



Invaluable Lessons in the Industrial Sector

Pinchin's Health, Safety and Environment Team

TODAY'S PRESENTERS



Kris Anderson

Director, Alberta EDR & OHS



Eric Magee

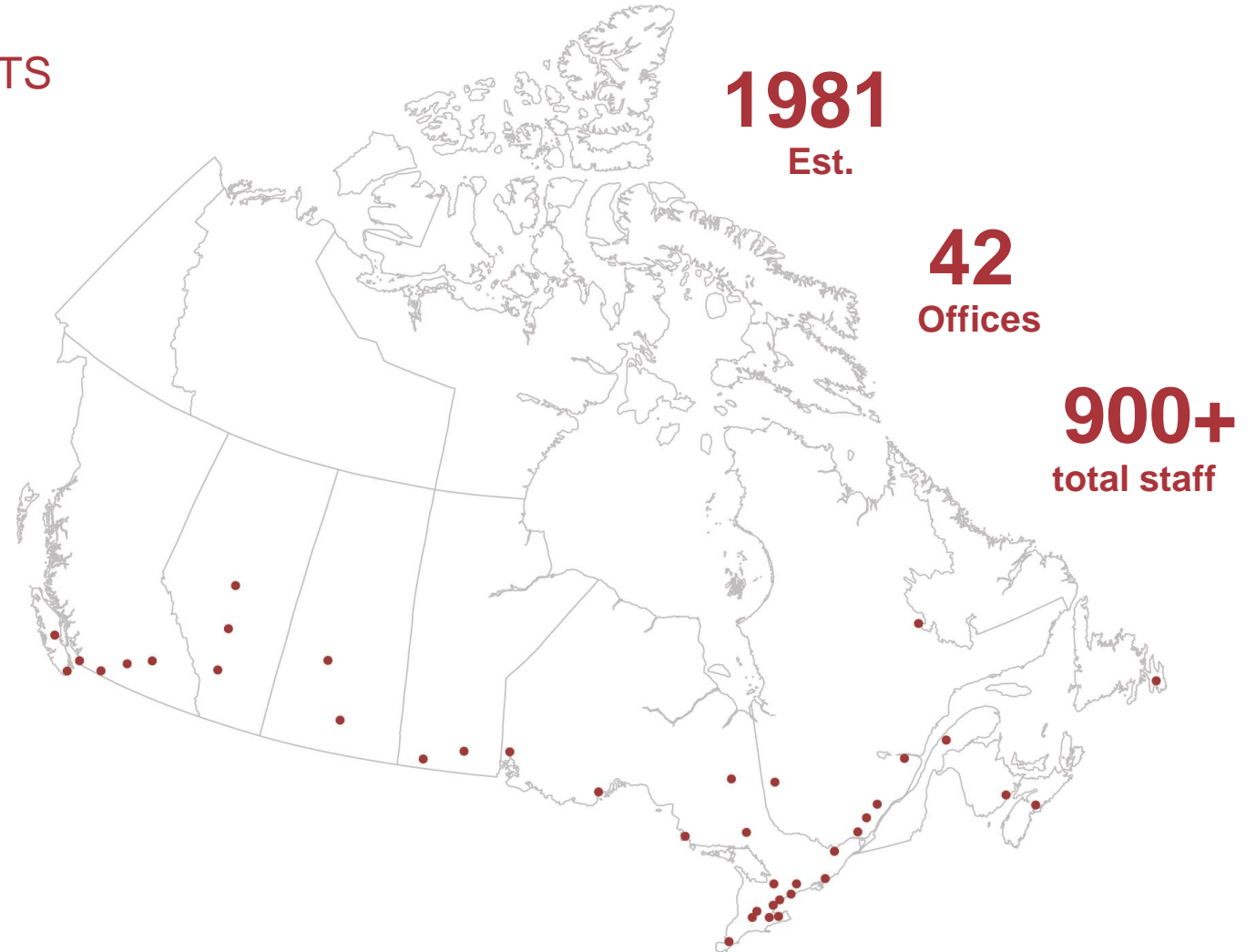
Project Manager, EDR

Why choose pinchin?



LOCAL RESOURCES, NATIONAL EXPERTS

- ✓ Hazardous Building Materials
- ✓ Environmental Science
- ✓ Indoor Environmental Quality
- ✓ Occupational Health & Safety
- ✓ Building Science & Sustainability
- ✓ Construction and Project Management
- ✓ Emissions Reduction & Compliance
- ✓ Environmental Due Diligence & Remediation
- ✓ Geotechnical Engineering
- ✓ Environmental Laboratory Services
- ✓ Mechanical Engineering & Design
- ✓ Training Seminars & Courses in all aspects of these fields



Health, Safety & Environmental Lessons



Part 1

- Health & Safety
- Occupational Hygiene

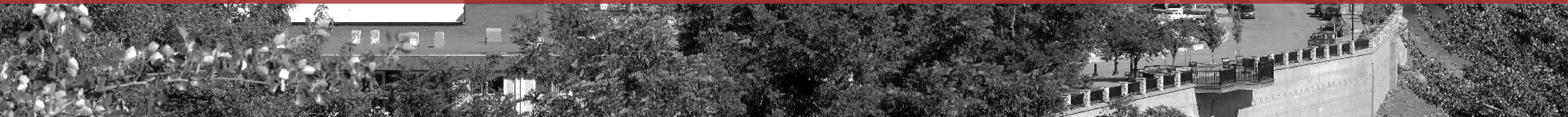
Part 2

- Environmental





Part I: Health and Safety, Occupational Hygiene Lessons



Why focus on Occupational Hygiene?

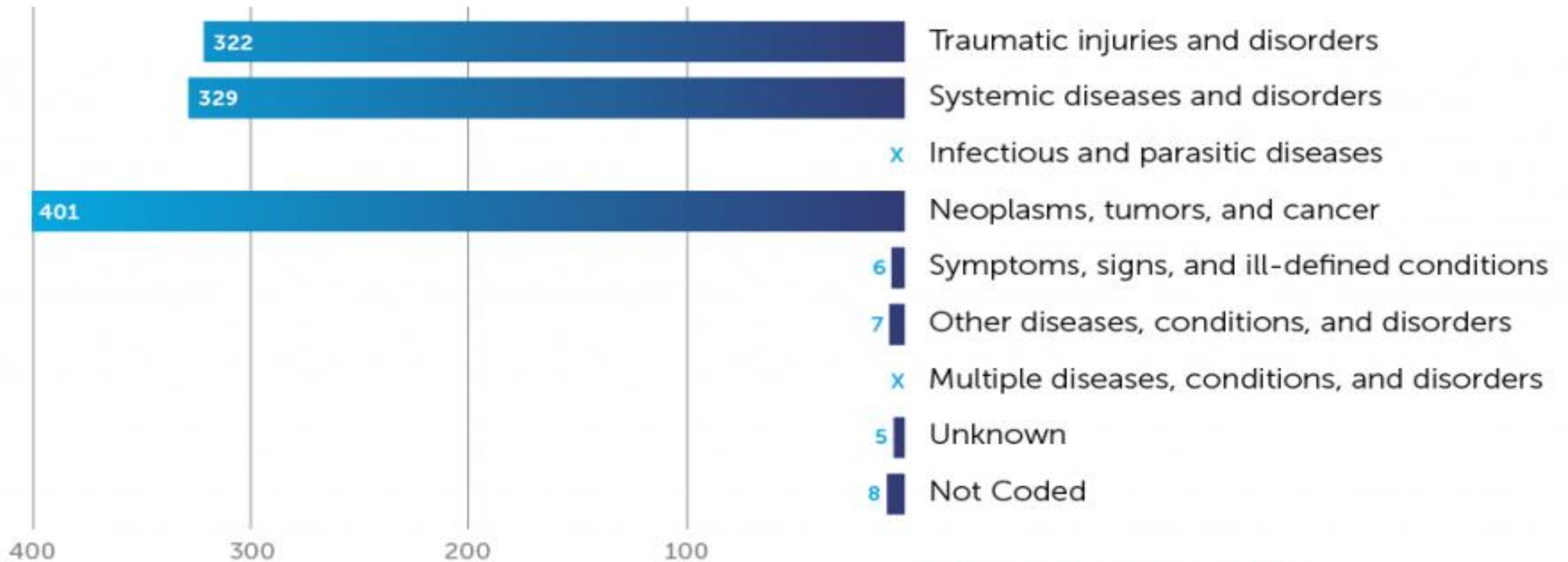


2021 Fatalities in Canada



CANADA TOTAL: 1,081

BY NATURE OF INJURY OR DISEASE



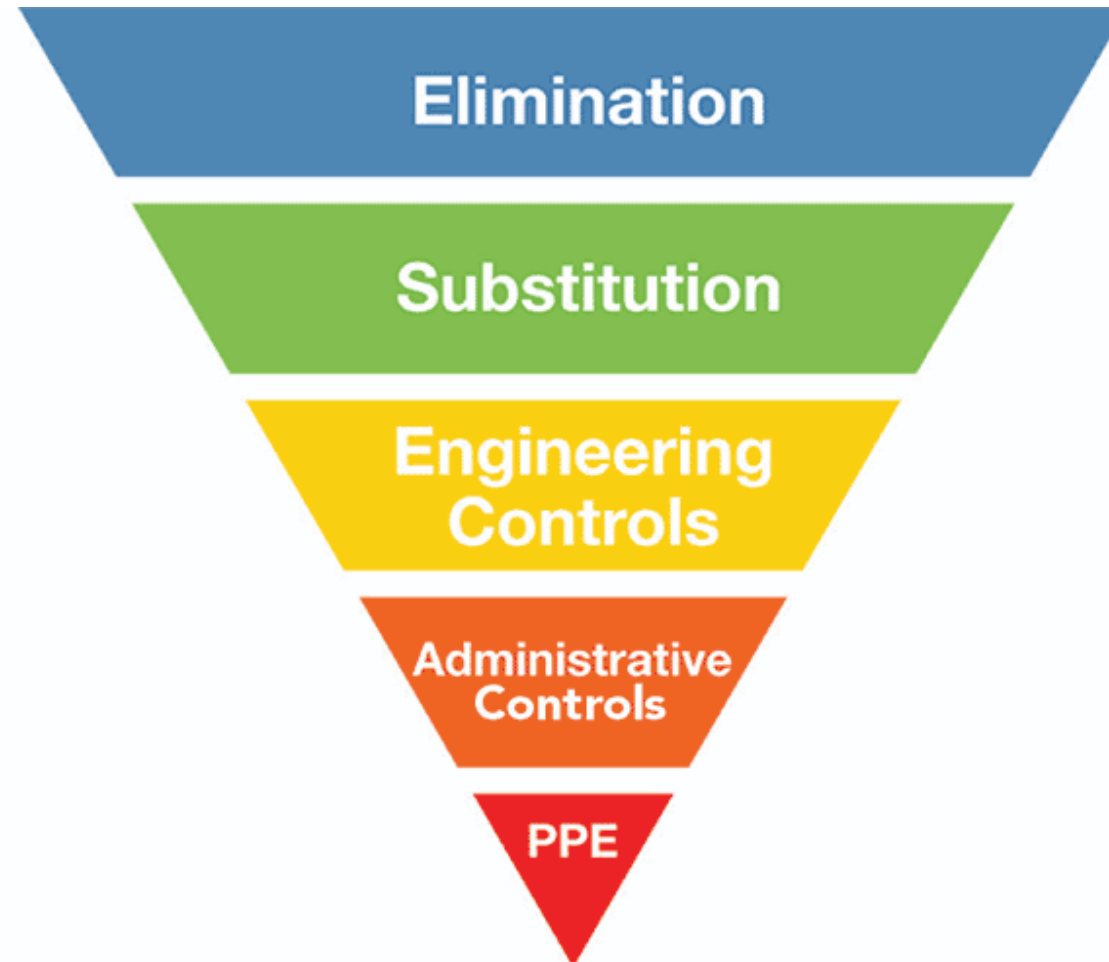
AN "X" INDICATES A VALUE OF 3 OR LESS

Need more information?



Each category above can be broken down into further detail. If interested, [Request Customized Lost Time Injury, Disease and Fatality Data.](#)

Hierarchy of Controls

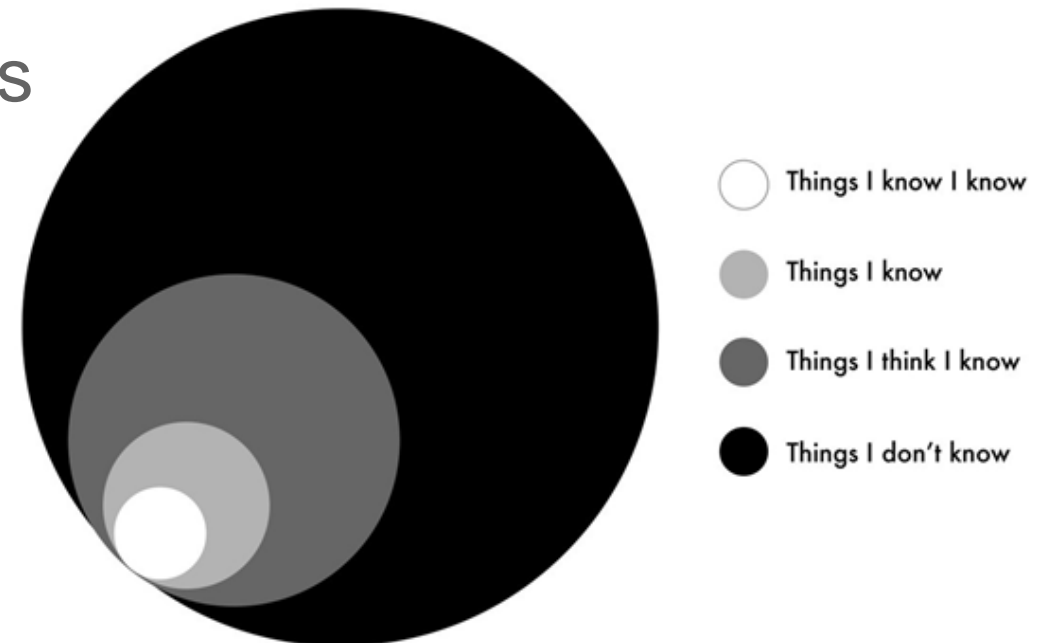


Hazard Assessment



WHAT I KNOW

- Under appreciated tool to reduce impacts
- Everything you are up against
- Consider how to plan
- OHS Code done **before** work begins



Occupational Health & Safety



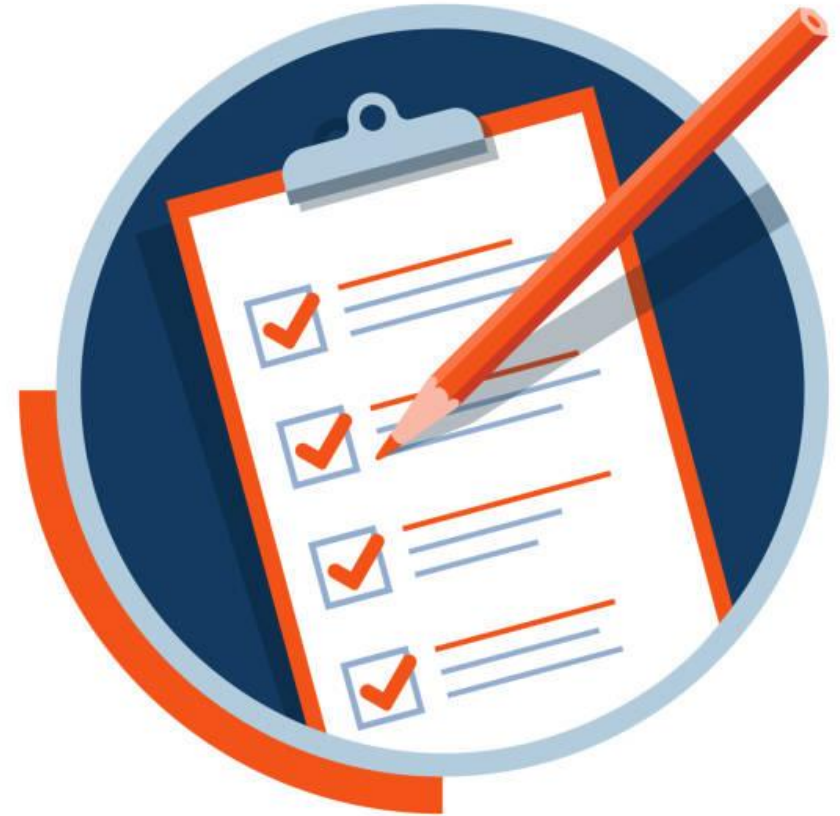
COMPLICATED QUICKLY



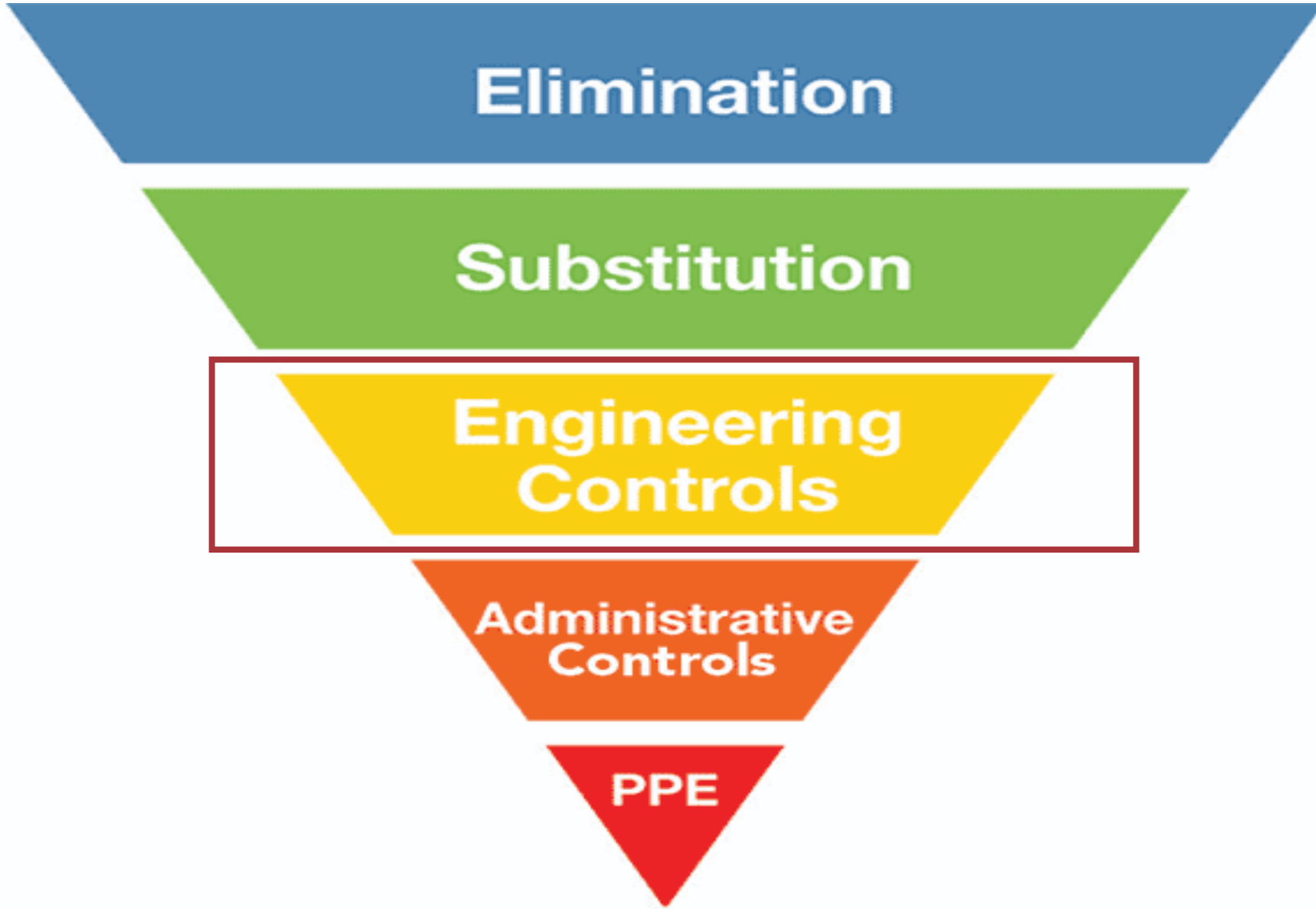
HAZARD ASSESSMENT: You Don't Know What You Don't Know



Spend the time and involve the resources you need to make a quality hazard assessment that is specific to the situation. Include this as a step in your change management process too.



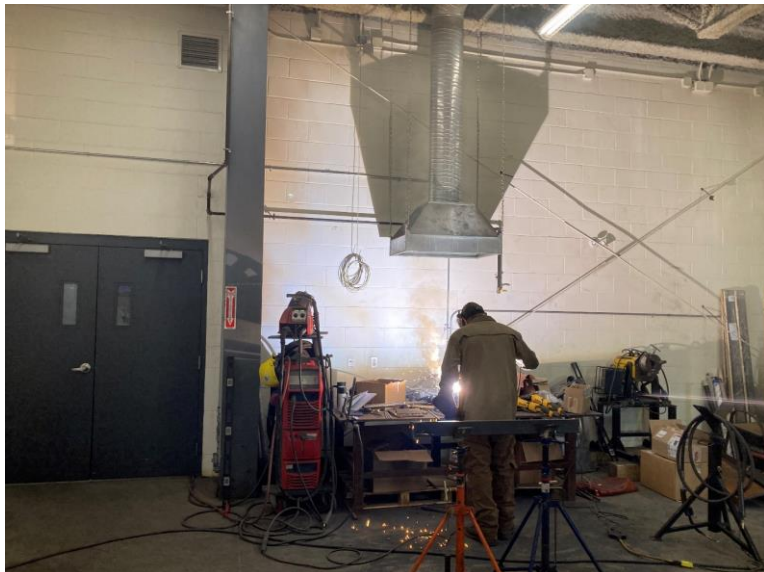
HIERARCHY OF CONTROLS IS CRITICAL



HIERARCHY OF CONTROLS ENGINEERING



- Obvious but \$\$\$
- Improper design / use is very common



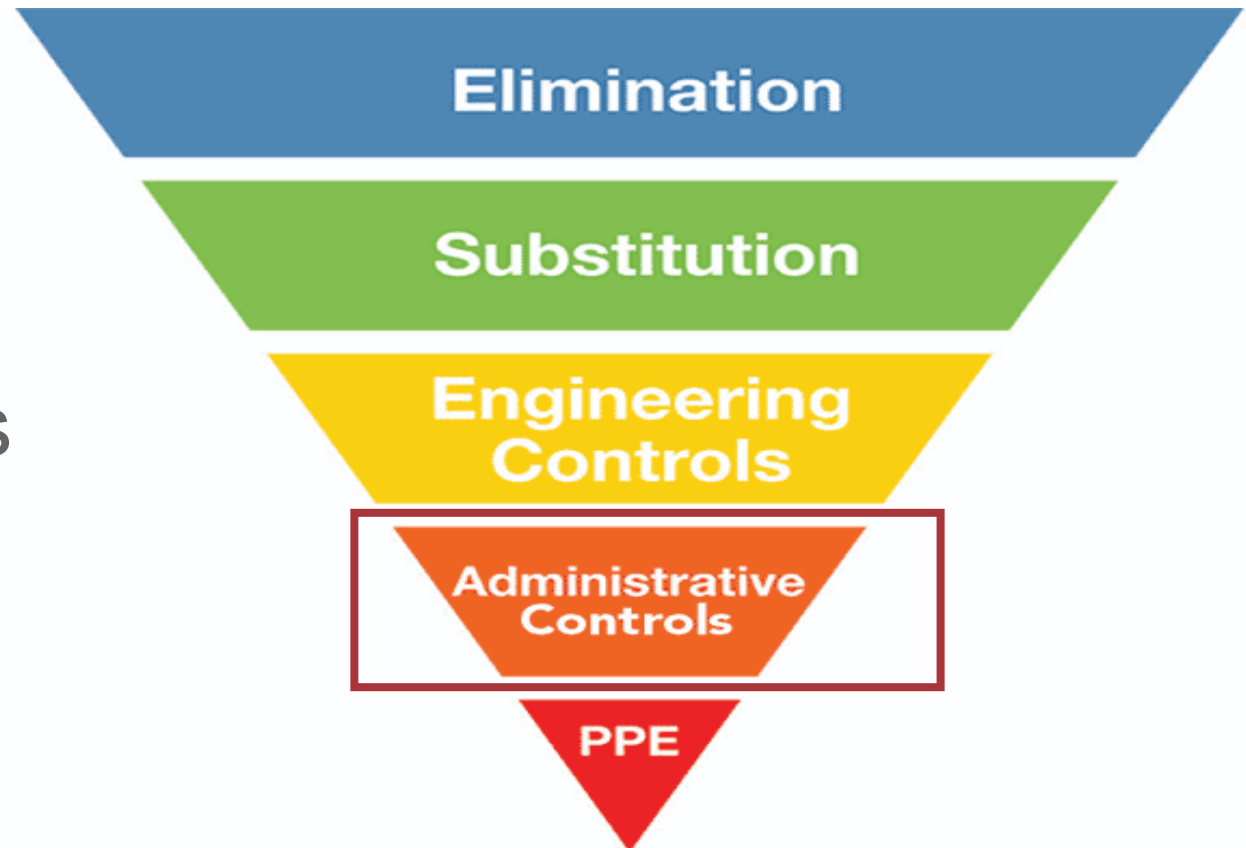
HIERARCHY OF CONTROLS ENGINEERING



Involve your H&S Team early, especially in manufacturing situations to help procurement. Buy a RESULT when you can. Test in-situ.



HIERARCHY OF CONTROLS: ADMINISTRATIVE



- Knowledge translation
- Difficulties when effects are delayed

2021 Fatalities in Canada



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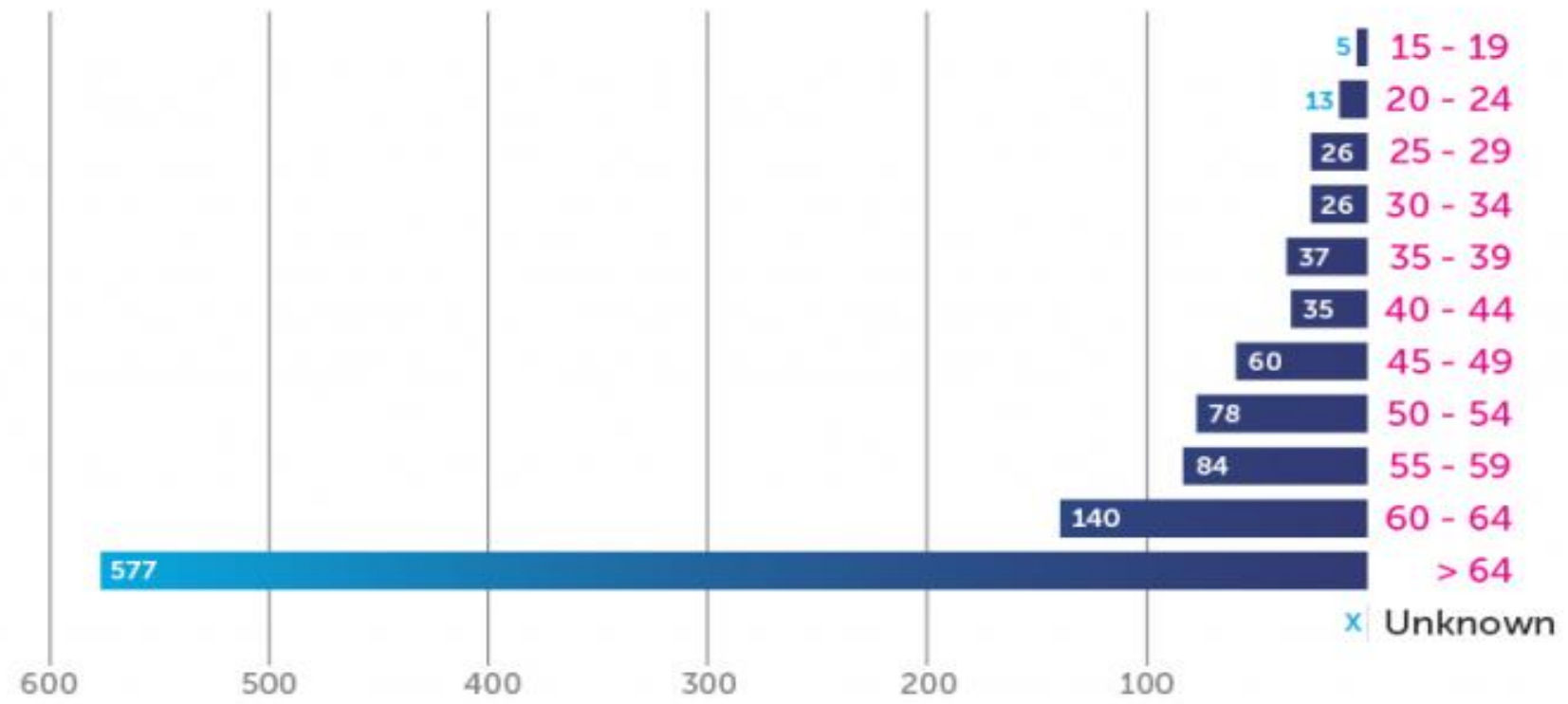
BY GENDER

Male: 1,009



Female: 72

BY AGE



AN "X" INDICATES A VALUE OF 3 OR LESS

Need more information?

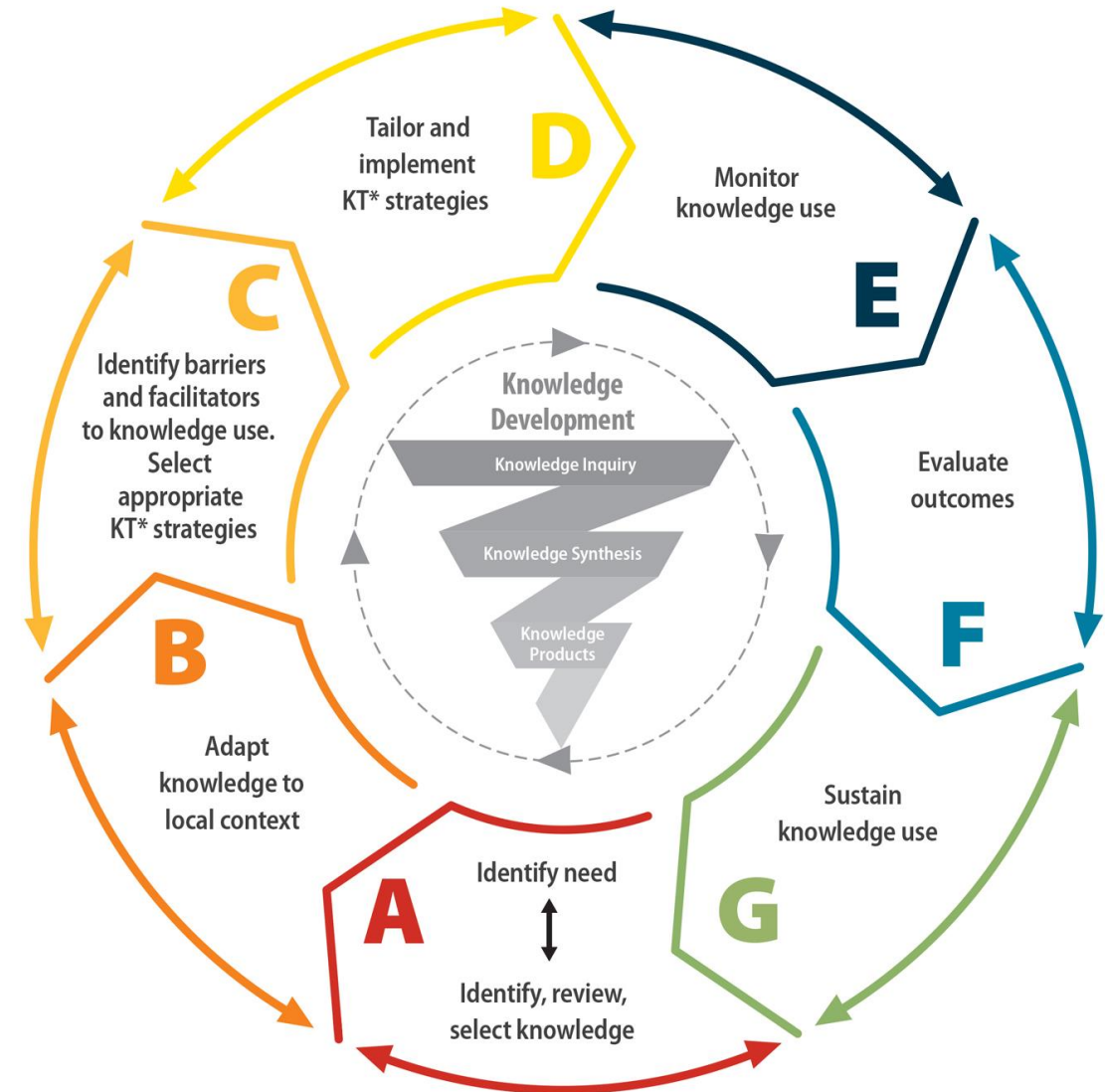


Each category above can be broken down into further detail. If interested, [Request Customized Lost Time Injury, Disease and Fatality Data.](#)

HIERARCHY OF CONTROLS: ADMINISTRATIVE



- Knowledge translation
- Difficulties when effects delayed
- Lack of understanding is a root cause of incidents



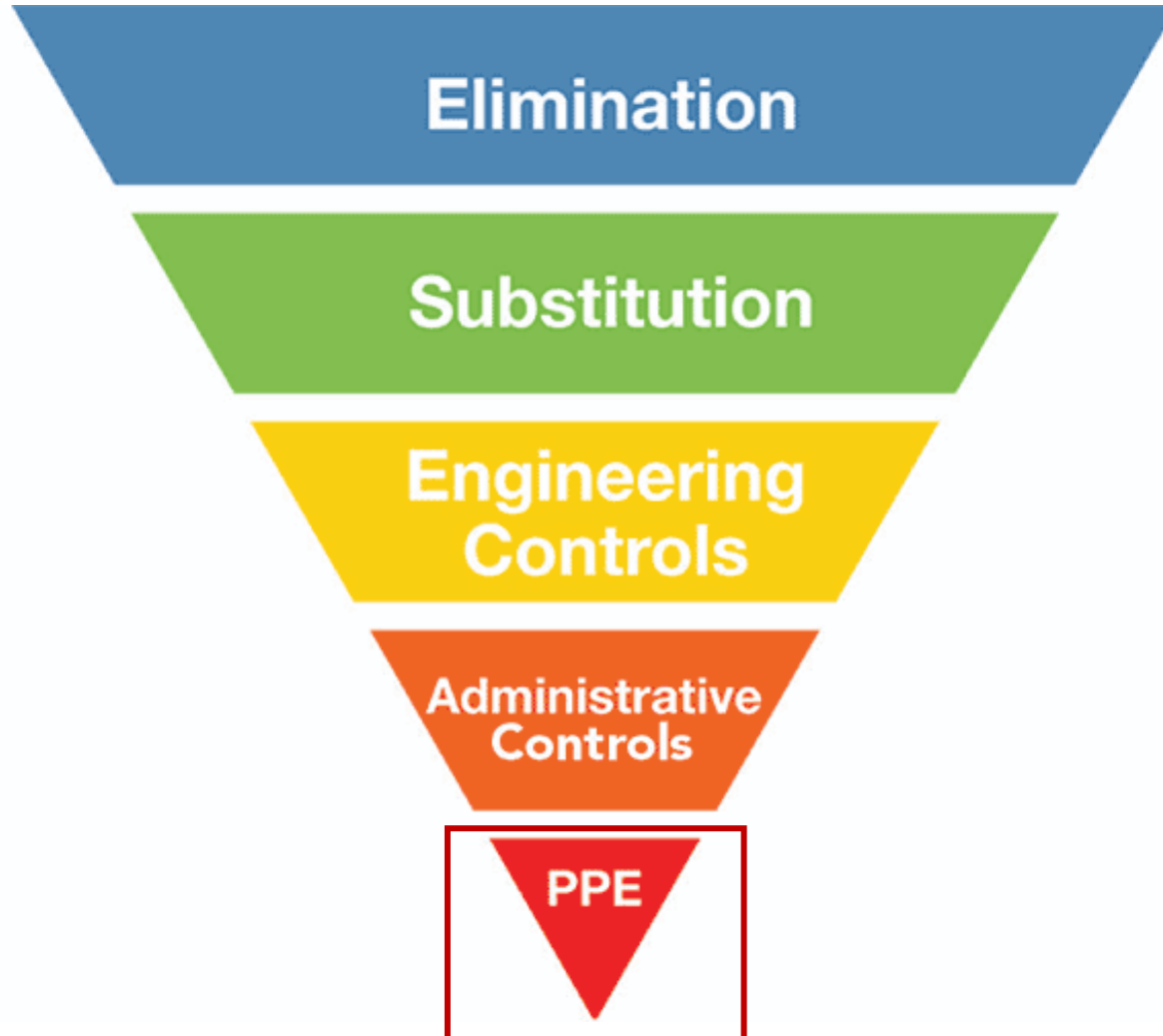
HIERARCHY OF CONTROLS: ADMINISTRATIVE



**Education of workers and knowledge translation
is paramount. Strategize KT.**



HIERARCHY OF CONTROLS: PERSONAL PROTECTIVE EQUIPMENT



Hazard elimination and control

9(1) If an existing or potential hazard to workers is identified during a hazard assessment, an employer must take measures in accordance with this section to

- (a) eliminate the hazard, or
- (b) if elimination is not reasonably practicable, control the hazard.

9(2) If reasonably practicable, an employer must eliminate or control a hazard through the use of engineering controls.

9(3) If a hazard cannot be eliminated or controlled under subsection (2), the employer must use administrative controls that control the hazard to a level as low as reasonably achievable.

9(4) If the hazard cannot be eliminated or controlled under subsection (2) or (3), the employer must ensure that the appropriate personal protective equipment is used by workers affected by the hazard.

9(5) If the hazard cannot be eliminated or controlled under subsection (2), (3) or (4), the employer may use a combination of engineering controls, administrative controls or personal protective equipment if there is a greater level of worker safety because a combination is used.

HIERARCHY OF CONTROLS: PERSONAL PROTECTIVE EQUIPMENT

- Limitations often not understood. Examples: coverall type, glove permeation, filter cartridges

GLOVES

Chemical Name	Natural rubber	Neoprene	Nitrile	PVC	Chemical Name	Natural rubber	Neoprene	Nitrile	PVC	Chemical Name	Natural rubber	Neoprene	Nitrile	PVC
Ammonium acetate					Sodium Chloride					Washing powders				
Amyl acetate					Potassium Chloride					Magnesia				
Butyl acetate					Creosote					Fuel oil				
Calcium acetate					Creosol					Methyl acetate				
Ethyl acetate					Potassium Cyanide					Methylamine				
Potassium acetate					Cyclohexan					Methyl aniline				
Acetone					Cyclohexanol					Methylcyclopentane				
Crystallizable acetic acid					Cyclohexanon					Methyl ethyl ketone				
50% Acetic anhydride					Hair bleaching agent					Methylformate				
Conc. Boric acid					Wood killers					Methyl isobutyl ketone				
Hydrobromic acid					Household detergent					Methyl salicylate				
30% & 5% hydrochloric acid					Diacetone alcohol					Mono ethanol amine				
Chromic acid					Dibutyl ether					Phenyl chloride				
Citric acid					Dibutyl phthalate					Naphtha				
30% Hydrofluoric acid					Ethylene dichloride					Naphthalene				
90% formic acid					Propylene dichloride					N-butyl amine				
85% lactic acid					Diehanolamine					Nitrate of ammonium				
20% nitric acid					Diocetylphthalate					Calcium nitrate				
Oleic Acid					Bleach					Nitrate of potassium				
Oxalic acid					Hydrogen peroxide					Sodium nitrate				
Carbolic acid					Nitro hydrochloric acid					Nitrobenzene				
Phosphoric acid					Fertiliser					Nitro propane				
Stearic acid					Turpentine					Perfumes and essence				
Conc. Sulphuric acid					Gasoline					Glycerophthalic paint				
Diluted sulphuric acid					Petroleum ether					Water paint				
Tartaric acid					Sulphuric ether (pharmacy)					Tetrachloroethylene				
Amyl Alcohol					Ethylamine					Potassium Manganate				
Benzyl alcohol					Ethyl aniline					Phosphates of calcium				
Butyl alcohol					Ethylene glycol					Potassium phosphates				
Ethyl alcohol					Fixing agents					Fish and shellfish				
Isobutyl alcohol					Hydraulic fluids (esters)					Potash Flakes				
Methyl alcohol					Calcium flu phosphate					Concentrated laundry potash				
Octyl alcohol					Fluorides					Hair-curling products				
Acetaldehyde					Formaldehyde					Petroleum products				
Benzaldehyde					Fuels					Polyster resins				
30% Formaldehyde					Furel					Shampoos				
Concentrated ammonia					Gas-oil					Silicates				
Aniline					Glycerine					Soda flakes				
Asphalt					Glycol					Concentrated laundry soda				
Benzene					Animal fats					Styrene				
Butter					Mineral greases					Potassium sulphate				
Beet root					Hexane					Zinc sulphate				
Potassium bicarbonate					Peanut oil					Dyes (Hair dyes)				
Sodium bicarbonate					cutting oils					Carbon tetrachloride				
Potassium carbonate					Diesel oils					Tetrahydrofuran(THF)				
Sodium Bisulphite					Brake oils					Toluene				
Non-alcoholic beverages					Lubricating oils					Tributyl phosphate				
Alcoholic beverages					Hydraulic oils					Trichlorethelene				
Borax					Lard oil					Tricresyl phosphate				
Bromides					Linseed oil					85% triethanolamine				
Ammonium carbonate					Turnipseed oil					Trinitrobenzene				
Sodium carbonate					Olive oil					Trinitrotoluol				
Quick lime					Paraffin oil					Triphenyl phosphate				
Dead lime					Wood turpentine					Vinegar and condiments				
Chlorine					Castor oil					Poultry				
Chloracetone					Soybean oil					Petroleum spirit				
Chloroform					Turbine oils					Xylene				
Ammonium chloride					Calcium hydrate					Xylophone				
Calcium chloride					Chlorinated lime									
Stannic chloride					Sodium chlorite									
Methylene Chloride					Isobutyl Ketone									
Nickel Chloride					Kerosene									
Sulphur, barium, hydrogen sulphides					Milk and dairy products									

Good Average Poor Not recommended
The above colours represents the performance of the gloves.



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HIERARCHY OF CONTROLS: PERSONAL PROTECTIVE EQUIPMENT



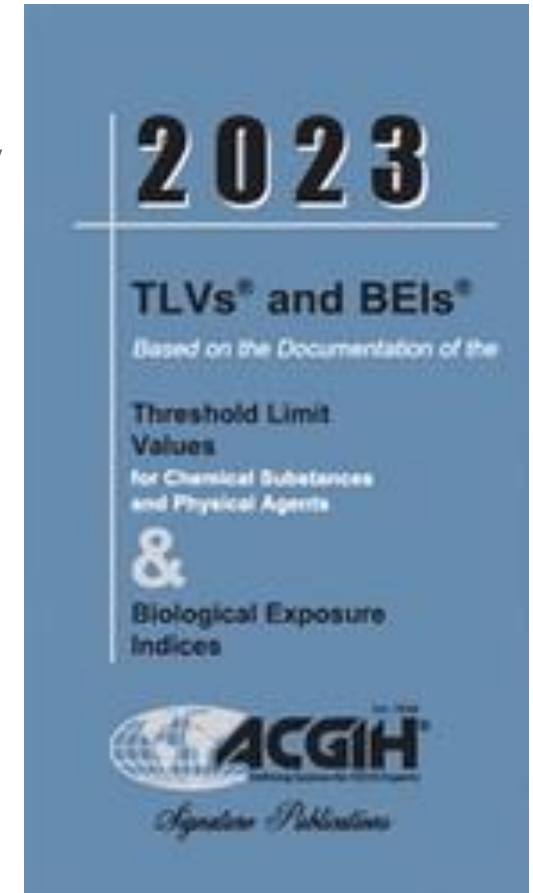
Know the limits (of PPE), stay within it.



PREPARATION FOR CHANGE: OCCUPATIONAL EXPOSURE LIMITS



- In other Canadian Jurisdictions there are very different exposure limits in play
- Do you know where the current (up to 2023) exposure limits are from?



OCCUPATIONAL EXPOSURE LIMITS



Occupational Health and Safety Code 2009
Explanation Guide

Part 4

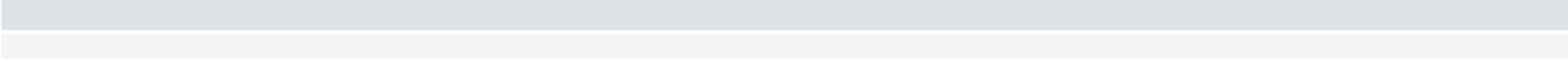
Part 4 Chemical Hazards, Biological Hazards and Harmful Substances

Highlights

- OEL changes — Occupational Exposure Limits (OELs) were revised for nearly 150 substances (see Schedule 1, Table 2). The revised OELs are based largely on the 2006 American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) for Chemical Substances.

17 years ago!

OCCUPATIONAL EXPOSURE LIMITS



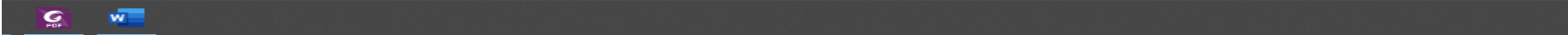
All services ▾ Public engagement Initiatives

2020-22

- Part 4: Chemical hazards, biological hazards and harmful substances
- Part 6: Cranes, hoists, and lifting devices
- Part 10: Fire and explosion hazards
- Part 11: First aid
- Part 13: Joint work site health and safety committees
- Part 15: Managing the control of hazardous energy
- Part 16: Noise exposure
- Part 17: Overhead power lines
- Part 18: Personal protective equipment
- Part 20: Radiation exposure
- Part 33: Explosives
- Part 36: Mining safety
- Part 37: Oil and gas

2023-24

- Part 27: Violence and Harassment
- Part 33: Explosives (continuation)
- Part 36: Mining (continuation)
- Occupational exposure limit (OEL) review



OCCUPATIONAL EXPOSURE LIMITS



Formaldehyde

Alberta: 0.75 ppm 8-hour, 1 ppm Ceiling

WorkSafeBC: 0.1 ppm 8-hour, 0.3 ppm STEL

TLV: 0.1 ppm 8-hour, 0.3 ppm STEL



OCCUPATIONAL EXPOSURE LIMITS

Benzene

Alberta: 0.5 ppm 8-hour, 2.5 ppm STEL

WorkSafeBC: 0.5 ppm 8-hour, 2.5 ppm STEL

TLV: 0.5 ppm 8-hour, 2.5 ppm STEL

But there is a NIC for the TLV to reduce it to 0.02 ppm 8-hour, 0.1 ppm STEL



OCCUPATIONAL EXPOSURE LIMITS



Nitrogen Dioxide

Alberta: 3 ppm 8-hour, 5 ppm STEL

WorkSafeBC: 1 ppm Ceiling

TLV: 0.2 ppm 8-hour



OCCUPATIONAL EXPOSURE LIMITS

Hexavalent Chromium

Alberta: 0.01 mg/m³ 8-hour

WorkSafeBC: 0.01 mg/m³ 8-hour

TLV: 0.0002 mg/m³ 8-hour, 0.0005 mg/m³ STEL



OCCUPATIONAL EXPOSURE LIMITS



Many other potential impacts:

- Additions of different particulate fractions (inhalable fraction vs. total)
- Ototoxicity
- The list goes on!



OCCUPATIONAL EXPOSURE LIMITS



Be aware of evolving landscape, most items are likely to decrease, not increase. Adopt other limits as best practices where feasible.



TECHNICAL SOLUTIONS



- Remote monitoring and video
- Access to information
- QR codes



ActiveIAQ Senors:

- 86mm x 86mm x 27mm
- 10-year battery life
- 2x 3.6V AA Lithium batteries
- Plastic enclosure
- Wall mounting: single screw
| adhesive
- AES-128 encryption

TECHNICAL SOLUTIONS



Problems breed solutions, provided you know who to ask.





Part 2: Environmental Due Diligence



UNDERSTANDING ENVIRONMENTAL LIABILITY CAN BE A CHALLENGE



- EA completed before operations begin
- EA may be required to be completed by an external party
 - New ownership of the facility
 - The sale of the property
 - Insurance claim due to a chemical spill



ENVIRONMENTAL ASSESSMENT EXAMPLES



- Phase I & II Environmental Site Assessments
- Peer Reviews & Expert Witness Services
- Soil Vapour Intrusion Assessments
- Hydrogeology & Groundwater Assessments
- Environmental Management Systems Development
- Environmental Compliance Auditing
- Insurance Claims Support
- Water Quality Assessments



Top 3 Areas of Concern on Industrial Sites



1. Chemical Handling
2. Wastewater Handling
3. Sandblasting



Poor Chemical Storage



Aboveground fuel storage tank operating without secondary containment



Waste oil storage tote with uncovered secondary containment

Poor Chemical Storage



Miscellaneous chemicals stored on shop floor with heavy staining



Automotive fluids leaking across a bay floor

Chemical Storage... Better!



Chemical storage with secondary containment, covered and on a partially sealed surface and well organized chemical storage



CASE STUDY

Vandalized Aboveground Fuel Storage Tank



- A gasoline fuel tank was vandalized
- Released 1,000 litres of fuel directly onto the ground surface
- Client waited several months to begin the cleanup
- Approx 680 tonnes of impacted soil was excavated
- Cost insurer approximately \$900,000 to clean up
- Project ran 11 years!!



Spilled fuel beneath a
damaged fuel storage tank

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CASE STUDY

Vandalized Aboveground Fuel Storage Tank



Exploratory excavation of ground around damaged fuel storage tank



Second, larger excavation of impacted area

CASE STUDY

Vandalized Aboveground Fuel Storage Tank



In-Situ Chemical Injection of contaminated area



Additional chemical injection event

CASE STUDY

Vandalized Aboveground Fuel Storage Tank



Third round of excavating with the installation of slide rail shoring



Fourth Excavation with more slide rail shoring

CASE STUDY

Vandalized Aboveground Fuel Storage Tank



New double walled tank nest area situated on a concrete surface

Chemical and Fuel Storage



Always worth the investment to store Chemicals and Fuel properly



INDUSTRIAL WASTEWATER MANAGEMENT



- Sumps and oil/water separator management / maintenance
- Don't dump down the drain!
- Sewer discharge rules based on municipal bylaws
- Bylaw compliance **does not always protect you from potential subsurface contamination when discharging wastewater**



INDUSTRIAL WASTEWATER MANAGEMENT



- Municipal bylaws specific to dumping water into sumps
- Avoid overloading the municipalities wastewater treatment system
- Does not protect operator if the wastewater collection system is damaged at collection point
- Link to Calgary's Wastewater Bylaw 14M2012: [14M2012-wastewater-office-consolidation \(1\).pdf](#)



Managing Waste Water Properly



Discharging wastewater into the municipal system

- Do you require a permit?
- Crack in drain lines can cause subsurface impacts

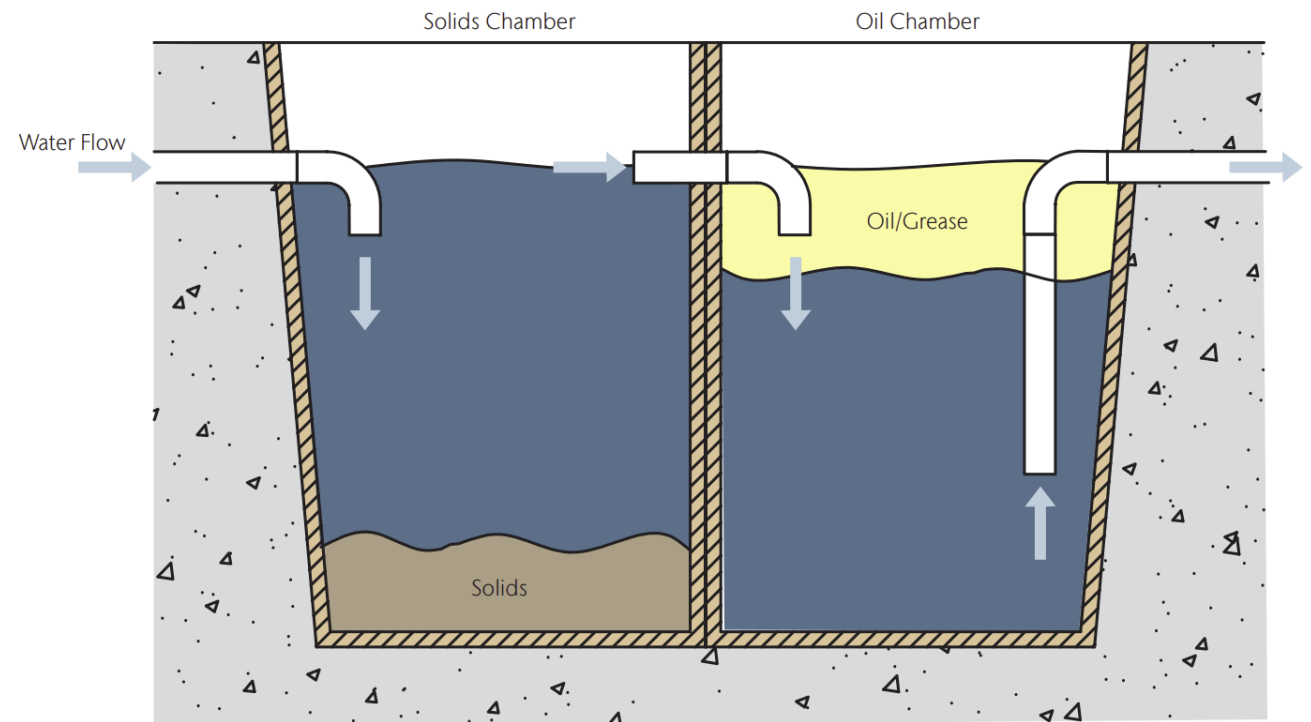


Managing Waste Water Properly



Dumping waste into a sump or an oil/water separator

- Have you checked the integrity of your sump?
- Is the sump cleaned out routinely?



Managing Waste Water Properly



Pouring waste out the back door or into a catch basin

- May not seem like a big deal
- **Can lead to contamination**
- Likely **against the bylaw**



Dual-Phased Oil / Water Separator Potential Risk for Contamination



View of a typical dual-staged oil/water separator (OWS)



Interior of an OWS

CASE STUDY

Remediation of a Damaged OWS System



View of a damaged OWS

CASE STUDY

Remediation of a Damaged OWS System



View of exposed contamination migrating through gravel fill material



View of excavation around former OWS separator

CASE STUDY

Remediation of a Damaged OWS System



View of newly installed OWS system



View of a portion of the excavation

CASE STUDY

Remediation of a Damaged OWS System



View of the damaged OWS and drain lines prior to excavation



View of the newly installed OWS and drain lines post excavation

Sandblasting – Identify a Potential Problem Proactively

- Keep sand under wraps
- Quality of the sand? Is it contaminated?
- **Clean sand will contaminate the ground after the sand blasting activities**
- Pick up heavy metals
- Contain spent sand within dedicated area



CASE STUDY

Operational Sand Blasting Facility



CASE STUDY

Operational Sand Blasting Facility



View of partially covered sand blasting area



View of stored sand placed beyond the limits of the covered storage yard

CASE STUDY

Operational Sand Blasting Facility



General view of spent sand observed throughout the storage yard



View of excavation of spent sand material

Proactively Monitor a Problem Area



- Operating Approval (OA) regular monitoring may already be a requirement to stay compliant
 - Frequency of monitoring required
 - Potential areas of concern (e.g. tailings ponds, former or current industrial lagoons, landfill areas or containment cells)
 - Remedial Action Plan at time of facility decommissioning
- Soil sampling during construction may be required if the crew is in contact with contamination. Retain environmental consultant to conduct testing

Regular monitoring of an active industrial site



A photograph of a group of people in a meeting or conference. Several hands are raised, pointing upwards, indicating an active discussion or a Q&A session. The background is blurred, showing bokeh light effects. A semi-transparent red banner is overlaid across the center of the image, containing the word "QUESTIONS?" in white, bold, uppercase letters.

QUESTIONS?