

Feb 13, 2022
Dr. Mike Hegedus
School of Engineering Science
Simon Fraser University
Burnaby, BC, V5A 1S6



RE: ENSC 405/440 Requirements Specification for Wrist Assist

Dear Dr. Mike Hegedus:

The requirement specification is enclosed below for WiCCSafe's WristAssist system as part of ENSC 405W/440. Our company aims to create a reliable communication system that aids in protecting students and faculty to create a safer environment on university campuses for all. This design will keep in mind government specifications on wireless communications guidelines to ensure the design complies with local regulations.

WristAssist will utilize wireless technology to locate and send out alert signals from the end users to campus security. Our solution provides feedback to the user about the status of the distress signals to ensure successful communication. Our main goal in the enclosed document is to carefully analyze consumer's needs from the WristAssist system, and categorize them clearly in the form of system requirements. The document will explore general system requirements, end user requirements, campus end requirements, safety & sustainability requirements, and government requirements.

Our team would like to thank the Engineering department for taking the time to read through our requirement specifications document. If you have any additional questions, please feel free to reach out to me via email: hbergero@sfu.ca

Sincerely,

A handwritten signature in black ink, appearing to read 'Hannah Bergeron', with a stylized flourish at the end.

Hannah Bergeron
CCO
WiCC SAFE



WICC SOFE

Requirements Specification: Wrist Assist

Company #10

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Abstract

The following document specifies the requirements of the WristAssist system. WristAssist is a system of personal safety devices (PSDs) that allow students to communicate distress discreetly to campus security. This document will explore the high level concept of WristAssist, and provide background on the issue of personal safety on university campuses. A system overview will illustrate the overall concept of the product, and demonstrate the subcomponents within the system. The requirements are carefully chosen to reflect the needs of multiple stakeholders, as each party will have different requirements from the WristAssist system. To distinguish between these different needs, the requirements are presented in the following categories: PSD requirements, campus end requirements, safety and sustainability requirements, and government requirements. This document illustrates the main priorities and concerns from each party, and provides insight into the WristAssist system and what it aims to accomplish with respect to personal safety.

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Glossary

The following table includes a list of terms used throughout the document.

Term	Definition
User Interface	User Interface refers to the monitoring system interface that resides at campus security's headquarters
End user	The end user of the personal safety device (i.e.college/university students)
PSD	Personal Safety Device (PSD) signed out by the end user (i.e. WristAssist)

Table 1.0 - Definition of the common terms used throughout the document

1. Introduction

The concept of WristAssist originated from a desire to support students on college/university campuses who deserve a reliable, discreet, and effective way to communicate with local authorities. WristAssist is a small, compact device able to discreetly send a distress signal to campus security, alerting them of potentially dangerous situations. Students will be able to sign out these devices from their university for use on campus, guaranteeing accessibility to any students who are concerned for their personal safety. With the help of this device, students can communicate their level of distress to campus security along with their positional data and identification information. Campus security will receive this data on a provided user interface, where they will be alerted of any incoming signals from devices across campus. The information they receive will allow them to efficiently locate, track, and personally respond to users in distress. WristAssist is marketed as a comprehensive system to universities, allowing them to offer a safe environment to their students. Subsequently, this strategy keeps the financial strain of buying personal safety devices off of the end users.

1.1 Background

Violence and harassment have long been issues in college/university settings, and the subject has been extremely prevalent in past years due to factors such as the presence of social media platforms. As an example, women in the United States aged 18-24 are at a risk three times higher than that of the average woman to be victims of sexual violence. [1] Similarly, men aged 18-24 who are enrolled in college/university are 78% more likely than the average man to be victims of sexual violence. [1] Given this risk, the common solutions for students' personal safety are often outdated and don't offer effective options in the event of dangerous situations. A survey conducted in the United States by ADT found that in 2021, programs such as SafeWalk were only utilized by 17% of college/university students, while 82% of students reported feeling concerned for their personal safety. [2] These statistics contribute to a feeling of unease by students on campuses and indicate the presence of an expanding market for personal safety solutions.

1.2 Requirement Classification

The encoding of the development stages is listed in the table below:

Encoding	Stage
A	Proof of Concept
B	Prototype
C	Final Product

Table 1.2.1 - Development Stage Encoding

Each stage in the requirement specification is encoded with a letter in the table. The Proof-of-concept stage (A) outlines requirements that will be met in the early development stages to verify that the conceptual requirements can be accomplished. The prototype stage (B) will improve upon the design as a whole and start incorporating requirements as the design matures. Lastly, the final production stage (C) indicates requirements for the device in a production setting. This stage will take into consideration mass production requirements for the design of the final system.

2. System Overview

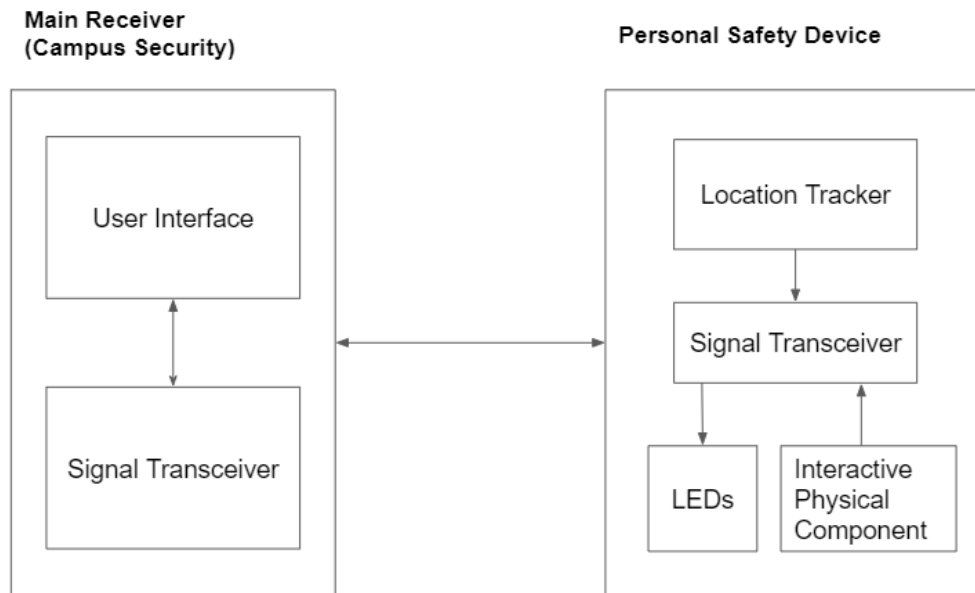


Figure 2.1: An overview of our system

The system will consist of a personal safety device and a main receiving unit. The receiving unit of the system will contain a signal transceiver and a user interface that will be located at campus security headquarters. The signal transceiver located in campus security is designed to receive distress signals from the personal safety devices and send confirmation signals back to the personal safety devices when applicable. The other component in the system is the personal safety device that contains a location tracker, an interactive physical component, LEDs, and a signal transceiver. The end user will interact with the physical component on the device to send different levels of distress signals to the main receiver. The LEDs on the personal safety device will have distinct colour sequences to represent different signal statuses, the device's health, and the user's location status.

3. Requirements

3.1 System Requirements

The following table presents general requirements for the entire system including the user interface and the PSDs. The requirements below mainly define how the PSDs and the system's user interface interact with each other.

Requirement #	Description	Stage
Req 3.1.1	System will consist of PSDs which communicate with campus security's user interface.	A
Req 3.1.2	PSDs will be able to send two different distress level signals to campus security.	B
Req 3.1.3	A user interface will be created to monitor the system.	B
Req 3.1.4	PSDs will be signed out at easily accessible locations.	C
Req 3.1.5	Upon sign out of PSD, user's student information will be associated with the PSD's unique identifier for student identification purposes.	B
Req 3.1.6	PSD will communicate information necessary to locate and identify end users to the user interface.	B
Req 3.1.7	Signals from the PSD should be sent to the user interface as quickly as possible.	B
Req 3.1.8	For continuous tracking, the user's location will be updated on the user interface at regular intervals while the distress signal is active.	B
Req 3.1.9	Once a distress signal from the PSD is received by campus security, a signal indicating the reception of the distress signal will be sent back to the PSD.	B
Req 3.1.10	System coverage should focus on areas of concern specific to the implementation environment.	C

Table 3.1.1 - General System Requirements and Stages

3.2 Personal Safety Device Requirements

The following table contains the requirements for the personal safety devices. An important priority demonstrated in the table below is ensuring our device is discreet enough not to alert a harasser, while also providing the user with options for different levels of distress. Additionally, feedback requirements guarantee that the user is aware of important information with respect to the device's status, so that they are able to make informed decisions while in possession of the PSD. Furthermore, the below requirements specify that the device should be simple to use and easy to maintain to guarantee that the user can operate it even under the most stressful circumstances.

Requirement #	Description	Stage
Req 3.2.1	PSD should be portable and lightweight.	B
Req 3.2.2	PSD should be wireless.	A
Req 3.2.3	PSD should be discreet to use.	B
Req 3.2.4	PSD should be robust and water resistant.	C
Req 3.2.5	PSD battery life should exceed standard sign-out period.	B
Req 3.2.6	PSD should have a standardised charging port for easy re-charging.	B
Req 3.2.7	PSD will be able to send a distress signal to the user interface containing the following information: <ul style="list-style-type: none"> • The location of the user • Emergency level (Low, High) • The PSD's unique identifier 	A
Req 3.2.8	PSD will position the end user to an accuracy of at least 10 metres.	A
Req 3.2.9	PSD will include an interactive physical component to send two distinct distress signal levels to campus security.	B
Req 3.2.10	The sequence in which the user interacts with the physical component will determine the level of distress of the user.	B
Req 3.2.11	The aforementioned sequences will be unique and straightforward in order for the user to remember the appropriate sequences.	B
Req 3.2.12	The level 1 user interaction sequence will be used to indicate low level emergencies.	B
Req 3.2.13	The level 2 user interaction sequence will be used to indicate high level emergencies.	B

Req 3.2.14	PSD will include a feedback system to communicate the status of the distress signal to the user.	A
Req 3.2.15	The user will be made aware of the status of their distress signal and location fix status via varying LED colours.	B
Req 3.2.16	The PSD will alert the user if the distress signal was not received by the user interface.	B
Req 3.2.17	The PSD will indicate to the user if the distress signal is received by the user interface.	B
Req 3.2.18	The PSD will indicate to the user when the PSD is out of range of the coverage area.	B
Req 3.2.19	The PSD will indicate to the user if the PSD is unable to determine user location.	B
Req 3.2.20	PSD will include a feedback system to communicate the status of the device to the user.	B
Req 3.2.21	The PSD will notify the user of the battery status.	B
Req 3.2.22	The PSD should take less than 1 minute to boot up.	B
Req 3.2.23	The PSD will have an ON/OFF switch.	B
Req 3.2.24	The PSD will be able to cancel an existing distress signal.	B
Req 3.2.25	Clear instructions should be provided to the user upon sign out of the PSD.	C
Req 3.2.26	The PSD will offer a calibration process to allow the user to verify the functionality of the PSD.	C
Req 3.2.27	The PSD should be reasonably priced and reliable.	C

Table 3.2.1 - Personal Safety Device Requirements and Stages

3.3 Campus End Requirements

The table below contains requirements detailing the user interface and sign out features of the system from the campus perspective. To provide a good user experience to campus security and those who monitor the system, the requirements below take into consideration the workflow between end user and campus security. In order to make the system as easy to use as possible, the requirements indicate a straightforward and non-demanding system.

Requirement #	Description	Stage
Req 3.3.1	Campus security will be provided with a user interface for the system to display necessary details when a distress signal is received.	B
Req 3.3.2	User interface should be easy to use and understand.	B
Req 3.3.3	User interface should alert the campus security when a distress signal is received.	B
Req 3.3.4	User interface should receive the following information in the event of a distress signal: <ul style="list-style-type: none"> • Emergency level (Low, High) • PSD's location • PSD's unique identifier 	B
Req 3.3.5	User interface should determine the following information from the unique identifier of the device: <ul style="list-style-type: none"> • Student ID (Name, photo) • Student phone number 	B
Req 3.3.6	PSD's location should be presented on the user interface as a location on a map.	C
Req 3.3.7	PSD's location should be resolved with a positional accuracy of 10 metres.	A
Req 3.3.8	User interface should timestamp and log the received signal(s).	C
Req 3.3.9	User interface should independently log each PSD's distress signal(s) separately.	C
Req 3.3.10	Campus security should be provided with training to utilise/maintain the PSDs and user interface.	C
Req 3.3.11	PSDs should be easy to set up and maintain.	C
Req 3.3.12	System should be easily integrable with current campus security safety protocols/systems.	C

Req 3.3.13	Sign out stations should have charging capabilities.	C
Req 3.3.14	<p>Sign out stations should do the following:</p> <ul style="list-style-type: none"> • End user should be prompted to provide student ID and student phone number • System should associate the information from above to the unique identifier of the PSD • System should log appropriate sign out information 	C
Req 3.3.15	User interface should notify if a PSD rental exceeds the sign out period.	C
Req 3.3.16	System's capacity should be able to handle signal load from all PSDs at once.	C

Table 3.3.1 - Campus End Requirements and Stages

3.4 Safety & Sustainability Requirements

This system records personal sensitive information and it is an utmost priority to guarantee the safety of this data. The location services on the device are potentially threatening to the end user, and could result in dangerous circumstances if data protection is not taken into consideration. Therefore, the company is responsible to ensure that the end user's personal information is safe and secure within the system. Furthermore, taking sustainability into account, requirements were chosen to minimize the possible environmental damage done by any products that cannot be reused.

Requirement #	Description	Stage
Req 3.4.1	The signal transfer protocol should be secure and not easily decryptable.	C
Req 3.4.2	User interface software should be able to securely store end user data and should not be easily hackable.	C
Req 3.4.3	The production materials of our PSDs will be carefully chosen to minimize damage done to the environment and increase their sustainability.	A
Req 3.4.4	The outer material of the PSD will be precisely sealed with silicon to provide resistance against water and external forces.	B

Table 3.4.1 - Safety and Sustainability Requirements and Stages

3.5 Government Requirements

The following table includes the requirements for the system based on Canadian law and standards. The requirements below refer to wireless transmission standards, radio transmission standards, and electronic standards.

Requirement #	Description	Stage
Req 3.5.1	The PSD and the user interface need to be licensed as exempt wireless low power devices (RSS-210).	C
Req 3.5.2	The signal towers need to be licensed as radio broadcasting equipment (RSP-100).	C
Req 3.5.3	Distress signal's transmission frequency does not cause interferences on existing networks (SP Gen).	B
Req 3.5.4	The service needs to allocate frequency in the radio spectrum (SP Gen).	C
Req 3.5.5	Signal tower service contour application needs to be submitted and accepted (BPR-1).	C
Req 3.5.6	The product follows the Telecommunications Act (S.C. 1993, c. 38).	C
Req 3.5.7	The product follows the General requirements for battery-powered appliances (CSA C22.2 NO. 0.23:15 (R2020)).	C
Req 3.5.8	The product follows the Functional safety of electrical/electronic/programmable electronic safety-related systems (CAN/CSA-C22.2 NO. 61508).	C

Table 3.5.1 - Government Requirements and Stages

4. Conclusion

WristAssist is designed to be a personal safety device that is inclusive to all students by offering an updated and affordable solution that can help improve safety on campus. The WristAssist system considers the user requirements to deliver a functional and convenient solution to safety that can be used by students through a sign out method. Additionally, the requirements for the user interface and sign out feature were designed to make the system efficient and non-demanding towards campus security. The safety, sustainability, and government requirements were also considered to make the PSD secure and safe to use while also abiding by Canadian laws and standards.

In the end, the main goal was to create a comprehensive solution to the issue of personal safety on campus by providing a product that prioritizes the needs and requirements of consumers. Continuously aiming to uphold the client's expectations and deliver a dependable product is the highest priority. WiccSafe believes that innovation in technology is the stepping stone to a brighter and safer future, and WristAssist is just the beginning.

5. Proof of Concept Deliverables

By the end of ENSC 405W, WiccSafe will present the following proof of concept deliverables:

- A user interface to monitor the system and communicate with a personal safety device
- A wireless personal safety device that can communicate the following to a remote user interface:
 - Personal safety device's location resolved to an accuracy of 10 metres
 - Two levels of distress signals
 - End user's information

References

- [1] "Campus Sexual Violence: Statistics | RAINN," *Rainn.org*, 2000.
<https://www.rainn.org/statistics/campus-sexual-violence>.
- [2] "Research Finds 82 Percent of American College Students are Concerned About Their Personal Safety | ADT Inc.," *news.adt.com*.
<https://news.adt.com/news-releases/news-release-details/research-finds-82-percent-american-college-students-are>.
- [3] Government of Canada, "Licensing Procedure for Global Positioning System(GPS) Active Repeater Stations," *www.ic.gc.ca*.
<https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10260.html> (accessed Feb. 12, 2022).
- [4] Government of Canada, "BPR-1 — General Rules," *www.ic.gc.ca*, Jan. 19, 2021.
<https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01326.html> (accessed Feb. 12, 2022).
- [5] Government of Canada, "RSP-100 — Certification of Radio Apparatus and Broadcasting Equipment," *www.ic.gc.ca*, Aug. 29, 2019.
<https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01130.html> (accessed Feb. 12, 2022).