A Discussion on Hand Safety

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Canadian Centre for  
Occupational Health and  
Safety  www.ccohs.ca

WebMD  
Hand Injury Prevention  
www.webmd.com
Factoids for Consideration

• Workers receive about 85% of their information from the sense of sight

• Momentary blindness is caused by the eye adjusting between bright and dark areas

• Wearing gloves reduces hand injuries by 60% … Liberty Mutual Research Institute

• The average hand injury cost is $6000 to $7500 … Bureau of Labor Statistics
The hand and its usefulness
The hand, phalanges and metacarpal bones

- Injuries to hands are hard to repair
  - due to the complexity of the hand and the fact that
  - the bones in the hands are made of several pieces

- After an injury, the hand is unable to function as it did before the injury due to loss of:
  - Grasping ability,
  - Dexterity,
  - Movement
  - Ability to carry out simple tasks
The hand and its usefulness

Instrument for carrying out complex movements:

- The hand lets us grasp,
- hold,
- manipulate,
- throw
- but also recognize,
- signal,
- defend..
- It can use its strength, formulate its feelings…

Wonderfully adapted to a whole host of functions, the hand is an invaluable tool for man
Incident Diagram on Recordable Injuries for XXXX Employees 2009-2012. Note year to year variability

Injury = •
Incident Diagram on Recordable Injuries for XXXX Employees 2013-2014
Injuries to hands

Common causes of injuries to hands are:

– Incorrect body position
– Pinching fingers and hands
– Hands and fingers in the line-of-fire
– Failure to apply safety processes
– Not wearing suitable gloves when handling sharp objects
– Absent mindedness – Doing several things at the same time
Injuries to hands

To Avoid injuries to hands:

● Be aware of the risks and hazards of the activity to be carried out
● Be aware of the points where pinching is a risk
● Be aware of hot surfaces
● Be aware of rotating devices
The ability to see depends on:

- Time to focus on an object
- Fast moving objects are hard to see
- Size of the object
- Contrast between the object and its immediate background
- Color rendering is affected by the type of lamp used
Koehler – Bright Star
Work area lighting
Prevention of hand injury
Injuries to hands

Engineered and Administrative solutions:

● The control systems of automated equipment are often at a distance from or controlled by time-delayed apparatus meaning that machines start up automatically (without warning)

● Loose, hanging clothing and jewelry may be caught up in moving equipment parts

● Never remove machine guards or operate machinery with the guards removed
# Sample Hand & Fingers Awareness Campaign Roadmap

## Awareness
- An awareness program has been developed
- Presentations on awareness have been produced and are ready to be distributed
- Posters for areas are finished and ready to be put up
- 50% of the awareness program aimed at all employees and contractors has been achieved
- 80% of the awareness program aimed at all employees and contractors has been achieved
- 100% of the awareness program aimed at all employees and contractors has been achieved
- The program has been examined on its completion so as to prepare refresher training
- Refresher training will be communicated every year

## Reinforcement and Promotion of Safety Behavior
- Requirements relating to protection of hands and fingers have been defined
- Safety goals and targets have been set
- Employees and contractors are familiar with the requirements relating to protection of hands and fingers thanks to the awareness campaign communication process
- A checking system has been implemented to monitor progress of safety goals and targets set
- Incentives to encourage the adoption of safety behavior have been implemented
- Protocols (manual handling, PPE) have been used to check that safety behavior has been adopted
- The RCM senior mgmt. team has looked into the issues of nonconformity and implemented improvements
- RCM has achieved its safety goals and targets
- RCM fully conforms to the requirements relating to protection of hands and fingers and examines conformity and safety results each year

## Identification of High Risk Tasks
- Mechanisms have been implemented to detect high risk tasks
- Identify high risk tasks for each contractor on site
- 50% of high risk tasks identified have been reviewed and additions made so as to reduce the risk level lower
- 75% of high risk tasks identified have been reviewed and additions made so as to reduce the risk level lower
- 100% of high risk tasks identified have been reviewed and additions made so as to reduce the risk level lower
- A mechanism has been set up to examine the efficiency of the checking measures

## Improve HSE Interaction Program
- An improved interaction program has been developed
- Include SafeStart concepts to promote awareness and hazard recognition
- Establish a process to allow interactions in pairs
- Presentations have been developed and ready for use
- Provide refresher training for employees and contractors
- 70% of the interaction program aimed at employees and contractors has been achieved
- 100% of the interaction program aimed at employees and contractors has been achieved
- The program has been examined on its completion so as to prepare refresher training
- Refresher training will be communicated every year
# Sample Hand & Fingers Awareness Campaign Roadmap

## Improved Take 5 Program
- An improved Take 5 program has been developed
- Include SafeStart concepts to promote awareness and hazard recognition
- Communicate that Take 5 is a requirement for non-routine tasks
- Enforce Take 5 as a requirement

## Standardization of Gloves
- Development of an inventory sheet
- The sheet has been examined and validated with departments
- Examination of the level of protection per glove type is complete
- A matrix has been prepared (images, characteristics of gloves and article number)
- The matrix has been displayed in the various areas and is understood by the employees
- The matrix will be examined each year to guarantee appropriate protection

## Reduction of Cutting Tools
- A cutting tools program has been implemented to reduce the use of cutting tools
- Replacement tools have been designated
- 50% of replacement tools have been distributed and the tool formerly used has been withdrawn from the site
- 100% of replacement tools have been distributed and the tool formerly used has been withdrawn from the site
- A process has been set up to examine regularly the efficiency of the new tools and ensure that the pointed and cutting tools formerly used have been withdrawn from the site

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<table>
<thead>
<tr>
<th>LEVEL OF EFFICIENCY</th>
<th>1 - BASE</th>
<th>2 - DEVELOPMENT</th>
<th>3 - TRANSITION</th>
<th>4 - MATURITY</th>
<th>5 - EXCELLENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug 20xx</td>
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<td>May 20xx</td>
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<td>Jul 20xx</td>
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<td>Aug 20xx</td>
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<tr>
<td>Feb 20xx</td>
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</table>
Hand Hazards

- Perforation
- Chemical
- Rotating equipment
- Pinching points
- Extreme temperature
- Cutting
- Insect bites
- Vibrating equipment
Line of defense

- Always keep your hands and fingers at a safe distance from pinching points
- Be aware of hazards and prevention measures
- Always use Personal Protective Equipment (PPE)
- Adopt Proper Hygiene practices (wash your hands) and seek first aid whenever necessary (to prevent infections)
What is the best glove?

Ensure you use the RIGHT glove for the TASK

- Cutting (i.e. Kevlar)
- Extreme Temperatures (Welding)
- Electrical (rubber insulating)
- General Activities (cotton & leather)
- Chemicals (i.e. Nitrile or other synthetics)
- Vibrating Equipment (absorbent)
- Cold Stress (i.e. gortex)
- Using Knife (wire mesh)
Looking after your gloves

- Inspect gloves prior to use to detect any tears, excessive wear or holes.
- Store them in a clean dry place.
- Scrap leather and fabric gloves if they are saturated with oil or other chemicals.
- Carry out a chemical test to ensure glove tightness by sealing the wrist and filling the glove with air.
Glove size

Using a tape measure, measure around the palm of your hand at the knuckles
Taking care of your hands

- Do not wash your hands with solvents
- Clean and bandage cuts and scratches
- Immediately remove any foreign matter
- Wash immediately after using chemicals of any kind
First Aid

- **Cuts:** Apply direct pressure to large or bleeding cuts and lift your hand up above your shoulder – clean small cuts using warm soapy water and then apply a sterile bandage.
- **Amputations:** Apply pressure immediately to the injured area – keep the amputated part in a plastic bag and place it in icy water but not in direct contact with ice.
- **Broken bones:** Keep control of the situation and seek medical assistance.
- **Sprains:** Apply cold compresses to reduce pain and swelling.
- **Chemical burns:** Rinse with running water for at least 15 minutes.
- **Heat burns:** Soak minor burns in cold water, then apply a sterile bandage – burns that are carbonized or blistered require medical attention.
Categories of Aggressors
Categories of aggressors

• Hands are exposed to a large quantity of aggressors that can be divided into various categories:

  – Striking aggressors
  – Pointed aggressors
  – Cutting aggressors
  – Rotating aggressors
  – Toxic, corrosive, irritating aggressors
  – Burning – cold aggressors
STRIKING AGGRESSORS

THE AGGRESSORS

- Hammers
- Weights
- Rams
- Crowbars
- Doors (buildings, vehicles)
- Manual handling of heavy objects
- Magnetic fields

THE RISKS

- Striking by, striking up against, crushing, jamming

THE CONSEQUENCES

- Scratches, bruises, rips, fractures
POINTED AGGRESSORS

THE AGGRESSORS
- Punching machines
- Screwdrivers
- Nails, screws
- Wooden splints
- Steel cable pieces
- Damaged ropes

THE RISKS
- Contact with, foreign body, striking up against

THE CONSEQUENCES
- Scratches, cuts, jabs, splinters, rips
### CUTTING AGGRESSORS

#### THE AGGRESSORS
- Guillotines, grafting tools
- Blades, saws
- Axes
- Knives, scissors
- Two pointed-edge objects passing one next to the other
- Sharp objects (steel sheet, iron filings, metal clippings)
- Pieces of broken glass

#### THE RISKs
- Cutting by, shearing

#### THE CONSEQUENCES
- Scratches, rips, cuts, amputation
ROTATING AGGRESSORS

THE AGGRESSORS

- Gears
- Belts
- Drive shafts
- Fans (blades)
- Conveyors, endless screws
- Rotating machines/tools (drills, grinders, lathes, etc.)

THE RISKS

- Entrainment, jamming, crushing, striking by, cutting by, particle splattering

THE CONSEQUENCES

- Rips, cuts, bruises, amputations, death
TOXIC, CORROSIVE AND IRRITATING AGGRESSORS

THE AGGRESSORS

- Chemicals
- Products containing acid (batteries, detergents)
- Basic products (caustic, fresh cement)
- POL products (fuel, tar, grease, oils, lubricants)
- Guard/caretaker stocks

THE RISKS

- Burning, skin exposure

THE CONSEQUENCES

- Chemical burns, irritation, dermatitis, poisoning
AGGRESSORS

THE AGGRESSORS

- Molten metal
- Fumes, vapors
- Blow torches
- Burning-hot equipment (by friction, flame, electricity, contact with burning-hot substance)
- Ultraviolet and infrared radiation, electric arc, laser beam
- Pressurized liquid gases (nitrogen, refrigeration gases)
- Equipment stored at low temperatures (winter)

THE RISKS

- Burning, skin exposure

THE CONSEQUENCES

- Heat burns, irritations, dermatitis, poisoning, chilblains, amputation
Examples of Risky Situations
Improved Anti-swing mechanism on an overhead traveling crane hook

Rubber band inserted to restrict hook rotation. Used to avoid holding the hook with your hands when you fasten a lifting beam.
Improved Hoisting equipment for motors and pumps

Tool to raise manhole cover
The Good Practices
The good practices

- Be rested: keep alert!
- Familiarize yourself with your working area and directives
- First inspect your tools and machinery
- Never place your fingers in dangerous zones
- Switch off the power supply before undertaking repairs
- Comply with working safety practices and procedures
- Use appropriate PPE
- SLAM

Hand safety principles
The good practices

- **Hand tools**
  - First inspect your tools
  - Use the right tool…. properly

- **Hammers**
  - Should be one inch wider than the surface of the object to be struck
  - Keep your eyes on the task in hand
  - Wear safety goggles

- **Wrenches**
  - Always pull the wrench towards you
  - Never strike a wrench to generate more force
The good practices

- **Screwdrivers**
  - Check that the object on which you are working is fixed
  - Never hold the object in your hands
  - Use a screwdriver with an insulated grip

- **Knives**
  - Keep blades well sharpened
  - When cutting hold the blade away from you
  - Use retractable knives whenever possible

- **Chemicals**
  - Safety and tools
The good practices

- **Choose appropriate PPE**

- **Criteria for selecting appropriate PPE:**
  - The PPE provides protection against risks associated with a specific operation
  - The glove must be adjusted to the size of your hand
  - Do not wear gloves near danger zones of tools and machines

- **If you are not sure what type of glove to use, refer to the glove Chart**

Personal Protective Equipment
# The good practices

## Glove Matrix

<table>
<thead>
<tr>
<th>Type of work</th>
<th>General Purpose Gloves (Leather, summer/winter)</th>
<th>Latex Palm Gloves</th>
<th>Latex Gloves</th>
<th>Welders Gloves</th>
<th>Hot Gloves (electrical)</th>
<th>Lineman Gloves</th>
<th>Anti-vibration</th>
<th>Rubber, Monkey Grip</th>
<th>Heavy duty rubber Gloves</th>
<th>Furnace Gloves</th>
<th>Metal mesh Gloves</th>
<th>HyFlex Kevlar</th>
</tr>
</thead>
</table>

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**For Us**
For Our Families
For Our Environment

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Use the right glove for the task at hand.
Injuries due to cuts by cutters

• The majority of cuts by knifes (cutters) follow the same process:
  – The blade is breakable (Cutter) and projects excessively from its holder. The blade breaks under the pressure of the hand and is left in a part of the body, usually in the hand that holds the cutter.
  – The same thing applies for long stable blades. However, in this case, the blade does not break but slides from the surface.
  – As a rule the part of the body at risk is not protected by sufficiently suitable PPE. Frequently, the part of the body is
There are hundreds of different knives/cutters on the market. Which one is suited to our task and can be used in complete safety?
Selection criteria

• The most suitable knifes are those whose blade is concealed in the handle. You cannot touch the blade even if you wanted to.

• Not as efficient as concealed blades, the second best solution is a knife with retractable blade that projects from its handle as little as possible and whose mechanism allows the blade to automatically return safely into the handle as soon as power is cut. The blade disappears even if the finger tries to block it outside the handle.
Selection criteria

• Third place is taken by the knife with (the smallest possible) part of the blade outside and a retraction mechanism that functions as soon as pressure is released on the button (however the blade will remain outside its handle when the finger presses the pushbutton).

• The least desirable knife is one whose blade is permanently outside its handle or that is manually retracted. If this type of cutter cannot be avoided, it should at least have a rounded edge and a non-breakable blade.
Examples of bad knives
High hazard cutter

- The cutter is the knife most often implicated in injuries at EP.
- Its main characteristic is its blade with break lines at regular intervals.
- Often the blade breaks suddenly. The cutter then carries out an uncontrolled movement that leads to a cut.
- Some manufacturers still call them safety knives
## Priority of cutting tools

<table>
<thead>
<tr>
<th>Level 4</th>
<th>Level 3</th>
<th>Level 2</th>
<th>Level 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed and manually retractable blades</strong></td>
<td><strong>Self-retractable blades</strong></td>
<td><strong>Tools with interesting technology</strong></td>
<td><strong>Concealed blades, scissors or shears</strong></td>
</tr>
<tr>
<td>External or manually retractable blade.</td>
<td>External blade that retracts as soon as pressure is released on the pushbutton. The retraction function is not automatic.</td>
<td><strong>Automatic retraction:</strong> Even if the button to retract the blade is not used, the blade will automatically move to a safety position after each cutting operation.</td>
<td>Blades concealed in the handle.</td>
</tr>
<tr>
<td>Reduced risks if edges are rounded.</td>
<td>Reduced risks if projected blade length is limited</td>
<td>Automatic covering of blade as soon as it is no longer in cutting position (the blade cover is extended on a spring)</td>
<td>Scissors with rounded edges or shears</td>
</tr>
</tbody>
</table>
Good practices to ensure that operators have the right knives at hand when necessary

Knives with blades (level 4) will always be stored in a case.
**Cut-resistant PPE**

- PPE is always the last option in the inspection hierarchy.
- Cut-resistant PPE is necessary to check residual risks when a blade is used as the latter could lead to injury during an uncontrolled movement.
- The minimum requirement: **Cut-resistant PPE must be used if use of level 3 and 4 knives cannot be avoided.**

<table>
<thead>
<tr>
<th>Level 4</th>
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<tr>
<td>Fixed and manually retractable blades</td>
<td>Self-retractable blades</td>
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<tr>
<td>External or manually retractable blade.</td>
<td>External blade retracted as soon as pressure is released on the pushbutton. The retraction function is not automatic.</td>
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<td>Reduced risks if edges are rounded.</td>
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*Important: do not forget other possible risks concerning cuts, e.g. cutting edges of equipment. It may be important to wear cut-resistant gloves even if the cutter used is as safe as possible or if no cutter is used.*
Parts of the body

• In theory all parts of the body may be affected by an accidental movement when using a cutter.

• At least both hands must be protected if use of level 3 or 4 knifes cannot be avoided.

• Good Practices recommend protection of forearms.
Cut-resistant gloves in the USA

- The cut-resistant gloves approved as providing protection against mechanical hazards have been classified as per standard ANSI / ISEA.

- The ASTM F1790 test and the CPP tester are different from ours in Europe.

- Unlike the European classification, there are not 5 but 6 levels from 0 to 5.

<table>
<thead>
<tr>
<th>Level</th>
<th>Weight needed to cut through material with 20mm of blade travel (grams)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>&lt; 200</td>
</tr>
<tr>
<td>1</td>
<td>&gt; 200</td>
</tr>
<tr>
<td>2</td>
<td>&gt; 500</td>
</tr>
<tr>
<td>3</td>
<td>&gt; 1,000</td>
</tr>
<tr>
<td>4</td>
<td>&gt; 1,500</td>
</tr>
<tr>
<td>5</td>
<td>&gt; 3,500</td>
</tr>
</tbody>
</table>
Recommended minimum cut resistance threshold

For knives with safety levels 3 or 4

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</table>

Level 3 per test
ASTM F1790

For American gloves
Examples of typical cut-resistant gloves

- Leather with Kevlar lining
- Kevlar with non-slip lining
- Standard Kevlar
- Kevlar with non-slip points
- Kevlar arm protection
- Kevlar mixed with steel fiber

Be prudent and study the classification carefully. The material does not necessarily mean that cut-resistance is level 3 or more.
Good practice: Dyneema gloves

- High sensitivity
- Level of performance normally 3
Good practice for major work

- Less slippy on oily surfaces
- Forearm protection included in glove
- Excellent cut-resistance with Kevlar lining or Dyneema gloves worn under Docker gloves

There are many other criteria such as resistance to piercing and heat. Although these are not included in our criteria, they may influence the selection.
Possible questions for your checking phase

- Does this knife have the highest possible safety level for this task?
- Is this knife fitted with a breakable blade (cutter) and must it be destroyed?
- Is it a knife with a long fixed blade that cannot be changed for a knife with a higher safety level? If it is, are the edges at least rounded?
- Is part of the blade exposed and is this inevitable? If this is the case, is the exposed part at least as short as possible?
- Were the operator or his colleagues involved testing for use of this knife and the possible alternatives?
- Is it a knife with a safety level 1 or 2 and is it not possible to find a knife with a higher level? If it is not, is the hand holding the knife at least protected by a cut-resistant glove?
- Is the cut-resistant glove used by the operator at least category 3?
Hand safety

• Think about what it would mean to have an accident that could affect use of your hands

• What could you no longer do if you were injured or lost the use of your hands?
Check Lists
Screwdrivers

When using a screwdriver:

– Grasp it firmly in your hand!
– Use the tools that are ergonomically designed to adapt to the person
– Do not use screwdrivers as chisels or crowbars
– Use proper sized heads to change screws
– Change hands to reduce injuries due to repetitive strain
– Rest when necessary (as required as...
Crowbars

- Always wear gloves when using crowbars

  - Grasp the crowbar firmly in your hand!
  - When using the crowbar as a lever, press downwards close to another surface or structure. Keep a safe distance to prevent your hand or fingers from being injured in the event of accidental slipping.
  - Eliminate all potential residual energy
  - Use the right sized crowbar for the task in hand
Knives/Cutters

- Use safety knives whenever possible that have a retractable blade
- Use knives with very sharp blades
- When cutting, hold the knife away from you
- Do not use blades as screwdrivers
- Do not work in the firing line on the same object when a colleague is using a knife
Hammers

• Never use a hammer whose handle is shattered, cracked or missing
• Use the right hammer for the task in hand
• Do not use a double face hammer as a bar
Hand saws

- Exert moderate pressure on the saw to avoid breaking it
- Slightly spray the saw blade with lubricator prior to use
- Keep the blades sharpened at all times (Change the blade if necessary)
- Keep your body and hand out of the “firing line”
Table Saws

- Always use a thrust stick (never your hand directly)
- Never remove the machine safety guards
- Always wear appropriate goggles and gloves
- Always keep out of the firing line
- Ensure that the blade is sharp
- Ensure the working area is kept free of debris
Chisels

- Whenever possible, use **safety chisels**
- Do not use mushroom headed chisels
- Use the right chisel for the task
- Do not use chisels as levers

“Mushroom” head
Wrenches

- Use the right sized wrench for the task in hand
- Do not use pliers whose serrations are worn or adjustable wrenches with worn or separated jaws
- Do not use pliers or adjustable wrenches on excessively tightened bolts and nuts
- Pull rather than push on wrenches
- Never use extensions on wrenches
Energized hand-held tools

- Grasp the tool with both hands
- Cut power to tools if they are not used, and before replacing components, blades and other accessories
- If the tools jam or seize up: stop and re-assess how the work can be carried out
- Never remove the safety guards!
- Use tools with grounding unless they have double insulation
- Wear gloves, but make sure they cannot be caught up in moving parts
- Place the tool on a vise – do not hold in your hand!
- Do not use tools with a trigger lock device

Only use the right type of disc for the grinding wheel
Workshop tools

- Use a thrust stick to cut small pieces
- Disconnect or insulate tools before replacing blades
- Ensure tools are always sharp and never remove their safety guards
- Use a drill press vise when drilling – never hold parts in your hands!
- Remove your jewelry and tie back long hair when working with rotating tools
Grinding wheels on bench:

- Never wear gloves when using fixed grinders
- Never remove the safety guards
- Keep the workbench clean and a maintain tool rest within 1/8” of the wheel
- Maintain protective glass within 1/4” of the wheel

Do not use the grinding wheel on aluminum or brass!
Extreme temperature

• Use pliers or gloves at high temperature to grasp hot or cold parts of equipment
• Label “Hot” if it is hot
Hoisting

- Use guide ropes to control all loads and never wind the rope around your hands
- Remain out of the firing line – never be under a suspended load
- Wear leather gloves
- Never place your hand between the load and a fixed object
- Inspect hooks and chain flanges before use
- All hooks must be equipped with a safety lock unless otherwise specified in the risk assessment
Jewelry

- Remove jewelry before using energized tools, working on a machine, or near rotating parts.
- Button up your sleeves.