

Reduction of Unintentionally Produced Persistent Organic Pollutants (UPOPs) emissions by improving waste management practices at landfills

Personal protective equipment for landfill operators – types and functions

GEF Project ID: 5558 – Component 2 - Development and Implementation



Personal Protective Equipment

Personal Protective Equipment (PPE)

What is it?

PPE is designed to protect employees from serious workplace injuries or illnesses resulting from contact with hazards, such as:

- Chemical
- Radiological
- Physical
- Electrical
- Mechanical
- Other hazards



Personal Protective Equipment (PPE)

Hazards related to landfill operation

The most frequent hazards related to landfill operation are, in arbitrary order:

- Respiratory system illness, intoxication or death due to landfill gas, emissions from fires, inhalation of dust, etc.
- Accidents due to traffic on haul roads and access roads
- Presence and use of large vehicles, heavy equipment (excavators, bulldozers, compactors)
- Uneven or slippery surfaces, waste mass or land slides
- Fire and combustible materials including explosives or explosive atmospheres
- Handling of hazardous materials (bio-hazard exposure, harmful chemicals)
- Cuts and punctures wounds from handling of sharps
- Infections from contact with disease transmitting pests
- Working in adverse conditions (high temperatures, heavy rainfall, poor visibility, etc.)

Personal Protective Equipment (PPE)

Landfill accidents/incidents

	#	Summary Nr	Event Date	Report ID	Fat	SIC	Event Description
<input type="checkbox"/>	1	116122.01	05/02/2019	0625700	X		Employee Is Struck By Falling Tree Branches And Is Killed
<input type="checkbox"/>	2	112775.01	01/14/2019	0625700	X		Employee Is Found Unresponsive Under Trash While Spotting Fo
<input type="checkbox"/>	3	112746.01	01/14/2019	0625700	X		Employee Is Struck And Killed By Dump Truck
<input type="checkbox"/>	4	105652.01	03/22/2018	0751910			Employee Is Struck By Clamp And Fractures Both Leg And Wrist
<input type="checkbox"/>	5	102047.01	01/08/2018	0355114	X		Employee At Landfill Was Struck By A Piece Of Equipment And
<input type="checkbox"/>	6	104599.01	12/28/2017	0950631			Employee Injured When Struck By Tipped Over Wheel
<input type="checkbox"/>	7	85609.015	05/26/2016	0452110	X		Employee Collapses, Falls, And Dies.
<input type="checkbox"/>	8	85361.015	05/17/2016	0522000	X		Worker Is Struck By Shackle And Killed
<input type="checkbox"/>	9	82944.015	02/06/2016	0215800	X		Employee Struck And Killed By Truck At A Landfill
<input type="checkbox"/>	10	78595.015	07/26/2015	0951510	X		Employee Is Killed When Ejected From A Grader Operator Cab
<input type="checkbox"/>	11	65249.015	05/30/2014	0419400	X		Employee Stuck-By A Tractor Trailer Is Killed
<input type="checkbox"/>	12	202637278	07/15/2013	0551800	X	1629	Worker Collapses And Dies From Heart Attack
<input type="checkbox"/>	13	202471892	06/12/2012	0950643		4953	Employee Is Struck And Injured By Trash Bale

Evidence of accidents at landfills

Source: Occupational Safety and Health Administration (OSHA). United States Department of Labour

https://www.osha.gov/pls/imis/AccidentSearch.search?acc_keyword=%22Landfill%22&keyword_list=on

Personal Protective Equipment (PPE)

OSHA Requirements

- PPE must be made available by the employer to all employees where it is deemed required to complete the assigned work tasks
- Employee must wear the appropriate PPE
- PPE must be stored in a sanitary and reliable condition
- PPE includes:
 - ✓ Safety hats/helmets
 - ✓ Respirators and dust masks
 - ✓ Safety coveralls
 - ✓ Safety footwear
 - ✓ Safety eye protection
 - ✓ Safety gloves
 - ✓ Other devices, depending on hazard exposure risk

Personal Protective Equipment (PPE)

Rules

- Users must be trained and authorized to use PPE
- PPE procedures (putting on and taking off) must always be followed
- PPE must be inspected prior to each use
- Never use damaged or defective PPE
- PPE not provided by the company must be approved by your supervisor
- PPE has a use life span, replace at or before that date
- Check to be sure that you have the size and model of PPE that you were trained and fitted for
- Keep PPE clean and store the PPE in a designated, clean and dry location

Personal Protective Equipment (PPE)

1. Eye and Face Protection

- Protect the eyes from sharp objects that may cause injury or lead to eyesight loss.
- Protect the eyes from harmful chemicals, flying particles, dust that might be in waste from spilling into the eyes.



Image source: <https://corsafetydemo.corsafety.ca/orientation/ppe05/02ppe05.htm>

Personal Protective Equipment (PPE)

2. Ear Protection

- Ear protection is meant to protect the employee's ears from damage as a result of excessive noise levels at the workplace
- They should be worn while the employee is performing a task where noise levels are above normal



Image source: <https://kryptoneconsultingltd.weebly.com/articles/solid-waste-management-personal-protective-equipment-ppe>

Personal Protective Equipment (PPE)

3. Head Protection

- Safety hats protect the employee's head from injury caused by falling or flying objects.

- Bump caps do not provide impact protection, rather offer only minimal protection in the work area



- Hard hats provide protection from impacts and some hard hats provide protection from electrical shock



Personal Protective Equipment (PPE)

4. Safety Footwear



Depending on type, safety footwear

- Protect employees from foot injury as a result of sharp objects piercing through the soles or from falling objects.
- Protect employee from water borne disease causing pathogens.
- Protect employee against electrocution
- Special foot PPE can be required when working in wet areas or where chemicals are present

Image source: <https://vattuthietbidelta.com/product/foot-protection/>

Personal Protective Equipment (PPE)

5. Safety Gloves

Employee must wear hand protection when is exposed to any of the following hazards:

- skin absorption of hazardous materials
- cuts
- abrasions
- punctures
- chemical burns
- thermal burns / harmful temperature extremes

- ✓ Mechanical resistant gloves
- ✓ Chemical resistant gloves
- ✓ Micro-organisms resistant gloves



Image source: <https://www.exportersindia.com/shree-sai-enterprise-company4369048/hand-gloves-3419177.htm>

Personal Protective Equipment (PPE)

Safety Gloves. Pictograms – what do they mean?



Image source: <https://www.badgeraustralia.com.au/blog/a-comprehensive-guide-to-en-and-australian-glove-standards/>

Personal Protective Equipment (PPE)

Mechanical resistant gloves

- European Standard EN388 Mechanical Ratings Diagram

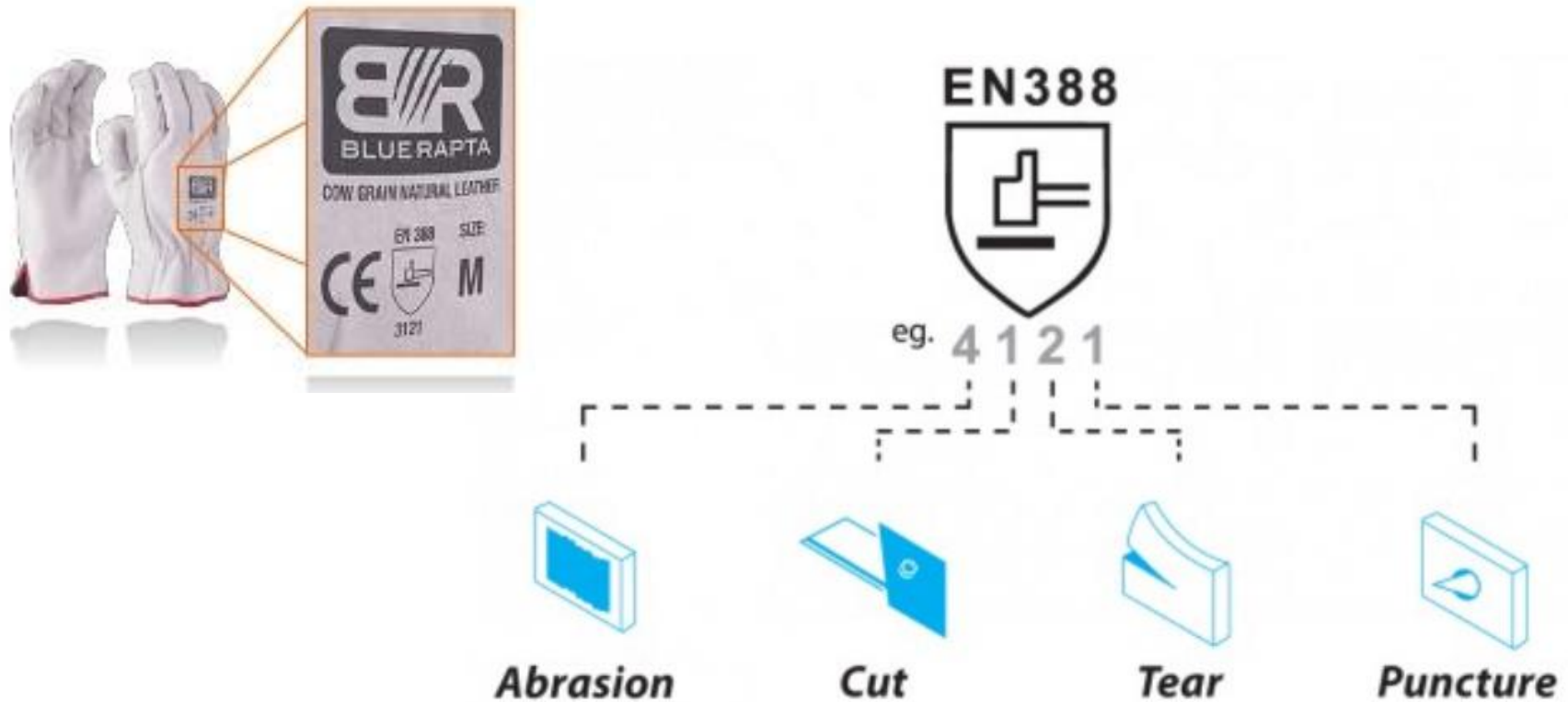


Image source: <https://www.theglovecompany.com.au/glove-info/glove-ratings/>

Personal Protective Equipment (PPE)

Mechanical resistant gloves

- European Standard EN388 Mechanical Ratings Diagram

Hazard test	Performance level				
	1	2	3	4	5
Abrasion resistance (cycles)	<100	500	2000	8000	-
Cut resistance (cycles)	<1.2	2.5	5	10	20
Tear resistance (Newtons)	<10	25	50	75	-
Puncture resistance (Newtons)	<20	60	100	150	-

Table source: <https://www.theglovecompany.com.au/glove-info/glove-ratings/>

Personal Protective Equipment (PPE)

Chemical resistant gloves

- European Standard EN374 Chemical Resistance Pictogram



Letter	Chemical
A	Methanol
B	Acetone
C	Acetonitrile
D	Dichloromethane
E	Carbon Disulphide
F	Toluene
G	Dimethylamine
H	Tetrahydrofuran
I	Ethyl Acetate
J	N-Heptane
K	Sodium Hydroxide 40%
L	Sulphuric Acid 96%

Table/image source: <https://www.theglovecompany.com.au/glove-info/glove-ratings/>

Personal Protective Equipment (PPE)

Micro-organism resistant gloves

- European Standard EN374-2 Micro-organism Resistance Pictogram



- ❑ This pictogram is shown when the glove conforms to at least a performance of 60 mins (level 2) for the Penetration* test

*Penetration is defined as chemicals and micro-organism flowing through the porous material, seams, small holes and/or other small defects in the gloves material

Personal Protective Equipment (PPE)

6. Respirators and Masks. Types of Respirators

- Particulate respirators – the commonly known “**N-95**” dust mask, protects against particles/ some infectious agents, they do not protect against chemicals, gases or vapours
- Chemical Cartridge/Gas Mask Respirator - “air-purifying” respirators
- Powered Air-Purifying Respirator – use a fan to draw air through the filter to the user
- Self-Contained Breathing Apparatus – commonly used by firefighters



Image source: <https://kryptoneconsultingltd.weebly.com/articles/solid-waste-management-personal-protective-equipment-ppe>

Personal Protective Equipment (PPE)

Masks. How are particulate filters classified?

- US Coding – three series **N**, **R**, **P**. Each series is available at three efficiency levels: 95%, 99% and 99.97%

N

- Used in environments free of oil mists

R

- These filters can be exposed to oil mists, but should only be worn for one work shift

P

- These filters can be exposed to oil mists for longer than one work shift



Image source:

<https://www.twincities.com/2020/04/20/coronavirus-masks-whats-the-difference-between-n95-and-kn95/>

Source: https://www.osha.gov/dts/shib/respiratory_protection_bulletin_2011.html

Personal Protective Equipment (PPE)

Masks. How are particulate filters classified?

- EU Coding

FFP1

- Non-toxic, non-fibrogenic
- Building/food industry

FFP2

- Dust, smoke and aerosols
- Metal working, mining, SWM activities

FFP3

- FFP2 + viruses, bacteria, fungi
- Chemical industry



FFP3 face mask

Personal Protective Equipment (PPE)

7. Safety Coveralls



Source: <https://kryptoneconsultingltd.weebly.com/articles/solid-waste-management-personal-protective-equipment-ppe>

- Protect the employees from hazardous chemicals that may be in the waste during solid waste operations
- Protect the employee from harmful disease-causing pathogens
- Hinder the spread of disease-causing pathogens from the waste by the employees

Personal Protective Equipment

Landfill employees



STEEL TOED
FOOTWEAR



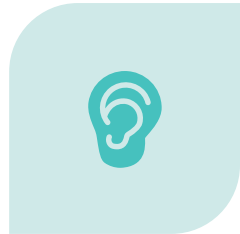
HIGH-VISIBILITY VESTS
OR CLOTHING



HARD HATS



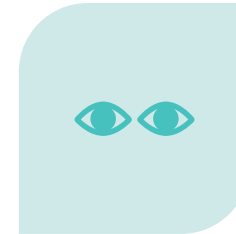
GLOVES



HEARING PROTECTION



COVERALLS OR
CLOTHING THAT
COVERS THEIR LEGS
AND BODY



EYE PROTECTION

Conclusions



PPE is the last line of defence. There are many PPE options, thus it is very important to choose the right equipment according to the occupational risks to which the employee is subjected



Landfill manager must make sure the landfill staff are wearing their PPE properly. Additional PPE may be required depending on the specialized operations



Inspect PPE before each use



Clean reusable PPE and store properly after use
After use, discard appropriately single-use PPE or damaged PPE



Appropriate PPE must be used when in contact with chemicals. Always check the chemical's Material Safety Data Sheet (MSDS)