instead of consolidated to increase the effect.¹⁰⁷ Other uses like schools and grocery stores should also be located close with evidence showing that residents are more likely to walk with useful destinations in reach.¹⁰⁸

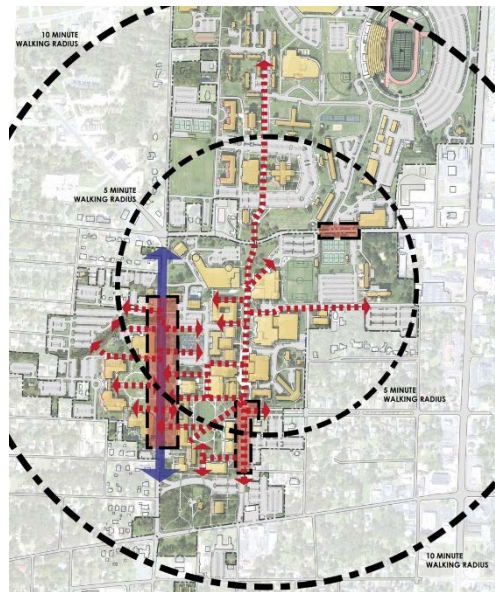


Figure 18: Murray State University Campus Planning with 5-, 10-minute Walking Circles. From: Element Design. <http://www.element-site.com/master-planning>

¹⁰⁵ Ewing and Cervero, “Travel and the Built Environment.” 275.

¹⁰⁶ Bloomberg et al., “ACTIVE DESIGN GUIDELINES.” 26.

¹⁰⁷ Speck, *Walkable City Rules: 101 Steps to Making Better Places*. 18-19.

¹⁰⁸ Bloomberg et al., “ACTIVE DESIGN GUIDELINES.” 26.

The fourth and final principle is that of visual interest (see figure 20¹⁰⁹). This principle is wide-ranging, from focusing on buildings to landscaping to the location of parking. The pedestrian



Figure 20: Poor visual environment versus enhanced visual environment. From *Model Street Design Manual*. Credit Michele Weisbart. http://modelstreetdesignmanual.com/model_street_design_manual.pdf

moves through the built environment slowly and, therefore, has to time to observe the world around them. In recognition of this, buildings should be oriented to the pedestrian and public space. Orienting buildings to recreational spaces like parks have even shown to increase levels of physical activity to its occupants.¹¹⁰ Buildings should also maximize fenestration and entrances, with a focus on the bottom two floors of the façade (see figure 19¹¹¹);¹¹²¹¹³ this creates a human-



Figure 19: Multi-story Building with First Two Floors Oriented to the Pedestrian. From: Hym Investments. <https://www.hyminvestments.com/residencesatbostonlanding>

¹⁰⁹ Los Angeles County, “Model Street Design Manual.” 13-7,10.

¹¹⁰ Bloomberg et al., “ACTIVE DESIGN GUIDELINES.” 30.

¹¹¹ “Lantera at Boston Landing.”

¹¹² Bloomberg et al., “ACTIVE DESIGN GUIDELINES.” 88.

¹¹³ Speck, *Walkable City Rules: 101 Steps to Making Better Places*. 210.

scale environment rather than an auto-oriented one. Additionally, ample landscaping cannot only provide a buffer (as mentioned in Pedestrian Comfort) but can also offer an interesting component to the pedestrian experience.¹¹⁴ In areas that support walkable activity, adding public plazas and other pedestrian-only areas (pedestrianizing a street) can making walking trips feel shorter¹¹⁵ and offer more activities oriented to the walker (see Figure 21¹¹⁶). It is also encouraged



Figure 21: Rendering of a 'Pedestrianized' Oxford Street, London. From: *Topos Magazine*. <https://www.toposmagazine.com/pedestrian-zone-called-london/>

to add art and appropriate way-finding signage that can add visual appeal but not disorient pedestrians. Alternatively, it is encouraged to remove parking from pedestrian routes and hide it behind buildings; Jeff Speck goes as far as to say to “never” allow parking in front of buildings.¹¹⁷ Lastly, when adding security measures into design, attention must be paid to the signal being conveyed. Speck notes that overbuilding security can incite fear and uncertainty¹¹⁸, and therefore, security measures should be disguised. For anti-vehicle bollards, disguise them as bench seating or use carefully planted street trees to provide barriers.

¹¹⁴ Bloomberg et al., “ACTIVE DESIGN GUIDELINES.” 41, 56.

¹¹⁵ Bloomberg et al. 34.

¹¹⁶ “A Pedestrian Zone Called London - Topos.”

¹¹⁷ Speck, *Walkable City Rules: 101 Steps to Making Better Places*. 200.

¹¹⁸ Speck. 207.

Additional Anti-Terrorism Force Protection: Crime Prevention Through Environmental Design (CPTED)

Crime Prevention Through Environmental Design (CPTED) is a concept of designing the built environment in such a way that it positively enforces safety and security. It is fundamentally based upon Oscar Newman's (an Urban Designer and pre-eminent CPTED thinker) hierarchy of space with intermediate spaces being between public and private space (see Figure 22¹¹⁹)

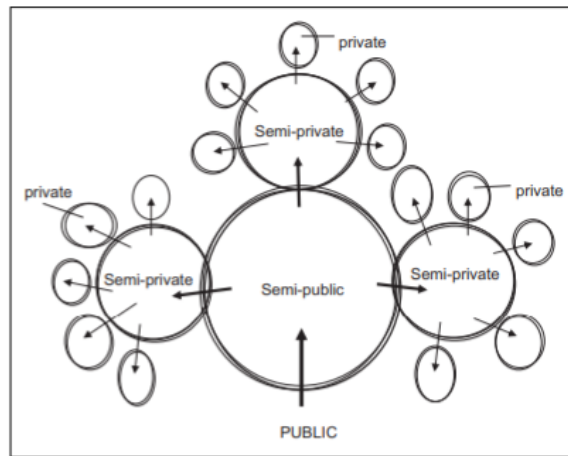


Figure 22: Hierarchy of Space with Arrows Delineating Movement Between Space. From *Defensible Space*.

It is referenced in *UFC 2-100-01 Installation Master Planning with Change 1* as a consideration to defensible planning, focusing on its three key physical security principles of Natural Surveillance, Territorial Reinforcement, and Natural Access Control.¹²⁰ CPTED is a critical addition to anti-terrorism/force protection design in that it pays attention to more passive points of design versus the AT/FP focus of more active defense.

¹¹⁹ Cozens and Love, "A Review and Current Status of Crime Prevention through Environmental Design (CPTED)." 394.

¹²⁰ Department of Defense, "Installation Master Planning with Change 1." 17.



Figure 23: Urban Design Accounting for Principles of CPTED. From Powerhouse Growers. <http://www.powerhousegrowers.com/cpted-designing-the-way-to-safer-communities/>

The security principle of Natural Surveillance is most similar to Jane Jacobs ‘Eyes on the Street’ concept, where the built environment encourages intruders to be kept under observation through bystanders.¹²¹ A built environment with windows, well-placed entrances, and sightlines provides residents and others to have opportunities to observe and is fundamental to this principle (see figure 23¹²²).¹²³ This surveillance can be more than just ‘natural,’ however, and can include formal/organized surveillance (like security guards) and/or mechanical surveillance (like CCTV).¹²⁴ This principle is centered upon the assumption that criminals do not want to be seen. The first method for this principle is to create places where the outside space is heavily used; this

¹²¹ National Crime Prevention Council of Singapore, “Crime Prevention Through Environmental Design Guidebook.” 4.

¹²² “PowerHouse Growers | ‘CPTED.’”

¹²³ Cozens and Love, “A Review and Current Status of Crime Prevention through Environmental Design (CPTED).” 396.

¹²⁴ Reynald, “Translating CPTED into Crime Preventive Action: A Critical Examination of CPTED as a Tool for Active Guardianship.” 71.

can be accomplished through mixed-use designs with street-level retail as well as placing high-activity centers next to low uses to encourage surveillance.¹²⁵ Additionally, the physical environment can contribute to surveillance by creating clear sightlines and great lighting. For buildings, minimizing hiding places and maximizing fenestration ensures that “eyes on the street” have options and can see everything. Having the potential for observation from buildings adds to the natural surveillance of pedestrians.¹²⁶ This availability of observation from buildings is even more paramount for isolated areas like parking lots and stairways.¹²⁷ Lighting can provide additional opportunities for surveillance by lighting up those isolated areas to provide enough light so that a pedestrian can identify another person at no less than 10 meters.¹²⁸



Figure 24: Simple Landscaping Emphasizing Pathway. From CPTED Security. http://www.cptedsecurity.com/cpted_fight_crime.htm

The security principle of Natural Access Control uses special definition elements of the built environment like doors and landscaping (see figure 24¹²⁹) to keep people out of areas that they

¹²⁵ National Crime Prevention Council of Singapore, “Crime Prevention Through Environmental Design Guidebook.” 18-22.

¹²⁶ National Crime Prevention Council of Singapore. 9.

¹²⁷ National Crime Prevention Council of Singapore. 13.

¹²⁸ National Crime Prevention Council of Singapore. 11.

¹²⁹ “Fight Crime With Flower Power.”

should not be in and direct them to areas they should be.¹³⁰¹³¹ The idea is to use psychological barriers that signal an individual whose path is acceptable. This can be positively reinforced by placing entrances in proper places like the front of buildings instead of the side or rear, as well as negatively reinforcing by restricting access to back areas with signage, changes in the pavement, etc.¹³² These elements can create a higher sense of risk to offenders.¹³³ With intelligent landscape design, plants, contours, pathways, etc. can be used to funnel individuals to or away from private areas.¹³⁴ The *CPTED Design Guidebook* describes all of these different methodologies as “anything that announces the integrity and uniqueness of an area.”¹³⁵

The last security principle of CPTED is Territorial Reinforcement and is best described as establishing a clear boundary between public and private space.¹³⁶ These boundaries can be set explicitly (with physical barriers) or implicitly (with signage).¹³⁷¹³⁸ This principle is based on the

¹³⁰ Cozens and Love, “A Review and Current Status of Crime Prevention through Environmental Design (CPTED).” 398.

¹³¹ National Crime Prevention Council of Singapore, “Crime Prevention Through Environmental Design Guidebook.” 4.

¹³² National Crime Prevention Council of Singapore. 4, 54.

¹³³ Cozens and Love, “A Review and Current Status of Crime Prevention through Environmental Design (CPTED).” 397.

¹³⁴ “Building Resiliency: Crime Prevention Through Environmental Design | WBDG - Whole Building Design Guide.”

¹³⁵ National Crime Prevention Council of Singapore, “Crime Prevention Through Environmental Design Guidebook.” 4.

¹³⁶ National Crime Prevention Council of Singapore. 5.

¹³⁷ Cozens and Love, “A Review and Current Status of Crime Prevention through Environmental Design (CPTED).” 396.

¹³⁸ Reynald, “Translating CPTED into Crime Preventive Action: A Critical Examination of CPTED as a Tool for Active Guardianship.” 72.

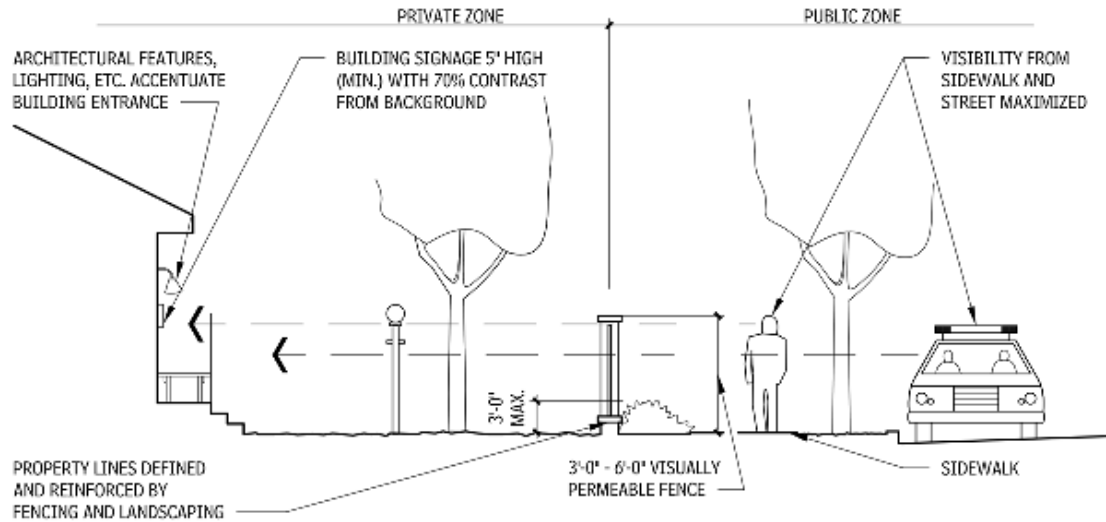


Figure 25: Territorial Reinforcement with Fencing. From *Whole Building Design Guide*.
<https://www.wbdg.org/resources/crime-prevention-environmental-design>

premise that people feel ownership of their territory and recognize when another territory is not theirs. Creating a “sense of place” can contribute to this principle as those who work in a building/area will feel more ownership of their space, which can lead to better protection. Additionally, building in territorial lines also establishes this effect (see figure 25¹³⁹).¹⁴⁰ Using things like fencing, landscaping, signage, pavement, etc. makes the boundary clear to those outside of it.¹⁴¹ Lighting can be crucial at night by making the lit areas intentional. By directing lighting to where it is needed and not lighting everything, a precedent is set of where an individual is supposed to be.¹⁴²

¹³⁹ “Building Resiliency: Crime Prevention Through Environmental Design | WBDG - Whole Building Design Guide.”

¹⁴⁰ “Building Resiliency: Crime Prevention Through Environmental Design | WBDG - Whole Building Design Guide.”

¹⁴¹ National Crime Prevention Council of Singapore, “Crime Prevention Through Environmental Design Guidebook.” 23.

¹⁴² National Crime Prevention Council of Singapore. 11-12.

Chapter 3: Qualitative Study on Designated Subject Matter Experts Responsible for Comprehensive Planning, Security Engineering, and Anti-Terrorism in the United States Air Force

This thesis consists of qualitative research, as this approach serves the purpose of building a foundation for understanding the relationship between the two concepts of walkability and anti-terrorism/force protection. According to *Research Design 5th Edition*, qualitative research, “is an approach for exploring and understanding the meaning individuals or groups ascribe to a social or human problem.”¹⁴³ This fits the intent of this thesis; to understand not only the relationship between the two concepts but also how that relationship is understood among people. The approach of the thesis is in grounded theory design, “a design of inquiry from sociology in which the researcher derives a general, abstract theory of a process, action, or interaction grounded in the views of participants.”¹⁴⁴ This thesis uses themes extracted from the literature review and compares them to themes extracted from interviews, and built the foundation of the interaction between walkability and anti-terrorism/force protection. An article in *SAGE Open Medicine* describes grounded theory as “appropriate when little is known about a phenomenon; the aim being to produce or construct an explanatory theory that uncovers a process.”¹⁴⁵ This thesis is precisely aiming to uncover the relationship between walkability and anti-terrorism/force protection and how the two could work together. The two concepts have extensive backgrounds individually but not concerning each other and therefore, the need exists to “explain” that

¹⁴³ Creswell and Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 4.

¹⁴⁴ Creswell and Creswell. 13.

¹⁴⁵ Chun Tie, Birks, and Francis, “Grounded Theory Research: A Design Framework for Novice Researchers.”

relationship. The thesis is grounded in the comparative analysis of the literature review and uses the codified themes of the interview to build an overall understanding.

Researcher's Role

With a fundamental characteristic of qualitative research being the *researcher as key instrument*, it is crucial to understand the background of the individual conducting the research. A researcher is obligated to identify anything that might shape their interpretations within the study. In *Research Methods 5th Edition*, Creswell discusses things like “biases, values, and personal background, such as gender, history, culture, and socioeconomic status.”¹⁴⁶ My perceptions of walkability and AT/FP come from my background as a Civil Engineer Officer in the United States Air Force and as a master's student in urban planning. Since I commissioned as a Second Lieutenant in August of 2015, I have served as a Civil Engineer in multiple roles: Project Programmer, Community Planner, and Flight Commander. As a project programmer, I was introduced to the requirements of AT/FP in writing project documents for new facilities. As a community planner, I worked on major projects like a \$300 million new aircraft beddown, where I learned about the struggle of creating walkable environments within the DOD. As a flight commander, I was in charge of a small Forward Operating Base in the Middle East and saw the importance of defending the base and the importance of walkability as there were no vehicles. My current status as a master's student in urban planning has additionally heightened my understanding of the need for walkability.

¹⁴⁶ Creswell and Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 183.

While all of these backgrounds have given me individual perceptions, I believe they have also given me a significant understanding of the issue and will contribute towards the thesis. Additionally, every effort will be made to create an environment of objectivity despite any biases. This will be made easier in that my biases are more associated with the base-level viewpoint of this issue, whereas this thesis looks at the issue from a headquarters level and conceptual view, reducing the effect of my personal biases. I proceed with this thesis with the perspective that walkability and AT/FP do have a relationship and that it needs to be figured out due to DOD requirements as well as the health of today's service members, their families, and DOD employees. As a military officer, I also proceed with a sense of responsibility to understand this issue for the safety and quality of life of my airmen that serve with me.

The Study

Literature Review

The literature review progressed to building design principles of walkability and AT/FP individually through conglomerating best practices and widely used literature on the concepts. The review concluded by combining the two concepts in a comparative analysis to understand how the two concepts relate to each other, both positively and negatively. This analysis started with defining the design characteristics of Walkability and AT/FP. Then, each Walkability characteristic was looked at individually to see how it overlapped with each AT/FP characteristic. These overlaps were then labeled either positive or negative, with positive representing both characteristics acting in concert with each other and negative if they were opposed. If there was no relationship seen then the overlap was written as "no relationship understood." The results of this analysis were then examined to extract common themes from the

relationship. The themes between the concepts were then compared to the codified results of interviews.

Interview

After the literature review, the study progressed to the interviews. The interview was chosen as the data collection method due to the importance of viewpoints and opinions. The literature review was intended to show the theoretical relationship between walkability and AT/FP, but the relationship only matters if it is seen/understood by those who can act upon it. The interview method consists of open-ended questions on the topic meant to elicit views and opinions from different subject matter experts (SMEs).

Subjects

These interviews were conducted with the Subject Matter Experts (SMEs) of Comprehensive Planning, Security Engineering, and Anti-Terrorism/Force Protection. The SMEs were selected from the Air Force designated functional leads in their respective fields within the Air Force Installation and Mission Support Center (AFIMSC). Criteria to be considered for the interview consisted of: required to be currently employed or previously employed (<3 years past) within AFIMSC (and its subsidiary organizations) within the aforementioned functional areas, required to have worked in the functional area within AFIMSC for minimum of one year, required to be a GS-13 (pay grade) or higher for Civilians or required to be at minimum a Major (O-4, rank) or higher for Officers or Master Sargent (E-7) or higher for Enlisted. The requirement to be currently or previously employed within AFIMSC and have at least one year of experience ensured that the interviewee had an Air Force-wide view of issues as that organization is tasked to support the Air Force mission across the globe. The requirement to be a minimum of a GS-13 or Major (O-4) ensured that the individual has a management/policy level point of view. The

study contained two individuals from each functional area so as to agglomerate as many views as possible without overloading the analysis. By interviewing each functional area, the study achieved perspectives from the major players within the design process that are involved with walkability and AT/FP.

Recruitment

All potential subjects for this study were current employees of the Air Force within the Department of Defense. Additionally, all subjects worked for AFIMSC and therefore are located in San Antonio, Texas. Due to these factors, subjects were recruited through emailing their DOD email addresses. I, the researcher, would typically use my own DOD email to contact them, but as a current student, this is not an option. Therefore, the subjects were identified with help through the Air Force Civil Engineer Center (AFCEC) - Comprehensive Planning Division Chief (CPPD). Due to her position, she personally knew or knew how to contact each of the potential subjects. With a list of subjects provided by AFCEC/CPPD, a standardized email was sent to all potential subjects. The email contained details like the topic of the study, why the subjects are being contacted, the qualifications needed to be included, an attached consent form, and finally my contact information (both personal cell phone number and personal email address) so that the subject could contact myself in case of questions. There was no alternative form of contact outside of email. This is because all participants are required to be proficient in email, Microsoft Office, and Adobe Acrobat and that email communication is a primary form of communication within the Air Force.

Interview Analysis

The analysis began as soon as the first interview was completed. Each interview was recorded using Zoom meeting software. Then, each interview's audio file was uploaded to Temi, a digital

software transcribing tool, and transcribed. Temi, being a computer program rather than a human, produced an imperfect transcript, and therefore each transcript was reviewed and edited for clarity. Once transcribed and edited, each interview transcript was coded using the aid of Dedoose, an additional digital software tool. This coding narrowed down the interview data into notable themes.

The coding process was the link between the raw interview data and the resultant themes. To begin, each transcript was read, and coherent ideas highlighted into exclusive excerpts. These ideas were then coded into distinct concepts with some excerpts containing multiple codes. Using Dedoose, a hierarchy of codes was created to group said codes into categories and finally themes. The hierarchy of codes is described as parent codes and child codes, child codes being that underneath of a more extensive parent code. The software helps to organize those codes and themes into easy to understand charts and graphs that can reveal patterns.

The codes, categories, themes, and patterns then helped generate a narrative summary. These narratives provided a framework for the discussion portion of the thesis that discussed the themes as they relate to the literature review.

Validity and Reliability

In order to ensure validity within the study, three procedures were used. First was a reflection of my potential bias on the topic and how that may be reflected within the findings. Secondly, was a reflection of negative or discrepant findings that do not fit or follow into the presented themes. Lastly, the thesis was reviewed by a committee of two faculty members from the Department of Urban Planning at the University of Washington.

Reliability was ensured through multiple methods, as well. First, as the study was completed by a single researcher, there exists an internal consistency in the interview process, being a similar voice and speed of progression through questions. Additionally, the interview protocol set a strict guideline for the completion of each interview. Lastly, transcripts were meticulously re-read to ensure the accuracy of the transcribing software.

Chapter 4: Findings

Walkability and Anti-Terrorism/Force Protection Cross-Examined

The Literature Review revealed principles of Walkability and principles of Anti-Terrorism/Force Protection that were supported by design characteristics.

Walkability:

1. **Continuity of Network** – The pedestrian network should be connected, not disjointed.
 - a. Interconnected Streets and Sidewalks¹⁴⁷ - Pedestrian networks should be complete with minimal gaps. Additionally, curb-cuts should be minimized.
 - b. Interior-block Connections¹⁴⁸ - When blocks become too large (>300 feet), cross block connections should be provided to give pedestrians a quicker route.
 - c. Improved Crossings¹⁴⁹ - When the pedestrian network must cross another mode (roads), the crossings should be often and not impeded.
2. **Pedestrian Comfort** – The pedestrian should feel safe and secure in their environment.
 - a. Separated Pathways with Physical Barriers¹⁵⁰¹⁵¹ - pedestrian pathways should have a buffer distance between them and other modes, preferably with barriers like street trees and/or other landscaping.

¹⁴⁷ Bloomberg et al., “ACTIVE DESIGN GUIDELINES.” 37.

¹⁴⁸ Bloomberg et al. 37.

¹⁴⁹ Speck, *Walkable City Rules: 101 Steps to Making Better Places*. 164, 192.

¹⁵⁰ Bloomberg et al., “ACTIVE DESIGN GUIDELINES.” 40.

¹⁵¹ Speck, *Walkable City Rules: 101 Steps to Making Better Places*. 186, 190.

- b. Traffic Calming¹⁵²¹⁵³¹⁵⁴ - Streets and roads need to have safe driving speeds by design in pedestrian areas. That includes narrower lanes and fewer lanes overall.
 - c. Complete Streets¹⁵⁵ - Streets should be multi-modal, equally designed for cars, transit, bikes, and pedestrians.
 - d. Lit/Clear Pathways¹⁵⁶ - pathways should be well-lit with proper sightlines to provide a secure environment.
3. **Connectedness of Places** – The pedestrian network should connect useable spaces that will create value-added pedestrian trips
- a. Mixed-Use Development¹⁵⁷ - development should contain uses like retail, residential, and offices to provide places to walk to.
 - b. Intersection Density¹⁵⁸ - the transportation grid should be a fine-grained network with high intersection density to facilitate multiple, direct routes.
 - c. Distance¹⁵⁹ - amenities should be located at close distances from users, preferably within a 10-minute walk radius.
4. **Visual Interest** – The pedestrian environment should be oriented to the pedestrian, offering a visually appealing built environment.

¹⁵² Bloomberg et al., “ACTIVE DESIGN GUIDELINES.” 40.

¹⁵³ Speck, *Walkable City Rules: 101 Steps to Making Better Places*. 174.

¹⁵⁴ Karim and Eng, “Narrower Lanes, Safer Streets.” 8.

¹⁵⁵ National Complete Streets Coalition, “Complete Streets Help Create Livable Communities.” 2.

¹⁵⁶ Bloomberg et al., “ACTIVE DESIGN GUIDELINES.” 32, 40.

¹⁵⁷ Ewing and Cervero, “Travel and the Built Environment.”

¹⁵⁸ Ewing and Cervero. 26.

¹⁵⁹ Bloomberg et al., “ACTIVE DESIGN GUIDELINES.” 26.

- a. Building Fenestration¹⁶⁰¹⁶¹ - maximize street-level building entrances and windows to create a human-scale environment.
- b. Building Orientation¹⁶² - building entrances should orient towards the street and other public spaces, not behind towards parking.
- c. Landscaping¹⁶³
- d. Pedestrianize¹⁶⁴ - in areas of high pedestrian activity, create pedestrian-only areas like plazas and/or street conversions.
- e. Continuity of Environment¹⁶⁵ - the built environment should have human-scale continuity without breaks (namely parking).

Anti-Terrorism/Force Protection:

1. **Vehicle Defense** – The threat of Vehicle-Borne IEDS and vehicles as a ramming device should be minimized on an installation.
 - a. Standoff¹⁶⁶¹⁶⁷ - Inhabited buildings should maximize standoff from vehicles. This includes both roads and parking.
 - b. Circulation Control¹⁶⁸¹⁶⁹ - Vehicle access should be minimized to where absolutely necessary as well as barrier controlled (Ex: gates and/or bollards).

¹⁶⁰ Bloomberg et al. 88.

¹⁶¹ Speck, *Walkable City Rules: 101 Steps to Making Better Places*. 210.

¹⁶² Bloomberg et al., “ACTIVE DESIGN GUIDELINES.” 30.

¹⁶³ Bloomberg et al. 41, 56.

¹⁶⁴ Bloomberg et al. 34.

¹⁶⁵ Speck, *Walkable City Rules: 101 Steps to Making Better Places*. 200.

¹⁶⁶ “UFC 4-020-01 DoD Security Engineering Facilities Planning Manual.” 4-2.

¹⁶⁷ Department of Defense, “DoD Minimum Antiterrorism Standards for Buildings.” 17, 37.

¹⁶⁸ “UFC 4-020-01 DoD Security Engineering Facilities Planning Manual.”4-32.

¹⁶⁹ Department of Defense, “DoD Minimum Antiterrorism Standards for Buildings.” 35.

2. **Unobstructed Space** – Occupied buildings should maximize clear space around them to prevent the possibility of hidden, hand-delivered improvised explosive devices.
3. **Crime Prevention Through Environmental Design (CPTED)** – The built environment should be designed to counteract crime naturally.
 - a. Natural Surveillance¹⁷⁰ - Provide ample fenestration to allow bystander viewing of public space.
 - b. Natural Access Control¹⁷¹ - Use landscaping, fencing, and building orientation to direct access to intended areas.
 - c. Territorial Reinforcement.¹⁷² – Clearly denote borders of public and private space that amplify ownership.

Each principle noted above contains the recommended design characteristics that were discussed in Chapter 2. The following table cross-analyzes the characteristics of Walkability with the characteristics of AT/FP. The table denotes positive overlap with a (P) designation and negative overlap with a (N) designation. A positive overlap is understood as when the two characteristics act in concert with each other, whereas a negative denotes when they oppose each other.

¹⁷⁰ Department of Defense, “Installation Master Planning with Change 1.” 17.

¹⁷¹ Department of Defense. 17.

¹⁷² Department of Defense. 17.

Walkability	AT/FP		
	Vehicle Defense	Unobstructed Space	CPTED
Continuity of Network a. Interconnected Streets and Sidewalks b. Interior-block Connections c. Improved Crossings	a. (N) If sidewalks are only on roads, increased continuity implies more roads and more needed Standoff (P) The added right-of-way for pedestrian network on roads adds needed Standoff distance b. (P) Interior-block pedestrian networks do not require standoff and can reduce the required road network density. c. (P) Improved pedestrian crossings can serve to slow down vehicles and contribute to Circulation Control	a. No clear relationship b. No clear relationship c. No clear relationship	a. (P) Interconnected networks provide more extensive coverage of pedestrians for observation (Natural Surveillance) b. (N) Interior-block connections can reduce the effect of Territorial Reinforcement by blurring borders of public vs. private space. c. No clear relationship

Figure 26: Cross-Examination of Continuity of Network and AT/FP.

Walkability	AT/FP		
	Vehicle Defense	Unobstructed Space	Vehicle Defense
Pedestrian Comfort a. Separated Pathways with Physical Barriers b. Traffic Calming c. Complete Streets d. Lit/Clear Pathways	a. (P) Street trees and other hard landscaping features provide vehicle barriers (Circulation Control) while boosting pedestrian safety. (P) A buffer zone between pedestrians and cars has shown to increase walking, while also boosting Standoff. b. (P) Traffic Calming increases pedestrian comfort while improving security through slower vehicles (Circulation Control). c. (P) Complete streets provide access for all modes while providing Standoff distances through on-street parking, bike lanes, landscaping, pedestrian right-of-way. d. No clear relationship	a. No clear relationship assuming barriers are on roads and, therefore, outside of unobstructed space. b. No clear relationship c. No clear relationship d. (P) Unobstructed space increases sightlines for pedestrians, which improves comfort.	a. No clear relationship b. No clear relationship c. No clear relationship d. (P) Exterior lighting encourages pedestrian path use as well as benefitting Natural Surveillance and Territorial Reinforcement.

Figure 27: Cross-Examination of Pedestrian Comfort and AT/FP.

Walkability	AT/FP		
	Vehicle Defense	Unobstructed Space	Vehicle Defense
Connectedness of Places a. Mixed-Use Development b. Intersection Density c. Distance	a. (P) Constructing multi-use areas increases pedestrian use and can reduce the need for vehicles and, therefore vehicle defense. b. (N) Increased intersections imply increased roads and, therefore, more Standoff required. c. (N) Reduced distances concentrate uses in close proximity, increasing potential damage from a vehicle bomb.	a. (P) constructing vertical and horizontal mixed-use buildings in close proximity can share unobstructed space and reduce land area requirements. b. No clear relationship c. (N) Required unobstructed spaces can increase distances between destinations	a. (P) Mixed-use areas with useful destinations entice residents to walk more leading to more “eyes on the street” and, therefore, Natural Surveillance. b. No clear relationship c. No clear relationship

Figure 28: Cross-Examination of Connectedness of Places and AT/FP.

Walkability	AT/FP		
	Vehicle Defense	Unobstructed Space	CPTED
Visual Interest a. Building Fenestration b. Building Orientation c. Landscaping d. Pedestrianize e. Continuity of Environment	a. (N) Increased fenestration can create more vulnerabilities to explosion and, therefore, must be blast-proof. b. (N) Entrances oriented to the road can create vulnerability to an explosion. c. (P) Landscaping is appealing to pedestrians and can additionally serve as vehicle barriers to protect pedestrians/facilities. d. (P) Pedestrianize major pedestrian streets removes Standoff requirement. e. (P) Consolidate parking behind facilities to “hide” from pedestrian view ¹⁷³ . This reduces standoff to a single location versus dispersed/linear parking.	a. (N) Increased fenestration can create more vulnerabilities to explosion and, therefore, must be blast-proof. b. No clear relationship c. (N) Increased landscaping for pedestrian interest can provide hiding spaces for hand-held IEDs. d. No clear relationship e. No clear relationship	a. (P) Maximizing fenestration for visual interest increases Natural Surveillance. b. (P) Orienting buildings towards public space increases Natural Surveillance of that space. c. (P) Natural Access Control and Territorial Reinforcement can be enforced through smart landscaping that adds visual appeal to the pedestrian. d. (P) Pedestrianized areas would provide maximum Natural Surveillance. (must be used when Natural Access Control and Territorial Reinforcement deemed unnecessary). e. (P) Minimizing gaps in the built environment reduces areas with difficult surveillance. Continuity can help encourage Territorial Reinforcement.

Figure 29: Cross-Examination of Visual Interest and AT/FP.

¹⁷³ Speck, *Walkable City Rules: 101 Steps to Making Better Places*. 200, 218.

Coding Results from Interviews

A total of six individual interviews were completed with Air Force-designated Subject Matter Experts (SMEs) in three career fields: Planning, Engineering, and Anti-Terrorism (two interviewees per career). The Planning SMEs consisted of two individuals, a GS-13 and GS-15, from the Comprehensive Planning Division (CPPD) at the Air Force Civil Engineer Center (AFCEC). Their roles consist of providing reach back to base-level Community Planners, setting implementable policies, and managing the career field's training. The Engineering SMEs consisted of two individuals, a GS-11 and contractor, from the Integrated Defense/Anti-Terrorism/Mission Assurance (ID/AT/MA) Branch at the Air Force Security Forces Center (AFSFC) with engineering backgrounds and approaches. Their roles consist of completing protective-design blast analysis as well as completing Vulnerability Assessments (VAs) on Air Force installations. The Anti-Terrorism SMEs consisted of two individuals: a GS-15 from the ID/AT/MA Branch at the Air Force Security Forces Center (AFSFC), and a GS-14 from the Engineering Division of AFCEC. Their roles consist of providing primary policy and guidance on AT/FP and Integrated Defense to the Air Force as well as writing security-related Unified Facility Criteria (UFC) for the Department of Defense (DoD).



Figure 30: Word Cloud of resulting codes. From Dedoose.

The interviewees were asked a set of five questions, one an introduction question, and four content questions. The content questions began with a discussion on their interpretation of Anti-Terrorism/Force Protection (215 total counts, including child codes), followed by their interpretation of Walkability (157 total counts, including child codes), ending with the last two focusing on their interpretation of the relationship between the two concepts (57 total counts, including child codes) (see figure 30). The results were then ordered into a hierarchy of codes with “parent-codes” being those directly beneath AT/FP and Walkability and ‘child-codes’ being underneath those.

AT/FP's parent-codes came out as CPTED, Layers of Defense, Level of Protection, Minimize Access Points, Threat Analysis, and Vehicle Defense (see figure 31).

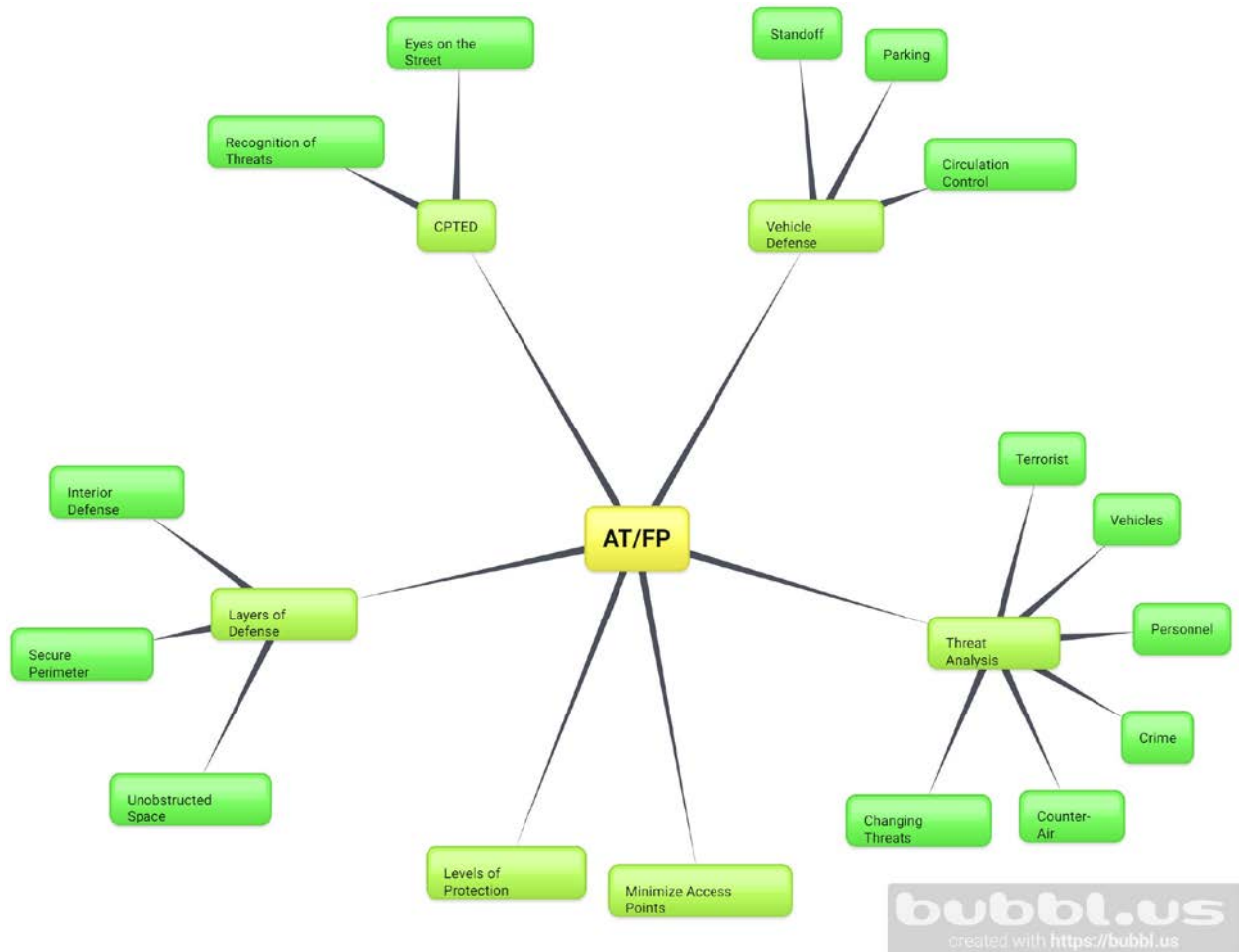


Figure 31: AT/FP Parent-Codes and Child-Codes. Created by Andrew Fenner using Bubbl.us.

Walkability's parent-codes came out as Access to Parking, Connectedness of Places, Continuity of Network, External Connectivity, Less Driving, Pedestrian Comfort, and Visual Interest (see figure 32).



Figure 32: Walkability Parent-Codes and Child-Codes. Created by Andrew Fenner using Bubbl.us.

Anti-Terrorism/Force Protection

The results of what is Anti-Terrorism/Force Protection was the most focused of all the questions, consistently resulting in commonalities. These common child-codes, discussed by all interviewee career fields were: Interior Defense (34 counts, includes 6 child-codes), Standoff (32 counts), Circulation Control (26 counts, includes 1 child-code), Secure Perimeter (24 counts, includes 3 child-codes), and Vehicle Threat (23 counts, includes 2 child-codes). Interior Defense was referenced under the umbrella of Layers of Defense and spoke to the defense mechanisms internal to military installations. Standoff was often described as fundamental and referred to as keeping distance between facilities and vehicle areas (roads and parking). Circulation Control was referred to as a means of altering and restricting vehicle access within an installation. Secure Perimeters were described as a fundamental requirement that each installation required for AT/FP to be successful, as well as the term, is used as the first line of defense. Lastly, Interviewees routinely called out the Vehicle Threat as the primary threat to design for with AT/FP.

When observing parent-codes (the codes directly under AT/FP), the Engineer SMEs most discussed Vehicle Defense followed by Layers of Defense then followed by Threat Analysis (see figure 34). Vehicle Defense was most represented by Standoff and Parking child-codes with 9 counts, each followed by Circulation Control. Layers of Defense was most represented by Interior Defense with 15 counts followed by Secure Perimeter with 7. Lastly, Threat Analysis was most represented by Vehicles with 9 of the 12 total counts.

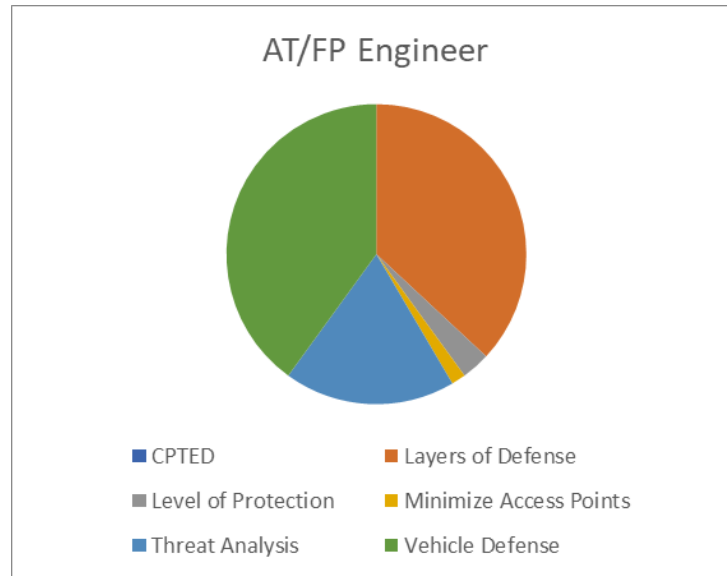


Figure 33: AT/FP Parent-Codes: Engineers

When observing parent-codes, the Planner SMEs most discussed Layers of Defense and Vehicle Defense, then followed by Threat Analysis (see Figure 33). Layers of Defense was most represented by Interior Defense with 13 counts followed by Secure Perimeter with 9. Vehicle Defense was most represented by Standoff with 14 counts, Circulation Control with 5 counts, followed by Parking with 4. Threat Analysis was most represented by Vehicles with 7 of the 11

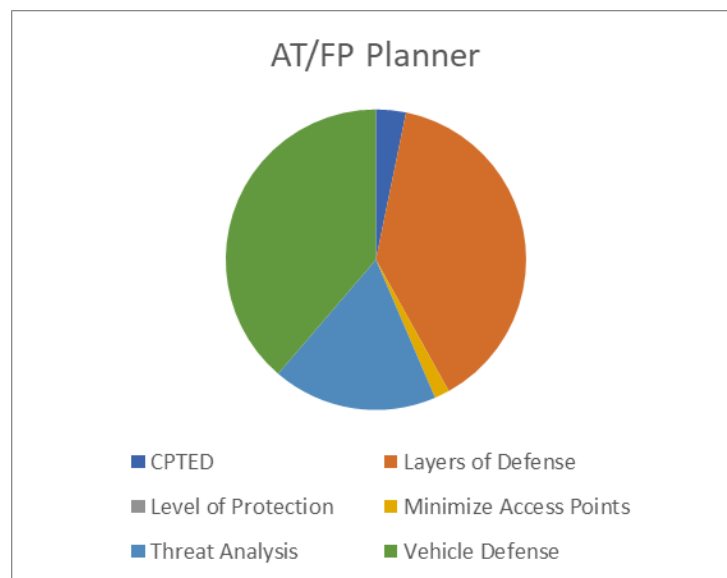


Figure 34: AT/FP Parent-Codes: Planners

total counts. Planners additionally had 2 counts within CPTED with both referring to the topic 'Eyes on the Street'.

When observing parent-codes, the Security SMEs most discussed Vehicle Defense followed by Threat Analysis then followed by Layers of Defense (see Figure 35). Vehicle Defense was most represented by Circulation Control and Parking child-codes with 15 counts, each followed by Standoff with 9. Threat Analysis was most represented by Vehicles with 7 counts of the total 18. Layers of Defense was most represented by Secure Perimeter with 8 counts, followed by Interior Defense with 6. There were an additional 2 counts of CPTED within the child-code of Threat Recognition.

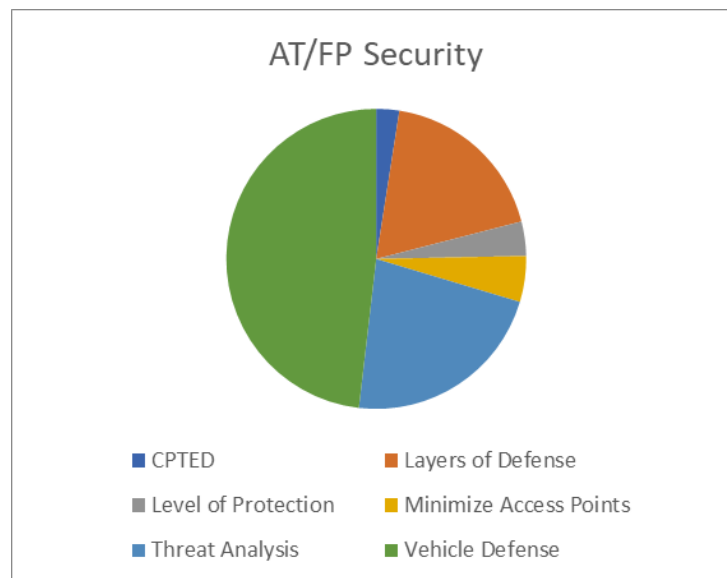


Figure 35: AT/FP Parent-Codes: Security

The description of AT/FP did unexpectedly lack and/or differ for some codes. Crime Prevention Through Environmental Design (CPTED) was never explicitly discussed, and even when it was, was mentioned barely at all. This is despite the UFC explicitly calling out the concept as an AT/FP requirement. Unobstructed Space, an additional UFC requirement, was mentioned a total of three times (2 Engineers, 1 Security). While all career fields discussed Standoff, planners

focused on the design principle the most with over 43% of the code's occurrence. Additionally, Consolidated Parking was almost twice as likely to be mentioned by the security career field as a piece of AT/FP than any other career field with 60% of the code's occurrence.

Walkability

The question on what is Walkability produced a multitude of answers, with three child-codes resulting in high frequency across the three career fields: Compact Development (41 counts), Visual Interest (16 counts), and Walking Distance (13 counts). By far, the most present code for walkability was the concept of Compact Development, often mentioned in the context of Campus Development (22 counts), and refers to a design where buildings are clustered together without vehicle access or roads in between. Visual Interest was mentioned in a generic sense, with some mention by planners and security individuals to landscaping specifically. Lastly, Walking Distance was discussed as a key to get people walking, as distance was conferred as a hinderance to the everyday worker on an installation.

When observing parent-codes, the Engineer SMEs most discussed Connectedness of Places followed by Continuity of Network and Pedestrian Comfort. Connectedness of Places consisted principally of Compact Development with 11 counts (Campus Development 9 counts) (see Figure 36). Continuity consisted mainly of discussion on the need for Pedestrian Paths with 4 of 5 total counts. Pedestrian Comfort was focused entirely on Safety with 0 counts to Security.

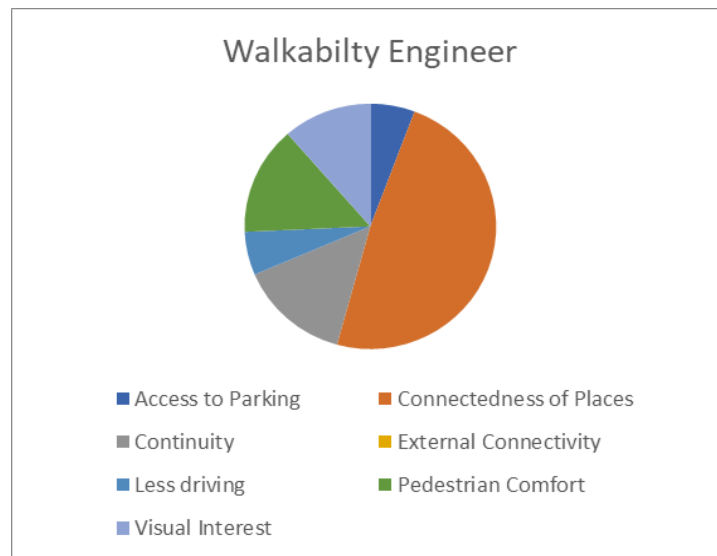


Figure 36: Walkability Parent-codes: Engineer

When observing parent-codes, the Planner SMEs most discussed Connectedness of Places followed by Pedestrian Comfort followed by Continuity of Network. Connectedness of Places consisted principally of Compact Development with 12 counts (Campus Development 6 counts) and Walking Distance with 9 counts (see Figure 37). Pedestrian Comfort consisted primarily of Safety with 10 counts but did additionally discuss Security with 4 counts (all related to Pedestrian Lighting). Continuity consisted mainly of discussion on the need for Pedestrian Paths with 9 of 13 total counts. Additionally, Planners discussed Visual Interest more than any other career-field with 9 counts toward the parent-code. As a career-field, planners had the most breadth to the definition of walkability.

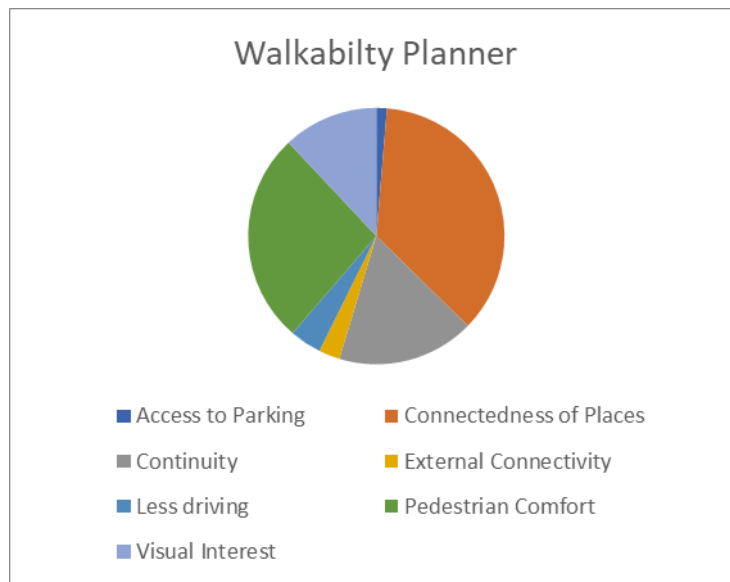


Figure 37: Walkability Parent-codes: Planner

When observing parent-codes, the Security SMEs most discussed Connectedness of Places, far more than any other topic, followed by Visual Interest. Connectedness of Places consisted almost entirely of Compact Development with 18 of 21 total counts (Campus Development 7 counts) (see Figure 38). Visual Interest, though second-most in total counts, consisted of only 3 counts with 2 specifically calling out Landscaping. Security SMEs were the only career-field, not to mention Continuity of Network.

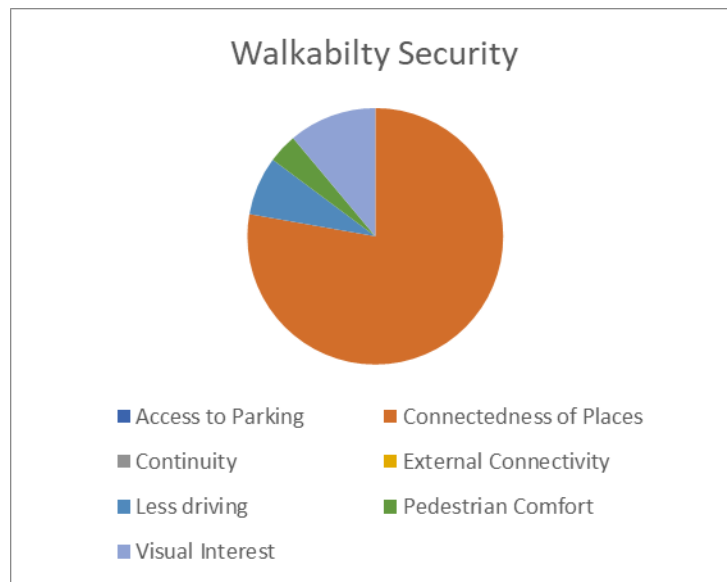


Figure 38: Walkability Parent-codes: Security

The question on walkability created a wide-ranging discussion on what the term means with the different career fields, often focusing on different concepts. Planners were most likely to discuss intangible requirements to walkability like feelings of Safety and Visual Interest, with 77% and 56% of the respective shares. Additionally, the concept of Continuity was most represented by planners with 72% of the share and with the security field not mentioning the concept at all. The security career field also completely ignored the concept of Pedestrian Security. Coincidentally,

just as the discussion of CPTED lacked within the AT/FP discussion, Pedestrian Security was mentioned only by the planning community and even then, only four times in total.

Combined: Relationship Between AT/FP and Walkability

The last two questions focused upon the relationship of walkability and AT/FP, of which the answers produced a variety of results. The SMEs described the relationship as a positive (the two concepts work together) or negative (the concepts oppose each other and therefore do not work together) association. These positives and negatives were spoken in relation to concepts of AT/FP and Walkability, often in concert with multiple codes in a single statement. Overall, there were 48 coded answers on the relationship: 38 were positive, and 10 were negative. The

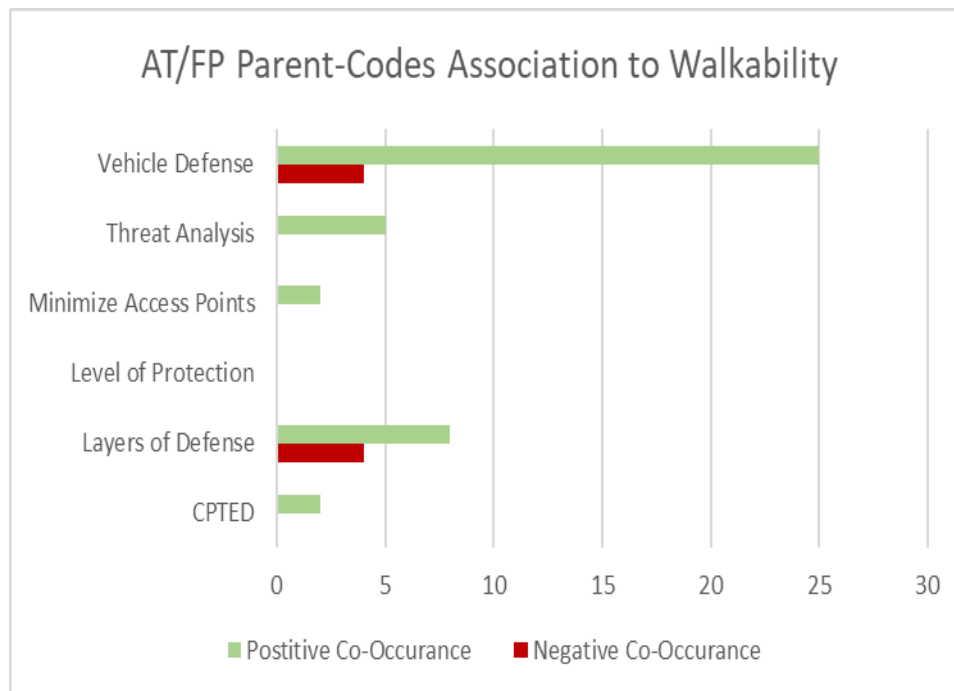


Figure 39: AT/FP Parent-Codes Association with Walkability, as said by SMEs

following charts show the number of instances each principle was mentioned, whether positive or negative. When AT/FP parent-codes were mentioned in association with Walkability, Vehicle Defense stood out with 25 positive associations versus 4 negatives. Layers of Defense received

mixed results with 8 positives and 4 negatives (see figure 39). When Walkability parent-codes were mentioned positively or negatively in association with AT/FP, Connectedness of Places

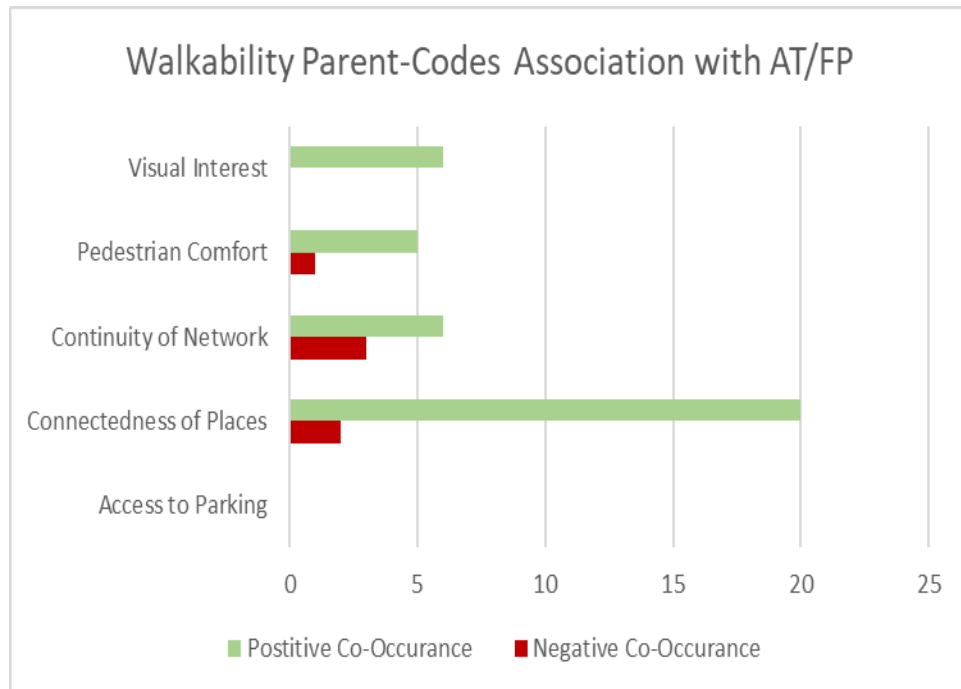


Figure 40: Walkability Parent-Codes Association with AT/FP, as said by SMEs

stood out with 20 positives and only 2 negatives (see figure 40). The parent-codes of Continuity of Network and Visual Interest both had 6 positive associations while Pedestrian Comfort had 5.

The relationship overall was most defined by seven child-codes: Campus/Compact Development (17 positive counts), Standoff (9 positive counts, 2 negative counts), Barriers/Circulation Control (7 positive counts), Visual Interest/Landscape (6 positive counts), Consolidated Parking (6 positive counts), Integration (5 positive counts), and Less Driving (4 positive counts).

Campus/Compact Development was discussed as related to AT/FP child-codes like Consolidated Parking (12 counts) and Standoff (7 counts) (both under the Vehicle Defense Parent Code) with a focus on the positive effects it has on protection against vehicles. Standoff was most discussed in context with the previously said Campus/Compact Development with the focus on how that kind of development can remove the need for standoff to only the exterior of a campus, both an

improvement for walkability and AT/FP. Barriers/Circulation Control was discussed in two forms; landscaping and restriction of vehicle flow versus pedestrian. From the landscape perspective, it was associated with the dual use of landscaping as both a vehicle barrier and a boost for pedestrian visual interest. From the vehicle versus pedestrian flow perspective, the code was associated with the ability to use barriers that only restricted vehicle flow and not pedestrian flow, therefore allowing walkability but preventing the vehicle threat. Visual Interest/Landscape was discussed as using appropriate landscaping elements to fill the voids required, as AT/FP requires standoff from roads and unobstructed space from buildings. Consolidated Parking was discussed as both a positive for AT/FP because it concentrates the vehicle threat into one area as well as a positive for walkability as it removes parking from pedestrian routes. Integration was discussed as it relates to the communities of planning, engineering, and anti-terrorism working together early-on to coordinate efforts. It was discussed that difficulties between AT/FP and walkability could be reduced or eliminated through proper integration. Lastly, Less Driving was discussed as a result of walkability that also benefits AT/FP as it reduces the prevalence of the vehicle threat.

The relationship was not, however, always seen the same as expected, with some codes mentioned very little and career fields seeing things differently. Unobstructed space, while a pillar of AT/FP, was only mentioned 2 times (1 positive, 1 negative). Crime Prevention Through Environmental Design (CPTED) was not mentioned at all with a component, Eyes on the Street, only mentioned once. Additionally, there was minimal mention of cost reductions when discussing the relationship between the two concepts. As a career field, planners had the most negatives (8 counts) for the relationship but also the most positives (16 counts).

Chapter 5: Discussion

The thesis sets out to answer two research questions: how does walkability relate to anti-terrorism/force protection, and how is that relationship understood in the Air Force? The cross-examination of the literature review-established principles shows that a relationship exists for all principles in some shape or form. The interviews revealed that those relationships are not seen equally or at all by the leading Subject Matter Experts within the Air Force.

How Does Walkability Relate to Anti-Terrorism/Force Protection?

The cross-examination looked at overlaps between walkability principles and AT/FP principles. Overall, 21 positive associations were noted as opposed to 9 negative associations, establishing that a relationship exists. Within the principles of AT/FP, Vehicle Defense experienced the most overlap (11 positive, 5 negative), followed by CPTED (8 positive, 1 negative), and finally Unobstructed Space (2 positive, 3 negative)

Vehicle Defense clearly experienced the most substantial overlap with Walkability, which is not surprising considering both revolve around modes of transportation. The overly positive relationship to Continuity of Network, Pedestrian Comfort, and Visual Interest indicates an opportunity to overlap goals when planning/designing Air Force installations. Connectedness of Places, however, showed a negative relationship. This highlights the effect of standoff, the primary method for vehicle defense, and how it interferes strongly with distances between buildings.

Crime Prevention Through Environmental Design (CPTED) experienced almost complete positive overlap with walkability. Natural Surveillance was the most prevalent, as the concept is focused around the idea of 'Eyes on the Street' and the more walkable a place is, the more

pedestrians there are to keep a watchful eye. Territorial Reinforcement also connected well with ideas like Pedestrian Comfort-security lighting and Visual Interest-landscaping, establishing areas where people should or shouldn't be. CPTED's only negative relates to the issue of having a more extensive pedestrian network means more areas will need to be kept safe. It indicates that extra attention must be paid to any pedestrian 'cut-throughs' so as to make sure the pedestrian's safety is maintained. CPTED primarily deals with design at the human-scale, so it is no surprise that it overlaps well with walkability.

Lastly, Unobstructed Space experiences mixed overlap when compared to walkability, with zero overlaps at all with Continuity of Network. The concept of Unobstructed Space, requiring 33 feet of clearance around all inhabited buildings, can improve pedestrian sightlines and denser, walkable areas may require less unobstructed space due to mixed-use construction. The walkability principle of Visual Interest (more specifically, the recommendation for landscaping) is in opposition with Unobstructed Space and highlights the importance of looking at this issue in more detail. It does not preclude attractive, pedestrian-oriented design but rather requires unique landscaping solutions (for example: no bushes as they could conceal a small bomb, rather a tree-like bush with no foliage near the ground) near facilities that still meet the unobstructed space requirements.

How is the Relationship Between Walkability and Anti-Terrorism/Force Protection Understood Within the United States Air Force?

The interviews produced exciting results in how the terms AT/FP and Walkability were defined and then related. The definitions of the two terms were less comprehensive, with the description of AT/FP mainly focusing on Vehicle Defense as opposed to Unobstructed Space and CPTED,

and Walkability focusing on Connectedness of Places significantly more than Pedestrian Comfort, Continuity of Network, and Visual Interest. The discussion of the relation between the two terms differed significantly from the results of the literature review as well, with some concepts being seen, albeit in a narrow view and others being missed entirely.

Defining Anti-Terrorism/Force Protection and Walkability

The resultant definitions of AT/FP and Walkability produced a narrowed opinion of what the two terms mean to the Air Force's Subject Matter Experts, as compared to the literature review result. The literature review showed that AT/FP could broadly be broken down into three principles: Vehicle Defense, Unobstructed Space, and CPTED. In the interviews, however, AT/FP was primarily defined as a defensible design against the threat of Vehicle Borne Improvised Explosive Devices (VBIEDs), resulting in a focus on standoff. One of the Anti-Terrorism SMEs described this as, "We basically have the protection requirement against an explosive... ..and the primary principle we try to utilize for mitigating explosive threats is standoff," while an Engineer SME said, "I think we focus a lot on [sic] vehicle-borne IEDs because like I said, they, they probably have the largest impact on personnel and [sic] on your facilities." Overall, Vehicle Defense was discussed 89 times as opposed to the three mentions of Unobstructed Space and zero mentions of CPTED. This is drastically different from the governing documents of the Department of Defense that explicitly call out all three as requirements to AT/FP design. Through the results of this question, it is clear that AT/FP is seen as a focus on Vehicle Defense and on practically nothing else, potentially skewing the designs of how AT/FP is implemented in the built environment.

Walkability, as a term, was much less familiar to the SMEs and resulted in a narrow definition, much in the same as AT/FP. The term was mostly described as a function of distance, describing

the need for buildings to be close enough together to walk to. A Planner SME stated, “when I think about the walkability, some of it's somewhat related to how far apart buildings are,” while an Engineer SME said, “I think we, as Americans and our culture, it's the shortest distance.” This discussion on distance heavily translated to the idea of campus/compact development as the primary method for achieving short distances. This fulfilled the walkability principle of Connectedness of Places, where amenities need to be located close enough together to walk to with 65 total remarks on that principle. The other principles were completely overshadowed with Continuity of Network being discussed 18 times, Pedestrian Comfort being discussed 26 times (mostly with a focus on Safety rather than Security), and Visual Interest discussed 16 times. While all principles were mentioned, it is clear that Connectedness of Places had the most visibility and that the other principles may be overlooked when planning Air Force Installations.

The Relationship of Walkability and AT/FP as seen by the Subject Matter Experts

The Subject Matter Experts showed that they do see a relationship between Walkability and AT/FP that is exceedingly positive versus negative. The observations were almost entirely focused upon Campus/Compact Development but did additionally mention positive associations between Barriers and Visual Interest. While these two associations are a significant component, as seen from the literature review cross-examination, they are narrow in scope and miss design principles like CPTED, and Pedestrian Comfort.

The most frequent relationships discussed were Campus/Compact Development, Standoff, Barriers/Circulation Control, and Consolidated Parking, all revolving around vehicles and their separation from people. Campus/Compact Development was not only discussed frequently but was also mentioned by all three career fields, indicating it is a widely understood concept. This idea combines the walkable principles of Connectedness of Places by reducing the distance

between destinations, as well as Continuity of Network by dis-associating the pedestrian network from roads, creating a comprehensive system. On the AT/FP side, Campus/Compact Development removes parking and cars from the development, reducing standoff and concentrating cars into fewer locations. Combining all of those factors together and it is easy to see why the SMEs focused so firmly on the concept with one of the Planner SMEs saying, “I think that if you design right, you can cluster your buildings to where you're parking on the perimeter, and you're walking between buildings and you're much less of a force protection threat as a walker, as opposed to someone in a vehicle.” Overall, this focus by the SMEs does align well with the results of the literature review cross-examination.

The additional observation of Visual Interest and its positive effect on vehicle barriers differs from Compact/Campus Development in that only the two Planner SMEs and one Anti-terrorism SME discussed the relation. This is opposed to the literature review, where Visual Interest had the most considerable positive overlap with AT/FP. The Planner SMEs seemed to have the best understanding of the potential overlap with one of them discussing the idea comprehensively; “I've seen is people who just use the setback well and think a lot about how to actually combine AT/FP elements and walkability elements. So, for instance, using trees or bushes or [other] landscaping depending on where you're at and the kind of landscaping that you have, like landscaping as a way to provide the bollard instead of using just straight bollards.” While the understanding within the planning career field appears to be present, the concept does not seem to make a mark in the other two career fields with the Anti-terrorism SME just discussing landscaping as, “we don't prohibit all benches, all trash cans, all types of vegetation,” and the other SMEs omitting the idea altogether. It is clear that this relation will need more attention in the future and may require more conversation across career fields to do so.

As for Pedestrian Comfort (Safety and Security), and Crime Prevention Through Environmental Design, the SMEs did not acknowledge much, if any, of their overlaps. Pedestrian Comfort was shown in the literature review to only overlap positively with AT/FP, with commonalities like reducing vehicle speeds, creating ‘buffer zones’ between pedestrians and cars, increasing sightlines, and providing proper exterior lighting on public right-of-ways. This is an indication that this concept is not getting the attention it needs and will require further research to understand why. CPTED was another design principle with only positive relations noted in the literature review. The concepts of Natural Surveillance and Territorial Reinforcement overlapped well with walkability as more pedestrians increase Natural Surveillance, and well-designed landscaping and lighting can boost Territorial Reinforcement. With CPTED being a required concept, being explicitly called out in *UFC 2-100-01 Installation Master Planning, with Change 1*¹⁷⁴, it is surprising that no discussion existed on its merits. It could be that the concept is only written into the installation planning UFC and not the AT/FP UFCs, but more research is needed to understand where the disconnect is occurring.

In addition to the design principles of Walkability and AT/FP, all three career fields discussed the merits of Integration with one of the planning SMEs saying, “I think there's things that we could do systemically, institutionally, across the Air Force that would improve the walkability and not degrade force-protection measures.” This reflection is critical to the success of the two concepts working together. The literature review and interviews showed that Walkability and AT/FP overlap and therefore would require some level of integration across career fields if that overlap is to be implemented. This may be an essential note that even though there exists a

¹⁷⁴ Department of Defense, “Installation Master Planning with Change 1.” 16.

design overlap between Walkability and AT/FP, a working relationship between all involved is critical to the success of making both concepts work.

Chapter 6: Conclusion

The opportunity to design for both Walkability and Anti-Terrorism/Force Protection is an exciting prospect full of possibilities. The positive overlap between principles like Vehicle Defense, CPTED, Connectedness of Places, and Visual Interest provide a starting line to examine how this can be implemented. Further research into the full extents of these overlaps may yield more opportunities and can inform an implementation process. This thesis examined overlaps with design principles but did not go into specific, implementable designs. Researching actual designs can give a face to the theoretical understanding.

Additionally, understanding funding lines and administrative processes within the Air Force would be valuable research into creating an effective process. Funding is the backbone of the built environment, and research into its effects on this topic would be critical. For example, the Department of Defense often funds buildings on an individualized basis, posing severe difficulty to the ‘Compact/Campus Development’ discussed by the Subject Matter Experts since that kind of development can consist of many uses and buildings. A campus-style development would be more successful with a large-scale funding effort versus a piece-meal package. Administratively, the military is a unique organization where military personnel rotate every few years. This can pose challenging to planning as new people must be read in on projects and decision-makers make leave for another base in the middle of a project. These changes would undoubtedly have an effect on this topic and must be understood how and to what extent. The success of this thesis really depends upon its employability in the built environment, specifically in the United States Air Force and potentially beyond; understanding these additional variables is therefore critical.

To coincide with additional research into the design and implementation, more attention needs to be paid to how information on Walkability and Anti-Terrorism is understood. The Subject Matter Experts were generally aware of the two concepts but missed on some more of the intricate design principles like Visual Interest and Crime Prevention Through Environmental Design (CPTED); more research is needed to understand why that disconnect exists. Are there missed training opportunities? Are some career fields receiving necessary training that others are not? Interviewing a broader range of subjects is an excellent first step to solving these questions. For example, interviewing not only those at the functional headquarters like the Air Force Civil Engineer Center but also those at the Air Force Headquarters at the Pentagon. In addition to the headquarters individuals, interviewing those at the base level (Community Planners, Base Civil Engineers, and Anti-Terrorism Officers) may give another perspective as they are the ones who have to execute the policy. With the broader breadth of subjects, education levels could be researched as to how that affects the understanding. Are planners with Masters degrees in Planning understanding the relationship more than those without? Are Base Civil Engineers (the Civil Engineer Commanders) with engineering degrees differing in opinions from their Community Planners? Understanding how the concepts are understood across the enterprise can aid the process of implementation, whether that be better integration between career fields or refining governing documents.

This thesis has shown that Walkability and Anti-Terrorism/Force Protection share commonalities between their design principles, with substantial enough overlap that the two concepts can mutually benefit each other with proper planning. This overlap, however, is not comprehensively understood by the Air Force's Subject Matter Experts in Planning, Engineering, and Security career fields. There exists a disconnect from what exists theoretically between the two concepts

and what is thought of by the Air Force's SMEs. This thesis, therefore, opens the door for a new way forward in implementing these two concepts together. It highlights the need for more cooperation and education on the relationship between the two concepts. Additionally, future research into this topic will be necessary in order to develop a deeper understanding of the design relationship and implementation process. This thesis has shown there is an overlap in the definitions of Walkability and AT/FP as they stand now. With these overlaps now seen, does Walkability have the same design principles that it did before? What about AT/FP? Should Walkability and AT/FP share design principles? The research that this thesis has completed, both the cross-examination and interviews, has established a starting point for a more extensive and rigorous exploration of these questions.

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Appendix A: Definition of Terms

❖ Walkability

- “[p]resence of continuous and well-maintained sidewalks. Universal access characteristics. Path directness and street network connectivity. Safety of at-grade crossing treatments. Absence of heavy and high-speed traffic. Pedestrian separation or buffering from traffic. Land-use density. Building and land-use diversity or mix. Street trees and landscaping. Visual interest and a sense of place as defined under local conditions. Perceived or actual security.”¹⁷⁵

❖ Air Force Installation Mission Support Center (AFIMSC)

- “one of six specialized centers assigned to Air Force Materiel Command. AFIMSC serves as the single intermediate-level headquarters responsible for providing installation and mission support capabilities to 77 Air Force installations, nine major commands and two direct reporting units with an annual budget of approximately \$10 billion. The AFIMSC cross-functional team provides globally integrated management, resourcing and combat support operations for Airman and family services, base communications, chaplain, civil engineering, contracting, financial management, logistics readiness, public affairs, and security forces programs.”¹⁷⁶

❖ Anti-terrorism

- “Defensive measures used to reduce the vulnerability of individuals and property to terrorist acts, to include limited response and containment by local military and civilian forces. The AT program is one of several security-related programs that fall under the overarching Force Protection and Combating Terrorism programs. An AT program is a collective effort that seeks to reduce the likelihood that Department of Defense affiliated personnel, their families, facilities, and materiel will be subject to a terrorist attack, and to prepare to respond to the consequences of such attacks should they occur.”¹⁷⁷

❖ Anti-terrorism Officer (ATO)

¹⁷⁵ Lo, “Walkability: What Is It?” 153-154.

¹⁷⁶ *AF Installation & Mission Support Center*.

¹⁷⁷ “DoD Instruction 2000.16.”

- “The installation, base, regional, facility, or deploying AT advisor charged with managing the AT Program.”¹⁷⁸

❖ **Asset**

- “A resource requiring protection.”¹⁷⁹

❖ **Design Basis Threat (DBT)**

- “The threat (aggressors, tactics, and associated weapons, tools or explosives) against which assets within a building must be protected and upon which the security engineering design of the building is based.”¹⁸⁰

❖ **Force protection (FP)**

- “Security programs designed to protect Service members, civilian employees, family members, facilities, information, and equipment in all locations and situations, accomplished through the planned and integrated application of combating terrorism, physical security, operations security, personal protective services, and supported by intelligence, counterintelligence, and security programs.”¹⁸¹

❖ **Force Protection Conditions (FPCON)**

- “The threat (aggressors, tactics, and associated weapons, tools or explosives) against which assets within a building must be protected and upon which the security engineering design of the building is based.”¹⁸²

❖ **Inhabited Building**

- “Buildings or portions of buildings routinely occupied by 11 or more DoD personnel and with a population density of greater than one person per 430 gross square feet (40 gross square meters). This density generally excludes industrial, maintenance, and storage facilities, except for more densely populated portions of those buildings such as administrative areas.”¹⁸³

¹⁷⁸ “DoD Instruction 2000.16.”

¹⁷⁹ “UFC 4-020-01 DoD Security Engineering Facilities Planning Manual.” Glossary 4.

¹⁸⁰ “UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings.” 71.

¹⁸¹ “DoD Instruction 2000.16.”

¹⁸² “UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings.” 73.

¹⁸³ “UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings.” 73.

❖ Installation

- “an area or locality subject to the custody, jurisdiction, or administration of the Secretary of a Military Department or the Secretary of Defense, in the case of an activity in a foreign country, under the operational control of the Secretary of a Military Department or the Secretary of Defense. This term includes but not limited to, military reservations, bases, posts, camps, stations, or arsenals.”¹⁸⁴

❖ Level of protection

- “The degree to which an asset (person, equipment, object, etc.) is protected against injury or damage from an attack.”¹⁸⁵

❖ Planning team

- “A team of people with responsibilities relating to a project that is formed to develop design criteria and review material from all phases of the design process.”¹⁸⁶

❖ Security Engineering

- “The process of identifying practical, risk-managed short and long-term solutions to reduce and/or mitigate dynamic manmade hazards by integrating multiple factors, including construction, equipment, manpower, and procedures.”¹⁸⁷

❖ Standoff distance

- “A distance maintained between a building or portion thereof and the potential location for an explosive detonation.”¹⁸⁸

❖ Sustainable Planning

- “meets the needs of the present without compromising the ability of future generations to meet their needs. The inter-relationship between environments, resources consumed, waste products, and use of facilities and land must be

¹⁸⁴ “UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings.” 73-74.

¹⁸⁵ “UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings.” 74.

¹⁸⁶ “UFC 4-020-01 DoD Security Engineering Facilities Planning Manual.” Glossary 8.

¹⁸⁷ “UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings.” 75.

¹⁸⁸ “UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings.” 75.

carefully designed and developed to preclude permanent damage to the future environment.”¹⁸⁹

❖ **Terrorism**

- the calculated use of violence or the threat of violence to cause fear.¹⁹⁰

¹⁸⁹ “UFC 2-100-01 Installation Master Planning.” 73.

¹⁹⁰ “DoD Instruction 2000.16.”

Appendix B: Human Subjects Division Exemption



UNIVERSITY of WASHINGTON

HUMAN SUBJECTS DIVISION

DETERMINATION OF EXEMPT STATUS

October 2, 2019

Dear Andrew Fenner:

On 10/2/2019, the University of Washington Human Subjects Division (HSD) reviewed the following application:

Type of Review:	Initial Study
Title of Study:	Walkability and Anti-Terrorism/Force Protection: Understanding the relationship and how it can work on United States Air Force Main Operating Bases
Investigator:	Andrew Fenner
IRB ID:	STUDY00008225
Funding:	None

Exempt Status

HSD determined that your proposed activity is human subjects research that qualifies for exempt status (Category 2).

- This determination is valid for the duration of your research.
- This means that your research is exempt from the federal human subjects regulations, including the requirement for IRB approval and continuing review.
- **Depending on the nature of your study, you may need to obtain other approvals or permissions to conduct your research. For example, you might need to apply for access to data or specimens (e.g., to obtain UW student data). Or, you might need to obtain permission from facilities managers to approach possible subjects or conduct research procedures in the facilities (e.g., Seattle School District; the Harborview Emergency Department).**

If you consider changes to the activities in the future and know that the changes will require IRB review (or you are not certain), you may request a review or new determination by submitting a Modification to this application. For information about what changes require a Modification, refer to the [GUIDANCE: Exempt Research](#).

Thank you for your commitment to ethical and responsible research. We wish you great success!

Sincerely,

Lindsey Westlake
Review Administrator
206-897-1748
scaggl@uw.edu

4333 Brooklyn Ave. NE, Box 359470 Seattle, WA 98195-9470
main 206.543.0098 fax 206.543.9218 hsdinfo@u.washington.edu www.washington.edu/research/hsd
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Appendix C: Interview Protocol

Introduction

My name is Andrew Fenner, and I am a Captain in Civil Engineering and am currently a master's candidate at the University of Washington, studying Urban Planning. The purpose of this study is to build a foundation of how walkability and anti-terrorism/force protection interact in the United States Air Force. I want to learn your opinion on the topic from your functional expert point of view. The information in this interview will be critical to the final analysis of my thesis.

You were selected due to your functional background being a crucial piece to the design of our built environment and having a critical point of view. A total of six interviews will be completed from three functional groups being planners, security engineers, and the anti-terrorism/force protection community.

Prior to this interview, you were sent a consent form. You have agreed to allow me to record this interview and take notes. Additionally, you have agreed to the naming of your job title within the Air Force to be named within the thesis. Your personal name and rank will not be used and will remain confidential. The interview will take approximately 30 to 45 minutes and follow a designed interview protocol.

Do you have any further questions before we begin?

Questions

Opening Question

What is your role within your organization?

Probe: Can you describe your expertise?

Content Questions

What does anti-terrorism/force protection mean to you?

Probe: Can you talk about personal experiences with incorporating it?

What does walkability mean to you?

Probe: Is it necessary? Is it desirable?

Is there a relationship, positive or negative, between anti-terrorism/force protection and walkability?

Probe: Can you explain why?

Can walkability and anti-terrorism/force protection work together?

Probe: Can you give examples? (Osan AB, Kunsan AB, Pentagon, deployed? Why do they work together? How do they work together?

Is there anything else you would like to discuss what you have not had the chance to?

Additional Probes

- Ask for more information
- Ask for an explanation

Closing Instructions

Thank you very much for your time! It is much appreciated. The thesis will be finished by the end of the year, and I will provide you the abstract at a minimum! I would like to ask if it is possible to contact you in the future in regard to any clarifications?