4688

SAINTS BOT

TEAM 4688 SAFETY MANUAL

SAINTS BOT 2019

INFINITE RECHARGE

UL

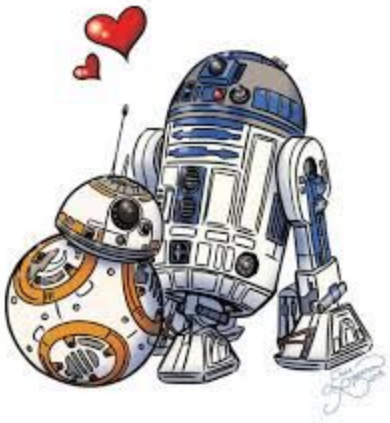
FIRST®

CSA

Episode I : Every Journey Has a First Step

All team members, including mentors, are required to read this manual. This manual is revised every year. Team members are also to look over the rules relevant to their team. As a part of safety, it is one's job to make sure this happens.

Not only is this book meant to be a guide to team members, it is also supposed to help a new safety member ease into the safety branch of the team. In this manual, I have included all sorts of things that are good to know. During the build season, I expect this manual to be rewritten to accommodate the new safety manual published from FRC. It is also highly recommended that future safety captains are Standard First Aid and CPR Certified.



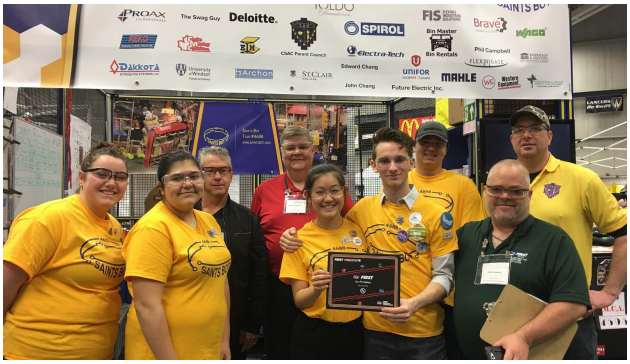
Contents

Team members are expected to read pages 4-12.
In addition, Pit members are expected to read page 15.
First Aid Crash Course for those NOT FIRST AID TRAINED is available on pages 13-14.

A Safe Galaxy : Intro

History of Safety

Before continuing, we must pay tribute to Hunter Ruskin, our first ever safety captain. Back in 2016, our first year, he was thrown into the position as a last-minute thing. Two years later, he and I accepted safety awards at every single competition we attended, including Provincials (FIRST Power Up). We both won best safety captain of the day as well as pit safety at every competition. He put forth incredible dedication to our team's safety, giving our team the reputation of being gracious and safe since the very beginning.
-Chloë Chang, Safety Captain 2019 Season



This Manual

This manual will be combining information from the 2019 FIRST Safety Manual, the 2018 "Ontario Occupational Health and Safety Act and Regulations" ('Green Book'), Creighton University Hearing Protection PowerPoint, and the Ontario "Hydro Electrical Worker Safety". It will be updated annually to incorporate any changes to safety regulations and to apply to the current year's materials, robot requirements, etc.

All members and mentors must be aware of the rules of this book, specifically to whatever group they work with (ie. mechanical, electric, pneumatic). Mentors are encouraged to promote the rules in this book by example. It is mandatory to notify a student or mentor if he or she is
not following a safety rule.

General (Hux) Rules : The Essentials

ALL MEMBERS MUST READ THIS MANUAL FROM PAGES 4 TO 12. Pit members are expected to read page 15. First aid procedures are outlined on pages 13-14, following the teachings of St. John Ambulance and Lifesaving Society.

In case of injury or emergency, please alert a Mentor or Safety Captain. Incident reports are CRUCIAL in order to prevent repeating the same incident.

Kylo Ren Had Face Protection Right : PPE

General

Before stepping into the shop, the following must be worn:

- **Closed-toe shoes** with any FIRST activity (must completely cover the entire foot, must be substantial, shoes with heel; steel toe boots are recommended).
- **Safety glasses** when working on the robot, or there is a risk of exposure to flying particles or chemical exposure (must be ANSI-approved, UL-listed, CE EN166 rated, or CSA certified). They can only be lightly tinted, no reflective lenses. If you wear prescription glasses that do not have a marked safety rating, you must wear rated safety goggles over them to achieve adequate protection.
  If you wear marked safety rated glasses, it is highly recommended that you also wear ANSI-approved, UL-Listed, CE EN166 rated, AS/NZS certified or CSA rated side shields.
  Safety rated glasses, side shields and frames can be identified by markings stating the standard that they are rated to (ex. Z87.1).

- **Avoid loose clothing, headphones, hanging jewelry, ties** (to avoid being drawn into rotating parts).
- **Long hair tied back** (bun if long enough).
- **Hearing protection** (earplugs & sound ear muffs) should be used with any noise levels above 85 dB. Refer to examples below.
    - 85 Decibels (dB) - the minimum "Action Level" where hearing protection is required. For example, the sound of our main shop fan is around 80 dB.
    - 90 dB - the OSHA, 8 hour average exposure limit.
    - 100 dB - exposure longer than 15 minutes is not recommended.
    - 110 dB - regular exposure of more than 1 minute risks permanent hearing loss.

Properly fitted ear plugs (low frequency noise) or muffs (high frequency noise) reduce noise 15 to 30 dB. Simultaneous use of earplugs and muffs usually adds 10 to 15 dB more protection than either used alone. Combined use should be considered when noise exceeds 105 dB (approximately the sound level of a live rock bands such as *Cymbolism*).

Other Protection

- Face shields should be worn in the presence of sparks or when cutting metal on machines.
- Hand protection (latex/ nitrile gloves, chemical gloves, etc.) should be used with heat, electrical, or chemical hazards.

Hydrospanner Handling : Tool Safety

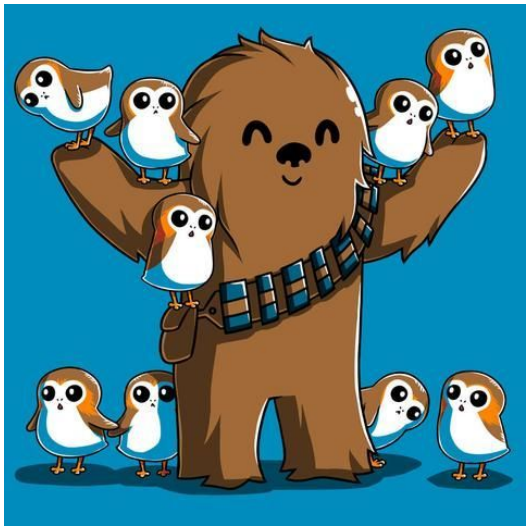
Hand Tool Rules (according to FRC)

Hand tools include power tools which must be used:

- In good condition, if this is questionable, ask a mentor!
- On a workbench or hard surface, use a vice, don't hold it down with your hand
- Aiming cutting strokes of blades away from your body, watch your fingers
- Carrying them shielding the point, like walking with scissors

Mr. Bertucci's Tool Rules

- Know what you're doing, or ask for help
- Treat them nicely, they're expensive, if you get them dirty, clean them
- PUT THEM AWAY PROPERLY WHEN YOU ARE DONE
- Milwaukee is the BEST!



UNLIMITED POWER : Electrical & Energy

Stored Energy (FRC)

When working on the robot:

- **Electrical energy**
  - Ensure it is shut down
  - Disconnect the electric power source (battery)
  - De-energize the robot before working on it (open the main circuit breaker, unplug batteries)
- **Pneumatic energy**
  - Vent any compressed air
  - Open the main vent valve, all pressure gauges must indicate zero pressure

- **Miscellaneous energy**
  - Relieve any compressed or stretched springs or tubing
  - Lower all raised robot arms or devices that could drop down

Electrical Rules (FRC)

- Treat all circuits and equipment as live until they are isolated, locked out, and grounded
- Use the correct tool for the job
- Inspect cords and equipment often to ensure ground pins are in safe condition
- Notify mentors if any tools are defective
- Whenever possible, de-energize apparatus before you work on it
- DO NOT "daisy chain" (plug a power strip into another power strip)
- Prevent overloading by:
  - No extension cord plugged into another extension cord
  - No extension cord plugged into a power strip

- No multi-device receptacle plugged into a power strip/extension cord

"Roger, roger" : Robot Handling

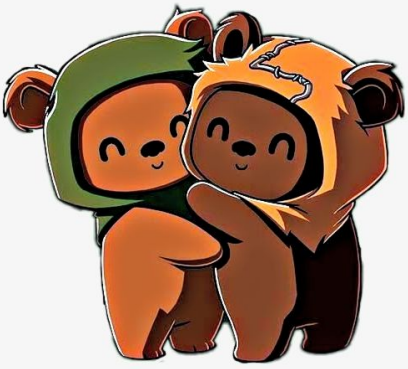
Robot Cart

- Must remain in pit area when not in use (at competitions)
- Should fit through 30 inch standard door frame
- No speakers for music, only warning sounds
- Visible team number

The Lift & Move

All team members (including mentors) should be trained in how to properly lift a robot.

- PPE required (safety glasses, closed-toed shoes, & dangling items tied back)
- Ensure robot is off, 2-4 people to lift, ensure path is clear
- LIFT WITH YOUR LEGS, bend your knees, keep your back "straight"
- Keep the robot close to your body
- Make sure the robot is stable on cart before transporting



Kyber Crystals : Battery Safety

Batteries contain H_2SO_4, a corrosive, colourless liquid THAT *BURNS*. Any battery that is visibly damaged in any way is dangerous and unusable. All team members should be trained in how to properly handle a leaking battery.

- Flush any contacted skin with water
- Seek medical treatment
- Periodically inspect batteries for leaking electrolyte, damage, bent terminals *(especially before & after each competition)*
- Dispose of properly (bring to nearest battery recycler)

Procedure for Handling a Leaking Battery

- Neutralize it with baking soda (sodium bicarbonate) on all exposed surfaces, the base will react with the acid to produce water and a salt that can be cleaned conventionally with water (wow chemistry!)

$$2NaHCO_3(aq) + H_2SO_4(aq) \rightarrow Na_2SO_4(aq) + 2CO_2(g) + 2H_2O(l)$$

- Put on gloves
- Place the battery in a leak-proof container for removal
- Neutralize acid on gloves before removing them
- Seek medical attention if necessary
- Properly dispose of the battery, it is now a hazardous material

Handling & Charging

- Keep the battery charging area clean & orderly
- Allow charging batteries to have cool air circulate freely
- Do not short out the battery terminals, if metal tools/ parts contact the terminals simultaneously, it can create a direct short circuit (so cover all exposed terminals and connections)
- Do not charge battery at greater than manufacturer's max. recommended rate

Carbon(ite) Fibre : Material & Chemical

Chemicals

- Keep chemicals in good condition
- They should all be labeled by manufacturer, legible
- SDS should be obtained & stored, available for all members upon request

Aluminum

- When cutting, immediately deburr edges as they become quite sharp
- It gets hot quickly with friction, use with caution when holding after being worked on
- It is conductive; keep particulate away from electrical equipment since this will cause short circuiting

Steel

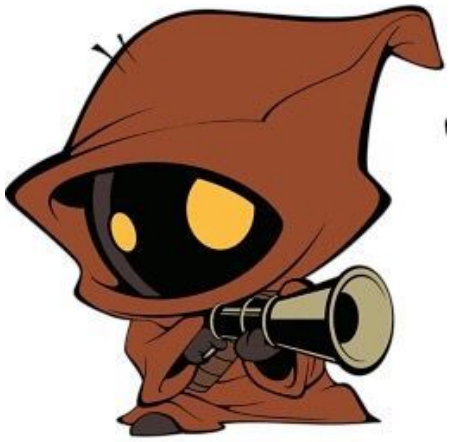
- Note: This can include washers, bolts, nuts, etc.
- It gets hot quickly with friction
- It is conductive
- It sparks easily with grinder, use face shield & gloves

Polycarbonate (aka Lexan)

- When cutting, watch for burrs since they don't fly off
- Ventilate properly to avoid inhalation of dust particulates
- Melts easily with heat & will bend

Carbon Fibre

- Have appropriate ventilation (vacuum) to relieve irritating dust
- Cover entire body with clothing, easily irritates skin
- Face shield or dust mask necessary to prevent inhalation of dust particulates
- Gloves necessary when handling to prevent slivers, if you get slivers, use tape to remove dust from skin, the fibres break easily
- It is conductive
- When cutting, watch for burrs since they don't fly off
- Chemical coating (often epoxy or other resin) is volatile, flammable, and irritating, work with caution if material is still "green" or epoxied



Don't Lose Your Hand Like Luke : First Aid

Basic First Aid

All First Aid equipment is available in:

a) the Shop's white box near the main entrance door (green cross on outside);

OR

b) the Pit's green & beige tackle box - placed at front of pit in Safety station.

WHEN IN DOUBT, CALL 911

★ Cuts, Scrapes

1. Clean wound with antiseptic, use clean water if unavailable.
2. Utilise a bandage of appropriate size, put smiley face.
3. Apply pressure and/or elevate if wound is severe.
4. If bleeding continues, never remove a bandage to replace it, put another one on top.
5. Contact 911 if bleeding continues excessively.

★ Anaphylaxis (allergic reaction)

1. Retrieve Epi-Pen, Twinject, etc. & assist with administering medicine, if necessary (Note* a safety responder is allowed to administer an Epi-Pen to someone who is incapacitated, but this is not allowed for other medications).
2. Contact 911 or immediately receive professional medical treatment.

★ Burns (heat, chemical, electrical)

1. Heat: Flush with cool water for 10-15 minutes minimum. If fingers, wrap gauze in between. Seek medical attention if burn is severe or very large.
2. Chemical: Do not flush with water, seek SDS. If powder, scrape away & dispose of without contacting. Follow SDS, seek medical attention if necessary.
3. Electrical: Turn off electricity source. There is an entry wound and exit (usually where contact with shock object occurred and feet). Treat both as heat burn.

★ Blunt Force Trauma

1. Ice injury with packs from first aid kit.

2. Sit them down, rest affected area.
3. If head injury, seek medical attention.

★ Impaled Objects

1. LEAVE THE OBJECT ALONE, it will bleed if removed.
2. If it is something small (ie. sliver, small nail, etc.) it can be removed & treated like a cut.
3. Secure the object, to prevent it from moving around, immobilize affected limb, wrap with gauze (in first aid box) if necessary.
4. Seek medical attention.

★ Heart Attack & Stroke

1. Signs & symptoms of heart attack: denial, sweating, chest, jaw, left arm pain/ numbness, shortness of breath, for women: severe back pain

Signs & symptoms of stroke: paralysis on one side of the body (check by lifting their arms and asking them to hold their arms in the air as you let go), slurred speech, loss of bowel control, dilated pupils, loss of facial muscle control, headache, confusion

2. Call 911 immediately
3. Sit them down in a comfortable position on the floor, against a wall.

★ Unconsciousness

1. Check breathing.
2. Call 911.
3. If not breathing, commence CPR and seek out AED (At St. Anne CHS, it is outside of the locker rooms near the gym).
4. If breathing, check for secondary wounds and treat as necessary.

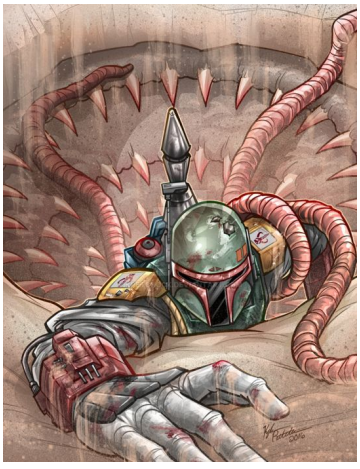
(Sarlacc) Pit Safety

Setting Up

- Use ladders
- 10 ft. height limit for the pit (including banners)
- Provide guards for bench-top power tools
- Remember PPE, safety glasses are mandatory
- Teams may not build any structure to support people or storage overtop work area

Pit Safety

- Control access, keep entrance clear
- Remove Safety keys for bench-top power tools when the pit is vacant
- Only 4 members & 1 mentor AT ANY TIME - NO EXCEPTIONS
- Keep neat and orderly
- Do not "daisy chain" (plug power strips into power strips)
- Safety glasses & closed-toe shoes for all pit area, including visitors
- Alert your neighbours if there is a hazard in your pit
- Children ages 12 and under must have an adult (18+) with them
- Child strollers are prohibited in individual pit stations, but allowed in general aisles
- Note: Safety Advisors are normally in red shirts



(NO) DeathStar : A Safe Workspace

Introduction

While we hold all of our meetings in a school that is already obligated to follow the rules of "The Green Book", as a robotics team we consistently emulate safe real workplace practices. The following rules apply to the Saints Bot Robotics team, eliminating those we consider irrelevant to us and that are common knowledge. The content of this manual *has been altered* from its original sources. Some rules have been omitted and some clauses shortened. Also, all team members are allowed access to the original texts used to create this manual.

If the shop classroom is found to be in malcompliance with the outlined regulations, the team will refer to the classroom's teacher to see where the equipment is or address the issue as necessary.

"The Green Book" Regulation 851 - Industrial Establishments

R.R.O. 1990, Reg. 851, s. 4 (1-2) Safety Regulations (1) The minimum age of (a) a worker, or (b) a person who is permitted to be in or about an industrial establishment shall be:

A. 14 years of age in a workplace other than a factory

(2) Clause (1)(b) does not apply to a person who,

A. Is accompanied by a person who has attained the age of majority;
B. Is being guided on a tour;
C. Or is in an area of the industrial establishment to which the public generally has access (the shop does not qualify to be a general public access area as decided by Lead Mentor, shop teacher, and vice-principal)

R.R.O. 1990, Reg. 851, s. 21 Lighting Where natural lighting is inadequate to ensure the safety of any worker, artificial lighting shall be provided, shadows and glare shall be reduced to a minimum.

R.R.O. 1990, Reg. 851, s. 24 Machine Guarding Where a machine or prime mover (initial source of motive power) or transmission equipment has an exposed moving part that may endanger shall be equipped with and guarded by a guard or other device that prevents access to the moving part.

R.R.O. 1990, Reg. 851, s. 27 An emergency stop control on a power-driven saw shall,

A. Be conspicuously identified; and
B. Be located within easy reach of the operator.

R.R.O. 1990, Reg. 851, s. 29 A grinding wheel shall be,

A. Marked with the max. speed at which it may be used;
B. Checked for defects before mounting;
C. Mounted in accordance with the manufacturer's specifications;
D. Operated at a speed which does not exceed the manufacturer's recommendations;
E. Provided with protective hoods that enclose the wheel as closely as the work will permit;
F. Operated only by workers protected by eye operation; and
G. Stored where it will not be subjected to,
    a. Extreme heat or cold, or
    b. Damage from impact.

R.R.O. 1990, Reg. 851, s. 38 A hand-held nailing gun or similar tool shall be (a)capable of being operated only when in contact with the work surface; operated only by a competent person wearing eye protection.

R.R.O. 1990, Reg. 851, s. 40 Electrical equipment, insulating materials and conductors shall be,

A. Suitable for their use; and
B. Certified by the Canadian Standards Association or the Electrical Safety Authority.

R.R.O. 1990, Reg. 851, s. 73 Maintenance and Repairs A portable ladder shall,

A. Be free from broken or loose members or other faults;

B. Have non-slip feet;
C. Be placed on a firm footing;
D. Where it,
    a. Exceeds 6m in length and is not securely fastened or
    b. Is likely to be endangered by traffic,

    Be held in place by one or more workers while being used; and
E. When not securely fastened, be inclined so that the horizontal distance from the top support to the foot of the ladder is not less than ¼ and not more than ⅓ of the length of the ladder.

R.R.O. 1990, Reg. 851, s. 81 Protective Equipment A worker exposed to the hazard of eye injury shall wear eye protection appropriate in the circumstances.

R.R.O. 1990, Reg. 851, s. 82 A worker exposed to the hazard of foot injury shall wear footwear protection appropriate in the circumstances.

R.R.O. 1990, Reg. 851, s. 83 (1) Long hair shall be suitably confined to prevent entanglement with any rotating shaft, spindle, gear, belt, or other source of entanglement.
(2) Jewellery or clothing that is loose or dangling or rings shall not be worn near any rotating shaft, spindle, gear, belt, or other source of entanglement.

R.R.O. 1990, Reg. 851, s. 84 A worker exposed to the hazard of injury from contact of the worker's skin with, (a) a noxious gas, liquid, fume or dust; (b) a sharp or jagged object which may puncture, cut, or abrade the worker's skin; (c) a hot object, hot liquid or molten metal; or (d) radiant heat,
Shall be protected by wearing apparel sufficient to protect the worker from injury; or a shield, screen,. Or similar barrier, appropriate in the circumstances.

R.R.O. 1990, Reg. 851, s. 124 Industrial Hygiene Where a worker is exposed to a potential hazard of injury to the eye due to contact with a biological or chemical substance, an eyewash station shall be provided.

"The Green Book" Regulation 860 - WHMIS

R.R.O. 1990, Reg. 860, s. 6 An employer shall ensure that a worker who works with or who may be exposed in the course of his/her work to a hazardous product received from a supplier is informed about all hazard information and all further hazard information of which the employer is or ought to be aware concerning its use, storage, and handling.

R.R.O. 1990, Reg. 860, s. 7 (1) An employer shall ensure that every worker who works with or may be exposed in the course of his/her work to a hazardous work product is instructed in,

A. The contents required on a supplier label and workplace label, and the purpose and significance of the information contained on the labels;
B. The contents required on a safety data sheet and the purpose and significance of the information contained on a safety data sheet
C. Procedures to follow in case of an emergency involving a hazardous product.

R.R.O. 1990, Reg. 860, s. 8 (1-5) Labels (1) An employer shall ensure that every hazardous product not in a container, and every container of a hazardous product, received at a workplace from a supplier is labelled with a supplier label.
(2) No employer shall alter a supplier label on a container in which hazardous product is received from a supplier while any of the hazardous product remains in the container.
(3) If a label applied to a hazardous product or a container of a hazardous product becomes illegible or is removed, an employer shall replace the label with either a supplier label or workplace label.
(4) Despite subsections (20 and (3), a supplier label may be removed from a container with a capacity of 3 mL or less if the label interferes with the normal use of the hazardous product.
(5) If an employer receives significant new data from a supplier about a hazardous product, the employer shall, ASAP, attach to every relevant supplier label required under this section, new information that reflects the significant new data.

R.R.O. 1990, Reg. 860, s. 17 (1-3) Safety Data Sheets (1) An employer who receives a hazardous product from a supplier for use, storage or handling at a workplace shall obtain a supplier safety data sheet for the hazardous product from the supplier

unless the supplier is exempted under the *Hazardous Products Regulations* (Canada) from providing a safety data sheet for the hazardous product.
(2) An employer shall update a supplier safety data sheet obtained under subsection (1) as soon as practicable after significant new data about the product is provided by the supplier or otherwise becomes available to the employer.
(3) An employer may provide a safety data sheet in a different format from that of the supplier safety data sheet for the hazardous product or containing additional hazard information if,

A. The safety data sheet provided by the employer, subject to subsection 40 (6) of the Act, contains no less content than the supplier safety data sheet; and
B. The supplier safety data sheet is available at the workplace and the employer-provided safety data sheet indicates that fact.

"The Green Book" Regulation 1101 - First Aid Requirements

R.R.O. 1990, Reg. 1101, s. 1 (1-3) First Aid Requirements (1) A first aid station shall contain,

A. A first aid box containing the items required by this Regulation; and
B. A notice board displaying,
    a. The Board's poster known as Form 82
    b. The valid first aid certificates of qualification of the trained workers on duty, and
    c. An inspection card with spaces for recording the date of most recent inspection of the first aid box and the signature of the person making the inspection.

(2) A first aid station shall be in the charge of a worker who works in the immediate vicinity of the first aid station and who is qualified in first aid to the standards required by this Regulation.
(3) First aid stations shall be so located as to be easily accessible for the prompt treatment of any worker at all times when work is in progress.

R.R.O. 1990, Reg. 1101, s. 2 (1-2) (1) A first aid box shall contain as a minimum the first aid items required by this Regulation and all the items in the box shall be maintained in good condition at all times.

(2) The box shall be large enough so that each item is in plain view and easily accessible.

R.R.O. 1990, Reg. 1101, s. 3 Every employer shall at all times keep posted in other conspicuous places in the place of employment the Board's poster known as Form 82 respecting the necessity of reporting all accidents and receiving first aid treatment.

R.R.O. 1990, Reg. 1101, s. 5 Every employer shall keep a record of all circumstances respecting an accident as described by the injured worker, the date and time of its occurrence, the names of witnesses, the nature and exact location of the injuries to the worker and the date, time and nature of each first aid treatment given.

R.R.O. 1990, Reg. 1101, s. 6 Employers shall inspect first aid boxes and their contents at not less than quarter-yearly intervals and shall mark the inspection card for each box with the date of the most recent inspection and the signature of the person making the inspection.

R.R.O. 1990, Reg. 1101, s. 10 (1-2) Every employer employing more than 15 and fewer than 200 workers in any one shift at a place of employment shall provide and maintain at the place of employment one stretcher, two blankets, and a first aid station with a first aid box containing as a minimum,

A. A current edition of a standard St. John Ambulance First Aid Manual;
B. 24 safety pins;
C. 1 basin, preferably stainless steel; and
D. Dressings consisting of,
    a. 48 adhesive dressings (individually wrapped),
    b. 2 rolls of adhesive tape (1" wide),
    c. 12 rolls of gauze bandage (1"),
    d. 48 sterile gauze pads, (3" sq.),
    e. 8 rolls of gauze bandage (2"),
    f. 8 rolls of gauze bandage (4"),
    g. 6 sterile surgical pads suitable for pressure dressings (individually wrapped),
    h. 12 triangular bandages,
    i. Splints of assorted sizes, and
    j. 2 rolls of splint padding.

(2) The employer shall ensure that the first aid station is at all times in the charge of a worker who,

A. Is the holder of a valid St. John Ambulance Standard First Aid Certificate or its equivalent; and
B. Works in the immediate vicinity of the box.

"The Green Book" Regulation 381 - Noise

R.S.O. 1990, Reg. 381/15, s. 2 ((1) Every employer shall take all measures reasonably necessary in the circumstances to protect workers from exposure to hazardous sound levels.

(2) The protective measures shall include the provision and use of engineering controls, work practices and, subject to subsection (5), hearing protection devices.

(4) Without limiting the generality of subsections (1) and (2), every employer shall ensure that no worker is exposed to a sound level greater than an equivalent sound exposure level of 85 dBA, Lex,8.

(5) Except in the circumstances like subsection (6), the employer shall protect workers from exposure to a sound level greater than 85 dBA without requiring them to use and wear hearing protection devices.

(6) Workers shall wear and use hearing protection devices appropriate in the circumstances to protect them from exposure to a sound level greater than the limit described in subsection (4) if engineering controls are required by subsections (1) and (2) and,

(a) are not in existence or are not obtainable;

(b) are not reasonable or not practical to adopt, install or provide because of the duration or frequency of the exposures or because of the nature of the process, operation or work;

(c) are rendered ineffective because of a temporary breakdown of such controls; or

(d) are ineffective to prevent, control or limit exposure because of an emergency.

(7) Where practicable, a clearly visible warning sign shall be posted at every approach to an area in the workplace where the sound level, measured as described in subsection (3), regularly exceeds 85 dBA.