

from a Person to a Professional

Occupational Health and Safety in Solid Waste Management

A.K. Thavaraj



FROM A PERSON TO A PROFESSIONAL

From a Person to a Professional

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From a Person to a Professional

*A handbook on
Occupational Health and Safety in Solid Waste Management*

A. K. Thavaraj

Foreword

FROM A PERSON TO A PROFESSIONAL is a training program developed by Hasiru Dala Innovations, a social enterprise focused on creating better livelihoods for waste-pickers through inclusive businesses that have an environmental impact.

Waste-pickers and waste workers, in general, do not use Personal Protection Equipment (PPE) such as gloves, masks, helmets, boots, protective eyeglasses and ear plugs for multiple reasons including affordability, lack of awareness of consequences of not using, discomfort of cheap products, owners or managers trying to cut costs, lack of monitoring by authorities and so on.

This training program aims to take the waste-picker on a journey of discovery of identifying his or her own reasons for resisting use and learning the benefits, short and long-term of using PPE regularly in their work. The program design includes recreation of their daily lives to set the context, factual content and emotional tugs to change their mind set. The program is designed for facilitated participation by a trained moderator who plays the role of a guide showing the path to discovery and self-realisation rather than a pedantic workshop. This is based on our conviction of working with waste-pickers that sustained behaviour change is affected only through self-awareness and understanding.

The content is a carefully calibrated mixture of moderator-delivery, videos, visuals and participative activities that are interwoven to progress on the journey to the end-goal of the participant willingly and voluntarily committing to use of PPE and demanding their employers to provide the same. All the content is designed to be used in an integrated fashion and not as independent units. For example, the videos allow the participants to visualize a situation that they can empathize with and create cues for the moderator to explore with the participants.

We are confident that through this program we will be able to bring about a healthy change in working practices among the waste-pickers and workers in the sector.



SHEKAR PRABHAKAR
Co-founder & Director
Hasiru Dala Innovation

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Conventions

ABBREVIATIONS AND DEFINITIONS

@abcdef: Web-link. Replace @ with 'https://tinyurl.com/' to get the web address https://tinyurl.com/abcdef. See LINKS TO WEBSITES → [A-I] for a list of all web links in the book.

ABS: Acronitrile Butadiene Styrene. A thermoplastic polymer commonly used to make articles that require impact-resistance, such as helmets.

AP: Active Participant(s). A person at the workshop who volunteers to participate in activities and engages with the moderator and other participants.

Aromatic hydrocarbon: An organic compound that contains one or more benzene rings (⬡). These compounds have a characteristic 'aromatic' odour.

CAS number: Chemical Abstracts Service Registry Number. (Also called CASRN and CAS) A unique numerical identifier assigned by the Chemical Abstracts Service (CAS) to every chemical substance described in open scientific literature. In 2020, more than 158 million unique organic and inorganic substances and 67 million protein sequences had been assigned a CAS number.

DP: Disengaged Participants. Those who show no interest in the activities or discussions.

EP: Engaged Participant(s). Someone who is following the activities with interest and curiosity, but does not volunteer to participate in the activities.

HDPE: High Density Polyethylene. Also LDPE, which is a low-density polymer of ethylene. HDPE is more rigid and has better chemical resistance than LDPE.

HoHC: Hierarchy of Hazard Control. A standard practice used in industry to eliminate or minimize exposure to hazards in the workplace.

IPA: Isopropyl alcohol. Also called isopropanol and propan-2-ol. Often sold in diluted form as rubbing alcohol or cleaning alcohol.

IUPAC: International Union of Pure and Applied Chemistry.

Latex: Latex is a milky fluid found in 10% of all flowering plants. It is a complex emulsion of proteins, starches, alkaloids and other compounds that coagulate on exposure to air. 'Latex' generally refers to non-vulcanised rubber made from the latex of the rubber tree. In this handbook, 'latex' and 'rubber' both refer to 'natural latex rubber'. 'Synthetic rubber' refers to SBR (see **SBR**).

Nitrile, Nitrile rubber: Nitrile rubber is a synthetic rubber copolymer of acrylonitrile (ACN) and butadiene. It is also called NBR, Buna-N, and acrylonitrile butadiene rubber. Nitrile rubber is more resistant to oils and acids than natural rubber and has superior strength, but is less flexible. In this handbook, 'nitrile' means 'nitrile rubber.'

OHS: Occupational health and safety

P2P: From a Person to a Professional.

PET: Polyethylene terephthalate. A thermoplastic of the polyester family. Most commonly used to make synthetic fibres (commonly called polyester, terylene, and Dacron®). SWM workers encounter PET in the form of water and carbonated-beverage bottles.

PPE: Personal Protection Equipment is protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury or infection. The hazards addressed by protective equipment include physical, electrical, heat, chemicals, biohazards, and airborne particulate matter. Hasiru Dala recommends the use of appropriate PPE—the emphasis being shared between 'appropriate' and the PPE being recommended. Both underprotection and overprotection are considered inappropriate.

PtD: Prevention through Design (also called Safety by Design). The process of eliminating or mitigating the effect of workplace hazards by prioritizing the health and safety of workers when designing or upgrading workplaces, processes, tools, and equipment.

PVC: Polyvinyl chloride. A polymer with a wide variety of uses. It can be moulded into rigid objects such as pipes and helmets and (with the addition of plasticisers) into softer and flexible forms such as sheets.

RPE: Respiratory protection equipment.

SWM: Solid Waste Management. An umbrella discipline that deals with the processes, technology and personnel associated with the collection, treatment, and disposal of discarded solid materials.

SBR: Styrene-Butadiene Rubber. A family of synthetic rubbers created from styrene and butadiene and most commonly used to make automobile tyres.

Type DW (gloves): Gloves suitable for handling dry waste. See TYPE DW GLOVES → [131].

Type GP (gloves): General purpose gloves suitable for handling non-hazardous material. See TYPE GP GLOVES → [136].

Type S (gloves): Speciality gloves recommended only for jobs involving a specific extreme hazard. See TYPE S GLOVES → [139].

Type WW (gloves): Gloves suitable for handling wet waste. See ③ WET-WASTE GLOVES → [163].


SYMBOLS




→[*n*] See page *n*, e.g., →[15] means ‘see page 15.’ The page number may be clicked in the PDF version of the handbook.

D or **DEFER**. Put discussion on hold for later (**D** \rightarrow) or reopen a discussion (\rightarrow **D**) using the **DEFER** protocol. This protocol is also called a *parking space*, or a *holding area*. The **DEFER** protocol is used to postpone discussion on a matter and re-open it later. See **DEFER PROTOCOL** \rightarrow [A-21] for how the protocol is defined and used in this handbook.

 Academic information that may be useful in workshops with NGO workers, managers, CSR departments in companies and so on.


 Technical information that may be useful for skilled swm workers, technicians and engineers.

☯ Use the **OPINION** protocol. Used to evaluate the opinions of a group or consensus on an **OPINION**. See **OPINION_PROTOCOL**_→[A-26].


 Vote by a show of hands.

2 A frequently-asked question (FAQ): The handbook contains answers to questions that are asked frequently by participants at P2P workshops.

☐ Summarize. ‘Summarize what has been discussed.’ Use the `TRANSFER PROTOCOL` [A-28] to summarize what has been discussed.

 Note this down in the Note Sheet (See NOTE SHEET → [A-36]). In some cases, the symbol might have a suffixed modifier, such as [1 AP], [1 EP], [*n*, *a number*] and so on. These modifiers indicate subsets—[1 AP] means, ‘Note down the name of one AP who responded.’ Modifiers may be combined.

(I II III IV V VI VII VIII), (① ② ③ ④ ⑤), (a b c d e) Roman numerals refer to modules. Circled numerals refer to activities. Circled letters are optional activities, e.g., the phrase ‘III ⑥ a → [213]’ refers to Optional Activity 6a of Module III. Similarly, II ① refers to Activity 1 in Module II. A reference to, say ① or ② a, by itself, refers to Activity ① and Optional Activity ② a, respectively, in the current module.

 **Prescription.** A ‘best practice.’ An indication that the image (or text) illustrates appropriate usage of PPE or OHS principles. (See IMAGE 58 ↗ [39].)

☐ Slide. Thus, ☐5 is slide 5 in the current activity. References to slides linked to other activities are done using the standard convention. II②☐5 is Slide 5 in Activity ② of Module II.

☐ Card. Thus, ☐₁ refers to Card 1. Unlike slides, cards are not linked to any specific activity.

☐☐: A conversation or dialogue provided as an example to explain the topic at hand is formatted like this:

This is something the moderator might say to participants. Conversations may be descriptions, explanations or questions you could ask. Conversations are used to explain dry or complicated information in a simple style.

☐ *This is a reply from participants. Note the prefix ☐.*

☐ *When conversations include replies from participants, the moderator's statements are prefixed with ☐.* (See KARTHIK AND HIS HELMET →_[32] for an example of these icons used in a conversation between a moderrator and a participant.)

☐ Refer to film. Therefore, ☐₄, refers to the film *Laxmi falls Ill*, which is part of Module IV.

@abcdefgh: A web-link. Replace @ with <https://tinyurl.com/>

For example, @y5myhvh8 is <https://tinyurl.com/y5myhvh8> which leads to http://www.dc.engr.scu.edu/cmdoc/dg_doc/develop/material/overview/a3000002.htm. See LINKS TO WEBSITES →_[A-I] for a list of all web links in the book.



Introduction

THE P2P WORKSHOP

Traditional approaches to Occupational Health and Safety (OHS) are often reactive: problems are discovered and addressed only after a worker is injured, or a safety standard or regulation becomes mandatory, or if funding becomes available for OHS-related programmes—events that typically provoke reactions in small factories, municipal corporations and NGOs, respectively. More often than not these organisations turn to PPE for a solution. Instead, proactive interventions that are part of an OHS framework are the preferred approach in traditional industries—OHS methods are standardised, their performance is monitored, and outcomes are evaluated. Such frameworks are promoted by leading OHS regulators around the world,¹ and used by industry leaders like Toyota, Sony, and General Electric. A comprehensive, but pragmatic training programme to modernise the Solid Waste Management (swm) industry's attitude towards OHS is required.

Hasiru Dala Innovations has created such a programme. It may be used by individuals and organizations, and it begins with a workshop on the subject of Occupational Health and Safety for swm workers. *From a Person to a Professional* (P2P) is a one-day workshop designed for thirty participants. It consists of three modules on OHS, one module on health, and three modules on financial planning and social security, all designed for swm workers. One module—Module VIII—was designed for technical specialists and administrators who work in the swm industry.

TARGET GROUPS

P2P is designed for organizations, companies, government institutions and NGOs dealing with swm workers, specifically those involved in the collection, processing, and transportation of waste. This handbook was written to train moderators of a P2P workshop. Target groups are those people who handle, process, or transport waste, such as door-to-door waste-collectors, sanitation workers, housekeeping staff, itinerant scrap buyers, sorters, workers in compost and bio-gas production plants, e-waste and plastics processors, machine operators, and transporters. The P2P curriculum also includes content for government administrators, private-sector and municipal contractors, NGOs, and OHS trainers.

¹ See @t7beyhf, @y7sedmnk, @ybev9zuc, and @y83okomo. (Replace @ with <https://tinyurl.com/>)

THE P2P METHOD

P2P can be used to train workers at all levels of expertise in the SWM sector, from manual labourers and managers, to skilled machine operators and engineers. Some participants might be functionally literate at best and may struggle to understand Powerpoint-led presentations or, indeed, any printed material. The workshop must also address the counter-productive precedent set by several well-meaning government and NGO programmes that try to force PPE upon workers. The methodology chosen by Hasiru Dala Innovations emphasises discussion and communication between participants, instead of merely lecturing them on the subject of OHS.

Briefly: The P2P workshop teaches participants how to select and use appropriate work-safety methods, including PPE, for the job at hand. It does not try to force (or urge, or guilt, or threaten) participants to use PPE. Instead, it helps them to re-evaluate their attitude towards safety and (in that context) to decide whether to use (or not use) PPE. The step-by-step movement from problem to problem-statement to options to informed choices and finally to a solution is called the P2P method. It was developed by Hasiru Dala Innovations specifically for this workshop. It uses an eclectic mix of teaching methods² to create practical, pragmatic solutions to a given problem; it does not steer participants towards ideal solutions or even attempt to define ideal or ‘desirable’ solutions or goals.

In detail: Traditional theories of adult education assume that students all *want* to change,³ understand the need for change, and that students need only be furnished with the information required to effect change. As such, participants at conventional OHS workshops are guided by a moderator through a series of activities designed to convey technical and procedural information that is created by a subject expert. It is assumed that the expert, by definition, is more knowledgeable about OHS than the participants, and that the moderator knows how to convey this expertise.

These assumptions are not universally applicable. Unlike students of adult-education programmes and attendees at NGO workshops or corporate committees, most members of the target groups mentioned earlier may not know anything about an OHS programme, let alone appreciate its benefits; many are tough, self-employed workers schooled in their trade by hard apprenticeships in scrap shops and, in many cases, on the streets. The way they think and work is influenced by precedent, circumstances, priorities, traditions, work-experience, and inertia. To dismiss the importance of their knowledge (or to expect participants to discard what has worked for them) is counter-productive and futile. An example of reason succumbing to inertia and practicality sits in front of many literate, degree-wielding office workers. The arrangement of letters on a keyboard (QWERTY)⁴ was devised to prevent jamming the typebars on a mechanical typewriter when neighbouring keys were pressed in quick succession. The mechanical flaw does not apply to computer keyboards. QWERTY is not (and never was) the most ergonomic keyboard layout for typing. Yet, despite the existence of far more ergonomic arrangements such as the

2 The ideas of George Polya (*How to solve it*), Kaoru Ishikawa (*What is Total Quality Control*), Charles Munger (described in *Poor Charlie's Almanack*), Richard Feynman (*Surely you're joking Mr. Feynman*) and Paolo Freire (*Pedagogy of the Oppressed*) are implemented in the P2P method. Techniques that are well known to engineers are used to explain concepts to non-technical participants and vice-versa. The method takes techniques from different disciplines and applies them to problems in the SWM industry.

3 Since students attend adult and continuing education programmes voluntarily, the assumption is correct—the classroom is self-selecting since students do want to learn, and are willing to be taught.

4 See the Wikipedia entry for the history of QWERTY.

Dvorak layout, which reduces finger movements by half or more, most users continue to use the QWERTY layout, and experienced typists are faster on QWERTY than a layperson who uses Dvorak. People continue to use the QWERTY layout for a variety of reasons⁵, and keyboard manufacturers respect this choice when they design new keyboards.

Another example: most motorists *know* that helmets prevent fatal accidents, yet they refuse to wear helmets. Further, many motorists wear helmets only to avoid being penalised, which shows (for reasons best known to them) that their own safety is less important than being fined. And a final example: thousands of educated women around the world perch themselves on high-heeled shoes and teeter about all day on slippery floors, which demonstrates (without requiring any explanation) that personal choice, self-image, social norms, and tradition can supersede functionality and usability even when educated people make choices about clothes, equipment and tools.

Technical and procedural information of any kind will not be accepted by participants until they are convinced of its usefulness. Moderators must understand the concerns and beliefs of the participants to find solutions that the participants are ready to accept. Therefore, the concept of MENTAL MODELS⁶ has been applied to the subject of occupational health and safety: (1) participants from diverse backgrounds are encouraged to discuss each other's perspective of the problem at hand, and (2) P2P moderators are taught to present different perspectives by adopting the mental models and modes of thinking associated with different disciplines: think like an engineer, think like a social-activist, think like a worker at a plastic-sorting facility, think like an administrator, and so on. By doing so, they are better equipped to facilitate the exchange of information and generate consensus between participants about the nature of the problem at hand.

When a moderator provides information about a situation, participants will react differently to it: *I don't trust you*, or *I don't think he has ever seen a biogas plant*, or *All that is fine, but what should I do?* or *I didn't know that but my system works too, so why should I change it?* and so on. The P2P workshop includes a tool II①Ⓐ PERSPECTIVE PLAYBACK_→[57] that is designed to allow participants to express their reactions freely. The moderator responds to such queries by issuing additional or modified information. They continue to cycle information back and forth until there is consensus.

Traditional assumptions about a participant's knowledge are also evolving. A participant at a workshop is, nowadays, considered to be an 'expert' of his or her own experiences, i.e., it is assumed that he or she has valid reasons for doing things in a certain way. Therefore, any 'improvements' (beginning with an assessment of the need for improvement) to tools and techniques are, nowadays, always developed in consultation with the user of those tools. This approach is used by engineers when designing all kinds of consumer appliances—phones, refrigerators, computer keyboards, and so on.

P2P takes the evolved approach: SWM workers (and other target groups) first define *practical*, *cost-effective*, *safe* and *efficient*, and then learn about options to work safely, economically and efficiently. The format of teaching and learning is now a structured dialogue between one subject-expert (the moderator) and many subject-experts (the participants) communicating with each other. Instead of teaching participants what they should and shouldn't do, the workshop explores the participants' attitude to OHS

5 'What if I need to use someone else's keyboard?' 'What if someone else wants to use my computer?' 'I already know QWERTY and it works for me.' 'I don't need to type faster.' 'It is difficult to replace the key-caps on a laptop.'

6 See @ y8yrvhk7. Also see VIII② MENTAL MODELS_→[518].



Image 1. A P2P workshop on financial security in progress. Bangalore, 2019.

and the resistance of many unskilled SWM workers towards PPE. A series of activities and thought-experiments encourages participants to discuss the reasons that drive their choices about OHS and then re-evaluate these reasons in the light of new knowledge created during the workshop.

All the technical information on equipment and procedures is made available to participants in its purest form—as data—which they may use to solve their problem. The P2P workshop does not offer pre-processed solutions; instead, it helps participants to evaluate information and arrive at better-informed solutions.

The workshop differentiates itself by applying the Hierarchy of Hazard Controls (HOHC), shown in IMAGE 2,⁷ [21] and the principle of Prevention through Design (PTD) to the problems faced by SWM workers instead of merely teaching them how to use PPE. Why? Because PPE *is the least effective means of improving safety at the workplace*⁷. Both the HOHC and PTD are standard industry practices. While OHS is the principle subject at a P2P workshop, it is also hoped that the P2P method will serve as a useful tool in the day-to-day life of the participants and the moderators.

The transformation implied by the title *From a Person to a Professional* is not the outcome of the workshop: all participants, every day, transform from persons at home to professionals in the workplace. The title merely acknowledges the change, and makes participants consciously aware of it. The P2P workshop emphasises and strengthens the agency—the ability, freedom, and right—of SWM workers to guide the transformation of their lives both as persons and professionals.

CURRICULUM

The subject matter of the workshop is divided into three components. The handbook contains information which may not be necessary for every workshop, e.g., much of Module III contains detailed technical specifications and procedural information on PPE that is useful only to skilled SWM workers employed in mechanised SWM factories.

⁷ This nugget of information surprises most laypersons. It is true. It is the reason why this handbook is a little bulkier than a pamphlet detailing how to wear safety gloves and masks.

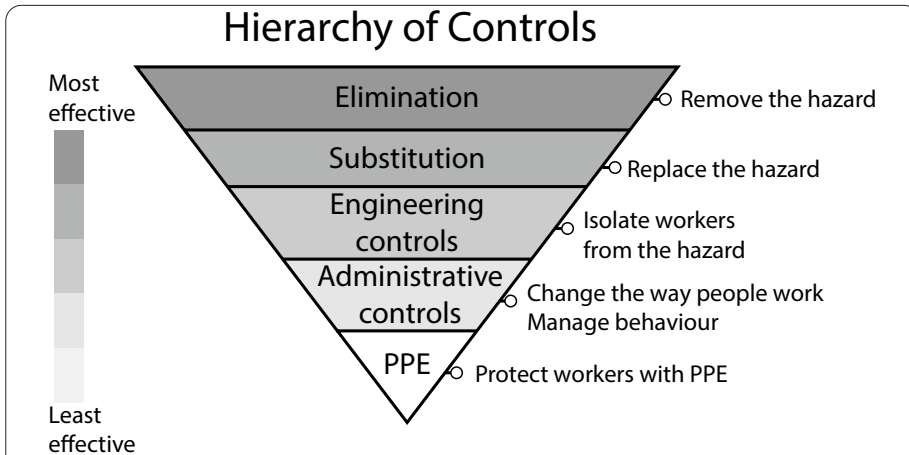


Image 2. The Hierarchy of Hazard Control is a widely accepted system promoted by numerous safety organizations around the world, including NIOSH, US-OSHA, and the European Agency for Health and Safety at Work.

Bombarding participants with extraneous theoretical information is counter-productive; the handbook, however, includes technical information for the benefit of the moderator—and only such technical information that is relevant to the SWM industry. USING THIS HANDBOOK → [26] explains how to tailor the agenda of a workshop to fit the requirements of participants, and to provide only such information that is useful to them.

Also included in the curriculum are activities that are customised for specialist workers, such as technicians, site-engineers, and OHS experts hired to train SWM workers. Also included are activities customised for social workers and administrative staff at NGOs, municipal employees and CSR personnel at companies that fund OHS-related projects.

§ COMPONENT 1. TECHNICAL AND PROCEDURAL INFORMATION

On Occupational Health and Safety

- What is workplace safety? What are the different methods used to improve safety? What are the different kinds of PPE? Why are they used and how do they work?
- How to create *practical* solutions to improve safety in specific workplaces and for common jobs using the Hierarchy of Hazard Control.
- Identifying, selecting, and implementing safety control options as part of a long-term OHS strategy. Evaluating the performance of an organization's existing OHS strategy and improving it.
- Adapting hazard and quality-control techniques used in the engineering industry to improve safety at waste-processing units.
- Choosing appropriate PPE using standard protocols. Detailed technical information on gloves, footwear, eye and ear protection, face and head protection and other PPE used in the SWM industry.
- Protocols for SWM jobs that require workers to handle hazardous chemicals; protocols for handling bio-medical waste.
- Relevant global and Indian standards (2020) on OHS and PPE.
- Overview of Indian laws that are relevant to SWM work .

On Health and Nutrition

- How to use a first aid kit? What are the protocols for giving first aid for wounds, burns, snake-bites and animal-bites?
- How should one properly wash hands? How are common diseases contracted and spread? When should I seek medical attention?
- Why is good nutrition important? What is the link between nutrition and income?

On Social Security and Financial Planning

- What is the best way for *me* to save money? What are the different methods of saving?
- Different government programs for people in the swm field.
- What do *I* need to know about the banking and credit industry?
- Explanations of economic concepts—value, cost, price, inflation and depreciation—as applied to swm, and explained with examples that are familiar to swm workers.

§ COMPONENT 2. SUBJECTIVE APPRAISALS

On Occupational Health and Safety

- What is *my* threshold of ‘safe’?
- Who is responsible for my safety? Who should decide if I am safe?
- I feel shy when I work with PPE. What should I do?
- Why should I work bother about efficiency or ergonomics? I do my job, don’t I?

On Social Security and Financial Planning

- How do I calculate what is ‘enough’ when I plan my savings? Is there a simple way to calculate how much to save?
- Why do some swm workers earn more than others? Why do some have access to credit in the formal banking sector, while most do not?
- Who is responsible for my future? How should I plan for my financial obligations in the future when I retire or when I die?

§ COMPONENT 3. MOTIVATION TO CHANGE

- Testimonials from colleagues and co-workers from the swm field in different cities who use PPE. If others use PPE, perhaps I should too?
- Exploration of identity, image and self-image.
- What does it mean to be a professional? Am I a professional swm worker? What is the connection between being a professional and using PPE?
- Am I professional? Yes. I am!⁸

⁸ Notice that the answers to these questions become progressively more complex as one goes down the list. The questions in Components 2 and 3 have no ‘correct’ answers, and depend upon an individual’s perspective. The component headings too are listed in order of complexity—concepts under Component 1 are easier for the moderator to explain and for participants to understand, than those in Component 2, and more so in the case of Component 3. Helping swm workers to understand, accept, and embrace their identity as professionals is the final, and most complex component of the P2P curriculum.



Image 3. Laxmi's World is a series of seven films about Laxmi, a worker in a composting unit in Bengaluru, India. Laxmi plays herself in these films.

LAXMI'S WORLD

Peer education environments are enhanced if the peer-educator and learner share a social, financial, and cultural background. During their interaction the one assumes that the other knows and understands the intangible factors that influence a person's life. Consider a workshop on adolescent sexual health, a peer-educator who has experienced the awkwardness involved when seeking information on menstrual hygiene knows that her peer-learners might hesitate to speak freely; the peer-learner too assumes that the awkwardness is understood by her peer-educator, and is more likely to open up about the problems she faces. Therefore, the discussion between them moves quickly to the matter at hand. Hasiru Dala Innovations has adapted this advantage of peer-education and incorporated it into the P2P methodology. Indeed, the title P2P suitably reflects the adoption of peer-to-peer methods in the workshop.

Subjective components, i.e., the various mental models that influence decisions are discussed over a narrative arc of seven films featuring a protagonist—Laxmi, a waste-worker—who deals with injury, illness, debt, nightmares, a superhero, a talking tortoise and, finally, death. Laxmi, in real life, is a waste-worker. She is about 40 years old. She is married with two children. She has been a waste-worker for as long as she can remember, but wants to give her children a different life, a 'better life.' Laxmi is barely literate but is intelligent and hard-working. Her decisions are guided by precedent, intuition and a survival instinct. She is the heroine and, in a way, she is every member of the audience. Participants all understand the context in which Laxmi takes decisions and it need not be explained⁹. Her decisions can be discussed as thought-experiments—not to decide whether she was 'right' or 'wrong' but to observe and gain conscious insight into what *influenced* her decision. The presuppositions, assumptions, misconceptions, expediency as well as the information and physical limitations that influence Laxmi's decision are then generalized to reach conclusions relevant to the participants. Laxmi has strong opinions

⁹ Laxmi represents both the peer-educator and the peer-learner. Her life provides the shared context that is missing from traditional workshops. Laxmi's World helps the moderator explain subjective concepts using a real SWM worker as an example.



Image 4. In traditional training films, Laxmi would be eager to learn, enthusiastic, immediately receptive to PPE and so on. In *Laxmi's World*, the characters and their reactions are true-to-life. The image, shown above, is from the second film—Laxmi is not amused when the narrator gives her gloves to wear. She is willing to learn, but is not willing to be 'taught.'

about everything and loves to argue, but in the film, she never speaks out aloud. The participants can hear her thoughts and see her expressions, but she does not move her lips—what she thinks is more important than what she says.

Laxmi also plays the villain in that she is the only fair target of criticism permissible in the workshop. The methodology encourages participants to discuss (or, if they wish, to criticise) Laxmi's decisions, which allows them to assess any criticism of their own decisions without feeling awkward or targeted. Laxmi's dual-role as the heroine and villain as well as her refusal to speak creates a unique situation that is suitably ironic. Participants openly judge Laxmi's choices, while they assess their own choices—which may be identical to Laxmi's—in the privacy of their

minds. Participants may, of course, disagree with one another privately, but in public their disagreement is with Laxmi.

Laxmi's reactions to her environment—annoyed, angry, happy, puzzled, sad, and so on are like R.K. Laxman's *Common Man*, and are shared by virtually any waste-worker in India.

The flow of information at the workshop is determined not by agenda but by consensus generated among the participants.¹⁰ The objectives listed at the beginning of each module are stages in consensus (among participants) to be attained by the moderator.

REQUIREMENTS

The workshop requires a moderator with a little experience. 'Little' is hard to explain—if you, the reader, found yourself in familiar territory while reading the previous section on methodology, then you are qualified to moderate this workshop.

The moderator must be able to speak, read, and write in the local language and have good interpersonal skills. The P2P method requires the moderator to spend a lot of time listening to participants and summarising the discussion—he or she should be able to convey, quickly and accurately, the intent and content of what was just said. If you hear a one-minute conversation and can accurately summarize it to a couple of sentences, you are ready for the job! Experience in the swm field or the social service sector is ideal, but not necessary. You don't have to know everything about swm to be an effective moderator; you merely need to learn how to ask the right questions—remember that the worker in front of you earns a living in the swm industry. Learning how to ask insightful questions instead of merely providing generalized answers is one of the skills that is taught in this handbook.

The workshop uses a variety of props used in role-playing activities as well as visual

¹⁰ Flow of consensus and information is described in the next chapter.



Image 5. Laxmi's house is the setting for most of the films. Participants get to see the neighbourhood where she works and her small sorting shed near her house.

learning aids such as cards, worksheets and so on. The services of an assistant are essential. An able assistant can arrange props and equipment, operate the projector, update the DEFER chart (see DEFER PROTOCOL → [A-21]), cross-check data online, distribute and collect worksheets and perform other sundry tasks that would otherwise take up the moderator's time. The handbook contains guidelines for assistants as well—when should the DEFER chart be updated, which props should be prepared and when, which answers should be noted down. The next section (USING THIS HANDBOOK → [26]) contains detailed instructions on how to conduct a P2P workshop.

The workshop is designed to be held indoors with space enough to seat 30 or more people comfortably. Location, equipment and other technical and logistical requirements for the workshop are in PREPARATIONS AND DOCUMENTATION → [A-15].



Using this handbook

GETTING STARTED



Image 6. Laxmi with her husband Chandu and their children Shahrukh and Kutty.

You, the reader, are the ‘you’ in this handbook. You are a moderator of a P2P workshop. This handbook was written for your use and not for participants at your workshop. Familiarize yourself first with the abbreviations, conventions and symbols used in this handbook_→[14]. APPENDIX 1: ABOUT SWM_→[A-1] contains information on the processes and jargon of SWM. APPENDIX 3: PROTOCOLS_→[A-19] contains notes on the various moderation protocols used in the workshop.

Watch all seven films on the companion USB drive. They are called *Laxmi wears a sari*, *Laxmi makes a choice*, *Laxmi makes a film*, *Laxmi falls ill*, *Laxmi tells a story*, *Laxmi's earrings*, and *Laxmi is all alone*. The films are located in two files¹¹: EN-I-V-PPE.mp4 contains the first five films linked to Modules I to IV on the subject of OHS; EN-VI-VII.mp4 contains one film each on financial planning

and social security. Pay close attention to the decisions that Laxmi takes in the films and try to understand the reasons that influenced her decisions.

Read all the case studies¹² for an overview of what to expect in a P2P workshop—most case studies are edited conversations that took place between a moderator and participants at a P2P workshop or during tests that were conducted while this handbook was being written. Most focus solely on the technical aspects of work-safety, some deal with intangible concepts such as identity and motivation. They may provoke you to re-evaluate some of your preconceptions about SWM workers.

Read VIII② MENTAL MODELS_→[518]; it explains the rationale behind the flow of information and the structure of a P2P workshop. The material in Module I and onwards assumes that you have seen all the films, read all the case-studies, and are familiar with the concept of mental models.

¹¹ The file-names on the USB drive may be different from those mentioned here. Suffixes EN, and KA refer to the English, and Kannada versions of the film. There may be other versions on the drive.

¹² A list of all case studies may be found at the end of the Table of Contents.

STRUCTURE OF A P2P WORKSHOP

§ MODULES

There are eight modules in this handbook, numbered I to VIII. Attitudes and commonly-held beliefs about OHS are discussed in Modules I and II. Technical and procedural information on OHS is sequestered in Module III. Health and first-aid are discussed in Module IV. Aspirations and motivational topics are in Module V. Finance and social security are the subject of Modules VI and VII. Information useful for engineers, NGO-workers, and administrators is in Module VIII.

Each module (except Module VIII) is associated with a film that should be screened if an activity within that module is included in the workshop programme.

§ ACTIVITIES

Each module contains one or more activities; each activity has a specific objective. Objectives, indicators (measurable changes that show that the objective has been reached) and explanatory notes are listed at the beginning of each activity. The agenda of a P2P workshop consists of a series of activities suitable for the participants at *that* workshop. The WORKSHOP PROGRAMME section at the beginning of each module (and activity) provides guidelines on the inclusion (or exclusion) of an activity into the agenda.

Let us assume that an SWM company hires you to train thirty members of their doorstep waste-collection staff on the subject of 'basic OHS'. Twenty five participants are unskilled workers with secondary-school education, and five are supervisors with high-school education. The latter are responsible for managing work-schedules, planning routes, purchasing PPE, and customer-service. The agenda of activities for a workshop with these participants could be as follows:

Screen *Laxmi wears a sari*, I①, I①③, screen *Laxmi makes a choice*, II①, II①③, II③③, II③, screen *Laxmi makes a film*, III①, II①③, III①, III⑩, III② (STANDARD GLOVE-KIT, [149]), screen *Laxmi falls ill*, IV②③, IV⑥, screen *Laxmi tells a story*, V①, II④, VII②.

Notice that the film associated with a module is screened only once—the first time an activity within that module is taken up. Therefore, *Laxmi makes a choice* is screened before II①, but not before II①③ or II④ at the end of the workshop. Notice also that 80% of the activities in Module III were excluded from the agenda; none of the activities in Modules VI to VIII are included, apart from VII②. The agenda for most P2P workshops usually covers only about ¼ of the material in this handbook. You could conduct a 3-hour P2P workshop for specialists consisting only of III⑩ and III②, without screening any films.



Assume now that a company hires you to train two managers, ten supervisors and thirty workers. These employees work are responsible for house-keeping jobs at a shopping mall; the company was asked to trained its staff so that the mall complies with municipal OHS rules. The agenda for their workshop could be as follows:

Screen *Laxmi wears a sari*, I①, II①③, screen *Laxmi makes a film*, II③, III⑩, III②, II①③, III④, III④③, III③, III④③, II④, and VII②.

Notice that *Laxmi makes a choice* was not screened, and that II①③ is included twice in the agenda. III⑩, which is a problem-solving activity, is initiated close to the start of the workshop. Such agenda are common in workshops with skilled workers doing jobs whose hazards are known, clearly defined, and do not vary.

INFORMATION IN A P2P WORKSHOP

§ INFORMATION MUST BE USEFUL

This handbook contains information for all types of swm jobs done by workers with different skills and education. During each activity, participants should only be provided such information that is useful to them. Irrelevant information is useless. Most activities contain compartmentalised information based on its usefulness to workers doing a specific job. In some chapters (mostly activities in Module III) you will find technical or academic information that is demarcated with icons  and , respectively.

In this handbook, *jobs* is used in its technical sense—a series of tasks performed as part of a process¹³. *Jobs* are not precisely defined by a worker's *job-title*. A 'doorstep waste-collector' is a job-title but what does this worker do, exactly? Her safety-related requirements depend upon the kind of waste she handles, the level of segregation of that waste, the processing and disposal procedures that she uses, and so on. A municipal conservancy worker on a street-sweeping job has no use for information on chemical waste handling and disposal—she is best served by knowing how to use a set of equipment and tools that is best suited for the job at hand, the job she does. A site supervisor at a shopping mall, on the other hand, must know about standard PPE and tools for her workers as well as the safe storage of cleaning chemicals and so on, even if she never handles chemicals; a manager or consultant needs to know how OHS techniques may be applied to a wide variety of swm jobs, including the cost vs. benefit of each technique.

In some cases, only a subset of exercises may be relevant, e.g., III④ⓐ HAZARD CLASSIFICATION SYSTEMS → [198] contains classification information that is useful for swm professionals who regularly work with hazardous chemicals. However, most swm workers may handle only a few cleaning chemicals, and need only to know how to identify GHS pictograms and take appropriate precautions; a few may need to know how to interpret an SDS or prepare a TREM card. The explanatory notes at the beginning of each activity contain guidelines for deciding which parts of that activity are suitable for a given job.

The handbook also contains a few activities designed for uncommon swm hazards: selection of PPE (and other OHS techniques) for workers who might accidentally come into contact with extremely hazardous chemicals or bio-medical waste, and the management of heat and noise-related hazards in mechanized waste-processing plants.

§ INFORMATION BECOMES USEFUL WHEN IT IS USABLE

Participants should only be provided such information that is *useful* to them, and *only when they are ready* to make use of it, e.g., III① GLOVE-FITTING GUIDE → [117] shows participants how to select a glove that fits properly—this is important information, but it is useless if participants feel that gloves reduce productivity. Information is useful only if the *participants* can recognise its usefulness *at the workshop*. If they believe that safety-gloves hinder their work, then the information about proper fit is irrelevant to the participants' mental model¹⁴ of the problem. They will ignore everything you say about gloves:

¹³ For more information, see II①ⓐ THE JOB AT HAND → [69].

¹⁴ See VIII② MENTAL MODELS → [518].

"Gloves reduce dexterity. I can't work if I wear gloves. So why must I learn how to select a glove?"

The alternative model—when she is ready to use this information—is as follows:

"Gloves reduce dexterity if they do not fit properly. A worker wearing gloves can be as dexterous as a worker who prefers to work without gloves."

Therefore, before initiating the activity in which glove-selection protocols are discussed, the moderator challenges participants to a game of dexterity to establish the validity of the alternative premise. It is for this reason that technical and procedural information is introduced into the workshop only in Module III. A few participants may alter their mental model during Modules I and II to receive this information:

"OK. I agree. Gloves are probably alright, but there are so many other problems. Gloves are itchy, gloves are expensive. And I don't know how to select a glove that fits properly."

You must confirm that participants agree with this statement before you initiate the activity on glove-selection—the handbook will indicate such moments with 🤝 or 🧤. Do participants need to know about segregating bio-medical waste? Do they know how to identify bio-medical waste? Ask them! The handbook contains hundreds of questions that you could ask to provoke a discussion or clarify an argument or evaluate consensus on the problem at hand.

Reducing the distraction of useful (but untimely) information creeping into an activity is done with the DEFER protocol (indicated by **D**). You will find suggestions to DEFER any discussion on subjects that will be taken up later in the workshop. (**D** → III② any questions of choosing proper gloves; **D** → III③ any questions on availability of gloves.) Why is the vital subject of glove-selection not raised earlier during the workshop, during Module I or Module II? The answer is simple: the emotional foundations of the prevalent mental model on OHS must be challenged before OHS can be discussed. Unskilled swm workers often say *I feel shy when I wear PPE*, or *People look at me when I wear gloves. I feel awkward*. These are valid emotional responses to situations that they face; to must be confronted by equally valid subjective arguments, which are the subject of Module II. Participants who hold these beliefs are not ready for new information... Therefore the discussion on glove-selection with unskilled swm workers is put on DEFER till Module III.

II①④ PERSPECTIVE PLAYBACK → [57] and II①⑤ FROM SPECTATOR TO SPECTATOR → [62] are designed to be used as tools, and may be used whenever the solution to the problem at hand depends upon the perspective of the person posing that problem. Assume that a participant (a shift-supervisor at a shopping mall) complains that her workers refuse to wear PPE. She feels that forcing workers to wear PPE (a coercion weighted with the threat of sacking them) is acceptable; if she were an engineer she may have considered technical measures that remove the need for PPE; as an experienced administrator she might realize the need for PPE but may wish to discuss the issue of cost since she is constrained by a budget. Clearly, you must arrive at a solution that satisfies both the shift-supervisor and the workers on *her* shift. Perspective Playback allows you create a dialogue between stakeholders—in this case, the shift-supervisor and the workers—without the awkwardness of hierarchies interfering with the process. Such situations are identified in the handbook.

Some activities consist entirely of one or more exercises or demonstrations on how to solve specific problems, e.g., EXERCISE 7→[152] demonstrates a problem specific to latex gloves—if nobody is curious about the relative merits of nitrile and latex or no one has found that latex gloves sometimes mysteriously begin leaking when sorting kitchen-waste, skip the activity.

Do not attempt to ‘solve’ problems that participants do not face; do not provide information that they cannot or will not use, e.g., if participants work at a compost-production unit but do not use a mechanical shredder, skip III⑦→[305].

§ INFORMATION MUST SOLVE A PROBLEM

Hasiru Dala’s P2P programme differentiates itself by the use of a systematic problem-solving process that was created specifically for SWM workers. All activities, you will notice, begin by posing a common problem faced by SWM workers, and then solving it. The moderator and participants jointly discuss the problem at hand and then formulate a solution that is acceptable to all stakeholders. The handbook contains many examples of such sessions with excerpts of real conversations between a moderator and participants. All workshops must contain one or more problem-solving sessions using the method described briefly below and explained in III⑩ USING THE P2P METHOD→[343]. The choice is yours—you could DEFER all work-related problems to a single problem-solving activity towards the end of the workshop or you could initiate it whenever a participant speaks about a problem. The P2P method was designed to yield pragmatic solutions.

1. UNPACK THE PROBLEM-STATEMENT as described by the participant into three different components—the technical, subjective and motivational components listed earlier→[21]. A participant might describe the problem in a manner that suggests a subjective component might be at work. However, subjective appraisals of a problem might be founded upon incorrect or invalid technical information. This statement holds true for the majority of OHS-related complaints.
2. CREATE A SEPARATE SOLUTION for each of these components.
3. PRESENT AND DISCUSS EACH COMPONENT IN ASCENDING ORDER. Begin with Component 1 and present a technical or procedural solution that is easiest (quickest, least expensive and so on) for the participant to implement. If the participant wants more options proceed to explore solutions that more difficult (slower, more expensive) to implement. Do not explore solutions from Component 2 without exhausting all options in Component 1. Technical and procedural solutions are usually accepted by most participants.
4. SHOW, DON’T TELL. Demonstrate topics that are technical or procedural with the help of volunteers from among the participants. If applicable, always provide a Standard Operating Procedure (SOP) or general protocol for variations of the same problem. The handbook lists an SOP for most common problems.
5. RECURSIVE ITERATION AT THE END OF EACH SOLUTION. Re-evaluate the problem with the participants in the light of the technical solution to check if the problem-statement has changed.

- If participants accept the solution, *stop*.
- If the problem-statement has changed, *go back to STEP 1*.
- Else, one or more subjective components are influencing the participant's decision: *proceed to STEP 6*.

6. PROVOKE DISCUSSION AND INTROSPECTION ON SUBJECTIVE FACTORS among participants only if necessary. Let them debate the issue. Use case-studies, Perspective Playback, and thought-experiments to generate ideas. Use the narrative arc—Laxmi's life as shown in the films—to discuss long-term issues. Return to these issues during the course of the workshop—perhaps the discussion on the costs of injury has changed the participants' opinions about PPE at work? Let participants become Laxmi, or argue with Laxmi or defend Laxmi. Remember that subjective factors are neither negative nor positive. They

are merely the way a person looks at a given situation, e.g., imagine Laxmi talking a young NGO worker about the benefits of wearing a sari: she might be surprised to hear that many young women choose not to wear a sari because they find it difficult to drape it, and to work while wearing it. The *difficulty* is subjective; if a sari was required dress-code at work then the difficulty must be overcome, but how? Firstly the women must learn how to wear a sari quickly and without help. Then she should hear the perspective of other women who choose to wear a sari to work. Perspective Playback is a useful tool in such situations. However, if the woman's mental model—it is *difficult* to wear a sari—is changed by learning how to efficiently wear a sari then Perspective Playback is not required.

7. SUMMARISE AND MOVE ON. If the participant's problem remains rooted in subjective evaluation, do not formulate an SOP or checklist. Do not attempt to change the participant's mind during the workshop—subjective factors are too complex to be addressed during the workshop. Let the participants mull over them at leisure.

8. ADDRESS MOTIVATIONAL COMPONENTS only if necessary and at the end of the discussion using any one of the case studies in III@ USING THE P2P METHOD, [343]. Motivation is like garnish; it can enhance the flavour of a good meal, but cannot be the substitute for a meal. Use motivation sparingly.

The annotated case study that follows describes an inexperienced moderator attempting to solve a problem at a workshop. Read it carefully. The moderator fails to solve the participant's problem even though it appears that a solution was found. The 8-step P2P method is then applied to explain *why* the moderator failed.



Image 7. In Film 1, Laxmi reacts with surprise at the narrator's suggestion that wearing a sari might be difficult for some people.



Image 8. Karthik owns a helmet but doesn't wear it. He uses a mobile phone while riding his motorcycle. He is on his way to a P2P workshop.

THE P2P METHOD

✦ KARTHIK AND HIS HELMET

The following exchange took place at a workshop between a moderator and a young man, called Karthik, on the subject of road-safety:

[P] *[Karthik] I have a helmet. But I feel hot and uncomfortable. I cannot hear properly.*

[M] *A helmet can save your life. Wear a helmet to be safe on the road.*

[P] *OK.*

[M] *Many people wear helmets. The discomfort is temporary. You will get used to it if you wear it every day. Discomfort is better than death.*

[P] *OK.*

[M] *Also, remember that wearing a helmet is required by law. In some cities, the pillion rider too must wear a helmet. The police can fine you ₹500 if they catch you. It is illegal to ride a motorcycle without wearing a helmet.*

[P] *Yes. You are correct.*

[M] *Good. I am happy that you will be safe in the future. Now, does everyone promise to wear PPE?*

[P] *Thank you so much!*

If you have ridden on a motorcycle without a helmet or driven a car without a seat-belt (or given in to temptation and eaten *chaat* or *paani-puri* at a filthy street vendors') you are already familiar with the commonly-held mental model towards OHS and PPE:

"Accidents are rare and I am unlikely to suffer from one."

In the exchange described above, the moderator provides correct and relevant information about safety and PPE: (1) Helmets are mandatory protection required by law, and (2) A motorist wearing a helmet might walk away from a road accident that would be fatal to an unprotected rider. However, even though Karthik agrees with the moderator, it is unlikely that his attitude towards PPE has changed at all. Why? Read the same exchange with sub-text (marked *Unsaid* in the exchange that follows on the next page)—this is how the conversation might sound if one could hear the young man's thoughts. The sub-text reveals that Karthik and the moderator are talking to each other about a problem, but *not the same* problem¹⁵:

[P] *I have a helmet. But I feel hot and uncomfortable. I cannot hear properly.*

[M] *A helmet can save your life. Wear a helmet to be safe on the road.*

[P] *OK. (Unsaid) I know. But you have not solved my problem of discomfort.*

[M] *Many people wear helmets. The discomfort is temporary. You will get used to it if you wear it every day. Discomfort is better than death.*

[P] *OK. (Unsaid) I'm not dead, but I am uncomfortable in a helmet. If I am uncomfortable, I cannot concentrate on the road. Also, I've been riding for 15 years without incident. It is my life. I am willing to take the risk. Solve my problem instead of lecturing me!*

[M] *Wearing a helmet is required by law. In some cities, the pillion rider too must wear a helmet. The police can fine you ₹500 if they catch you.*

[P] *Yes. You are correct. (Unsaid) If! If I am caught, I will pay the fine. Besides, I was caught once and I paid the cop ₹50 to look the other way.*

[M] *Good! I am happy that you will be safe in the future. Now, does everyone promise to wear PPE?*

[P] *Thank you so much! (Unsaid) I can take care of myself. What's for lunch?*

The moderator failed to solve Karthik's problem, but he probably assumed that the problem was solved. Further, he reinforced Karthik's mental model that PPE is uncomfortable, and it might increase the risk of a road-accident. The moderator's failure is analysed in the next section.

¹⁵ You will notice that Laxmi does not speak in the films—her lips do not move, but her thoughts are heard. Vocalising a character's thoughts is an important technique used in the P2P process and is described in II①© PERSPECTIVE PLAYBACK → [57].

§ THE PROBLEM STATEMENT

The first step in the P2P process is to unpack the description of the problem into the three components—technical, subjective, and motivational—explained earlier \rightarrow [21]. Doing so results in the following insights about Karthik's problems with his helmet. Notice that the insights emerge organically in the same order as the components of the P2P curriculum. In P2P, concepts that are easy to explain, understand, or implement are considered more important than abstractions.

KARTHIK'S PROBLEMS ARE DEMONSTRABLE. I can't hear; I feel hot; My hair looks bad. Any solutions to the problem would be demonstrable as well. A good helmet will allow him to hear; it will feel more comfortable. The impact on his hairstyle will also be demonstrable.

IMPORTANT TECHNICAL INFORMATION IS MISSING. Karthik does not know that a well-fitting helmet with adequately engineered components and materials will protect him while allowing safe ingress of sound and fresh air, and egress of humidity. Such a helmet would reduce the severity of the problems described by him. In the case of a helmet (and most PPE), the relationship between comfort, dexterity and safety is neither linear nor constant. Sacrificing a little comfort corresponds to a large improvement in safety; apparent discomfort diminishes over time and in a few months, using the helmet might not feel uncomfortable at all.

Even if Karthik knows that a 'good' helmet is more comfortable than a 'bad' one, he does not have the information to evaluate the quality of the helmet he owns. A checklist for identifying and choosing an appropriate helmet is required in this situation. The checklist will enable him to identify and purchase a suitable helmet.

The moderator does not provide any of the information noted above because he assumes that Karthik prioritises his safety and bought an appropriate helmet to be safe. Consequently, a technical solution that would have been quick and demonstrable becomes a discussion on subjective components, even though it is unclear whether subjective factors were the *primary* reason for Karthik's disinclination towards wearing a helmet.

SUBJECTIVE FACTORS WERE MISINTERPRETED. The moderator assumes that Karthik owned a helmet *to be safe*. The moderator should simply have asked Karthik why he bought a helmet! If safety was the principal concern, then, logically, Karthik must have decided that *not* wearing the helmet was somehow safer than wearing it—which we know is true since Karthik felt that the discomfort was a distraction. The moderator should have discussed this matter. He assumes that Karthik did not spend enough time getting used to wearing a helmet, and offers encouragement and the assurance that the discomfort will decrease. Effectively, the moderator has just told Karthik that the solution is to be uncomfortable for a while longer. Karthik rejects the solution.

Karthik's argument—I *am safe and have remained safe for many years. Why do I need a helmet now*—is incorrect but cannot be disproved without using the tools of probability, which the moderator and participants do not know. (IV②@ THE ACCIDENT \rightarrow [377] contains a simple demonstration to visualise probabilities.)

Karthik's sense of personal responsibility and consequences—I *can handle the cops. In a worst-case, I'll die. So what*—is incorrect but not uncommon in a young man. The moderator does not realise this or chooses to disregard it. This is probably the right

approach especially since it was left unsaid. However, what should the moderator have said if Karthik had, indeed, said that his life and death was his personal concern? Nothing. The moderator cannot be expected to solve such problems and should not try. Karthik's thoughts do suggest an attitude of defiance to authority, which is to be expected in a young person.

AESTHETIC CONSIDERATIONS. Karthik wants to look well-groomed.

RESISTANCE TO AUTHORITY. He is young and dislikes being lectured.

MOTIVATIONAL COMPONENTS ARE NOT EFFECTIVE IN ISOLATION. Polite assurances and bland encouragement will be ignored at best, and can be counter-productive at worst if they are the only solutions offered to the participants.

It is unlikely that Karthik reconsidered his attitude towards PPE even though he voiced his agreement with the moderator's arguments. The moderator failed to appreciate Karthik's perspective of the problem:

- He did not verify his assumptions about Karthik's choices.
- He incorrectly conflated Karthik's understanding of safety in the context of using a helmet, Karthik's attitude towards his safety, and an idealised concept of personal safety. Each must be addressed separately: *how to be safe and comfortable while driving a motorcycle*, *am I safer wearing an uncomfortable helmet if it distracts me*, and *Safety First*, are different problems, and each has a specific problem-statement. The first calls for a technical solution, the second calls for a slight change in attitude after the technical solution is provided, the third is a motivational slogan that only works after Karthik is satisfied with the technical solution. The moderator went straight to Safety First.
- The moderator tried to explain what should have been demonstrated. He should have asked to see the Karthik's helmet. Examining it would eliminate doubts about proper fit and materials. Even if Karthik had not brought his helmet inside the workshop (perhaps he had left it on his motorcycle), the moderator should have asked if someone else had brought a helmet and used that in a demonstration—it is easier to show than to tell. Demonstrable problems have demonstrable solutions. The moderator should have brought different helmets to the workshop to demonstrate the features found on helmets in varying price segments.
- His first suggestion ('you will get used to it') is not a demonstrable solution to the problem, but merely an assurance that the problem will go away on its own if Karthik is willing to suffer the discomfort. His second suggestion ('you will be fined ₹500') is valid (but useless) information, and also acts as an impotent disincentive. If a fine of ₹500 was enough of a deterrent, then Karthik would wear his helmet when he rode his motorbike. Disincentives (and incentives) rarely work in isolation, and should not be proposed when their enforcement is not within the power of the proposer. In this case, the disincentive also shifted the focus of the argument away from Karthik's safety (*how to be safe*) to one of legal compliance (*how to avoid being fined*.)

IN SUMMATION. The moderator was trying to convince Karthik to wear a properly-designed helmet, which Karthik did not have nor know how to select; Karthik had problems with his helmet, which the moderator did not solve. Instead moderator provided

information that Karthik already had; he offered encouragement that was not needed, and ‘solutions’ that required Karthik to accept and respect authority: that of the moderator (which exists only at the workshop) and of the police, a problem which the young man has already ‘solved’. It is not surprising that the moderator failed.

The solution to Karthik’s problem lies in STEP 4 and STEP 5 (mentioned earlier → [30]) of the P2P method. Steps 1, 2 and 3 are common to all solutions and are unique to the P2P thought process. The conversation between the moderator and Karthik shows that the definition of a problem as well as its solution depends upon perspective—who is asking the question and who requires a solution. Therefore, while technical and procedural information is the preferred primary component of all solutions, the P2P methodology gives special priority to the perspective of the target group when defining a problem-statement.

The approach to solving Karthik’s problem is used by P2P moderators all the time, repeatedly, to solve specific problems. This handbook provides the information required to do the job: (a) technical information about OHS, including PPE for a given job (b) guides on how to select appropriate PPE for a given job, how to identify good- and poor-quality PPE before purchasing them, and how to select appropriate PPE given the constraints of costs and workers’ comfort, (c) guides on how to *help* a participant understand and overcome subjective problems without being preachy, and (d) a dash of motivation, and just a tiny bit of cheer that was included to help you help the participants at your workshop.

The P2P method is used in all case-studies in the handbook; read them carefully and try to identify the moments when the moderator switches from one step to the next. Most importantly, you must understand that the P2P method is not an exercise in pedagogics—you do not have to teach participants about it; instead, use it as problem-solving tool to find a practical solution that is acceptable to them.

§ CHANGING ATTITUDES

Participants will arrive expecting to be lectured about PPE—a consequence of their prior experiences of workshops and meetings. The narrative arc of Laxmi’s life will help you re-focus their emotional energy away from you. Your problem-solving sessions will become faster when participants cease to perceive you as someone being paid to bore them.

In the first stage, which should end midway through Module II, participants should realize that you are not lecturing them, and that you do not have any power over them on the matter at hand, i.e., you cannot force them to wear PPE *after* the workshop, and you are not going to coerce, cajole or guilt them into doing so *during* the workshop. They will recognise that you are merely offering them information and options.

In the second stage, participants should agree that the ability to choose is empowering, that while they might not have many options from which to choose, they ought to grasp the opportunity and make an informed choice when they can.

In the third stage, participants will have enough information at hand to understand that *most* of the problems that they associate with PPE are caused by incorrect technical information, procedures and business practices. They will also have enough information to select and use appropriate PPE.

In the final stage, participants should agree that the consequences of their decisions (on the matter of OHS) are theirs to enjoy or regret.

§ ESTABLISHING CONSENSUS

The attainment of each objective in a module is determined by consensus, which in turn is determined by the presence of one or more indicators. These objectives and indicators are both listed on the title page of each module; the objectives of the workshop may be summarised as consensus on the following statements:

1. (On OHS) A person's safety (as a human being, as an employee, as a worker and so on) may be measured differently by others. Objectively, a person's attitude towards their safety is the overriding influence on their decision to adopt or reject OHS.
2. (On OHS) PPE improves safety, but it is an intervention of last resort. There are other more effective and efficient ways to work safely.
3. (On health and nutrition) Health-care costs can wipe out savings within days. The death of an earning member can ruin a family. Staying healthy is an important financial responsibility.
4. (On Social Security and Financial Responsibility) The services of the formal banking and financial industry is available to the poorer sections of society including SWM workers.
5. (On Social Security and Financial Responsibility) An honest appraisal of ones income, expenditures, and savings is required to plan for the future. The details are a matter of simple arithmetic.

§ YOUR JOB AS THE MODERATOR

You must provide the relevant information to answer the many different variations of the following question:

How do I overcome this (physical, technical, financial or attitudinal) problem regarding my health and safety?

The participants have the ability and right to make their own decisions about OHS; your job is to help them make better-informed decisions.

That's it. Good luck!

I. Laxmi wears a sari



Objectives of this module

- Establish that you are not going to lecture the participants; you are not a teacher, and they are not students.
- Establish that the workshop will only proceed from one activity to the next if there is consensus among the participants that the matter at hand has been discussed adequately.
- Introduce Laxmi and her family.

Indicators

- Participants laugh with you and, sometimes, at you.
- Participants are eager to see what Laxmi does next.

Notes

- LAXMI WEARS A SARI serves as the introduction to the workshop. The participants and moderator get to know each other; the style of the workshop and the idea of consensus is established; the structure of the workshop—screening of a film, followed by activities and discussion—is established. Participants are introduced to Laxmi and her life.

Workshop Programme

- ① LAXMI AND HER FRIENDS_{→[41]} should always be the first activity of the workshop.
- If the workshop curriculum is limited to the modules on finance and social security, play *Laxmi wears a sari*, continue with ① LAXMI AND HER FRIENDS_{→[41]}, then initiate V ① BEING LAXMI_{→[415]}.

ACTIVITY 1

Laxmi and her friends

Objectives

- Introduce Laxmi and her family.
- Establish the one strict rule at the workshop—participants may interrupt you at any time, but they may not interrupt others.
- Establish the methodology of referring back to something in the film while a subject is being discussed.
- Participants realise that their perspective as individuals, women and SWM workers is understood by you, the moderator.

Notes

- Do not reveal that Laxmi is an SWM professional. Her identity is revealed in the last activity of the workshop VII② GOODBYE, LAXMI → [503].
- Restrict discussion on this activity to ten minutes or fewer.

Steps

1. Introduce yourself briefly—your name and job-description should suffice.
2. Ask participants about their first impressions of Laxmi and her family. Establish the methodology of referring back to something in the film while a subject is being discussed.
3. Introduce the concept of perspective by collectively defining the words ‘easy’ and ‘difficult.’
4. Introduce the idea of power and consensus as shown in the film—Laxmi is willing to learn, but cannot and will not be forced to learn or do something.

DISCUSSION

Establish Laxmi's character. She is strong, hard-working, intelligent and has strong opinions—just like anyone in the room.

The films are your best friend. Instead of laboriously having to explain a situation, the films allow you to place a participant in Laxmi's shoes, and ask him or her to react. Ask participants to imagine Laxmi working in their workplaces or walking through their neighbourhood. Then place Laxmi in the situation that you want to discuss and ask for opinions on what might happen. Once the method is established, participants will understand the context of the subject being discussed.¹

Do you remember the scene with Kutty and Laxmi? Was she helping Laxmi or just playing the fool? Would she do the same with your boss?

What did you think when Laxmi's husband was looking at her? What was he thinking? Does your house look like Laxmi's house?

Was Laxmi trying to tell the Narrator something? What do you think she wanted to say?

F 1: Who is the Narrator? Does she remind you of anyone? Do you feel that someone like me is the Narrator?² Do you come across people like Mrs. Annoying Voice who are educated and wealthy, but simultaneously crude and insensitive?

Q What should we name the Narrator and Mrs. Annoying Voice?³

§ PRACTICE MAKES PERFECT

After discussing the first two scenes, and after the laughter has diminished to manageable levels, explain the concept of perspective in the context of 'relative difficulty.' There are numerous examples—cooking, public-speaking, knitting, and wearing a sari—similar to one shown in the film wherein relative difficulty is proportional to the amount of effort and practice one has invested to master a skill. What if someone does not want to practice, or cannot practice? Explain this concept.

Relative ease is linked to options and choices. Nobody is born with the ability to cook. A wealthy person can, however, choose not to learn how to cook and hire someone else to cook; a person might like to cook, but might not have the time to cook; a young woman might not like cooking, but she cooks every day because it is expected of her and, consequently, she becomes a good cook. Cooking looks easy for those who have practised cooking or have been cooking every day for a few years—ease (or difficulty) has nothing to do with whether a person wants (or needs) to cook.

¹ You will have to do most of the talking at first. Participants will laugh during the first film and will talk to each other a lot during this activity. Assert your authority as a moderator gradually and gracefully.

² Ask a leading question if necessary—is the Narrator an NGO worker who wants to force people to do something?

³ Refer to Mrs. Annoying Voice and the Narrator by the names given to her by the participants. If the participants identify the Narrator with you, use your own name.

Elicit OPINION on any one or more of these examples and narrow down the field—an excellent opportunity to call out to participants by their names.⁴ How many participants cook at home?⁵ How many of these actually like cooking? How many would choose not to cook if they could? Was cooking easy when they first started?

§ RELATIVE EASE VS. RELATIVE DIFFICULTY

F1: When the Narrator announces that she is going to teach Laxmi to wear a sari as if it is difficult⁶.

Is the Narrator stupid? Is it possible that she might find it difficult to wear a sari?

Explore the Narrator's perspective. Many women nowadays do not know how to wear a sari; the Narrator assumed that Laxmi would not know too. She probably finds it difficult to work while wearing a sari, though she does not mention it.

Assumptions should always be tested. Also, they should be tested again and again as one grows older and wiser. Just because something was difficult ten years ago doesn't mean that it remains difficult forever. Nothing is permanently easy or difficult.


 How many participants know how to make rotis?

There are many women who are considered good cooks, but they are not adept at rolling rotis because their families don't eat rotis. What would you say to a person who claims that making rotis is difficult?


☯ What is the most difficult recipe that you can cook well?

§ MOVING FORWARD WITH CONSENSUS

Even if people disagree with each other, establish that the discussion is fruitful if there is consensus that the subject at hand is important. *We might not agree on whether a sari is easy to wear. Name⁸ finds it easy, Name finds it difficult. Laxmi and most of you think it is easy, but the Narrator thought it was difficult. Can we agree that what is easy for some people may be difficult for others?*

 How many of you think that woman who played the role of Laxmi is a real waste-

4 Use the CLIPBOARD PROTOCOL → [A-20]. From time to time, refer to EP by name: "I noticed that [Name] was nodding in agreement when we were discussing this topic. [Name], do you agree with the conclusion?" and so on.

5  Names of participants who react enthusiastically to this discussion. Return to them during IV ⑤ A BALANCED DIET → [391] when discussing nutrition.

6 Your assistant should begin preparations for II ① towards the end of this activity. He or she should note down potential AP and EP among the participants on the NOTE SHEET → [A-34] or a separate sheet of paper to identify EP, and the topics that interest them. Comments made here about wearing a sari are relevant to the discussion in II ② WHO AM I? WHO IS SHE? → [86].

7 Observe how the participants react. Use examples that are familiar to most participants. Driving is a valid analogy, but a poor choice because participants may not have driven a car. Follow up with questions directed at AP. Call participants by their names.

8 Check your notes for all references to names of participants..



Image 9. (from Film 2) Laxmi rummages through the waste-bin in her kitchen.

worker⁹? How many of you think she is an actress? Or an NGO worker?

☹ Can we all agree that Laxmi is a tough, courageous woman?¹⁰

[Name] and others thought that Laxmi is a waste-worker. [Name] and others thought the Narrator was a bossy person who works for an NGO. Did you notice that Laxmi openly defies the Narrator! It takes courage to stand up for one's beliefs. She thinks to herself, 'I might be poor and not as well read, but if you want my attention, you have to treat me with respect'. Would this happen in real life? The character of Laxmi is clearly that of an SWM professional. Or a waste-worker. But what about the person who plays the role of Laxmi? Think about it. I will tell you the answer at the end of the workshop!

📖 Laxmi does not say anything out loud. Why did the film-makers choose to keep Laxmi silent, but allow her thoughts to be heard?

🔄 Establish that you will only proceed to the next activity now that there is consensus on the matter at hand. Also establish that you will ask the participants to agree or disagree during the workshop and that both are valid responses.

If we all agree that a matter is important and we need to think about it further, we have consensus. Are we ready to proceed to the next activity?

9 📖 Laxmi's profession in real life, according to the participants. Do not reveal Laxmi's identity till the last activity in the workshop.

10 📖 Note down the names of participants who say that Laxmi is a tough woman. Include them in the discussion during II ① LAXMI'S CHALLENGE → [51].

ACTIVITY 1A

PET or kadkadi?

Objective

- Introductory session.

You will need:

- Samples of different kinds of plastics.

Steps:

1. Display the chart of recycling codes (IMAGE 11→[47]). Hold up each sample and ask participants to identify the plastic. Ask participants to call out the name of the plastic in the local vernacular (*phugga*, *kadkadi* and so on). Before they do, ask them to introduce themselves out loud.
2. Ask the participants if there are other names (or terms) for the plastic and the selling price of that kind of plastic.¹
3. Repeat with the other samples. Use different objects made with the same kind of plastic.

Notes

- Keep the conversations brief; try to speak to all participants at least once during this activity.
- NGO employees who interact with workers may also find this game useful. EXERCISE 1→[77] may also be used as an icebreaker for non-technical participants.

Workshop Programme

- This activity may be used as the icebreaker for all workshops, including the ones that only include the finance modules.


1  Note down any unfamiliar terms or names. Use this opportunity to identify AP and EP by name.



Image 10. Workers sorting plastic waste into different bins at a small facility that processes around 500kg of waste every day. A mechanized operation with the same number of workers in the same working area can process 5000kg or more of plastic waste.

DISCUSSION

The participants are the teachers in this activity; you, the moderator, are the learner. It is an opportunity for you to learn about the local scrap market that have their own lexicon, which can vary from one region to another. Objects can be categorised by material, range of materials, as a standard Stock Keeping Unit (SKU) or by their usage. PVC might be called 'plastic' when it is in the form of sheets, but when it is used as plumbing, it might be called 'pipe'; aluminium foil is called 'German' in the Pune scrap markets.

§ SAMPLE QUESTIONS

How often does this plastic show up? Where? Is it easy to segregate? Is micro-segregation necessary? How long does that take? If segregated properly, what is the difference in profit?

Technicians and managers might have information on bulk-processing of plastics; employees at companies that offer event-management services might have information on techniques that are employed on site:

Are aluminised bags or oriented-polypropylene bags¹ segregated from polyethylene bags? Are cups stacked while they are collected to save storage space?

¹ A polyester film made from stretched polyethylene terephthalate (PET), e.g., Mylar®. These may be coated with a thin film of aluminium.

P2P



PLASTICS

RECYCLING CODES

N	ABBR.	CHEMICAL/COMMON NAME	COMMONLY SEEN IN
1	PET(E)	Polyethylene Terephthalate	Water/soft drink bottles, food containers, polyester cloth
2	HDPE	High-density Polyethylene	Milk containers, plastic bags, bottle caps
3	PVC, V	Polyvinyl Chloride	Chairs, bottles for chemicals, plumbing pipes
4	LDPE	Low-density Polyethylene	Shopping bags, buckets, squeeze bottles, plastic tubes
5	PP	Polypropylene	Bumpers, industrial fibers, microwave food containers
6	PS	Polystyrene	Disposable cups, thermocol/styrofoam packaging
7	O	Other plastics	Polycarbonate bottle caps, nylon, acrylic
9	ABS	Acrylonitrile Butadiene Styrene	Cell phones, calculators, most computer-case plastic

CELLS AND BATTERIES

8	LEAD	Lead Acid	Automobile and UPS/inverter batteries
9	ALKALINE	Alkaline	TV remotes, torches (usually AA, AAA size)
10	NiCD	Nickel Cadmium	Some cameras and RC toys
11	NiMH	Nickel metal-hydride	Rechargeable batteries (AA, AAA)
12	Li	Lithium	Mobile phones, coin-cells, cameras
13	SO(Z)	Silver oxide	Coin cells in clocks and watches
14	CZ	Zinc Carbon	Regular (AA, AAA) and similar batteries

GLASS

70	GL	Clear Glass	Jars, transparent bottles
71	GL	Green Glass	Beer bottles
72	GL	Brown Glass	Beer bottles, medicine bottles, wine bottles
73	GL	Dark-sort Glass	Medicine bottles, wine bottles, other dark-brown bottles
74	GL	Light-sort Glass	Light-brown bottles
75	GL	Light leaded Glass	Televisions, some calculators
76	GL	Leaded Glass	Older televisions, ash trays, older beverage holders
77	GL	Copper-mixed/backed Glass	Electronics, LCD displays in clocks and watches
78	GL	Silver-mixed/backed Glass	Mirrors
79	GL	Gold-mixed/backed Glass	Computer glass, glazed crockery

PAPER

ORGANICS/BIOMATTER

METALS

20	PAP	Corrugated cardboard	50	FOR	Wood	40	FE	Iron/steel
21	PAP	Cardboard, non-corrugated	51	FOR	Cork	41	ALU	Aluminium
22	PAP	Paper	60	COT	Cotton			
23	PPB/PBD	Paperboard	61	TEX	Jute			
24	PPB	Paperboard, white cardboard	62-69	TEX	Other textiles			

PAPER COMPOSITES

81	PAP/PET	Paper + Plastic
82		Paper + Fibreboard/Aluminium
83		Paper + Fibreboard/Tinplate
84	C/PAP	Paper + Cardboard/Plastic/Aluminium
87	CSL	Card Stock Laminate, Biodegradable plastic
90	C/LDPE	Plastics + Aluminium
91	C/LDPE	Plastics + Tinplate



ABBR.



ABBR.

(ASTM, 2013 RIC only)

Image 11. Recycling codes of different waste materials that can be recycled.

II. Laxmi makes a choice



Objectives of this module

- Realise that a person's evaluation of the consequences of injury to themselves (irrespective of their usage of PPE) determines their safety at work; that even though other people might have various, valid reasons for urging, forcing, requesting or otherwise promoting the usage of PPE, it is a worker's mental model of workplace hazards that is the most powerful influence on their health and safety.
- Understand the mental model of the participants and their perspective of OHS. Be aware of other mental models about OHS.
- Establish the technique of thinking 'as if' one is observing one's life with the view to change it.
- Know that a person can have various identities; know how these identities influence one's work and other aspects of life. Create a standard 'identity' for Laxmi and establish the visual connection between a professional's equipment and uniform, and her identity.
- Look through the eyes of a process engineer to appreciate the complexity of mundane tasks that appear simple to people in non-technical professions.

Indicators

- Consensus that PPE is an important component of a safe workplace.

Notes

- The number of options available to a person is an indicator of their social and financial power. Wealthy people at one end of the spectrum have many options available to them; the poor at the other end, do not have as many options, opportunities, and resources. Sometimes, however, opportunities are available but are just out of reach. Three changes are needed to make use of these options— (1) Realizing the need for change and identifying new options, (2) the confidence to reach out and grasp them, and (3) the information required to use them. The last change is the subject of module III. The activities in this module prepare the participants to ask themselves if they are ready to reach out and grasp the options that are theirs to take...¹
- In this module participants are asked to compare their appearance as waste-workers to other professionals like firefighters, cricketers, and Bahubali to establish the connection between a professional, her work and the equipment or clothing associated with that work; various non-technical problems with PPE are discussed; finally, participants are asked to vote on the appropriate 'look' of a waste-worker.

¹ The spirit of all the activities in this module is not to challenge the mental models held by the participants, and to make them feel ill-informed; these activities are designed to help participants appreciate other perspectives on OHS. The spirit is similar to that of the famous exhortation "[...]to break the chain and pluck the living flower."

ACTIVITY 1

Laxmi's challenge

Objectives

- Establish the flaws in the prevalent mental model that SWM workers associate with PPE—they face hazards everyday and that a severe injury is an inevitable part of their life.
- Establish that the choice to use PPE is theirs to make as are the consequences of that choice.
- Force participants to put a price on the risks they are willing to take. The amount will be discussed later in module VI, during which participants will be asked to re-evaluate the decision they take during this activity.

Steps

1. Place two garbage bins on the table. One is filled with dry waste, and the other is empty. Explain very clearly what the dry waste contains. Assure participants that there is nothing harmful inside the dry-waste bin.
2. Place one pair each of cotton TYPE GP gloves and medical TYPE WW gloves beside the bins. Do not offer a TYPE DW pair yet. (See TYPE DW GLOVES → [131], TYPE GP GLOVES → [136], STANDARD GLOVE-KIT → [149])
3. Invite volunteers to transfer the contents from one bin to another. Do not ask them to wear gloves. They are free to choose whether or not to wear them.
4. Wear TYPE DW gloves and break a bulb with a stone or a hammer in from of the audience and place the contents inside the bin, then repeat the offer. Again, the participants are free to use the gloves or not.
5. Create options: Take off your TYPE DW gloves and offer these as an option. Would anyone be willing to take up the challenge *without* gloves? Would anyone be willing to do this with TYPE GP gloves but not with TYPE WW gloves?
6. Place a ₹10 note inside the bin: Would anyone take on the challenge without gloves and keep the ₹10 note. How about a ₹50 note?

Notes

- Break the bulb into small and medium shards in front of the participants for maximum effect—the demonstration is safe if you have de-pressurized the bulb before the workshop.¹

1 The process is described here: @y3pwm6t

DISCUSSION

Observe how all participants react to the volunteers' actions during the activity.

AT STEP 3. If anyone chooses not to wear gloves, continue without comment; if someone does decide to wear gloves (or asks if they may), explain to all participants that they are free to choose, unlike in daily life where they might be forced to wear gloves or cannot afford to wear gloves. Explain that waste-workers (and poor people, in general) have very few options in life. Ask participants for examples where they could not do something because they could not afford it. If the first two volunteers do not choose to wear gloves, continue to STEP 4. The first participant may choose to wear one of the gloves, and all the subsequent volunteers copy the choice made by their predecessor. If this happens twice, refer to the discussion about toughness earlier¹, break the bulb and immediately proceed to STEP 5.

[M] *I mentioned that the contents of the bin are safe. I see that you decided to wear gloves nevertheless. That's fine. Now, let us make this challenge precisely like the one Laxmi faced.*

At STEP 5: Raise the stakes. Make the situation similar to that faced by Laxmi in the film. Force volunteers to decide whether they would rather not use gloves (or the wrong kind of gloves) for money. Place ₹10 inside the bin. Do they not risk their limbs every day when they work for money? For dramatic effect, after the glass has been put inside the basket, wet the contents with some water and shake the bin. Doing so will increase the difficulty of the challenge because the water will make some of the waste stick to the bin. Explain with humour that dry waste containers are not always dry!

[M] *Oh No! Mrs. MBA has emptied her coffee into the dry-waste! But she insists that you clean up every last bit of waste.*

At STEP 6: Raise the stakes further. Offer ₹50.

[M] ₹50 is $\frac{1}{4}$ the average daily wage for unskilled workers—you can earn it in 30 seconds. All you have to do is exercise your choice not to wear gloves².

Wait for the offer to sink in. If someone *does* volunteer to stick their hands into a bin full of broken glass, offer them the money right away.

[M] *I can't take the risk that one of you might get injured.*

Be prepared to hand out ₹200 or more! After the vote that follows, discuss the matter of WHO IS RESPONSIBLE FOR SAFETY? → [53]. Call for a vote at the end:

- Would you tell Laxmi to wear gloves regardless of how tough she considers herself to be?
- Who agrees with Laxmi that she is so tough that she does not need gloves?³

1 The names you noted down here → [44].

2 [M] Names of participants who are willing to risk cutting themselves for money. Names of participants who have been seriously injured at work. Refer to these notes during the discussion in IV① INJURY → [369] AND ③ UNDERSTANDING RESISTANCE TO PPE → [92].

3 [AP] who agree that Laxmi is tough. Refer to the observation in V → [415].



Image 12. A sharp object inside the bin injures Laxmi. She knew that the bin contained a broken bottle, three razor-blades, and a bulb but she was injured regardless.

§ WHO IS RESPONSIBLE FOR SAFETY?

☞ Who would be responsible if someone was injured during this activity? Who would be held accountable?

In this workshop, it is my responsibility to ensure your safety. I will have to explain why I allowed someone to injure herself during this workshop. If you cut your hand on the broken bulb you probably cannot work for a day or two. Most of you would go to work with an injured hand. But if you cut your hand in this workshop, I will lose my job. No explanation or excuse would be enough. Even if I told people that you took a risk and cut your hand for ₹50, no one would hire me.

Nobody wants responsibility. The person who takes responsibility for safety is usually the one who has the most to lose. Remember that [Names] took responsibility for their safety.

Many waste-workers only use PPE when they are being supervised or observed. Many of them will enthusiastically endorse PPE simply because they are at your workshop.

F2. Laxmi nods when Bahubali asks her about gloves but is annoyed when the Narrator does so. Is this a matter of perspective? Why does the answer change depending upon who asks the question? Is it possible that Laxmi is reacting ‘appropriately’ depending on the situation? What if Shahrukh asked Laxmi to wear gloves? Do you remember the expression on his face? How would Laxmi respond? Do not be melodramatic when discussing this topic, e.g., *do not* say the following:

Look at poor Shahrukh looking concerned about Laxmi! Think about your children!

Shahrukh does not run to stop his mother. He observes what happens and continues

reading. If Laxmi was determined to prove her toughness, Shahrukh could not have prevented her from doing so, because he has no power over Laxmi's decision. Similarly, Laxmi nods meekly when Bahubali questions her about gloves, but even the almighty Bahubali cannot run around Laxmi all day to check if she wears gloves.

1. What was the purpose of this game? Clarify *your* position before you begin a discussion.

[M] *I wanted to know your attitude towards your own safety. I wanted to know if any of you have a number—a value—in mind when evaluating your safety. Finally, I wanted to test my fears—what if someone was injured during this activity? Imagine my position. At every workshop, I must ask myself to put a value on your safety, and I pay this price. Sometimes I pay ₹100; sometimes I pay ₹500. Today I paid ₹50. I felt that your safety and my reputation are worth more than what I paid. To take responsibility for safety could be seen as taking an ethical stand, but the cost of taking responsibility plays an important role too. What if there were 200 people in this room and all of them had stood up? Would I have paid ₹10000? I don't know, but that is not important because we are not here to discuss my attitude towards safety, or how I value my reputation. I have a low-risk job; you do not. You have to appraise the value of your safety. We will discuss all these matters and learn about safety today. I promise you that this workshop is not a PPE distribution-event!*

2. Why did you use (or not use) the gloves on the table?
3. Why did you choose to use gloves only when there was glass?

Again, clarify your position before you begin a discussion.

[M] *All of us have a threshold for risk. Clearly, some of you already trust me when I said that the contents in the bin were not harmful. It is true. The bin did not contain any dangerous material. Some of you chose to use the gloves, regardless—that is fine too. You are putting your hands into a bin and it is alright to be cautious. As I said earlier, the purpose of the game was to see your attitude towards your safety.*


4. If you didn't know what was in the bin, would you still use gloves?
5. Should our choices be made simply to copy others?


[P] *We know about gloves. Is there anything new you want to teach us?*

[M] *Excellent! But I might have some information that might help you. We will discuss that very soon.⁴*

[P] *Can we use these gloves on the table?*

[M] *If you want to use them you can.⁵*

4  II③.④ Any excuses and reasons for not using gloves.

5  Names of participants who ask to wear gloves. Do not react to their choice to use gloves—react to the instinct to keep their hands safe.

(If someone completes the challenge without using gloves and the next volunteer decides to wear gloves, do not question her choice.)

P *Can I transfer by tilting the contents of one bin into the other and not put in my hands?*

Allow them to do so, but ask them if they have this choice when they collect household waste, especially during doorstep pickup service. Ask the room if there is someone on their daily route who insists that all the contents in the bin must be transferred, including the scraps stuck to the bottom and sides of the bin.

☹ Tilting and shaking the bin is what everyone does but, is it possible cleanly to transfer mixed-waste only by tilting and shaking the bin? Waste-collection workers do, sometimes, need to touch waste, i.e., there are times when they are forced to stick their hands into a bin to remove all its contents. Do you find dry waste stuck to the sides and bottom of a bin because someone threw a half-empty cup of water or coffee in it?

F1 Would Mrs. Annoying Voice insist that Laxmi remove every single bit of waste stuck at the bottom of the bin?

☒ Ask participants to guess while they watch *Laxmi makes a film* which characters are wearing gloves because they want to and which are wearing gloves because their supervisor was watching.





Image 13. G. Sagar at a workshop. A good moderator can appear to speak to individuals even if he or she is addressing the group. The picture was taken at a workshop on theatre for SWM workers.

ACTIVITY 1A

Perspective playback

Objective

- Learn how to analyse a situation or problem-statement from different perspectives.

Notes

- This activity is a tool. It may be initiated when either a problem-statement or a solution (or both) depends entirely upon the perspective of the person who poses the problem. The activity allows participants to become observers of the circumstances that influence the choices that they make. It also allows them to express negative comments about the situation, since they are 'acting' as a character and not speaking for themselves. Examples include the discussions on the cost of PPE in VI② COST, PRICE, AND VALUE → [443], selection of III⑥ SAFETY SHOES AND HELMETS → [293], and VI②④ THE VALUE OF HEALTH → [451].
- Perspective Playback may also be used to help participants appreciate the perspectives of others. For example, NGO administrators (or anyone who works at a desk) can be shown a situation through the eyes of a worker or technician.
- When you initiate Perspective Playback for the first time during a workshop, explain how film-makers employ playback-singing their films using the famous scene in *Padosan* (IMAGE 14 → [58]) as an example. You could play a short clip of the scene from the movie— its usage in a P2P workshop is considered 'fair use'—for younger participants who may not have seen the film¹.
- Ask yourself always if you are merely imposing your mental model on the character.
- The next activity, ①⑥ FROM SPECTATOR TO SPECT-ACTOR → [62], is a variation of Perspective Playback.

Procedure

1. Ask a few volunteers to stand shoulder-to-shoulder facing the other participants in the room.
2. Announce that each volunteer represents a character in a given situation. You are to be a playback artist—you will speak for the character, or voice the character's thoughts.
3. Stand behind each volunteer in turn and speak what each character might say in the given situation, then ask the volunteer to describe the character. You might have to prompt the volunteer with questions when you first play this game; once the process is established, volunteers will be able to describe their characters without help.
4. Ask each volunteer, first, to give her character a name². Then ask her to try to identify the character's profession—a work-floor supervisor, a young NGO worker, a veteran activist, a chemical engineer and so on—after she hears the playback voice. Ask her to describe other characteristics such as age (old, young, middle-aged), income (poor, wealthy, salaried, entrepreneur) and so on. Ask for clarifications if the description is vague or incongruous. Finally, ask the volunteer why her character might think or say what she did.
5. After voicing dialogue for all characters, discuss the different perspectives with all participants³. Begin discussion⁴ by defining the problem at hand from the perspective of each of the characters. Then analyse the character's approach to the solution.
6. Ask volunteers consciously to think 'as if' they are their character—Would their character say what you said? What would they say?

1 The scene may be played from Youtube.

2 Remember these names and re-use them later in other role-plays. You now have a character that has been created by the participants.

3 Do not comment on whether the guess was correct or not. After the volunteer replies, ask the rest of the participants if they agree or disagree with the answer, then move on to the next character. The discussion should begin only after all characters have spoken.

4 Allow the participants to settle down before you begin the discussion.



Image 14. Perspective Playback shows that both the problem statement and its solution depend on the perspective of the viewer. Who is singing in this scene from the movie *Padosan*? Kishore Kumar or Sunil Dutt? Therefore, is it Kishore Kumar who calls the actress (Saira Bano) ‘a lame horse’ or Sunil Dutt? The difference is significant because it allows participants to express feelings through the identity of their characters—the characters in the film do not matter, since they are not real. (Photo: taken from the film.)

MIRROR OR DOORWAY?

Perspective Playback allows you to help a participant see another's point of view or even see a version of themselves in the character they play. Always keep in mind that even after the participants and volunteers correctly identify a character, each person in the room visualizes this character in a different way. The stereotypical ‘bossy supervisor’ is an immediately recognisable character, and each participant visualizes *their* bossy supervisor; when a volunteer describes a generic NGO administrator, some participants might see their own (*pedantic, kind, fussy, naïve, generous, stingy, old, young, flaky*) NGO administrator.

This superimposition of identities allows participants to have a conversation with the character ‘as if’ they were talking to the person they have in mind.¹ However, since the character is universal, they will notice that their peers, i.e., other participants, interact with the character in different ways. Since you are the playback artist, you can decide the pairing of volunteer with a character. The possibilities are endless:

- You could pair all volunteers with the same character and see if their descriptions coincide.
- You could voice a character to resemble the volunteer.
- Since volunteers must name their characters, you could bring characters back from one instance of the game to the next and see if the character is identified.
- You could play Laxmi or one of the other characters in the films. *Bahubali* is a popular choice. The character allows you to voice the perspective of the stereotypical tough guy or big brother.

If the character and volunteer are substantially different, the volunteer will be forced

1 This idea is extended in ①© FROM SPECTATOR TO SPECT-ACTOR → [62]

to abandon her mental model of the situation to create a convincing description of her character. She will have to think of reasons why the character would say what *you* said. That is the objective of this activity. The case study that follows shows a simple example of Perspective Playback. The scene is the sorting room of an e-waste processing plant. The owner of the shop, the floor-supervisor, two workers and a volunteer from a local NGO are the five characters in the scene. Five volunteers are in front of the room. The moderator has explained the rules of the game to them.

✦ DIFFERENT PERSPECTIVES ON SAFETY

The moderator stands behind each volunteer (c1 - c5), in turn, and says the following:

c1. *I cannot sort while wearing gloves but I will lose my job if I don't wear gloves and am caught by the new supervisor. (The volunteer names this character Nalini.)*

c2. *(Named Nirmala) I hope this useless woman wears gloves; otherwise she will cut herself, and I have to find someone to replace her.*

c3. *I hope they are all wearing gloves because there's an inspection today and I will have to bribe the safety inspector if they are not wearing PPE.*

c4. *I want them to wear gloves because I'm running this workshop. People will think I am useless at my job if they don't wear PPE!*

c5. *(Named Pushpa) Last month, I took my gloves off because they were slippery and I got injured. I lost my job and some new boy called Karthik took my place. If I ever get a job, I will always wear gloves...*

c6. *(Named Indira) Please wear gloves and take care of your health. Let me take a photo of you wearing gloves. All right, everyone smile!*

The moderator has a flair for acting! The tough worker sounds reckless; the supervisor sounds exasperated and the workers sound anxious. All the volunteers identified their characters correctly. Did you? Before you continue, try to identify the six characters.

The following discussion ensued:²

Ⓜ *What are the problems faced by Nalini, the first worker³?*

Ⓟ *Nalini cannot sort while wearing gloves. But she has to wear them because she would lose her job if she did not.*

Ⓜ *There seem to be two problems. Firstly, Nalini finds it challenging to sort with gloved hands. Secondly, she is being forced to wear gloves that make her job difficult. Correct?*

² The conversation between the moderator and the participants illustrates the first step of the P2P method—she and the participants are dismantling a problem into its components. While the process is not conscious for the participants, notice that the moderator's responses are directed always to this end.

³ Always refer to the character by the name given to him or her by the volunteer. Write down the name of the character.

[P] Yes.

[M] *Let us analyse the second problem. What would happen if she is unable to sort waste while wearing gloves?*

[P] *She would get less money if she is slow. If she is unable to sort at all, she would lose her job and be replaced. It depends on the owner.*

[M] *Would she be replaced by a worker who can sort while wearing gloves? What you are saying is that in Nalini's workplace, gloves are compulsory.*

[P] *Yes. I would guess that Nalini works in a shopping mall. There you have to wear gloves and you have to work fast. It's tough.*

[M] *So, if she does not wear gloves, she might lose her job. Even if she wears gloves, she might lose her job because she does not work fast enough?*

[P] Yes.

[M] *Ok. Now, what about Pushpa, the second worker. Pushpa is a waste-worker who wants to use gloves. Why do you think she has a different perspective?*

[P] *Because she was injured and lost her job. The supervisor has given her place to a new recruit. But if she gets a new job she will always wear gloves.*

[M] *Are gloves a matter of taste? Nalini hates gloves, Pushpa loves gloves...*

[P] *No. It is not about likes or dislikes. I feel that both Pushpa and Nalini have similar problems and they want a solution to their problems.*

[M] *Ok. So Nalini faces the prospect of losing her job; Pushpa wants to return to her job, which she lost due to injury. And both wish that they could use gloves efficiently. I wonder if Nalini and Pushpa work in the same place, in the same shopping mall?⁴*

👏 How many agree that threatening Nalini to wear gloves against her will is wrong? I don't think it is correct to force someone to do something they don't want to do. Do you agree?⁵

[P] *Nalini will lose her job. She has no other options. If you threaten to fire her she will do anything to keep her job.*

🗳️ How many agree that had Pushpa been forced to wear gloves, she would not have been injured?

4 See ①⑥ FROM SPECTATOR TO SPECT-ACTOR → [62], and VIII① MALL TALES. EP. 2 → [509].

5 Elicit opinions from volunteers who wore gloves during the activity → [56].

M *One cannot change the past. Pushpa doesn't have a job but she wants to use gloves. Her priority is not job-security; she now prioritizes her safety, which leads to job security.*

H Can we all agree that both Nalini and Pushpa have a valid arguments and that each has a genuine problem?

M *The supervisor (Nirmala) promotes safety equipment for workers to avoid the headache of dealing with injuries or replacements. Her priority is job-security too! If too many of her workers were injured, she would have to answer to the management. However, if she had ready replacements, she would not care. This is true, correct⁶? Ironically, Revati might hire Pushpa to replace Nalini.*

M *The company owner (Baburao) promotes safety for legal reasons or to reduce insurance costs, or to prevent workers from getting injured. He is interested in lowering the ratio of cost to benefit, and will do whatever is cheapest. Why should Baburao spend the extra money?*

M *The NGO worker (Indira) might be working a project to promote PPE among her 'target audience'. The project will fail if someone is injured.*

Participants should understand why everyone talks about safety when only a worker needs to use PPE.

M *Of all the characters in the activity, only Pushpa gives priority to her health. She is the only person who wants to use PPE voluntarily. There is nothing wrong with Pushpa's caution It is her choice.*

M *However the central problem is safety and it remains unresolved. The main objective is to keep workers safe. Correct?*

P *Yes. But Nalini and Pushpa had difficulty working with the gloves. This is the same problem we face.*

M *You are right. Slippery, ill-fitting gloves are useless. We will discuss that in about 10 minutes!*

6 **H** Remind participants of this discussion here during VI② COST, PRICE, AND VALUE → [443]. Unskilled workers can be replaced more easily than skilled workers. Knowing how to work with PPE is a skill that professionals need to learn. However, do not enter into these details at this stage, unless the workshop is for administrators and skilled technicians.

ACTIVITY 1B

From Spectator to Spect-actor

Objective

- Participants have the opportunity to speak freely in a situation that, in real-life, would require them to remain silent.

Procedure

- Re-enact a scene from Perspective Playback or one of the films.
- Announce that the game has two rounds. In the first round, the volunteer plays one of the characters in the scene while you play the other.
- Summarise what happened in the scene. Prompt the volunteer with the first line of dialogue *exactly* as spoken in the film. Let her respond to you. A round ends when the volunteer has nothing new to say to the other character.
- Discuss the re-enacted scene with all participants. Invite them to come forward and play the game if they wish.
- After the first round, you and the volunteer must switch roles and re-enact the scene. The volunteer must play both roles 'as if' something better could be said or done in the situation.
- Again, discuss the re-enacted scene with all participants. .

Notes

- Remember that this activity (like the previous one) is a tool and can be initiated whenever required.
- *From Spectator to Spect-actor* should only be initiated when you want participants to speak directly to one of the characters in the film or one of the characters named by the participants during a session of *Perspective Playback*. During Perspective Playback, participants 'hear' a different perspective, and try to understand it; they do not have the option to 'be' the character or say anything because all the dialogue is spoken by you. This activity allows participants to experience what it might feel to 'be' the character. It encourages participants to experience both sides of the argument—if they want to give voice to Laxmi, they must also speak as Mrs. Annoying Voice...
- What would happen, for example, if Pushpa and Karthik (characters that were named during Perspective Playback in the previous activity) were to meet? Karthik has just got a new job, he is comfortable using PPE, and they do not seem to hinder his work. How would he react to Pushpa's situation? Or Pushpa could be put face to face with Nirmala, the supervisor, who sacked her. Nirmala insists that all workers must wear gloves at all times; she also requires them to work fast. Is this fair?



Image 15. Janasanskriti is the world's largest theatre group. They perform Forum Theatre. The image shows a performance of *Sonar Meye* (The Golden Girl) in Calcutta. After the final act, spectators are invited to replace any character and re-enact the scene. They could choose to be the protagonist, or one of the antagonists. *Sonar Meye* has been performed more than 30,000 times. (Photo by: Sanjoy Ganguly, Twitter: @janasanskriti)

INTRODUCTION

Initiate this game only if you know that he or she has something useful or intriguing to add to a scene.¹ Unlike *Perspective Playback*, in which the dialogue is voiced only by the moderator, this game encourages volunteers to improvise, which can quickly turn a serious discussion into stand-up comedy, especially if there are boisterous AP among the participants. Your assistant should always volunteer to be the first spect-actor to show the participants how to play the game.

Two case studies follow. In the first, an AP attempted to solve a problem raised during DIFFERENT PERSPECTIVES ON SAFETY → [59] but did not give the situation much thought. She said *I would tell Bahubali to give me gloves. He is rich. He can afford it, but I cannot.* Her argument can be rephrased into a genuine request for help: *I want gloves.* Read the dialogue carefully and try to understand the participant's motivation for saying what she does; also notice that the moderator's handling of the same scenes is different in this activity—here, he *confronts* the participant and opposes her ideas.

¹ Forum Theatre practitioners will frown upon the surreptitious censorship of the opinions of spect-actors but, unfortunately, a P2P workshop does not have enough time to allow the usage of proper Forum Theatre methods. The Joker in Forum Theatre would never bar anyone from participating since allowing people to experiencing the transformation from a spectator to spect-actor is one of the goals of this art form.

✦ LAXMI VS. BAHUBALI

The scene is Laxmi's house. She has cut her hand while picking through the waste-bin in the second film. Bahubali appears. In the first round, the volunteer played Laxmi. The activity was initiated during a discussion of the cost of gloves while the moderator was showing the STANDARD GLOVE-KIT_→[149]. Again, remember that this activity and Perspective Playback may be initiated at any time during the workshop.

[M] *Pooja (the volunteer's name) said that if she was in Laxmi's place, she would have said something else to Bahubali. Let us see what she has to say. Remember, even though she wants to speak as Laxmi, but she must later speak as Bahubali. I will begin with the first line of dialogue and then Pooja can respond with her dialogue. Pooja, remember that you are playing the roles of Laxmi, I am playing the role of Bahubali. Speak freely! You are not talking to me, Laxmi is talking to Bahubali.*

[M] *What's this Laxmi? You don't need gloves?¹*

[P] *I cannot afford gloves. If you give me gloves I will wear them.*

[M] *I didn't ask if you could afford them. I asked if you need gloves.*

[P] *Yes. I need gloves. But they are too expensive.*

[M] *Ok. What type of gloves do you need and how much do they cost?*

[P] *(She is silent, then she laughs, unsure of what to say.)*

[M] *All right. What if I gave you some money, right now. Can you go out and buy gloves?*

The moderator announces the end of the round. The volunteer laughs and declines to play the role of Bahubali in the second round. The moderator does not press her.

[M] *Please applaud Pooja's effort. It takes courage to come to the front and play the game. Thank you Pooja.*

The moderator announces the end of the round. He summarises the re-enacted scene and opens the floor for discussion. He holds a pair of waxed cotton-canvas TYPE GP gloves.

[M] *Firstly I think Pooja has a point. Gloves cost money. These gloves cost ₹20 in the market if you buy a packet of five pairs. That is a total of ₹100 for gloves that will last you approximately one year. These gloves are not suitable for daily mixed-waste handling and sorting, but are adequate for the task given to you in Laxmi's Challenge. They are also appropriate for general material handling work and for sorting dry garden-waste.*

The moderator takes out a TYPE DW 4343 pair of gloves from his pocket.

¹ Notice that this is the exact line of dialogue in the film.

Ⓜ *These gloves can be used to handle mixed-waste. They cost ₹80 each and will last two or three months of hard use. You might need a third pair of gloves as well. We will discuss all available options soon. For convenience, let us assume that PPE will cost ₹100 every month. The real figure is less, but let us assume that it is ₹100 every month. Some SWM workers cannot afford to spend this amount of money. Even if they can afford it, they might not want to. It is their money and they have a right to decide how to spend it.*

The moderator holds up both pairs of gloves.

Ⓜ *These are both good-quality gloves. But how do you know if they are good-quality?*

The participants do not respond.

Ⓜ *How many of you can identify a good quality sari?*

Almost all participants raise their hands.

Ⓜ *How many of you wear good quality saris to work?*

Ⓟ *(An AP sitting at the back) Sir. If you buy me a Banarsi sari, I will wear it to work.*

Everyone laughs.

Ⓜ *That's a good point. Please come and sit in the front so we can all hear you... A fine sari is the worst sari for sorting waste. But it must be durable or it will tear, it must be easy to wash, it must dry quickly. Correct?*

The participants agree.

Ⓜ *It's the same with gloves. You need to know what characteristics are essential in a working glove for the work you do. Even if I give you money to buy gloves, you wouldn't know what to buy; Sometimes well-meaning organizations distribute PPE that is useless for SWM work... Today will be different. You will learn how to select PPE that is right for your work, which is to say that each of you will have the chance to create a PPE kit that is best suited for your specific job.*

👏 The moderator calls for a vote.

Ⓜ *Can we agree if we want someone else to pay for our gloves, we must know what kinds of gloves we need and how they cost? (All participants agree.)*

The interaction between Bahubali and Laxmi (or the moderator and Pooja) illustrates a simple but necessary condition that must be met when seeking help: when asking for help one should be able to supply essential information about the nature of the help that one requires. Notice that the moderator supplies detailed information but does not urge the participants to use gloves. The next case study contains three interactions between Laxmi and Mrs. Annoying Voice.

✦ LAXMI VS. MRS. ANNOYING VOICE

The scene is the street where Laxmi works. Mrs. Annoying Voice yells at her to clean the street. The participants are semi-skilled SWM workers.

[M] *Laxmi! Useless woman. Why haven't you cleaned the street?*

[P] *Madam, sweeping the street is not my job.*

[M] *Useless woman. Either you clean the street or I'll register a complaint against you.*

[P] *Go and register a complaint. You don't own me. I am not your servant. Tell your stupid dog to go and eat the garbage. That should clean it up.*

The participants cheer loudly. The moderator ends the round and waits for the participants to calm down. He discusses the scene with them.

[M] *Is this response realistic?*

[P] *(Everyone) No.*

[M] *I'm sure some of you might want to hit her a broom. It feels nice to be able to speak sense to Mrs. Annoying Voice, doesn't it?*

[P] *Yes.*

[M] *Let us try the scene again but this time think about a different intervention—perhaps an intervention that might work in real life. Say what is on your mind, but keep it real. And be honest. And let us give Mrs. Annoying Voice a name.*

The moderator plays the role of Mrs. Annoying Voice again. A second volunteer plays Laxmi. The scene remains the same.

[M] *Laxmi! You lazy woman. Have you cleaned the street?*

[P] *Madam, the municipal corporation is supposed to clean the street.*

[M] *I pay your company a lot of money. You had better clean the street in front of the building or I'll call your supervisor and register a complaint against you.*

[P] *Madam. You pay me ₹240 every year to collect your household waste. If I don't collect your waste on time or if I don't do my job neatly, then you have the right to complain. But Madam, you pay the municipal corporation ₹25000 every year as tax. You should raise a complaint with them.*

Again, the participants cheer loudly. The moderator discusses the scene with the participants.

[M] *Was that realistic?*

[P] *Yes. We could never muster the courage to say that but this intervention was more realistic than the previous one.*

[M] *Why was it more realistic?*

[P] *Because I am not making fun of her. I am just standing up to her and not getting scared. If I make fun of her she will be forced to respond.*

[M] *Ok. So you feel that if someone stood up to Mrs. Annoying Voice, she would realize that no one can bully you into doing extra work?*

[M] *Yes.*

[M] *Why don't SWM workers stand up to such people?*

[P] *Some people feel insulted if you stand up to them. We are expected to behave meekly. Also, some people are just [expletive deleted]. It is better to treat them tactfully.*

[M] *Thank you! That was very useful. Anyone else?*

A third volunteer (Sumita) steps forward.

[M] *Laxmi! Useless woman. Watching TV on duty. Is this why I pay you?*

[P] *Wait. That's not the same scene. This scene is from the third movie in which Laxmi makes a film.*

[M] *(Staying in character) First, you watch films on duty, now you have started to make films on duty! Do you think you're Deepika Padukone?.*

Everyone laughs. The moderator announces the end of the round. Once the point is made, stop.

[M] *The objective of this game is to allow you to voice what you would want to say to someone in real life. Be honest. I'm not saying how you should respond or what you should say. You might want to say, "No. I'm going to watch TV. I don't care if you complain." That is fine.*

All of you can decide if the intervention is realistic, or if it might be useful. Or you might agree with her that watching TV while on duty is wrong. There is no right or wrong response in this game, as long as it is honest. The situations are all real. Some of you probably deal with Mrs. Annoying Voice every day; some of you deal with a bossy supervisor every day... Correct?

[P] *Yes.*

■ You can all decide, in your minds, what is right and wrong or who is being unjust or who genuinely cares for your safety. Someone just said that Mrs. Annoying Voice is a [expletive deleted]. I don't have to imagine such a person. I know that they exist; and that you have to deal with them every day. Thank you, Sumita for coming forward! Now let us discuss safety at work...

The moderator ends the activity.

The second intervention is a fine, practical example of a participant responding to a situation *as if* it were possible to reason with an unreasonable, powerful opponent. AP might volunteer to play a character usually because they love attention and have a keen sense of humour. However, this activity has a fair chance of provoking introspection among a small number of participants². Try to initiate Perspective Playback or this activity at least once before you begin Module III.

■ This role-playing game is adapted from Forum Theatre³ in which actors first perform a sketch or play about a political or social problem. Once the play is finished spectators are encouraged to take the place of the protagonist and enact a solution to the problem shown in the play. Spectators may also play the role of the antagonist if they wish. Spectators become *spect-actors*. Instead of observing a situation and, perhaps, imagining how it might be changed, a spect-actor gets the opportunity to experience the weight of the situation and its natural inertia, its resistance to change. Forum Theatre actors improvise this resistance to the Spect-actor's intervention. If the spect-actor playing the protagonist (say, a young woman, just married) says, "Why are you asking me to pay more dowry now? My father has already given you everything he had," the antagonist actor, playing the evil mother-in-law does not sympathise with her. Instead, she might say, "These are hard times. My son has to take care of you for the rest of your life. Surely your father should contribute some more? We are asking for your benefit. Why don't you ask your father before arguing with me?" The opposition faced by the spect-actor (playing the bride) is real, and is never comical or exaggerated. Imagine yourself in this situation, as a spect-actor. Firstly, the act of stepping on to centre-stage indicates that you think the situation is wrong, or that it ought to change. What would you say to the mother-in-law? More importantly, what would you do to ensure that the situation on stage did not occur in your life?

Forum Theatre does not provide solutions. According to its creator Augusto Boal, "[*Forum Theatre*] is not revolutionary; it offers a chance to rehearse for revolution. It stimulates the practice of resistance[...] to make changes in reality." Forum Theatre requires a mediator or facilitator who ensures that is called a Joker, named after the playing card that may assume different roles in different games. This person must remain neutral while ensuring that a spect-actor's intervention is realistic and plausible.

2 One or two participants might speak about it at the end of the workshop during VII(2) GOODBYE, LAXMI → [503], when you ask participants to comment on their experience at the workshop.

3 See @y89oxkap

The job at hand

Objective

- An introduction to P2P techniques.
- An introduction to process thinking—learning to think like an engineer.
- Distinguish between tasks, jobs and processes. Visualize how tasks and jobs change when a process is scaled up or down, and how the role of a professional changes according to the scale of a process.
- An appreciation of the complexity of SWM processes.

Procedure

- Start with an explanation of terms used in process analysis using POTATO CURRY → [70] as a guide.
- Ask the participants to create a Process Flow Diagram of a simple job of RECYCLING SHOES → [77]. They may elect a leader, form teams etc., if they wish. At the end of ten minutes, they must determine if the job can be scaled up into a viable business.
- Skip this activity in workshops with technicians or engineers.

Notes

- The activity may also be used as an ice-breaker with technical participants.
- This activity was designed to help non-technical participants improve their understanding of the various technical aspects of SWM jobs. It serves as an introduction to nomenclature by process engineers and TQM professionals¹, which have been adapted for use with the P2P method. It can be used for NGO workers and private-sector employees (staff at corporate CSR departments and so on) who do not know the various jobs done by SWM workers. It is also useful as a mental exercise for moderators since it teaches how to break down a problem into elementary steps, which can help in formulating a problem-statement.
- Restrict this activity to a maximum of 15 minutes. Assign it as homework if participants are unable to complete the exercise in the allotted time.
- Skip EXERCISE 1 → [77] in workshops with SWM workers.
- ③② WHAT DOES APPROPRIATE MEAN? → [99] is a simplified version of this activity.

1 TQM: Total Quality Management.

PROCESS, JOB, TASK AND STEP

§ DEFINITIONS

- A **STEP** is a basic biomechanical action. Holding, gripping, twisting, pushing, pulling, pressing, and movement (walking, reaching, bending, and so on) are steps.
- A **TASK** is performed by combining or repeating one or more steps. Cutting, tearing, lifting, transporting, screwing, stitching, unscrewing, and welding are all examples of tasks. Muscle-memory is associated with any task that is usually performed by a single worker using a set of tools; some tasks, such as welding, require many years of experience before they can be performed to the highest standards.
- **JOB**s are a series of tasks that may be performed either sequentially or in parallel. Jobs are done by one or more workers. Job-specialists are those workers who are skilled at all the tasks necessary to do a job.
- A **process** is the set of jobs required to produce a commodity or provide a service. In the past, a single worker would perform all the jobs needed to produce a recycled commodity or provide a sorting or recycling service; nowadays, SWM is best described as an industry that involves workers, supervisors, accountants and managers.

These terms (specifically as they are defined above) are used often in this handbook and are not used interchangeably—a **TYPE GP** glove may be recommended for a *job* while a **TYPE DW** glove rated 4343 may be recommended only for a *specific task* of that job.¹ This recommendation allows a worker to spend most of her work-shift wearing a pair of gloves that are inexpensive, comfortable, and safe; she wears a less comfortable, more expensive pair only for a specific hazardous task that requires extra protection. Engineers and trained technicians will be familiar with these definitions—a brief review of them and the **RECYCLING SHOES** → [77] will be sufficient to refresh their memories. You must find a way to explain engineering concepts to non-technical participants without boring them or overwhelming them with jargon. The case study that follows—participant analyse the process of making potato curry—shows how it might be done.

✦ POTATO CURRY

The following conversation takes place at a workshop for NGO workers and explains the terms *step*, *task*, *job*, and *process* with a simple example that should be familiar to most participants. The concepts learnt are then applied to the analysis of a common job done by self-employed SWM workers who sort and sell waste to small scrap shops.

[M] *Let us analyse two jobs. The second job is to dismantle 50 pairs of shoes into different saleable components. Let us put that aside for a moment! The first job is to make potato curry. How many of you know how to make potato curry?*

A volunteer (called Kalpana) steps forward.

[M] *I don't know how to make a potato curry, but let us assume that I have been given the*

¹ What do **TYPE GP** and **TYPE DW** 4343 mean? See III ② EN388 AND OTHER GLOVE STANDARDS → [125].

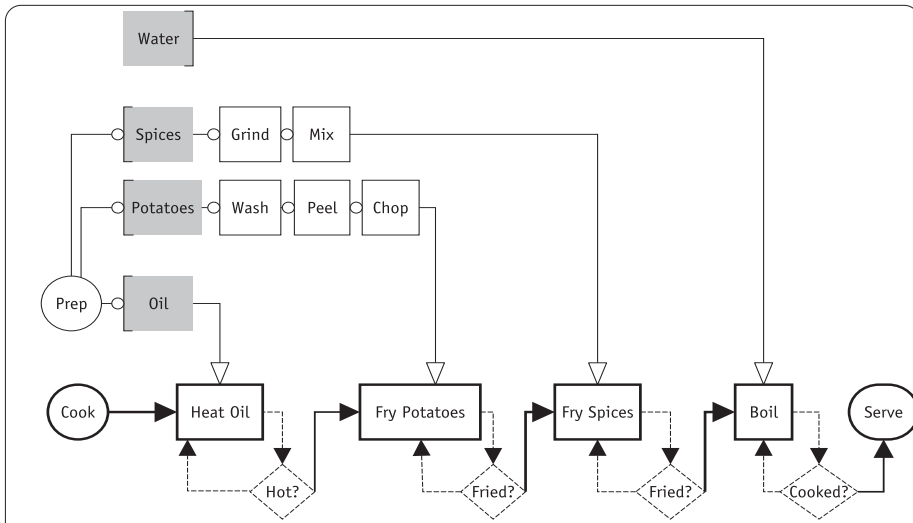


Image 16. A Process Flow Diagram (PFD) that shows the tasks and inputs required for the job of making potato curry. Tasks are displayed in heavy-bordered rectangles, preparatory tasks in light-bordered rectangles; decisions to be made are enclosed within rhombuses, inputs in grey boxes; white arrowheads indicate the transportation and insertion of materials into the job. Compare this with IMAGE 18, which is a partial PFD of a small restaurant.

job. Kalpana knows how to make potato curry. Let us see how she teaches me to do the job. I will ask for instructions at every stage; she has to answer my questions. My training allows me to analyse the instructions I receive from Kalpana and systematise them.

M *My job is to make potato curry. How do we proceed?*

P *We need potatoes, spices, gas-stove, pressure-cooker...*

[An assistant (called Priya) joins the moderator with a bag of ingredients and equipment. She gives the moderator two potatoes.]

M *Now how do we proceed?*

P *First, we wash the potatoes, then we peel them.*

M *Let me ask Priya to wash them. While she does that, let us continue.*

P *First, you have to peel the potatoes, then chop them into small pieces, then we make a gravy with spices[...]*

[The moderator displays a second slide (see IMAGE 16), which shows the procedure to make potato curry.]

M *Is this the proper procedure, more or less?*

P *Yes. It looks fine.*

M *A job consists of specific tasks as you can see in the slide. It has a predefined initial state and a final state. One or more jobs may be combined to create a process. A task is an intermediate procedure. Right now, the task of washing the potatoes is being done by Priya. Some tasks can be done concurrently, while others require the completion of one task before the next can be started. I could wash the potatoes either before preparing the spices or after, but I cannot cut the potatoes before I wash them. Or can I? Is there any reason why I cannot wash them after cutting them?*

P *It is more hygienic to wash the potatoes before cutting them.*

M *Correct. It is easier too. I have to peel the potatoes and I think it would be easier to peel a whole potato.*

[Priya gives the moderator two washed potatoes.]

M *Thank you, Priya. Now we have to peel them?*

P *Yes.*

M *I can't peel them with my hands. So I need a tool. Should I use a knife?*

P *A knife can be used but a potato peeler would be easier and faster.*

 **How many of you use a potato peeler?** [Most participants raise their hands.]

M *I have no doubts that Kalpana has suggested a tool that is more appropriate for this task than a knife. But I have a few questions to ask her. Please raise your hand if you want to comment or ask Kalpana any questions. My questions are: What is the cost of a good-quality peeling-tool? What about a reasonably-good quality tool? How do I select a tool if I don't know anything about it?*

[Kalpana and the participants offer several suggestions, all of which are valid. Priya notes down the suggestions. Then, the moderator displays a slide, which shows four different types of peeling tools.]

M *I went to the market and found these peeling tools. Which of these is best?*

[Kalpana points at one.]

P *That's the one I use. It has a good-quality blade and can also be used to peel carrots and other vegetables.*

M *Is that best peeler for me? I have a knife at home and know how to use it*

P *I don't know. You should try it and check. Let's try all of them. I would like to use them to find out. And since I have the opportunity to interact with Kalpana, who is an expert, she can show me.*

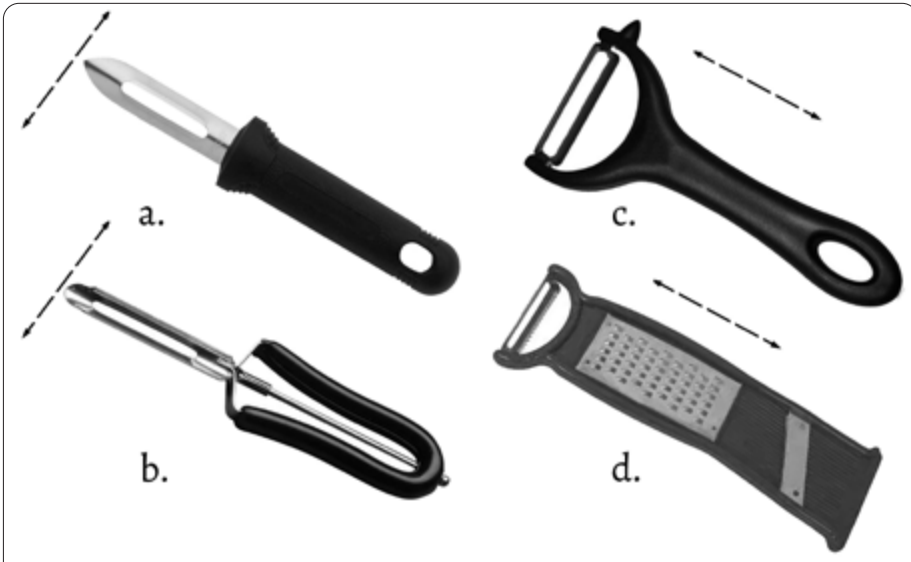


Image 17. Four types of peeling tools. The cutting motion of the tools are shown by the arrows. (a) is a traditional peeling tool, with a fixed cutting edge. The peeling motion is controlled by the wrist and may be supported by the thumb. (b) A modern variant of this tool has a blade that can swivel. The arm moves at the elbow while using (c) and (d). Muscle-memory acquired by regular use of the tools on the left cannot be applied to use the tools on the right and vice-versa. All four variants have two cutting edges. However, only one cutting edge of the tools (c) and (d) can be used efficiently. Tool (d) is useless to a professional who uses disposable polyethylene gloves.

[Sumita gives the moderator four peeling tools. The moderator has arrived well-prepared for this activity!]

☐ *Now I'll ask Kalpana to demonstrate how to peel a potato. Then, she can observe me use each of these peeling tools and can help me decide which is the best peeler for me.*

[Sumita gives them both a potato each to peel.] The moderator tries to peel his potato but is quite hopeless; Kalpana peels the potato easily with her tool of choice. After a few minutes, the participants reach the following conclusions:

- i. The task of peeling a potato consists of these steps: hold the potato with the non-dominant hand, hold the cutting edge of the tool against the potato, pull the edge gently against the skin to peel it, rotate the potato (with the non-dominant hand) to expose unpeeled skin, and peel again. These steps are repeated until the potato is peeled. Some steps require practice and efficiency at the tasks depends largely on muscle-memory:
 - The tool's cutting edge must be held at a proper angle against the potato. The cutting edge on some tools can swivel in response to the contours of the potato while other tools have fixed heads.
 - Adequate pressure must be applied to the tool while pulling the edge against the skin. The appropriate amount of pressure depends on the sharpness of the edge and whether or not it is serrated. Clearly, it also depends on the physical properties of the potato, which is, however, a common variable.
 - The peeling movement requires the tool to be moved back and forth using either

the wrist, the elbow or both as the fulcrum. Using the wrist is marginally faster but can be tiring and is not a suitable technique for peeling large quantities of potatoes. Keeping the wrist locked while moving the arm is marginally slower but allows a worker to peel larger quantities without fatigue and without risking repetitive stress injury to the tendons in the carpal tunnel.

- Some tools have thin stems, which can be held in a fist-grip; some have wide stems which must be held between the fingers.
2. Learning to use a peeling tool efficiently takes time.
 3. The moderator can work faster if he uses a knife. The process is quick but wasteful. It is hazardous too since knife-slips can result in injury.
 4. Kalpana can peel fast and efficiently with the tool that she uses at home but is slower when she uses a different peeling tool. Her efficiency with a new tool is low, even though she is an experienced cook.

[M] *There will be no potato curry for lunch today! Let us concentrate only on the task we are doing right now in the context of work-safety and PPE, which is the subject we are here to discuss. I want to clarify four important aspects of the P2P method that you should keep in mind.*

[M] *Firstly. The 'most appropriate' tool for a job is the one that the worker decides to use after obtaining all the information necessary to make that decision.*

I should be using a peeling tool, but which one? Kalpana found that her efficiency at the task was highest when using a familiar peeling tool, which may or may not be the most efficient or safest. I would venture that if Kalpana habitually used a knife to peel vegetables, her efficiency with a knife would have been adequate for the task at hand². The P2P method has a standardised process of recommending a tool for a job. We will discuss the method later. However, we must also acknowledge that a worker has valid reasons for using a tool that might not be the safest or the most efficient.

[M] *Secondly. A P2P moderator should, whenever possible, give information that is specific to a worker; then, by discussing the recommendation with other participants, he or she should find ways so that the other participants may use this information. There are only 40 participants at a P2P workshop and there is enough time to solve specific problems.*

The process of finding these solutions is not wasted because it is participatory. We just spent around ten minutes analysing the advantages and disadvantages of various peeling tools. In doing so we have realised that selecting a tool is not a trivial task. The next time you need to recommend a tool, you will take the time to pause, think about the task being performed, and search for available options before making a choice. You don't have to know everything about the task to do so — remember that the worker in front of you does this task for a living. I didn't know how to peel a potato properly before Kalpana showed me. You merely need to learn how to ask the right questions. Learning how to ask insightful questions instead of merely providing generalized answers is one of the abilities that we will learn over the course of this workshop.

² The use of a QWERTY keyboard is another example.

■ Thirdly. A professional is part of a complex system of processes, machines, and people working together to make a profit or earn a living. Work-safety must always be discussed in the context of a task (or job) being performed as part of a process in a given workplace.

The white circles and arrows in the PFD (see Image 16→[71]) indicate a transfer of material (potatoes in this case) from one task to another. A domestic kitchen has three workstations — a washing area, a preparation area for cutting, peeling and so on, and a cooking area — all of which are located within a meter of each other. The material being transported can be carried by a single person who also performs all the tasks within a few minutes of each other.

A small restaurant (see Image 18→[76]) with five workstations and a staff of nine does the same job differently. It has the equipment and staff to make potato curry for a hundred people at once. Study the image carefully.

■ It may be easier to remove a hazard or substitute it with a safer alternative than to create protocols and tools to handle it safely.

Restaurants do not peel potatoes. They use fresh (or ‘new’ or ‘young’) potatoes, which have thin skins that are palatable. Fancy restaurants will cheekily serve unpeeled potatoes as a premium ‘healthy’ option because potato-skins contain several essential nutrients. Regular restaurants boil potatoes before processing them, which makes peeling the skin faster and safer. Indeed, boiled potatoes (like boiled rice and daal) are considered staple ingredients and are usually prepared (see Image 18) before the restaurant begins a meal service.

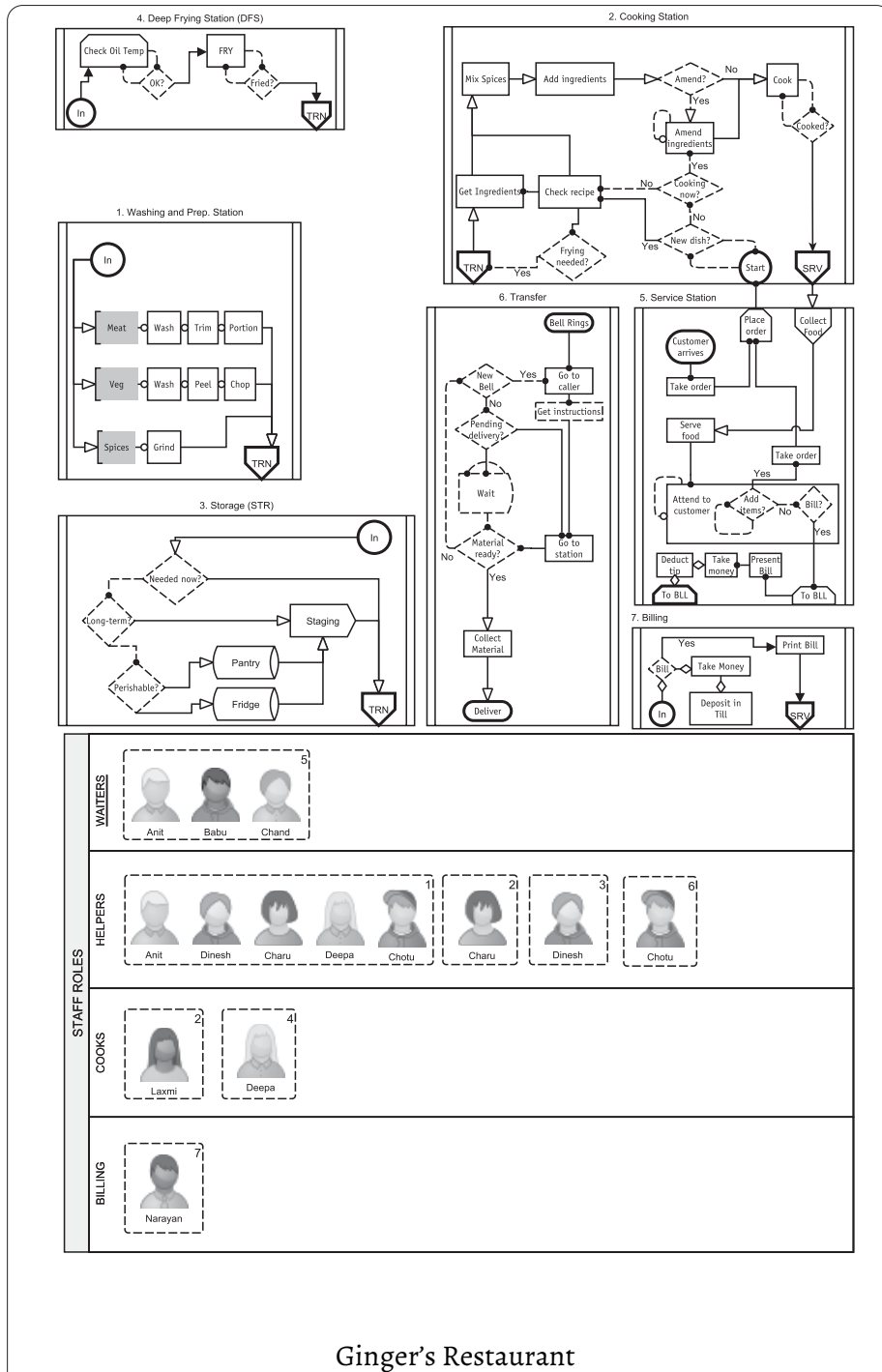
If a dish may be cooked with unpeeled potatoes (or any vegetable), the appropriate recommendation is “Don’t peel.” The recommendation to remove the task of peeling is in agreement with the first stage of the Hierarchy of Controls.

If the taste or texture of the peel is unacceptable, the Hierarchy of Controls suggests substitution. The recommendation becomes, ‘Boil the potatoes first, then peel them.’ Indeed, the process of boiling followed by rapid cooling allows potatoes to be peeled in a single motion! Restaurants, of course, use new (or boiled) potatoes to reduce costs and not to improve work-safety.

The modern work-safety philosophy called Prevention through Design (ptd) is built upon concepts mentioned in the previous conversation between the moderator and the volunteer. Also see the following for real-world examples of these concepts in practice:

In MALL TALES EPI: ANITA HAS A PROBLEM→[189] the moderator breaks down the the job of cleaning restrooms at a mall into its component tasks which clarifies the problem and helps her devise a solution.

In VIII① MALL TALES. EP. 2→[509], an experienced worker tries to help her young colleague do his job more efficiently. She does not know the jargon of systems engineers, but she uses the same techniques that a process engineer would.



Ginger's Restaurant

Image 18. The tasks for the job of making potato-curry in home-kitchen are now parts different jobs, done by different workers at five different workstations in a restaurant. A PFD (even a partial PFD, such as this one) makes it abundantly clear why the P2P method uses the job at hand (instead of a task or a process) as its fundamental unit—to recommend tools, equipment and protocol for a task would be impractical, to do so for a process would be lazy.

EXERCISE 1: RECYCLING SHOES

Create a Process Flow Diagram (PFD) for the job of recycling leather shoes. Participants are to identify its component tasks, identify which tools and PPE are required for these tasks, identify ways to improve a worker's efficiency, perform a quick cost-benefit analysis of the job and determine if it can be profitably integrated into a large SWM operation. Use spreadsheet software to analyse numerical data and equations. The list that follows will help to create a plan of action. At each stage, note down the information required to make an informed decision:

1. Begin with an examination of a pair of leather shoes or sandals and identify the components that could be recycled and those that cannot be recycled. What is the percentage by weight of the recycled components?
2. Determine how the shoe is held together. Is the sole glued, stitched or nailed to the upper? How can the sole be separated from the upper? What tools could be useful to perform the task?
3. Identify potential improvements to the ergonomics of each task, e.g., should the worker sit or stand for the job? Should she use a table? Should she use a work-holding jig? Does she need an anvil?
4. Identify potential hazards associated with each task, e.g, if she uses a blade to cut the stitches that hold the upper to the sole, does she need PPE? Do nuisance cuts increase the risk of infection?
5. Determine the sale price of recycled components. Determine the minimum quantity of each component that a scrap shop will buy—called a Stock-Keeping Unit (SKU)—and the number of shoes that she would have to dismantle to collect one SKU of each component.
6. Determine the amount of time taken to dismantle enough shoes to collect this at least one SKU of the most profitable component. Do certain kinds of shoes yield greater quantities of profitable components?
7. Analyse the costs for one business cycle, i.e., collection, processing and sale of one SKU taking into account the cost of storage, transportation, and any capital investment in specialist tools that cannot be used for other jobs.
8. How many shoes would the worker have to process in a day to make the job profitable? Can recycling shoes be profitable for self-employed SWM workers?

While Rekha Khandagale (shown in IMAGE 19) might not be able to explain the job in the manner described above, she could provide you with a ballpark estimate of Item 8 within a few seconds! You have 10 minutes to complete this exercise.



Image 19. Rekha Khandagale dismantles a shoe into its saleable components: leather, pvc and rubber soles, laces, nails and eyelets. She earns more if she separates these components before selling them to a scrap shop. She does not use tools or PPE for the job.

ACTIVITY 1D

*The Hierarchy of Hazard Control**Objective*

- Know how the Hierarchy Of Hazard Control (HOHC) is used.

Procedure

- Start with an explanation of term *control*.
- Give examples of a control from each tier in the HOHC using the example of the restaurant in ①④.
- Begin EXERCISE 2 → [82].

Notes

- Restrict this activity to a maximum of 10 minutes. Assign the exercise as homework if time is short.

WHAT IS A CONTROL?

The word *control* in this context is engineering jargon that means *a limit or a method to regulate the variations of a variable*. The variable in this case is the hazard. The relationship between hazard, exposure, and risk may be expressed as follows:

$$\text{Hazard} \times \text{Exposure} = \text{Risk}$$

Eliminating or substituting the hazard turns the risk to zero, or close to zero. Engineering controls are focused on isolating the worker from the hazard. Workers are at risk if the control fails or is disabled or circumvented. Administrative controls, such as warning signs and training programmes are subtle—these try to influence a worker's behaviour to reduce their exposure to a hazard, but depend on workers to adopt these controls. If a worker ignores a warning sign then the control fails.

§ WHY IS PPE THE LEAST EFFECTIVE CONTROL?

PPE is the least effect control because it depends on a number of additional variables:

Exposure \propto (the probability of) appropriate PPE being used & PPE is used correctly & PPE is used all the time in hazardous situations & workers can identify failure indicators of PPE & PPE does not reduce productivity.

\propto means *directly proportional to*. In the equation above, we see that if *any* of the variables is true, i.e., becomes 1, then exposure becomes inevitable. Also exposure is difficult to determined in advance when PPE is used as a control. In real terms it cannot be determined at all—a worker might take off her mask, she might continue to use gloves that have developed a leak, she might be forced to remove her gloves because she cannot grip a wet tool and so on. Laypersons do not have an intuitive understanding of this equation because they have never worked in a hazardous environment. OHS professionals know all too well that PPE is the worst control to implement with unskilled workers. How can risk be reduced?

Eliminating the hazard is usually the cheapest solution. In the case of the restaurant dealing with knife injuries from potato-peeling, the hazard associated with the tool used to peel potatoes—eliminating the need to peel potatoes removes the hazard. And, not surprisingly, it turns out to be the cheapest solution to buy potatoes that have thin, edible, tasty skins and simply serve them with the skins. Alternative approaches might work at a large scale too—if thick-skinned potatoes are cheap enough, a restaurant may simply outsource the peeling job to a third-party and let *them* solve the problem. You must realise that OHS concerns must fit into a business process, and sometimes it is cheaper to outsource hazardous work to specialists instead of building in-house skills to do so. Remember that the potato is not the hazard; the peeling tool is the hazard. If elimination is not a viable option, move down one level in the pyramid. Substitution with a safer tool (a blunt, curved scraper or knife) is possible if the potatoes are boiled before they are peeled. Is this possible? Yes. It is feasible if the restaurant is ready to remove such dishes

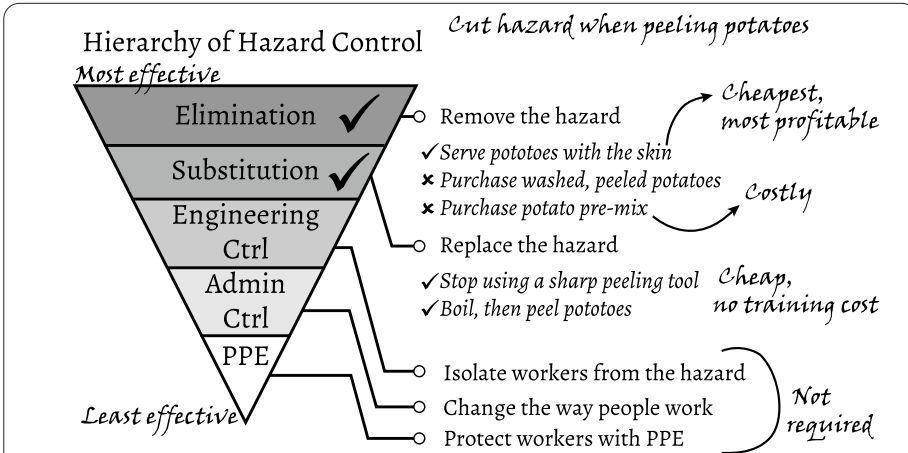


Image 20. Slide 1. The Hierarchy of Hazard Control applied to the task of peeling potatoes.

from the menu that require peeled raw potatoes like chips (or french fries). Everything else can be made with boiled potatoes. There is no need to consider the rest of the HONC.

§ COST TO COMPANY

Compromising a worker's safety beyond a minimal, pre-determined acceptable risk is associated with severe financial risks, especially in developed nations—even massive multinational companies can face expensive lawsuits¹ if they are found to be wilfully exposing their workers or the natural environment to hazards that are (a) known to exist on their workforce, (b) known to be beyond prescribed limits. and most importantly, (c) PPE is known to be ineffective especially when used by workers without suitable and repeated training. In developed countries the company can be held financially responsible if its workers are injured.

We gave them gloves is not an excuse. The company must ensure that workers are trained to use PPE and are retrained periodically. Even then, workers make mistakes.

The cheapest and most effective solution was to outsource the hazardous jobs. The e-waste industry exists in India, China and other countries simply because developed nations cannot *afford* to process this waste *safely*. In the OHS business, the cost to implement a suitable control determines which control is adopted by a company. The cost-to-company in the case of the restaurant is as follows:

- Elimination incurs no upfront costs. The restaurant might lose some revenue if customers do not like the taste of unpeeled potatoes. Some restaurants, though, make a profit from unpeeled potatoes by promoting the healthiness of a dish *filled with all-natural nutrients and minerals*.
- Substitution does not add any costs either. Potatoes are usually boiled anyway. Some dishes would have to be removed since they cannot be made with boiled potatoes.

¹ Companies that have violated safety and environmental regulations and have been taken to court. A waste-collection company in the UK was fined £1million and costs in 2019 after an employee was killed by a reversing lorry on site. See @2ftu4rd for a list of OHS related court verdict from the UK in 2019.

Again, this leads only to a notional loss of revenue.

- The last three options—engineering controls, administrative controls, and PPE—will be more expensive and less effective, e.g., a potato-peeling machine would involve a huge capital investment as well as space and the need to train workers to use the machine. Administrative controls, such as a training programme for workers to learn safe-peeling techniques would be expensive, and will require expensive, periodic refresher courses.
- Finally, issuing cut-resistant gloves to workers is costly. Further PPE would simply fail as a means to mitigate the hazard. Working out the reasons is left to you as an exercise.

Always remember that OHS interventions must be financially viable to the business—whether it is a large company with 2000 workers or a one-person operation. Always discuss the budget that is available to them. “As cheap as possible” is the most common answer! Managers and administrators at SWM companies usually work to a pre-determined budget and you should know that OHS is not a high-priority item on it.

EXERCISE 2: APPLYING THE HOHC

Objective

- A basic understanding of the HOHC and the approach taken at each tier in the context of a worker’s behaviour.
- Know the different kinds of controls and their relative strengths and weaknesses.
- Know which control to apply under given constraints.

Steps

1. Display SLIDE 1 and quickly explain the meaning of *control*.
2. Display SLIDE 2 and discuss the following:
 - What are the hazards in this work-station? Display SLIDE 3.
 - How can each control-tier in the HOHC be applied to remove the hazard?
 - Display SLIDE 4, which shows engineering and administrative controls used to improve safety while working with wood-chippers and shredders as well as appropriate PPE for the job. Discuss how these controls reduce exposure to the hazard.
 - Which of these controls is the best in terms of cost-to-company? Why?
3. Divide the participants into groups of four or five and give each group a worksheet for this exercise. (See APPENDIX 6: WORKSHEETS → [A-63].)
4. Display SLIDE 5, which shows a worker loading crates into a lorry. Ask the groups to apply the HOHC to solve the problem shown in the workplace. Give participants five minutes to fill in the worksheet.
5. Discuss their results.

Notes

- Do not go into great detail about the solution (shown in SLIDE 5). The objective is to explain the different *approach* taken by each tier in the HOHC and the influence of worker-error on the solution. Elimination and substitution do not depend on a worker’s behaviour to be successful; the success of PPE as a control depends largely on a worker’s behaviour and involves several variable that are difficult to predict.
- If participants do not work with wood-chipper, explain the hazards of the job before they begin the exercise.
- See @2p8uaad for the OSHA guide on wood-chipper safety.

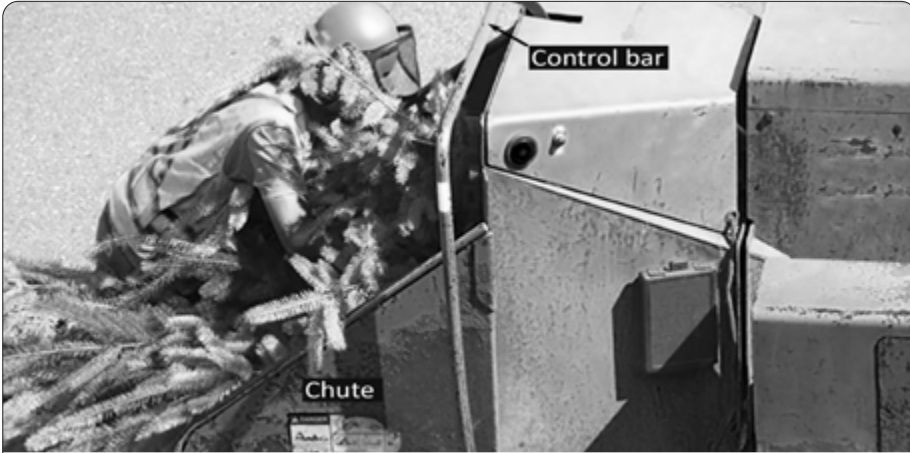


Image 21. Slide 2. A worker leans into a wood-chipper to clear a blockage. Has she turned off the in-feed? The feed control bar at the top is pulled out, which is the 'feed' position! The bar is pushed to the centre to stop the feed, and all the way in to reverse the feed. Ask participants if they can tell if the machine is turned off. Also ask them if the hazard does not exist because the worker can easily turn the in-feed off.

§ DISCUSSION

Describe the hazard at the workplace shown in Slide 2.

The obvious hazard is getting ones hands trapped in the in-feed of the machine. The machine gets jammed quite often and these must be manually cleared. Obviously one would imagine that the worker would turn the machine off before sticking her hands into the machine. Obviously, they do not do this all the time. Other hazards are splinters, excessive noise, and dust.

👏 How many of you have seen people eat without first washing their hands?

Such people are betting that they will not contract a water-borne disease and, if they do, they feel that it will not cause too much trouble — at least not as much as delaying lunch by a minute so as to wash their hands. People make mistakes all the time; people ignore their instincts and common-sense all the time. Such behaviour is the reason why PPE is the least effective control. We must accept it, and find ways to keep workers safe.

In the case of this job, can the in-feed hazard be eliminated or substituted? Yes. The job could be done manually with a hatchet, or a hand-cranked rotary shredder. However, it would take ten times longer to complete. If the amount of time (and energy spent by the worker) is not a problem, then this hazard can be eliminated by substitution. Of course new hazards are introduced by the use of a hatchet and those must be addressed too... But what if the job needs to be done quickly? We must search lower down in the HOHC to find a suitable solution.

(Slide 3) Engineering controls seek to isolate the worker from the hazard. Look carefully at the slide. The worker must lean into the machine to be exposed to the hazard. If the chute — the box-like tray into which wood is loaded and fed — were made longer,

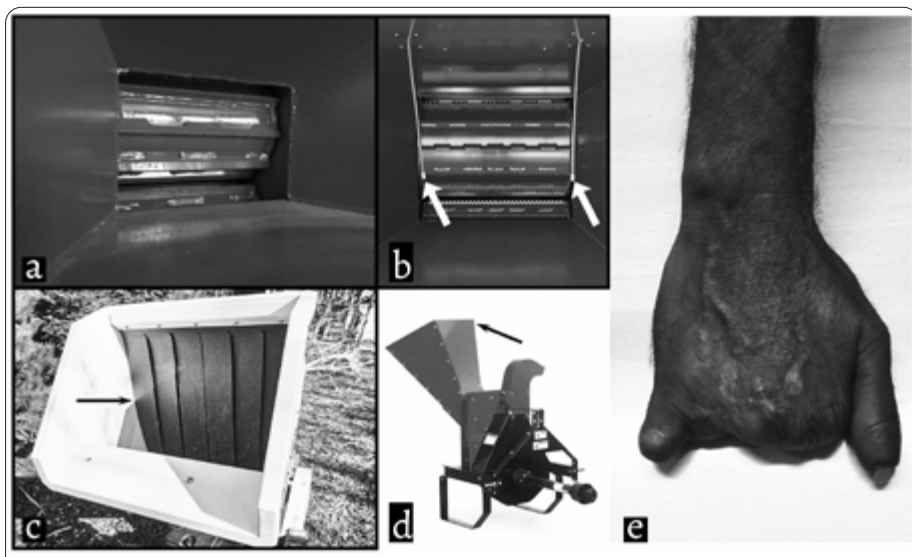


Image 22. Slide 3. (a) In-feed mechanism of a wood-chipper. (b) tugging the “panic cords” dangling just in front of the in-feed will stop the in-feed mechanism. Discuss if panic cords are a viable solution or a solution at all. (c) Rubber flaps cover the chute and obstruct access to the in-feed. These also protect the worker from splinters. (d) A wood-chipper with a raised chute forces the worker to turn the machine off before accessing the in-feed. (e) A moment’s distraction caused by a splinter can lead to this.

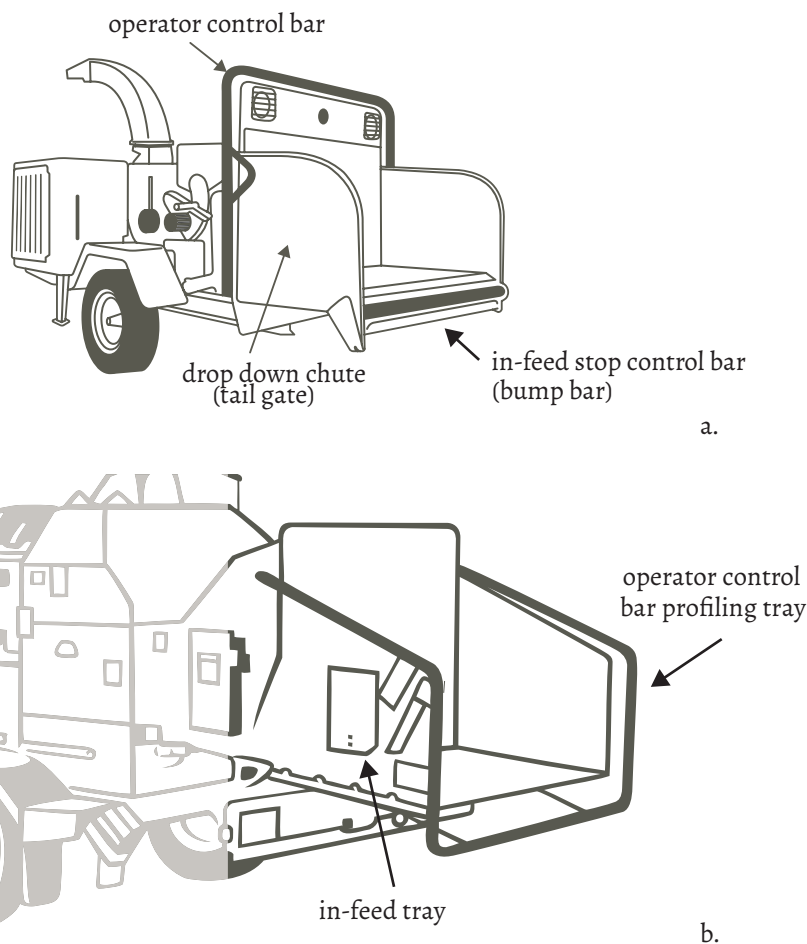
or raised above waist-height, then the worker would, effectively, be isolated from the hazard. She would have to use a wooden push-stick to guide garden waste into the in-feed. If the in-feed was jammed she would be forced to turn the machine off before she climbs in (or detaches the chute) to clear the jam. These solutions would slow down the job but would keep the worker safe.

(Slide 4) A bump-bar may be installed if possible. It will automatically stop the in-feed if a worker leaned against it by accident or if she was reaching inside the feed chute.

Engineering controls, in the case, are enough to isolate the hazard of the in-feed, but other hazards remain. These cannot be solved without PPE. Workers require puncture-resistant gloves to protect them from splinters, ear-protection from the noise, and eye protection from splinters and dust, and a suitable respirator.

- ☹ Which controls would work at your company?
- ☹ Compare the cost-benefit of engineering controls vs. training workers and using administrative controls? What challenges will you face while implementing administrative controls with unskilled workers or workers who cannot read English?

Distribute the worksheets and display Slide 5. After the participants have completed their worksheets, verify if the information is correct.



Engineering Controls

Figure a. A bump-bar that stop the in-feed as soon as it is pushed (which would happen if the operator leans in to clear a blockage.)

Figure b. Repositioned operator control bar so that it is easily accessible if the operator wants to clear a blockage. (Notice the position of the control bar in Figure a. vs Figure b.)

Administrative Controls

Develop a safe work procedure, based on manufacturer recommendations that cover:

1. Stopping the in-feed rollers before removing any debris or blockage
 2. Using appropriate non-metallic items, such as push sticks, or branches, to remove blockages
 3. Prohibiting climbing onto or standing on the in-feed chute
- branches being fed butt-end first to further minimise the risk of snagging

PPE and clothing

Ensure clothing is a firm fit or overalls are worn above clothes.

Gloves should be single-stitched so they can tear away if they become snagged.

Eye protection and hearing protection must be worn.

Image 23. Suitable engineering controls, administrative controls and PPE for the job. (Diagrams from Worksafe, New Zealand.)

ACTIVITY 2

Who am I? Who is she?

Objective

- Establish the link between a professional and her appearance. Establish that the use of *appropriate* equipment and tools differentiate a person from a professional.
- Create a broad consensus on what a waste-worker should wear to be immediately recognized as a professional.
- An introduction for non-technical participants to the social aspects of SWM.

Steps

1. Display [S]1 to [S]5 and invite comments on each slide in order. Use 🗨️ if needed.
2. After [S]1 to [S]5 have been displayed, discuss the difference between *being* a professional and *being perceived* as a professional.
3. Invite comments on [S]6. Which of the images accurately represents Bahubali?
4. Invite comments on [S]7. Specifically, discuss why an unkempt person is not associated with a ‘profession’; also discuss why an unkempt person may be immediately associated with a caste or her livelihood as a ‘rag-picker.’
5. → 🗨️ Before you move on to the next activity.

Slides

- [S]1: A municipal waste-worker from a western country
- [S]2: Laxmi
- [S]3: A cricketer in regular clothes
- [S]4: The same cricketer in cricket dress
- [S]5: A fire-fighter
- [S]6: Bahubali in armour, Bahubali in lungi and mask, and Chandu.
- [S]7: Indian woman, unkempt, wearing dirty clothes
- [S]8 and [S]9: Japanese sanitation workers

Notes

- Your assistant should handle the projector during this activity, leaving you free to continue talking without interruptions.
- Perception of waste-workers as thieves and beggars has nothing to do with the work that they do, which is merely collecting and processing waste. This activity allows you to explore scholarly aspects of the subject of identity with the participants. Social activists might wish to discuss, say, how SWM workers in different parts of India identify themselves.



Image 24. Slide 7. A woman and her child. Who is this woman? Is she a beggar? Is she an SWM worker?

DISCUSSION

When you look at a person, you make decisions based on what you see. This is true when others look at you as well. When people see a person dressed a certain way, say in a uniform, they make assumptions about the person wearing that uniform. A uniform is any dress and equipment (or accessories) associated with a profession.

📖 A person's social, financial, and cultural identity¹ ('I am poor,' 'I am powerless,' 'I am a low-caste rag-picker,' and so on) determines how they think and act in a given situation: it influences how one perceives a problem and finds solutions to it. The phenomenon may be observed in all films: Laxmi's identity influences the process by which she makes decisions or solves problems. Her approach to solving a problem is neither right nor wrong. Indeed, Laxmi always finds a solution that is good enough for her. In situations where she does not find an immediate solution, she trusts her instincts somehow to find one. She applies what information she has, and never gives up. In *LAXMI MAKES A CHOICE*, she recognises a hazard but does not perceive it as a problem to be solved—a perception shared by many unskilled SWM workers. The first step forward requires a broadening of perspective, which is done by urging participants to take a step back. They must transform from spectators into 'spect-actors,' i.e. from people who were observing their reality in the films into people acting to change it.² The change in perspective will allow you to discuss the various subjective notions that influence decision-making not as theoretical abstractions but as case-studies. Activities in this module establish the technique of participants thinking *as if* circumstances were different, and *as if* they were

1 The concepts of 'identity' and 'self-identity' are important enough to merit two activities—this one and ④ VOTE FOR LAXMI → [103]. Both are designed to illustrate different aspects of the subject without using jargon.

2 Spect-actors is a word coined by Augusto Boal. (*Theatre of the Oppressed*, 1993). See ① ⑥ FROM SPECTATOR TO SPECT-ACTOR → [62].

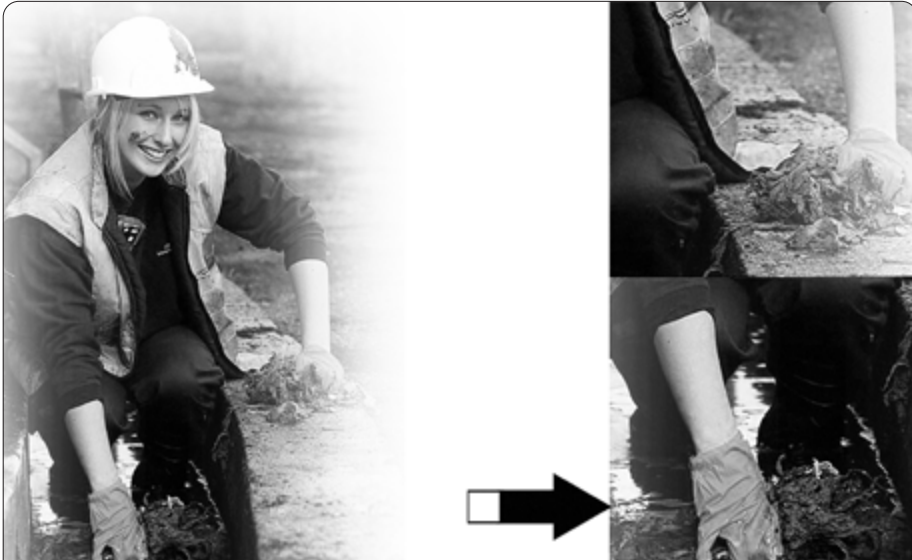


Image 25. Slide 1. Return to Slide 1 after Slide 7 and ask participants to re-evaluate their answers to the following questions: Who is this woman? Is she wealthy? Well educated? Does her attire look strange?

a different person. Active Participants (AP) will be able to grasp the concept intuitively; for others, the process will be self-conscious and artificial. Participants must propose ideas and engage in discussion *as if* a solution existed, or *as if* circumstances were such that the solution was affordable and feasible³. The ‘as if’ method of thinking (and putting thoughts into action) should be allowed to sink in over the course of the day. ①⑥ FROM SPECTATOR TO SPECT-ACTOR → [62] allows participants to speak to Laxmi and other characters in the film as if they were real people. New ideas or a change in behaviour that may emerge as a consequence of thinking ‘as if’ should be noted down 📝. Write down these incidents in your Notes Sheet. You should refer to your notes during Perspective Playback and other role-playing activities— if a participant changes her mind about a matter, ask her what sparked the change.

Discuss the strangeness of a cricketer’s PPE. Nobody laughs at cricketers in a stadium because PPE is a part of their job. But, if they are seen walking down the road in full cricket gear, people will stare at them or laugh at them. Discuss this with participants who mentioned that they feel awkward.

F 2: Discuss Bahubali’s dialogue, “If I go to war in a lungi, people will say I am a fool.” Why would he say this?

🕒 Discuss the necessity of a firefighter’s uniform. It is bulky and not at all comfortable. It is designed to protect the firefighter’s life.

Generalize the issue—anyone can be a thief, or a cricketer, or a waste-worker. People

³ The history of thinking and acting ‘as if’ is described as a revolutionary act by Christopher Hitchens (*Letters to a Young Contrarian*, 2005.)



Image 26. Slide 6. Which one of these people is Bahubali? The thin man in the middle wears a Bahubali mask his face is the same as Bahubali. The bodybuilder on the right wears Bahubali's armour and a sword, but doesn't look like Bahubali at all. Chandu, on the left, is pleased to see that the man in the mask is wearing the same clothes. It is clear who he believes to be the real Bahubali.

assign a profession to an unknown person based entirely upon how he or she looks. This assignation defines the person and, in turn, leads to other assumptions: People see an unkempt woman on the street, and they may assume she is a beggar. If she has a sack with her, they will assume that she is a waste-picker. Further conclusions are drawn from this initial assessment: she is illiterate, she smells of garbage, she uses foul language and so on. If the same woman is dressed in a beautiful sari, they will assume something else. One of the advantages of wearing a uniform is that people will not see a *rag-picker*, they will see a *waste-worker*. If she is using specialist equipment, they will see an *SWM professional*, and so on. Appearing to be a professional by wearing a uniform is not an act of deception; apart from the obvious utilitarian use of a uniform, donning one merely provides the appropriate visual stimulus to an observer. In the eyes of a layperson, a photographer becomes a professional camera-person merely by using a tripod; a physician is not perceived as a medical professional unless she is seen with a stethoscope around her neck. This is not to say that SWM workers should pretend to be doctors, but merely to assert that professional equipment and apparel is associated with the identity of a professional, not a person.

On the other hand, a worker might not like to be identified as an SWM professional if she is ashamed or embarrassed by this identity. Many unskilled SWM workers do not wish to be identified by their profession not just because of the negative 'perceived identity' forced upon them but also because they do not believe that their labour qualifies as a 'proper' vocation. Such attitudes cannot be changed during the workshop.

PERSPECTIVE PLAYBACK and FROM SPECTATOR TO SPECT-ACTOR can be used to address this matter by forcing participants to think and act *as if* they were someone else. Acting 'as if' can set in motion the shift from acting (on stage) to action (in real life) because the participant suddenly realises that *my acting feels natural. This is what I wish I could say and do in my life*. Sometimes the realisation is subtle and is associated with a change in perceived identity: *This man thinks I am some kind of engineer. Why? I am just writing down shift timings. Is it because of the way I am dressed? My hat? My clip-board?*



Image 27. Slide 8. What do these Japanese workers do? In which industry do they work?

Unskilled swm workers hold a diverse range of mental models, and one must not assume that they all hold the same (or very similar) identities. Different socio-cultural hierarchies exist within the class and these exert a palpable influence on the self-identity of an individual. In the case of unskilled workers these hierarchies have not been influenced by education and training. A discussion on these matters is beyond the scope of the workshop. (See FURTHER READING → [91].) When you display [58] and [59], ask workers if they were able to recognise their colleagues in Japan. Initiate PERSPECTIVE PLAYBACK and ask them to voice dialogue for the workers in [58].⁴

☯ 📖 Is there any difference between what you are and what others think you are? Who is correct? Whose opinions matter to you?

👏 Does Laxmi ([52]) look like a waste-worker? What about *this person* ([57])⁵?

👏 Does the tie alter the identity of the worker in Slide 8?

👏 Is Laxmi illiterate? Is this person (in [51]) illiterate? Does she smell of sewage?

Analyse the answers with the participants.

She might smell of sewage because she is working in an open drain. Her boots and gloves are covered in sludge. Her fair skin indicates that she might not be illiterate, which is a logical inference, but not necessarily true. But she is working in a sewer, and it is wrong to assume that she does not smell of sewage — she might not, but her clothes do. There is nothing wrong with the work she does and the smell will disappear after a bath. Appearance matters. Use it to your advantage!

Observe how participants react to these questions and the ones on the next page. Don't

⁴ Forum Theatre practitioners have seen the first hints of change take place on stage numerous times. Whether this change in though always leads to a change in life, i.e., whether acting leads to action, is obviously not known

⁵ 📖 Note down names and opinions. These will be used in the next activity.



Image 28. Slide 9. All three work at a company that provides cleaning and janitorial services. (Photo credit, Slide 8 and 9: yolo-japan.com)

attempt to explain the concept of a person having various identities, and their influence on a person's behaviour. Instead, allow the participants to absorb the concept gradually.

☪ Recall KARTHIK AND HIS HELMET → [32]. What assumptions did the moderator make about the Karthik's social and financial status? Would the moderator's attempts to solve the problem been different if Karthik was identified as an unskilled SWM worker? Would it have been different if he was perceived as a manager with an MBA degree? During the workshop the moderator should consciously discard all assumptions about the participants for the same reason that you have, in this activity, asked them to

question their assumptions about themselves. This process takes time and will require conscious effort during the first dozen or so workshops. It becomes easier with each workshop and, in time, you will find yourself able to adopt whatever mental model is appropriate to assess and solve the problem at hand.

SAMPLE QUESTIONS

- 📖 Why did you say "Laxmi" instead of "waste-picker"?
- What makes Bahubali identifiable as Bahubali? Is it his face? His dress? His armour?
- How many of you think that ☐7 shows a thief? A beggar?
- What would you say about the *nature* of the person shown in Slide 7? Is she generous, kind, selfish, angry, depressed? What about Slide 1?
- What would you say about the profession of *this* person in Slide 1 now that you know that she is an SWM worker and not a model? What if I told you that she is not an SWM worker but is a model hired for a photoshoot? Has your reaction changed?
- 📖 Is it possible to know her profession if she changed into everyday clothes?
- 📖 Who benefits from thinking of Laxmi as a waste-picker? Why? Who benefits if Laxmi is identified as an SWM *professional* instead of a *waste-picker*?

Further reading

- Du Gay, Paul, Jessica Evans, and Peter Redman. 2013. *Identity: a reader*. London: SAGE Publications in association with the Open University.
- Hitchens, Christopher. 2005. *Letters to a young contrarian*. New York: BasicBooks.
- Lawler, Steph. 2016. *Identity sociological perspectives*. Cambridge: Polity.
- Osbeck, Lisa M. 2013. *Science as psychology: sense-making and identity in science practice*. Cambridge: Cambridge Univ. Press.
- Owens, Timothy J., Sheldon Stryker, and Robert W. White. 2003. *Self, identity, and social movements*. Minneapolis: Univ. of Minnesota Press.
- Peterson, Jordan B. 2018. *12 rules for life: an antidote to chaos*. Toronto: Random House Canada.

ACTIVITY 3

Understanding resistance to PPE

Objective

- The moderator is able to see the problem from the perspective of the participants.
- Formulate problem-statements about PPE (especially safety gloves) from the perspective of SWM workers.

Steps

- Merge DEFER¹. Display [S]2, then call for a show of hands:
 - ☞ How many participants at least one of these problems?
 - ☞ How many participants do not face any of these problems?
 - ☞ Is there anyone who faces a problem with PPE that is not listed here?
- Discuss each of the problems in order and ask for opinions.
- Switch to [S]3 and [S]4 when discussing awkwardness or shyness.
- If a participant wishes to add to the list of problems, ask her to describe the nature of her problem and place it into one of the listed categories.

Slides

- [S]1: Still from the film
- [S]2: Icons and text showing problems
- [S]3: Woman wearing a T-shirt and jeans
- [S]4: Woman cricketer in a T-shirt and jeans
- [S]5: Woman cricketer in cricket-gear

Notes

- This activity is designed to help the moderator gain insight into the perspective of the participants—you are the learner in this activity. Most of this activity consists of OPINION and vote sessions that will help you create practical problem-statements when they ask you to solve specific problems.
- Use ①⑥ PERSPECTIVE PLAYBACK → [57] whenever necessary, e.g., ask participants respond to the thoughts of a worker and an employer on the subject of the cost of gloves.
- Get cost out of the way first. Whenever cost is perceived to be the obstacle to a potential solution, refer to the consensus generated on the matter during this activity. Everything has a cost; everything also has a value that depends upon the person paying that cost. This concept is discussed in detail in VI② COST, PRICE, AND VALUE → [443]. Consider merging some of the exercises from VI② into this activity if the financial modules are not part of the programme.
- At the end of this activity, the DEFER chart will be full of topics deferred to Module III. Your assistant should begin the process of sorting DEFER subjects into merged groups.
- Keep a pair of TYPE DW, TYPE WW, and a pair of TYPE GP gloves with you. When a participant speaks about glove-related problems, ask her which type of gloves she wears.
- Information from module III may be included in the discussions during this activity. If a majority of participants are SWM workers, consider including the following sections from Module III into discussions during this activity: III① GLOVE-FITTING GUIDE → [117], EN388 RATINGS: A GLOVE'S REPORT CARD → [127], STANDARD GLOVE-KIT → [149], and ②⑥ GLOVE RECOMMENDATION: S.O.P. → [145].
- Do not initiate this activity before ② WHO AM I? WHO IS SHE? → [86]. The discussion about identity is pertinent to the discussion here.

1 D → D[merge] Assure everyone on DEFER for the current activity that they will get a turn to speak soon. This assurance should be required only the first time you merge DEFER. Ensure that participants realise that merging DEFER does not mean that their question was less important than what you want to say.

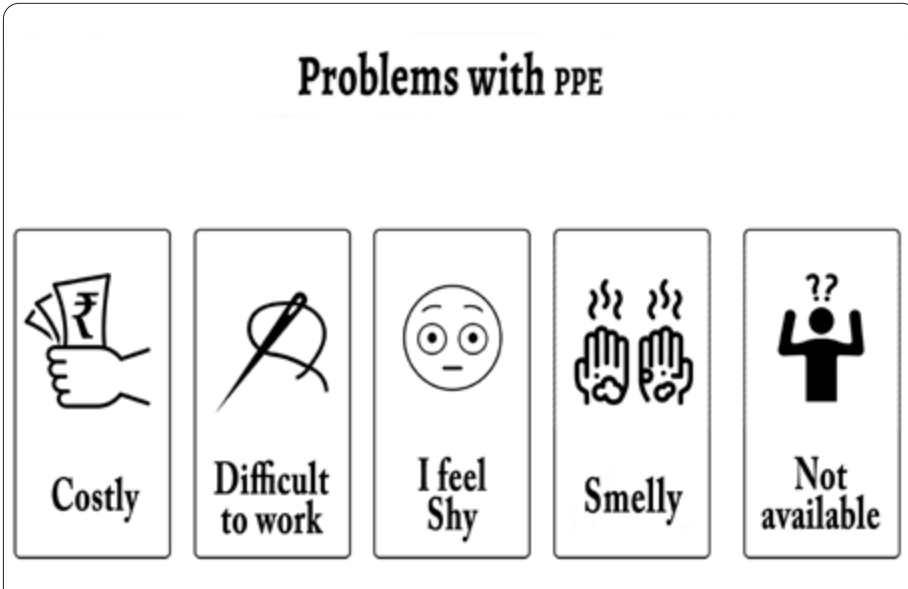


Image 29. (Slide 2) The most common problems associated with gloves and other PPE.

INTRODUCTION

Discuss the various problems that SWM workers have with gloves and PPE from their perspective. These are, in order: 'PPE is costly', 'It hinders my work', 'Gloves make my hands smelly', 'I feel awkward when I wear PPE', and 'PPE is not available.'¹ Notice that the problem-statements are phrased according to how SWM workers usually describe a problem and not in the 3-component categorization of the P2P method. This is intentional. You must first understand the participants' perspective before you begin to explore appropriate solutions. Use this activity to understand their problems, DEFER to III① and ②, as required, and then explore solutions using the P2P method. Do not change the order of the problems.

Begin with cost and continue down the list. The problem of cost allows you to reverse the focus of the discussion right at the beginning and involve the participants as a part of the problem and the solution. Consequently, you cease to be the sole provider of solutions while simultaneously avoiding the perception that you do not have answers.

The choices made by SWM workers influence the budgets made by business-owners and NGOs (or other organisations) that wish to spend money on PPE). When invoking OPINION on the issue of whether gloves fit properly, stress the word *properly*. The situation is a self-fulfilling prophecy: organisations do not purchase of good quality PPE because workers do not use them; therefore, they purchase the cheapest products that barely meet regulatory requirements and (to pass) visual inspection; such PPE is of poor quality and does not fit properly; workers, naturally, do not use them or discard them as soon as possible. And the cycle continues...

¹ Do not change the order of the problems. Begin with cost and continue down the list.



Image 30. (Slide 5) Harmanpreet Kaur of the Indian women's cricket team at work.

DISCUSSION

§ ON COST

P *Gloves are costly.*

You might not have to pay for them. If you are working for a contractor, then it is his responsibility to provide you with gloves. If you work for an NGO, it is their responsibility to provide you with gloves or give you better wages to purchase appropriate PPE. When NGOs distribute gloves, most waste-workers do not use them. ☹: Have you seen this happen?

Municipal administrators, private companies and NGOs have a different perspective on the matter. Ask the **OPINION** of participants² on the following responses:

- “Why waste money on gloves when they are thrown away or used only when the supervisor goes to inspect?”
- “If we give them money to purchase gloves and boots, they use it for something else.”
- “We spent ₹2 lakh on gloves, and the women didn’t use them.”

☹ How do we solve this problem of cost, if those who can spend say that the expenditure is useless?³

We have established during the previous activity that many of you would not risk cutting your hands even if I paid you ₹10. But this is far more than the cost of gloves!

² Use ①Ⓢ PERSPECTIVE PLAYBACK → [57], if necessary. The list of statements may be used as dialogue.

³ 📝 Note down the solutions that participants suggest. Use ①Ⓢ PERSPECTIVE PLAYBACK → [57], if necessary.

Remind participants of their reactions during ①LAXMI'S CHALLENGE→[51]. A pair of D-rated gloves⁴ costs ₹120. These would offer adequate protection to play Laxmi's Challenge 200 times everyday—approximately the same daily hazard exposure that SWM workers (on waste-collection jobs) face. These gloves are also durable enough to last around 2 months and, in these terms, they cost ₹2 per day; in terms of cost per exposure, they cost 1 paisa!

Compare this *cost* with the *value* that the participants themselves assigned to avoid being cut—how many participants *did not* volunteer to play the game for ₹10? How many did not play for ₹50? Clearly, the participants value their safety more than the cost they would pay for safeguard it using an appropriate pair of gloves. The participants, however, do not have enough information to evaluate the value of gloves—in most cases they are not given gloves suitable for the jobs they do; waste-collection jobs cannot be done with 2121 gloves⁴.

You might not have to purchase these gloves at all. We will create a work-kit for each of you made specifically for the job that you do and I can guarantee that it will not cost more than 4 per day. We will discuss these matters soon.

Take a vote on the following before moving on. Note down the participants' reactions.

☞ Let us put aside all matters apart from cost. Would PPE have any value to you if someone, anyone, pays the cost? 📝

§ ON COMFORT AND DEXTERITY

📌 *Gloves hinder my work.*

📌 *Yes. It can be difficult to do some jobs while wearing gloves. Let me try to understand how exactly they hinder your work. Firstly, are you wearing gloves correctly? We can discuss this right now or a bit later.*

Apply the P2P method: Understand the meaning of *hinder* from the perspective of the participant. What is the hazard? Are gloves needed for the job? How do gloves hinder the person's work? How is this hindrance measured (takes longer to work, comes loose, gets snagged, and so on.) Does the glove fit? Is the problem adequately described by one or more of the categories in IMAGE 29→[93]?

You will hear variations of the phrase *hinder my work* many times during the workshop. It is your job to understand (a) the nature of the hindrance, and (b) the nature of the hazard. If this is your first reading of the handbook, do not panic. The technical information required to understand these concepts, and to define a suitable problem-statement (*what is the hazard, and what is the problem?*) is available in Module III. The interaction between the participant and moderator demonstrates what was said, earlier, about the usefulness of information⁵—only usable information is useful. Till this moment you had

⁴ What are D-rated gloves? What are TYPE DW 2121 gloves? See EN388 RATINGS: A GLOVE'S REPORT CARD→[127] and ANSI 105:2015 CUT-RATINGS→[128].

⁵ See INFORMATION IN A P2P WORKSHOP→[28].

no reason to learn about various mechanical hazards, and EN388 ratings for safety gloves. This information is usable *now* and has, only now, become useful. The same applies to participants.

⑥ How can you tell if a glove fits you properly? (At this point, you may initiate III① or D. If you DEFER the topic, the person who asked the question should be placed at the top of the list.) Note that wearing an incorrectly fitted glove is the most common reason for poor dexterity; a properly fitted glove does not significantly reduce dexterity and, with practice, the efficiency of a worker who uses appropriate⁶ gloves is identical to one who does not use gloves. In the long term, a worker who uses PPE is likely to be more efficient than a worker who does not. A worker who can work efficiently and comfortably while wearing gloves will invariably replace workers who are cannot do so⁷.

Use the following example to explain the concept of ‘proper fit’⁸:

You can compare the fit of gloves to blouses and shoes⁹. A small difference here and there can make a blouse uncomfortable. The same applies to shoes. If you have size 7 feet, then sizes 6 and 8 are useless to you. This does not mean that shoes are impractical, or size 6 shoes are useless: it just means that you are wearing the wrong size; sometimes, ‘loose and tight’ are inaccurate descriptions of a dress — the appropriate fit for a blouse is very different from the appropriate fit for a kameez¹⁰. The former is supposed to be a close-fitting garment, the latter is not. Similarly, a glove that is one size too large (or small) will not be comfortable. But, I understand your conclusion that gloves don’t fit because they usually do not. How can they fit properly if someone has bought the ‘average’ size that is supposed to fit all of you. We will discuss the matter of proper fit in the next activity.

□ *Gloves make my hands smelly.*

For specific problems, use the P2P method. The gloves for wet-waste collect sweat and the user’s hands might smell of sweat and latex. Are appropriate gloves being used for the job? However, never assume that participant’s personal belief and her mental model are the sole influencers of her decision. (See KARTHIK AND HIS HELMET → [32].) Acknowledge the validity of the problem just as Laxmi does in the film.

I agree with you. Laxmi agrees with you as well. There are options available to decrease the discomfort caused by sweat¹¹. You could remove rubber gloves and let them dry, but this is not always convenient. You could wear cotton gloves underneath, which is what wicket-keepers do. This is also costly and inconvenient.

6 You could initiate III① GLOVE-FITTING GUIDE → [117] here.

7 Remind participants of Pushpa, who lost her job (see DIFFERENT PERSPECTIVES ON SAFETY → [59]) and of Karthik, who replaced her. See VIII① MALL TALES. EP. 2 → [509].

8 Or initiate ③⑥ WHAT DOES APPROPRIATE MEAN? → [99].

9 Do mention both examples since women do not usually wear laced shoes and men do not wear blouses.

10 Opinion may be divided on the appropriate fit of a *kameez*, but the essence of the argument remains valid.

11 The P2P method dictates that before you discuss solutions to ‘sweaty hands and bad smell,’ i.e., with TYPE WW gloves, you should first consider easier solutions—maybe the work at hand does not require the participant to wear rubber gloves. Maybe coated TYPE DW gloves are suitable for the task and so on.



Image 31. (Slide 3) This woman does not feel awkward wearing a t-shirt. The point is not what she wears, but that she does not feel awkward wearing these clothes. She might feel awkward wearing a sari.

The most inexpensive options are chalk powder mixed with boric powder or baking soda. Talcum powder is expensive; chalk powder is cheap. You could dust some chalk-powder on your hands before you wear gloves. It will absorb some of the sweat from your hands. But, chalk and sweat tend to form clumps, and the glove must be inverted and cleaned daily. We will discuss specific solutions to this problem in the next activity. With your permission, I will DEFER this matter for later, but you will be happy to learn, for now, that most jobs do not require you to use rubber gloves.

Remember that in this activity you are trying to understand the problem from the perspective of the participants. Solutions to all glove-related problems are discussed in III②③ GLOVE RECOMMENDATION: S.O.P. → [145]. Defer queries to III②, and identify AP and EP during this activity. Pay careful attention to how they phrase the problem. Compare the following statements:

- (1) *My gloves are not comfortable. It is difficult to pick up things while wearing them.*
- (2) *My gloves slip when I lift wet bins.*
- (3) *The fabric of the gloves bunches up and hurts my fingers.*

Each of these statements describes a problem linked to poor dexterity. However, the amount and quality of information contained within each statement is different. The solution to Problem 3 is quite obvious — the gloves are either too large, or the participant is using TYPE WW gloves for a job that requires TYPE GP gloves. Problem 2 requires more information — what is the weight of these bins? why are they wet? and so on. Problem 1 shows how most participants describe a problem. In most cases you will have to ask for specific information to create a suitable problem statement.

In the case of rubber, i.e., TYPE WW gloves, the following is a suitable answer at this stage:

- *You do not have to wear rubber gloves all the time, even if you handle wet-waste—we will discuss such options in about ten minutes.*

§ ON FEELING AWKWARD WHILE WEARING PPE

- *I feel awkward or shy wearing gloves and other PPE.*

Display Slides 3 and 4. Initiate PERSPECTIVE PLAYBACK with these characters.

Would you feel awkward wearing this? (S 3) Have you seen women dressed like this? What about the cricketer? (S 4 and S 5).



Image 32. (Slide 4) Switch back and forth between Slides 3 and 4. Harmanpreet Kaur wearing jeans and a T-shirt is dressed exactly like the woman in Slide 3. Does the cricketer look out of place in this image?

☹ Would you feel awkward dressed like this on the road?

☒ *Yes! You would. Unless you are going to play cricket, you would not want to dress like that. If you do, it will not harm you, but I would then recommend that you get your head checked. But, if you were a cricketer and were dressed in a sari on the field, you will most certainly get hurt. A cricketer wears her uniform and PPE to do her job. You wear your uniform to do your job. We just discussed this in the previous activity. As I said earlier, you only need to wear appropriate PPE for the job at hand.*

Explain that everyone in the room is a professional doing a job and remind them of the discussion during

② WHO AM I? WHO IS SHE? → [86]. Appropriate PPE is a part of a professional's identity; is it essential for her safety at work. Indeed, sensible people would stare if a worker was not wearing PPE.

In the film, Babubali would have said: "Look at that strange woman, going to war without her armour."

Participants have to decide who they are, and how they want to appear when they work. They may choose to eschew the protection afforded by PPE if they wish but should consciously weigh the options they have—be safe and be perceived as a professional SWM worker or be an anonymous waste-picker.

In the next movie, Laxmi goes around the city asking others about their choices, and participants will see many people using masks and gloves. Ask everyone who mentions awkwardness to decide if the waste-workers in the movie look awkward. Understand their perspective and see if it changes.

☐ *I do not know how to use [this type of] PPE.*

If you have not initiated III① before this question, then ➤.

We will demonstrate how to use all kinds of PPE in about ten minutes during the next activity. We will discuss how to select appropriate safety gloves, boots, helmets, masks, glasses, ear-muffs and jackets for the job that you do. Each of you will have the opportunity to discuss your work, and we can all discuss and select appropriate PPE for you.

The DEFER chart should be full at the end of this activity and your assistant should begin to group together similar queries. You should also have identified all the AP and EP among the participants. Encourage AP to participate in the next activity.

ACTIVITY 3A

What does appropriate mean?

Objective

- Establish the meaning of 'appropriate' in the context of PPE.
- Understand that the body takes a while to adjust to a new tool or equipment even while performing a familiar activity.
- A practical guide to process-thinking for non-technical workers and administrators.

Notes.

- This is a simplified version of ①© THE JOB AT HAND→[69]. The text in this activity uses the words *job*, *task* and *process*, which are defined in the aforementioned activity.
- The results of this activity lead logically to III① GLOVE-FITTING GUIDE→[117]. Include it towards the end of module II.
- Explain to participants during these early activities that they always should grasp any opportunity *to choose* from available options. There are jobs open only to those SWM workers who can work while wearing PPE. These new jobs come with incentives, e.g., they are better-paying, they are more 'respectable', they give workers access to new technology, and the opportunity to improve their skills.
- In the initial stages of the workshop, you must concentrate on understanding how the participants perceive their problems (their version of the problem-statement) with PPE, emphasise their right to choose, and urge them to do so when they can.
- Identify EP and try and get them to talk. Be aware that the generally upbeat mood till now will begin to fade when participants realise that they are part of the problem and that they must contribute their thoughts and energies to find solutions.
- Monitor the DEFER board for hot topics. Relevant activities in Module III may be initiated as and when required.

INTRODUCTION

The words 'appropriate' and 'proper' are very important! I will use them a lot over the next four hours... However, the words only carry meaning when you choose to define them. The question is: what is appropriate for you, in a given situation? We were talking about saris earlier¹ and one of you said that wearing a Banarsi sari to work was silly. She's correct! It is not the appropriate sari to wear to work.

Therefore, the words 'good-quality', 'expensive', 'cheap', and so on are useless too unless we understand the situation to which they were applied. Similarly, the words 'useful' and 'useless' must also be used in context. What is useful in one situation may be useless in another.

EXERCISE 3: DEMONSTRATION NO. 1. SAME SIZE SHOES?

1. Ask two volunteers who wear the same sized shoes² to join you at the front of the room. (The demonstration works best with leather lace-up shoes).
2. Ask them to swap shoes and walk around the room.
3. Ask them to swap just one shoe, i.e., either the left or the right shoe, and walk around the room. Discuss how they 'feel.'

☹ Walking in someone else's shoes feels strange; even new shoes of the correct size feel odd for a while. You have to give the body enough time to adjust to new equipment and PPE.

EXERCISE 4: DEMONSTRATION NO. 2. USE THE RIGHT EQUIPMENT.

Ask for a vote on the following:

☑ *Imagine that you are in a race and have the choice between wearing shoes, wearing slippers and running barefoot.*

- ☞ Who would choose to run in slippers (flip-flops)?
- ☞ Who would choose to run in shoes?
- ☞ Who would run barefoot?

Tally the results.

☹ Sandals and slippers (flip-flops) meant to be loose because they are designed to be worn (and taken off) quickly — you can step into flip-flops and walk away. They are not designed to be worn for running³. If you use equipment that is not designed for the job at hand, you put yourself at a significant disadvantage.

¹ See the comment made by an AP in the LAXMI VS. BAHUBALI → [64].

² Demonstration 1 works best with laced leather shoes. Trainers or 'sports shoes' will diminish the intended effect of the mild discomfort caused by wearing unfamiliar shoes.

³ Mexican running slippers, called *huarache*, are designed for running. However, these must be cinched around the ankle; also, unlike flip-flops, the length of the straps on *huarache* are adjustable to fit the wearer's feet. See @y8tcdlgw.

If someone mentions that running barefoot is better than running in slippers, ask them if they would want to try running barefoot on a floor with broken glass? Remind everyone of LAXMI'S CHALLENGE. The point you are making here is that improperly fitted gloves are the primary reason for discomfort and, consequently, leads to a natural disinclination towards their usage.

EXERCISE 5: DEMONSTRATION NO. 3. EQUIPMENT SHOULD BE IN GOOD WORKING ORDER.

1. Ask a volunteer wearing flip-flops to join you at the front of the room. (The demonstration works best with flip-flops).
2. Remove the anchor of the front strap.
3. Ask the volunteer to walk around the room. Discuss how she 'feels.'

☯ Gloves, like slippers, rely on a snug fit. Cheap gloves use low quality elastic yarn, which quickly loses its elasticity. TYPE WW gloves are often purchased without any concern for fit or size. Compare TYPE WW gloves to a pair of rubber flip-flops — both are made from virtually the same material, and both can only be used comfortably only by reducing relative movement between the material and the body, i.e., between the feet and straps or the fingertips and the glove.





Image 33. Laxmi reacts with annoyance when the narrator gives her a pair of gloves to wear in *Laxmi makes a choice*. Her reaction is not unjustified—the gloves are too large for her and would reduce her dexterity.

ACTIVITY 4

Vote for Laxmi

Objective

- Establish the identity of an appropriately dressed SWM worker.

Slides

- [S]1: Laxmi dressed in a simple sari.
- [S]2: Laxmi in PPE.
- [S]3: Laxmi in an elegant silk sari, flowers in her hair, holding a purse.
- [S]4: All three images placed side by side.
- [S]5: Laxmi and a foreign SWM worker.

Steps

1. Divide the whiteboard into three columns.
2. Ask the participants to decide which image of Laxmi looks ‘appropriate.’ Do not offer any additional explanations beyond simple colloquial synonyms of the word.
3. Start the voting process by stating your job description (say, NGO consultant) and register your vote for [S]1. Explain that if Laxmi were dressed like that, she would not look out-of-place in *your* office.
4. Your assistant votes in favour of [S]2 and a third person¹ (briefed in advance) votes for [S]3. There is now a vote in favour of each image.
5. First, specifically, ask for a show of hands from those who support your choice of [S]1.
6. Then continue to the other two images.
7. Tally the votes and announce the results. Discuss the results.

Notes

- Do not confirm or deny that Laxmi is an SWM professional—leave this for the last activity in the workshop, VII② GOODBYE, LAXMI → [503].
- You will have the opportunity to discuss self-image and identity later when Laxmi gets her earrings back from the pawnbroker. Do not spend more than the allotted time for this activity even if the discussion gets animated. DEFER if necessary. Some participants, such as NGO workers, may be interested in the subject, and will find ④② TRYING TO STEREOTYPE → [108] useful.

1 The third person could be one of the workers at the venue. If your assistant is known to the participants, ask him or her to vote for [S]3 while the third person votes for [S]2. Essentially, the person who votes for [S]2 should be a stranger.



Image 34. (Slide 4) A person's attire changes how they are perceived by other people. Their assumptions are drawn from knowledge, precedent, intuition and, often, pure guesswork. People were shown this photograph and asked to guess Laxmi's profession. Teacher and house-wife were the most common replies, followed by social-worker, and civil-servant. No one thought that she might be an engineer or technician. Also, no one thought she was a waste-worker either! Those who guessed Laxmi's profession assumed that the person in the photograph was a model.

DISCUSSION

The first three questions, below, are for the initial vote.

1. Who supports my choice?
2. Who supports [S]2?¹
3. Who supports [S]3?
4. What does [S]3 look like?
5. Did any of you recognize Laxmi when you first saw [S]2?
6. Is it strange that the same person can appear so different?

[P] *How should I choose?*

Participants must decide which image of Laxmi is 'appropriate'. Use an 'appropriate' colloquial expression to define *appropriate*. Explain that they can define 'appropriate' in any way they want.

[M] *It is your choice and is similar to government elections. We all vote for someone we have never met. Our vote is influenced by what we see on street-signs and TV. This is the same decision. Look at the pictures and pick the appropriate one. Don't guess. Your vote should be influenced by a specific reason—any reason.*

¹ If [S]2 gets 3 consecutive votes, halt the process briefly and ask the most recent voters if they are sure of their choices. Explain that they must make independent choices—it is fine to arrive at the same conclusion as others (and make the same choice) as long as one has given it thought.



Image 35. Laxmi with the staff at Hasiru Dala. Does she look out of place? When this image was shown to people, after they had seen IMAGE 34, they were certain that Laxmi worked at an NGO. They picked another person when asked to find the ‘waste-picker’ in the photograph.

□ *I do not know which one is appropriate, so I voted for the second image.*

All choices are valid. The word ‘appropriate’ is entirely subjective when applied to a person’s clothing and accessories. However, it becomes objective (or measurable, verifiable) when used in the context of a professional, and her equipment and tools—imagine a cricketer or Bahubali without their equipment.

That’s fine. Image 2 shows Laxmi in her professional uniform. If I didn’t know her, I would assume she is a professional of some kind.

👏 How many of you voted for the PPE image simply because you felt that I was expecting you to vote for it?

If you honestly do not know which image to choose then following in the footsteps of a knowledgeable, trustworthy person is fine — it is good to ask colleagues and friends for information and opinions. If you chose the second image because you trust my judgement, it is quite flattering but unhelpful because the objective of the game is to determine what you think is appropriate, and not what I find appropriate!

📖 The solution to the problem of awkwardness is to be found in this discussion. Spend as much time as needed. Establish consensus that *determination of appropriateness should be an informed decision based both on objective data and subjective factors*. It is possible (even desirable) that one or more participants may disagree on what is appropriate because their decisions are influenced by subjective factors that do not apply to others. There is no need for participants to discuss the definition of consensus or analyse the process by which it is reached. The process of eliciting opinions from participants and

asking them to comment on Laxmi's decisions and each other's opinions is enough. In doing so, each participant will begin to realise how *they* make an informed choice or take an informed decision; also, whenever they take a reasoned decision in the workshop and find that others have come to the same conclusion independently they are operating in consensus.

Do *not* describe Laxmi's profession in the slides, i.e., do not say that "Laxmi is dressed as an SWM worker in this picture" before the vote. Do not mention her name either.

The outcome of this exercise will vary.² The PPE image is likely to be the overwhelming favourite simply because the participants will anticipate that you expect them to vote for it. Analyse the spread of votes. Most participants will have voted for the PPE image. Re-iterate that this confirms the results of the discussion in ②. Explain that your vote for the first image was not a trick—that people in your office do dress in simple clothes. Similarly, a college-teacher might look like the third image. The person may or may not be a college-teacher, but she looks like one and, in the absence of any other information people assumed that she is one. The vote will also show that the *same* person is perceived differently when the word *appropriate* is added.

People assume different things about Laxmi depending upon how she is dressed. The influence of subjective components should be allowed to seep into the consciousness of participants over the course of the workshop, instead of discussing them as theoretical abstractions. The participants' reaction to OPINION questions will give you clues about how they think—ask yourself if participants are weighing the subjective nature of their information against data. These discussions will also help *you* understand their perspective on the matter at hand. Discuss if the results of the vote confirmed the conclusions reached during the previous activity. After displaying [5]4, ask the following questions:

1. If you had not seen the films, would you think the person in [5]3 is a waste-worker?
2. If I had said that Laxmi was a college-teacher playing the role of waste-worker would you believe me after you saw [5]3? Display [5]5 and ask participants to think again about their vote. Is Laxmi simply an actress hired to play the role of an SWM worker?
3. If you had not seen the films and saw [5]2, would you believe that Laxmi was a professional SWM engineer or technician working in a large company?

Self-image and perceived identity depend to a great extent on how an individual sees herself and how she perceives others in her group, or her peers. Some individuals dress and behave a certain way because they see others in their group behave a certain way. Some people place greater importance on how others perceive them. This can be used to one's advantage—not to deceive, but to affirm that an individual's identity ought to be defined by that individual.

If you see yourself as a poor waste-worker, others will too. If you look like a professional, others will see you as a professional, even though the work you do is the same. People make assumptions based on what they see.

***** When people see a person in uniform, they see not merely a person, but a professional doing her job.


²  Check your notes to see if anyone has changed their mind about Laxmi's appearance since the previous activity. If so, discuss why they changed their mind. Discuss how participants voted in other workshops.



Image 36. (Slide 5) Laxmi with a foreign SWM worker. Ask participants (who thought that the foreign SWM worker was an actress) if Laxmi might also be an actress.

Keep track of votes in ② and ③, especially those votes cast by EP and AP. If they have changed their minds, follow up immediately. Encourage this attitude, but do not patronize them by applauding. Ask them to discuss what made them change their minds. Ask the other participants if anyone has changed their minds. If either the first or third image gets one-quarter of the votes, ask the participants to explain their choice. With time at hand, you could discuss the matter of identity vs received identity³. The third image looks like⁴ a reasonably wealthy woman.

1. Is she also well-educated?
2. What does she do? Does she work? Is she married to a wealthy man?

At the end of the activity, if the discussion was particularly lively, ask if the participants want to change their votes. If they do, ask them why they wanted to change their vote. Ask them to imagine themselves as Laxmi, dressed in the three different ways. Would they vote for themselves, i.e., would they consider themselves appropriately dressed?

Tally the results and announce the final scores. Two films about Laxmi have now been screened. In the next film Laxmi the actress, will change into Laxmi the film-maker. Ask one participant to look at everyone wearing safety gloves in Laxmi's upcoming film, and determine if the person is wearing them only because she was being filmed.

Further reading

- Du Gay, Paul, Jessica Evans, and Peter Redman. 2013. *Identity: a reader*. London: SAGE Publications in association with the Open University
- Lawler, Steph. 2016. *Identity sociological perspectives*. Cambridge: Polity.
- Osbeck, Lisa M. 2013. *Science as psychology: sense-making and identity in science practice*. Cambridge: Cambridge Univ. Press.
- Owens, Timothy J., Sheldon Stryker, and Robert W. White. 2003. *Self, identity, and social movements*. Minneapolis: Univ. of Minnesota Press.

³ If one of the organizers (or any person who holds a position of influence over the participants) votes for ③2, then participants are likely to copy their choice. Ensure that the person who votes for ③2 is someone not known to the participants.

⁴ Note that 'looks like' is a perceived identity—she might not be educated or wealthy, but she looks as if she might be.

ACTIVITY 4A

Trying to stereotype

Objective

- Establish that work-uniforms and PPE allow an SWM workers to move from a negative stereotype that is associated with pity or disdain towards a neutral stereotype that evokes no particular reaction.
- Establish the stereotypes are universal—everyone is inclined to stereotyping others, and is likely to be stereotyped in turn. It is easy to stereotype someone; it is extremely difficult to stereotype someone accurately.

Workshop programme

- For participants employed in NGOs, initiate this activity immediately after Activity 4.
- Skip this activity with engineers and technicians, or if the participants work in B2B companies that do not have client-facing jobs. This activity is designed specifically for SWM workers and administrators in B2C, or client-facing jobs, such as door-to-door waste collection, and housekeeping.

Steps

1. Divide the participants into two equal groups G1 AND G2. Each group must pick a representative.
2. Ask the two representatives (R1 and R2) to join you at the front of the room and give each of them a white-board marker. The representatives may not speak to their group during the game.
3. Write 'swm worker' and 'Annoying Voice,' respectively on two copies of the questionnaire (see IMAGE 37→ [109]) and give each group one copy. The questions are:
 - What is her name?
 - What clothes does she wear?
 - In what part of the city does she live?
 - In what part of the city does she work? Does she appear dressed for work (Yes or no)?
 - Does she look physically fit and healthy? What did she eat for dinner yesterday?
 - (You may add as many questions as you like.)
4. One group, say G1, must create a set of three different descriptions of Mrs. Annoying Voice based on their answers to these questions.
5. The other group G2 must create a set of three different descriptions of a female SWM worker—a door-to-door waste collector, a house-keeper at a shopping complex, and a municipal sanitation worker.
- Take the questionnaires from the groups.
6. Divide the white-board into two columns, one for Mrs. Annoying Voice and the other for the SWM worker.
7. Read out one characteristic from the three characters created by the G1.
8. The representatives R1 and R2 must identify the character—an SWM worker or Mrs. Annoying Voice—that best fits the characteristic and write it down in the appropriate column.
9. Once all characteristics have called been out, discuss the results.

Notes

- Do not read out the field-name, i.e., just say 'Rajaji Nagar' instead of 'Place of Work is Rajaji Nagar.' The simplest version of the game would be to read out characteristics from a character in the same order given in the questionnaire. You would read out, one by one, Lata, Sari, Alipur, Golpark, and so on. Then, you might read out an SWM worker's characteristics and so on. The most difficult version of the game would be to mix the characteristics—Lata's place of work followed by Laxmi's clothes and so on.
- Representatives may ask you for clarifications before they indicate their choice: 'Is this the place of work or where she lives?' In such cases, you should decide if you want to clarify—'It is her place of work'—or leave the decision to them—'It could be either or both. Isn't it possible that some characters live and work in the same place?'
- The activity throws up amusing results in cities where there is a vast disparity between the wealthy class and the working class.

SWM Worker		Annoying Voice	
Lata Work(?) Alipur	Lata		Lives in Alipur

Annoying Voice		
What is her name? What clothes does she wear? Where does she live? Where does she work? Describe how she looks?		
1	2	3
Lata ✗	Natasha	Smriti
Sari ✗	Sari	Salwar
Alipur ✗	Entally	Kameez
Gol park	Entally	Garia
(Short,	(Thin,	Golparke
Fat, fair,	dark,	(Tall,
long hair)	beautiful)	bindi)

Image 37. (Left) The white-board after a location (Alipur) was called out. Both representatives (R1 and R2) incorrectly guessed that Lata was an SWM worker; R1 guessed that Lata must work in Alipur, which is a wealthy neighbourhood, R2 thought that Lata might be Mrs. Annoying Voice who lives in Alipur. (Right) A questionnaire titled “Annoying Voice” filled in by one of the groups. The other group would receive an identical questionnaire titled “swm worker.” Notice that the moderator has marked each guess.

DISCUSSION

The questionnaire filled by one of the groups is shown on the right and provides interesting insights into the minds of the participants. Two out of three stereotypes assume that Mrs. Annoying Voice lives in a wealthy neighbourhood; two thirds also assume that she goes out to work. In some cases, participants try hard not to propagate a stereotype! Discuss the results of the game. You must help participants realise that the image of a woman carrying a sack scrounging for scrap on the streets is a dated stereotype and whether it is time for a new, updated stereotype? The following questions should get you started:

- What attributes might definitively enable the representatives to guess correctly?
- What attributes might be confusing?
- What if one the questions was “does she appear dressed for work?” If this attribute was called out, “She appears dressed for work,” and “She is wearing a sari,” would she be more likely to be an swm worker?
- How many swm workers do you see dressed in work-overalls and appropriate PPE?
- Did everyone assume that the swm worker was unskilled or semi-skilled? What if the swm worker was a skilled technician working at a company that processed chemical waste? Or a lorry driver? (See IMAGE 38, [110].)
- The instructions of the game required the groups to describe a female swm worker for obvious reasons, but if the questionnaire had asked you to describe, “a garbage lorry driver with an HCV driver’s permit,” how would this worker be described? Would representatives assume that this worker would be male?
- In the image above two out of three descriptions of Mrs. Annoying Voice implied that she went out to work. Is this assumption also true of swm workers?



Image 38. (Slide 1) What if the SWM worker was like Satvashila Potekar who is one of many women in Pimpri-Chinhwad who drive a garbage-lorry?

People can have varying degrees of self-awareness about the content of the stereotypes they hold, and the effects that their expressions of these beliefs have on others. But the act of stereotyping itself cannot be entirely escaped. We cannot avoid making inferences based on visual cues even if we are fully committed to judging others fairly by their character or nature. Or, as Walter Lippman said in his book *Public Opinion*:

"For the most part we do not first see, and then define, we define first and then see. [...] For when a system of stereotypes is well fixed, our attention is called to those facts which support it, and diverted from those which contradict it. [...] Except where we deliberately keep prejudice in suspense, we do not study a man and judge him to be bad. We see a bad man."

It works both ways. Mrs. Annoying Voice is a typical example of stereotyping in action. None of the participants (at workshops where the films screened), found anything wrong with the depiction of this character and yet door-to-door workers said that very few women (from whose houses they collect waste) behaved like

Mrs. Annoying Voice. NGOs and other social-sector organisations refer to *waste-pickers* even though they work with people who do not actually pick waste—though it must be said that the stereotypical waste-picker can still be seen working on the streets and landfills of small towns and cities. Therefore, even though most SWM workers do not resemble the stereotypical woman-with-a-sack, it seems that they propagate the stereotype simply because no one has bothered to update it. Stereotypes about SWM workers can influence how they are treated, and in turn provoke behaviour from SWM workers that is consistent with the stereotype:

They treat me like a waste-picker. I am expected to look and behave a certain way.

④ VOTE FOR LAXMI → [103] shows the stereotype of a professional SWM worker that the participants hold; it also established, as a corollary, that the same person is slotted into a different stereotype solely on the way she is dressed. Could (and should) this be used to one's advantage? Would an SWM worker on household-waste collection job be treated better if she was dressed in uniform, and used equipment that altered her appearance, i.e., if she looked like a professional waste-processing technician instead of, say, 'a waste-worker dressed in a jacket worn over a sari.' Also, would a change in appearance influence an SWM worker's own self-identity?

❶ Was Laxmi shown dressed as a stereotypical waste-picker in IMAGE 34 → [104]? What about IMAGE 41 → [114]? What do SWM workers wear to work in your city?

❷ What are the advantages and disadvantages (if any) of associating modern equipment, work-dress, and PPE with the stereotype of an SWM worker? Or, is there any advantage

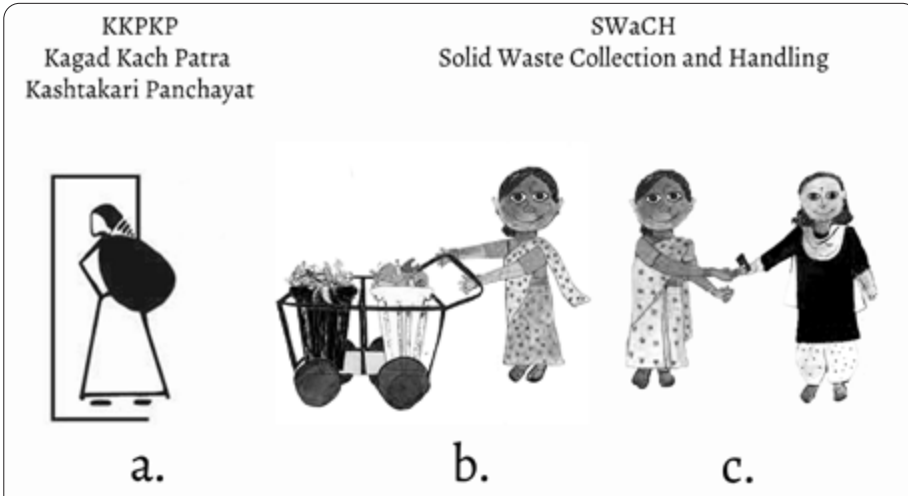


Image 39. The change in self-identity is reflected in the logo of one of India's oldest and most respected SWM organisations. (a) The logo of KKKPKP, a trade union of waste-workers created in 1993, depicts a nameless, faceless waste-picker carrying a sack and walking away from the viewer. (b) KKKPKP created a worker-run cooperative called swach, which began work in Pune in 2008. swach is owned and run by SWM workers and it processes the solid-waste of 800,000 houses in Pune! swach's 'face' now has a name—Sugandhabai. (c) The change in identity is obvious. (Image credits: kkp-kp-pune.org and swachcoop.com)

or disadvantage of linking SWM worker to the pre-existing stereotype of a technician or a trained industrial worker? Discuss both the advantages and disadvantages.

⑥ Describe a stereotypical *industrial worker*. What preconceptions do you have about this person, especially if the worker is a woman:

1. What are her educational qualifications?
2. Where does she work?
3. How much does she earn?
4. Is she the sole earning member in her family?


Organisations like Hasiru Dala in Bengaluru and Kagad Kach Patra Kashtakari Panchayat, KKKPKP, in Pune campaigned for many years to establish the rights of rag-pickers. Their first achievement was the recognition of SWM workers, in 1993, as legitimate workers (see @y3okjpjq). Three decades of campaigning, litigation, agitation, and strikes have resulted in the gradual transformation of an SWM worker's identity from a thief to a rag-picker to a waste-picker to a waste-worker, and to an SWM worker; the popular stereotype lags behind—readers who flinched when reading the word *rag-pickers* should recall the time when Mrs. Annoying Voice would have stereotyped Laxmi as a thief or a kidnapper.

Identity is a subject of research in the fields of sociology, philosophy, psychology and neuroscience. (@77r4qz7,) Yet, it is not only with a person's self-defined identity (and all the different aspects of such a definition) that we are concerned. The client-facing sides of an SWM business must address the stereotypes that people hold about their workforce—about SWM workers, waste-pickers, rag-pickers, and so on.

⑥ How should a client-facing SWM business tackle the problem of negative stereotypes?

*In October 2016, Tamika Cross was on a Delta flight from Detroit to Minneapolis when she heard a scream for help from a woman whose husband had become unresponsive. Cross, who is a doctor, rose to assist but, according to her account, was initially prevented from doing so by a flight attendant because the flight crew was looking for “actual physicians or nurses or some type of medical personnel.” Cross is young, black, and female, and it appears that in the eyes of the flight attendant seeking a trained physician, she just didn’t look the part. She didn’t fit the stereotype. —from *Shadows of doubt: stereotypes, crime, and the pursuit of justice*. (See @zuo5tu for the Washington Post’s article on the incident and Dr. Cross’s post on Facebook.)*

In social psychology, a stereotype is defined as an over-generalized belief about a particular category of people. It is an expectation that people might have about every person of a particular group. The type of expectation can vary; it can be, for example, an expectation about the group’s personality or ability. Stereotypes lead to social categorisation, which is one of the reasons for prejudiced attitudes, and may arise for several reasons. (@7a9xpoi)
(Also see @zqn5spq. and @wztwwmp.)

 The Stereotype Content Model (scm) argues that stereotypes are captured by two dimensions (warmth and competence) and that different combinations of stereotypical warmth and competence result in unique intergroup emotions — prejudices — directed toward various kinds of groups in society. Pity targets the warm but not competent subordinates; envy targets the competent but not warm competitors; contempt is reserved for out-groups deemed neither warm nor competent, and so on. The functional premise is that people want to know *the others’* intent (i.e., warmth) and capability to pursue it (i.e., competence). The four kinds of stereotypes that result from combinations of perceived warmth and competence are shown in IMAGE 40 → [113]. Individuals in the out-groups (quadrants 2–4) are distinguished according to their potential impact on the in-group (quadrant 1) and, therefore, on the individual holding the stereotype. Essentially, instead of describing the stereotype, scm describes how and why people stereotype others. The range of descriptions (physical, intellectual, cultural, and other attributes) of the stereotyped individual by members of the in-group is proportional to the diversity of the in-group. If one assumes, say, that all members of an in-group belong to the same socio-economic class, have similar levels of education, and live in the same apartment block, then the attributes associated with their stereotype of the swm worker who collects their household waste are likely to be similar.

QUADRANT 1: High Warmth, High Competence (Admiration): The group to which the observer (Mrs. Annoying Voice, in this example) belongs is called the ‘in-group’. Close friends, allies, and societal reference groups, such as class, caste, language etc., tend to be rated high on both warmth and competence, i.e. they are loved and admired.
QUADRANT 2: High Warmth, Low Competence (Pity): Examples include the elderly and the disabled. Old workers are often placed into this category by those in the In-group.
QUADRANT 3: Low Warmth, Low Competence (Contempt): Out-groups that are appraised with low warmth and low competency are subject to the greatest amount of hostility. swm workers tend to be placed closer to the neutral line (with housekeepers, delivery agents and so on). Some swm workers, especially migrant workers who collect scrap from the street, are placed lower, on par with petty criminals.

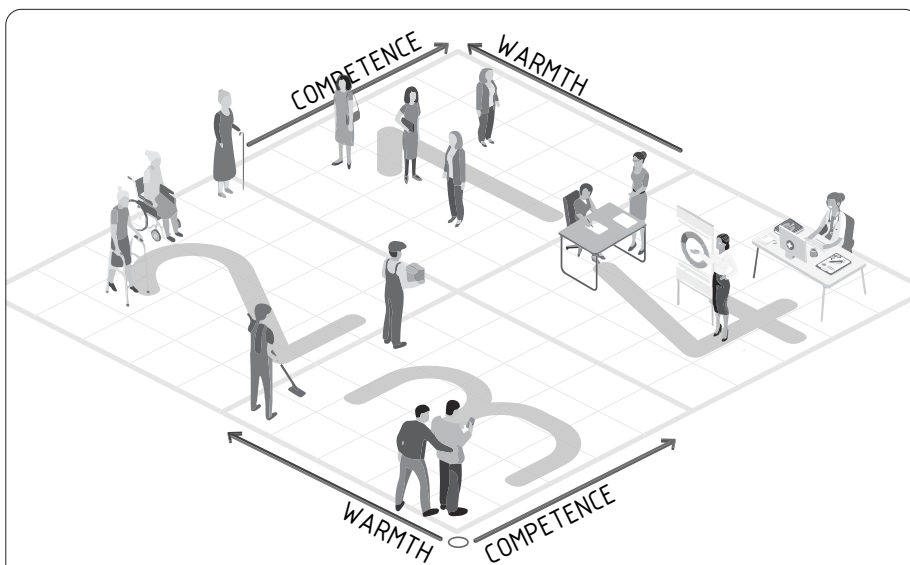


Image 40. Stereotypes and identity. Mrs. Annoying Voice interacts not with Laxmi but with the stereotype she has assigned to Laxmi. (See @zqn5spq.)

QUADRANT 4: Low Warmth, High Competence: Examples include professionals, those with business-school degrees and so on. This group evokes envy of those in the In-group.

☹ Consumerism has hastened the inevitable evolution of a worker. Just as assembly-line workers learned to use computers and robots to create products, an SWM worker must learn to use industrial tools and techniques to un-create them. She must become an SWM professional, and be perceived as a professional. Is it time to create a different stereotype?

Further Reading

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Image 41. Baby Mohite and her husband own a two-storey house in Yerwada, a low-to-middle-income neighbourhood in Pune. After her husband was injured in an accident, Baby became the sole breadwinner in the family. Their daughter is married, and works as an accountant in a large company. What does Baby Mohite do?

III. Laxmi makes a Film



Objectives of this module

- Know how to assess hazards in a workplace.
- Know how to apply the Hierarchy of Controls to find a suitable solution.
- Know about the different kinds of PPE available.
- Know which PPE to use for a given task or job.

Indicators

- Consensus that PPE is an essential component of a safe workplace.
- Participants are able to recognise the different hazards in their workplace.
- Participants are able to create a Standard Glove Kit for the jobs they do.
- Consensus that SWM workers should ask for appropriate PPE if they feel that using PPE is a sensible choice.

Notes

- This module contains a large amount of technical information. Keep the level of detail appropriate to the requirements of the participants; if in doubt, ask them. Technical information will only be useful for skilled workers, safety engineers and those employed in modern recycling plants.
- You don't need to be an engineer to explain technical solutions—See MALL TALES EP.I: ANITA HAS A PROBLEM → [189]. However, mastering the technical portions of this handbook will help you, the moderator, apply the P2P method in workshops with participants from technical, academic and administrative fields.
- If this is the last module in a workshop (i.e., the health and financial modules are excluded). Screen the film in Module V *Laxmi tells a story* after the last activity in this module, and conclude the workshop with VII② GOODBYE, LAXMI → [503].

ACTIVITY 1

Glove-fitting Guide

Objectives

- Establish that a properly fitted glove does not significantly reduce dexterity.
- Know how to use a Glove Sizing Chart.

Slides

- [S]1: Laxmi wearing gloves.
- [S]2: Correct fit for TYPE DW gloves.

Steps

- Begin with A TEST OF DEXTERITY → [118]. Discuss the results.
- Demonstrate the procedure to find the correct size of gloves for a person.
- Repeat the exercise with properly fitted gloves. Let two participants compete for a prize: the winner gets a free Standard Glove Kit.

EXERCISE 6: A TEST OF DEXTERITY

Objective

- Demonstrate that a properly fitted TYPE DW glove¹ with the appropriate coating does not affect dexterity.

Steps

- Ask for a volunteer, v1, and ask her to wear, on her dominant hand, a TYPE DW polyurethane-coated glove. Make sure it fits properly. Take off the glove, note down the size. Do not explain the procedure for fitting yet.
- Ask the volunteer to find someone in the audience, v2, whose hand is roughly the same size or slightly smaller (not larger!)
- Give v1 the glove that fits; give v2 a larger sized glove.
- Draw two circles on the table (or any smooth surface) and place five sewing needles in both of them. v1 and v2 should each stand in front of a circle.
- The volunteers must pick up each needle one by one and place them in a neat row outside the circle, one at a time. The first person to do so is the winner. She wins a pair of TYPE DW gloves!
- Discuss the results. Display [5] 2 and demonstrate the Standard Operating Procedure (using the Glove Sizing Chart) to ensure a proper fit².

Notes

- You and your assistant should wear a properly fitted TYPE DW gloves with a polyurethane coating on the dominant hand. When you explain the SOP for measuring glove size, your assistant wearing a slightly larger glove on their non-dominant hand. She should approach participants and show them the difference in fit.
- This activity is a variation of the standard dexterity test used in EN420:2009. The table below shows the dexterity rating of a glove as defined in EN420.

EN420 DEXTERITY RATING	Ø PIN DIAMETER IN MM.
1	11
2	9.5
3	8
4	6.5
5	5

Table 1. EN420 dexterity ratings. A glove is given a rating of 3 if the test subject was able to pick up from a smooth, flat surface a pin that is 8.5 mm thick while wearing those gloves.

1 A glove suitable for handling dry waste. See TYPE DW GLOVES ↗ [131].
2 ↗ III ② ③ any questions of choosing proper gloves and any questions on availability of gloves.

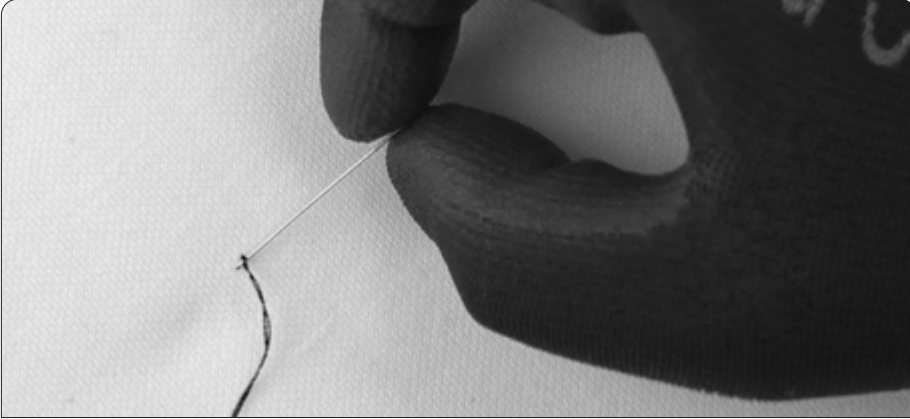


Image 42. A properly fitted polyurethane-coated TYPE DW glove is the best choice for jobs that require dexterity.

DISCUSSION

Introduce this activity as a contest to test the hypothesis that micro-segregation is difficult with gloves. Initiate the exercise.

Volunteer v1 will always win. If v2 is exceptionally dexterous, the contest will be close, but it is highly unlikely that she will win.¹ Regardless of who wins, point out that if someone can pick up needles with a glove, then clearly micro-segregation with gloves is not a problem! This activity dispels the myth that gloves reduce dexterity to the extent that work becomes significantly difficult or even impossible.

Ask the following questions and discuss the participants' responses:

- Why did v1 perform much better than the other?
- Did you think *you* (participants who did not volunteer) could pick up these needles while wearing gloves?
- Would you risk picking up *used* surgical needles without gloves?
- Would you risk sorting mixed waste if you suspected that it contained needles?

Picking up a needle while wearing nitrile or PVC gloves is a fiddly affair unless you know how—raise the needle slightly by levering the tip with the ring finger, and grasp the other end with your forefinger and thumb in one smooth motion.² The demonstration will defuse any objection to gloves on the grounds of dexterity. If you practice for fifteen minutes, you can pick up needles with gloved hands as fast or faster than someone who is not wearing gloves.

Repeat the demonstration with TYPE DW PVC- or nitrile-coated gloves. In the case of PVC gloves, ignore the size markings and wear the smallest size that fits snugly. Poorly fitted gloves can reduce sensory feedback from the fingertips and results in the worker exerting a higher gripping force than necessary, which results in fatigue. Fatigue is also increased by working against the fabric's tension while wearing gloves that are too tight, or trying to get a tight grip with stiff and bulky gloves. The demonstration also shows that PVC-coatings reduce tactile sensitivity a little more than polyurethane coatings of the same

¹ Before the activity begins, do not explain that v1 has been given properly fitted gloves or that you expect her to win.

² You should practice handling needles with TYPE DW gloves with both polyurethane and smooth nitrile coatings. [131]. With practice it is easy to finish the task in fewer than five seconds.



Image 43. (Slide 2) A properly fitted glove. The creases are clean and the fabric is perfectly contoured over the thumb, index and middle fingers. Also see IMAGE 45→[122]. The glove is neither too loose nor too tight.

thickness. If participants are curious about the different coatings, initiate III②⑥ COATING MATERIAL MATTERS→[152]. Safety should not be ignored for the sake of dexterity.

If the contest was hopelessly one-sided, reverse the odds by giving v1 the larger glove and v2 a properly fitted glove. The game can be played with progressively thinner objects such as a length of sewing thread. Remind them, repeatedly, during the exercise that the gloved volunteers are able to do tasks that far exceed the dexterity required for any micro-segregation job. A proper fit makes all the difference! Once the point is established, proceed to demonstrate how participants can determine if a glove fits them properly.

If you had asked the participants to watch out for people in the film who were wearing PPE, ask them about it. What kinds of gloves were they wearing? (SEE IMAGE 141→[345]). Ask the participants if any of the locations shown in the film were similar to their own workplaces.

🔄 In real life (unlike *Laxmi's Challenge*) an SWM worker would not know whether the waste was safe to handle, and they would not have the option not to handle waste—therefore, they ought always to handle mixed-waste as if contains hazardous objects. If the contents of a bag or bin (of, say, mixed waste) are unknown, it should be treated as if it may contain cut or puncture hazards. Does this mean that all door-to-door waste collectors must wear bulky gloves? No. Not Always. The GLOVE RECOMMENDATION PROCEDURE→[146] should be used to determine which type of gloves are appropriate for a given job.

☹️ Ask the men if they can walk comfortably while wearing shoes that are the incorrect size; ask the women if an incorrectly fitted blouse is comfortable. Walking on a surface littered with broken glass is much faster when one is wearing shoes. The typical attitude is that accidents happen very rarely. This is true—the probability of an accident is small for one person on a given day, but the risk increases exponentially over longer durations. You could initiate IV②④ THE ACCIDENT→[377], which demonstrates the relationship between a hazard, the duration of exposure, and the risk of injury.



Image 44. (from Film 2) Laxmi is injured by a sharp object inside the bin. She knew that the bin contained a broken bottle, three razor-blades, and a bulb but she was injured regardless.

§ GUIDELINES FOR DETERMINING CORRECT FIT

1. Ask for a volunteer and measure the ‘finger-length’ and ‘palm-width’ of her dominant hand as shown in IMAGE 46→[123]. Note down the recommended size from TABLE 2. Check if the glove-size chart (IMAGE 47→[124]) also recommends the same size.
2. The glove should not extend beyond the tips of the thumb, index and middle fingers on the dominant hand; the fabric should crease neatly when the fingers are bent (see IMAGE 43→[120], IMAGE 45→[122], and IMAGE 77→[167].)

FINGER LENGTH (IN cm)		GLOVE SIZE			PALM WIDTH (IN cm)	
MEN	WOMEN		MEN		WOMEN	
10.0-10.8		XXX-S	<5.0			
10.8-11.5		XX-S	5.0-5.8			
11.5-12.3		X-S	5.8-6.5			
12.4-13.0	10.0-10.5	SMALL (S)	6.5-7.5			
13.0-13.8	10.5-11.0	MEDIUM (M)	7.5-8.5		5.5-6.5	
13.8-14.5	11.0-11.5	LARGE (L)	8.5-9.8		6.5-7.5	
14.5-15.2		X-L	9.8-11.0		7.5-8.5	
15.2-15.9		XX-L	11.0-12.2			
15.9-16.5		XXX-L	12.2-13.7			

Table 2. Glove sizes as defined by one reputed manufacturer that provides different sizes for men and women. Other manufacturers have different measurements. The table is a starting point for determining fit. Workers should always wear the gloves to assess proper fit before purchase.

3. The fabric of good-quality gloves will invariably include stretchable yarns. Top-brand gloves use exotic fabrics, such as Lycra® and Spandex® that result in a proper fit that is comfortable and durable.
4. Cheap gloves are a false economy. Elastic threads made with cheap materials deteriorate fast, resulting in a loose-fitting glove— if it does not fit properly, it is unfit for use.



Image 45. (L) Properly fitted polyurethane-coated glove. (R) A PVC glove of the same size does not fit properly. Note the excess material extending beyond the tips of the fingers. See IMAGE 67→[151] for another photograph of the same PVC glove.

5. Different manufacturers use different sizes—SIZE M from one manufacturer and SIZE S from another may be the correct fit for the same person. Invite participants to check if this applies to them. Sometimes, glove sizes from a single manufacturer may vary from one batch to another—this is especially true for inexpensive gloves.
6. If the perfect fit is between sizes, the smaller size is preferable when selecting TYPE DW gloves for work that requires dexterity. The fit should be snug, but not tight—the fabric should follow the contours of the back of the hand, and should stretch uniformly when the user's fingers are flexed.³ A glove that is too tight will cause fatigue since the fingers exert more force to overcome the elasticity of the fabric.
7. Most SWM workers in India are given SIZE M gloves, which are too large for women. Sizes S and X-S suit most women.
8. Cheap gloves have a distinctive lumpy finish (see IMAGE 45→[122]), which is a consequence of penny-pinching during the manufacturing process—uncoated gloves are stretched over a 'standard-size' form (to save time and tool-changes), then dipped into the liquid coating material. When the coating dries, the fabric bunches up since the tension (that was created by stretching it over the form) is now absent. Top-brand manufacturers use correctly-sized forms, which result in a coating with an even finish since the fabric was not under tension when it was coated.
9. The coating on cheap gloves is less durable than that on premium gloves. Nevertheless, if gloves are required for a given job, using inexpensive, *properly-fitted* gloves is preferable to working without them.
10. Makeshift contrivances such as electrical tape, rubber bands or string should not be used to cinch the cuff of a loose glove. These can cause fatigue when used for long periods because they restrict the movement of the tendons in the wrist.

Your assistant should help *all* participants at the workshop measure their dominant hand, and determine their glove size—merely showing them images of proper fit is not enough. They should try on a pair of TYPE DW polyurethane-coated gloves of the correct size and verify that they fit properly. All participants must know where to measure their

3 Also see PROPERTIES OF VARIOUS FABRICS→[133], and STANDARD GLOVE-KIT→[149].

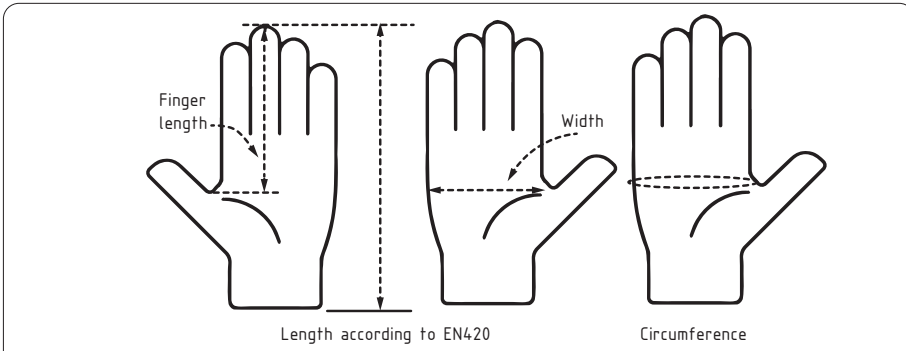


Image 46. (L) EN420:2003+A1:2009 defines the length of a glove as the distance from the cuff to the tip of the middle finger. Most manufacturers, however, use *finger-length* as a measuring standard, which is calculated from the base of the thumb to the tip of the middle finger; (M) and *width of the palm*, calculated from the base of the thumb as shown. (R) Some manufacturers use the *circumference of the palm* as a reference for size.

hand and determine their glove size— they should be able to tell employers that they wear, say, a SIZE X-S glove made by a particular manufacturer. Better still, they should be able to show their employer a glove that fits perfectly—you should give all participants a pair of perfectly-fitted TYPE DW gloves at the workshop.

If you intend to distribute gloves at the workshop, bring 30 pairs each of SIZE X-S and SIZE S— these should fit most participants. Also bring ten pairs of SIZE M, and five pairs of SIZE L. Never distribute gloves that do not fit properly. Thousands of ill-fitting gloves have been given to SWM workers—these hinder work and are discarded within minutes

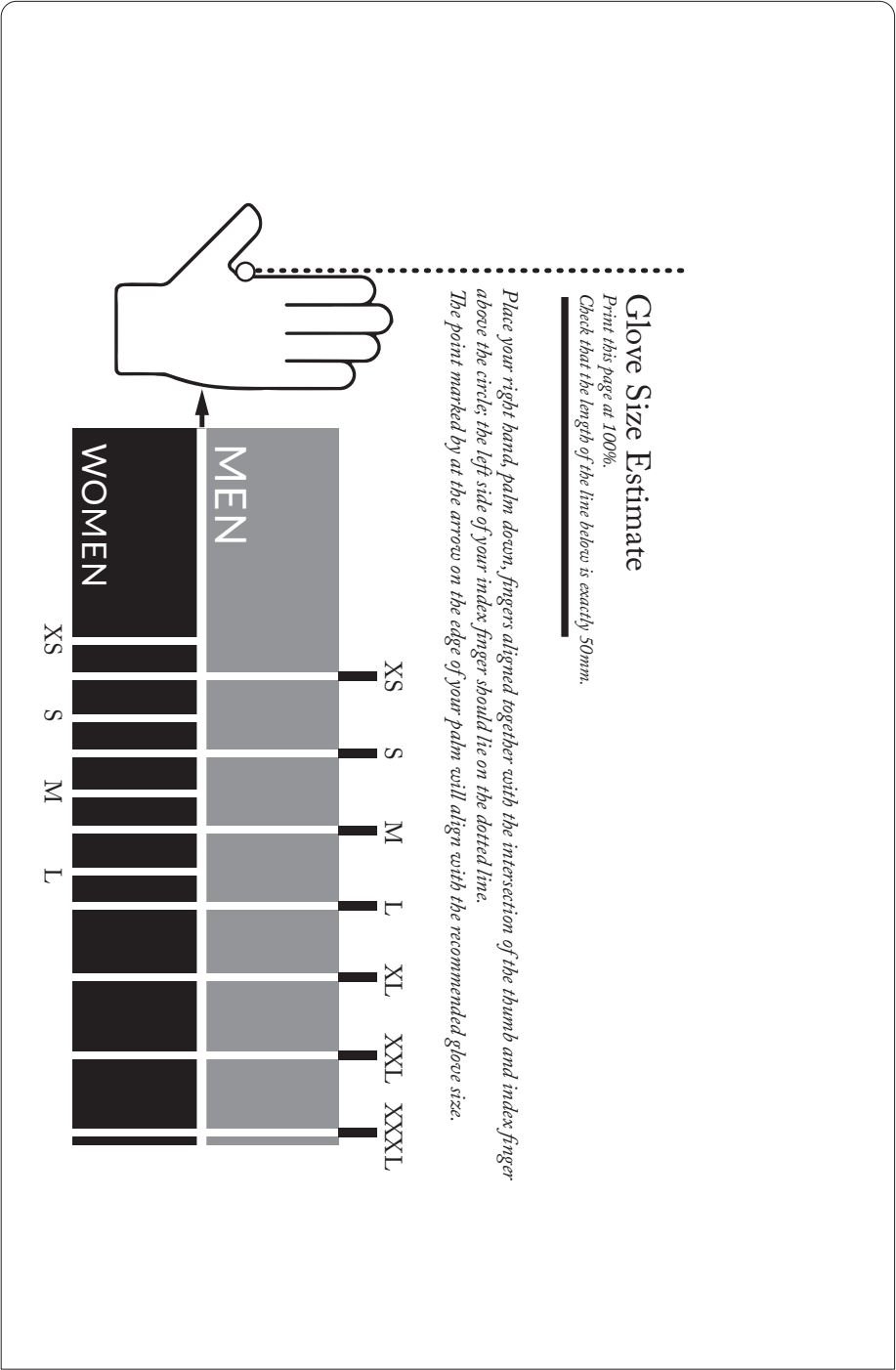


Image 47. Glove-size estimate. This image can be used to estimate your glove size. Note that the chart merely provides an estimate—gloves should always be worn to assess proper fit. This chart is based on the sizing chart used for Ironclad® gloves.

ACTIVITY 2

EN388 and other glove standards

Objectives

- Know the different standards for safety gloves suitable for handling dry waste, and how to interpret a glove's rating, as specified by that standard.
- Know how the fabric substrate, weave, coating material, and texture affect the performance of a glove. Know when to choose a speciality glove for jobs that require extra protection.
- Know how to interpret a glove's EN388 or ANSI safety rating.

Steps

- Display [S]1 and explain how to interpret the number below the EN388 pictogram. Use a commonly used glove rated, say, 4121 as an example.
- Initiate discussion on selection of appropriate gloves from first-principles: how do the fabric, coating, texture, construction techniques, and any specific safety features in a glove affect its performance? Use the P2P method.
- Discuss the pros and cons of using specialist TYPE S gloves.

Notes

- This activity contains technical information that is not required by those who do *not* create Standard Glove Kit or do *not* use PPE at work, such as NGO employees, administrators, and so on. Skip the activity entirely.
- With non-technical participants and SWM workers, discuss only the procedure to interpret EN388 rating numbers → [127]. Skip the rest.
- Workers and administrators who are responsible for health and safety, and those who make purchase recommendations will prefer a question and answer session. Start with EN388 RATINGS: A GLOVE'S REPORT CARD → [127], then open the floor to questions. Encourage them to describe the problems they face at work and use the P2P method to find solutions. Alternatively, you could use the information in this activity in discussions during III ② ③ GLOVE RECOMMENDATION: S.O.P. → [145].
- Useful online references for all PPE: @vtrq46r. For gloves, see @whjfp6s.
- Bring samples of TYPE S gloves to the workshop.

Slides

- [S]1: EN388 standard.



Image 48. Generic, commonly available TYPE DW glove with polyurethane coating. It has an EN388 rating of 4131. What do these numbers mean?

SAFETY GLOVE STANDARDS

👉 The EN420:2003+A1:2009 standard defines the properties (physical, chemical and mechanical) that are required in a glove to be classified as a “safety glove”. These include acceptable pH range, maximum chromium VI (hexavalent chromium) content of leather gloves, water vapour transmission and absorption, and minimum length. EN420:2003+A1:2009 is the base standard upon which other specific safety glove standards are built. The standard includes procedures to examine and standardise the sizing of gloves and to measure the dexterity of users while wearing gloves. Glove-length is measured from the base of the cuff to the tip of the middle finger as shown in IMAGE 46 → [123]. Dexterity is measured by asking testers to wear gloves as per the manufacturer’s recommended size and try to pick up pins that measure 5 mm to 11 mm in diameter. The levels of performance are rated as follows: 1 = minimum, 2 = good, 3 = very good, 4 and 4+ = excellent, 0 = no protection, x = performance not measured, as shown in TABLE 1 → [118]. Working gloves are divided into three categories:



CATEGORY I: *Gloves designed to protect against minimal risks.* Household gloves for cleaning and for protection against warm objects or temperatures that do not exceed 50°C, fabric and flexible leather gloves usually fall under Category I. Manufacturers are permitted to test and certify such gloves in-house. Category I gloves may carry the CE marking.¹

CATEGORY II: *Gloves designed to protect against intermediate risks.* The category includes TYPE GP gloves that require good puncture and abrasion performance in accordance with EN388 → [127].

CATEGORY III: *Gloves with complex designs that protect against irreversible injuries and mortal risks.* Gloves under Categories II and III must be independently tested and certified by a Notified Body approved by the European Commission.

¹ CE, from *Conformité Européenne* or European Conformity/Standard.



EN 388			EN 388		
4344			4344DX		
	Test	Rating		Test	Rating
	Abrasion	1-4		Abrasion	1-4
	Cut (Coup Test)	1-5		Cut (Coup Test)	1-5
	Tear	1-4		Tear	1-4
	Puncture	1-4		Puncture	1-4
Previous Standard				Cut (TDM-100)	A-F
				Impact	P,F,X

Image 49. (Slide 1) EN388 standard for mechanical gloves. (L) EN388:2003 standard; (R) EN388:2016, the current standard.

EN388 RATINGS: A GLOVE'S REPORT CARD



To carry the EN388:2016 pictogram shown to the left and be classified as a *safety glove*, a glove must pass the requirements of EN420:2003+A1:2009; then it must meet the criteria defined in EN388:2016+A1:2018, which is the most recent version of the European safety standard for safety gloves that are designed to protect against mechanical hazards. EN388:2016 uses index values to rate a glove's resistance to abrasive materials, cutting edges tear, puncture and impacts, which are measured in standardised tests. The glove's test scores are listed below the pictogram as a four digits followed by two letters. The numbers from left to right indicate abrasion-resistance, cut-resistance measured by the coup test, tear-resistance and puncture-resistance on a scale of 1-4; the exception is cut-resistance, which is a 5-mark test. The glove must receive at least one score of 1 or more to qualify for certification. The coup test², which measures the cut-resistance of a material relative to sample of 'standard' cotton fabric, was the test-protocol defined in EN388:2003. The coup test is now supplemented by an additional test defined in EN ISO 13997:1999. For most participants, a brief description of the process to interpret EN388:2016 test results should be adequate.³

What does 4131 say about this glove that I am wearing? Think of the number as the glove's report-card. This glove scored $\frac{4}{4}$, $\frac{1}{5}$, $\frac{3}{4}$, and $\frac{1}{4}$ in the tests for ACTP, which means abrasion-resistance, cut-resistance, tear-resistance and puncture-resistance, respectively.

The first result, 4, means that the glove affords excellent protection when handling rough, abrasive surfaces such as tyres, ropes, and so on. This is a durable glove.

The second result indicates cut-resistance. This glove's score of $\frac{1}{5}$ is the minimum pass

² Coup, from *couper*, which means *cut* in French.

³ Safety gloves available in most Indian cities in 2019 carried EN388:2003 ratings. An industry-wide shift to EN388:2016 markings will happen within a few years. No gloves with Indian safety ratings were found in the market. A few gloves carried both EN388 and ANSI:105 ratings.

mark, which does not mean that it is a low quality glove! It merely means that the glove was not designed for working with sharp-edged objects like glass and metal scrap. A cut-rating of X indicates that the glove was tested to the 2016 standard. In such cases the first letter (A–F) after the four numbers indicates the glove's cut-rating: A is the lowest score, F is the highest. Also, a glove with a high cut-resistance score of $\frac{5}{5}$ or F does not necessarily mean that it is the best glove for, say, handling mixed-waste.


The best glove is the least expensive one that allows you to do the job at hand safely, comfortably and efficiently. F-rated gloves are expensive. You should decide whether the extra protection is worth the price.

The third result, 3, indicates that the glove does not tear easily. It is not tear-proof, but not flimsy either. A rating of 3 is recommended for general material and cargo handling and light dry-waste sorting jobs. A rating of 2 is the minimum required for most SWM jobs.

The last result, $\frac{1}{4}$, is the minimum score for puncture resistance. It will not protect you from pointed objects like splinters. Therefore, the numbers indicate that this glove, which rated 4131, is best suited for material handling jobs and light sorting. It is not designed for handling sharp or pointed objects.

§ ANSI 105:2015 CUT-RATINGS

Safety gloves in North America carry an ANSI/ISEA rating. ANSI is the American National Standards Institute; ISEA is the International Safety Equipment Association. ANSI/ISEA 105 describes the standard procedures for measuring resistance to cuts, abrasion, tearing and punctures. ANSI 105:2016 cut-ratings are determined with a standard test described in ASTM F2992-15 (*Standard Test Method for Measuring Cut Resistance of Materials Used in Protective Clothing with Tomodynamometer* (model TDM-100) *Test Equipment*).

 Before 2016, EN388:2003 and ANSI/ISEA 105:2005 cut-levels had different reporting methods and requirements, which made comparison of cut-protection levels difficult. The coup test, used to determine cut-protection in the EN388 standard, reports the number of repeated cutting movements in the same position that are required to cut through the test fabric under a static load of 5N; the TDM-100 test, used in ANSI 105, reports the force required by a new blade to cut through the test fabric. The most recent versions of both the standards have harmonized their testing and reporting methods. While EN388:2016 still allows the use of coup test results (the second number under the pictogram), the protocol defined in ISO 13997:1999, which uses the TDM-100 apparatus is now mandatory. This test result is indicated by a letter (A–F) after the four numbers.

JOB	ANSI 105	EN388:2003	EN388:2016
Jobs that do not require any contact with waste.	A1	1,2	A
General cargo handling.	A2	3	B
Dry-waste sorting, packaging operations that use nylon box-packing strips, baling, processing hard plastics like PET.	A3	4,5	C

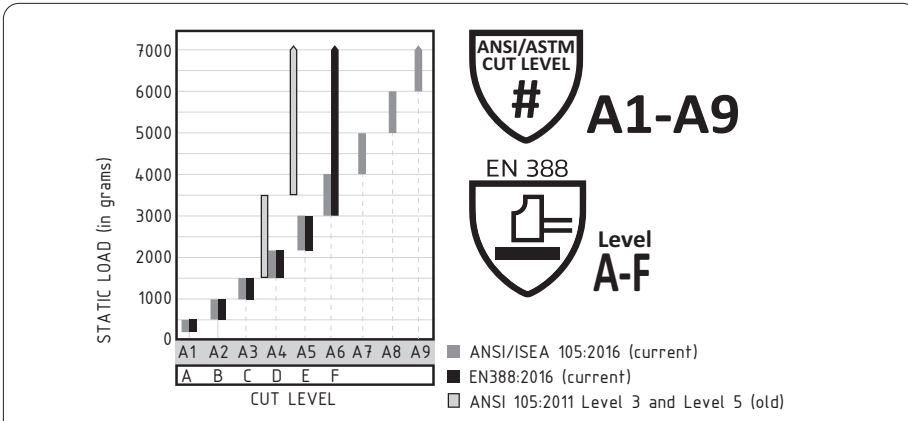


Image 50. Comparison of cut-protection as defined by EN388:2016 and ANSI/ISEA:105:2015 gloves.

JOB	ANSI 105	EN388:2003	EN388:2016
Handling and processing glass and metal waste, and household mixed waste. Baling and boxing with metal strips.	A4	5	D
Cutting operations such as stripping insulation, cutting rubber pipes, disassembly of e-waste products.	A5	5	E
Industrial-scale disassembly work such as ship-breaking, and metal-stamping jobs.	A6	5	F
Handling mixed-waste from unknown sources with high-risk cut and puncture hazards and non-segregated medical waste. Disposal of non-segregated medical waste is illegal.*	A7+	5	F

Table 3. Recommended ANSI 105:2015 and EN388 cut-ratings for typical SWM jobs. *Use the HOHC—elimination, engineering and administrative controls before using PPE to solve such problems. Workers handling non-segregated bio-medical waste should use an A7+ TYPE DW glove over a TYPE WW surgical glove.

An EN388:2016 cut-rating of D (or ANSI/ISEA:105:2015 A4) is the catch-all recommendation for SWM jobs, though lower ratings are usually adequate for most jobs. Under *static* cutting loads of up to 30N (the force exerted by a load of approximately 3000 grams), the A1-A6 ANSI/ISEA levels are more or less equivalent to the A-F levels in EN388:2016. The ANSI/ISEA scale has three additional levels (A7-A9) for loads up to 60N (or a static load up to 7000 grams). The extra levels on the ANSI scale allow workers to fine-tune their selection of gloves, which may result in lower costs since gloves rated A6 and above are made with exotic (and more expensive) materials such as Dyneema® and Kevlar®. The same principle applies to recommending the appropriate ratings of puncture and abrasion resistance of a glove for a job. When you make recommendations, always fit the job (i.e., the hazards a worker may encounter while doing a task) to an appropriate glove.

TABLE 3→[129] shows how to match a job to the cut-hazard level appropriate for that job.

The cut-protection rating in both EN and ANSI standards relates only to those cut-hazards that are similar to the cutting action of a *smooth cutting edge*. Protection from serrated edges, abrasive cutting edges, impacts with sharp edges, or shearing cuts (from saws, grinders, cleavers, and scissors, respectively) are outside the scope of the test as are any puncture hazards that often accompany cut-hazards.

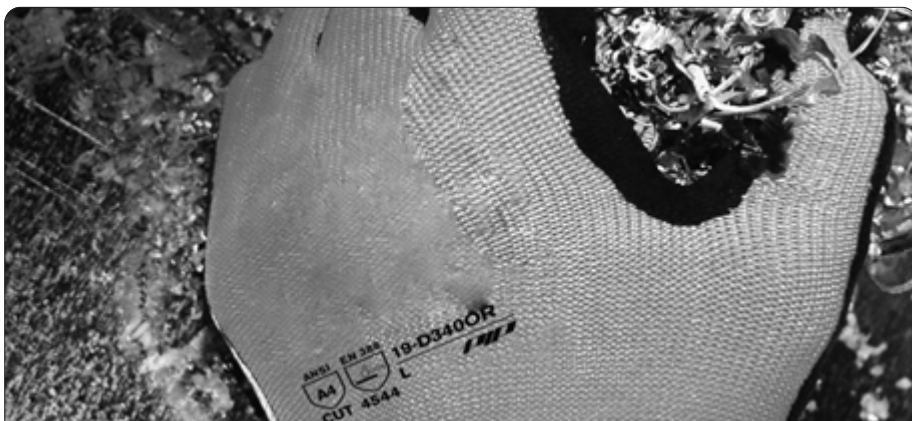


Image 51. TYPE DW Kevlar® glove with nitrile coating, rated 4544. Appropriate for handling sharp materials. The image shows a worker handling metal filings and swarf.

When a participant describes a situation that resembles a ‘cut-hazard’, it is *your* job to clarify the nature of the hazard, i.e., is it a cut-hazard, a puncture-hazard or a combination of the two, e.g., hypodermic needles are very different from the tip of the standard probes used in puncture tests for EN388 and ASTM 1790. The tip of a hypodermic needle has a sharp bevelled edge, which cuts the fabric as it pierces it. Standard probes don’t cut; they stress the material until the fibres are either forced apart or break. However, this does not mean that SWM workers must use a glove specially designed to handle hypodermic needles just in case someone callously discards one into the household waste-bin: the solution, *in the short term*, would be a fully covered TYPE DW glove rated ANSI A7 or better with Level 4 puncture-resistance. The sustainable, long-term solution would be to eliminate the hazard. A glove appropriate for handling mixed waste (such as the one shown in IMAGE 64, [146], LEFT) should only be recommended for jobs that require workers to touch mixed waste all the time. Also, you should investigate if a job necessarily requires workers to touch mixed waste, and whether she can be isolated from the hazard with the use of appropriate handling jigs or other equipment.

§ INDIAN PPE STANDARDS FOR SAFETY GLOVES

In India, PPE guidelines are defined in the following standards: IS 8519: 1977, IS 8520: 1977, IS 5983: 1980, IS 5557: 1999, and others. Specifications for safety gloves are defined in IS 6994: 1973, Part 1 (which defines standards for industrial safety gloves made from leather and cotton) and IS 8807: 1978 (which is a technical guide for selection of PPE for arms and hands).

This handbook does not refer to BIS standards⁴ simply because most manufacturers of PPE follow the criteria laid down in EN-ISO and ANSI standards. Consequently, the rating stamps on most PPE invariably mention either EN-ISO ratings or ANSI ratings, or both, instead of BIS ratings.

⁴ Industrial safety standards in India are maintained by the Directorate General, Factory Advice Service and Labour Institutes (<https://dgfasli.gov.in/>) which reports to the Ministry of Labour. Standards may be read at: <https://services.bis.gov.in>

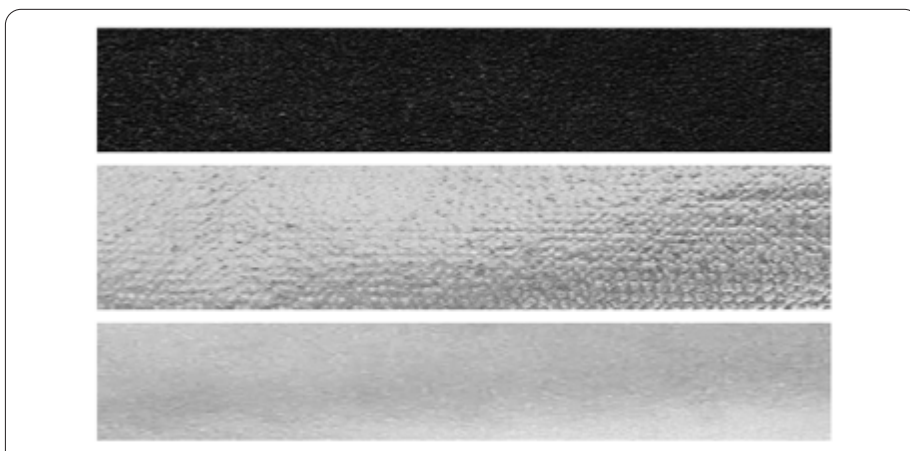


Image 52. (From top to bottom) Smooth nitrile, polyurethane, and PVC coatings on TYPE DW gloves.

TYPE DW GLOVES

‘TYPE DW’ gloves is a grouping convention *used in this handbook* for mechanical gloves that are partially-coated (uncoated back with coated palms and fingers). TYPE DW gloves are used to handle dry waste (DW); SWM professionals usually call them *dry-waste gloves* and so should you. Explain why you prefix the word *appropriate* to all PPE.

I am going to use the word ‘appropriate’ a lot. In the context of PPE the word simultaneously means ‘suitable,’ ‘fitting,’ ‘adequate,’ and ‘relevant.’

Properties of various coatings.

Coatings made from latex, neoprene, nitrile, and PVC are recommended for most SWM jobs. Butyl rubber, PVA, Viton®, and other polymers designed for speciality uses are not described in this handbook. While exotic materials might offer additional benefits to those who can afford them they are often too expensive to justify the marginal performance increase.

1. Latex coatings have excellent dry grip, high elasticity, and high cut- and heat-resistance. However, they degrade in contact with many hydrocarbons and organic solvents.
2. PVC coatings are more durable and cheaper than both nitrile and polyurethane. PVC coatings reduce tactile sensitivity the most (given that all other factors are equal). PVC is, by far, the best coating when working with adhesives.
3. Nitrile⁵ coatings offer a practical balance between sensitivity, protection from cuts and punctures, and impermeability to liquids. Nitrile is exceptionally resistant to oils.
4. Polyurethane coatings are comfortable, stretchable, highly breathable and offer the best tactile sensitivity. They are not suited for working with wet and oily substances and hot (>60°C) surfaces.

⁵ Nitrile-rubber, also known as NBR, Buna-N, and acrylonitrile butadiene rubber, is a synthetic rubber co-polymer of acrylonitrile and butadiene. Different nitrile rubbers are all referred to as *nitrile* in this handbook. If the word *rubber* is used alone, it refers to latex or natural rubber.

5. Neoprene-coatings are suitable for most jobs. However, it is a relatively expensive material; most exotic coatings, such as pva, butyl, and Viton® are not recommended for jobs done by SWM workers.
6. TYPE DW gloves, regardless of the coating material used, are unsuitable for handling biomedical waste or in any job that requires handling of contaminated liquids and hazardous chemicals. Such jobs should be done only with TYPE WW gloves⁶.
7. The coating material or the thickness of the coating does not increase the cut-protection offered by a glove. Cut-protection is determined principally by the fabric used in the glove, the number of layers of fabric and the method used to bind the different layers. Indeed, thick coatings can reduce the cut-protection of both knitted and woven single-layer fabrics. Thick coatings prevent the yarn from flexing or rolling in response to a cutting edge, which reduces the cut-protection of the glove. See PROPERTIES OF VARIOUS FABRICS → [133].
8. Coatings influence the puncture-resistance of a glove. Thick coatings or multiple layers of thinly-coated fabrics improve puncture-resistance at the cost of dexterity. Puncture resistance is also improved by the use of composite fibres and materials which are made with yarn or threads⁷ that are coated (or otherwise treated to improve their strength) before they are woven. See PROPERTIES OF VARIOUS FABRICS → [133].
9. Some gloves have features such as padded or capped fingers, palms with rubber- and gel-pads and so on, designed to protect from impacts or to dampen vibrations. These are considered TYPE S gloves and discussed in IMPACT PROTECTION → [139].
10. Gloves that are designed for specialist jobs that require protection from high temperatures and splashes of molten metal (hazards typically faced by SWM workers in the ship-breaking business) and are described in HEAT RESISTANCE → [141].

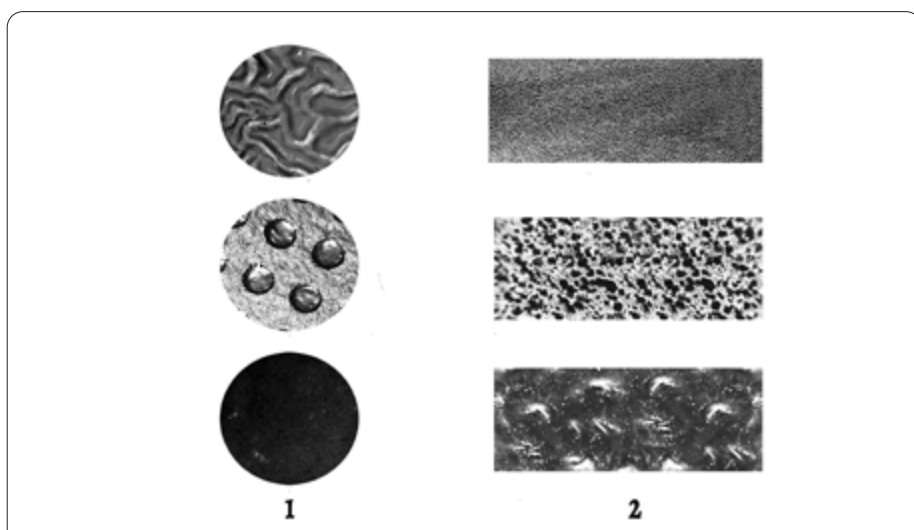


Image 53. (1). Coarse nitrile textures (from top to bottom) etched, dotted, and smooth. (2) Fine textures (magnified 20x) micropore, air-injected foam, and smooth (magnified 50x). The gaps in air-injected and micropore textures act as suction cups.

6 See © BIO-MEDICAL WASTE → [324] for PPE that is appropriate for these jobs.

7 See PROPERTIES OF VARIOUS FABRICS → [133].for the difference between fibre, yarn, and thread.

Properties of various textures

1. Smooth textures are suitable for general purpose work. They are a commonly available option for nitrile-coated and PVC-coated TYPE DW gloves.
2. Foam-textures are available as an option for nitrile-coated gloves. This texture improves tactile sensitivity at the fingertips, especially when working with wet or oily surfaces and is best suited for jobs that require dexterity such as label-removal.
3. Micropore (also called *micro-finish*) textures are an intermediate option available for gloves with a nitrile coating. They offer a level of sensitivity that is lower than foam and higher than smooth-textured gloves. Micropore textures are more durable than foam textures, and are commonly available.
4. Residual moisture on thick, textured gloves can harbour bacteria and mould.
5. Coarse textures such as dots and ribs are usually found on TYPE GP gloves intended for material handling jobs. The extra grip from these textures depends on their size and hardness of the coating-material used: small, hard dots are purely cosmetic; large dots or ribs made from a soft material improve *grip* when handling smooth, hard materials that present cut hazards, such as glass. They do *not* improve cut-resistance.
6. Stylised thick textures of any kind do not offer protection against crushing impacts. Pads and thick coatings that absorb or deflect impacts, and dampen vibrations are available on some TYPE S gloves (see IMAGE 6I→[14I]). .

COATING	DRY GRIP	WET GRIP	SUITABLE FOR ADHESIVES	DURABILITY OF COATING*	DEXTERITY
Polyurethane	Good	Moderate	Poor	Moderate	Excellent
Smooth nitrile	Good	Poor	Poor	Good	Moderate
Foam nitrile	Good	Good	Poor	Moderate	Good
Micro-finish nitrile	Good	Good	Poor	Good	Moderate
PVC	Good	Moderate	Excellent	Moderate	Moderate
Latex	Excellent	Poor	Poor	Good	Good

Table 4. Properties of different coatings and textures. *Refers to the durability of the coating, not the glove. A glove's durability depends largely on the fabric.

Properties of various fabrics

The cut-, tear- and puncture-resistance of a fabric depends upon the tensile properties of its yarn⁸, and the density of threads used to weave or knit it. Thick yarns are stronger than fine yarns; individual threads in knitted fabrics and coarsely woven fabrics can 'roll' when they come into contact with a knife edge, which results in superior cut-resistance; a dense weave of fine threads creates a flexible fabric that has better puncture-resistance than one of the same weight but made with thicker threads, loosely woven (see IMAGE 54→[134]). Gloves may have one or more layers of fabric. These layers may be independent or connected together e.g., glued, stitched, dipped, or impregnated. The base fabric is usually made of a polyester cloth or (rarely) cotton; the former dries faster. Stretchable

⁸ A fibre is a single filament of material; fibres are spun into yarn; two or more yarns are twisted together to make a thread; a fabric is made by weaving or knitting either threads or yarns.

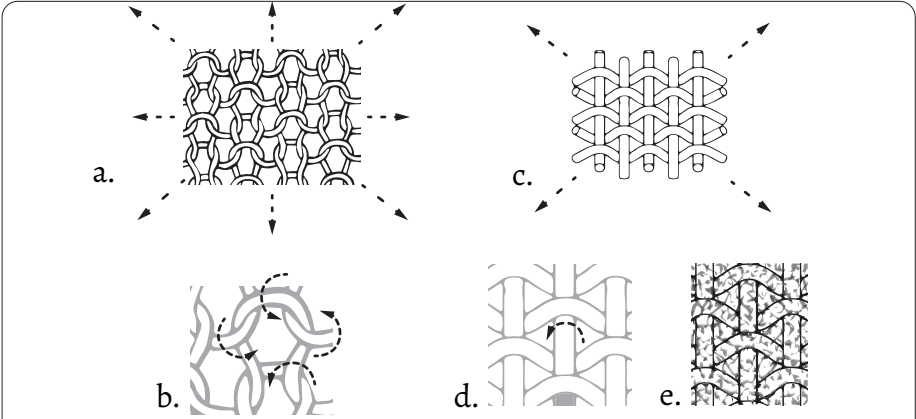


Image 54. Properties of knitted and woven fabrics. (a) Knitted fabrics can stretch in all directions, and (b) its threads can twist and roll freely, which improves its resistance to cuts. Inflexible, tough yarns can be knitted into a flexible fabric. Their flexibility significantly reduces their puncture-resistance. (c) The threads in woven fabrics can stretch a little along the diagonals. (d) The threads do not roll, twist, or slip significantly. This reduces their flexibility, but increases puncture resistance. (e) Coatings restrict the twisting and rolling movement of individual threads in a fabric; coatings may reduce cut-resistance of high-strength fabrics, but can increase puncture resistance.

materials such as elastane (used in Spandex® fabric) are woven into gloves to improve fit. Fibreglass, basalt continuous fibre (BCF), aramids, such as Kevlar® and UHMPE/HPPE⁹, PET-composite fibre, such as Dyneema® may be used in one or more protective layers to improve cut-resistance.

Fabrics used in safety gloves, ordered in decreasing strength, are Dyneema®, Kevlar®, BCF and fibreglass, nylon, polyester, cotton, and wool.

Fabrics with stainless-steel threads offer outstanding cut and puncture protection at the cost of reduced dexterity; as general rule, yarns (or threads) made from inexpensive materials must be thicker to match the cut-resistance of stronger exotic fabrics.

☹ A glove made of Dyneema® is both comfortable and durable, but expensive. Can a glove made with an exotic fabric be the appropriate choice?

FABRIC	CUT RESISTANCE	ABRASION RESISTANCE	DEXTERITY
7 gauge (ø=4.5mm) pure Kevlar®	3	2	3
7 gauge Kevlar®/stainless steel blend	4	2	2
15 gauge (ø=1.7mm) Dyneema®	3	3	4
10 gauge Dyneema®/stainless steel blend	4	3	4
10 gauge (ø=3.4mm) fibreglass/nylon blend	4	3	2
10 gauge stainless steel/polyester fabric.	4	2	2
Alycore®(a stainless steel composite fibre)	5	2	2

Table 5. Relative levels (on a scale of 1-5) of cut-resistance, abrasion-resistance and dexterity of different fabrics used to make safety gloves. Adapted from @ya4bx5ld.

9 Ultra High Modulus (or Molecular weight) Polyethylene, or High Performance Polyethylene.



Image 55. ♻ Back and front of a TYPE DW Dyneema® fabric glove with nitrile coating. Its palm and fingers are textured with large, soft dots. This glove has an EN388 rating of 4540 and can be used for handling sheets of glass and metal.

In most cases however, a pair of thick cotton-canvas gloves (with or without rubberised textures for grip) are adequate for material handling tasks. They are comfortable, protect the worker from dirt and debris, and significantly reduce the formation of calluses on the worker’s palms and fingers. Densely woven fabrics like duck cloth and heavy twill-weave fabrics (such as denim) are durable and can be waxed to create a water-repellent surface.

<div>MATERIAL</div> <div>PROPERTY</div>	WOVEN (COTTON-CANVAS)	KNIT (POLYBLEND)	NON-WOVEN (POLYBLEND)
Durability	+++	+	---
Cut resistance	=	++	--
Puncture resistance	++	--	--
Breathable	-	++	+
Fitting and flexibility	--	++	--
Water-resistance	++	-=	=+
UV Protection	++	-=	-=
Cost	=	+	--
As masks	+	---	+++

Table 6. Relative properties of woven, knit and non-woven fabrics. -, =, and + respectively mean lower, neutral and higher.



Image 56. Different kinds of TYPE GP gloves. (a) Leather, with textured leather (nubuck) grip, (b) Knit fabric with leather fingers and double-leather palm, (c) Poly-blend knit (PET cotton and elastane) with rubber dots, (d) uncoated knit wool, (e) Twill-woven rag-canvas with rubber dots with an elastic knit cuff, (f) Waxed, densely woven cotton-canvas gloves. The material is also called duck cloth. The gloves (a-f) are listed in descending order by price.

TYPE GP GLOVES

Gloves that are appropriate for general purpose material handling jobs are called TYPE GP gloves in the handbook.¹⁰ The most common ones are:

1. Leather gloves.
2. Woven or knitted, uncoated fabric (nylon, cotton, rag canvas, wool, poly-blend, and so on) gloves.
3. Woven or knitted fabric gloves with textured or dotted rubber grips.
4. Woven or knitted, waxed cotton-canvas gloves.

Duck-cloth gloves made from twill-woven, waxed cotton-canvas are comfortable, durable and inexpensive. Material handling and some dry-waste sorting tasks may be done safely with TYPE GP duck-cloth gloves since they protect against dirt and chafing. They do not provide sufficient protection for use with rough or sharp materials. They do, however, allow a stronger grip than bare hands, and reduce the formation of calluses.¹¹

Leather has been the material of choice for workers' gloves for many centuries. They offer protection against sparks and heat, and are resistant to abrasion and tearing. Leather is *not* cut-resistant and should not be used to handle materials with sharp edges, such as blades, broken ceramic and glass; it is not recommended for tasks that require tactile sensitivity. Leather gloves are also appropriate for operations that require handling of thick ropes, hot, dry surfaces (leather can protect from temperatures ~200 °c for short durations without degrading) or using cargo-handling equipment, such as trolleys, carts, winches and so on. They may also be used for loading, unloading and other

¹⁰ Ask participants if any of the workers in Laxmi makes a film were wearing TYPE GP gloves.

¹¹ An SWM worker mentioned an incident that applies to material handling gloves in EXERCISE 33 → [355].



Image 57. (L) TYPE GP safety glove made with knitted 7-gauge pure Kevlar® threads. It may look like a plain, knitted cotton glove, but its cut-protection is five times better; it is lighter and dries faster. (R) A glove made with 7-gauge Kevlar® and stainless steel threads.

material handling tasks. Leather gloves are extremely durable if properly maintained. Leather gloves should be wiped clean with a damp cloth at the end of the day. Periodic application of linseed or mineral oil is essential to keep the leather supple and prevent cracks. Full-grain leather gloves will endure many years of hard use if they are properly maintained. They can be used as an outer glove on one hand to spread dry waste on a moving conveyor, while the dominant hand wears the appropriate TYPE DW glove for sorting and grading.

Inexpensive, synthetic leather gloves may be used in jobs that do not require the heat-resistance of natural leather.

Premium TYPE GP gloves (See IMAGE 56→[I36]B and C) have elastic threads incorporated into the weave, multiple layers of woven or knit fabrics, caps made from an abrasion-resistant material, and other features designed to improve comfort, fit and durability.

♻️ SWM workers should carry one pair of cotton-canvas gloves in their kit at all times.

🕒 Participants who work at mechanised SWM factories will benefit from a discussion on the relative merits of cotton-canvas gloves and TYPE DW polyurethane-coated gloves that are rated 2121 or 4121. TYPE GP gloves are adequate for most of the jobs done in mechanised units. Discuss durability, availability, ease of washing and drying, cost, and comfort of each type of glove. Carry a complete set (one of each TYPE GP glove shown in IMAGE 56→[I36]) as well as different kinds of cotton-canvas TYPE GP gloves with you. Let participants try them on.



Image 58. Glove rated EN388 4543F and ANSI A8, appropriate for jobs that present extreme cut and puncture hazards. These gloves are relatively expensive, costing more than ₹800 for a pair. Participants often ask if e-waste workers should use such gloves if they handle glass—such workers often deal with fragile incandescent and fluorescent bulbs. Selection of PPE depends on the job, and only after engineering controls have been implemented. Can the hazard be reduced by the use of tools and jigs? If so, that is the appropriate recommendation.

Further reading

- Guide® Gloves. Safety Standards. @tbrzxm
- Health and Safety International Magazine. @jjv7m76n
- IS:6994(1) Specification for Industrial Safety Gloves (Part 1, Leather and cotton gloves). @5233kfs7
- IS 8807: Guide for selection of industrial safety equipment for protection of arms and hands. @5e9mfr2b
- OH&S Magazine. November 2015. @86zjt看vav
- ISO 7211-1. Textiles—Woven fabrics—Construction—Methods of analysis—Part 1: Methods for the presentation of a weave diagram and plans for drafting, denting and lifting; Part 2: Determination of number of threads per unit length (ISO 7211-2:1984 modified); Part 4: Determination of twist in yarn removed from fabric; Part 5: Determination of linear density of yarn removed from fabric.
- EN ISO 12947-1, Textiles — Determination of the abrasion resistance of fabrics by the Martindale method.



Image 59. TYPE S stainless steel chain-mail glove.

TYPE S GLOVES

Some SWM jobs may require specialist TYPE S gloves for a variety of reasons: company-specific variations in jobs or tasks, workers who have begun to use power tools for jobs that were traditionally done using hand-tools, SWM workers being asked to take on work that was previously done by other tradesmen and so on. Recognizing the need for extra protection for a particular task and recommending appropriate PPE is *your* job. The risks of not getting it right leaves workers open to injury; over-specifying can be as costly and dangerous as under-specifying, with evidence showing that workers won't wear personal protective equipment if it is cumbersome, uncomfortable or restrictive.

§ CUT PROTECTION

The glove shown in IMAGE 59 is made of stainless steel chain-mail. It is immune to slashing cuts, easy to clean, and durable; it offers no protection against puncture and crush hazards, and no grip when handling hard, smooth surfaces. Such gloves are used primarily by butchers and fishmongers and may prove useful for swm workers at composting units that do not have a mechanical shredder—some composting jobs require workers to chop organic waste into manageable chunks before it is composted. TYPE S stainless steel gloves may be worn over a type WW nitrile glove on the non-dominant hand while performing such jobs. The glove shown in IMAGE 58 offers protection from extreme cut-hazards.

§ IMPACT PROTECTION

Impact injuries are the most common hand-related hazards. Impact wounds most often affect the muscles, skin and bones on the back of the hands, i.e., the dorsal side. The most common impact injuries in SWM workers occur when their fingers or hands get trapped between or under heavy crates, equipment, or drums while moving them (see IMAGE 71 → [157]). However, TYPE S gloves will not prevent injury in such accidents; they will merely reduce the severity of the injury; and a worker may walk away with a severely bruised hand instead of a fractured or crushed hand. Consider recommending TYPE S gloves for impact-protection only after weighing the pros and cons.

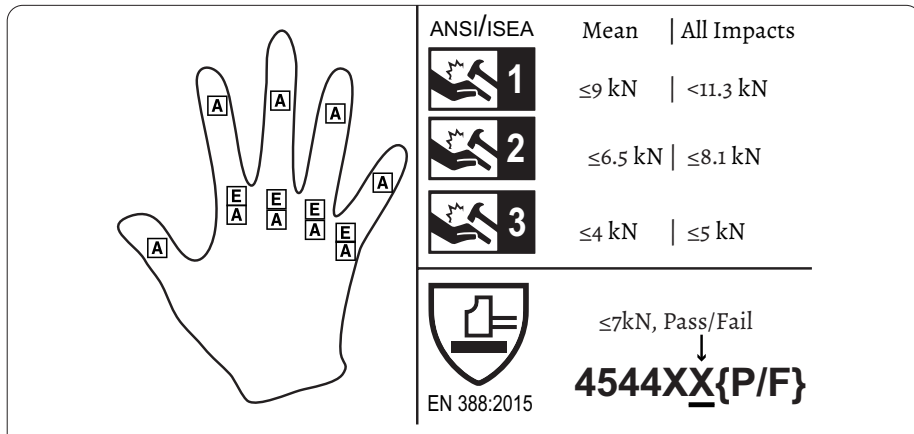


Image 60. Comparison of EN388 and ANSI impact protection rating. The ANSI 138 rating has three levels; the protection offered by gloves is tested at locations marked A and E. The EN388 rating is a pass or fail result (indicated by P or F) and is equivalent to ANSI Level 2; gloves are tested at locations marked E. Never purchase TYPE S gloves based solely on their appearance! Always check the EN388 or ANSI pictogram (Illustration credit: Drawing of hand by Kenny S.H., Wikimedia Commons.)

- Impact-protection gloves reduce the severity of pinch injuries—usually fingers getting trapped between heavy objects; they may be useful for SWM jobs that require workers to manoeuvre heavy objects, such as pallets, crates and bins in cramped areas. However, the relatively poor dexterity caused by using TYPE S gloves may increase the hazard. It might be safer, in some cases, to recommend TYPE GP gloves which allow greater dexterity, and use other controls in the HOHC to isolate or reduce the pinch hazard.
- TYPE S gloves may also be recommended for some manual disassembly and such jobs involving frequent (all-day) use of winches for handling heavy industrial scrap. Again, investigate the problem in detail before recommending a TYPE S glove.

§ VIBRATION PROTECTION

EN ISO 10819



Exposure to high levels of vibration is known to cause injury to workers over time. There are two categories of vibration exposure: hand-arm and whole-body vibration. Hand-arm vibration exposure (HAV) may damage the fingers and hand; symptoms include erratic tactile sensitivity, dexterity, and grip. Whole-body vibration (WBV) should be suspected of there is an unusually high incidence of lower back pain and back injuries among workers. Regular use of heavy rotary and reciprocating tools such as angle-grinders, impact-drills, pneumatic or electric impact-wrenches, and demolition hammers, etc., can cause HAV injury. The duration from initial exposure to onset of symptoms can depends on the type of tools used, and the intensity of vibration; the first symptoms may present in two years. EN ISO 10819:2013 defines the criteria for measuring protection against mechanical vibrations.

Wearing vibration-resistant gloves can help protect workers from these injuries. In all cases, however, eliminating or reducing the source of vibration is better than recommending TYPE S gloves. (See ②③ MECHANISED SWM OPERATIONS → [154].)



IMAGE 61. TYPE S gloves (L) with impact-protection pads on the back of the hand, and leather grip-pads on the fingers and palm and (R) with shock-absorbing pads on the palm and fingers. These pads reduce the fatigue and muscle-tension when working for long hours with power tools, such as impact drills and demolition hammers. Safety, then comfort should be the criteria to determine whether these special-purpose gloves are appropriate. Some workers prefer TYPE GP leather gloves for such jobs; others prefer a cushioned glove. (Photo credit: <https://workwear.co.uk>)

§ HEAT RESISTANCE



EN407 EN407 is the European standard that defines criteria for heat-protection. Heat-protection is defined and rated (on a scale of 1-4) on six criteria: Resistance to flammability, contact heat resistance, convective heat resistance, radiant heat resistance, resistance to small drops of molten metal, and resistance to large drops of molten metal.

RESISTANCE TO FLAMMABILITY indicates how soon a glove catches fire and the length of time it continues to burn, then glow after the fire is removed.

AFTER-BURN TIME (SECONDS)	AFTER-GLOW TIME (SECONDS)	RATING
Under 20 seconds	-	1
Under 10 seconds	Under 120 seconds	2
Under 3 seconds	Under 25 seconds	3
Under 2 seconds	Under 5 seconds	4

Table 7. EN407 criteria for ‘resistance to flammability.’

CONTACT HEAT RESISTANCE tests the thermal resistance of the palm of the glove by measuring the rate of temperature rise inside it. Palm samples are placed on plates heated to 100°C and 500°C. Performance is determined by how long it takes the temperature on the side opposite the sample to rise by 10°C. This is known as the threshold time. Gloves

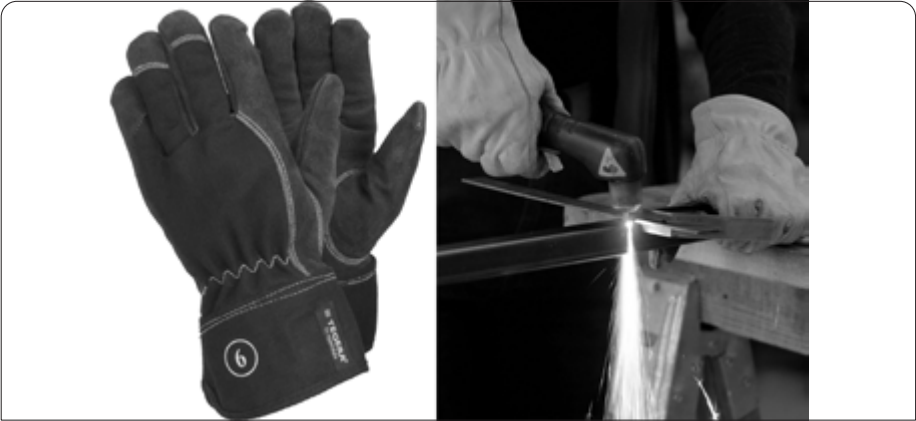


Image 62. (L) Ejendals Tegera 139. EN388:2016 4244B, EN407 4I324X; (R) Worker wearing leather ‘welding’ gloves. (Photo credits: (L) <https://workwear.co.uk>, (R): J. Bolles, Wikimedia Commons.)

must resist the increasing thermal load for at least 15 seconds to pass a given level. If a glove obtains an EN 407 Level 3 in this test, it should record at least EN 407 Level 3 in the test for resistance to flammability. If it does not, the maximum contact heat resistance is reported as Level 2.

TEMPERATURE AFTER 15 SECONDS	RATING
100°C	1
250°C	2
350°C	3
500°C	4

Table 8. EN407 Contact heat resistance ratings.

CONVECTIVE HEAT RESISTANCE is tested based on the length of time the glove can delay the transfer of heat from a flame. A level of performance is only mentioned if a performance Level 3 or 4 is obtained in the flammability test. This test resembles the resistance to flammability test; however, the flame is more aggressive and the cuff, back, and palm of the glove are tested separately. The goal is to determine how long it takes to raise the inner temperature of the glove by 24°C.

SECONDS	RATING
< 4 seconds	1
< 7 seconds	2
< 10 seconds	3
< 19 seconds	4

Table 9. EN407 Convective heat resistance ratings.

RADIANT HEAT RESISTANCE is measured with the length of time the glove is able to delay the transfer of heat when exposed to a radiant heat source. A level of performance is only mentioned if a performance Level 3 or 4 is obtained in the flammability test.

SECONDS	RATING
< 5 seconds	1
< 30 seconds	2
< 90 seconds	3
< 150 seconds	4

Table 10. EN407 Radiant heat resistance ratings.

RESISTANCE TO SMALL DROPS OF MOLTEN METAL is designed to assess a glove's protection when working with small amounts of molten metal—welding, brazing and plasma-cutting are examples of jobs that expose workers to this hazard. Two palm and two back-of-the-hand samples from the glove are exposed to small drops of a molten metal, such as copper. Protective performance is based on the number of drops needed to raise the temperature by 40°C on the opposite side of the sample. A level of performance is only mentioned if a performance Level 3 or 4 is obtained in the flammability test.

NUMBER OF DROPS	RATING
< 5	1
< 15	2
< 25	3
< 35	4

Table 11. EN407 Ratings for resistance to small drops of molten metal.

RESISTANCE TO LARGE DROPS OF MOLTEN METAL. Gloves rated under this criterion are designed for use by foundry workers. Molten metal, such as iron, is poured over a glove sample that, in turn, is placed over PVC foil. After each of three tests, the foil is assessed for changes. If a drop remains stuck to the sample, or it ignites or is punctured, the result is a failure.

GRAMS OF MOLTEN METAL	RATING
30g	1
60g	2
120g	3
200g	4

Table 12. EN407 Ratings for resistance to small drops of molten metal.

Working with plasma- or gas-cutting torches—usually on industrial-scale disassembly jobs—requires the use of an appropriate pair of EN407 gloves. Skilled and semi-skilled SWM workers who are trained to use such equipment will invariably also use some kind of leather heat-protection glove. These are sold as “welding gloves” and are available in most shops that sell welding equipment. There are a few exceptions. Many thousand unskilled workers employed at informal battery-recycling units often handle molten lead without using appropriate hand and foot protection. Discuss the use of EN407 gloves as well as appropriate shoes that offer protection against splashes of molten lead.



Image 63. A ship being dismantled for scrap in Alang, India. Though ship-breaking does not usually come to mind when discussing Solid Waste Management, what else is ship-breaking but recycling at an industrial scale? SWM workers in this sector are exposed to high-risk cut, puncture, impact, chemical, fire, and electrical hazards. (Photo credit: Anil C. Patel, Wikimedia Commons.)

§ CHECKLIST: TYPE S GLOVES

Use the following rules when evaluating the need for TYPE s gloves. These gloves should be recommended only after first eliminating other options in the HOHC.

1. Is the hazard intermittent? If an SWM worker is exposed to heat, impact, and vibration hazards all day, then a TYPE s glove may not be the ideal solution—apply the HOHC and investigate appropriate engineering controls. TYPE s gloves should be recommended only for prolonged exposure to hazards that cannot be eliminated or isolated. They may be included as the third glove in a worker's STANDARD GLOVE-KIT → [149].
2. TYPE s gloves that provide cut-protection may be recommended for extended daily use only for worker facing extreme cut hazards that cannot be eliminated, e.g., for workers who handle broken glass all day.
3. SWM workers who operate plastic processing machinery (which have exposed hot surfaces) may not require additional speciality PPE if appropriate engineering controls are used: exposed hot surfaces may be covered with protective screens.
4. Certified TYPE s gloves are expensive—you should examine the job and nature of the hazard and discuss if the extra expense of a certified TYPE s glove is justified. Notice that the glove shown in IMAGE 62 → [142] is not very different from a sturdy leather glove. Sturdy leather gloves offer adequate protection from accidental contact with surfaces of 100°C–150°C.
5. Once you are certain that a TYPE s glove is required, use the procedure described in ②a GLOVE RECOMMENDATION: S.O.P. → [145] to identify the appropriate glove for the job.

ACTIVITY 2A

*Glove recommendation: S.O.P.**Objectives*

- Know the procedure to select an appropriate glove for a given job.

Steps

- Ask for a volunteer, and use the glove recommendation procedure to create a Standard Glove Kit suited to her job.

Notes

- You must prepare, in advance, two suitable Standard Glove Kits—one with size s, and another with size m gloves.
- Useful online references for all PPE: @vtrq46r. For gloves, see @whjfp6s. These should be bookmarked by your assistant for quickly checking if a glove (of given brand, size, type, and so on) is available in the city or from an online seller who delivers to the city.

Slides

- [5]1: Standard Glove Kit for swm workers.

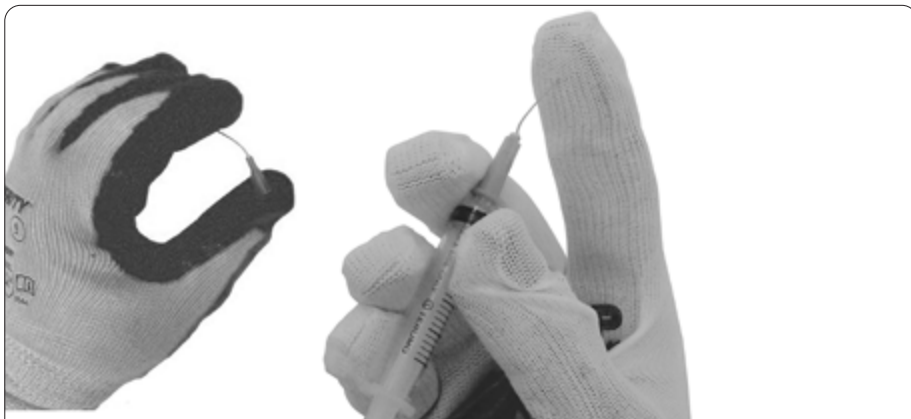


Image 64. ♻️ (L) EN3544 rated glove. (R) A TYPE S glove designed for handling hypodermic needles may not be appropriate for SWM workers handling mixed-waste because it has poor grip, inappropriate fit and is not durable enough for handling wet-waste. The nitrile-coated safety glove on the left is an excellent choice for handling mixed waste because its grip, comfort, cut and puncture protection are optimal for the job. If the job involves, say, removing needles from syringes, then the TYPE S glove is appropriate—it affords protection of both sides of the hands, and not just the palm.

SELECTING TYPE DW GLOVES

Cut and puncture resistance (indicated by the EN388 or ANSI 105 rating, discussed earlier) are the most important characteristics to evaluate when selecting a TYPE DW glove for most SWM jobs. The exception is the presence (or potential presence) of chemical or biological hazards in which case the type-classification (ww, or s) takes precedence.

GLOVE RECOMMENDATION PROCEDURE

1. FIT THE JOB TO THE GLOVE

- a. Adequate information about the nature of the job(s) at hand is necessary to make an informed recommendation. You must deduce the nature and severity of the hazard from the participants' description of their work: The statement *I sort wet-waste and dry-waste* provides very little information. Ask for clarifications.

What kinds of waste (metals, plastics, and so on) do you encounter? What is the hazard (sharp, pointed, slippery, edged, and so on)? Who are your clients (residential, commercial, industrial and so on)? Have you ever been injured? Describe what happened and the type of injury.¹ Has anyone else been injured? Do you have a photograph of the workplace?

- b. Once the hazards have been identified, verify if technical and administrative controls can be used to reduce the severity of the hazard.²

¹ It is *your* job to determine the nature of the hazard

² See II⑩ USING THE P2P METHOD → [343]. PPE must only be considered if other interventions in the hierarchy of controls cannot eliminate the hazard completely. In most cases, such engineering and administrative controls that will reduce the severity of the hazards can always be found. For this S.O.P, however, we assume that these options have already been considered. Also see MALL TALES EP.1: ANITA HAS A PROBLEM → [189].

- c. Recommend as many gloves as the number of different types (or severity) of a hazard. Therefore, if a worker performs two or more tasks, apply this SOP to each task. In most cases, a worker will not need more than two types of gloves.
- d. Take into account any temporary requirements (does the worker need to shield an injury while it heals, etc.,) when assessing the appropriate level of safety.
- e. The table below indicates which of the four EN388 ratings matters the most when selecting or comparing TYPE DW gloves for *that* job:

JOB	EN388 RATING (A,C,T,P)			
	ABRASION	CUT	TEAR	PUNCTURE
Cargo and material handling jobs—emphasis on durability.	Y	N	Y	N
Handling glass or material with sharp edges.	N	Y	N	Y
Handling objects with sharp or pointed tips.	N	Y	N	Y
Presence of chemical or biological hazards or suspicion of their presence.	N	N	N	N
The worker wants a water-proof glove with a good grip.	Y/N	N	N	N

Table 13. Selection of TYPE DW gloves based on EN388 numbers.







These are generalised recommendations. Notice that EN388 ratings do not matter for the last two cases. If a wound is to be protected from infection, the most appropriate glove is a TYPE WW nitrile surgical glove, worn inside a TYPE GP or TYPE DW glove.³

2. DETERMINE THE APPROPRIATE TYPE OF GLOVE

- a. If the job at hand requires protection from chemical or biological hazards, a TYPE WW is appropriate; TYPE WW gloves_[I63] are also indicated for any jobs that require waterproof gloves.
- b. For specific high-risk tasks a TYPE S glove may be appropriate.
- c. For all other jobs, consider a TYPE DW or TYPE GP glove. If cost is a constraint, evaluate appropriate TYPE GW gloves before TYPE DW gloves in the next step.

3. DETERMINE THE APPROPRIATE GLOVE

- a. Select an appropriate fabric that affords adequate cut and puncture resistance required for the job. Demonstrate that it does! When recommending a glove for handling sharp glass you should show that the glove protects you when you handle it.
- b. Select an appropriate coating material and texture that offers the best balance between grip, durability and dexterity.
- c. Is the glove available?⁴ Does it fit the participant?
- d. Is she comfortable? A worker will not use an uncomfortable glove. Investigate the reasons why she feels uncomfortable. Is the fabric itchy? Is she shy? Does the glove feel stiff and reduce her dexterity? Use the P2P method to solve the problem.

3   III③ any questions about gloves for handling wet-waste and liquids;   III④ any questions about chemical-handling gloves;   III⑤ any questions about handling biomedical waste.

4 Check the internet for availability.



Image 65. ♻ Kokila uses 4242 rated TYPE DW gloves when she operates the shredder. Notice that she uses a stick to push garden waste into the machine. The glove will not protect her from injury from the shredder! It protects her hands from sharp splinters. She keeps a pair of TYPE WW gloves in her overalls for handling wet waste. She is wearing ear-plugs, and eye protection.

4. COST CONSTRAINTS.

Always quantify the word ‘economical’ from the perspectives of both the participant *and* the organisation (or person) who pays for the glove:

- a. A worker may be willing to pay a premium for comfort, even if the supervisor is not.⁵
- b. The most appropriate glove for the job may be too expensive for the worker—she wants a recommendation that fits her budget.
- c. An organisation might wish to purchase either the most appropriate gloves, or equally safe (but less comfortable) cheaper gloves thereby saving some money to purchase disposable N95 masks. Workers may opt to use the expensive (but comfortable) pair of gloves and offer to wear homemade masks⁶.
- d. The cost of preventing injuries and the cost of treatment must also influence an informed decision.⁷

5. RECOMMEND THE MOST APPROPRIATE GLOVE(S).

- a. In most cases you will find that the appropriate glove will be similar to either No. 1 or No. 2 (see IMAGE 66 → [149]) in the kit recommended for all SWM workers.
- b. Conclude the discussion by referring to the kit. Always finish this procedure by showing participants the Standard Glove Kit.

5 The glove on the left in IMAGE 64 has a rating of EN 3544, i.e., the same cut-resistance and top-tier puncture resistance as the Dyneema® glove in IMAGE 55 → [135], yet it costs and weighs half as much. Dyneema® repels water better than nylon fabric and is half the weight. Both factors increase the comfort of the glove. Also, Dyneema® is extremely durable and the glove may be re-purposed for material handling tasks after the coating has degraded.

6 Respiratory hazards at the workplace must also be investigated to confirm that (a) the hazard is from particulate matter, and (b) the homemade masks afford adequate protection. (See ⑤ RESPIRATORS → [274].)

7 Discuss this topic only if the financial modules are part of the agenda. Never try to scare participants into using PPE!



Image 66. (Slide 1) (1 and 2) Recommended gloves for sorting, logistics, cargo handling and light dry-waste handling jobs. Optional gloves (3a) for micro-segregation and/or (3b) for wet-work and mixed-waste segregation.

STANDARD GLOVE-KIT

A standard kit of gloves should contain three gloves, as shown in IMAGE 66—(1), (2), and either (3a) or (3b).⁸ The recommendations take into account safety, availability and cost of gloves in India. Three kits are listed below.

1. Kit 1: Two pairs of TYPE DW gloves—one $x3x3$ and one $4x4x$ —and an (optional) TYPE DW 3121 (or 4142) for jobs that require exceptional dexterity, or a TYPE WW 3121 (or 4122) for wet-work.
2. Kit 2: One TYPE DW $x2x3$, one TYPE GP thick waxed-canvas glove, and one TYPE WW 3121 (or a pair of dish-washing gloves) for occasional wet-work.
3. Kit 3: One TYPE GP canvas glove, and two TYPE WW 3121 (with long sleeves if necessary) for working with cleaning chemicals—switch TYPE WW gloves between shifts allowing one to dry.
4. To protect injuries: An *inexpensive* pair of TYPE WW glove, such as a surgical glove, should be part of every SWM worker's standard glove kit even if her job does not require her to use one. These should be replaced after a single use.
5. In some operations (such as door-to-door collection), wearing a more durable and 'safer' glove on the non-dominant hand and a thinner glove, more dexterous glove on the dominant hand will extend the life of both gloves.
6. Coarse segregation (mixed-waste sorting) is a fast-paced operation and is done 'blind,' i.e., a hazardous object or material may be out of sight or hidden behind a safe material. Therefore, gloves for these operations should prioritise safety⁹. Cut

⁸ The point is best made with the analogy of saris—some are used for daily-wear and others are kept aside for special occasions.

⁹ The most important intervention to improve safety when handling mixed-waste is a continuing information campaign

resistance of 4-5 (or D+, ANSI A4+) and puncture resistance of 2 or better are recommended. Both polyurethane and nitrile coatings are appropriate; the latter is to be preferred for its durability. Texture does not matter, though coarse nitrile and pvc are to be preferred for reasons of cost; perfect fit for such jobs is not a priority but should be preferred.¹⁰

7. Dry-waste sorting operations that require tool-handling, such as coarse disassembly of white-goods and e-waste, require a combination of grip and dexterity. Nuisance cuts and nicks from slipped tools are common during such operations. The appropriate recommendation for such jobs are gloves rated xxx2 (4I42 is commonly available) with micro-finish nitrile or polyurethane coatings, in that order. Dry waste sorting jobs may also be done with waxed, tightly woven cotton canvas gloves.
8. Always prefer perfect fit over cost. Loose gloves are likely to tear more often, negating the marginal savings made by selecting a cheaper glove; loose gloves will increase the time required to perform a task.
9. Operations that require *exceptional* dexterity should be done with gloves that have the thinnest fabric that affords appropriate protection. Dexterity and comfort are to be prioritised. 3xxx or 2xxx gloves with polyurethane coating, and thin-yarn, knitted fabric are best for such jobs. These gloves *must* fit perfectly. Always keep in mind that most SWM jobs do not require exceptional dexterity.
10. Gloves suitable for dexterous jobs such as micro-segregation may also be used for dry-waste segregation, but such practices are best avoided—why should one use a less durable glove for work that requires a durable glove?
11. (♻️) Gloves should *not* be recommended for operating machinery that has exposed, fast-moving parts, which present pinch-hazards. See ②© MECHANISED SWM OPERATIONS → [154] for safety guidelines for workers who use machinery. Machinery without pinch-hazards may be operated while wearing gloves. If a physical barrier against oil or debris is required (to, say, protect an injury) a *properly-fitted* nitrile surgical glove may be worn under a TYPE GP glove to protect the fragile nitrile glove from nicks and tears. These gloves may be worn safely even when pinch-hazards exist.
12. As a general rule, an appropriate TYPE GP substitute for TYPE DW glove can be found for most SWM jobs—a pair of good-quality canvas gloves costs ⅓ the price of good quality 4I2I TYPE DW gloves. If a cheaper product is *appropriate* for the job at hand, it should be recommended.
13. Do not recommend TYPE WW gloves unless the job requires it. These gloves are waterproof and cannot be comfortably worn for long periods. When wet-work is finished, recommend that workers switch to the TYPE GP or TYPE DW glove in their kit. They should turn the TYPE WW glove inside out and tuck it into their belts to dry.¹¹

for source-segregation of household waste. Mixed-waste disposal by households, apart from increasing mechanical hazards, creates higher transportation costs, which are borne by the households. Most importantly disposal of mixed-waste is a violation of the Supreme Court's verdict on the subject of segregation.

10 See IMAGE 45 → [122], which shows the fit to expect when using inexpensive PVC gloves.

11 See ⑥ BODY PROTECTION → [313]. The usefulness of a good jacket and a belt with tool-holding attachments cannot be exaggerated.



Image 67. Beware of fake stamps and markings. This glove is made from polyester and is coated with a thin, uneven layer of recycled PVC. It cannot possibly achieve its rated safety performance of 4332. It is a cheap imitation of a rated glove made by a reputed company. It is possible that this glove may be a factory reject—perhaps a lower-rated glove was stamped incorrectly—however, the poor fit and quality of printing suggests otherwise. Poor quality prints are usually found only on fakes. See IMAGE 48 → [126] for an example of good printing quality.

IDENTIFYING “GOOD QUALITY” GLOVES

Gloves, like most PPE, are manufactured to a budget. You get what you pay for. As a general rule, at a given safety rating, the more expensive glove will be of better quality than a cheaper glove. The following are quick indicators of good quality in a mid-price glove:

1. The fingers of coated TYPE DW gloves will not be wrinkled as seen in IMAGE 67.
2. The middle-finger will always be longer than the index- and ring-finger; the little finger will be shorter than the others. Avoid gloves that have more or less the same finger-size—the manufacturer is trying to sell you the same glove for both hands!
3. Coated TYPE DW gloves will not be flattened when unpacked. They should hold their form, i.e., they should look filled-out when placed on a flat surface.
4. Flattened TYPE WW gloves indicate that either the rubber has perished or it is very thin. Top-quality TYPE WW gloves for wet-waste jobs (such as feeding kitchen waste into a mulching machine, and so on) will hold their form when placed on a flat surface; a TYPE WW glove that holds its form is more durable than one that does not.
5. Coatings on TYPE DW gloves will be supple, and will not crack if creased or stretched.
6. The manufacturer’s mark, ratings and logos will be printed clearly.
7. The fabric of the cuff will be thicker than the rest of the glove. The end of a good-quality cuff will have a corded and serged¹² seam as seen in IMAGE 43 → [120].
8. Disposable TYPE WW gloves suitable for SWM work will have a rolled seam; rubber gloves designed to be re-used will have a strengthened cuff with a rolled seam.
9. Woven TYPE GP gloves will have double-stitched seams that will not yield when stretched. The ends of the cuff will be serged. The seams of good-quality woven TYPE GP gloves will also be serged. This can be checked by turning them inside out.

¹² A serging stitch prevents the ends of a fabric from unravelling. These can be found on seams, and the ends of loose fabric. They look like criss-cross stitches.

Coating material matters

EXERCISE 7: LATEX VS. D-LIMONENE

You will need:

1. An orange
2. A balloon

Steps

1. Inflate the balloon.
2. Peel the orange.
3. Ask a volunteer to squeeze the peel so as to squirt liquid on the inflated balloon.

The balloon will burst¹. The effect is dramatic and demonstrates why the appropriate choice of the type and material of gloves is important. It also shows that a harmless substance (the oil in the orange peel) can dissolve the material on a glove, rendering it useless. Some kinds of oils (see TABLE 32→[264]) can dissolve latex (used to make balloons) which creates tiny pinhole-sized punctures in the material causing it to burst. The oil itself (D-Limonene², in the case of orange peel) may be safe to handle but the damage to the glove may expose the worker to other potentially hazardous substances.

Most surgical gloves are made of latex. Pinhole punctures in latex gloves or in the latex-coating are not immediately visible. Ideally, surgical latex or nitrile glove should be discarded at the end of the workshift—they are inexpensive and should be treated as disposables or consumable stock. TYPE WW gloves may be tested by turning the gloves inside-out, then filling them with water, which will reveal any pinhole leaks.

The coating on TYPE DW gloves is not designed to be a barrier against pathogens or chemicals: they are designed to improve grip. Accidental exposure to some classes of chemicals will degrade the coating, rendering the glove useless (see TABLE 32→[264]).

1 A video of this experiment can be seen on Youtube. See @ y4jn74ov

2 Limonene is a mild skin irritant. See @ y8cpw78y.



Image 68. SWM workers often collect waste from industrial areas. Unfortunately, many small industries do not follow safety protocols when they dispose waste. Harmless waste such as cleaning rags soaked in degreaser or lubricating oil will degrade latex gloves. This, in turn, exposes SWM workers to potentially hazardous substances. Choice of material is important!

Mechanised SWM operations

Objective

- Know how to identify and eliminate or reduce nip-point hazards in the workplace.
- Know how to implement simple engineering controls to reduce noise in the workplace.
- Know how to implement a lock-out protocol for maintenance.

Steps

- Initiate a P2P discussion on the different hazards of working with machinery.

Notes

- Engineering controls to reduce or eliminate noise hazards requires an audit of the workplace.
- If suitable engineering controls are too expensive to implement, workers must fall back on PPE (see ⑦ SAFETY GLASSES AND EAR-PROTECTION → [305]) to work safely. A few simple measures to reduce noise are presented here.
- The use of warning labels, lock-out tags, and other administrative controls for pinch hazards should be supplemented by periodic refresher courses for workers.

Workshop Programme

- If this activity is relevant to the workshop, then initiate II ① ④ THE HIERARCHY OF HAZARD CONTROL → [79] before this activity.
- Skip this activity if participants do not work with machinery.

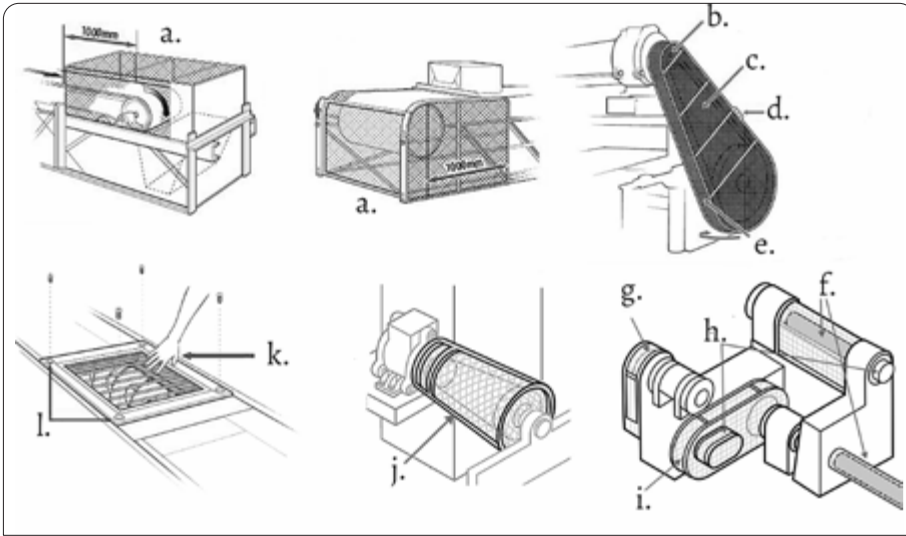


Image 69. Machinery nip-point guards. (a) Sturdy plastic or wire-mesh guards at the take-up and discharge pullers on a conveyor; (b) provision for lubrication without requiring removal of guard; (c) wire-mesh openings should not allow accidental entry of the hand; (d), (l) guards secured with at least one fastener that requires a tool for removal; (e), (g), (i), (j) transmission (belt/chain etc.) are fully enclosed from all sides; (f) revolving shaft (or pulleys, etc.) are covered; (k) inspection panels of screw-conveyors are guarded, the entire length of the screw conveyor is fully enclosed. (Image credits: OSHA and Worksafe, New Zealand. See @yxg294ds)

INTRODUCTION

The following machinery is commonly used in waste-processing units:

- Belt or slat conveyors for assembly-line sorting
- Screw conveyors for loading material into machinery
- Shredders for garden waste
- Chippers and shredders for plastic waste
- Baling machines and compactors
- Mechanised jigs for dismantling rubber tyres
- Bag stitching machines
- Pallet transporters, forklifts and similar material handling equipment

Engineering controls should be the employer's first choice for dealing with machine hazards—they isolate the hazard and do not rely on a worker's behaviour to be effective. Whenever engineering controls are not available, not practical, not fully capable of protecting workers, or if an extra measure of protection is required, workers must wear PPE¹. Note that PPE alone can not prevent injuries associated with most machine hazards; in some cases using PPE without appropriate engineering controls can increase the risk of injury—a glove can get trapped in an exposed chain-and-sprocket transmission and will pull the worker's hand into the machinery before she has time to react.

¹ See @ y4ywc3az for OSHA safety guidelines on the operation of machinery.

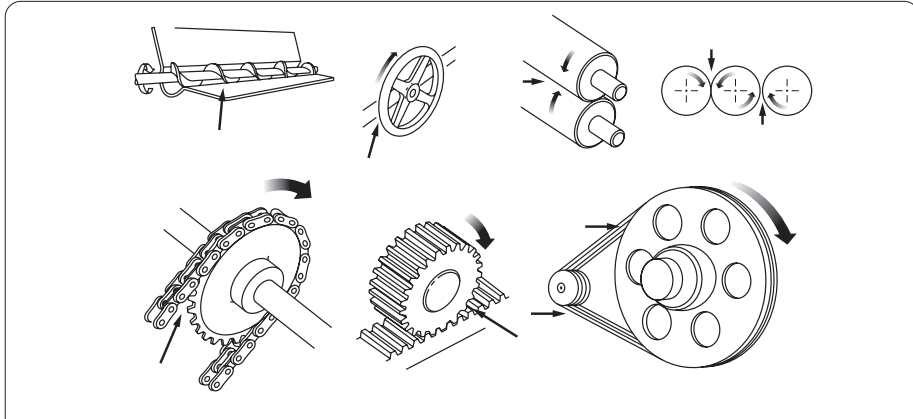


Image 70. Common nip-points in mechanised equipment. (Image credit: OSHA.)

§ IDENTIFYING NIP POINTS

All pinch points associated with the machinery must be identified before engineering controls can be implemented. A nip-point is a place where it is possible for a body part to be caught: either between moving machine parts, or moving and stationary machine parts, or moving parts and materials being processed or moved. OSHA recommends² the following engineering controls:

FOR BELT CONVEYORS. Hazards: Conveyor take-up and discharge ends, where the belt or chain enters or exits the in-going nip-point; where the belt wraps around pulleys; where the belt changes direction, such as take-ups; or where multiple conveyors are joined. Controls: Guarding of belt conveyors used for sorting waste is not feasible because the guarding devices interfere with normal operation. Options for hazard control include shielding the shafts of the idlers with a flexible rubber or plastic skirt, installing mesh guards (see IMAGE 71, [157]) around the take-up and discharge pulleys, and installing warning signs near pinch-hazards. If skirts are installed, the conveyor should be grounded since the friction between the skirts and the belt can cause a build-up of static charge.

FOR SCREW CONVEYORS. Hazards: In-going nip points of turning helical flights for the entire length of the screw conveyor when the housing is opened. Controls: The housing should completely enclose the moving elements of the conveyor except for the loading and discharge points. If such guarding is not feasible, the entire conveyor should be guarded by railings unless the location of the conveyor is such that its hazardous areas cannot be easily accessed by workers. Permanently affixed grids or Plexiglass™ can be installed to allow workers to inspect the operation.

ROLLER CONVEYORS. Hazards: In-going nip points between the drive chain and sprockets; nip points between belt and carrier rollers, and at terminals, drives, take-ups, idlers, and snub rollers. Controls: Substitute with a belt-conveyor, if possible. Roller conveyors should have permanent guards that can be adjusted as necessary to protect workers, e.g.,

2 See @ lrggvd



Image 71. Nip-points in machinery (Top row, from left to right) Nip-point hazard pictogram; exposed chain-transmission in wood-chipper; canvas winch-line; (Bottom row, from left to right) closely-spaced heavy objects such as drums; the space between fences and drums, crates and so on; bridal and winch lines, in general, should always be treated as pinch-hazards; PPE does not protect against pinch hazards.

when transporting small items on a roller conveyor, the unused section of rollers closest to the workers should be guarded.

FOR WOOD CHIPPERS. Hazards: In going nip-points at the feed intake screw, transmission chains, and sprockets. Controls: Push sticks should always be used to feed material into the machine; transmission mechanism should always be fully enclosed; jams should be cleared after powering down the machine; use an appropriate ‘normally off’ foot-pedal to power the machine.

FOR COMPOSTERS. Hazards: In going nip-points at the feed intake screw. Controls: Use an arm-length conical (or pyramidal) funnel over the input; use a push stick to force material into the machine.

General rules for minimising nip-point hazards

- Identify machines that might have nip-points. These should be shielded.
- Replace heavily worn or broken guards; broken guards are a sign of excessive vibration, which should be investigated.
- Workplaces and machines that have nip-points should also be marked with a warning label.
- Avoid wearing clothes with loose fabric, such as *sari*, *dupatta* etc., or wear them underneath overalls or an apron (see JACKETS, APRONS AND OVERALLS → [314]); hair should be secured under a cap or a bandana—an SWM worker in Pune was severely injured when her hair got snagged on a piece of wood being fed into a wood-chipper.
- Turn off a machine and wait for any rotating parts to come to a complete stop before beginning any kind of maintenance, including lubrication of bearings. If a shield is

removed to complete maintenance, make sure the shield is securely in place prior to operating the equipment.

- All hazardous machines should be equipped with at least one emergency stop device. The emergency stop device should be located and mounted such that it is readily accessible by the operator while she is working. The emergency stop device should either require a key or a two-step procedure (unscrewing or rotation of a safety cap) to manually reset the device before the machine can be restarted. Examples of emergency stop devices include emergency stop buttons, emergency stop pull-cords, and emergency stop foot pedals.



Machines under maintenance should be disabled using a standardised a lock-out procedure (See IMAGE 72→[159]); workers responsible for maintenance should be trained to use this procedure; *all* workers, including administrators, should be trained to identify lock-out devices used on the work-floor.

§ LOCK-OUT TAG-OUT PROCEDURE

A Lock-out Tag-out (LOTO) procedure ensures that all energy sources (whether electrical, mechanical, pneumatic or hydraulic) of a machine are isolated, disconnected or discharged before commencing work like maintenance, repair, and installation of machine. This is to prevent the machine from being inadvertently activated or energised while the work activity is in progress. The recommended procedure³ for LOTO is as follows.

1. **ANNOUNCE THE SHUTDOWN:** Notify all affected workers of the impending shut down.
2. **SHUT DOWN THE MACHINE:** Shut down the machine via normal procedures. Ensure that all moving parts have come to a complete stop and the act of shutting down the machine does not cause a hazard to other workers.
3. **DISCONNECT ALL ENERGY SOURCES:** Disconnect all sources of energy supply (whether electrical, mechanical, pneumatic or hydraulic) to the machine. Confirm that any stored energy (e.g., found in springs, flywheels, and any electrical, hydraulic, and pneumatic systems) is dissipated before starting work.
4. **APPLY LOCK-OUT AND TAG-OUT:** Apply a lock-out device (see IMAGE 72) over each source of energy so that the machine cannot be restored unexpectedly or accidentally; inlet valves for tanks etc., should be locked out if, say, a storage tank is being cleaned. Lock-out devices must be robust enough to prevent accidental removal. Each lock-out device should be affixed with a durable tag to indicate the identity of the person applying the lock-out. The tag serves as a warning that a work activity involving the machine is in progress and it must not be turned on under any circumstances.

A lock-out device is an engineering control; a tag, without a lock-out device, is an administrative control.

3 See @y4dslwu8 for the OSHA guidelines on lock-out tag-out procedures.

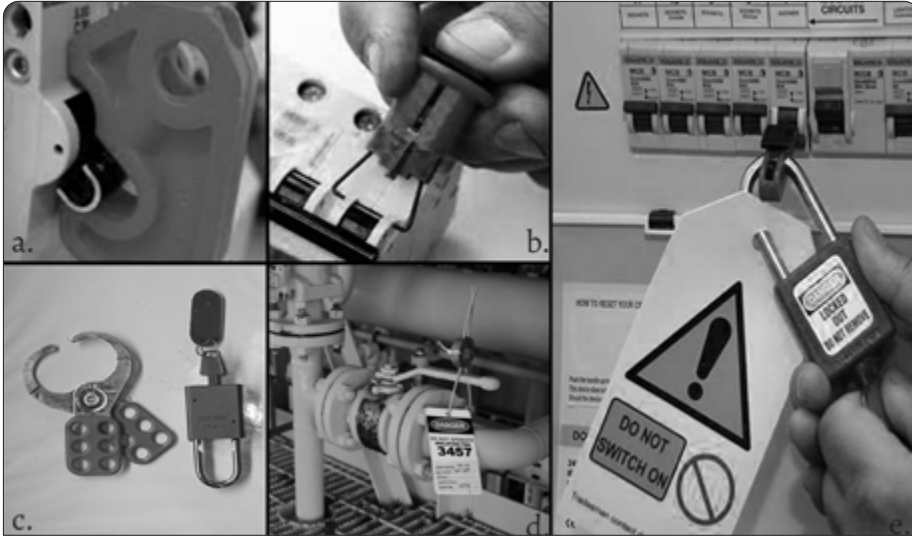


Image 72. Examples of Lock-out Tag-Out devices in use. (a) Mains circuit breaker with lock-out device in place, but not locked; (b) Locked mains circuit breaker; (c) Lock-out device with slots for multiple locks. All workers involved in maintenance operations are required to fix their lock into the device, which ensures that the machine remains in its powered-down state until each worker removes her lock (Image credit: Wtshymanski); (d) LOTO must also be applied when servicing the insides of tanks to prevent accidental operation of inlet valves; (e) worker locks-out a mains circuit breaker.

5. **VERIFY THE ISOLATION AND LOCK-OUT:** Check that the isolation and lock-out are in use and effective. Test the operating controls by putting (or trying to put) the controls in the 'on' position to confirm that the machine is unable to start up. After the test, return operating controls to the 'off' position.

Restoring a locked-out machine for operation

When the repair or maintenance work for a machine is completed, the next step is to restore it to its normal operation. Follow the steps below to ensure workers' safety during machine restoration:

1. Ensure that all tools have been removed from the machine.
2. Confirm that all safeguards and other safety devices are functional and have been returned to their original locations.
3. Check the machine's immediate vicinity to ensure that its start-up will not endanger anyone.
4. Announce that the machine would be turned on.
5. Remove all lock-out devices and re-energise the machine. A pre-operational functionality test should be carried out before the actual operation to ensure that the machine is working properly.
6. Notify affected workers that the machine is now ready to resume normal operations.

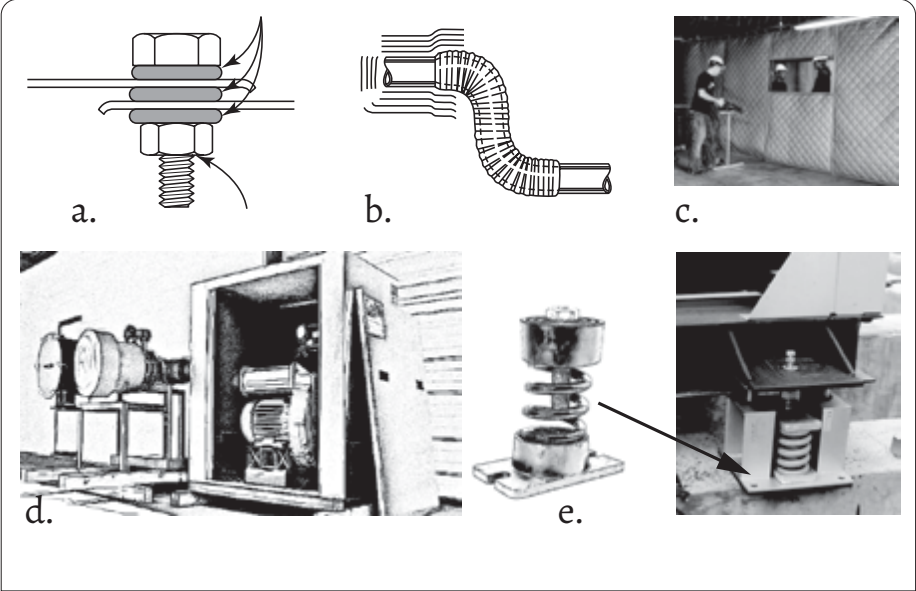


Image 73. (Top) Implementation of different engineering controls in a workshop. (Image credit: OSHA) (Bottom) Engineering controls for reducing noise. (a) Vibration-damping washers; (b) flexible pipe couplings prevent transmission of vibration from one pipe to the next (From: ASFAHL, C. RAY, AND DAVID W. RISKE. 2010. INDUSTRIAL SAFETY AND HEALTH MANAGEMENT); (c) Sound-absorbing curtains (From Steel guard Safety, @ yxtukyvp); (d) blower and motor mounted on spring-loaded, vibration-isolating mounts, enclosed in a sound-damping enclosure; (e) an example of a spring-loaded, vibration-isolating mount, shown installed.

§ ENGINEERING CONTROLS TO REDUCE NOISE

An audit of the workplace is necessary to evaluate the appropriate engineering controls to reduce or eliminate its noise hazards. The subject is complex and beyond the scope of this handbook.

A few simple low-cost controls that may be implemented are listed below.

SOURCE	CAUSE	ENGINEERING CONTROL
Impact noise	1. Impact tools 2. Large drop heights from conveyors. 3. Vibratory polishers, chip-pers, and shredders.	1. None. Appropriate PPE is essential. 2. # Reduce drop heights; use rubber pads, or baffles to absorb the impact of dropped material. 3. PPE essential—used only with the appropriate feeding tools or jigs. Use damped plastic or rubber linings on the inside of machines; enclose the machine in a sound-dampening enclosure with sound-absorbing material on the inside.
Wind noise		Reduce turbulence around fans—# lower the speed, increase the number of fans or fan-blades to maintain adequate airflow; avoid tight bends in air ducts and exhaust-pipes; increase the width of ducts. Use mufflers on engine exhausts and in air-ducts.

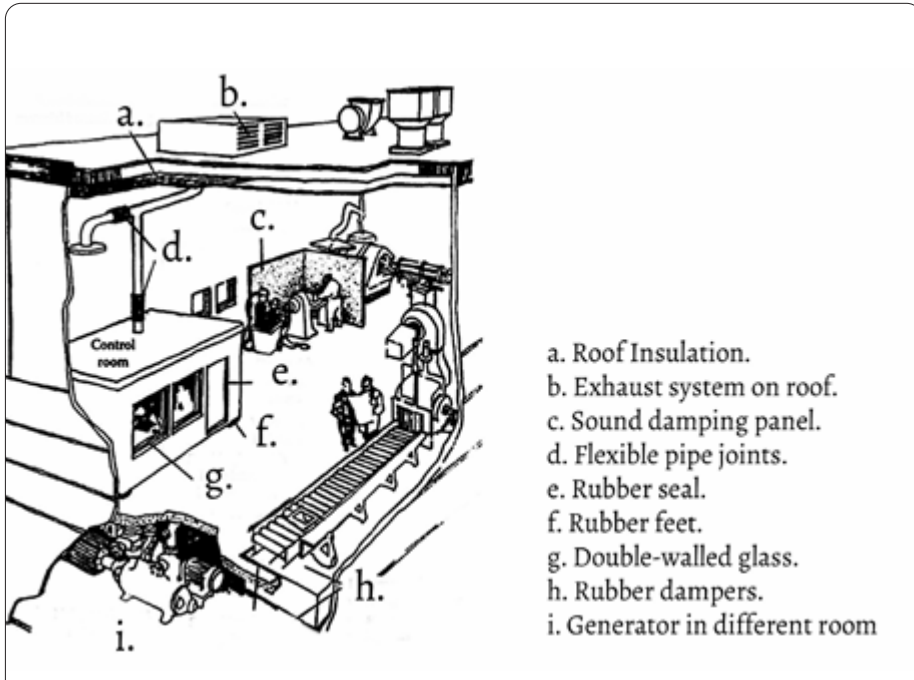


Image 74. Noise reduction techniques implemented at a factory. (Illustration by OSHA.)

SOURCE	CAUSE	ENGINEERING CONTROL
Machine noise	<p>1. Unbalanced rotating parts; friction; transmission noise.</p> <p>2. Vibrating surfaces (panels, guards, and so on.)</p>	<p>1. # Maintain motors and gearboxes regularly; use flexible couplings when possible; isolate heavy machinery from the floor with vibration isolators or inertial-dampers; install heavy machinery away from the main workflow; replace chain-drives with belt-drives; use multiple, narrow-belts instead of a single broad belt.</p> <p>2. Use damped rubber-sandwich panels; # use grid or mesh panels and guards instead of sheet-metal panels or guards; # use plastic mesh guards instead of sheet-metal guards; use sound-absorbing materials on the inside of panels.</p> <p>Use flexible or damped couplings for pipes and ducts; use sound-absorbing panels on walls; place machines away from walls; enlarge (or reduce) the size of mufflers to prevent resonance.</p> <p># Replace rigid wheels with pneumatic tyres.</p> <p>Use sound-absorbing barriers or screen to absorb radiated noise.</p> <p># Install one or more sound-proof booths, from which workers can monitor machinery without being exposed to noise and airborne hazards.</p>

Table 14. Engineering controls to reduce noise. # Low-cost controls.

Further reading

- Asfahl, C. Ray, and David W. Riske. 2010. Industrial safety and health management —6th ed. Pearson. New Jersey.
- Mansdorf, S. Z (editor). 2019. Handbook of occupational safety and health. Wiley. New Jersey.
- Lundgren, Regina E., and Andrea H. McMakin. 2018. Risk communication a handbook for communicating environmental, safety, and health risks.
- Workplace Safety and Health Council, Singapore (Government Agency).2014. Workplace Safety and Health Guidelines: Safe use of Machinery.
- WorkSafe, New Zealand (Government agency). 2018. Guarding of conveyors. Fact Sheet.
- WorkSafe, New Zealand (Government agency). 2016. Safe use of Machinery.

ACTIVITY 3

Wet-waste gloves

Objective

- Know how to select appropriate TYPE WW gloves for handling kitchen and garden waste.

Slides

- [S]1: Different kinds of TYPE WW gloves.
- [S]2: Workers at a biogas plant.

Steps

- Display [S]1 and explain the situations in which each TYPE WW glove is appropriate. Discuss the advantages and disadvantages of each type of glove.
- Display [S]2 and discuss how the safety of the workplace shown may be improved. The image shows why PPE is the least effective control in the context of workplace safety. Discuss the HOC and how it may be applied to the situation shown in [S]2.
- Initiate a discussion using the P2P method.
- Discuss the jobs in which each of the different kinds of TYPE WW gloves shown in IMAGE 75→[165] are appropriate—fit the job to a glove.

Workshop programme

- With participants that do not handle wet-waste, the material in this activity should be incorporated into the discussion on the STANDARD GLOVE-KIT→[149].
- With participants employed at composting and biogas units, begin with a discussion of the jobs they do and the problems they face. Make an appropriate glove recommendation for each situation. Discuss how to select one of the different kinds of TYPE WW gloves shown in IMAGE 75→[165] one by one.
- Skip this activity with participants employed in housekeeping and janitorial jobs. Begin with ④ HOUSEKEEPING AND CHEMICALS→[169] and incorporate the material in this chapter into the discussion on the STANDARD GLOVE-KIT→[149].
- In a mixed group, use the P2P method to create a set of problem-statements, and then proceed to find solutions. Initiate II①a PERSPECTIVE PLAYBACK→[57] if necessary.

DISCUSSION

TYPE WW gloves are defined, in this handbook, as those fully-coated, waterproof gloves that are suitable for extended work with wet-waste, contaminated liquids and cleaning chemicals that are *commonly handled* by SWM workers engaged in composting, biogas manufacturing, vermiculture, household mixed-waste processing and housekeeping.

Specialised TYPE S gloves may be needed for handling hazardous chemical, and bio-medical waste.¹ Selection and usage of PPE for such work is discussed in ④ HOUSEKEEPING AND CHEMICALS → [169] and ⑨ BIO-MEDICAL WASTE → [324]. The following types of gloves are categorized as TYPE WW gloves in the handbook (see Image 75):

1. Thin latex or nitrile surgical gloves.
2. Thick nitrile gloves without flocking (dish-washing gloves).
3. Thick PVC or nitrile gloves with an inner cloth lining².
4. Fully coated TYPE DW gloves.

SELECTING TYPE WW GLOVES

1. Surgical or 'medical' gloves are made of latex or nitrile. Latex gloves are usually white; nitrile surgical gloves are always coloured, usually blue. While thick latex gloves have excellent tensile strength and elasticity, surgical gloves are too thin to be useful for segregation or sorting. They can be used as an inner glove to protect a bandaged wound but never without a second glove on top.
2. Latex disintegrates in contact with most hydrocarbons and oil-based chemicals, such as petrol, diesel, kerosene, acetone, varnish, paint thinner and so on. The damage caused to the latex is not always visible to the naked eye.
3. Nitrile rubber is resistant to most chemicals. Most glove manufacturers and distributors publish chemical resistance guides with hundreds of chemicals (→ [262]), which contain a table of the glove-material and rating best (and worst) suited for each chemical.
4. Nitrile gloves are best for segregating wet-waste or handling wet waste during composting. The appropriate thickness and texture of the coating depends upon the job at hand, the comfort of the user, and the desired longevity of the glove. These should be taken off, turned inside out, and dried as often as needed (♻️). They are more expensive than latex gloves. Nitrile and neoprene gloves are the only options for workers who are allergic to latex rubber. Gloves made from a mix of nitrile and vinyl are also available; these are thicker, but less flexible, than nitrile gloves.
5. Neoprene is a synthetic rubber with good pliability, density and tear resistance. It does not degrade in contact with petrochemicals, alcohols, organic acids and alkalis.
6. Butyl rubber gloves are made of a synthetic rubber, and protect against a wide variety of chemicals, including highly corrosive acids such as sulphuric acid (battery acid) and strong bases. Either butyl or neoprene gloves are recommended for workers who recycle lead-acid batteries. These need only be used when draining batteries or when

¹ Gloves that are designed for working with hazardous chemicals can also be used for general SWM work. The extra protection they offer is often unnecessary and, in some cases, their mechanical properties might be inferior than a cheaper TYPE WW glove— always fit the job to a glove, not the glove to a job.

² Inner lining is called 'flocking'. This is usually a woven fabric substrate though non-woven fabrics are also used. Flocking makes it much easier to put on and remove the glove. Flocked gloves are thicker, more comfortable, and provide a greater resistance to puncture and abrasion. This additional thickness increases the glove's durability.



Image 75. (Slide 1) Different kinds of TYPE WW gloves. The number above each glove corresponds to the list on the previous page. Note that #4 is a TYPE DW glove with a water-proof nitrile coating on both sides and is classified as TYPE WW even though it is, essentially, a flocked nitrile glove (See IMAGE 77→[167] for a larger photograph.) The same person was photographed wearing all four gloves shown in this image. Note the difference in fit. The cuffs of each glove are folded over to show any inner lining (flocking) material. When using these gloves, the cuffs should not be folded. Note that the cuffs of the second glove are designed to cover the entire forearm. Also see MALL TALES EP.I: ANITA HAS A PROBLEM→[189].

- handling material covered in battery-acid.
- 7. Fully coated TYPE DW gloves are classified as TYPE WW in this handbook. These are water-proof (they can be used to handle wet tools and equipment), and have better cut and puncture resistance than gloves without a fabric substrate. However, they are relatively expensive.
- 8. Gloves designed for high-voltage electrical work are waterproof but are excessively bulky for SWM workers. These should not be recommended.
- 9. Some people are allergic to latex³.

☹ Do you get a rash on your hands soon after wearing rubber gloves?

A rash could be the sign of a latex allergy. Offer to test if this is the case—ask the participant to wear a latex surgical glove for five minutes. Most allergies to latex present with mild symptoms, such as itchiness in hands, redness, hives or local rash. Dry-cleaners, housekeeping contractors, general household contractors, leather manufacturers and e-waste processors are allowed to use toxic chemicals under strict regulations, which include work-place safety and safe-disposal of chemical waste. Workers should beware of business-owners who do not implement safe-disposal procedures that are required by law (see IMAGE 68→[153]). The warning applies to employees of such businesses too.

In most cases, the owners are simply unaware of the hazards associated with their work, and the mandatory safety regulations to which their business must be compliant.

3 For more on latex allergies, see @y6gkpuum



Image 76. ♻ Kokila and her colleague use TYPE WW nitrile dish-washing gloves for wet work. She has changed gloves to suit the job at hand—compare with IMAGE 65 → [148]. Such gloves are inexpensive, easy to clean and safe to handle kitchen waste and discarded food. Notice that the compost pit contains garden-waste, which may contain sharp wooden splinters, which can tear dishwashing gloves. A different glove, such as the one shown in IMAGE 77, which will easily resist the cut-hazard presented by wooden splinters may be *safer* for this job; it will, however, become soiled easily, since it has fabric cuffs that will absorb water and wick it into the rest of the fabric. Kokila has made a pragmatic choice—she has chosen to use an inexpensive glove that can be disinfected every day; it will dry fast and can be replaced cheaply if it tears.

🔗 TABLE 32 → [264] lists the relative suitability of the four most common coating materials for handling different chemicals⁴. Chemicals that SWM workers might *inadvertently* handle because they are discarded inappropriately are marked with an asterisk. Small machining units (common in industrial zones on the peripheries of large cities) often dispose of cotton rags soiled with degreasing chemicals and other potentially hazardous chemicals; dry-cleaners, painters and interior-decorators may discard ‘empty’ containers of hazardous chemicals; garages that service old cars may discard quantities of asbestos mixed with other harmless waste. Additional protection (above the recommended standard respiratory and hand protection) is not required for these situations, especially since many of these chemicals are toxic only if the exposure to them is prolonged. However, if participants are specialist SWM workers who handle industrial and commercial waste regularly, or if they regularly work with hazardous housekeeping chemicals, then allocate an hour for ④ HOUSEKEEPING AND CHEMICALS → [169]. Allocate an hour for ⑨ BIO-MEDICAL WASTE → [324] for workers in companies that process bio-medical waste. Activity ④ also contains information relevant for participants who collect waste from municipal landfills or work in small scrapyards that process industrial waste. However, in addition to safety, allocate some time to discuss the various opportunities to learn new skills. Apart from the obvious hazards of recycling waste from landfills, explain to participants that the work will cease to be profitable in the near future (this topic is discussed later, in VI and VII).

⁴ Participants who handle or process residential and commercial waste might never come into contact with industrial waste, however, all SWM workers ought to be aware of the potential risks of handling chemicals.



Image 77. Fully coated TYPE DW gloves, rated EN 3434D. These are designed for wet-work; they have a comfortable inner lining that absorbs moisture and the nitrile texture offers excellent wet grip. However, they are more expensive than nitrile TYPE WW gloves, which do not have an inner lining. This glove is a catch-all recommendation for SWM workers who process wet-waste.

CHECKLIST: TYPE WW GLOVES.

These recommendations for TYPE WW gloves are for handling wet-waste. For jobs that require handling of bio-medical waste, see ⑨ BIO-MEDICAL WASTE → [324]. See ④ HOUSEKEEPING AND CHEMICALS → [169] for jobs that require regular handling of hazardous chemicals.

1. Nitrile or latex surgical gloves or examination gloves are fragile and are not designed for extended use. They should only be used to protect an open wound from infection. A TYPE GP canvas glove or a TYPE DW glove should be worn above the nitrile surgical glove to prevent cuts and tears. An *inexpensive* TYPE WW glove should be part of every SWM worker's standard glove kit even if her job does not require her to use one. (See STANDARD GLOVE-KIT → [149].) A pair of nitrile examination gloves is recommended.
1. Prioritise cleanliness and ease of disinfection over sturdiness. If the raw material for composting contains garden waste (or if mixed waste is being segregated for composting) a fully coated TYPE DW glove (34x3 or better) may be suitable instead of a TYPE WW glove to prevent accidental tears. However, if the composting material is water-logged, a pair of sturdy dish-washing gloves might be appropriate. These are easier to wash and disinfect and may be replaced if they tear. A flocked TYPE WW glove, on the other hand, will become damp and may become a breeding site for fungi and bacteria.
2. For composting of segregated kitchen waste, a pair of good quality nitrile dish-washing gloves is sufficient.
3. For material handling operations, such as loading and carrying containers in composting and biogas units, a pair of waxed canvas or twill-weave cotton gloves



Image 78. (Slide 2) Workers at a biogas and compost facility. Both are wearing ill-fitting nitrile dish-washing gloves and gum-boots. Clearly, their usage of PPE does little to address the many hazards in the workplace. Identify the hazards. Discuss how the safety of these workers may be improved using the Hierarchy of Hazard Control.

with grips are appropriate. Discuss the use of tools (such as spades, shovels, and rakes) to process the raw materials used to make compost, vermicompost, and biogas. Appropriate tools and workstations give the worker a mechanical advantage and they may be used effectively with TYPE DW gloves, which are more durable and comfortable than TYPE WW gloves; tools minimize direct contact with hazardous materials such as manure and black-water slurry, which are common raw materials used in biogas plants. Do not recommend a TYPE WW glove as the primary work-glove simply because a worker is employed at a biogas or composting plant.

4. Nails should be trimmed when using surgical latex or nitrile gloves.
5. Machine operators should follow safety precautions appropriate to the machinery⁵.
6. Nitrile TYPE WW gloves suitable for wet-work are adequate for *brief* incidental contact (or inadvertent contact, such as accidental splashes) with most hazardous chemicals. In case of accidental contact with a hazardous (or unknown) chemical, the glove should be replaced immediately.

⁵ Machinery with mechanised feed-inputs, such as chippers, and shredders are often used in composting units. They should be operated with the appropriate material-feeding tools. See ②③ MECHANISED SWM OPERATIONS → [154]. Gloves are usually *not recommended* for operating any machinery with exposed moving parts. Close-fitting TYPE WW nitrile gloves may be used, if necessary, to protect an injury. Also see II①④ THE HIERARCHY OF HAZARD CONTROL → [79].

ACTIVITY 4

Housekeeping and chemicals

Objectives

- Know the risks associated with chemicals that SWM workers use; know the correct procedures to use them safely.
- Know how to identify the various ingredients in cleaning products and evaluate the hazards associated with their use in the workplace.

Steps

- Initiate a discussion on cleaning chemicals using the P2P method. Use the material in this activity during the discussion. See WORKSHOP PROGRAMME for guidelines on the agenda (what material to include depending upon the participants' jobs).

Notes

- The material in this activity is aimed at the following users: (1) SWM workers whose jobs require them to handle and use potentially hazardous chemicals, such as housekeepers, janitors, washroom attendants, e-waste processors, and biogas production workers, and (2) SWM workers, such as commercial-waste processors, who face a high risk of *accidental* contact with hazardous chemical waste that has been disposed incorrectly or mixed with non-hazardous waste. The scope of this activity, including material presented in ④③ - ④④, is restricted to hazardous substances that SWM workers use or may encounter.
- The subject material in this chapter deals with chemical hazards that SWM workers might face; it might not be applicable to workers in other industries. SWM workers face both accidental and chronic exposures to a wide variety of chemical hazards.
- As a general rule a rudimentary knowledge of how various classes of chemicals react with materials commonly used in gloves (and PPE) is essential for all SWM workers. ②⑥ COATING MATERIAL MATTERS → [152] illustrates this point.
- Guidelines for storing, handling and using various cleaning products used by SWM workers, the different categories of chemical compounds used in these products, and improvements to traditional housekeeping protocols are discussed in this chapter.
- MALL TALES EP.I: ANITA HAS A PROBLEM → [189] shows how a moderator used the P2P method to help a worker solve a problem at work; it also shows that the moderator must be familiar with housekeeping jobs to make an appropriate recommendation on the subject. The annotations included in the case study

- are instructive and will show you how an experienced moderator thinks.
- The sites listed below will allow you quickly to identify the hazards (if any) associated with most known chemicals. Keep a browser tab opened to one of these sites during the workshop.
<https://echa.europa.eu/information-on-chemicals>
<https://www.osha.gov/chemicaldata/>
<https://pubchem.ncbi.nlm.nih.gov/>
<https://www.ilo.org/dyn/icsc/showcard.home>

Workshop programme

- If you have the time (and participants understand English) screen this Youtube film on chemicals and toxicity: @wckrr86u
- For non-technical participants in the housekeeping sector, begin with VIII ① MALL TALES. EP. 2 → [509] and move on to a discussion of their problems. Initiate EXERCISE 19 → [266] and discuss how to create safe workflows for two housekeeping jobs, such as cleaning restrooms, and disinfecting dining tables. Use the material in HOUSEKEEPING CHEMICALS → [171] as a reference. End with EXERCISE 8 → [194].
- Administrators might define the 'problem' from a narrow perspective, i.e., they might complain that they are unable to force workers to use PPE. Your job is to redefine the problem-statement using inputs from SWM workers—those who face hazards in the workplace. Initiate II ① ③ PERSPECTIVE PLAYBACK → [57] using the characters in the story as subjects. You may also include ③ ③ HEAT STRESS → [316] if workers must use full body PPE for the jobs they do.
- Skilled workers in the housekeeping sector, supervisors, will prefer a discussion in the question and answer format: begin with VIII ① MALL TALES. EP. 2 → [509], initiate EXERCISE 19 → [266], and then initiate a P2P problem-solving session using the material in HOUSEKEEPING CHEMICALS → [171] as a reference. Use the characters in Mall Tales as your peer-references. End with EXERCISE 8 → [194].
- Purchasers, product-testers and managers in organisations that provide housekeeping and event-management services will prefer a straight question-and-answer session about applying the different controls in the HOHC after completing II ① ③ THE HIERARCHY OF HAZARD CONTROL → [79]. Use the material in HOUSEKEEPING CHEMICALS → [171] as a reference. Topics for discussion may include:
 1. How best to store chemicals?
 2. Which chemicals may be substituted for safer alternatives?
 3. What changes may be made in workflows to reduce hazards and improve worker-comfort.
 4. What equipment and gear should companies include in a standard PPE kit for their housekeeping employees and so on.
 5. Should a housekeeping company consider the use of specialist TYPE S gloves or are TYPE WW nitrile gloves adequate? How does one choose?

WHAT IS A CHEMICAL HAZARD?

Everything around us is entirely made of up chemicals, and all chemicals have intrinsic properties that may be hazardous—even water and oxygen can be hazardous. Chemical ingredients found in everyday products are sometimes criticized as being harmful to human health. But the mere presence of a hazardous chemical ingredient does not automatically mean it will cause harm. The actual chance of harm from exposure to a chemical ingredient depends on a variety of factors including how much of the chemical ingredient is in a product; how the product is used; and what kind of exposure to the chemical typically occurs from using a product that contains that chemical. Warning labels and Safety Data Sheets provide the following information:

- The nature of the hazard associated with a chemical: Does it explode? Does it catch fire? Is it poisonous if ingested? What if it is inhaled?
- The severity of the hazard: How easily does it catch fire? What quantity of it is poisonous? At what concentration does it dissolve flesh? At what concentration does it merely irritate the skin?

Safety Data Sheets and warning labels are discussed in ④③ HAZARD CLASSIFICATION SYSTEMS → [198]. This chapter deals with the practical problems faced by SWM workers, such as housekeepers and janitors, who handle and use chemical products everyday.

HOUSEKEEPING CHEMICALS

§ ALL-PURPOSE CLEANERS

Cleaning is defined as the physical removal of dirt and debris; disinfection is defined as the elimination (usually 99% or more of) all pathogens except bacterial spores; decontamination is the removal of pathogenic organisms from an object to make it safe to handle, use or discard; sterilization is defined as the complete (100%) elimination of all organisms. (See @yaptxp7g). Most housekeeping jobs only require workers to *clean* an area or a surface; they may be required to *disinfect* toilet seats, bathroom fittings, and food-service areas. SWM workers who process medical waste are required to *decontaminate* waste before disposing of it. *Sterilization* is never required in SWM jobs.

Liquid cleaning products that are labelled all-purpose or general-use always contain a detergent and a disinfectant though other active ingredients may be present. Non-active ingredients, such as perfumes (including terpenes), pH buffers, colouring agents, stabilizers, fillers and other excipients are also present (see @yazhqt66).

ALL-PURPOSE CLEANERS are adequate for household work but are not economical for use by commercial cleaning services. Commercial cleaning products are designed to do a specific task at a low cost. Therefore, such products consist only of water, a detergent and a few excipients¹. The user is expected to added other ingredients to the mix as required depending upon the job at hand.

¹ Some brands of cleaners designed for use in dishwashers may contain enzymes.

§ DETERGENTS

DETERGENTS² are dilute solutions of one or more surfactants, which are class of chemical compounds that lower the surface tension between two liquids, between a gas and a liquid, or between a liquid and a solid (see @hobpzx8). In surfactant-based cleaning products, one or more surfactants may be used as a wetting agent, emulsifier, and foaming agent. Surfactants require water to be effective cleaners. A surfactant molecule attaches itself to oily particles stuck to a surface, pulls them free and floats in water. This ‘dirty water’ is rinsed away.

SODIUM LAURETH ETHER SULPHATE is also called SLES, which is derived from sodium lauryl sulphate (SLS). Sodium lauryl sulphate is the same as sodium dodecyl sulphate (SDS), which is the chemical’s IUPAC name³, and sodium pareth sulphate. It is a surfactant found in many cleaning products. SLES may be created from ingredients extracted from petroleum oil or some vegetable oils. The chemical synthesis consists of these steps: Fatty acid (+ catalyst) → fatty alcohol (+ sulphuric acid) → sulphate (+ sodium carbonate) → sodium lauryl sulphate.

Detergents made solely from palm-kernel oil or coconut oil are often marketed to consumers as ‘100% natural origin’ or ‘100% plant-derived’. However, the final product is identical to that derived from petroleum oil⁴; the same chemical synthesis described earlier is used to make SCS from coconut oil. *All surfactants, including SCS are skin irritants.*

BUILDERS enhance a detergent’s potency by binding calcium and magnesium ions in water. Sodium carbonate (commonly called washing soda) is a builder. Phosphates were the most common builder used in combination with detergents, but this class of chemicals are banned in most countries because they cause eutrophication⁵ in lakes and other water bodies that receive effluents. Nowadays chemicals such as EDTA, trisodium citrate, sodium silicate, and others that do not cause eutrophication are used in good-quality detergents. Some builders may also be used as active ingredients for specific jobs (see STRONG ALKALIS).

Some household detergents may also contain peroxide-releasing bleaching agents, such as sodium perborate and sodium percarbonate, which react with water to release hydrogen peroxide. Bleach activators, such as tetraacetylenediamine TAED (see @y67hdp75) and sodium nonanoyloxybenzenesulfonate (NOBS) are used to improve the efficacy of the peroxide by reacting to release peroxy acids that are more effective than peroxides at temperatures below 60°C.

2 Though most cleaning products contain surfactants, only those cleaning products in which surfactants are principal active ingredients are called ‘detergents’ in this handbook. Unless specifically noted, it is also assumed that any cleaning product will contain one or more surfactants.

3 International Union of Pure and Applied Chemistry. See <https://iupac.org>

4 Sodium Coco Sulphate (SCS) used in some ‘organic’ detergents is derived from coconut oil instead of a pure fatty acid, which results in a blend of sodium lauryl sulphate, sodium caprylic sulphate, sodium oleic sulphate, and so on. Lauric acid constitutes about ½ of the many different fatty acids in coconut oil. Therefore, about ½ of sodium coco sulphate consists of sodium lauryl sulphate. The raw material makes no difference to the chemical properties of SLES. (Also see @yba82mfs).

5 See @yyfxgj4p

Guidelines for handling detergent-based cleaners

RECOMMENDED PPE: TYPE WW nitrile gloves. All detergents will cause skin irritation and can cause chronic skin problems. Detergents are safe to use while wearing appropriate PPE.

§ ABRASIVES

Abrasives are minerals used to clean surfaces by grinding away the surface of materials. Abrasive materials for manufacturing jobs are usually harder than the material to be cleaned or shaped; abrasives used in housekeeping tasks are almost always softer than the surface to be cleaned because they are used to remove stubborn residues or deposits from surfaces without scratching them or otherwise marring the surface finish.

SCOURING PADS (ScotchBrite® and other brands) made of nylon or spun-polypropylene are commonly used to remove organic residue such as dried food from tables and counter-tops, without scratching the surface; for tough residues, a scouring powder (such as Vim®) may be used with the pad.

MELAMINE SPONGE (Mr. Clean®). Generic variants are usually called ‘magic’ cleaners or ‘magic erasers’. Melamine sponge is a microporous, open-cell foam with a hard microstructure. Melamine foam is an effective abrasive that does not require a surfactant to be effective.⁶

CALCIUM CARBONATE (chalk powder), PUMICE (used in Brasso®) silica (fine sand) and feldspar are the most commonly used abrasives found in products are used by housekeepers. Alumina and titanium dioxide may be used in scouring powders meant for industrial use. Mild abrasives are appropriate for surfaces such as fibreglass, grout, ceramic tile, sinks, toilet bowls, and glass.

Products in which the principal cleaning agent is an abrasive include scouring powders (Vim®, Pril® etc.), buffers (Pitambari®) metal polishes (Brasso®, Silvo®, Waxpol® etc.), and abrasive degreasers (Cif®). Cleaning products with abrasives are sold in various forms, such as suspensions in liquids, thixotropic gels and powders. These products usually contain small amounts of other active ingredients, such as ammonia, white spirits, and surfactants to improve their efficacy.

Guidelines for handling abrasive cleaners

RECOMMENDED PPE: Nitrile gloves. Abrasives are the least hazardous option for removing hard-water spots, mineral deposits, and chemical stains. Regular cleaning with a mild detergent mixed with a mild abrasive should be adequate to remove shallow mineral residues from hard surfaces such as ceramic tiles, metal counter-tops, sinks, toilet bowls and bathroom fixtures without resorting to the use of strong acids. Disinfection may be done using an appropriate chemical after the surface has been cleaned. The philosophy of Prevention through Design suggests that rest-rooms in commercial areas should be designed with soft-water plumbing for all water outlets to prevent the formation of limescale, thereby eliminating the need for acidic toilet-bowl cleaners.

6 See @ y5e7nh68

☹ Would this option be practical?

Strong abrasives may scratch the surface finish of washroom fittings rendering them dull and rough. When surfaces are damaged in this way, they soil faster and stain deeper. It will then be necessary to continue to use a harsh abrasive to remove embedded dirt and stains.

§ DISINFECTANTS

Disinfectants are chemicals that destroy disease-causing organisms. They work best on *cleaned*, non-porous surfaces, such as tables, countertops, door and cabinet handles, toilets, and other bathroom surfaces. Evaluate disinfectants on the following criteria:

1. The lowest concentration at which the active ingredient remains effective. Lower concentrations are cheaper, though the trade-off is an increase in dwell-time (see below.)
2. *Dwell-time* is the minimum duration that the disinfectant must remain in contact with the surface being disinfected, and time spent (for, say, ventilation) before the area is safe to use.
3. Cost of consumables and equipment, including PPE.

CHLORINE is a cheap and powerful disinfectant. For ease of transport and safety, bleaching powders and liquids contain chlorine in the form of a hypochlorite salt of sodium or calcium—the active microbicides, in this case, are hypochlorous acid (HOCl) and the hypochlorite ion (OCl^-). Bleaching agents may be used as disinfectants. They are inexpensive, fast-acting and are unaffected by water hardness.

LIQUID BLEACH is usually sold at ~5% (50,000 ppm) concentration. Therefore, it should be diluted 1:50 with water for use as a floor and surface disinfectant on clean floors. Commercial preparations are stronger. The recommended dwell-time on *clean* surfaces is 10 minutes. The solution may be safely left to dry on the surfaces like toilet-bowls, urinals and basins that will not be touched.

BLEACHING AGENT	ACTIVE INGREDIENT	DESCRIPTION, USAGE AND SAFETY
Bleaching powder	A mixture of calcium hypochlorite, calcium hydroxide and calcium chloride. Proportions of each chemical may vary.	White powder. Used extensively as a disinfectant. Effective and the least expensive. The recommended dwell-time is 20 minutes. Bleaching powders leave a white, insoluble residue which may not be acceptable in commercial, healthcare, and retail environments.
Liquid Bleach	Sodium hypochlorite (usually 3-6%) solution in water.	Clear, pale yellow liquid. 0.05%-0.1% sodium hypochlorite solution may be used to disinfect non-porous surfaces after they have been cleaned.
Chlorine-free bleach (Colour-safe bleach)	Hydrogen peroxide (or chemicals, such as sodium percarbonate, sodium perborate, and benzoyl peroxide that release hydrogen peroxide) in water.	Based on peroxides, these are less effective disinfectants than chlorine but are stable if stored correctly (in opaque containers) and remain potent for a year. The recommended dwell-time is 20 minutes. Products that are marketed as toilet-cleaners (Sani-Fresh) may contain peroxides as an active ingredient

Table 15. Bleaching agents that are used as disinfectants. Ingredients and safe usage.

A 0.1% hypochlorite solution is recommended by the US Centre for Disease Control and the European Centre for Disease Prevention and Control (see @y9yw6bj9 and @rz62njv) for disinfecting most surfaces. When diluted to 1% or less, a sodium hypochlorite solution has a shelf life of 24 hours. Hypochlorite bleach at these concentrations may be stored for 24 hours and then be disposed of safely in sewage. Hypochlorite bleach should not be mixed with products that contain strong acids such as toilet cleaners (see ACIDS → [177] and IMAGE 100 → [267]) and ammonia (such as glass cleaners) since the compounds will react to produce potentially toxic amounts of chlorine or other toxic gases; mixing chlorine and chlorine-free (peroxide) bleach can result in an explosion. (Also see HAZARDS OF MIXING INCOMPATIBLE CLEANING PRODUCTS → [266].)

OTHER CHLORINE-RELEASING DISINFECTANTS that are used (primarily in health-care environments) are chlorine dioxide, sodium dichloroisocyanurate, and chloramine-T. These are unlikely to be found in products made for housekeeping work. Free, available chlorine (in any form, e.g., HOCl, OCl⁻, and Cl₂) is a biocide at concentrations as low as 25ppm when used on a cleaned surface; if the surface is contaminated by organic matter, a larger amount of chlorine is required.

QUATERNARY AMMONIUM COMPOUNDS (usually called *quats*) are salts of a quaternary ammonium cation, which has the structure NR₄, where R is an alkyl or aryl group. Examples are Benzalkonium chloride (used in Lysol®), cetrimide (one of the active ingredients in Savlon®), and trichloroisocyanuric acid, which is used in some scouring powders. They are effective in destroying a wide range of harmful bacteria, viruses, and fungi. Dwell times depend on the chemical and its concentration—the manufacturer's instructions should be followed.

TERPENES (also called pine oils, and turpentine) are made from a natural resin distilled from pine trees. Pine oils are used in general-purpose floor-cleaners and may be combined with alcohols and quats to improve their disinfecting and cleaning properties. Note that pine-oil or other terpenes might not be the active disinfectant in a floor cleaner—they may have been added solely for fragrance, and to appeal to the growing market for 'natural' or organic products, e.g., the active ingredient in a well-known floor cleaner is not pine-oil, as its brand name suggests, but glycolic acid (see ACIDS → [177]). Terpenes at a concentration of 15% or higher can act as disinfectants. The recommended dwell time cannot be determined precisely because the concentration and potency of various terpenes in cleaning products vary greatly. Products that rely *solely* on terpenes for disinfection should be avoided.

PHENOLIC COMPOUNDS are used in soaps, liquid soaps and handwashes. The most common phenolic compound that SWM workers will encounter in cleaning products is chloroxynol, which is the active ingredient in Dettol®. Carbolic soaps (such as the discontinued Lifebuoy® soap) contain carbolic acid which is a phenolic compound obtained from coal tar. Floor cleaners are often called 'phenyls' in India. Some brands of 'phenyl' contain light creosote or coal tar oils, which contain a mixture of cresols, which are phenolic compounds. Commercial cleaners that contain phenolic compounds are usually sold in concentrated form and must be diluted before use. Dwell-times depend on the chemical and its concentration—the manufacturer's instructions should be followed.

ALCOHOLS such as ethanol, propanol and isopropanol are effective germicides. Some shopping centres use 70% solutions of isopropanol (or a mixture of propanol and isopropanol) to wipe food-service counters between servings. This is usually done by kitchen-staff or service-staff, and not by housekeeping staff. Alcohol-based hand sanitizers may be used by housekeepers for disinfecting their hands (and gloves) when they move from one work area to another. Alcohol-based cleaners are inflammable and must be stored appropriately⁷. The recommended dwell-time of alcohol-based disinfectants is 20 seconds, which makes their use as surface disinfectants expensive—they are volatile chemicals and evaporate within seconds. A large volume of liquid must, therefore, be used.

Alcohol-based hand-sanitizers are most appropriate for personal hygiene. They should be used after washing one's hands with soap and water.

General guidelines for handling disinfectants

RECOMMENDED PPE: nitrile gloves and a suitable respirator.

Masks designed for particulate matter (N95 etc.) will not protect the user from gases and vapour. Such hazards require the use of a respirator with an appropriate cartridge (see ⑤ RESPIRATORS → [274]). Always recommend one or more suitable engineering controls or administrative controls in addition to PPE:

1. Increase the ventilation of the area. In most cases, additional forced ventilation is enough to reduce the hazard to permissible, safe levels.
2. Disinfectants require dwell-time during which the worker can do other tasks, which reduces the severity of any chronic hazards associated with the disinfectant. The recommended concentration and dwell-times must be followed strictly. One of the reasons that commercial cleaning products are not sold as 'all-purpose' mixtures is to allow workers to clean the surface, then apply and leave the disinfectant for the recommended dwell-time. A disinfectant cannot do its job properly if it is mopped away within a few seconds of application!
3. Some disinfectants are hazardous in tiny quantities; some are harmful if exposure to them is chronic; all may be used safely if appropriate precautions are taken. The hazard lies in the dosage, duration of exposure and the nature of exposure—skin contact is common and is usually the least hazardous form of exposure, followed by inhalation and accidental ingestion. The warning applies to so-called 'natural' cleaners too. If in doubt, check the chemical's datasheet on one of these websites → [169].
4. Chlorine-releasing products (especially in the form of powders) are not recommended for use by those workers who suffer from asthma.
5. Significant savings and a reduction of effluent-related hazards may be achieved by establishing procedures that use regular cleaning with neutral detergent, mild abrasive powders and hypochlorite disinfectant.
6. 'Clean' has no smell. Some cleaning products may contain fragrance as an indicator that the area has been cleaned. The mental association of citrus and pine smells with cleanliness has advantages and disadvantages. Some HVAC systems may include an ozone generator. Ozone reacts with d-limonene and other terpenes (used in some air fresheners) to create small quantities of airborne particulate matter, PM_{2.5}⁸.

⁷ See ④① SAFE STORAGE OF CLEANING CHEMICALS → [265]

⁸ See @ya6wjehu. The effect of chronic exposure to these particles may be assumed to be similar to PM 2.5 particles.

☉ Is it better to purchase cleaning products that include perfumes or should fragrances be used as required, by housekeepers? Professional cleaning products should do exactly what they are meant to do: clean the surface. Nothing more or less should be required of them.

§ ACIDS

Acids are used to remove mineral deposits, rust stains, and hard water spots. They can remove tarnish⁹ from non-ferrous metals, such as aluminium, brass, bronze, and copper. Commonly-used acids range in order of increasing potency are listed in the table that follows.

PRODUCT	ACIDIC COMPONENT
Toilet bowl cleaners	Most common: Hydrochloric acid (usually 10%, e.g., Harpic®). Others: Sodium bisulfate, sulfonic acids ¹⁰ , and phosphoric acid
Specialist rust removers	Most common: Phosphoric acid, gluconic acid (e.g., Rust-oleum® Rust Dissolver, see @y3kqmopo). Others: hydroxyacetic acid, and oxalic acid
Specialist metal cleaners	Most common: Citric acid and acetic acid
Descalers	Most common: Acetic acid, citric acid. Others: Sulphamic acid
Tarnish removers	Sulphamic acid (Tarn-X®), acetic acid, hydroxyacetic acid, citric acid, and gluconic acid.

Table 16. Cleaning products in which an acid is the active ingredient

ACETIC ACID (vinegar) is a natural cleaning agent. It removes hard water deposits from glassware, rust stains from sinks, and tarnish from brass and copper. After using alkaline cleaners, dilute acetic acid can be used as a rinse to neutralize any acidic remnants.

CITRIC ACID is naturally found in lemons, oranges and other citrus fruits (the word ‘citric’ is derived from ‘citrus’). It is a chelating agent—it binds to metal ions in hard water—which makes it effective against limescale. While it is not as efficient as EDTA, citric acid is a commonly used in ‘organic’ detergents since it can be produced on an industrial scale by a fungus; users who prefer organic products should know that sodium carbonate and sulphuric acid are used to isolate the citric acid from the fungal slurry. Unlike acetic acid, citric acid is odourless. A 6% solution of citric acid may be used to dissolve hard-water stains, coffee and tea stains, and urine or faecal stains.

PHOSPHORIC ACID is a clear, colourless, and odourless liquid. It is very mild, but is more acidic than food-grade vinegar or lemon juice. It is most commonly used in rust cleaners. Phosphoric acid is also used in all-purpose bathroom tile cleaners, and toilet bowl cleaners.

OXALIC ACID is a bleaching agent and an effective rust remover. It is poisonous and should not be used to clean food-preparation surfaces.

⁹ Tarnish is a product of a chemical reaction between a metal and a non-metal compound, especially oxygen and sulphur dioxide. It is usually a metal oxide, the product of oxidation. Sometimes, it is a metal sulphide.

¹⁰ Sulphonic acids are a class of organosulphur compounds. They are less potent than mineral acids. (See @ yxswe9k9)

SODIUM BISULPHATE (NaHSO_4) forms sulphuric acid when exposed to water and was used in a common toilet bowl cleaner (Sani-Flush®) that may have been discontinued; the reaction between sodium bisulphate and water releases sulphuric acid. The compound is sometimes confused with sodium metabisulphite ($\text{Na}_2\text{S}_2\text{O}_5$) which is not used in cleaning products.

HYDROCHLORIC ACID (HCl) is an aqueous solution of hydrogen chloride gas. It is sold at concentrations of up to 38% (called ‘concentrated’ hydrochloric acid at these strengths) for industrial use. HCl is a potential hazard even at concentrations that are deceptively low in number. A 38% solution of the acid at room temperature emits white fumes of hydrogen chloride gas mixed with water; the solution boils at 48°C . While a drop of 38% solution can destroy skin tissue, the greater danger is from HCl fumes, which can cause severe, permanent lung damage and even death if inhaled. HCl solutions at 10% strength are commonly used in toilet bowl cleaners¹¹; splashes can burn skin. Solutions of 3% concentration or less are mildly corrosive but require longer dwell-times to remove stubborn mineral residues. (Note: The concentration of hydrochloric acid in our stomach is around 0.5%.) HCl may also be used for removing rust from metals and rust-stains other surfaces if abrasives and milder acids (like citric acid or acetic acid) prove ineffective.

SULPHURIC ACID (H_2SO_4) is a strong oxidizer. It is used in potent drain cleaners and some toilet-bowl cleaners. A 15% solution will burn skin instantly.

Guidelines for handling products with strong acids

RECOMMENDED PPE: Nitrile gloves, an apron, protective glasses and a suitable respirator. Gloves must cover the arms. This is an essential protection. If acidic cleaners are bought in bulk and diluted on-site, a respirator with an appropriate cartridge that blocks organic vapours and fumes and a face shield are essential (see IMAGE 106 → [284]). Forced ventilation of the area with a portable fan is recommended.

A regular cleaning schedule will allow workers to remove mineral deposits with abrasives in combination with less aggressive acids—acetic acid and citric acid are safe, easier to store and dispose. Water-softeners replace calcium salts with sodium salts that are soluble in water. These use common salt—mainly sodium chloride—as a consumable chemical. Since industrial-grade sodium chloride is inexpensive, it might be economical, in the long-term, to soften water (with calcium-hardness above 100ppm) before using it in washrooms. Hotels and other commercial establishments that provide hot water on the tap will reduce cleaning time and costs of descaling, replacing clogged washroom fittings, cleaning chemicals, PPE, and sewage pre-treatment. However, acidic cleaners are inexpensive and safe if they are used with appropriate safety protocols. Some acids may also disinfect the surface being cleaned. However, if a surface must be disinfected, then the disinfectant properties of acidic compounds should not be relied upon to do the job; acidic cleaners must never be mixed with hypochlorite bleach. The reaction may release potentially fatal amounts of chlorine gas: $2\text{HCl} + \text{NaClO} \rightarrow \text{H}_2\text{O} + \text{NaCl} + \text{Cl}_2$. (See EXERCISE 19 → [266].)

11 Harpic® is approx. 10% HCl . Sani-Fresh® is approx. 14.5% HCl . Most toilet bowl cleaners are approx. 10%. Note that Harpic® is a brand name used for many different cleaning products many of which do not contain HCl . Always check the product’s Safety Data Sheet when using more than one cleaning product on the same surface. Also see TABLE 20 → [184].

§ ALKALIS

Alkalis help clean food spills, oils, and grease. They can dislodge oily dirt without rubbing, and vary in strength from mild to moderate to strong. The table that follows lists alkalis found in cleaners:

PRODUCT	ALKALINE COMPONENT
All-purpose cleaners Examples: Ajax®, Lizol®, Clorox®, etc.	Ammonium compounds, sodium bicarbonate (baking soda), sodium carbonate, sodium metasilicate, sodium borate (borax)
Drain cleaners	Sodium hydroxide
Oven cleaners	Sodium hydroxide, ammonia
Scouring powders	Alkali salts, sodium metasilicate, trisodium phosphate (TSP)
Window cleaners	Ammonia or ammonium compounds, sodium bicarbonate (baking soda)

Table 17. Cleaners in which the active ingredient is an alkali.

AMMONIA (NH_3) is a strong, colourless gas. When the gas is dissolved in water it is called *liquid ammonia*, or just *ammonia*. General purpose solutions contain up to 10% (by mass) of ammonia in water; most cleaners with ammonia also contain a detergent; dilute ammonia solutions (up to 3%) are the commonly used in glass cleaners, such as Colin®. Ammonia's odour is the main deterrent to its use. Ammonia should never be used in combination with chlorine and bleach products because the mixture releases a toxic gas. The active ingredient in most degreasers and drain cleaners is a strong alkali. Strong alkalis can dissolve fat, grease, oils and protein. Like acids, this class of compounds can be highly corrosive and cause chemical burns on the skin and lungs, even at concentrations that appear to be low.

SODIUM HYDROXIDE (also known as caustic soda or lye) is used in drain cleaners (Drainex®). It is an intensely corrosive chemical. The reaction of sodium hydroxide with water (or any acid) generates a lot of heat, which can create a mist of sodium hydroxide and water vapour that is corrosive enough to burn the skin and cause blindness.

SODIUM CARBONATE (also known as washing soda or soda ash) is not as corrosive as sodium hydroxide. It may be used to remove oil and grease stains from hard surfaces in combination with a detergent.

Guidelines for handling products with strong alkalis

RECOMMENDED PPE: nitrile gloves that cover the arms, an apron, a cap, a suitable respirator and protective glasses. This is essential protection when using strong acids and alkalis. A respirator with an appropriate cartridge (see ⑤ RESPIRATORS → [274]), and a face shield is also recommended. Alkaline drain cleaners and acidic toilet bowl cleaners will react violently if mixed in the quantities that are typically used at work (or at home) to clean a single lavatory. Alkali solutions will slowly dissolve most surfaces that contain oils or organic polymers. Damage can be prevented by rinsing or mopping up the cleaner with soft water immediately after cleaning.

§ SPIRIT SOLVENTS

Three situations of exposure to solvents are discussed in this section: chronic exposure to small quantities of one or more solvents, accidental exposure to potentially toxic amounts of one or more solvents, and chronic exposure to solvents used for cleaning.

1. CHRONIC EXPOSURE. Solvents are used frequently by industries. Dyers, dry-cleaners, painters, automobile repair-shops, and printers are required to dispose of solvents (including empty containers and soiled rags) in clearly marked, segregated containers. This may not happen in commercial areas that are not bound by the strict environmental regulations that govern industrial zones. Workers who process commercial waste may be exposed to small amounts of solvents during their work and may develop chronic health problems, e.g., workers in plastic recycling units may complain of mild headaches, dizziness, nausea, and fatigue if they work in rooms where empty containers of solvents are stored; since these symptoms pass quickly, the hazard is not linked to the presence of volatile organic solvents (voc). These complaints should be investigated at once since solvents may evaporate in a day or two, after which the symptoms too will disappear till the next contaminated batch arrives.

Waste-processing companies should inform the source (the generator of improperly-disposed chemical waste, see TABLE 18, [181]) about proper procedures for disposing of empty or nearly-empty containers of chemicals as well as soiled rags that were used to clean surfaces with solvents.

SOLVENT	CHARACTERISTICS	FOUND IN	DISCARDED BY
Benzene	Characteristic 'aromatic' odour.	May be used by industries as a thinner and additive.	The use of benzene in commercial solvents is banned.
Toluene (<i>Methyl benzene</i>)	A colourless and inflammable liquid related to benzene, an important component in coal tar, obtained from the petroleum refining process.	Permanent marker fluid, general-purpose ink solvent.	Commercial printing ink suppliers.
Xylene (<i>Dimethyl benzene, three isomers</i>)	An inflammable liquid with an aromatic odour similar to that of benzene.	General-purpose degreasers, insecticide sprays.	Household waste.
Ethyl acetate	A colourless liquid, easily inflammable.	Paint thinner.	Painters.
Acetone	A colourless liquid with an aromatic odour. Inflammable.	A common general-purpose solvent used in nail-polish removers.	Beauty salons, painters, printers.
Methyl isobutyl ketone	A colourless liquid, inflammable and toxic, with an odour similar to acetone and camphor.	Rubber solvents, resins, nitrocellulose lacquers, production of coatings and adhesives.	Painters, footwear manufacturers.
Methyl ethyl ketone	An odour that is similar to mint, colourless liquid, very volatile and highly inflammable.	General-purpose solvent.	Painters.

SOLVENT	CHARACTERISTICS	FOUND IN	DISCARDED BY
Isopropyl alcohol (<i>isopropanol</i> , <i>rubbing alcohol</i>)	Colourless liquid with dry, alcoholic odour.	Hand-lotions, liquid soaps, hand-sanitizer and paint thinner.	Chemists, hospitals and clinics, beauty salons.
Methanol (<i>spirit</i> , <i>denatured spirit</i> .)	Colourless liquid with bitter, alcoholic odour.	Paint removers and varnishes.	Dry cleaners, painters, carpenters, garages.
Naphtha	A colourless liquid, aromatic odour.	Dry cleaning solvent, lighter fluid, shoe-polish.	Dry cleaners, garages.
Heptane	Colourless liquid with an odour characteristic of gasoline, soluble in alcohol, ether, and chloroform.	General-purpose solvent for inks and paints.	Printers.
Hexane	Inflammable liquid, volatile and colourless, component of petroleum-aromatic odour.	General-purpose paint thinner.	Printers.
Tetrachloroethylene	Colourless liquid with a characteristic odour.	Metal degreasers, dry cleaning supplies.	Dry cleaners.
Methylene Chloride	Volatile liquid, colourless, sweet smell.	Many paint removers and paint strippers.	Dry cleaners, carpenters
Glycol ethers (all classes)	A colourless liquid with characteristic mild odour.	Spray paints. General-purpose solvents.	Painters, garages, carpenters
White spirits (<i>white-petrol</i> , <i>thinner</i> , <i>kerosene</i>)	A colourless liquid (usually a mixture of different petroleum distillates.) Medium to strong petroleum odour.	Standard thinner for acrylic paints, sealants, lacquers and primer for wood and metal.	Painters, garages.
Turpentine	Resinous, colourless liquid with a strong 'pine' odour.	Traditional paint thinner, nowadays replaced by white spirits. Sometimes used as a disinfectant, antiseptic, or insect-repellent.	Painters, cattle sheds, veterinarians.

Table 18. Likely sources of solvent containers that have been inappropriately disposed of with commercial waste. Also see TABLE 32 → [264] to select the appropriate materials for gloves that may be used to handle containers suspected of chemical contamination.

Some items of household waste may contain toxic amounts of solvents. Workers should segregate the following items: aerosol cans¹², partially-used containers of nail-polish, nail-polish removers, perfumes, degreasers, naphthalene balls and camphor. SWM workers should be instructed to teach people who dispose of these items in dry-waste bins that such items must be handed over separately with dry-waste. Even cosmetics labelled 'organic' must be handled with caution and must be segregated at source.

12 Shaking the can to detect residual liquids is not a valid test for emptiness. Aerosol cans should always be segregated.

2. **INTENTIONAL USE OF SOLVENTS.** Housekeepers might be forced to use spirit-solvents to clean dried paint, cosmetics, inks, and dyes. Solvents are the heavy artillery of cleaning products. If selected and used correctly in the proper order, they can dissolve inks, paints, oil and grease without damaging the soiled surface. In some situations, solvents are the only solution, e.g. cleaning ball-point ink from upholstery requires the use of a solvent for acceptable results. The table that follows lists situations in which solvents may be used.

USES	RECOMMENDED SOLVENT	NOTES (SOLVENTS LISTED IN INCREASING ORDER OF POTENCY)
Fruit stains, natural dyes and fruit-drinks on fabric.	Distilled or deionized water, carbonated water (club soda), 70% isopropyl alcohol.	Safe. First choices. (sds: @yyey3us3)
Fresh oil and grease on fabric.	Glycerine (glycerol). (sds: @y3dnn7et)	Safe. Glycerine will dissolve small fresh stains; it will soften older stains.
Paint, nail-polish, and ballpoint ink on fabrics.	Acetone.	Acetone dissolves some plastics and all kinds of wood finishes. Test before use. Do not use in poorly ventilated areas. (sds: @y2943gvf)
Grease, crayons on hard, unpainted surfaces.	Petroleum-based spirits such as kerosene, and petrol.	Inflammable. Will stain wood and dissolve lacquers. Test before use. Do not use in poorly ventilated areas.
Old grease, oil stains, paints	White spirits, naphtha, or turpentine.	Will dissolve lacquer and wood polish. Test before use. Will leave a strong lingering odour. Do not use in poorly ventilated areas.
Tough grease, fat, and oil-stains on fabrics. Dried paint stains on hard surfaces and fabrics.	Tetrachloroethylene (sds: @y4mstbd5) Methylene chloride (sds: @y27cs7g8.)	Dry-cleaners' solvents. Will dissolve most paints. Test before use. Use <i>only</i> as a solvent of last resort. Use EN374:TYPE A gloves → [257], and a respirator with an organic vapour cartridge (see IMAGE 105 → [283]). Do not use in poorly ventilated areas.

Table 19. Recommended solvents, in order of preference and use-cases.

3. **ACCIDENTAL EXPOSURE.** Accidental skin contact with the solvents listed above is harmless and may be treated by washing the area with soap and water.

Guidelines for handling spirit solvents

Solvents can be handled safely if precautions are understood and followed:

1. Vapours burn when mixed with air (or other sources of oxygen) in specific proportions; air-vapour mixtures burn when a source of ignition is present.
2. Spilt liquid or vapour can seep through cracks in masonry and woodwork.

The following precautions are recommended for storing and using solvents:

1. Control or eliminate vaporization during storage. Use tightly sealed containers. Avoid spills
2. Good ventilation in areas where they are used. Additional forced ventilation with fans will reduce the hazard.

3. Eliminate all ignition sources, such as sparks, flames, and static. The product's SDS will contain precise information on ignition temperatures and safe-handling practices.
4. Use appropriate organic vapour cartridges when working in areas with poor ventilation or in enclosed spaces.
5. Petroleum distillates (such as white-petrol and naphthas) can degrade latex gloves, which can result in exposure to harmful biological and chemical hazards. Latex gloves should be changed immediately if accidental contact with a solvent is suspected even if the damage is not visible.

§ GUIDELINES FOR USING CLEANING PRODUCTS

Nitrile gloves should be worn when cleaning. Some jobs in the food-service industry require the use of disposable gloves to reduce the risk of biological and chemical contamination. Workers in these jobs may use polythene gloves instead of nitrile gloves.

Cleaning products that contain chlorine-releasing chemicals should not be mixed or stored with ammonia or acids. Doing so may release chlorine gas, which can damage the airways and may even cause death. An explosive release of gas is also possible.

Concentrated cleaning products should be handled (transported, mixed, or applied) in a properly ventilated area. A respirator with the appropriate cartridge is best; if one is not strictly required, a pedestal fan placed behind the worker may be used to blow vapour and fumes away from the worker.

Cleaning chemicals must only be stored in their original container. Never keep a cleaning product inside a mislabelled or unlabelled container. (See ④⑦ SAFE STORAGE OF CLEANING CHEMICALS → [265]). Workers who use concentrated chemicals should know how to dilute cleaning chemicals.

Workers should know the proper procedure for the safe disposal of used and unused cleaning products.

Workers should not wash hands with any cleaning chemical. Wash hands with soap and water. Isopropyl alcohol may be used to disinfect hands *after* cleaning.

Prefer cleaning products that have an accessible Safety Data Sheet (SDS) or at least a list of all ingredients used in the product (see @yazhqt66 for an example).

As a general rule, avoid manufacturers that do not supply at least a list of ingredients used in a product. The warning applies equally to products marked 'natural' or 'organic,' especially if the manufacturer adopts an intentional alarmist position on the use of 'chemicals' and refuses to supply the user with an SDS or a list of ingredients. The following is an excerpt from the brochure of a company that sells an 'organic,' imported, cleaner:

"Each bottle we supply contains a label describing the contents and a list of all hazardous materials that are not in the bottle. We categorically state that these are not part of our offering. The ingredients in this bottle are free of caustics, phosphates, alkalis, amines, petroleum derivatives, d-linolenic [sic.] strong acids, terpenes, butyl cellosolve [sic.], glycol ethers."

What *does* it contain? One could guess, but safety decisions must never be based on guesswork. If the manufacturer does not wish to print 'chemical-sounding' names on the packaging or provide an SDS, they should make available online at least a list of ingredi-

ents¹³; a QR code or short-code may be used to save space. (Also see ④ⓐ HAZARD CLASSIFICATION SYSTEMS_→[198].) Potential chemical hazards from cleaning products are but one aspect of a larger problem. The SDS for a hazardous chemical will allow you only to evaluate the hazard posed by the chemical; it may not provide information about the risks of using the chemical at a given workplace; it will not contain any information for non-chemical hazards, e.g., while a solution of mild detergent may be chemically harmless, a wet floor is a serious hazard—falls account for 1/3 of all non-fatal injuries in the United States—therefore, a disinfectant with a shorter dwell-time may present a lower hazard than one that requires, say, 20 minutes to be effective. Always investigate the possibility or more than one hazard being present in a workplace before recommending a solution (See MALL TALES EP.I: ANITA HAS A PROBLEM_→[189].)

Hazard information should always be available in a form that workers understand. SWM professionals may be required to handle or process hazardous chemicals; they have the right to know the risks. (Also see ④ⓐ HAZARD CLASSIFICATION SYSTEMS_→[198].) Some house-keeping products can create toxic chemicals if they are mixed. These chemicals are safe to handle and apply if the area is properly ventilated and appropriate PPE is used. The table that follows lists the worst-case consequences of mixing incompatible cleaning products.

CHEMICAL 1	CHEMICAL 2	HAZARD
Toilet cleaner with hydrochloric acid.	Chlorine-based bleach (powder or liquid.)	Chlorine gas. Severe irritant that can be highly toxic in poorly ventilated spaces.
Toilet cleaner (or any product with a strong acid.)	Drain cleaner (or any product with sodium hydroxide.)	Heat and steam and acid or alkali splashes, which can cause severe skin burns.
Ammonia-based cleaner.	Chlorine bleach.	Chloramine gas. Severe irritant that can be highly toxic in poorly ventilated spaces.
Acetone or isopropyl alcohol.	Chlorine bleach.	Chloroform. Sedative. Can cause drowsiness and loss of consciousness in poorly ventilated spaces.
Peroxide bleach.	Chlorine bleach.	Violent reaction that can cause splash hazards.

Table 20. Cleaning chemicals that should not be mixed. Worst-case hazards.

The heavyweight champion of chemical solvents is included here, at the very end of the chapter, where it might escape the notice of eagle-eyed readers who abhor powerful chemicals: Pure DHMO, also known as hydric acid¹⁴, it dissolves more substances than any other liquid. It is commonly used to make battery acid; the ultra-pure, deionised form of the chemical is used to transfer energy from the radioactive core in nuclear power plants. A combination of DHMO, a mild detergent and a mild abrasive is appropriate for most cleaning tasks. (Also see @y502nrum for research on DHMO.)

13 Some countries require that the SDS must always be included with the product.

14 Also called di-hydrogen monoxide, or DHMO. CASN 7732-18-5. Safety Data Sheet: @y595gtnp

§ ANSWERS TO FREQUENTLY-ASKED QUESTIONS

P *If it burns is it an acid?*

M *Not necessarily. This is a common misconception—anything that burns is assumed to be acidic. A strong alkali can also burn the skin. Read the SDS or the list of ingredients.*

P *If a glove is rated safe to handle 96% sulphuric acid, can I assume it is also safe for 40% sulphuric acid or 10% hydrochloric acid?*

M *Never assume that different concentrations of the same acid (let alone a different acid) will have the same effect on the glove.¹⁵ Always check the glove's safety data sheet (SDS). Perform a test to verify the information on the SDS, especially the degradation test. If you do not have the resources to perform a test, take the cautious route and insist on an SDS.*

P *What if the manufacturer does not provide a datasheet?*

M *Don't use that manufacturer's products. A manufacturer is required to put together an SDS for gloves that are to be used for handling potentially hazardous chemicals. When selecting appropriate PPE for handling chemicals and bio-medical waste, stick to well-known brands, especially if your company does not have the equipment to test gloves in-house.*

P *Can I assume that the SDS for a nitrile glove¹⁶ made by a different manufacturer would be roughly the same as the nitrile glove that I use?*

M *No. Variables such as thickness, material properties and quality assurance of glove materials can affect the performance of the glove even though it may be made from the same material. Either select another brand of gloves with the appropriate test data (the better option), or conduct your own test if the test data is not available.*

+ CHEMICALS AND WHATSAPP UNIVERSITY

Consider the following conversation between a moderator and employees from an NGO that promotes the use of environmentally-safe, organic materials¹⁷:

P *[Aparna] I have heard that chemicals are toxic and there are dangerous chemicals found in products that we use every day. Even processed food contains dozens of toxic chemicals.*

P *[Bindiya.] I have heard this argument. I think it is true. Modern cleaning products contain many toxic chemicals.*

P *[Charu.] I too have heard this argument. I don't understand why it is correct or not but I trust the person who send me this information.*

¹⁵ In the case of inorganic acids, a reduction in their concentration does not always result in a proportional reduction of the associated chemical hazard.

¹⁶ Or any other material such as neoprene, PVA, PVC and so on.

¹⁷ The conversation was not part of a workshop and took place while the handbook was being written. Names have been changed.

[M] *Where did you read this information?*

[P] *[Charu] Someone sent me a message on Whatsapp that all commercial toothpastes contain toxic chemicals that are used to clean garages. Also, did you know that chewing on a twig of neem is a safe alternative to toothpaste?*

Such queries require tactful answers. Many cleaning products do contain toxic chemicals in hazardous quantities, and while the participant is correct in making a broad generalisation, it is certainly not appropriate in the case of toothpaste and processed food. Railing and ranting against WhatsApp (and other popular sources of misinformation) is futile. If the information is correct or largely correct, confirm that it is so and suggest a credible source to verify it; if the information is incorrect, provide credible sources that contradict the information; if a participant offers nothing more than vague generalisation ('chemicals are toxic') then ask them to provide examples that support the argument.

Toxicity depends on dosage and the duration of exposure. All chemicals, even water and oxygen, can be toxic. Many products are, indeed, toxic in small amounts and should be avoided if possible; however, the decision should be based on evidence. An SDS allows users to evaluate the risks of a product and take an informed decision.

[M] *Which chemicals are these? May I see the message?*

The message was an lump of excrement from the 1990s; nowadays, it may be found even today floating in the sewers of various social media¹⁸. The message was as follows:

Check the ingredients listed on your shampoo bottle, and see if they have this substance by the name of Sodium Laureth Sulfate, or simply SLS [sic]. This substance is found in most shampoos, and the manufactures [sic] use it because it produces a lot of foam and it is cheap. BUT the fact is that SLS is used to scrub garage floors, and it is very strong. It is also proven that it can cause cancer in the long run. I went home and checked my shampoo [brand], it doesn't contain it; however, others such as [brands], the new [brand] shampoo, etc. contains this substance.

So I called one company, and I told them their product contains a substance that will cause people to have cancer. They said "Yeah, we know about it but there is nothing we can do because we need that substance to produce foam." By the way, Colgate toothpaste also contains the same substance to produce the "bubbles." They said they are going to send me some info. Research has shown that in the 1980s, the chance of getting cancer is 1 out of 8000 and now, in the 1990s, the chances of getting cancer is 1 out of 3, which is very serious. So I hope that you will take this seriously and pass this on to all the people you know, and hopefully, we can stop giving ourselves the cancer virus. Check your bottles and toothpaste!

[M] *This is an old scaremongering e-mail. Why don't you look up the NIOSH Pocket Guide to Chemicals for information on SLS? You should talk to your dentist about the effectiveness of neem and whether chewing on a neem twig is a suitable alternative to using a*

18 See @yxcgnfa4.

brush and toothpaste.

Never argue with participants. Many people talk about ‘toxic’ chemicals without understanding what toxicity means and how it is evaluated. Your job is to provide them with information and the different mental models that may be applied to evaluate a problem at hand.

§ HOUSEKEEPING AND P2P: RECOMMENDATIONS

SOLVE THE PARTICIPANT'S PROBLEM FIRST: Costs, eco-friendly alternatives, and ergonomics are secondary goals. The process of defining the problem statement with the participant will indicate improvements in other areas but first solve the participant's problem. The ideal solution is one that the participant can implement herself with resources she has available to her.

USE THE HOHC: Try to eliminate the hazard; investigate engineering and administrative controls; and finally recommend appropriate PPE.

KEEP IN MIND THE REQUIREMENTS OF THE JOB AT HAND: Advise the simplest, safest, and most economical product that will get the job done: do not recommend an all-purpose cleaner when water and a mild abrasive are adequate; do not recommend an all-purpose cleaner when a specialist cleaning product is required; do recommend a chemical solvent if one is needed.

KEEP THE SCALE OF OPERATIONS IN MIND: Vinegar, baking soda and two-minutes of scrubbing might be the appropriate recommendation to polish metal fittings in a small office; it is not an appropriate recommendation for a hotel with 1,548 brass door handles that must be kept disinfected and polished everyday.

DISINFECTION REQUIRES A DISINFECTANT: Cleaning products are not designed to kill germs even if they contain one or more chemicals that may be germicidal. If the job merely requires an area to be clean, then the disinfectant properties of the cleaning product are irrelevant; if a site must be disinfected, then recommend a disinfectant and use the P2P method to create an efficient disinfection protocol and schedule.

KNOW HOW AN ACTIVE INGREDIENT(S) WORKS: Rust stains on a hard surface may be removed by employing either an acidic cleaner or an abrasive cleaner. The former dissolves the rust; the latter abrades it away. Each has its advantages.

DO THE JOB ONLY AS WELL AS IT SHOULD BE DONE: How is 'cleanliness' measured at the workplace? What is 'clean enough?' A table at a food court *must* meet minimum requirements for cleanliness and level of disinfection; anything more is a waste of time and resources.

TIME IS MONEY: Standard protocols for disinfection require that a surface must first be cleaned to remove organic loads, and then disinfected. This might be impractical for the job at hand. Well-designed protocols include feedback that allow a worker to employ different tasks and tools to achieve the same result, e.g., if a visibly clean surface requires frequent disinfection, then using a larger volume of a weak, inexpensive disinfectant is more practical than requiring the worker to clean, mop up, and then disinfect. (See AN ENGINEER VS. AN NGO ADMINISTRATOR, [512].)

✦ MALL TALES EP.1: ANITA HAS A PROBLEM

The conversation that follows takes place at a workshop for SWM workers employed by a company that provides housekeeping, janitorial, and waste-collection services to shopping centres. The annotations (in brackets) illustrate how the moderator applied the P2P method to the problem. Read the moderator's questions carefully and try to infer why she asked these questions.

[P] *(Anita) I have heard that Harpic® contains dangerous chemicals. What PPE should we use when using it?*

(Question: What is Anita's problem? How would you proceed from here?)
The moderator recognises that while Anita wants a recommendation of PPE she has not precisely described the nature of her problem. Instead of attempting to clarify, she first tries to involve anyone else who might have the same problem and might be able to describe it in greater detail. In doing so, the moderator expands the discussion to include other participants.

☞ Has anyone else heard this argument? Anyone else with the same problem?

[P] *(Rekha) Yes. I have heard it too. I have experienced it. I also face problems with this product.*

(The moderator resumes speaking with Anita, but she reminds the other participants to intervene if they wish.)

[M] *OK. I will interact with Anita and Rekha since they raised this issue first. Please feel free to interrupt me if you want any clarifications. Anita, what exactly are the symptoms of the problem?*

[P] *My eyes and nose burn when I use this product in the washroom. I wear long gloves, so my hands do not burn, but my face burns even when I am not cleaning the washroom. That is why I believe that this product is toxic.*

(Rekha also describes her experience.)

[P] *[Rekha] My face doesn't burn. But my hands itch and burn because I wear short gloves. It stops when I wash my hands. I don't wear long gloves because they snag on my bangles.*

A problem-statement has emerged. Anita's symptoms can be caused by the product that was mentioned—it contains 10% hydrochloric acid (HCl), which is used to dissolve deposits of mineral salts that are common in hard water¹. Acidic compounds are commonly used in many products that are marketed as 'toilet cleaners' and 'bathroom cleaners' and

¹ See HOUSEKEEPING CHEMICALS → [171] for a list of commonly used cleaning products and the chemicals used in them. The number of hazardous chemicals that SWM workers handle regularly is much smaller than, say, the number of hazardous chemicals that pharmaceutical technicians and chemical engineers must use.

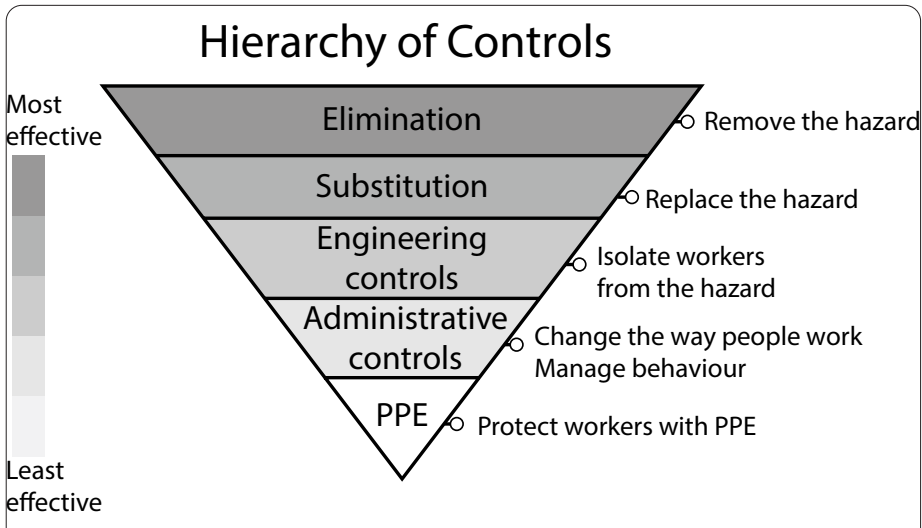


Image 79. Hierarchy of controls.

causes the symptoms described by the participant. If it is used according to the manufacturer's instructions, brief exposure to acidic cleaning chemicals is harmless and does not require the use of PPE—the best solution is to improve the ventilation of the washroom; the duration of daily exposure for housekeepers is not brief enough to be considered harmless. Chronic exposure to HCl vapour might cause long-term damage to the lungs and nasal passage. Further, commercial-strength washroom cleaners may be sold as concentrates that require dilution to working-strength before they are used as shown in IMAGE 106, [284]. The dilution process releases large amounts of vapour. Therefore, the moderator must first determine the precise nature of the hazard—is it chronic or acute—by asking Anita a series of simple questions. Notice that she has not yet spoken about PPE; she does not refer to the brand-name of the product either since this might lead other participants to assume that the hazard is limited to a single product and not to the entire range of acidic cleaning products. (The questions and answers that follow have been condensed into two segments.)

[M] *How long have you used this product? When did the symptoms first arise? Do your eyes water or burn even when you do not use the product? How many washrooms do you clean everyday? Do you use this cleaning chemical every time? How many bottles of cleaner do you use everyday? Has your supervisor ever told you to mix the chemical with water? Do you use any other cleaning products in combination with this one?*

[P] *I have used this product since I joined the company last year. The problem started within a week. We don't mix the product with water. It is applied directly to the toilet bowl. [Anita answers all the questions. Rekha also contributes to the discussion, but she is not as worried as Anita is when handling the chemical—her face doesn't burn, and she doesn't mind itchy hands. Anita's responses are summarised in the annotations that follow.]*

(Question: Anita's replies indicate that her exposure to the hazard is chronic, but her face burns even when she isn't using the chemical. Re-read what Anita said and try to

explain what might cause her face to burn even though Rekha does not face this problem.) The moderator, meanwhile, formulates a hypothesis and attempts to confirm it. Read the moderator's questions carefully and try to follow her train of thought.

M *Anita. Do you wear elbow-length gloves when you clean the washrooms?*

P *Yes. All the time.*

(Rekha interrupts.)

M *I don't use long gloves. They catch (snag) on my bangles. I use water-proof gloves like the ones you showed earlier.²*

M *Anita, do you clean the toilet bowls at the end of your shift or is there any other job you do after that?*

P *Toilet-bowls are usually cleaned first because the product has to soak for a few minutes. After mopping the counters and basins, we swab the toilet bowls clean and mop up the wash-room. Then I move on to the common areas to sweep and mop.*

M *Do you wear long gloves when you sweep and mop?*

P *[Anita] Yes. I rinse my gloves after I clean the restrooms and also at the end of the shift as I was taught. [Rekha] I prefer to wear short gloves. I bought them for my own use. I rinse my gloves just like Anita does.*

M *Where do you rinse your gloves?*

P *[Both] In the restroom basin.*

M *Is the mall air-conditioned?*

P *Yes. But the system is turned off when we work.*

(The moderator now has enough information to confirm her hypothesis. Could you solve the problem?)

Urinals in the men's washrooms are about ½m tall with the drain at floor-level and the water inlet at the top. Anita follows the correct SOP while cleaning the urinals—acidic toilet-bowl cleaners require time to dissolve salts. Therefore, the company had trained her to apply the toilet-cleaner first before cleaning the rest of the washroom. When using elbow-length gloves, Anita (unlike Rekha) is fully protected against accidental splashes. This is important because when she swabs the drain, her arms are exposed to drops of acid and water dripping from the water-inlet. While the gloves protect her hands, drops of acid and water remain on the arms of the glove; unfortunately Anita was not told to rinse, thoroughly, the *entire length* of her gloves. Anita associated the task of rinsing her

² Rekha is referring to TYPE WW dish-washing gloves.

gloves with the cleanliness of the glove and not as a precautionary measure—since the arms of her gloves are always relatively dry and clean, she did not bother to rinse the entire glove after cleaning the restrooms. Also, elbow-length gloves cannot be rinsed effectively in shallow basins, such as those found in the average restroom...

This is what happened: hydrochloric acid is a strong acid and is readily soluble in water. A few drops of 10% acid can render the water on the surface of the gloves potent enough to irritate the relatively tender skin on a person's face—which is likely to happen if Anita used her arms to wipe the sweat off her face in a hot and humid mall. Rekha did not face this problem because she used short gloves, which do not protect the skin on her arms; she had, over time, developed a tolerance for the burning sensation caused by the occasional drop of acid on her arms. A perfunctory rinse removed all the acid that might have dripped on her short gloves and her arms. It is also possible that Rekha took her gloves off while she worked outside the washroom! Anita, on the other hand, follows the SOP faithfully.

The problem is clear: While the company has issued PPE for the job at hand, it had failed to create a sensible, practical SOP for its workers. The training programme too was inadequate.

(Question: Now that the source of Anita's problem has been identified, how would you proceed?)

The moderator first investigates if the simplest and most effective solution—elimination of the hazard—is feasible. She proceeds down the Hierarchy of Controls, one by one. She does not rush to point out the problem because she does not yet have an effective solution.)

[M] *What happens if you don't use this cleaning product? How does your supervisor decide if a toilet bowl is clean enough?*

[M] *If we skip using this product for a week the toilet bowls are clean enough to pass inspection; the drain and water-inlet become discoloured within a few days. The supervisor would know that we have skipped using this product and we would be fined. Actually, I don't blame the supervisor because the company will lose the contract if a visitor to the mall complains about the cleanliness in the toilet.*

(The moderator is now sure that the water supplied to the washrooms has high mineral content and that the hazard of an acidic cleaning agent of some kind cannot be eliminated. There are safer alternatives to hydrochloric acid, but Anita does not have the power to influence a switch to these products since they are all more expensive. Therefore, the moderator does not discuss any solutions that involve substitution—she tries to find a solution that Anita can implement easily. She explores the possibility of using an engineering control.)

[M] *Is there an exhaust fan in the washrooms?*

[M] *Yes. But it is not very powerful.*

[M] *Is there is a pedestal fan that you can use?*

[M] *Yes. We use one to dry the floor of the washroom after we have mopped it.*

(The moderator has now obtained all the information required to find a solution. Before discussing possible solutions, she asks Anita and Rekha to describe the other jobs that they do and the other cleaning products they use.)

[P] *We sweep the floors, then mop them with Neemyle® floor cleaner. Handrails on escalators, stairways, and balconies are wiped with 'Dettol-water.'*

[M] *Are you sure it is Dettol®? What colour is it? Does it have a smell?*

[P] *Not sure. We are all supplied 1L plastic bottles of the solution. The bottles do not have a label. It is yellowish in colour. Water turns milky when this chemical is added; it also becomes slightly soapy and slippery but it does not lather. It smells like Dettol.*

[M] *How do you apply the disinfectant?*

[P] *We are trained to use a sponge with a handle. We dip the sponge into the Dettol-water and run it along the length of the rails.*

(Question: Why did the moderator ask about the other jobs that Anita and Rekha do at the mall? Why did she inquire about the brand of cleaning product—is there a difference between the two brands in the context of safety? Why did she ask about the smell and colour of the disinfectant?)

The moderator made sure that the disinfectant was not a chlorine-releasing compound³. If Anita had mentioned that the disinfectant was a colourless liquid with a faint odour, the moderator would have cautioned Anita about the hazards of accidentally mixing the toilet-cleaner with the disinfectant. The moderator recommended to all the participants that they use two kinds of gloves—one pair of elbow-length TYPE WW gloves only while cleaning washrooms and one pair of nitrile-coated TYPE DW gloves when cleaning common areas. These gloves offer adequate protection and are more comfortable than TYPE WW gloves. She also recommended that Anita and Rekha should begin their shift by applying the acidic cleaning product and then do some other job outside the washroom for ten minutes. A pedestal fan should be switched on when the product is used and kept on till the washroom is dry. The fan ventilates the washroom and dilutes any HCl gas to safe levels. She also recommended that all cleaning products be labelled so that they can be identified by workers.

(Question: How should Anita rinse her elbow-length gloves?)

The moderator demonstrated the problem in the restroom at the venue and showed the participants two techniques to rinse their long gloves:

1. Use a sanitised hand-shower to rinse the gloves before mopping-up the restrooms.
2. Wash the palms of the gloves, remove the gloves, roll up the open end, and rinse the entire length of the glove in the basin.

³ Note that the moderator does not inquire about the dilution ratio of the disinfectant or wonder if the disinfectant remains potent-enough to do its job—she focuses on solving Anita's problem.

EXERCISE 8: INVENTORY MANAGEMENT

Objective

- Create an inventory for a basic cleaning cart for use by a housekeeper assigned to a food court at a mall. The cart should be equipped for the all the jobs done by the worker on a food court and should have a fixed re-stocking schedule.

Notes

- swm workers know what chemicals they use, in what quantities these are used, and how often they are used. This information simplifies the task of inventory management—re-stocking and dispensing schedules, and so on can be calculated with this data
- If possible, take a well-designed cleaning cart to the workshop and demonstrate its features.

Slides

- Video: @yyj25htv
- [S]1 : A Japanese cleaning cart.

Steps

1. Play the Youtube video about Haruko Niitsu. (@yyj25htv)
2. Display [S]1. Discuss the useful features incorporated by the Japanese designers of the cleaning cart. Discuss the differences between the cart shown and the one used by participants. Discuss their relative advantages and disadvantages.

Workshop programme

- Include this exercise only if participants use a cleaning cart at work. Use QUESTIONS FOR SWM WORKERS → [195] as a guide.
- Skip the video in workshops with managers. Administrators and supervisors responsible for inventory probably use a system that is already in place. Discuss the relative advantages and disadvantages of their existing system using QUESTIONS FOR MANAGERS AND SUPERVISORS → [196] as a guide.
- For non-technical participants, this exercise allows them to supply information to the moderator. Haruko Niitsu, the subject of the video about a cleaner in Japan who is considered a National Treasure. She is a source of inspiration. Play the video. Display [S]1 and discuss her attitude towards cleaning with participants. Create an inventory for a cleaning cart that requires replenishing once a week.



Cleaning Cart

1. Cleaning products in separate* carry-basket
2. Mop holders*
3. Dry-waste bin
4. Broom and dust-pan
5. Cleaning cloth storage
6. Dusters
7. PPE, uniform, and spare bin-liners
8. Wheeled water-bucket
9. Collapsible frame*
10. Rubber wheels*

Image 80. A Japanese cleaning cart. *Discuss the importance of these features with participants. (Photo credit: Yuya Tamai.)

DISCUSSION

Inventory management systems for housekeeping and janitorial jobs are essential but should not be unnecessarily complicated. For any given location, the following conditions are true for any cleaning product:

1. Demand is continuous—if work is being done, the product is being used.
2. Demand is uniform—average usage per period is stable over time.
3. Demand is predictable—usage in any given period is known in advance.

Companies that offer housekeeping and janitorial services, however, must operate under the constraint of available storage space. Storage space is expensive—commercial buildings that have hired a cleaning service to a contractor will not make available as much space as required for *safe* storage of cleaning products and equipment. The key word is safe. Companies must make do with whatever space that they are given for on-site storage; conscientious companies that care for their workers must develop procedures to use this space safely.

Workers who use cleaning products can provide useful, practical insights on the usage of cleaning products at their workplace.

§ QUESTIONS FOR SWM WORKERS

1. Is this cart similar to the one that you use at work?
2. Why do you think this feature is important? (See features marked with an asterisk in IMAGE 80.) Discuss, specifically, the little touches of insightful, functional industrial design that stand out:

THE FRAME IS MADE OUT OF STURDY PLASTIC and can be collapsed to a floor space roughly equal to the size enclosed by the marks 10 and 9 in the image. Carts can

be stacked. The entire cart can be cleaned and disinfected without fear of rusting the frame.

FREQUENTLY USED PRODUCTS are placed in a basket; the bucket has wheels so that it need not be lifted; the mop holders are placed so that wet mops can drip-dry above the bucket; the wheels are rubberised to reduce noise; the dry-waste bag has a zipped side panel, which allows more than one bin liner to be used to segregate different kinds of dry-waste if necessary; the front wheels can fold into the frame, allowing empty carts to be stacked on top of each other in the store-room; lockable wheels and a flat-sided frame that will stand flush against a wall turns the cart into a sturdy semi-permanent workstation.

3. Is there any feature on this cart that you would change?
4. Is there enough space for your cleaning products and equipment?
5. How long would the cleaning products last? Would one product run out before others? Is there any benefit in ensuring that the cart be restocked on a specific day of the week, i.e., should it be stocked such that it only needs to be stocked in exactly one week?
6. Did anyone notice the white-board and pen-stand? Why is this included in the cart?

§ QUESTIONS FOR MANAGERS AND SUPERVISORS

1. Do you have an inventory management system in place?
2. Do you face any problems related to inventory, e.g., synchronising re-stocking and purchasing schedules, price- and quality-variations, etc.? How could these be solved?
3. Is demand for cleaning products at your workplace continuous, uniform, and predictable? What variations do you see in practice?
4. Is it feasible to train your workers so that floor-level inventory management jobs might be delegated to them? Discuss the advantages of a inventory-management plan if the all workers use a standard, modular cleaning kit.

✦ THE CLEANEST AIRPORT IN THE WORLD

Haruko Niitsu works as a cleaner at Haneda airport in Tokyo. Her work—the cleaning techniques she has developed, and her ability to train her co-workers—resulted in Haneda airport being named the world's cleanest airport in 2013, 2014, 2016, and 2017. She was featured in *Purofesshonaru Shigoto no ryūgi* (Professional Work Style, broadcast in English as *The Professionals*)—a popular weekly programme on NHK—that features the life and work of Japanese professionals; she has written many books on cleaning (see @yyzwyj3e), including *Sekaiichi seiketsu na kūkō o sasaeru shokunin no ikizama* (The cleaner of the world's most immaculate airport).

Haruko's cleaning skills are 'professional' level: She knows the advantages and disadvantages of over 80 brands of detergent; she can analyse the composition of a stain, and recommend the best way to clean it.

The Japanese attitude to work—continuous improvement and respect for those at the top of their field, no matter the job—results in a cleaning cart that is perfectly designed for its task.

きれいは、
気持ちいい。

羽田空港は、「世界一、清潔できれいな空港」に選ばれました。

ロビーは隅々まできれいに、トイレはいつも清潔に。私たち空港スタッフは、
つねに快適で心地よい環境をお客さまにお届けできるように心掛けています。
国内からも海外からも、すべてのお客さまにご満足いただける旅客ターミナルを
めざして、羽田空港はますます進化し続けます。もっと便利に、そしてもっと快適に。

SKYTRAX® (WORLD AIRPORT AWARDS 2016)
「Best Airport Terminal Cleanliness」部門 世界No.1受賞(2011) / 「World's Best Domestic Airports」部門 世界No.1受賞(4年連続)

WORLD AIRPORT
WINNER
SKYTRAX
AWARDS 2016

羽田空港 清掃パイプラー 新井 幸子

羽田空港をご利用される皆さまをはじめ、空港の運営を支えてくださるすべての方々に深い感謝と敬意を申し上げます。 日本空港ビルテック株式会社 東京国際空港ターミナル株式会社

Image 81. Haruko Niitsu is a cleaner at Haneda Airport in Tokyo. The government of Japan has included Niitsu into a elite group of master craftspeople, artists, and performers who are considered to be “Living National Treasures of Japan”. The photograph shows a plaque installed at Haneda Airport by the government of Japan.

Hazard classification systems

Objective

- Working knowledge of warning labels and pictograms and the hazards they represent. SWM workers should know how to interpret (at least) the warning label (pictograms and text) affixed to containers.
- Working knowledge of Safety Data Sheets. SWM workers who purchase and dispense chemicals (usually in the form of chemical-based cleaning products) must know how to interpret Section 1 and Section 2 of a Safety Data Sheet (SDS). Workers and supervisors responsible for on-site safety must know how to interpret all sections in an SDS.
- Working knowledge of GHS hazard classification. Workers responsible for the purchase, storage, on-site dilution and transport of chemicals (e.g., industrial-strength, high-concentration cleaning products) must know how to prepare GHS-compliant warning labels; they must be able to interpret Safety Data Sheets, for which an understanding of GHS classification is essential.

Slides

- [S]1: Warning label on container.
- [S]2: GHS pictograms.
- [S]3: ADR transport pictograms.
- [S]4: Hazard severity.
- [S]5: Warning label on a can of acetone.
- [S]6: Warning label on a can of pesticide.

Steps

- Initiate a discussion using the P2P method. Use the material in this activity during the discussion. WORKSHOP PROGRAMME (facing page) contains guidelines on the agenda (which materials to include depending upon the participants' jobs.)

Notes

- Hazard communication systems are administrative controls, i.e., they rely on a worker's behaviour and vigilance to be effective. Refresher courses are essential.
- This chapter should be included in workshops for workers employed in commercial housekeeping, e-waste processing, ship-breaking and such companies (such as plastic-recyclers) that process waste that may be contaminated by chemicals.

- When this handbook was published, the most recent edition of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) was GHS (Rev.8) (2019)¹. All references are to this document, e.g. (GHS 1.2) refers to Chapter 1.2 in GHS (Rev.8) (2019).
- Current regulations on the storage, usage, and transport of hazardous substances are currently described in the Central Motor Vehicles Rules, 1989 of the Motor Vehicles Act, 1988, and in different rules of the Environment (Protection) Act (EPA), 1986. Rules in the EPA that are relevant to the SWM sector are contained in the Manufacture, Storage and Import of Hazardous Chemicals (Amendment) Rules (MSIHC), 1989, the Hazardous Wastes (Management and Handling) Rules, 1989, the Bio-medical Wastes (Management and Handling) Rules, 1989, and the Ozone Depleting Substance (R&C) Rules, 2000. The Ministry of Environment, Forests and Climate Change had published the draft called the Hazardous Substances (Classification, Packaging and Labelling) Rules, 2011, with the aim of harmonising regulations on hazardous materials; the said rules had not yet been notified. In 2019, the Ministry published the draft of a National Action Plan for chemicals, which included a recommendation to harmonize India's chemical safety regulations with GHS. Therefore, the handbook uses GHS pictograms and recommendations for warning labels and SDS.
- Hazardous materials are materials, preparations (mixtures) and objects (solid, liquid or gaseous) which have one or more dangerous properties and can therefore endanger the life and health of persons and animals, pollute the environment or cause material damage. Unfortunately, different national and international regulations and standards define the phrase 'hazardous material' differently. Whilst standards such as GHS and OSHA refer to substances, chemicals and mixtures of chemicals with intrinsic hazardous properties, OHS professionals use the phrase 'hazardous materials' in a broader sense that includes the handling and usage of these 'materials' in specific workplace conditions. Transporters use the phrase 'hazardous goods' in goods manifests and signs. For the sake of simplicity, the term 'hazardous material' is used in this handbook to mean chemicals, products, or any object that poses a physical, health or environmental hazard. Chapters on OSHA and GHS standards use 'chemical' and 'substance' as defined, respectively by OSHA and GHS.

Workshop programme

- This activity is usually taken up after ④ HOUSEKEEPING AND CHEMICALS → [169], ④⑤ SAFETY DATA SHEETS → [248], and ④⑥ SAFE STORAGE OF CLEANING CHEMICALS → [265]. The moderator, however, should first read the material presented here since a number of concepts in the aforementioned activities are described here.

¹ See @ yyw3fbh

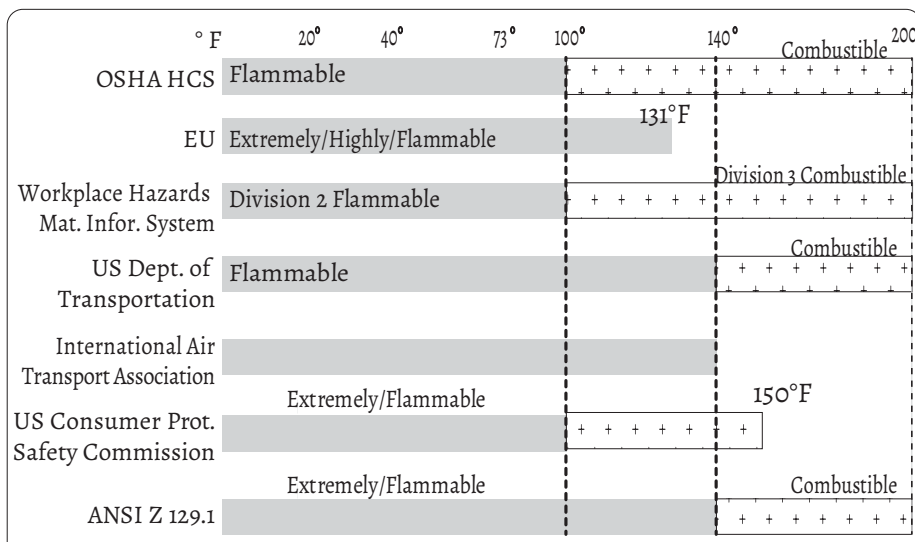


Image 82. Without a harmonized standard, a product may be considered flammable or toxic by one agency or country, but not by another which would result in the same product bearing different warning labels or none at all. (From OSHA guide on GHS)

INTRODUCTION

Hazard and risk are often used as synonyms of ‘danger.’ The terms have specific meanings in the context of hazard classification systems. The relationship between hazard, exposure, and risk may be expressed as follows:

$$\text{Hazard} \times \text{Exposure} = \text{Risk}$$

An example: Crossing a street presents the *hazard* of getting hit by a vehicle; the *risk* is the likelihood of harm occurring. The risk of getting hit by a vehicle while crossing an empty street in broad daylight is low because the exposure to the hazard is low; exposure is higher during rush hour. However, even during rush hour, the risk of getting hit at a zebra-crossing on a green crossing-light is low. Other variables may affect the severity of the hazard: crossing the same street at night (especially if it is poorly lit) is riskier. The inherent hazards of crossing a street (getting hit by a car) and the degree of exposure (the number of cars on the road, the speed of traffic, etc.) must be known to evaluate the risk of doing so.

Chemical-hazard classification systems quantify the nature of the hazard (*the chemical is corrosive; it is poisonous* and so on) and its severity (*it destroys tissue at 30% concentration, it causes burns at 10% concentration; it is fatal if inhaled, it irritates the nasal cavity if inhaled* and so on). Using this information, the risk may be minimized or kept within acceptable limits by using the various controls discussed earlier to reduce exposure to the chemical.

§ GHS HAZARD CLASSIFICATION




The Globally Harmonized System of Classification and Labelling of Chemicals (GHS) defines the criteria for classifying substances and mixtures according to the physical,

health, and environmental hazards that they present; it contains standardised hazard communication elements, including requirements for labelling and Safety Data Sheets, which are described in Annexure 4 of the document; the document is commonly known as The Purple Book¹. GHS is the global standard to which all international standards on the classification of hazardous materials will, eventually, be harmonized; it describes the sequential logic to create a standardised set of hazard communication materials, such as a set of standardised pictograms, warning labels, and a Safety Data Sheet for any product. GHS defines three groups of hazards—physical hazards, health hazards and environmental hazards as well as the criteria that determine both the classification of a hazardous material under one of the three groups as well as its categorization (under a class) based on the severity of the hazard. GHS eliminates the need for testing and evaluating chemicals against multiple classification systems. GHS increases safety for unskilled and semi-skilled SWM workers:

1. Workers who cannot read English well can be trained to interpret the GHS pictograms and signal words (“Danger” and “Warning”), and then use the appropriate safety procedures.
2. Workers in jobs that process packing material often encounter various warning labels of different transport-related classification systems, such as the NFPA fire-diamond and the ADR² transport pictogram. Both these agencies have adopted (or are in the process of transitioning to) GHS pictograms and labels. Consequently, the curriculum of OHS training programmes, including *From Person to Professional*, is easier to understand.

§ PHYSICAL HAZARDS

Substances are assigned to 17 different hazard classes; each class is divided into categories that are always numbered in order of the decreasing severity of the hazard, i.e., Category 1 presents a greater hazard than Category 2 and so on in any given hazard class.

HAZARD CLASS	HAZARD CATEGORY	EXAMPLE ³	SWM JOBS*	PICTOGRAM
Explosives	Divisions 1.1 to 1.6	Fireworks are placed in Division 1.4	(1. General waste-collection and processing)	
Flammable gases	Categories 1 and 2	Fuel Gases ⁴ , Ammonia	(2. Metal recycling), (3. Ship-breaking), (4. Biogas plants)	
Aerosols and chemicals under pressure	Categories 1 and 2	Any pressurised canister	(1), (5. Housekeeping), (6. Plastic-waste processors)	

¹ See @yyyw3fbh

² ‘ADR’ is derived from the French name for the treaty: *Accord Européen relatif au transport international des marchandises Dangereuses par Route*, which means *European Agreement concerning the International Carriage of Dangerous Goods by Road*. From 1 January 2021, the treaty will be renamed *Agreement concerning the International Carriage of Dangerous Goods by Road*. See@y6broevv

³ Examples of substances that SWM workers might encounter. ‘Rare’ simply means that SWM workers are unlikely to encounter any substances in this hazard class

⁴ Acetylene, hydrogen, propane, butane (LPG), and methane (CNG)















HAZARD CLASS	HAZARD CATEGORY	EXAMPLE ³	SWM JOBS*	PICTOGRAM
Oxidizing gases	Category 1	Oxygen, Chlorine	(2)	
Gases under pressure	See Notes, below		(2), (3)	
Flammable liquids	Categories 1 - 4	Fuels ⁵ , Petroleum-based solvents ⁶ , acetone	(1), (2), (3), (4), (5), (6)	
Flammable solids	Categories 1 and 2	Matches	(1)	
Self-reactive substances and mixtures	Types A-G	Rare		
Pyrophoric liquids	Category 1	Rare		
Pyrophoric solids	Category 1	Rare		
Self-heating substances	Categories 1 and 2	Rare		
Flammable gas emitters ⁷	Categories 1 - 3	Calcium carbide	(2)	
Oxidizing liquids	Categories 1 - 3	Hypochlorites, peroxides ⁸	(4), (5)	
Oxidizing solids	Categories 1 - 3	Rare		
Organic peroxides ⁹	Types A-G	Rare		
Substances corrosive to metal	Category 1	Strong acids and bases	(1) and (5) ¹⁰	
Desensitized explosives	Categories 1 - 4		Rare	

Table 21. Physical hazard classes and categories in GHS. *The numbers in column 4 are SWM jobs: (1) General Waste Collection and Processing, (2) Metal recycling, (3) Ship-breaking, (4) Biogas-plant operations, (5) Housekeeping, and (6) Plastic waste processing.

5 Petrol, diesel, and kerosene in order of decreasing flammability.

6 Such as white spirits, thinners, and naptha. See SPIRIT SOLVENTS → [180].

7 "Substances and mixtures that, when in contact with water, emit flammable gases."

8 These are classes of chemicals used in bleaching liquids that contain chlorine and peroxide in solution, respectively. See CHEMICALS THAT SHOULD NOT BE MIXED, TABLE 20 → [184].

9 The structure of hydrogen peroxide (H₂O₂) is H-O-O-H; in an organic peroxide one or both hydrogen atoms are replaced by an organic radical, e.g., R-O-O-R'. See @y69jeodr.

10 Also see HOUSEKEEPING CHEMICALS → [171].

Notes

SOURCES OF INFORMATION. Only information from internationally recognised scientific sources¹¹ may be used to determine if a substance presents *any* hazard and its categorization within the class of physical hazards; GHS, however, does not list specific sources of information to evaluate a product's *categorization* if it is classified as a health or environmental hazard.

ON GASES UNDER PRESSURE. This class includes compressed gases, liquefied gases, dissolved gases and refrigerated, liquefied gases. Compressed gases, liquefied gases and dissolved gases are hazardous because of the high pressure inside the cylinder, which may explode if heated. Additionally, refrigerated liquefied gases can cause severe cold (cryogenic) burns or injury.

PICTOGRAMS. The relationship between hazard categories and pictograms is not one-to-one—flammable liquids and gases, aerosols, TYPE C and TYPE D self-reactive and self-heating substances, pyrophoric liquids and solids, substances that emit a flammable gas, TYPE C, D, E and F organic peroxides and desensitized explosives all share the same 'flame' pictogram. (See ④④ PICTOGRAMS AND WARNING LABELS, [239]). Also, note that only the 'Danger' pictogram is shown in TABLE 2I; the 'exclamation mark' pictogram is used for low-severity hazards in all hazard classes.

SIGNAL WORDS AND HAZARD STATEMENTS. 'Danger' and 'Warning' are used as Signal Words in GHS. Each category in every hazard class has a set of specific Hazard Statements. Hazard Statements are assigned a unique alphanumerical code which consists of one letter and three numbers, as follows: (a) the letter "H" (for "hazard statement"); (b) a number assigned according to the chapter of GHS in which the hazard is defined—'2' for physical hazards; '3' for health hazards; '4' for environmental hazards; (c) two numbers corresponding to the sequential numbering of the hazard in GHS. Hazard Statements are listed in Annex 3 of GHS, e.g., H222 —*Extremely flammable aerosol*—is the standard hazard statement for a Category 1 pressurized aerosol and H223 —*Flammable aerosol*—is the standard hazard statement for a Category 2 pressurized aerosol. Hazard statements may not be changed and must appear on labels exactly as defined in GHS, e.g., *Highly flammable aerosol* is not a valid Hazard Statement. Annexure 3 also contains rules to combine Hazard Statements for substances that present multiple hazards. It also defines Precautionary Statements (each has a code, called a P-code) for each hazard class and category.

ON DEFINITIONS IN GHS (1.2): GHS defines its elementary unit—*substance*—in terms of a packaged commercial product¹². This allows for convenient inclusion of many thousands of products that already classified under the Harmonized Commodity Description and Coding System (HS)¹³. The elementary unit used in the Hazard Communication System of OSHA, on the other hand, is 'chemical,' defined as *any element, chemical compound or*

11 Such as the Chemical Abstracts Service for the physical and chemical properties of a substance.

12 According to GHS (1.2) substance means "chemical elements and their compounds in the natural state or obtained by any production process, including any additive necessary to preserve the stability of the product and any impurities deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition."

13 HS is an internationally standardised system of names and numbers to classify traded products. It maintained by the World Customs Organization. See @y82tkxos. It is used by Indian Customs.

mixture of elements and/or compounds. The explanatory notes in this section use the word ‘chemical’ as defined by OSHA.¹⁴

SCOPE OF GHS. OSHA has standards for hazards which are not covered by GHS e.g., combustible dust explosions¹⁵, and asphyxiation hazards caused by fine particulate matter. Further, some GHS definitions are different from the commonly understood sense of the word, e.g., GHS uses *aerosols* to mean *aerosol dispensers containing a gas that is compressed, liquefied or under pressure* (2.3.1.1); the commonly understood sense of the word is a suspension of fine particles or liquid droplets in the air. *Aerosols*, as defined in GHS are not explosion hazards, but flammability hazards and carry the ‘fire’ pictogram (GHS 2.3.1.3).



ON THE CONTENTS OF A PRODUCT: The pictogram and signal word on products that are placed in different categories in the same class are not indicative of the contents of the product. An aerosol canister that contains $\geq 85\%$ flammable components (by mass) is placed in Category 1; an aerosol canister that contains $\leq 1\%$ flammable components is placed in Category 3; however, the definition for Category 2 aerosols does not mention mass% at all and, instead, relies only on the results of an ignition test of the spray (or foam) ejected from the canister. While the results of this ignition test are used as a secondary criterion in each of the other two categories, the absence of the mass% criterion (which would cover the large interval between 1% and 85%) in Category 2 leads to strange results¹⁶. The SDS, on the other hand, will contain exact percentages of any hazardous substances present in the product.

ON RARE SUBSTANCES. Pyrophoric liquids and solids¹⁷, explosives, flammable gases, self-reactive and self-heating substances, and desensitised explosives are unlikely to be encountered by most SWM workers.

§ HEALTH HAZARDS

HAZARD CLASS	ASSOCIATED HAZARD CATEGORY	EXAMPLES	PICTOGRAM
Acute toxicity ¹⁸	Oral, Dermal, and Inhalation (Gases, vapours, dust and mists) each have categories 1–5,	Most pesticides.	
Skin corrosion ¹⁹	Categories 1, 1A, 1B, 1C	Mixtures with acid (conc. $\geq 1\%$) with pH ≤ 2 ; base (conc. $\geq 1\%$) with pH ≥ 11.5	
Skin irritation	Categories 2, and 3		

¹⁴ See @ y3cga3jh for a comparison of GHS with the OSHA Hazard Communication Standard 29 CFR 1910.1200(HCS)..

¹⁵ See @ y2op55ro for a list of OSHA standards that address dust explosions.

¹⁶ Consequently, the GHS Signal Word on a pressurised bottle of perfume containing 70% alcohol is “Warning” and not “Danger” even though its flammability hazard is comparable more to a bottle with 85% alcohol rather than the same bottle with $\leq 1\%$ alcohol.

¹⁷ Substances that will ignite on their own if exposed to air for 5 minutes or less. See @ d64cmp8

¹⁸ GHS specifies that substances classified as acutely toxic must differentiate the hazard based on the route of exposure. Hazard statements of substances in this classification should also reflect this differentiation, e.g., “Acute oral toxicity Category 1, and Acute inhalation toxicity Category 1.

¹⁹ Skin corrosion refers to irreversible damage; skin irritation refers to reversible damage. GHS combines corrosion irritation and into a single class, categorised as (1, 1A, 1B, and 1C) and (2, 3), respectively.

HAZARD CLASS	ASSOCIATED HAZARD CATEGORY	EXAMPLES	PICTOGRAM
Eye Damage Eye Irritant	Category 1, Categories 2A, and 2B	Same as above As above (conc. ≥ 3%)	
Sensitization (Skin or Eye)	Category 1A and 1B	Latex gloves	
Germ cell mu- tagenicity ²⁰	Categories 1A, 1B, and 2		
Carcinogenic- ity ²¹	Categories 1A, 1B, and 2	Benzene	
Reproductive toxicity ²²	Categories 1A, 1B, 2, and an additional cate- gory for effects on or via lactation		
Target organ systemic toxicity: single and repeated exposure	Single: Categories 1-3 Repeated: Categories 1 and 2	Many commercial solvents, e-waste	
Aspiration toxicity ²³	Category 1 and 2	Most petroleum distillates.	

Table 22. Health hazard classes and categories in GHS. Hazard categories are always numbered in order of decreasing severity of the hazard.

Notes

ON ROUTES OF EXPOSURE. There are four possible routes of exposure: inhalation, ingestion, absorption through the skin, and injection. Of these, inhalation (or aspiration) tends to pose the greatest risk. Relative to the skin (absorption) and the digestive system (ingestion), the respiratory system has the largest exposed surface area of roughly 70 to 100 square meters. In comparison, the digestive system has an exposed surface area of approximately 10 square meters; the skin 2 square meters. Also, the respiratory system is designed to be a gas-exchanger, which greatly increases the exposure to hazardous gas, vapour, or mist. The risk associated with an aspiration hazard decreases with the viscosity of the substance—a substance with low viscosity is ‘thin’ and ‘flows easily’ like water; high viscosity liquids (like honey) are ‘thick’. Common aspiration hazards are petrol and other low-viscosity petroleum distillates, such as kerosene, diesel, and so on, and aromatic compounds²⁴. Other examples include pine oils, turpentine, paint thinners and mineral oils. The digestive tract is designed to absorb chemicals. Ingestion occurs in one of two ways: the chemical is caught in or dissolves in nasal or throat mucus and is swallowed or, more commonly, chemicals contaminate the hands or eating utensils, food, etc., and are swallowed while eating. Ingestion introduces the chemical to stomach acids, which

²⁰ This hazard class describes chemicals that may cause mutations in the germ cells (sperm and ovum) of humans that can be transmitted to their progeny.

²¹ This hazard class describes chemicals that can induce cancer or increase the risk of cancer.

²² This hazard class describes chemicals that can cause adverse effects on sexual function and fertility.

²³ Aspiration hazards are the specific toxicity or other hazards posed by breathing in a chemical in this class.

²⁴ An organic compound that contains one or more benzene rings (⌬).

can force chemicals into solution, which can increase the chemical's absorption by the body. The skin is designed to be a protective barrier and is the least risky route of exposure. However, oils and fats can pass through the skin. Injection involves penetration of the skin by the toxin; a puncture or a cut from a contaminated object can inject toxins into the body. Note that GHS does not classify biological hazards.

ON ACUTE TOXICITY. The acute toxicity class uses the skull and crossbones to indicate substances that are fatal, toxic or harmful if they are inhaled, swallowed, or come into contact with the skin. The SDS and label will indicate if one or more routes of exposure is a concern.

ON CARCINOGENICITY, REPRODUCTIVE TOXICITY AND MUTAGENICITY: Agents that cause cancer or increase the risk of cancer are called carcinogens. Carcinogens can enter the body through the skin, lungs, or the digestive system. They can interact with the body directly (e.g., at the site of contact) or indirectly (the body transports, or converts the chemical substance into a carcinogen, that affects other sites of the body that were not exposed to the trigger carcinogen). Ultraviolet light is a common direct carcinogen; indirect carcinogens include benzene, which is known to cause leukæmia, and carbon tetrachloride, which is known to cause liver cancer. There is no known 'safe' level that a person can be exposed to for most carcinogens. People react differently and it cannot be predicted. Because of this variability, carcinogen exposure should be avoided or kept to the lowest level possible.

Germ cells are specialized cells involved in reproduction, which carry genetic material. For these cells to reproduce, there needs to be genetic information from the male (sperm) and the female (ovum). Damage to germ cells can alter the genetic information passed to an unborn child; this could result in illness or malformation depending on the genetic changes that occur. Reproductive toxins cause damage to (or are suspected of damaging) an unborn child. GHS classification for carcinogens, mutagens, or reproductive toxins *may be based on the strength of evidence and modified on a case-by-case basis*; OSHA standards for carcinogens, on the other hand, specify three sources²⁵ of information from which a determination of a product's carcinogenicity may be made. Any chemical on the list is assumed to be a carcinogen; any product that contains this chemical (in quantities above a pre-defined threshold), must carry the appropriate warning label and pictogram.

ON SENSITIZERS. Sensitization is an allergic response that affects the whole body, unlike irritation which is a localized response—irritation occurs at the site of contact. Responses to sensitizers vary. Some people will never become sensitized, others may become sensitized after a single exposure. Once a person has been sensitized, their body will respond to that sensitizer very quickly when exposed to it (even if the dose is much smaller than the initial dose that sensitized them). Common initial symptoms of exposure to a respiratory sensitizer are sneezing, or a runny nose; symptoms may increase in severity and might include wheezing, chest tightness, and shortness of breath. With continued exposure and without proper medical attention, these symptoms can be potentially fatal. Latex is a common respiratory sensitizer.

25 These sources are: the most recent editions of (1) the National Toxicology Program (NTP), "Annual Report on Carcinogens", (2) the International Agency for Research on Cancer (IARC) "Monographs" or (d)(4)(iii) 29 Code of Federal Regulations, part 1910, subpart Z, and (3) Toxic and Hazardous Substances, published by OSHA.

UNTESTED MIXTURES. GHS suggests applying bridging principles (3.1.3.5) with similar tested mixtures or using a ‘cut-off’ approach with the values described in the document. Bridging principles exist for dilutions, batching, various concentrations of ‘highly toxic’ mixtures, interpolation, and ‘substantially similar’ mixtures. The SDS for a product should be checked to see if the manufacturer has used a bridging principle to determine classification, e.g., many cleaning products are mixtures of different chemicals that vary depending upon the country of manufacture.

ON SKIN AND EYE DAMAGE. Products that contain strong acids or bases (such as toilet-bowl cleaners, see ACIDS→[177], ALKALIS→[179]) can cause skin corrosion and eye damage even if the warning label does not carry the Health Hazard pictogram. Though bridging principles in GHS are clearly defined, unscrupulous manufacturers will find ways to use the ‘exclamation mark’ pictogram and ‘warning’ signal word instead of the ominous ‘burning hand’ and ‘danger’.

ON THE RELEVANCE OF ANIMAL TESTING DATA. Most of the data used to determine the GHS health hazard classes and categories, as well as exposure limits are based on animal studies; animals can be more, or less sensitive to the hazards associated with a chemical. Workers who are elderly, sick, or pregnant may be more susceptible to hazardous substances.

ON GENERAL PRECAUTIONARY PRINCIPLES. Elimination, substitution and isolation (engineering controls) should be implemented whenever possible when dealing with health hazards. The following is an extract from the SOP on health hazard assessment²⁶ published by the University of Nebraska, Lincoln:

For acutely toxic chemicals, the rates of exposure and elimination determine whether an acutely toxic exposure occurs. For example, carbon monoxide is a Category 3 acute toxin by inhalation. Brief exposure to it at concentrations of 500 ppm (similar to being in the smoke of a camp fire) will cause no symptoms. However, once exposed, it may take as long as 5 hours for carbon monoxide to be eliminated from the body. Repeated exposures within that 5-hour window will increase the amount of carbon monoxide in the body and eventually result in headaches and dizziness. Severe exposures (>10,000 ppm) can cause death in seconds.

§ ENVIRONMENTAL HAZARDS



HAZARD CLASS	HAZARD CATEGORY	EXAMPLE	PICTOGRAM
Acute aquatic toxicity	Categories 1-3	Chlorine*, ammonia*, many insecticides and herbicides	
Chronic aquatic toxicity	Categories 1-4	Many insecticides and herbicides [§]	

Table 23. Environmental hazard classes and categories in GHS. *These are used to kill aquatic life in commercial aquaculture (see @yxs3w6ya); [§] from *Handbook of Acute Toxicity of chemicals to fish and aquatic invertebrates* (see @y4flgfva).

26 See @y4vngjul for the entire document

Notes

The Environmental Hazard class covers substances that can damage the environment; the environmental hazard pictogram shows a dead fish and leafless tree. If a product carries only this pictogram, the primary concern is its toxicity for aquatic life; if a product carrying this pictogram is also potentially hazardous to humans it must also carry one or more of the other hazard pictograms and the appropriate signal words.

GUIDANCE DOCUMENT. Classification of a substance's environmental hazard depends upon several interdependent variables; the process is complex and beyond the scope of this handbook. GHS includes guidance (GHS Annex 9) on the classification of substances as acute or chronic aquatic hazards.

OTHER HAZARD CLASSIFICATION SYSTEMS

GHS provides an elegant framework to classify the hazards associated with any substance; older classification systems, however, relied on extensive look-up tables or databases—lists of hazardous materials (chemicals, classes of compounds, and so on) each with a unique identifier. Other international classification systems that continue to be used in India and around the world are described in this section.²⁷

UN NUMBERS (United Nations numbers) are four-digit numbers that identify specific hazardous materials, such as explosives, flammable liquids, oxidizers, toxic liquids, etc. Some hazardous substances have their own UN numbers (e.g., acetone is UN 1090, methanol is UN 1230), while sometimes mixtures of chemicals or products with similar properties receive a common UN number, e.g., a mixture of acetone and methanol is classified under 'flammable liquids, not otherwise specified,' under UN 1993). If a substance poses several hazards, then subsidiary risk identifiers may be specified. It is not possible to deduce the hazard class(es) of a substance from its UN number: they have to be looked up in a table.²⁸ UN numbers range from UN 0004 to about UN 3548 and are assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods. UN numbers are part of UN Recommendations on the Transport of Dangerous Goods, also known as the Orange Book²⁹.

CLASS	DANGEROUS GOODS	DIVISION(S)	CLASSIFICATION
1	Explosives	1.1 - 1.6	Explosive
2	Gases	2.1	Flammable gas
		2.2	Non-flammable, non-toxic gas
		2.3	Toxic gas
3	Flammable liquid		Flammable liquid

²⁷ In Europe, SDS are mandated by EU legislation introduced by Regulation (EC) No 1272/2008 (CLP) via an updated Annexure II of REACH. In the United States, SDS are defined by OSHA. Specifications for SDS are listed in Hazard Communication Standard (HCS) (29 CFR 1910.1200(g)). Safety Data Sheets made according to OSHA guidelines have 11 sections. Both these systems are now harmonized with GHS.

²⁸ See @y2vtjcm for the most recent table of UN numbers. The site is updated regularly.

²⁹ See @y576p8vu



Image 83. NFPA:704 Diamond. The tank contains a chemically stable, extremely corrosive chemical that is non-flammable at room temperature.

4	Flammable solids	4.1	Flammable solid
		4.2	Spontaneously combustible
		4.3	Substance which in contact with water emits flammable gas
5	Oxidizers	5.1	Oxidising substance
		5.2	Organic peroxide
6	Toxic substances	6.1	Toxic (poisonous) substance
		6.2	Infectious substance
7	Radioactive material		Radioactive material
8	Corrosive substances		Corrosive substance
9	Miscellaneous		Miscellaneous dangerous goods

Table 24. UN Numbers. The UN class (column 1) is included at the bottom of ADR transport pictograms. See ADR TRANSPORT PICTOGRAMS.→[242]; the UN number is included in the warning label. See ④⑤ PICTOGRAMS AND WARNING LABELS→[239].

NFPA: The National Fire Protection Association (NFPA) developed a hazard identification system for emergency responders that is still in use today, especially by bulk transporters. The NFPA diamond (IMAGE 84→[210]) provides a visual representation of the health hazard, flammability, reactivity, and special hazards that a chemical may pose during a fire. The NFPA diamond consists of four colour-coded fields: blue, red, yellow, and white. The blue, red, and yellow fields—which represent a health hazard, flammability(in °F), and reactivity, respectively—use a numbering scale ranging from 0 to 4. A value of 0 means that the material poses essentially no hazard, whereas a rating of 4 indicates extreme danger. The white field is used to convey special hazards. The NFPA system was designed to convey safety information to trained emergency workers, such as fire fighters.

ADR³⁰ is a UN treaty that was adopted in 1957. ADR classification is built upon the UN classification system—it uses the same class-definitions and divisions—with an extra layer

30 ADR is derived from the French name for the treaty: Accord Européen relatif au transport international des marchandises Dangereuses par Route), which means European Agreement concerning the International Carriage of Dangerous Goods by Road, See@y6broevv.

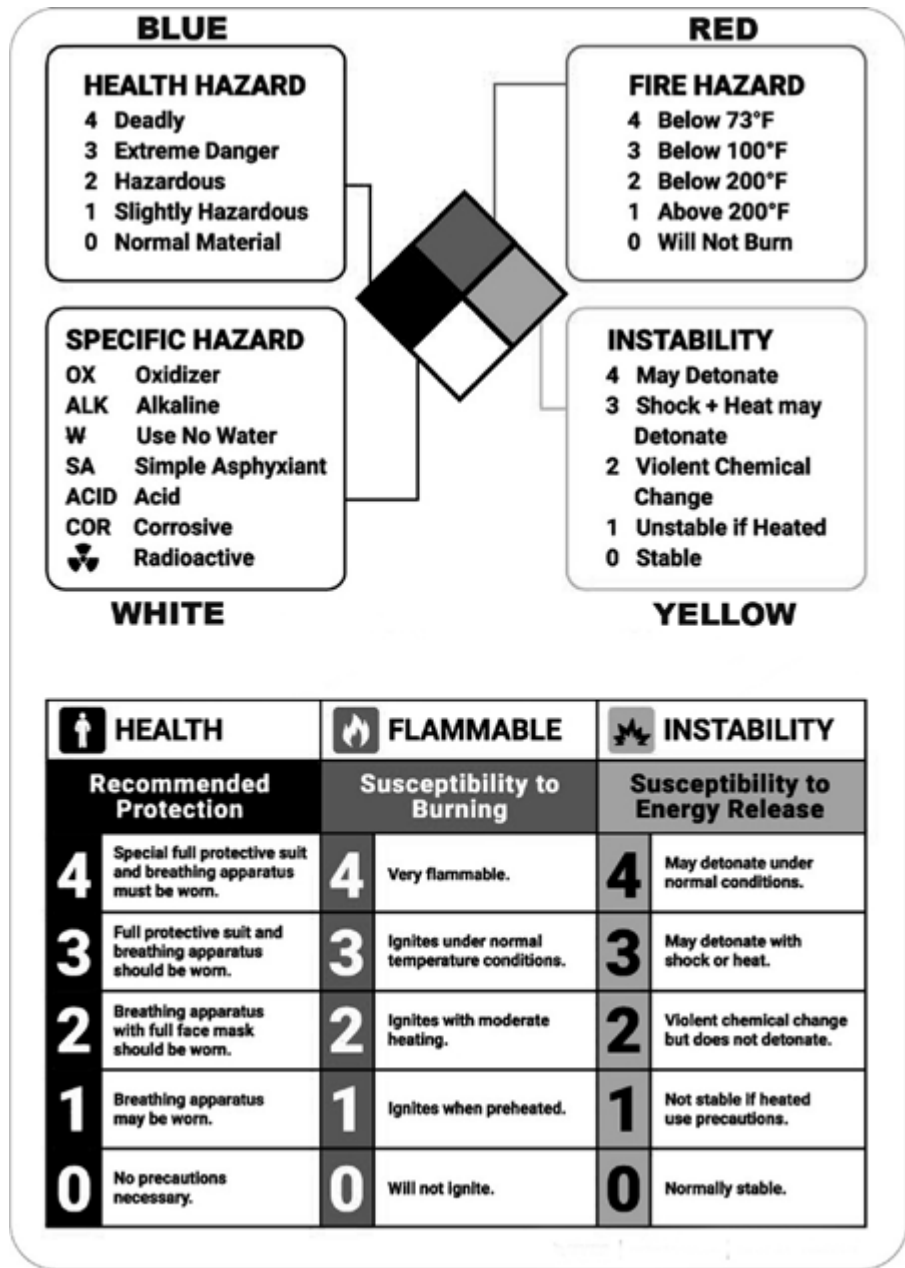


Image 84. NFPA:704 Diamond. The four divisions are typically colour-coded with red on top indicating flammability, blue on the left indicating the level of the health hazard, yellow on the right for chemical reactivity, and white containing codes for special hazards. Each hazard is rated on a scale from 0 (no hazard) to 4 (severe hazard). Note that the temperatures are in fahrenheit, not celsius.

of information that is relevant to the transport industry: conditions for the packing, labelling and transport of hazardous materials, certification of drivers, and special requirements for vehicles. ADR is the authoritative reference for the appropriate packing of hazardous material. It is, however, best known for its transport pictograms, which are now harmonized with GHS. (See IMAGE 9I→[242].)



OTHER INTERNATIONAL CLASSIFICATION SYSTEMS. The Dangerous Goods Regulation³¹ (DGR) of the International Air Transport Association (IATA), the International Maritime Dangerous Goods (IMDG) Code³², and the International Bulk Chemical (IBC) Code³³ all contain classification criteria, packing and labelling instructions, and tables of hazardous materials.

§ CLASSIFICATION OF HAZARDOUS MATERIALS IN INDIA

Relevant rules in the Environment (Protection) Act, 1986

THE MANUFACTURE, STORAGE AND IMPORT OF HAZARDOUS CHEMICALS RULES, 1989(MSIHC)³⁴; Part 1 of Schedule 1 of MSIHC defines classification criteria for 'extremely toxic' and 'highly toxic' chemicals, flammable chemicals, and explosives; Part 2 is a named list of 429 chemicals (including classes of chemical compounds) that are considered hazardous and toxic.³⁵

CHEMICAL ACCIDENTS EMERGENCY PLANNING, PREPAREDNESS AND RESPONSE (CAEPPR) RULES, 1996 defines procedures to prevent chemical accidents and deal with major chemical accidents.

THE HAZARDOUS WASTES (MANAGEMENT AND HANDLING) RULES, 1989³⁶ as well as the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016³⁷, both list and define classes of hazardous waste in Schedule 1. (Schedule 1 in both rules is identical.)

Other statutes and standards

INDIAN STANDARD IS 1446: 2002: This standard³⁸ lists hazardous materials along with their corresponding UN numbers. This standard is based on the recommendations of the United Nations Committee of Experts on the Transport of Dangerous Goods³⁹. INDIAN

31 See @yx8v86cf

32 IMO – the International Maritime Organization – is the United Nations agency that regulates the safety and security of shipping and the prevention of marine and atmospheric pollution by ships. See @y5ertqm

33 The International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk. The IBC Code contains the IMO regulations that govern the design, construction, and outfitting of newly built or converted chemical tankers.

34 See @y4kgqktt. Also see @y59c2nys for full text. 'Hazardous,' 'toxic,' etc., are defined in the document. MSIHC is maintained by the Ministry of Environment, Forests and Climate Change.

35 See @y3szhwlp. The official notification lists 429 chemicals, others (see @yxb2sr75) list 434 chemicals

36 See @y3z3xe73 for full text.

37 See @yy4zzto for full text.

38 See @yy479x4n for full text. Requires sign-in to the BIS portal.

39 See @y576p8vu

STANDARD IS 4209:2013 Annex B specifies, in great detail, the content and format of SDS for chemicals stored in and used by laboratories.⁴⁰

THE CENTRAL MOTOR VEHICLE RULES, 1989, of the Motor Vehicles Act, 1988: Rules 129 to 137 of the Central Motor Vehicle Rules, 1989 contain provisions for ensuring safe inland transportation of hazardous material⁴¹.

ELEMENTS OF A STANDARD SDS

A Safety Data Sheet can be created once the hazards associated with a chemical⁴² are identified, classified and categorized. Safety Data Sheets (SDS) are summary documents that provide information about the hazards of a product and advice about safety precautions. They are usually compiled by the manufacturer or supplier of the product. An employer may be required to prepare an SDS in some cases, e.g., when the product is produced and used exclusively in their workplace(s). Safety Data Sheets made by Indian companies must contain the following sections as defined in Schedule 9 of MSIHC: Section 1: Chemical Identity, Section 2: Physical and Chemical Data, Section 3: Fire and Explosion Hazard Data, Section 4: Reactivity Data, Section 5: Health Hazard Data, Section 6: Preventive Measures, Section 7: Emergency and First Aid Measure, Section 8: Additional Information/ References, Section 9: Manufacturer/ Supplier Data. However, the handbook recommends that GHS standards for Safety Data Sheets be used as the reference in workshops for the following reasons:

- The sixteen sections of a GHS-compliant SDS will include all the information about a hazardous material that would be present in an SDS created according to the specifications in Schedule 9 of MSIHC.
- MSIHC is likely to be harmonized entirely with GHS shortly and will adopt the same terminology and definitions, such as 'pictogram' instead of 'class-label'.
- Indian Customs Department uses the Harmonized Commodity Description and Coding System (HS), which is based on classification principles very similar to GHS.

GHS SAFETY DATA SHEETS

§ SECTION 1: IDENTIFICATION

This section identifies the chemical on the SDS as well as the recommended uses. It also provides the essential contact information of the supplier. The required information consists of:

- Product identifier used on the label and any other common names or synonyms by which the substance is known.
- Name, address, phone number of the manufacturer, importer, or other responsible parties, and emergency phone number.
- Recommended use of the chemical (e.g., a brief description of what it does, such as

⁴⁰ See @y9dn5kqw and @ya4vqfcu

⁴¹ See ④⑥ TRANSPORTING HAZARDOUS MATERIALS → [219].

⁴² 'Chemical,' defined as 'any element, chemical compound or mixture of elements and/or compounds.' is used in this section for brevity.

‘to be used as a flame retardant’) and any restrictions on use (including recommendations given by the supplier).

§ SECTION 2: HAZARD(S) IDENTIFICATION

This section identifies the hazards of the chemical presented on the SDS and the appropriate warning information associated with those hazards. The required information consists of:

- The hazard classification (e.g., Flammable liquid, Category 1).
- Signal word (either Danger or Warning).
- Hazard statement(s).
- Pictograms (the pictograms or hazard symbols may be presented as graphical reproductions of the symbols in black and white or be a description of the name of the symbol (e.g., skull and crossbones, flame).
- Precautionary statement(s).
- Description of any hazards not otherwise classified, e.g., the potential risk of dust-explosions.

§ SECTION 3: COMPOSITION

This section identifies all ingredients contained in the product indicated on the SDS, including impurities and stabilizing additives. The required information consists of the following:

Individual chemicals

- Chemical name(s).
- Common name(s) and synonyms.
- Chemical Abstracts Service (CAS) number and other unique identifiers.
- Impurities and stabilizing additives, which are themselves classified and which contribute to the classification of the chemical.

Mixtures

- The chemical name and concentration (i.e., the exact percentage in descending order of mass or volume) of all ingredients that are classified as health hazards and are:
 1. Present above their cut-off concentration limits ($\geq 0.1\%$ for chemicals categorised under respiratory system hazards and skin sensitisers, Category 1 mutagens, reproductive toxins and carcinogens, and $\geq 1\%$ for all other categories).
 2. Present a health risk below the cut-off/concentration limits.)

The concentration (exact percentages) of each ingredient must be specified except concentration ranges may be used in the following situations:

- A trade secret claim is made,
- There is batch-to-batch variation, or
- The same SDS is used for a group of ‘substantially similar’⁴³ mixtures.

43 ‘Substantially similar’ mixtures must satisfy the conditions defined in (GHS 3.1.3.5.6)

In the case of chemicals where a trade secret is claimed a statement that the specific chemical identity and/or exact percentage (its concentration) of composition has been withheld as a trade secret is required.⁴⁴

§ SECTION 4: FIRST-AID MEASURES

This section describes the initial care that should be given by untrained responders to an individual who has been exposed to the chemical. The required information consists of:

- Necessary first-aid instructions by relevant routes of exposure (inhalation, skin and eye contact, and ingestion).
- Description of the most important symptoms or effects, and any symptoms that are acute or delayed.
- Recommendations for immediate medical care and special treatment needed, when necessary.

§ SECTION 5: FIRE-FIGHTING MEASURES

This section provides recommendations for fighting a fire caused by the chemical. The required information consists of:

- Recommendations for suitable extinguishing equipment, and information about extinguishing equipment that is not appropriate for a particular situation.
- Advice on specific hazards that develop from the chemical during the fire, such as any hazardous combustion products created when the chemical burns.
- Recommendations on special PPE or precautions for firefighters.

§ SECTION 6: ACCIDENTAL RELEASE MEASURES

This section provides recommendations on the appropriate response to spills, leaks, or releases, including containment and clean-up practices to prevent or minimize exposure to people, property, or the environment. It may also include recommendations distinguishing between responses for large and small spills where the spill volume has a significant impact on the hazard. The required information may consist of recommendations for:

- Use of personal precautions (such as removal of ignition sources or providing sufficient ventilation) and protective equipment to prevent the contamination of skin, eyes, and clothing.
- Emergency procedures, including instructions for evacuations, consulting experts when needed, and appropriate protective clothing.
- Methods and materials used for containment (e.g., covering the drains and capping procedures).
- Clean-up procedures (e.g., appropriate techniques for neutralization, decontamination, cleaning or vacuuming; adsorbent materials; and/or equipment required for containment/clean up)

⁴⁴ The claim must be validated by the regulatory body of the country where the product is sold. Even if a trade secret is claimed, the reporting requirements for other sections remain the same.

§ SECTION 7: HANDLING AND STORAGE

This section provides guidance on the safe handling practices and conditions for safe storage of chemicals. The required information consists of:

- Precautions for safe handling, including recommendations for handling incompatible chemicals, minimizing the release of the chemical into the environment and providing advice on general hygiene practices (e.g., ‘eating, drinking, and smoking in work areas is prohibited’).
- Recommendations on the conditions for safe storage, including any incompatibilities. Provide advice on specific storage requirements (e.g., ventilation requirements).

§ SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

This section indicates the exposure limits, engineering controls, and personal protective measures that can be used to minimize worker exposure. The required information consists of:

- OSHA Permissible Exposure Limits (PELs)⁴⁵, Threshold Limit Values (TLV)⁴⁶, and any other exposure limit used or recommended by the chemical manufacturer, importer or employer preparing the safety data sheet, where available.
- Appropriate engineering controls (e.g., ‘use local exhaust ventilation’, or ‘use only in a self-contained ventilated system’).
- Recommendations for personal protective measures to prevent illness or injury from exposure to chemicals, such as PPE (e.g., appropriate types of eye, face, skin or respiratory protection needed based on hazards and potential exposure).
- Any special requirements for PPE, protective clothing or respirators (e.g., type of glove material, such as PVC or nitrile gloves; and breakthrough time of the glove material).

§ SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

This section identifies physical and chemical properties associated with the substance or mixture. The minimum required information consists of:

- Appearance (physical state, colour, etc.)
- Upper/lower flammability or explosive limits
- Odour
- Vapour pressure
- Vapour density
- pH
- Relative density
- Melting point/freezing point
- Solubility
- Initial boiling point and boiling range

⁴⁵ See@ yxkkehva

⁴⁶ The threshold limit value (TLV) of a chemical substance is believed to be a level to which a worker can be exposed day after day for a working lifetime without adverse effects. TLVs issued by the American Conference of Governmental Industrial Hygienists (ACGIH) are the most widely accepted occupational exposure limits both in the United States and most other countries. See@y2tsf4t5.

- Flash point
- Evaporation rate
- Flammability (solid, gas)
- Partition coefficient: *n*-octanol/water
- Auto-ignition temperature
- Decomposition temperature
- Viscosity.

The SDS may not contain every item on the list because information may not be relevant or is not available. When this occurs, a note to that effect must be made for that chemical property.

§ SECTION 10: STABILITY AND REACTIVITY

This section describes the reactivity hazards of the chemical and the chemical stability information. It has three parts:

Reactivity

- Description of the specific test data for the chemical(s). This data can be for a class or family of the chemical if such data adequately represent the anticipated hazard of the chemical(s), where available.

Chemical stability

- Indication of whether the chemical is stable or unstable under normal ambient temperature while in storage and being handled.
- Description of any stabilizers that may be needed to maintain chemical stability.
- Indication of any safety issues that may arise should the product change in physical appearance.

Other

- Indication of the possibility of hazardous reactions, including a statement whether the chemical will react or polymerize, which could release excess pressure or heat, or create other hazardous conditions.
- List of all conditions that should be avoided (e.g., static discharge, shock, vibrations that may lead to hazardous conditions).
- List of all incompatible classes of chemicals or specific substances with which the material could react to produce a hazardous condition.
- List of any known or anticipated hazardous decomposition products that could be produced because of use, storage, or heating. (Hazardous combustion products should also be included in Section 5.)

§ SECTION 11: TOXICOLOGICAL INFORMATION

This section identifies toxicological and health effects information or indicates that such

data are not available. The required information consists of:

- Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact). The SDS should indicate if such information is unknown.
- Description of the delayed, immediate, or chronic effects from short- and long-term exposure.
- The numerical measures of toxicity (e.g., acute toxicity estimates such as the LD₅₀ (median lethal dose))—the estimated amount [of a substance] expected to kill 50% of test animals in a single dose.
- Description of the symptoms. This description includes the symptoms associated with exposure to the chemical including symptoms from the lowest to the most severe exposure.
- Indication of whether the chemical is listed in the most recent edition of the National Toxicology Program Report on Carcinogens or is a potential carcinogen listed in the International Agency for Research on Cancer Monographs (IARC).

§ SECTION 12: ECOLOGICAL INFORMATION

This section provides information to evaluate the environmental impact of the chemical(s) if it were released to the environment:

- Data from toxicity tests performed on aquatic and/or terrestrial organisms, where available (e.g., acute or chronic aquatic toxicity data for fish, crustaceans, algae and other plants; toxicity data on birds, bees, plants).
- Potential for the chemical to degrade in the environment either through biodegradation or other processes, such as oxidation or hydrolysis.
- Results of tests of bio-accumulation potential, referring to the *n*-octanol-water partition coefficient (K_{OW})⁴⁷ and the bio-concentration factor (BCF), where available.
- The potential for a substance to move from the soil to the groundwater (indicate results from adsorption studies or leaching studies).
- Other adverse effects (e.g., environmental fate, ozone layer depletion potential, photochemical ozone creation potential, endocrine-disrupting potential, and global warming potential).

§ SECTION 13: DISPOSAL CONSIDERATIONS

This section provides guidance on proper disposal practices, recycling or reclamation of the chemical(s) or its container, and safe handling practices. To minimize exposure, this section should also refer the user to Section 8. The information may include:

- Description of appropriate disposal containers to use.
- Recommendations of appropriate disposal methods to employ.
- Description of the physical and chemical properties that may affect disposal activities.
- Statement discouraging disposal into municipal sewage.
- Any special precautions for landfills or incineration activities.

⁴⁷ K_{OW} values are used to assess the environmental fate of persistent organic pollutants. Chemicals with high K_{OW} tend to accumulate in the fatty tissue of organisms. The process is called bio-accumulation. See @ yvvn37sj .

§ SECTION 14: TRANSPORT INFORMATION

This section provides guidance on classification information for shipping and transporting of hazardous chemicals by road, air, rail, or sea. The information may include:

- UN number
- UN shipping name.
- Transport hazard class(es).
- Packing group number, if applicable, based on the degree of hazard as defined in the most recent edition of the United Nations Recommendations on the Transport of Dangerous Goods.
- Environmental hazards, e.g., identify if it is a marine pollutant according to the International Maritime Dangerous Goods Code⁴⁸ (IMDG code).
- Guidance on transport in bulk (according to Annex II of MARPOL⁴⁹ 73/783 and the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (International Bulk Chemical Code (IBC code))).
- Any special precautions which an employee should be aware of or needs to comply with, in connection with transport or conveyance either within or outside their premises (indicate when information is not available).

§ SECTION 15: REGULATORY INFORMATION

This section identifies the safety, health, and environmental regulations specific for the product that is not indicated anywhere else on the SDS. Any national and/or regional regulatory information of the chemical or mixtures is to be included here.

§ SECTION 16: OTHER INFORMATION

This section indicates when the SDS was prepared or when (and to which section) the last known revision was made. Other useful information also may be included here.

Notes

- Do not read out the material in this section during the workshop. Instead, refer to it during the various exercises in this chapter. Use the SDS of acetone as an example during FIND INFORMATION FROM AN SDS → [250].
- The GHS and the HS systems are fine examples of the science of classification. Both documents show how to classify millions of substances (in the case of GHS) and commercial goods (in the case of HS) into a cross-referenced structure; while the classification-logic in both systems does throw up the occasional odd or amusing result, the precision and elegance of both systems is undeniable—if there is a logical location in which a product belongs, that is exactly where it is found. Both documents (especially the explanatory notes) are highly recommended for moderators and engineers.

⁴⁸ International guidelines for the safe shipment of dangerous goods and hazardous materials. maintained by the International Maritime Organization, which is an agency of the UN. See @y5erltqm

⁴⁹ International Convention for the Prevention of Pollution from Ships See @jgdz2xy

ACTIVITY 4B

Transporting hazardous materials

Objective

- Know which regulations govern the transportation of hazardous goods in India.
- Know the difference between hazardous waste and hazardous goods in the context of regulations governing their transportation.
- Know how to prepare an Emergency Information Panel and Class Label for a commercial vehicle transporting hazardous goods in India.
- Know how to prepare a TREM card.
- Know the legal requirements for due-diligence when transporting hazardous goods.

Slides

- [S]1: Emergency Information Panel.
- [S]2: Correct placement of Emergency Information Panel.
- [S]3: TREM card.

Steps

- Using [S]1 and [S]2, describe the elements in a standard Emergency Information Panel.
- Discuss with participants the legal aspects of the goods they carry and whether their business is compliant with the rules governing their transportation.
- Initiate EXERCISE 10 → [235].
- Display [S]3 and describe the elements in a TREM card. Discuss why is it useful.
- Initiate EXERCISE 9 → [234].
- Discuss the importance of safe loading and unloading procedures.
- Initiate EXERCISE 11 → [236].

Notes

- This activity is suited for participants who prepare documentation for transport, and drivers of goods vehicles used to transport hazardous goods.

Workshop Programme

- Skip this activity if participants do not transport hazardous goods.
- Skip this activity if participants load or unload hazardous goods, but are not required to prepare legal documentation.

INTRODUCTION—LEGAL ASPECTS

Rules 129-137 of Central Motor Vehicles Rules¹ of the Central Motor Vehicles Act, 1988² govern the transport of hazardous materials in India and are relevant for mechanised SWM operations that process large amounts of plastic waste and companies that process bio-medical waste. The specifications for warning labels in CMVR are harmonized with ADR, which is a UN treaty that governs transnational transport of hazardous materials; ADR specifications are harmonized with GHS. The next section lists the rules in CMVR that are relevant to the transportation of hazardous materials with explanatory notes. Use this information during EXERCISE 9→[234]

§ CENTRAL MOTOR VEHICLE RULES

Rule 129. Transportation of goods of dangerous or hazardous nature

- Every goods carriage^{1*} carrying dangerous or hazardous goods^{2*} shall display a distinct mark of the class label^{3*} appropriate to the type of dangerous or hazardous goods.
- Every package containing dangerous or hazardous goods shall display the distinct class labels appropriate to the type of dangerous or hazardous goods.
- In the case of packages containing goods which represent more than one hazard, such packages shall display additional distinct labels to indicate the hazards.
- Every goods carriage carrying goods of dangerous or hazardous nature shall be fitted with a tachograph, an instrument to record the lapse of the running time of the motor vehicle; time speed maintained, acceleration and declaration etc., and a spark arrester^{4*}.

Notes on Rule 129

^{1*} DEFINITIONS: CMVR (2.14) defines a “goods carriage” as any motor vehicle constructed or adapted for use solely for the carriage of goods, or any motor vehicle not so constructed or adapted when used for the carriage of goods. The reasons behind the catch-all definition are irrelevant to the subject at hand. However, transport of hazardous goods is only permitted in a vehicle with a valid goods permit (according to the rules of the state in which the vehicle is registered). For brevity, the word ‘vehicle’ is used to mean ‘goods carriage’ in the next two sections in the handbook.

^{2*} CMVR defines “Dangerous or hazardous goods”, as goods of dangerous or hazardous nature to human life specified in Tables I, II, and III in Rule 137. This definition must be read with Rule 18 of the Hazardous and Other Wastes (Management and Transboundary Movement) Rules³, 2016 (HOWR) states: *The transport of the hazardous and other waste shall be in accordance with the provisions of these rules and the rules made by the Central Government under the Motor Vehicles Act, 1988 and the guidelines issued by the Central Pollution Control Board from time to time in this regard.* Therefore, ‘hazardous wastes,’ which are defined in Schedules I, II and III of HOWR are to be transported according to the rules laid down for ‘hazardous goods’ in CMVR, e.g., chemical residues (Schedule I, HOWR, 25.1), discarded containers/barrels used for hazardous wastes/chemicals (33.3) are both considered hazardous waste.

^{3*} CMVR uses the phrase ‘class label’ to mean a label containing the UN class number,

1 See @y6rl99lj for the full text.

2 See @y6g6ahm3 for full text.

3 See @y4xm3pn3 for full text.

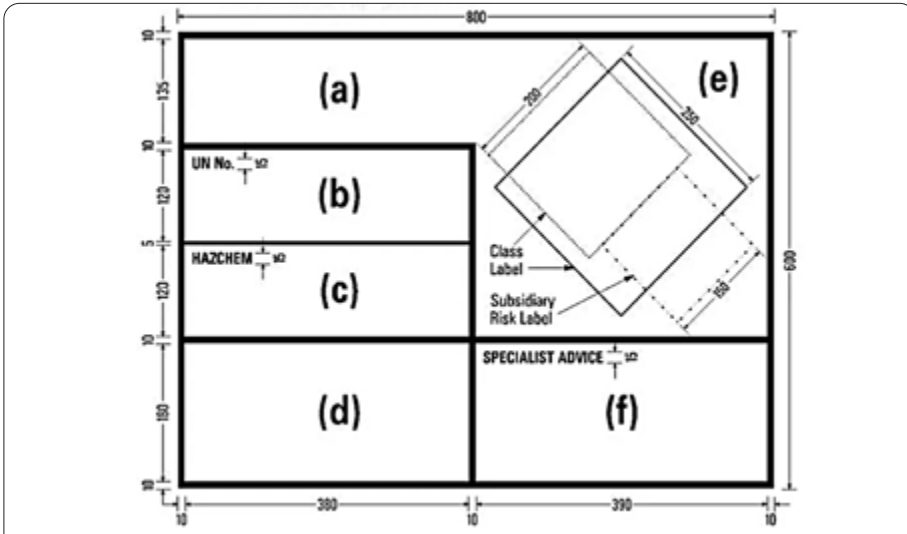


Image 85. (Slide 1) Appropriate Emergency Information Plate (a shown in CMVR). (a) Correct technical name; (b) UN class number; (c) Hazchem code; (d); (e) class label, i.e., the appropriate ADR pictogram; (d) emergency contact information; (f) specialist advice for first-responders in case of an emergency.

hazard classification and pictogram. These are identical to ADR transport pictograms (IMAGE 9I→[242]).

LEGAL INTERPRETATIONS: The Karnataka High Court ruled, in *National Insurance Co. Ltd. vs Mumtaz w/o Late Raj Ahmed and Others* (2013) that a vehicle registered as a vehicle but loaded with hazardous goods must comply with the regulations for carriage of hazardous goods laid down in CMVR. (Also see NOTES ON RULES 131, 132, AND 135→[224] for liability and third-party insurance.) Therefore, the law is quite clear on the matter: SWM operators who transport discarded containers of chemical waste etc., must comply with Rules 129-137 of CMVR. (Also see NOTES ON RULES 131, 132, AND 135→[224], AND RULE 19. TRANSPORT MANIFEST SYSTEM FOR HAZARDOUS WASTE→[229]. In addition to the rules laid down in CMVR, additional requirements specified in the Biomedical Waste Management Rules 2016 (See ⑨ BIO-MEDICAL WASTE→[324]) apply to vehicles used to transport bio-medical waste.

^{4*}CMVR makes no exceptions for the requirement of a spark arrester. Therefore, all vehicles that carry hazardous goods (regardless of their flammability) must be fitted with the device. The device is fitted between the engine and the exhaust system of a vehicle and may easily be retro-fitted by an experienced technician even on older goods vehicles. Note that specifications for a suitable spark arrester will depend upon the capacity of the engine—arresters designed for LCV and MCV-class vehicles, such as the Tata Ace® (commonly used by SWM transporters) might not be suitable for HCV-class vehicles.

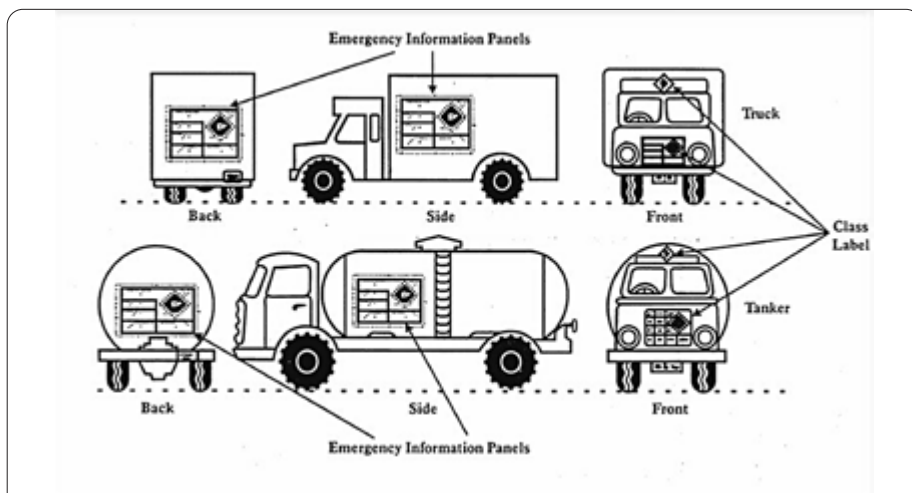


Image 86. (Slide 2) Correct placement of Emergency Information Panels, as described in CMVR.

Rule 130 Manner of display of class labels.

- Where a class label is required to be displayed on a vehicle⁴, it shall be so positioned that the size of the class label is at an angle of 45 degrees to the vertical and the size of such a label shall not be of less than two hundred and fifty millimetres square which may be divided into two portions, the upper half portion being reserved for the pictorial symbol and the lower half for the text: Provided that in the case of smaller packages a suitable size of the label may be adopted.
- Where the class label consists of adhesive material, it shall be waterproof and where it consists of metal or other substance on which the pictorial symbol and the text are printed, painted or affixed, they shall be affixed directly on such material and in every case, the surface of the vehicle surrounding the label shall be of a colour that contrasts vividly with the background of the class label.
- Every class label displayed on a vehicle shall be positioned in such a manner that it does not obscure other markings required to be displayed under any other law.
- Every vehicle carrying any dangerous or hazardous goods shall display the class label on the places shown in the Table in rule 134.

Rules 134, 137. Emergency Information Panel and Class Label

- Every vehicle used for transporting any dangerous or hazardous goods shall be legibly and conspicuously marked with an emergency information panel in each of the three places [...] so that the emergency information panel faces to each side of the carriage and to its rear and such panel shall contain the following information, namely:—
- (i) the correct technical name of the hazardous goods in letters not less than 50 mm high; (ii) the UN class number for the dangerous or hazardous goods [...], in numerals not less than 100 mm high; (iii) the class label of the dangerous or hazardous goods of the size of not less than 250 mm square; (iv) the name and telephone number of the emergency services to be contacted in the event of fire or any other accident in letters and numerals that are not less than 50 mm high and the name and telephone number of the consignor of the dangerous or hazardous goods or of some other person from whom expert information and advice can be obtained concerning the measures that should be taken in the event of an emergency involving such goods.
- The information contained in sub-rule (i) shall also be displayed on the vehicle by means of a sticker relating to the particular dangerous or hazardous goods carried in that particular trip.

⁴ Note that Schedule IV, part A of the Bio-Medical Waste (Management and Handling) Rules, 2016 (@ya5btczb) also describes the requirements for warning pictograms to be used on bags or containers of bio-medical waste. The class label described in Rule 137 of CMVR, 1989, refers to the labels to be placed on the vehicle carrying the goods and not the goods themselves. The appropriate class label is shown in Row 4, Column 3 of ADR TRANSPORT PICTOGRAMS. → [242]. (Also see ⑨ BIO-MEDICAL WASTE → [324].)



Image 87. Emergency Information Panel painted on the side of a lorry. (Photo credit: shipjustgotreal, Wikimedia Commons, cc-BY-2.0) Compare with the image on the facing page.

- Every class label and emergency information panel shall be marked on the vehicle and shall be kept free and clean from obstructions at all times.

Notes on Rules 130, 134, and 137

EMERGENCY INFORMATION PANELS AND CLASS LABELS: Most transporters prefer to paint the EIP on their vehicles. This is convenient for specialist vehicles such as fuel tankers since these vehicles carry the same material during their working life; SWM transporters, on the other hand, may transfer hazardous material in almost all hazard classes listed in CMVR and HOWR.

Most transporters do not place the appropriate class label (the ADR transport pictogram) on the vehicle. The appropriate class labels are shown in Rule 137. Since CMVR only requires that the EIP and class labels be legible and prominent while the vehicle is in transit with hazardous goods, and given that ‘painting’ is acceptable, a simple, inexpensive solution that allows for panels to be changed, as required, presents itself. It is discussed in A REUSABLE EMERGENCY INFORMATION PANEL. → [235].

Briefly, a set of white, enamelled metal panels may be made according to the specifications shown in IMAGE 85 and fitted (using wing-nuts or any tool-less fastener) to appropriately-sized frames that are permanently fixed to the vehicle at the locations shown in IMAGE 86. A set of panels printed with class labels of the appropriate size kept in the vehicle. These could be fitted, as required, to mounting points shown in IMAGE 86. These changes would allow hazardous waste transporters to quickly (and easily) become compliant with Rule 134 and 137.

Rule 131. Responsibility of the consignor

- The vehicle has a valid registration to carry hazardous goods.
- The vehicle is equipped with necessary first-aid, safety equipment and antidotes.
- The transporter or owner of the vehicle has full and adequate information about the dangerous or hazardous goods being transported.

- The driver is trained to handle the dangers posed during transportation of such goods.
- Every consignor shall supply to the owner of the vehicle full and adequate information about the dangerous or hazardous goods, being transported as to enable such owner and its driver:
- To make aware of the safety rules for the transportation of hazardous materials.
- To make aware of the risks created by such goods to the health or safety of any person.

Rule 132, 135 Responsibility of the owner

- The vehicle has valid registration and permit is safe for the transportation of the said goods.
- The vehicle is equipped with necessary First-Aid, Safety equipment, tool box and antidotes as may be necessary to contain any accident.
- The owner or transporter should satisfy himself that the information given by the consignor is full and accurate.
- The owner or transporter should ensure that the driver being deputed for transportation is trained to handle and transport such hazardous materials.
- The owner of the vehicle carrying dangerous or hazardous goods and the consignor of such goods shall lay down the route for each trip.
- The owner of the vehicle should ensure that the driver holds a driving Licence as per provisions of Rule 9 of the Central Motor Vehicle Rules.
- As per Rule 9 the driver should have the ability to read and write at least one Indian language specified in VII Schedule of the Constitution and English language.
- The driver should have successfully passed a course connected with the transport of hazardous goods⁵
- (Rule 135. Instructions to be given to the driver) The owner of every vehicle transporting dangerous or hazardous goods shall ensure to the satisfaction of the consignor that the driver of the goods carriage has received adequate instructions and training to enable him to understand the nature of the goods being transported, by him, the nature of the risks arising out of such goods, precautions he should take while the goods carriage is in motion or stationary and the action he has to take in case of any emergency..

Notes on Rules 131, 132, and 135

DEFINITIONS: “Consignor,” means the owner of the dangerous or hazardous goods. The “consignee” is the person to whom the goods are to be transported. The consignor and consignee can be the same person; “Owner” means the owner of the vehicle. Compliance with CMVR is the owner’s responsibility.

CERTIFICATION: CMVR relies on the driver having learned (and retained) what was taught during the mandatory certificate course described in Rule 9 of CMVR. Tests are conducted by institutes recognized by the each state’s Road Transport Authority.

The exercises in this section cover the non-driving topics of the certificate course. They will help drivers refresh their memory or, if they have not passed the mandatory certification, introduce them to the safety-related topics of the syllabus. They must, nevertheless, enrol in a recognized driving institute and pass the course.

ON LIABILITY AND THIRD-PARTY INSURANCE: Third-party insurance is compulsory for all vehicles; Section 145(i) of the Motor Vehicles Act, 1988⁶ includes the government, the driver and any-co-worker (on an insured vehicle) within the definition of a third-party Section 150 of the Motor Vehicles Act, 1988 regulates third-party insurance of vehicles; Section 150(2) describes conditions that exempt an insurer from liability. These include the *use of the vehicle for a purpose not allowed by the permit under which the vehicle was used*, and the vehicle being driven by *a person not duly licensed or disqualified from holding a license*. Many judgements on the subject of the liability of a third-party insurer

6 See @y6g6ahm3 for full text.

have been passed in various Indian courts. The Allahabad High Court held that a driver must, in addition to a valid licence, have passed the training course on hazardous goods (defined in Rule 9 of CMVR) and carry the certificate⁷; the definition of ‘hazardous goods’ in the context of the insurer’s liability was discussed in another judgement⁸ which noted that even if the driver had not cleared this course, the insurer remained liable to pay for damages *not* caused by the ‘hazardous goods’ (empty gas cylinders, in this case), i.e., if the vehicle causes damage unrelated to the intrinsic hazard(s) of its cargo (it ran over and killed a pedestrian, in this case), then the insurer remains liable to pay. The Supreme Court^{9,10} has held that unless the insurer can prove that one or more of the conditions listed in 150(2) is applicable, i.e., say, unless the insurer can establish that the owner knew that his driver had a fake license, then the insurer is liable to pay. Arguments made by insurers in court focus on proving that the provisions of 150(2) are applicable, the most common being that the driver of the insured vehicle did not hold a valid license or did not pass the mandatory certificate-course. Therefore, owners and consignors of hazardous cargo should be able to demonstrate that reasonable diligence was exercised while checking the documentation provided by the driver (license, certificate, goods-permit, and so on), and checking that the vehicle is equipped to transport the (hazardous) consignment. Creating a list of checks is a part of EXERCISE II → [236].

ON SAFETY: The safety equipment listed in CMVR is the minimum requirement to meet legal obligations. Other safety equipment and protocols (over and above those mandated by CMVR) are necessary. These are discussed in SOP FOR LOADING AND UNLOADING HAZARDOUS GOODS → [236]. Most importantly, The SWM industry must consider the long-term risk (hazard × exposure = risk) presented by the waste that they process. A few years of exposure to empty containers of hazardous chemicals can be extremely risky; the risk may increase several-fold *because* the hazard does not pose an immediate risk and is ignored by SWM workers. (The subject is discussed in IV ④ EXPOSURE TO CHEMICALS → [387].)

Legal requirements aside, a well-trained driver in a properly-equipped vehicle is essential for safety. Safety equipment is inexpensive and pays for itself many times over during the working life of a vehicle. (Also see ⑧ ⑥ OTHER SAFETY PROCEDURES → [320], and IV ⑥ FIRST-AID → [395].)

ON SAFE PACKAGING: CMVR does not describe safe packing procedures for hazardous materials. Packing protocols can vary from the simple (weather-sealing requirements for hazardous materials that are miscible in water) to complex (grouping of substances that may be transported in the same vehicle and appropriate protocols for keeping these substances safely segregated during transport). These are essential safety requirement. Volume II of ADR¹¹ (which contains ANNEXURE A: Parts 4 to 7 and ANNEXURE B: Parts 8 and 9) lists the appropriate packing procedures for the transportation of hazardous materials. Apart from packaging materials, the document also lists appropriate fastening techniques, outer coverings, PPE, segregation protocols, and so on that are appropriate

7 Krishna Kumar and Another v. United India Insurance Company Ltd, (2016) Allahabad High Court. The question of whether an (experienced) driver of a vehicle that carries hazardous goods must necessarily pass the certificate course has also been raised and answered in court. The certificate is mandatory

8 New India Assurance Co. Ltd. vs Smt. Lakshmi And 3 Others (2018), Allahabad High Court

9 Sohan Lal Passi vs P. Sesh Reddy and Others (1996). See @y3nfg73d for full text.

10 National Insurance Co. Ltd vs Swaran Singh and Others (2004) See @yy686qo9 for full text.

11 See @y6broevv for a print-ready PDF.

for a consignment—the information is presented in a series of cross-referenced tables and matrices that remove all guesswork from the process.

Since P2P was designed to be held indoors, this important subject was not included in the syllabus for the workshop. However, a printout of the document should be kept to hand during the workshop. You should familiarise yourself with this document if participants work for companies that transport hazardous materials.

*Rule 133, 136. Responsibility of the driver,
Instructions to a driver, Incident reporting.*

- It is the responsibility of the driver to keep all information provided to him in writing i.e., in the form TREM card (Transport Emergency Card). This is to be kept in the driver's cabin and is available at all times while hazardous material related to it is being transported.
- Every driver of a vehicle transporting any dangerous or hazardous goods shall observe at all times all the directions necessary for preventing fire, explosion or escape of dangerous or hazardous goods carried by him while the vehicle is in motion, and when it is not being driven he shall ensure that the vehicle is parked in a place which is safe from fire, explosion and any other risk, and at all times the vehicle remains under the control and supervision of the driver or some other competent person above the age of 18 years.
- (Rule 136) The driver of a vehicle transporting any dangerous or hazardous goods shall, on the occurrence of an accident involving any dangerous or hazardous goods transported by this carriage, report forthwith to the nearest police station and also inform the owner of the goods carriage or the transporter regarding the accident.

Notes on Rule 133

The format of the TREM card is defined in Rule 18 of HOWR_→[227].
Also see CREATE A TREM CARD_→[234].

§ HAZARDOUS AND OTHER WASTES (MANAGEMENT AND TRANSBOUNDARY MOVEMENT) RULES, 2016

Definitions¹².

- “actual user” means an occupier who procures and processes hazardous and other waste for reuse, recycling, recovery, pre-processing, utilisation including co-processing.
- “occupier” in relation to any factory or premises, means a person who has, control over the affairs of the factory or the premises and includes in relation to any hazardous and other wastes, the person in possession of the hazardous or other waste.
- “operator of disposal facility” means a person who owns or operates a facility for collection, reception, treatment, storage and disposal of hazardous and other wastes.
- “transporter” means a person engaged in the off-site transportation of hazardous or other waste by air, rail, road or water

Regulations that deal with the transport—packing, stowing, loading, unloading, routing and so on—of hazardous materials including regulations for the various permutations of one-or-more-source to one-or-more-destinations, are indicated by the title of HOWR; instead, the rules focus largely on classification of hazardous materials (which falls within the scope of MSIHC), storage (also within MSIHC), and regulations for inventory-management and records-keeping related to hazardous materials (which ought to be included in MSIHC); very little space is allocated to the subject of transport, which is the purpose of these rules. The rules create an artificial class of materials—‘hazardous waste’—that ought

¹² HOWR, 2016, notified in G.S.R No. 395 (E) 04-04-2016, which was the most recent version of the Rules..

to belong to the class of hazardous materials; they are listed in Column 3 of the table in Schedule I. Schedules II and III use classification codes from the Basel convention¹³

HOWR does, however, understand the quirks of the SWM industry, e.g., micro-segregation of plastic¹⁴ is often done by individual entrepreneurs or small companies on premises owned by a trading company to whom they sell the plastic. They are not employees or contract-labourers, but use the premises to process (or actually use) waste. Therefore, the distinction made between an ‘actual user’, an ‘occupier’, and an ‘operator of a waste-disposal facility’ is correct. Definitions of terms such as ‘hazardous waste generators’ are missing from the rules¹⁵. Definitions found in the various waste-management rules (the ones already discussed, and the *E-Waste (Management) Rules*, (2016), the *Plastic Waste Management Rules*, (2016), the *Batteries (Management and Handling) Rules*, (2001), and the *Solid Waste Management Rules*, (2016), and the *Bio-Medical Waste Management Rules*, (2016))¹⁶ are in urgent need of harmonization for there to be any clarity on regulatory compliance.

Rule 18 Transportation of hazardous and other wastes

- The transport of the hazardous and other waste shall be in accordance with the provisions of these rules and the rules made by the Central Government under the Motor Vehicles Act, 1988 and the guidelines issued by the Central Pollution Control Board from time to time in this regard.
- The occupier shall provide the transporter with the relevant information in Form 9, regarding the hazardous nature of the wastes and measures to be taken in case of an emergency and shall label the hazardous and other wastes containers as per Form 8.
- In case of transportation of hazardous and other waste for final disposal to a facility existing in a State other than the State where the waste is generated, the sender shall obtain ‘No Objection Certificate’ from the State Pollution Control Board of both the States.
- In case of transportation of hazardous and other waste for recycling or utilisation including co-processing, the sender shall intimate both the State Pollution Control Boards before handing over the waste to the transporter.
- In case of transit of hazardous and other waste for recycling, utilisation including co-processing or disposal through a State other than the States of origin and destination, the sender shall give prior intimation to the concerned State Pollution Control Board of the States of transit before handing over the wastes to the transporter.
- In case of transportation of hazardous and other waste, the responsibility of safe transport shall be either of the sender or the receiver whosoever arranges the transport and has the necessary authorisation for transport from the concerned State Pollution Control Board. This responsibility should be clearly indicated in the manifest.
- The authorisation for transport shall be obtained either by the sender or the receiver on whose behalf the transport is being arranged.

Notes on Rule 18.

HOWR contains prescribed formats of all necessary application forms. Form 8 is the label that must be fixed on containers of hazardous wastes. ‘Containers’ is not defined, label size and safe packing instructions for different kinds of hazardous wastes are not specified.

¹³ See @c2g7acq for full text. Transporters should be advised to download this document. Updated waste codes are listed in Annexure VIII.

¹⁴ The various tasks performed to dismantle a product, segregate its plastic components by recycling-class (HDPE, PET, and so on), and sort each class into saleable units by grade or quality.

¹⁵ These are defined in the Basel Convention.

¹⁶ See @yxqrmmbf to view a list of all rules..

HANDLE WITH CARE	
Waste category and characteristics as per Part C of Schedules II and III of these rules	Incompatible wastes and substances.
Total quantity	Date of storage
Physical state of the waste (Solid/Semi-solid/liquid):	
SENDER'S NAME AND ADDRESS	RECEIVER'S NAME AND ADDRESS
Phone	Phone
E-mail.	E-mail
Tel. and Fax No.	Tel. and Fax No.
Contact person	Contact person
IN CASE OF EMERGENCY PLEASE CONTACT	
NOTES. <ol style="list-style-type: none"> 1. Background colour of label—fluorescent yellow. 2. The word, 'HAZARDOUS WASTES' and 'HANDLE WITH CARE' to be prominent and written in red, in Hindi, English and in vernacular language. 3. The word 'OTHER WASTES' to be written prominently in orange, in Hindi, English and in vernacular language. Background colour of label - fluorescent yellow. 	

Table 25. Form 8. Appropriate labelling on containers of hazardous waste.

The warning label (shown above), TREM card and transport manifest specified in HOWR require the use of Basel Convention codes, which are not widely known. Strangely, none of these documents require the use of either GHS pictograms, ADR transport pictograms or Harmonised System codes¹⁷, which are better known and widely recognised. In their current format, both the warning label and the TREM card are useless in the context of safety. However, HOWR does not specifically disallow the inclusion of useful information such as the UN no. or CAS registry number, since this information may be included under “waste description” of the Transport Manifest. (See TABLE 28 → [231]) It is strongly recommended that this be done.

The format of the Transport Emergency (TREM) card is described in Form 9. Creating a TREM card is discussed in EXERCISE 9 → [234]. Again, in the interests of safety, the appropriate ADR transport pictogram should be included in the section ‘Exposure Hazard’ on the TREM card. This is not a violation of the HOWR Rules; indeed, including this information makes the TREM card compliant with Rule 133 of CMVR, which requires the use of a TREM card without specifying a format for one.

The TREM card is to be created by the sender of hazardous waste and given to the transporter. Basel codes for hazardous waste that is commonly handled by SWM workers are listed in TABLE 26.

¹⁷ The Basel convention is to be harmonized with the World Customs Organization's HS code system. However, the process has not been complete a decade after it was started.

BASEL CODE	DESCRIPTION
A1160	Waste lead-acid batteries, whole or crushed ¹⁸ .
A1170	Unsorted waste batteries excluding mixtures of only Part B batteries. Waste batteries not specified in Part B containing constituents mentioned in Schedule II to an extent to render them hazardous ¹⁹
A2010	Glass waste from cathode-ray tubes and other activated glasses ²⁰ .
A4130	Wastes packages and containers containing Schedule II constituents in concentration sufficient to exhibit Part C of Schedule III hazard characteristics ²¹ .
B1090	Waste batteries conforming to a standard battery specification, excluding those made with lead, cadmium or mercury ²²
B1110	Used Electrical and electronic assemblies other than those listed in Part D of Schedule III ²³

Table 26. Basel codes of hazardous wastes handled and transported by SWM workers.

Rule 19. Transport manifest system for hazardous waste

- Manifest system (Movement Document) for hazardous and other waste to be used within the country only:- (i) The sender of the waste shall prepare seven copies of the manifest in Form 10 comprising of colour code indicated below and all seven copies shall be signed by the sender.

NUMBER AND COLOUR	PURPOSE
Copy 1 (White)	To be forwarded by the sender to the State Pollution Control Board after signing all the seven copies.
Copy 2 (Yellow)	To be retained by the sender after taking signature on it from the transporter and the rest of the five signed copies to be carried by the transporter.
Copy 3 (Pink)	To be retained by the receiver (actual user or treatment storage and disposal facility operator) after receiving the waste and the remaining four copies are to be duly signed by the receiver.
Copy 4 (Orange)	To be handed over to the transporter by the receiver after accepting waste.
Copy 5 (Green)	To be sent by the receiver to the State Pollution Control Board.
Copy 6 (Blue)	To be sent by the receiver to the sender.
Copy 7 (Grey)	To be sent by the receiver to the State Pollution Control Board of the sender in case the sender is in another State.

Table 27. Reporting requirements for manifests of hazardous materials, as described in Rule 19 of HOWR. The format of the manifest is shown in TABLE 28 → [231].

¹⁸ Lead removed from batteries (or from any other source) is classified under A1010.

¹⁹ Any batteries that contain cadmium or mercury—the amount of these metals determines if the consignment is considered a hazardous waste. Hazardous concentration is determined from tables of a test— Toxicity Characteristic Leaching Procedure—which measures the amount of the chemical that leaches into the soil (usually in a landfill). As a rule of thumb, if the consignment consists entirely of batteries that contain cadmium or mercury, then it is hazardous. (See @y3zpx62q).

²⁰ The classification does not change even if circuit boards are attached to these tubes.

²¹ As above. Most consignments of this class may be considered hazardous.

²² Examples are zinc-manganese, Ni-MH, alkaline and lithium cells

²³ This class is usually called e-waste.

Notes on Rule 19

The text is misleading—the manifest consists of an original document (on white paper), and six copies on coloured paper. It must be prepared by the generator of hazardous materials. The generator and receiver must also send copies to various government authorities. Transporters may keep the orange-coloured copy for their records. PROCESSORS may be transporters and receivers of hazardous material, in which case they are required to send both Copy 5 and Copy 7 to the State Pollution Control Board.

TRANSPORT MANIFEST	
1. Sender's name and mailing address (including phone No. and e-mail)	
2. Sender's Authorisation No.	
3. Manifest Document No.	
4. Transporter's name and address (including phone No. and e-mail)	
5. Type of vehicle	Truck/Tanker/Special vehicle
6. Transporter's Registration No.	
7. Vehicle's Registration No.	
8. Receiver's name and mailing address (including phone No. and e-mail)	
9. Receiver's Authorisation No.	
10. Waste Description	
11. Total Quantity (specify either volume in .m ³ or number of containers)	
12. Physical form	Solid/semi-solid/sludge/oily/tarry/slurry/liquid
13. Special handling instructions and addi- tional information	
SENDER'S CERTIFICATE	
I, _____, hereby declare that the contents of the consign- ment are fully and accurately described above by proper shipping name and are categorised, packed, marked, and labelled, and are in all respects in proper conditions for transport by road according to applicable national government regulations.	
Name and stamp	Date (mm-dd-yyyy)
TRANSPORTER'S ACKNOWLEDGEMENT OF THE RECEIPT OF CONSIGNMENT	
Name and stamp	Date (mm-dd-yyyy)
TRANSPORTER'S ACKNOWLEDGEMENT OF THE RECEIPT OF CONSIGNMENT	
Name and stamp	Date (mm-dd-yyyy)

Table 28. Transport Manifest format (Form 10), its usage is described in Rule 19.A PDF version of the format is in the companion USB drive.



Toluene

Flammable liquid and vapour. May be fatal if inhaled and enters through absorption. Causes skin irritation. Serious risk of damaging the unborn child. Also harmful to aquatic life and in contact with skin.

CAUTION: Keep away from heat/spark/open flame surfaces. No smoking. Ground/bond when and receiving equipment. Wear protective respiratory clothing/eye protection.

IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs, get medical attention. If INHALED: Remove victim to fresh air. Keep at rest in a position comfortable for breathing. A POISON CENTER or doctor/physician if you feel ill. If SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do NOT induce vomiting. Dispose of contents/ container to an approved re disposal plant.

MSDS - The Compliance Center
225 William Street
Unit 7 Mississauga, Ontario L4T 1A8 Canada
Phone 905-899-1239

LOT NUMBER	NET WEIGHT
34234	20 KGS

UN1294, PG 11

FLAMMABLE LIQUID

3

20 KGS

UN1294, PG 11



TYPE OF WASTE			
Code in Schedule II or III:		(Basel Convention Code)	
Type of waste (as described in code) :			
HAZARDOUS CHEMICAL CONSITUENTS			
Common Name	UN No.	CAS	Physical properties
EXPOSURE HAZARD			
Emergency Contact No. for expert services:			
FIRST AID			
In case of spillage or leakage		In case of fire	
Transport Emergency Card			
Name			
Address			
Contact No.	Place and Date		Signature

Image 88. (Slide 3) TREM CARD.

EXERCISE 9: CREATE A TREM CARD

Objective

- Know how to create a Transport Emergency Card compliant with Rule 18 of HOWR and Rule 133 of CMVR.

Steps

1. Display the slide shown in IMAGE 88.
2. Divide the participants into groups of four or five and give each group a worksheet for this exercise and a copy of the SDS for lead-acid batteries (See APPENDIX 6: WORKSHEETS → [A-63]) and the companion USB drive for the SDS).
3. Explain the transportation situation (see Discussion, below) that requires a TREM card.
4. Explain the difference between hazardous wastes and hazardous materials in the context of HOWR. There isn't an elegant way to do this; you must make participants aware of the Rule 18, point out Schedules I, II, and III in the document and ask them to look up the tables to find the Basel convention code. A simplified explanation is provided in Discussion, below.
5. Give participants five minutes to fill in the worksheet. They may look for additional information on the internet.

Notes

- Skip this Activity with SWM companies that import hazardous wastes for processing in India. Section 8 of the Movement Document for consignments contains the Basel code, UN number, and HS code and it may be assumed that the company will know about TREM cards.

§ DISCUSSION

Describe the situation and the task at hand.

A TREM card is statutory documentation for transporting hazardous material, and not just hazardous waste. The Central Motor Vehicle Rules require a driver of a vehicle carrying hazardous materials is required to carry this card.

The first section is a requirement of the Hazardous and Other Wastes (Management and Transboundary Movement) Rules. The TREM card must be prepared by the sender of the consignment; it can also be prepared by the receiver if the goods. However, in most cases, the TREM card is prepared either by the manufacturer or by the importer of a consignment of hazardous waste.

Is the consignment a hazardous material or is it a hazardous waste?

If the cargo is not a new product, or has not been imported, and if the consignment contains hazardous materials, then it is hazardous waste. Basel codes for hazardous wastes that are commonly handled by SWM companies are on the worksheet¹. If the consignment does not belong to any of these common classes, you will have to refer to the HOWR document online. The link is on the worksheet.

¹ Also see TABLE 26 → [229].

Your company is an authorised lead-acid battery recycler². Every week, your lorry does the rounds of the authorised battery-drop locations, around the city to collect spent lead-acid batteries and deliver them to the company's recycling facility. Your job is to create a TREM card to be carried by the driver of the lorry. You have the SDS for lead-acid batteries. It contains the information required to fill in the other sections.


After the participants have completed their worksheets, verify if the information is correct. Read out the relevant section of the SDS if additional information is required.

EXERCISE 10: A REUSABLE EMERGENCY INFORMATION PANEL.

Objective

- Know how to create an Emergency Information panel compliant with Rules 134 and 137 of CMVR.

Steps

1. Display  1 with IMAGE 85 and IMAGE 86.
2. Divide the participants into groups of four or five and give each group a bank sheet of chart paper and a copy of the SDS for hydrochloric acid (See the companion USB drive).
3. Explain the specifications of an appropriate EIP. Ask participants to create an eip for a vehicle carrying 500L of hydrochloric acid in 10 HDPE barrels.
4. The information required is present in the SDS; they will also have to look up the hazchem code for hydrochloric acid and the appropriate ADR transport pictogram online—they must remember to use the ADR transport pictogram and not the GHS pictogram on the SDS.
5. Give them five minutes to create the eip, then discuss options for creating panels that may be used on vehicles.

§ DISCUSSION

Check that the participants have used the correct pictogram and hazchem code. The EIP should be made to scale; commend the groups that took the pains to do so.

The following materials (listed by cost, in increasing order) and may be used to create re-usable Class Labels (ADR pictogram) and Emergency Information Panels:

- Acrylic sheets of 3mm thickness and painted white.
- Mild-steel sheets, painted or powder-coated white. (Painting or powder-coating should be done after the mounting holes are drilled, to minimize corrosion.)
- Enamelled mild-steel sheets.
- Stainless steel sheets.

ADR pictograms in the form of stickers are readily available online.

² The exercise can be modified depending on the work of the participants. If they provide janitorial services, ask them to create a TREM card for cleaning solvents such as isopropanol or acetone. Note that the TREM card is a requirement specified both in HOWR and CMVR.

EXERCISE 11: SOP FOR LOADING AND UNLOADING HAZARDOUS GOODS

Objective

- Understand how the Standard Operating Procedure (sop) for loading and unloading hazardous materials (see GUIDELINES FOR USING CLEANING PRODUCTS → [183]) should be used to satisfy the requirements laid down in CMVR and HOWR.

Steps

1. Distribute 4 or 5 copies of the SDS for isopropanol (see the companion USB drive) among the participants.
2. Explain each item on the sop (see Discussion, below) and ask participants for suggestions. They should consult the SDS for relevant information.

Notes

- Focus on the legal requirements laid down in CMVR— participants must demonstrate that reasonable diligence was exercised to verify that all documentation was in order.
- Use the whiteboard for this Activity. Write down the suggestions made by participants for each item on the sop.
- The text describes a situation in which 500L of isopropanol are loaded into an LCV. Participants have to check the SDS for this chemical. If you have already used isopropanol as an example in any of the previous exercises, use a different chemical as an example so that they are forced to look for relevant information in the SDS.

§ DISCUSSION

Describe the situation:

Your company provides janitorial services to shopping malls and offices. You purchase cleaning chemicals in bulk, and must also dispose of empty containers of these chemicals. We created an SOP for safe loading of chemicals and empty containers earlier. Now we must add items to the SOP so that it is compliant with the Central Motor Vehicles Rules.

Discuss the following, one by one with participants:

1. A checklist for documentation that should be available with the driver. CMVR requires that the driver must have a valid driver's licence, a certificate of training for transporting hazardous goods; the vehicle must have a valid goods permit and fitness certificate.

🗣️ Ask the driver to show you these documents. How can you demonstrate reasonable diligence? Is it useful if two people should check the documentation in the presence of the driver?

2. A manifest for vehicle loading and unloading goods.

Display the slide with TABLE 28 → [231], which shows the Transport manifest described in HOWR and describe the situations in which it is required. If the HOWR manifest is not required, then any manifest with a list of the contents in the consignment may be used.

If your company follows the procedures for preparing empty chemical containers¹, then

¹ See GUIDELINES FOR USING CLEANING PRODUCTS → [183]

this manifest is not required because the consignment is not considered a hazardous waste.

If you are loading the vehicle with cleaning products, then the consignment may be classified as hazardous goods under CMVR. The warning label or the SDS has the relevant information. Let us assume that you are loading 500L of isopropanol.

- ☞ Is this a hazardous material?
- ☞ Are fire extinguishers required?

3. CMVR specifies that a vehicle carrying hazardous goods must be equipped with fire extinguishers

- ☹ What can be done if the vehicle does not have a fire extinguisher?

Place a fire extinguisher (the type appropriate for the hazardous goods (See ⑧ ⑥ OTHER SAFETY PROCEDURES → [320])) in the cabin of the vehicle if one is not available or if it has expired—the fire extinguisher may be included in the manifest and unloaded at the destination.

- ☹ How many fire extinguishers are required for 500L of isopropanol?

4. Rule 131 and 132 state that ensuring the suitability of a vehicle's safety equipment etc., is the responsibility of the owner and the consignor Does the vehicle have a spark arrester? Does it have a tachometer? Ask the driver or the owner of the vehicle if the vehicle has a spark arrester; check if a tachometer is present on the dashboard. If the vehicle does not have these devices installed, it is not fit to be used to transport hazardous materials regardless of the flammability of your consignment.
5. Drivers of vehicles that transport waste often keep TREM cards of different hazardous goods with them. This is poor practice. The consignor should impress upon the driver—with reasonable diligence—the importance of the TREM card and that it should be available to hand at all times.

- ☹ Consider asking the driver to read the Transport Emergency Card (TREM card) while the vehicle is being loaded. He does not have to read it out aloud! The TREM card should be taken from the driver when the vehicle is unloaded. It should be added to the manifest, if necessary.

6. Check the Emergency Information Panel (EIP) and class labels. If these are not appropriate for the consignment, then appropriately sized class labels and EIP should be pasted over the old ones.
7. Plan a safe route in consultation with the driver—avoid traveling through residential areas; if possible, avoid travelling through cities.



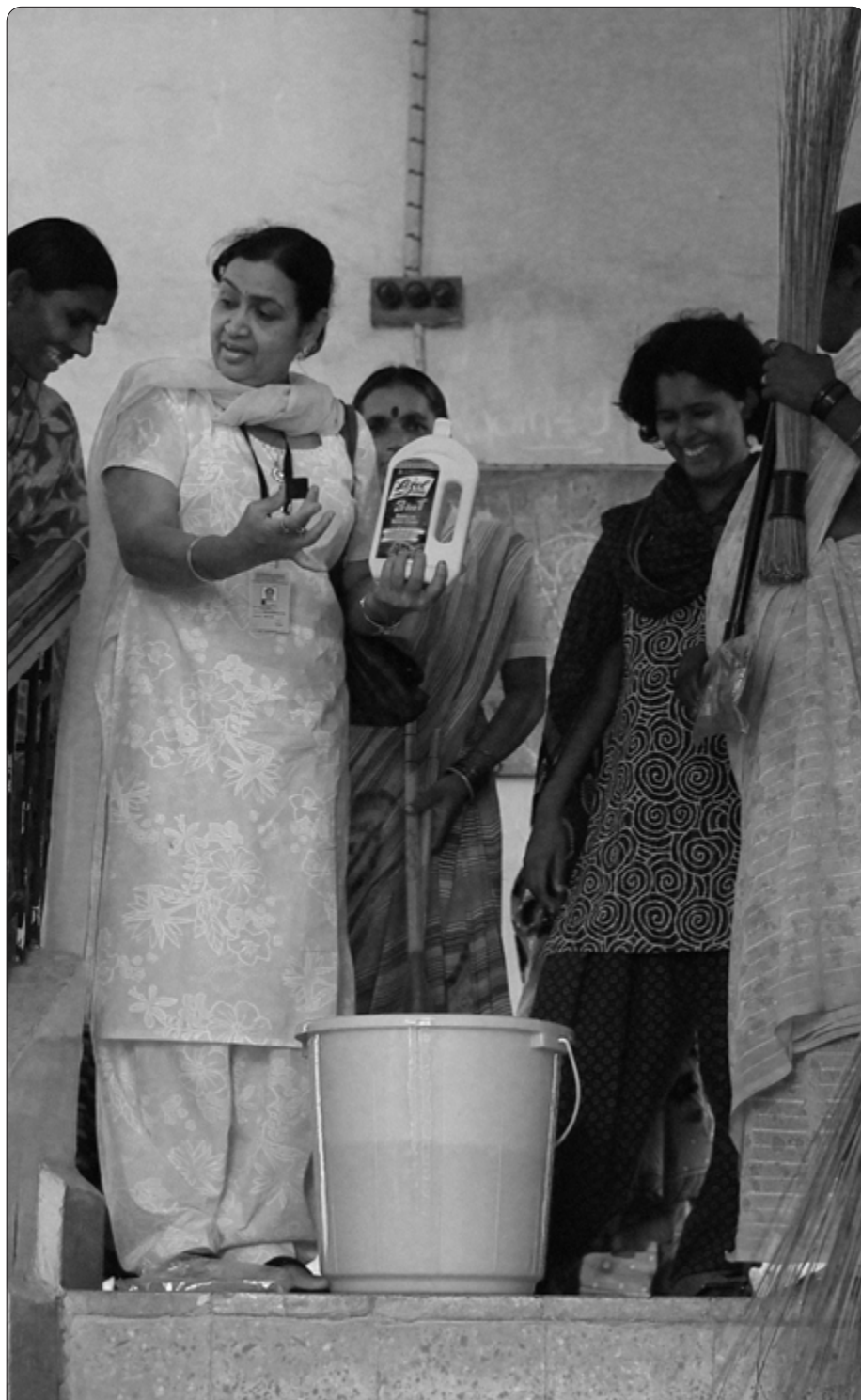


Image 89. Housekeeping workers in Pune at a workshop.

Pictograms and warning labels

Objective

Upon completion of the exercises in this activity, all participants should be able to:

- Identify the different information present on a warning label.
- Recognize the pictograms (both GHS and ADR) and understand the hazards that they represent.
- Be able to evaluate the severity of a hazard from the Hazard Statements and Precautionary Statements on a warning label.
- Know *where* to find additional information about hazards and protective measures on the product's SDS.

Supervisors, purchasers, and safety technicians should be able to:

- Train workers to identify specific warning labels on products that are used in their workplace.
- Create warning labels for chemicals that are used in their workplace, e.g., for cleaning products bought in bulk and transferred to smaller containers.
- Create warning labels in the vernacular which may be used (*in addition to*) the English warning label¹.

Notes

- For most participants at the workshop, the introduction to the subject of hazard classification will begin with the exercises in this section.
- EXERCISE I2 → [241], EXERCISE I3 → [243], and EXERCISE I4 → [244] are designed specifically for SWM workers who cannot read English well. More detailed information should be made available to participants (from the material in GHS HAZARD CLASSIFICATION → [200], CLASSIFICATION OF HAZARDOUS MATERIALS IN INDIA → [211], and GHS SAFETY DATA SHEETS → [212]), as required, during the discussion that follows after participants have completed the exercise.

¹ Warning labels, when required, must always be written in English. An additional warning label in the vernacular may be used if required.

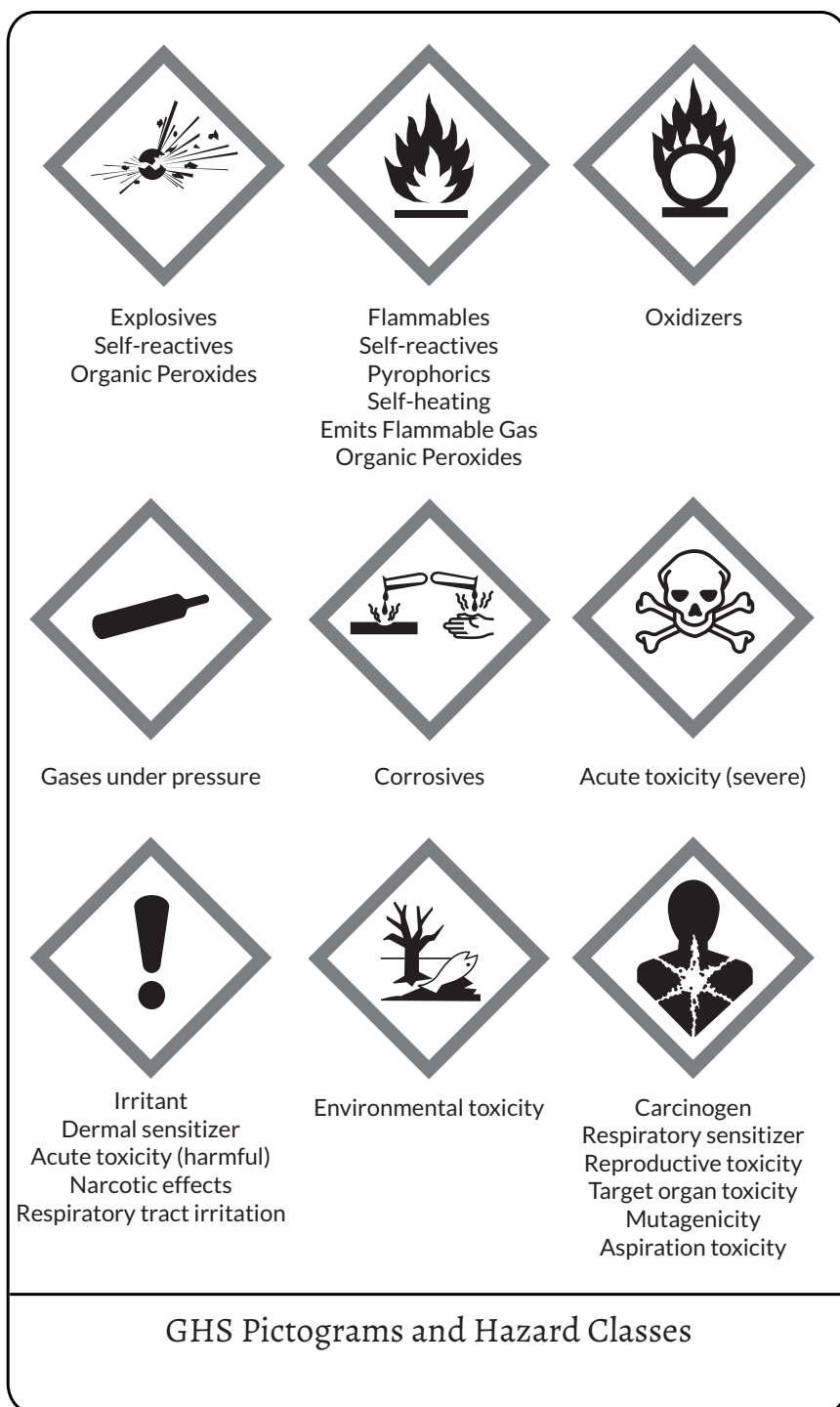


Image 90. GHS pictograms and hazard classes. The companion USB drive contains an A4 sized worksheet of this card without text.

EXERCISE 12: IDENTIFY THE HAZARD-CLASS IN GHS PICTOGRAMS.


Objective

- Know the hazards associated with each GHS pictogram.

Steps

1. Divide the participants into groups of four or five such that each group has at least one participant who can write.
2. Give each group a copy of the worksheet for this exercise. Ask them to write down the hazard depicted by each GHS pictogram. They should describe the pictogram as well as the hazard associated with it. Ask them leading questions, if necessary: What does this pictogram resemble? Is that a fish? Does that tree look healthy? What do you think this means?
3. Discuss the results. Participants should be able to explain what the pictograms depicts—these materials are inflammable, these materials will burn my skin, these materials can affect my health without showing any immediate symptoms, these materials can harm my unborn child, and so on.
4. Create a Hazard Chart in the local language. Use a blank worksheet and write down the name of each hazard in the vernacular.

§ DISCUSSION

After all the groups have completed their worksheets, display  2 and discuss the results. Establish the hierarchy of group, class and category.

GHS pictograms depict three kinds of hazards: Physical hazards, health hazards and environmental hazards. The first four pictograms represent physical hazards—things that explode, burn, increase burning, compressed gases, and things that are corrosive. The next two represent health hazards—things that have an immediate effect, and things that have long-term effects. The last pictogram represents environmental hazards—things that are dangerous to the environment. (Explain what each hazard means with examples.) The exclamation mark can represent any hazard—we will discuss what it means and its usefulness when we examine warning labels.

 How many participants recognized these hazards?

 How many participants recognized all the elements in each of the pictograms?

Discuss why health hazards have two kinds of pictograms; explain the difference between acute and chronic toxicity. Create a vernacular version of the worksheet and, if possible, give a photocopy of this worksheet to each participant.

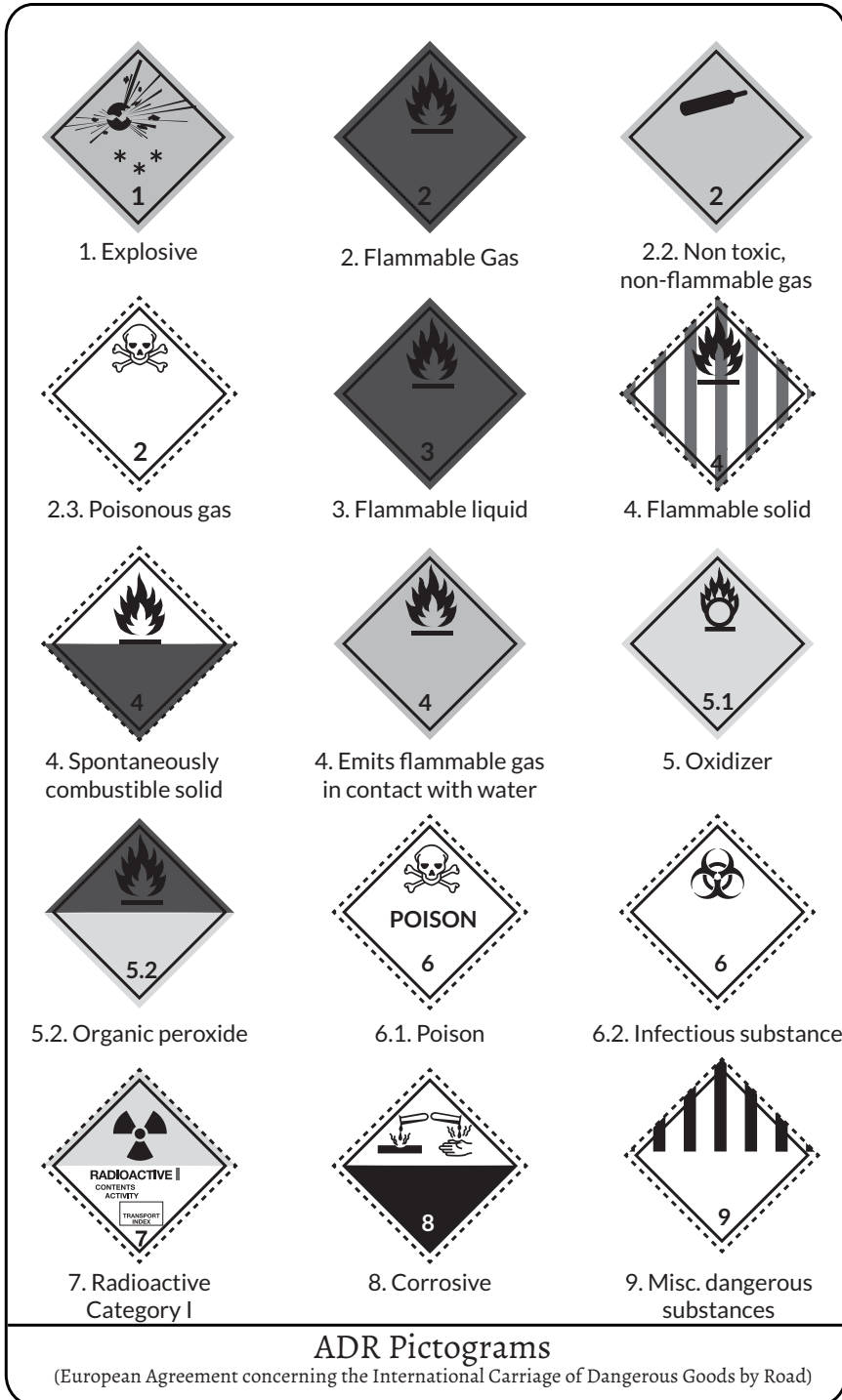


Image 91. ADR transport pictograms.

EXERCISE 13: ADR TRANSPORT PICTOGRAMS.

Objective

- Know the hazards associated with each ADR transport pictogram

Steps

1. Divide the participants into groups of four or five.
2. Give each group a copy of the worksheet for this exercise. Ask them to write down the hazard depicted by each ADR transport pictogram. They should describe the pictogram as well as the hazard associated with it.
3. Discuss the results.
4. Display the slide of the appropriate EIP format (see TABLE 25 → [228]).
5. Discuss how to use these pictograms in the EIP or in the TREM card, or D → EXERCISE 9 → [234].

§ DISCUSSION

After the groups have completed their worksheets, discuss their results.

ADR pictograms depict the nine UN hazard classes (Table 24 → [209]). Six GHS pictograms and two additional pictograms are used in ADR; one GHS pictogram is not used.

👏 How many participants recognized the additional pictograms? Which GHS pictogram is missing?

ADR pictograms are called class-labels in the Central Motor Vehicle Rules. These are to be fixed outside a vehicle carrying hazardous materials. The containers inside the vehicle should be labelled according to the rules in the Hazardous and Other Wastes (Management and Transboundary Movement) Rules.

Point out the pictogram for Class 6.2 (in row 4, column 3). This is the appropriate pictogram for vehicles that transport bio-medical waste; the red-cross and the staff of Asclepius (a snake coiled around a rod) should be used by ambulances and doctors, respectively.

🤔 Discuss what might happen if a vehicle filled with bio-medical waste but marked incorrectly with the red-cross met with an accident. What would well-meaning bystanders do in such a case?

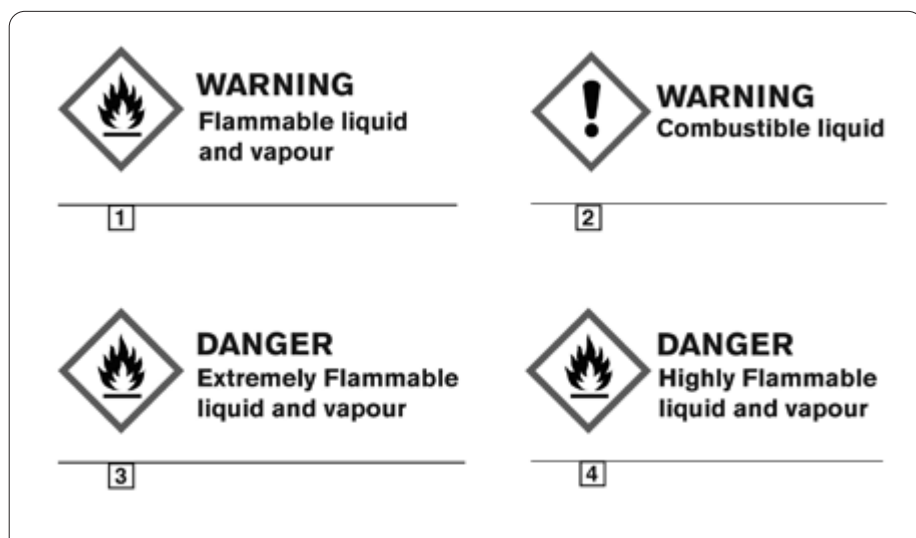


Image 92. Determine the severity of the hazard shown in the warning labels and arrange them in descending order. The correct order is (3),(4),(1),(2). The worksheet contains 6 exercises.

EXERCISE 14: IDENTIFY THE SEVERITY OF A HAZARD.

Objective

- Establish visual cues about a hazard for workers who cannot read English.

Steps

- Divide the participants into groups of four or five.
- Give each group a copy of the worksheet for this exercise. Ask them to rank each of the GHS Hazard Statements in descending order of the severity of the hazard.
- Discuss the results.

§ DISCUSSION

Establish the following visual cues that indicate the hierarchy of the *severity* of a hazard within a class (> means 'is greater than'):

- Signal words: Danger > Warning
- A specific hazard pictogram > Exclamation mark.
- Identify the Hazard Statement, then, in each hazard statement:
 - If present, 'Fatal' > 'Toxic' > 'Harmful'
 - If present, 'Severe' > 'Serious' > 'Mild' > neither of these words.
 - If present, 'Extremely' > 'Highly' > neither of these words.

These phrases are standardised and cannot be changed by manufacturers. .



Image 93. A warning label that is compliant with GHS guidelines. (1) Product identifier: Acetone (the common name), Propan-2-one (the preferred IUPAC name), CAS NO. 67-64-1, and UN 1090. The names used on the label should be identical to the ones used in the SDS (2) Signal word: Danger. (3) Standardised Hazard Statements. (4) Precautionary Statements. (5) Contact information of the manufacturer. (6) Pictograms.

EXERCISE 15: IDENTIFY COMPONENTS OF A WARNING LABEL.

Objective

- Introduction to the importance of classification and standardisation.
- Know what information is present in a warning label

Steps

1. Display the slide shown in the image above. Explain that this is the globally accepted standardised format for warning labels.
2. Ask participants to point out elements in the warning label that were discussed in the previous exercises—participants should be able to identify the pictograms, the signal word and the hazard statements.
3. Point out the presence of two pictograms in this label and explain why there are two pictograms.
4. Read out the precautionary statements one by one and point out the additional information that is present in them.
5. Display the slide of warning labels shown in IMAGE 95. It is not compliant with GHS recommendations. Point out the differences and ask them to identify the same information from the GHS label. Discuss the importance of a standard classification system.
6. Create a warning label for acetone in the local language using the GHS standard label as the reference.

§ DISCUSSION

Use STEP 2 as a revision of the previous exercises. During STEP 3, explain how to interpret more than one pictogram¹. The logic is as follows (simplify the explanation as necessary and establish the links to EXERCISE 14):

1. If a substance presents hazards in different classes that are all severe enough to

¹ GHS defines rules for pictogram precedence. In many cases a specific hazard pictogram is usually accompanied by the exclamation point pictogram.

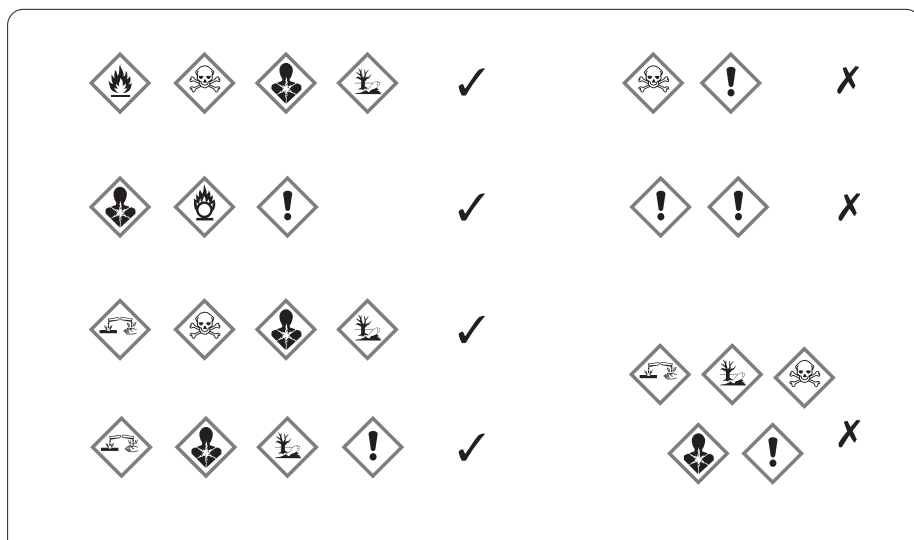


Image 94. Valid and invalid pictogram groups. Most warning labels will contain one (and rarely) two specific pictogram(s) and an exclamation mark. The invalid groupings shown will never appear. If the skull-and-bones appears, then an exclamation mark may not be used, even for hazards in other classes.

require the appropriate pictogram, then it will appear. In most cases, a specific pictogram from a physical hazard class will appear beside an exclamation mark from a health-hazard class.

- Only one exclamation mark can appear on the warning label; two exclamation marks are not allowed, even if they correspond to different hazard classes or groups.

In most cases, you will see two pictograms — a hazard and an exclamation mark. If there is a burning flame pictogram, then it is the most severe hazard. The exclamation mark is there as a reminder to read the Hazard Statement. The two pictograms say this: “This substance burns. Read the hazard statements for other less severe hazards.” If only an exclamation mark is present, it says this: “No severe hazards, but read the hazard statement.” Never ignore the exclamation mark. I’ll give you an example:

👏 How many here have itchy skin? How many have experienced the sudden onset of a skin rash? These could be caused by a tiny amount of many cleaning chemicals. Skin irritation can be minor, but for some people it might be a severe problem because the skin never heals — you keep getting the rash again and again.

During step 4 and step 5, ask the participants if any of them have faced symptoms that are associated with the precautionary statements.

At STEP 6, display the slide shown in IMAGE 95. Then, ask the participants to answer the following questions, one by one:

- Do you recognise the chemical mentioned in the label?
- Is it apparent, immediately, that the chemical is flammable? Did anyone recognise the stylised ‘flame’ pictogram in the second image?
- Each label has a different signal word—can you identify it?



Image 95. Warning labels for acetone. Neither is compliant with GHS recommendations.

4. What are the safety precautions mentioned on each label?
5. Is there any advantage in having one global standard for warning labels?

At Step 7, display the GHS label, ask for a volunteer to join you at the front and create a warning label for acetone in the vernacular. Ask the participants what should be translated, and what need not be translated, e.g., should the signal words be translated?

ACTIVITY 4D

Safety Data Sheets

Objective

- Know how to interpret a Safety Data sheet.

Steps

- Initiate EXERCISE 16 → [250].
- Discuss the results.

Workshop Programme

- This activity consists of two exercises and is designed for skilled swm workers responsible for OHS at the worksite. Skip the activity for all non-technical participants.
- EXERCISE 17 → [253] is designed for skilled swm workers and technicians. It may also be useful for administrative staff at NGOs to help them appreciate the technical complexity of jobs that appear simple to the untrained eye.

WHAT IS AN SDS?

The Safety Data Sheet (SDS) of a product is a reference document that contains information on the potential hazards (health, fire, reactivity and environmental) and how to work safely with the product. It also contains information on the use, storage, handling and emergency procedures related to the hazards of the product.

HOW DOES AN SDS HELP? Successful hazard communication (such as an easily-understood label) alerts workers to the presence of a hazard, the need to protect themselves and minimise their exposure to the hazard. An SDS provides additional information. It tells workers what the hazards of the product are, how to use the product safely, what to expect if the recommendations are not followed, how to recognize symptoms of exposure, and what to do if emergencies occur. Consequently, a worker's risk is reduced.

An SDS for a product provides four kinds of information:

1. **IDENTIFICATION:** The contents of the product.
2. **HAZARDS:** Physical, health, and environmental hazards associated with the product, categorized according to their severity.
3. **PREVENTION:** Steps you can take to work safely, and reduce or prevent exposure to the hazards.
4. **RESPONSE:** Appropriate responses if someone is exposed to the hazard(s).

The exercises that follow require participants to consult an SDS and extract relevant information.

1. (Verifiable) self-declaration – Each bottle we supply contains a label describing the contents and a list of all hazardous materials that are not in the bottle- We name the chemicals used cleaning companies, and categorically state these are not a part of our offerings. These statements can be verified (by an Rs.100/- test)by any lab and ensure there are no chemicals in our bottles. A typical label will contain the following information- The ingredients in this bottle are free of caustic, phosphates, alkalis, amines, petroleum derivatives,d-linolenic, strong acids, terpenes, butyl cellosolve, glycol ethers. Our product is made of 100% renewable resources; plant-based non-ionic surfactants & botanical buffering agents.

Image 96. Safety claim made by the manufacturer of an 'organic' general-purpose cleaner. The manufacturer does not provide an SDS. The 'self-declaration' shown in the image is supplied, instead. Typical non-ionic surfactants are ethoxylated or alkoxylated fatty acids; typical anionic surfactants are carboxylated fatty acids. As was discussed earlier in the case of $\text{SCS}_{[172]}$, while unrefined fatty acids derived from a plant may serve as the source material, they must be chemically processed into a surfactant. It also seems that the manufacturer has chosen to say 'non-ionic surfactant' instead 'anionic surfactant' in a vague attempt to distance the product from any association with chemicals. How can one know what is in this product, without an SDS?

EXERCISE 16: FIND INFORMATION FROM AN SDS

Objectives

- Participants are able to extract relevant information from an SDS.

Procedure

1. A 7-page SDS of acetone in PDF format is on the companion USB drive. Print six copies of the document. Sections 1 and 2 are shown in IMAGE 97.
2. Divide the participants into groups of four or five and give each group a copy of the SDS. Give the groups a few minutes to read the SDS.
3. Ask the questions listed below, one by one.
4. Discuss the results.

Questions

1. What is the product name?
2. What are the hazardous ingredients?
3. What are the main hazards of this product? Is 1L of this product hazardous? Are 50L of this product hazardous?
4. What are the label elements? (e.g., pictogram, hazard-class and category, signal word, hazard statement, precautionary statements). Is this SDS for the same chemical mentioned in the warning label that we saw earlier (see IMAGE 93)?
5. What are the symptoms of inhaling this product?
6. What are the first-aid measures for eye-contact?
7. What should be done if 50L of the product spills on the floor of your workplace? Should you clean it with water?
8. List the recommended protective measures.
9. What engineering controls are recommended when using this product?
10. What colour is the product?
11. Are there any special conditions to keep in mind while handling this product?
12. How should this product be stored safely?
13. How should it be disposed? What environmental hazards does it present?
14. Name the incompatible materials listed for this product. Can you think of an example of a chemical that is incompatible?

§ DISCUSSION

Evaluate the participants' answers on two criteria—correctness and completeness. The answers to some of the questions require them to check only one section of the SDS; some questions will require them to refer to multiple sections.

Ask each group one question, in turn; after they have answered, ask the other groups if their answer is the same.

Repeat the exercise with the SDS of a commercial cleaning product that SWM workers often use—say, the SDS for Harpic toilet-bowl cleaner—will allow you to demonstrate the following:

- Finding the Safety Data Sheet for a commercial cleaning product can be difficult. Often, the SDS for a cleaning product will contain very little useful information—this is especially true of products that cater to the growing demand for 'natural' or 'organic' products. As we have established earlier (see GUIDELINES FOR USING CLEANING PRODUCTS → [183]), informed decisions about workplace safety must rely upon information, and not upon the uninformed belief that if a product is called 'organic,' then it must be safe. (Also see @hobpzx8.)



Acetone

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations
 Date of issue: 11/12/1998 Revision date: 04/24/2018 Supersedes: 04/24/2018 Version: 1.0

SECTION 1: Identification

1.1. Identification

Product form : Substance
 Substance name : Acetone
 Chemical name : 2-Propanone
 CAS-No. : 67-64-1
 Product code : LC10420, LC10425
 Formula : C₃H₆O
 Synonyms : 2-propanone / beta-ketopropane / dimethyl formaldehyde / dimethyl ketone / dimethyl ketone / dimethyl ketone / keto propane / methyl ketone / pyroacetic acid / pyroacetic spirit

1.2. Recommended use and restrictions on use

Use of the substance/mixture : Solvent
 Cleaning product
 Chemical raw material
 Recommended use : Laboratory chemicals
 Restrictions on use : Not for food, drug or household use

1.3. Supplier

LabChem, Inc.
 Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
 Zelienople, PA 16063 - USA
 T 412-826-5230 - F 724-473-0647

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 or +1-703-741-5970

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Flammable liquids H225 Highly flammable liquid and vapour
 Category 2
 Serious eye damage/eye irritation Category 2A H319 Causes serious eye irritation
 Specific target organ toxicity (single exposure) Category 3 H336 May cause drowsiness or dizziness
 Full text of H statements : see section 16

2.2. GHS Label elements, including precautionary statements

GHS US labeling

Hazard pictograms (GHS US) :



Signal word (GHS US) : Danger
 Hazard statements (GHS US) : H225 - Highly flammable liquid and vapour
 H319 - Causes serious eye irritation
 H336 - May cause drowsiness or dizziness
 Precautionary statements (GHS US) : P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking.
 P233 - Keep container tightly closed.
 P240 - Ground/bond container and receiving equipment.
 P241 - Use explosion-proof electrical, lighting, ventilating equipment
 P242 - Use only non-sparking tools.
 P243 - Take precautionary measures against static discharge.
 P261 - Avoid breathing mist, spray, vapors.

04/23/2019

EN (English US)

Image 97. Sections 1 and 2 from a GHS-compliant Safety Data Sheet for acetone.

- Safety Data sheets for commercial products vary wildly depending upon the country where the product is made—worldwide compliance to GHS standards, especially for consumer products, is poor.
- Unlike pure laboratory chemicals (LR grade or better), commercial and industrial cleaning products are typically mixtures of chemical ingredients that have not been tested as a whole. Therefore, manufacturers are forced to use GHS bridging principles for mixtures and often do so incorrectly. The situation is unlikely to change for the better in the near future.

Participants must learn to extract relevant information from a document that might not be up to the precise standards required by GHS. The next exercise builds upon the goals of this exercise with problems frequently encountered by SWM workers.

EXERCISE 17: WHAT WOULD YOU DO IF...

Objective

- Participants should appreciate that the information in the SDS is essential to create practical work-safety protocols.

Procedure

- In each of the situations¹ described below, information contained in one or more SDS must be used to determine the best way to proceed. Read out each situation to the participants; give them 5 minutes to find the relevant SDS online and solve the problem. Encourage them to ask for clarifications; ask them to visualise the situation. Discuss their solutions.

1. Rainwater or corrosive acid?



Workers at a company that processes plastics waste are unsure what to do with the truck-load of 500 empty LDPE buckets that has just arrived at their company. The roof of the cargo area of the truck is protected by a water-proof fabric, however, some of the buckets contain small amounts of a liquid that looks like water. The cargo area has a faint, sour smell. The transporter insists that the containers were empty when they were collected; it had rained earlier that day, and the water-proof sheet had leaked—the liquid was rainwater that had dripped into some of the buckets stacked at the top. Workers estimate that around 20L of the liquid is present in the entire shipment.

The buckets display a warning label that identify the original contents of the buckets as Ethanoic acid, CAS: 64-19-7. The label says, “Danger. Flammable liquid and vapour. Causes severe skin burns and eye damage.”

All workers have nitrile gloves and rubber boots, however the word ‘acid’ and the ominous pictogram has made them uneasy since the gloves do not extend to their elbows.

- ☹ How would you process the shipment?
- ☹ How should workers be trained to process such shipments?

2. Mall Tales: Ep.2. Safe chemical dilution protocol

Nirmala is a manager at a company that provides housekeeping and janitorial services to a large shopping mall wants to save money by purchasing cleaning chemicals in bulk and mixing them, as required, on site. Her company uses around 4L of a household toilet-bowl cleaner that contains 10% hydrochloric acid every day; a separate cupboard on site has enough space to store 50L (in individual 500ml dispensers) of the product. The staff also uses a drain-unblocking product that contains sodium hydroxide, a general-purpose ammonia-based glass cleaner with a mild detergent, a general-purpose scouring powder, and a hypochlorite disinfectant. The janitorial staff is trained to use this product safely. Nirmala is aware that diluting a strong acid is hazardous; she is also aware that special

storage and PPE protocols may be required to handle strong acids since they are extremely hazardous at high concentrations. She orders 50L of an aqueous hydrochloric acid solution (24% concentration). The chemical will be delivered in a single HDPE barrel. It must be diluted to 8% concentration and transferred to individual 500ml dispensers; she intends to use empty dispensers of the household cleaner.

☹ How would you design a protocol for the safe dilution of the chemical? Consider the following while doing so:

- What are the hazards associated with the concentrated chemical?
- Create a warning label for the dispensers filled with the 'new' toilet-bowl cleaner.
- How should the product be stored—clearly there is not enough space if the entire contents of the barrel are diluted to working strength. Devise a storage strategy. Would it be safer to store 100 dispensers in the cupboard as before and dilute the rest of the acid in the barrel?
- Prepare a list of equipment needed safely to dilute the acid—Would they require a second barrel for dilute the acid?² How would they transfer the acid to the barrel of water—an HDPE mug? Is LDPE safe? What PPE would be required? Would the worker require a full face respirator with an acid-gas cartridge (see ⑤ RESPIRATORS → [274])?³

3. Hazards change with scale



A worker at a glass commercial recycling company showed her supervisor a 50mL glass bottle of a new 'acetone-free' nail-polish remover called Dissolv⁴. It contained a small quantity (<10mL) of a clear, pleasant-smelling liquid. More than 250 bottles of the solvent had been collected that day and (the worker reported) that the manufacturer had distributed more than 1000 bottles at various shopping malls, all of whom were clients of the recycling company. Some bottles had been discarded unused. The bottle displayed two pictograms (shown above) and the following signal words and hazard statements:

Danger: Highly Flammable liquid and vapour
Warning: Causes severe eye irritation

The supervisor checked the SDS of the product online. Section 3 listed the ingredients shown in TABLE 29 → [255]. Display the table on the projector screen

² Make sure that the participants understand the hazards involved in diluting the acid—the acid must be poured into water and not the other way around.

³ Encourage participants to visualise the situation—is it safer for the worker to lean into the barrel to scoop up the last 5L or so or the acid or is it safer to pour the last 5L into the second barrel?

⁴ Dissolv is a hypothetical name; the ingredients in the bottle, however, are commonly used solvents.

DISSOLV			
No.	INGREDIENT	CAS	PERCENTAGE (BY VOLUME)
1	Isopropanol	67-63-0	55 %
3	Propyl propionate	106-36-5	54 %
4	2-Butanol	78-92-2	< 0.5 %
5	Xylenes	95-47-6	< 0.2 %

Table 29. List of ingredients in a hypothetical general-purpose solvent called Dissolv.

The workers at the company segregate and store glass waste indoors in a hopper which can hold 1 ton of glass—the minimum viable shipment.

☹ What safety protocols should be used to process the bottles?

This exercise is the most complex. Unlike FIND INFORMATION FROM AN SDS_→[250], in which you gave participants an SDS, this exercise requires them to look up the SDS of individual chemicals on their own.

The obvious hazards presented by Dissolv should be analysed first. Isopropanol and propyl propionate are (relatively) safe chemicals. Participants should identify the hazards associated with these chemicals correctly. However, a second hazard lurks under the surface—the minute quantity of xylenes in Dissolv^{5,6}, do not represent a hazard when one considers a single bottle of the product; they do present a hazard when one must store 1000 bottles of Dissolv in a closed room. The risk increases for SWM workers since they must remove the LDPE caps and rings from the bottles, individually, before the glass can be shipped out for recycling. Whilst the general recommendation of GHS is that all ingredients, including those present as impurities, should be disclosed in the SDS, GHS does not compel the manufacturer to disclose the presence of xylene⁷ and 2-butanol since they are not hazardous to health at these concentrations, . Therefore, section 3 of the SDS for DissolvTM may contain only the first 3 rows, or it may contain a fourth row with the catch-all phrase *other hazardous ingredients* or, as in this exercise, it might show all ingredients. For typical users the 50mL bottle presents a hazard similar to that of any alcohol-based hand sanitiser. However, SWM professionals should be aware of potential hazards that might be present when processing large quantities of chemical products, e.g., processing large numbers of empty cans that contained insecticides, especially those that belong to the organophosphate and carbamate families⁸, which are commonly used as household insecticides.

Acute dermal toxicity	Category 4
Acute Inhalation Toxicity—Vapours	Category 4
Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2

⁵ Commonly found as trace impurities in most solvents—the need for comprehensive definition of ‘product’ in GHS is made clear by this exercise—xylenes are a potent, carcinogenic, chronic toxicity hazard.

⁶ See @y3lfc7a for the SDS of pure o-xylene. See @yaemk4wl for the USNIH article entitled *Xylene: An overview of its health hazards and preventive measures*

⁷ Usually a mixture of three isomers—o-xylene, p-xylene, and m-xylene.

⁸ See @yb4osded

Specific target organ toxicity (single exposure)	Category 3
Target Organs—Respiratory system and CNS. Specific target organ toxicity (repeated exposure). Target Organs—Liver.	Category 2
Aspiration Toxicity	Category 1

Table 30. Health hazards associated with xylenes.

The risks associated with chemical hazards (hazard \times exposure = risk) increases several-fold for SWM workers since they process small quantities of hazardous chemicals every day, for many years, without appropriate protection. The SWM industry must adopt OHS programs of the chemical industry to reduce the hazards faced by its workers. Using the SDS to create safe working conditions is the first step.

- 🕒 What jobs and workplaces in the SWM industry are associated with the risk of chronic exposure to chemical hazards? How can they be made safer?
- 🕒 Discuss the following:
 - The decisions you make should be based on an objective analysis of the hazards, rather than merely the perception of the risks involved. Once this has been accomplished, a reasonable means of controlling the hazards using the hierarchy of hazard control is relatively simple. Does this generalised statement about OHS apply to your workplace?
 - Unlike traditional industry where costs of re-tooling, rewiring, civil works, and so on may act as a deterrent, creating a safe workplace can be relatively inexpensive in the SWM industry since most workplaces have no equipment—a safe workplace can be built from scratch.

Have you considered commissioning a chemical safety audit of your workplace?

Perform a quick cost-benefit analysis and a SWOT analysis of a work-safety audit if participants are interested.



Chemical hazards: PPE standards

Objectives

- Know how to interpret chemical resistance codes on PPE for handling chemicals.
- Informed choices on the selection of appropriate gloves used by SWM workers who may have to handle waste that is contaminated by chemicals.
- Quick reference for glove-material selection for jobs that require infrequent or accidental contact with hazardous chemicals.

Notes

- This activity should be included in workshops with purchasers, and workers in charge of OHS in companies that process commercial waste that may be incorrectly disposed of or contaminated with hazardous chemicals.
- This activity is not recommended for housekeeping staff and other SWM workers who do not handle unknown chemicals or objects that might be contaminated with potentially hazardous waste. Knowing how to select the appropriate glove(s) for their job from the STANDARD GLOVE-KIT → [149] should provide enough information for such workers to take informed decision about their PPE.
- Your assistant should carry one pair of TYPE A, TYPE B, and TYPE C gloves that display the EN 374 pictogram during this activity.

Steps

- Display [S]1 and explain how to interpret the EN 374 pictogram.
- Initiate EXERCISE 18.
- Discuss any specific situations that might require the use of chemical-resistant gloves, e.g, processing empty LDPE containers procured from industrial zones.

Slides

- [S]1 : Different EN 374-1:2016 pictograms for TYPE A, TYPE B and TYPE C gloves.

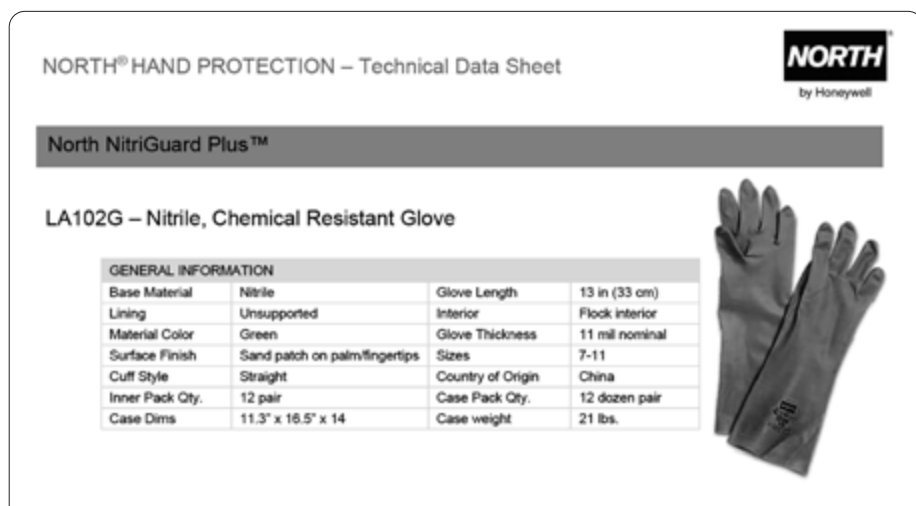


Image 98. Datasheet for a glove made by Honeywell®. It is certified to chemical testing protocols defined in ASTM F739.

INTRODUCTION

THERE IS NO PERFECT BARRIER MATERIAL that can protect against all chemicals while simultaneously being suitable for use as a durable glove for SWM workers. Therefore, specific chemical hazards of the workplace should be evaluated on a case-by-case basis to arrive at the most appropriate choice for gloves and other PPE. Businesses tend to have a ‘one-glove-fits-all-applications’ approach to safety, or they focus solely on the primary chemical hazard when selecting gloves (and other PPE). This approach is flawed—and may introduce new risks—because it often entails compromise in vital areas such as comfort, dexterity, or grip.

Typically, thicker gloves provide more chemical resistance, but excessively thick gloves can impair grip and dexterity, which can lead to accidents; thinner, lighter gloves offer better touch sensitivity and flexibility at the cost of lower chemical resistance. Glove manufacturers generally state that doubling the thickness¹ of a glove quadruples the breakthrough time of the chemical.

DEGRADATION is a change in physical properties of the glove material. Common effects include swelling, wrinkling, stiffness, and change in colour. The degradation ratings indicate how well a glove will hold up when working with a specific chemical. Degradation tests are defined in EN 374-4: 2013. Degradation is usually the first test conducted on gloves, and a low score will disqualify it for use with chemicals. The rating is determined by a puncture test that is very similar to the one described in EN 388:2016+A1:2018. The amount of force that is required to puncture an unexposed sample with a stylus is recorded; the test is repeated with a sample that has been exposed to a chemical for one hour.

Degradation is expressed as a percentage change in puncture resistance (between the

¹ Gloves manufactured for the North American market use ‘mil’ as the unit of thickness. 1 mil = $\frac{1}{1000}$ inch or 0.0254 mm. 1 mil \neq one millionth of an inch; 1 mil \neq 1 mm. The rest of the world uses the metric system, and the thickness of gloves is specified either in micrometers (also called microns), or millimetres. 1 micron = $1\mu\text{m}$ = $\frac{1}{1000}$ mm. Disposable nitrile gloves are usually 4-8 mil (\sim 0.1mm - 0.2mm) thick. EN374 requires that the test sample be taken from the palm of the glove.

unexposed and exposed test specimens) and is listed as the Degradation Rate (DR) in the glove's SDS. The importance of degradation in reducing the protective properties of gloves is particularly relevant to the more corrosive chemicals.

BREAKTHROUGH TIME (BT) is the duration between initial contact of the chemical on one side of the glove material and the analytical detection of the chemical on the other side of the glove material. The test protocol is defined in ASTM F739 (*Standard Test Method for Permeation of Liquids and Gases through Protective Clothing Materials under Conditions of Continuous Contact*.) The higher the result, the longer it takes for the chemical to pass through the glove material. The actual time reported on the chemical is usually listed on resistance charts. If breakthrough did not occur, the data reported is typically None Detected (ND) or greater than (>) the indicated test period.

Breakthrough time can be used to estimate how long a glove can be expected to provide protection when submerged in the test chemical.

PERMEATION RATE is a measurement that describes the rate of the chemical passing through the glove material at the molecular level. This process is similar to how a balloon loses air after enough time passes even though it is still tied and has no visible holes. The thickness of the glove can greatly affect the permeation rate. According to EN 16523-1: 2015, the permeation rate indicated by the test must be within 20% of the mean average of the three test samples. The lowest score is to be reported. The test must be repeated if the results vary by more than 20%.

This is a 'total immersion' test and may not be representative of the environment where the gloves are used. Here, the emphasis is typically on incidental chemical exposure and the gloves ought to be changed immediately after any contact with a chemical. It is also important to remember that the tests are done on new gloves under laboratory conditions. The test temperature is 23°C (±1°C) which is considerably lower than 37°C—the average human body temperature—and a higher temperature may accelerate the permeation rate. The test methodology also does not account for the stresses and strains to which disposable gloves are subjected whilst being worn.

Manufacturers report permeation rate in different ways—typically results are reported in micrograms of chemical per square centimetre of glove material per minute (µg/cm²/min). A higher result indicates that more of the chemical passes through the material every second. Other manufacturers rate the permeation similar to the reporting style for degradation: excellent (E), good (G), fair (F), poor (P) and not recommended (NR). Permeation rate is not measured if chemical breakthrough does not occur. This is reported as ND or not tested (NT) depending upon the manufacturer. Safety gloves must be tested for degradation, breakthrough and permeation rate with every chemical listed in TABLE 31.1 [260]. They must attain at least Performance Level 2 to carry the EN 374 pictogram.

Where test data are not available, the user can perform a crude test for chemical compatibility by filling a finger of the glove with the challenge chemical and observing for swelling, hardening, softening, dissolving, or leakage of the material.² If the chemical substance is especially hazardous, however, laboratory testing of the specific agent and glove should be either requested of the glove manufacturer or commissioned directly with a testing company. Not only does glove thickness affect permeation rate, but it is

2 Mansdorf, S. Z (editor). 2019. Handbook of occupational safety and health. Wiley. New Jersey. p 489.

also a factor determining resistance to tears and abrasions. Thicker is usually better; pvc in general has excellent resistance against most concentrated acids. However, thin ambidextrous pvc food-handling gloves (the kind that is usually sold in 100 per pack dispenser boxes) should generally not be worn when handling concentrated acids because they tear and abrade more easily and have quicker BT than their thicker counterparts intended for use as chemical protection PPE. The same is true of latex and nitrile surgical gloves, which are available in very thin (4 mil) versions.

CODE	CHEMICAL	CAS RN	CLASS OF CHEMICAL
A	Methanol	67-56-1	Primary alcohol
B	Acetone	67-64-1	Ketone
C	Acetonitrile	75-05-8	Nitrile compound
D	Dichloromethane	75-09-2	Chlorinated hydrocarbon
E	Carbon disulphide	75-15-0	Organic sulphur compound
F	Toluene	108-88-3	Aromatic hydrocarbon
G	Diethylamine	109-89-7	Amine
H	Tetrahydrofuran (THF)	109-99-9	Heterocyclic ether
I	Ethyl acetate	141-78-6	Ester
J	n-Heptane	142-82-5	Saturated hydrocarbon
K	Sodium hydroxide 40%	1310-73-2	Inorganic base
L	Sulphuric acid 96%	7664-93-9	Inorganic acid, oxidising
M	Nitric acid 65%	7697-37-2	Inorganic acid, oxidising
N	Acetic acid 99%	64-19-7	Organic acid
O	Ammonium hydroxide 25%	1336-21-6	Organic base
P	Hydrogen peroxide 30%	7722-84-1	Peroxide
S	Hydrofluoric acid 40%	7664-39-3	Inorganic acid
T	Formaldehyde 37%	50-00-0	Aldehyde

Table 31. Chemicals used in EN 374 tests. CAS RN is the Chemical Abstracts Service Registry Number.

EN 374-1:2016

European standards for gloves made for handling chemicals are defined in EN374:1-2016. These are based on three tests and are performed only if the a glove meets the general requirements specified in EN 420:2003+A1:2009:

1. Penetration test defined in EN 374-2: 2014
2. Permeation test defined in EN 16523-1: 2015
3. Degradation test defined in EN 374-4: 2013.

All three tests must be carried out and the passing scores must be available on the Safety Data Sheet (SDS) of the glove. Safety parameters and testing standards for gloves meant for handling chemical and biological waste are defined in EN 374. The most recent version

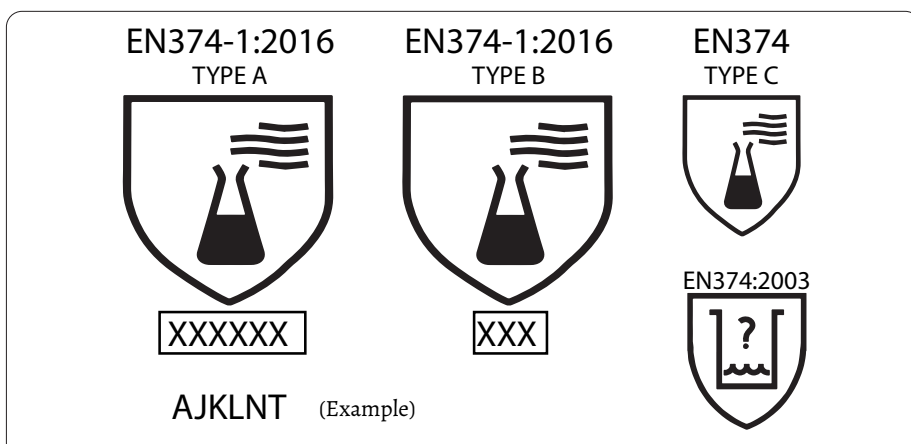


Image 99. Different EN 374-1:2016 pictograms. Each 'x' beneath the first two pictograms refers to a chemical code in the first column of TABLE 31 against which the glove would offer at least Level 2 of protection as defined in the standard. The pictogram on the left would be found on a glove that is rated at Performance Level 2 against methanol (A), n-heptane (J), 40% sodium hydroxide (K), 96% sulphuric acid (L), 99% acetic acid (N), and 37% formaldehyde (T).

(EN 374-1:2016) of the standard introduced six new test-chemicals and updated the testing methods for safety gloves. There are three levels of chemical resistance: TYPE A (high resistance) TYPE B (medium resistance) and TYPE C (lowest resistance). A glove must pass the air-leak, water-leak and permeation tests according to the criteria listed in EN420 before it may be tested for chemical resistance under EN374. The results of the permeation test determine the rating-type of the glove:

1. TYPE A: Permeation resistance (PR) to each of six or more test chemicals for at least 30 minutes.
2. TYPE B: PR to three or more test chemicals for at least 30 minutes.
3. TYPE C: PR to at least one test chemicals for at least 10 minutes.

Further, the level rating of a glove is determined by the least time taken for it to degrade when kept in continuous contact with each of the chemicals in TABLE 31_→[260]: Level 1 (<10 minutes), Level 2 (>30 minutes), Level 3 (>1 hour), Level 4 (>2 hours), Level 5 (>4 hours), and Level 6 (>8 hours). A Level 2 rating is the minimum requirement to achieve a TYPE A or TYPE B permeation rating. Level 1 gloves (irrespective of the number of chemicals to which they are resistant) are rated TYPE C, which indicates that the glove is airtight, waterproof and *might* provide splash-protection against one or more of the chemicals listed in TABLE 31; TYPE C gloves are not recommended for SWM workers who handle industrial waste. They may be used for handling segregated domestic wet waste.

PPE recommendations for SWM workers who regularly handle chemically-contaminated waste or those who regularly use or handle specific chemicals must be made, without exception, using the SDS of the hazard as well as the SDS for the relevant PPE. TABLE 32_→[262] lists common chemicals with which SWM workers may come into contact. It allows you to recommend appropriate glove material for accidental or infrequent contact with toxic chemicals in *specific one-off situations*, say, for sorting material collected from a waste-generator who is known to discard chemicals inappropriately.

EXERCISE 18: FIND THE HAZARDOUS CHEMICAL

Explain the following situation faced by a supervisor at a mall. Ask participants to solve the problem.

Workers have noticed that their nitrile gloves disintegrate when collecting waste from a mall. Your job is two-fold: minimize the risk of exposure of your workers to potential hazards and trace the source of the chemical in the mall.

SOLUTION: Check TABLE 32 (below) for chemicals that degrade nitrile rubber (marked P (POOR), under Column 4 and @ in Column 1). The table indicates that neoprene is be resistant to many chemicals that degrade nitrile rubber; recommend that workers switch to gloves rated EN374: XBX (or simply recommended neoprene gloves) when working at that mall. Check the list of tenants in the mall and cross-reference with TABLE 18, [181]. The chemical causing the problem *might be* acetone that was improperly discarded by one of the many beauty salons in the mall. Check the waste discarded by the beauty salons in the mall to verify your suspicions and speak to the owners of the salon.

CHEMICAL	NEOPRENE	LATEX RUBBER	BUTYL	NITRILE
Acetaldehyde*	VG	G	VG	G
Acetic acid (vinegar)	VG	VG	VG	VG
Acetone* [@]	G	VG	VG	P
Ammonium hydroxide*	VG	VG	VG	VG
Amyl acetate [@]	F	P	F	P
Aniline* [@]	G	F	F	P
Benzaldehyde*	F	F	G	G
Benzene*	P	P	P	F
Butyl acetate	G	F	F	P
Butyl alcohol	VG	VG	VG	VG
Carbon disulfide*	F	F	F	F
Carbon tetrachloride*	F	P	P	G
Castor oil	F	P	F	VG
Chlorobenzene* [@]	F	P	F	P
Chloroform	G	P	P	F
Chloronaphthalene	F	P	F	F
Chromic acid(50%)*	F	P	F	F
Citric acid(10%)*	VG	VG	VG	VG
Cyclohexanol	G	F	G	VG
Dibutyl phthalate	G	P	G	G
Diesel*	G	P	P	VG
Diisobutyl ketone	P	F	G	P

CHEMICAL	NEOPRENE	LATEX RUBBER	BUTYL	NITRILE
Dimethyl formamide	F	F	G	G
Dioctyl phthalate	G	P	F	VG
Dioxane	VG	G	G	G
Epoxy resins*	VG	VG	VG	VG
Ethyl acetate*	G	F	G	F
Ethyl alcohol*	VG	VG	VG	VG
Ethyl ether*	VG	G	VG	G
Ethylene dichloride [@]	F	P	F	P
Ethylene glycol*	VG	VG	VG	VG
Formaldehyde*	VG	VG	VG	VG
Formic acid	VG	VG	VG	VG
Freon (11,12,21,22)	G	P	F	G
Furfural	G	G	G	G
Glycerin*	VG	VG	VG	VG
Hexane	F	P	P	G
Hydrazine(65%)	F	G	G	G
Hydrochloric acid*	VG	G	G	G
Hydrofluoric acid(48%)	VG	G	G	G
Hydrogen peroxide(30%)*	G	G	G	G
Hydroquinone	G	G	G	F
Isooctane	F	P	P	VG
Isopropyl alcohol*	VG	VG	VG	VG
Kerosene*	VG	F	F	VG
Ketones(class)* [@]	G	VG	VG	P
Lacquer thinners (class)* [@]	G	F	F	P
Lactic acid(85%)*	VG	VG	VG	VG
Lauric acid(36%)*	VG	F	VG	VG
Lineolic acid*	VG	P	F	G
Linseed oil*	VG	P	F	VG
Maleic acid	VG	VG	VG	VG
Methyl alcohol*	VG	VG	VG	VG
Methylamine	F	F	G	G
Methyl bromide*	G	F	G	F
Methylene chloride* [@]	P	P	P	P
Methyl ethyl ketone [@]	G	G	VG	P
Methyl isobutyl ketone [@]	F	F	VG	P
Methyl methacrylate [@]	G	G	VG	F

CHEMICAL	NEOPRENE	LATEX RUBBER	BUTYL	NITRILE
Monoethanol amine	VG	G	VG	VG
Naphthalene*	G	F	F	G
Napthas, aliphatic*	VG	F	F	VG
Napthas, aromatic*	G	P	P	G
Nitric acid [@]	G	F	F	F
Nitromethane (95.5%)	F	P	F	F
Nitropropane (95.5%)	F	P	F	F
Octyl alcohol	VG	VG	VG	VG
Oxalic acid*	VG	VG	VG	VG
Palmitic acid*	VG	VG	VG	VG
Perchloric acid (60%)	VG	F	G	G
Perchloroethylene*	F	P	P	G
Petrol*	G	P	F	VG
Phenols (class) ^{*@}	VG	F	G	F
Phosphoric acid*	VG	G	VG	VG
Potassium hydroxide	VG	VG	VG	VG
Propyl acetate	G	F	G	F
Propyl alcohol	VG	VG	VG	VG
Sodium hydroxide*	VG	VG	VG	VG
Styrene	P	P	P	F
Sulfuric acid*	G	G	G	G
Tannic acid(65%)	VG	VG	VG	VG
Tetrahydrofuran* (THF)	P	F	F	F
Toluene ^{*@}	F	P	P	F
Toluene diisocyanate	F	G	G	F
Trichloroethylene*	F	F	P	G
Triethanolamine(85%)	VG	G	G	VG
Turpentine*	G	F	F	VG
Xylene ^{*@}	P	P	P	F

Table 32. Chemical resistance of various materials used in chemical resistant gloves. Use this table for recommendation for accidental or infrequent contact only. (*) : Indicates that swm workers may come into accidental contact with this chemical while sorting incorrectly disposed waste from industries. vg, g, f, and p, respectively mean very good, good, fair, and poor resistance. F is the minimum recommendation. (@) : The chemical will degrade commonly-used type ww nitrile-rubber gloves.

Safe storage of cleaning chemicals

Objectives

- Know how to store chemicals that are used in housekeeping and janitorial jobs.

Notes

- The scope of this activity is limited to the safe storage of cleaning chemicals. It does not address extremely important storage criteria for other kinds of chemicals.
- Do not demonstrate the chemical experiment in EXERCISE 19 → [266] if you are unsure about the safety of the participants—the workshop room must be properly ventilated; you should perform the experiment at home, in a well-ventilated room, to know what to expect when the chemical reaction occur; instead, show the video of the experiment being performed.
- The exercises in this activity require participants to know the following: Identification of chemical hazards associated with different kinds of cleaning chemicals, GHS chemical hazard classification, hazard communication (know how to read an SDS and so on), and selection of appropriate PPE for regular handling large quantities of cleaning chemicals. Therefore, this activity should be initiated only after the following activities: ④ HOUSEKEEPING AND CHEMICALS → [169], ④ ③ HAZARD CLASSIFICATION SYSTEMS → [198], ④ ⑤ CHEMICAL HAZARDS: PPE STANDARDS → [257], and ⑤ RESPIRATORS → [274].

Workshop programme

- Skip this activity if participants do not store or use cleaning products at work.
- This activity should be included only in workshops with purchasers, and workers in charge of health and safety in companies that provide janitorial or housekeeping services.
- This activity should be considered as a part of a group of three activities, the other two being ⑤ RESPIRATORS → [274], and IV ④ EXPOSURE TO CHEMICALS → [387]. If one of these activities is relevant to participants, the other two activities will also be useful.
- Start with EXERCISE 19. If you decide to skip the live demonstration of the chemical reaction in the exercise, begin at STEP 6 of the exercise; continue with the rest of the exercises in order.

EXERCISE 19: HAZARDS OF MIXING INCOMPATIBLE CLEANING PRODUCTS

Objective

- Realise the severity of hazards associate with improper storage of chemicals.

Slides

- [S]1 : News clip of worker who died from exposure to chlorine.
- [S]2 : Incompatible cleaning products. (See TABLE 33→[268].)

You will need

- A few disposable plastic teaspoons; a pair of disposable nitrile gloves; a bucket of water.
- 5mL (1 teaspoon) of 10% hydrochloric acid solution from a toilet cleaner.
- 20mL of distilled water¹.
- ¼ of a teaspoon of sodium hypochlorite bleaching powder.
- One glass test-tube.

Steps

1. Open all doors and windows in the room; switch on all fans. Wear gloves. Ensure that all participants are at least 2 metres away from you.
2. Prepare a 25mL solution of the cleaner:
 - Pour four teaspoons of distilled water into the test tube.
 - Pour one teaspoon on acidic cleaner into the test tube. Do not reverse the steps; as a general rule, always add acid to water, even though (in this case) the volume and concentration of the cleaner are not high enough to cause a violent reaction.
 - Stir the solution with the long-end of a clean plastic spoon.
3. Ask the participants to watch carefully since the next step will terminated in five seconds.
4. Pour ¼ of a teaspoon of bleaching powder into the test tube. The compounds react immediately; a fuming, yellow-green foam is formed. This is chlorine gas.
5. Allow the test tube to foam for 2-3 seconds—just long enough for participants to see the reaction—and immerse the test tube into the bucket of water.
6. Display [S]1. Discuss the hazard.
7. Play the video² that shows the reaction with 36% hydrochloric acid and bleaching powder.

Notes

- The chemical reaction produces a small quantity of chlorine gas. It can cause injury if the procedure and safety-requirements are ignored. Do not exceed the quantities of reagents described above. If in doubt, skip the live demonstration and begin the exercise at STEP 6.

1 Distilled water may be bought at any automobile garage or shop that repairs lead-acid batteries.

2 See @ y37cwy4. Play the video with sound turned down since it has a loud music track.

adly-accidental-mix-acid-bleach-blamed-buffalo-wild-wings-manager-n1078866

Deadly mix of acid and bleach blamed for Buffalo Wild Wings death

By David K. Li

4-5 minutes

An accidental mix of cleaners — acid and bleach — generated toxic fumes that killed the manager of a Buffalo Wild Wings in Massachusetts, authorities said Friday.

The eatery's 32-year-old manager, Ryan Baldera, was killed and 13 others were taken to the hospital, according to the Fire Department in Burlington, Massachusetts, a Boston suburb.

The accident occurred shortly after 5:30 p.m. Thursday when a worker began cleaning the kitchen floor just before the dinner rush, Burlington Fire Chief Michael Patterson told NBC News on Friday.

But that employee did not know that an acid-based cleaner, Scale Kleen, had been spilled on the floor earlier, Patterson said. So when the worker used chlorine- and bleached-based Super 8 on the floor, the mixture turned green and started to bubble, Patterson added.

After that worker fled the kitchen with burning eyes and breathing issues, the manager grabbed a squeegee and tried to push the bubbling green concoction out of the restaurant and into an outdoor drain before he was unable to continue, according to the chief.

"He was quickly overcome ... and the squeegeeing led him to a severe medical condition," Patterson said.

Image 100. NBC news report (see @y4a723ew for the entire report) about a worker who died when two incompatible consumer-grade cleaning chemicals were accidentally mixed. Both chemicals are used by millions of people everyday; they are safe to use if appropriate precautions are taken during storage and handling.



Image 101. The reaction between an acidic toilet cleaner and a hypochlorite bleaching powder releases chlorine gas.

§ DISCUSSION

Discuss the following rules:

CLEANING PRODUCTS MUST NEVER BE MIXED. If protocols require the use of disinfectants, then the surface should be cleaned, allowed to dry (or wiped dry) and then disinfected with an appropriate disinfectant. Not all chemical reactions will cause acute symptoms. Chronic exposure to small quantities of, say, chlorine gas, can result in irreversible damage to the lungs.

CHEMICAL 1	CHEMICAL 2	HAZARD
Toilet cleaner with hydrochloric acid (or any strong acid.)	Chlorine bleach (powder or liquid.)	Chlorine gas. Severe irritant that can be highly toxic in poorly ventilated spaces.
Toilet cleaner (or any product with a strong acid).	Drain cleaner (or any product with sodium hydroxide.)	Heat and steam, and acid or alkali splashes, which can cause severe skin burns.
Ammonia-based cleaner.	Chlorine bleach.	Chloramine gas. Severe irritant that can be highly toxic in poorly ventilated spaces.
Acetone or isopropyl alcohol.	Chlorine bleach.	Chloroform. Sedative. Can cause drowsiness and loss of consciousness in poorly ventilated spaces.
Peroxide bleach.	Chlorine bleach.	Violent reaction that can cause burns.

Table 33. Cleaning chemicals that should not be mixed. Worst-case hazards.

$$\text{HAZARD} \times \text{EXPOSURE} = \text{RISK}.$$

Janitorial staff work all day with cleaning products; reducing their daily exposure by 10% will reduce the risk by 10%; In day-to-day work, the extra effort taken to reduce exposure to cleaning products from 1 hour to 45 minutes might seem excessive (especially to workers) but it reduces their risk by 25%. Further, the correlation between exposure and risk is not strictly linear and, in many cases, if daily exposure to a hazard is kept at or below a chemical's Permissible Exposure Limit then the chronic risk decreases sharply.

Keep in mind that we are discussing cleaning chemicals and not radioactive waste! The proper perspective is essential—chronic exposure to the kinds of cleaning products used by housekeepers and janitorial staff have an associated risk, which can be calculated simply because they are used, everyday, by millions of people around the world. Ignoring the risk would be foolish; exaggerating the risk would also be foolish.

As a general rule chemical solvents must be used only when absolutely necessary (display TABLE 19→[182]).

PREMIXING SHOULD ONLY BE DONE BY TRAINED PERSONNEL. Cleaning products bought in bulk or as concentrates should be mixed or diluted and dispensed into clearly labelled containers for use by housekeeping staff.



EXERCISE 20: STORAGE OF CLEANING PRODUCTS

Objective

- Know how to store small quantities (<50L) of toxic or flammable cleaning chemicals.
- Know how to store large quantities (≤500L) of cleaning chemicals.

Notes

- Storage protocols for up to 500L or 500kg of cleaning products are discussed in this exercise; larger quantities will require additional protocols that are beyond the scope of this handbook. The exercise assumes that one room is available for use as a store for cleaning products.
- The priority is to understand safe storage principles instead of specific implementations.

Steps

1. Display [S]1 and explain how to use a flame-resistant cabinet for flammable or toxic cleaning products.
2. Display [S]2 and [S]3 and discuss the advantages and disadvantages of the two options shown for bulk storage.

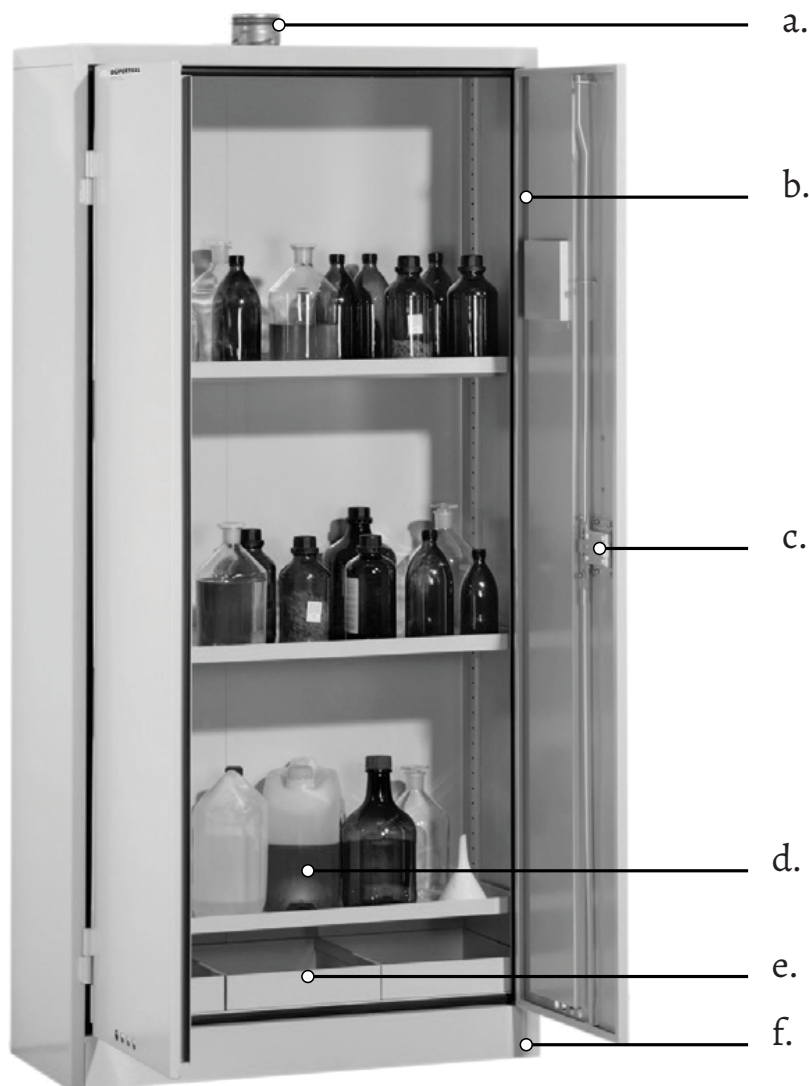
Slides

- [S]1 : Storage of toxic or flammable cleaning products.
- [S]2 : Option 2 for bulk-storage of cleaning products.
- [S]3 : Option 3 for bulk-storage of cleaning products.

DISCUSSION

Flammables and toxic cleaning products include all kinds of petroleum-derived solvents, such as white spirits and naphtha, and all sorts of organic solvents, such as ketones, halogenated aromatic compounds, ethers, etc. Solvents are not required in large quantities, and a month's supply of different solvents may easily be stored in a 2m tall cabinet¹. These cabinets should be bought from a reputed manufacturer—never use general-purpose metal cabinets for the storage of toxic or flammable cleaning products. The cabinet may be stored in the a storage room with other cleaning products as long as the room meets the requirements laid down in 1S3594. The entire volume of air inside the room must be replaced at least 6 times in a hour; it must have a fire-suppression system (sprinklers, fire extinguishers, etc.)

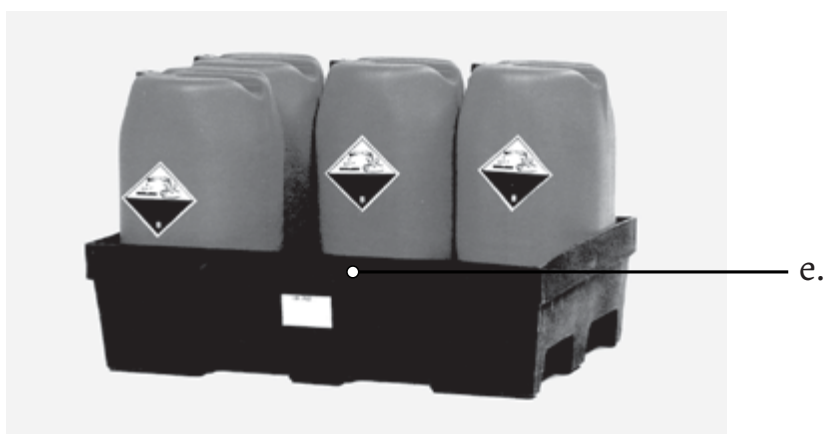
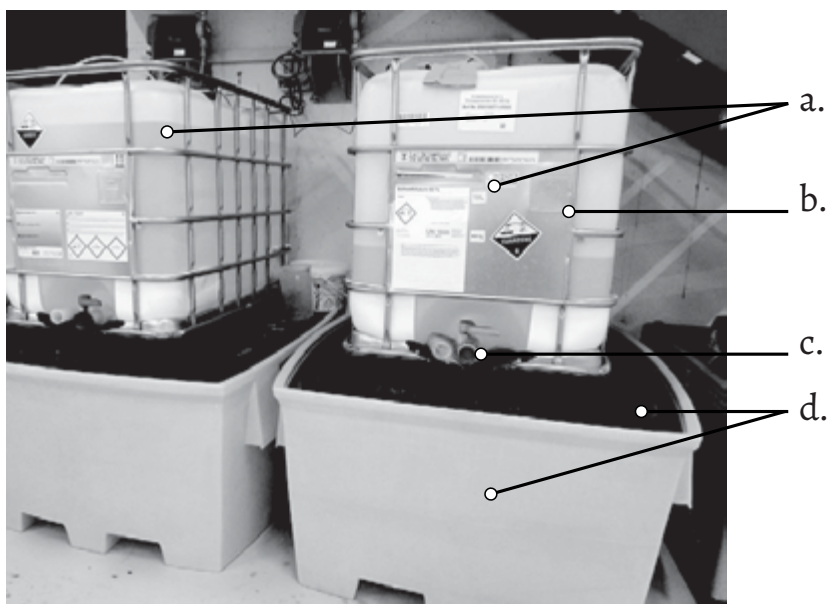
¹ OSHA standards for fire-resistant cabinets: @y2krjp83; EN14470-1 standard:@ yxfyw2sq; Indian standards for storage rooms 1S3594: @y3lgmpvz and @y4b3x5c5. Also see ⑧ ⑩ OTHER SAFETY PROCEDURES → [320].



Storage of flammable and/or toxic solvents.

- (a.) Ventilation duct; (b.) Flame-resistant doors and walls; (c.) Lock;
(d.) Large volumes stored on lowest shelf, the highest shelf is at eye-level;
(e.) Spill-retention containers at the bottom, with the capacity to store at least the entire contents of the largest container in the cabinet;
(f.) Cabinet is raised from the floor.

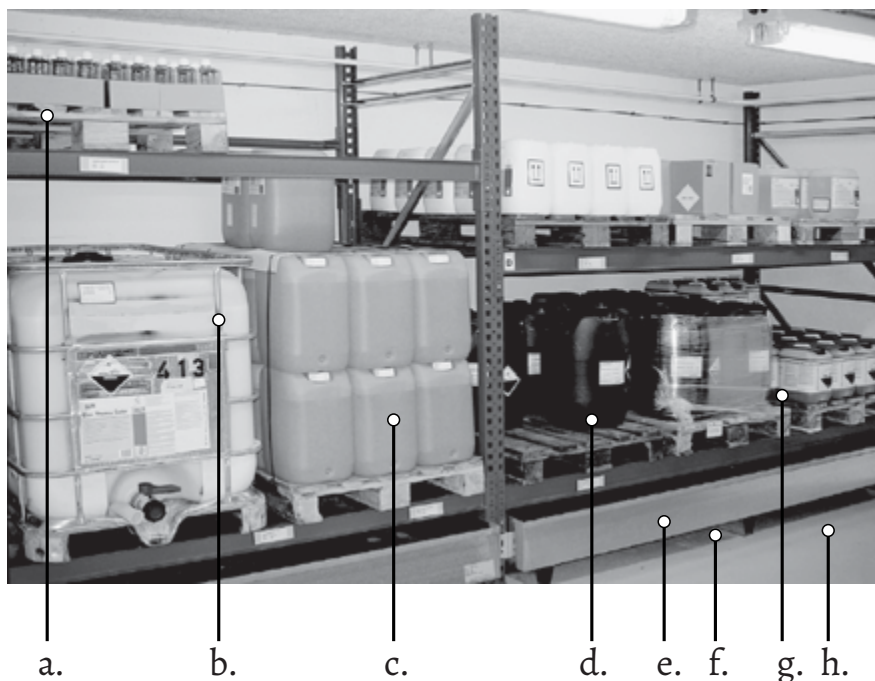
(Photo credit: Growag Feuerwehrtechnik AG, from Swiss Safety Centre (Government agency). 2018. Storage of Hazardous Materials: Guideline for Practice.)



Segregated bulk-pack storage.

(a.) Different classes of chemicals stored separately; (b.) metal guards; (c.) taps; (d.) Double spill-retention containers with the capacity to store at least the entire contents of the largest container; (e.) Spill-retention container

(Photo credits: (top) Environment Office, Canton TG. (bottom) Environment Office, Canton SO, from Swiss Safety Centre (Government agency). 2018. Storage of Hazardous Materials: Guideline for Practice.)



Combined bulk-pack storage.

(a.) Small containers on the top shelf, reachable without a ladder; large containers on the the bottom shelf. (b.) metal guards for high-volume containers with corrosive liquids; high volume container is equipped with a tap. (c.) non-hazardous liquids may be stored in jerry-can style containers. (d.) Incompatible cleaning products stored on different shelf with a separate spill-retention container. (e.) Spill-retention container with the capacity to store at least the entire contents of the largest container or 10% of the entire volume stored above it, whichever is larger. (f.) Adequate space below the container allows workers to check for leaks and mop up spills. (g.) solids are always stored on lower shelf. (h.) epoxy floor to prevent seepage in case of accidental spills; epoxy paint may be applied to cured concrete floors; apart from being impervious to most corrosive cleaning products, it is chemically stable, easy to clean, and can be applied with a slip-resistant finish.

General rules: flammable and toxic cleaning products are stored in a locked flame-resistant cabinet; the room has adequate numbers of fire-extinguishers or an appropriate fire-suppression; the room is well-ventilated.

(Photo credits: Environment Office, Canton TG., from Swiss Safety Centre (Government agency). 2018. Storage of Hazardous Materials: Guideline for Practice.)

ACTIVITY 5

Respirators

Objective

-
- Know about the different kinds of Respiratory Protection Equipment (RPE).
- Know how to select appropriate RPE for a job.
- Know how to check RPE for correct fit.
- Know how to maintain RPE in good working order..

Notes

- Respiratory Protection Equipment (RPE) should not be confused with surgical masks that are used by doctors. A surgical mask is a medical device covering the mouth and nose ensuring a barrier to limit the transmission of an infectious agent between the caregiver and the patient. Do not recommend the use of surgical masks for SWM jobs for any reason apart from precautionary protection from airborne pathogens.

Steps

- Begin with EXERCISE 21 → [281]. Discuss the jobs for which a disposable FFP-style mask is appropriate.
- Initiate a discussion using the P2P method for jobs that require participants to handle chemicals or expose them to severe airborne particulate or biological hazards. WORKSHOP PROGRAMME (below) contains guidelines for the agenda—what material to include depending upon the participants' jobs.

Workshop Programme

- EXERCISE 21 → [281] should be included in all workshop programmes. For non-technical participants doing waste-collection and processing jobs, a demonstration of the basic principles of respiratory protection—how to wear and remove an FFP-style respirator, and how to perform a User Seal Check—should be adequate.
- The procedure for checking proper fit for a reusable respirator with disposable cartridges is described in CHECKING RPE FOR PROPER FIT → [286]; a checklist for their maintenance is described in MAINTENANCE OF RESPIRATORY PROTECTION EQUIPMENT → [288]; the recommended cleaning procedure is described in CLEANING RPE → [292].
- For participants who handle chemicals, describe all the hazards → [275], then discuss the specific hazard(s) that they face. Use the P2P method to find solutions. Give each participant a printed copy of IMAGE 104 → [282], and the Respirator Selection Chart (IMAGE 105 → [283]).
- For participants who handle cleaning chemicals regularly, this activity should be considered as a part of a group of three activities, the other two being ④① SAFE STORAGE OF CLEANING CHEMICALS → [265], and IV④ EXPOSURE TO CHEMICALS → [387]. If one of these activities is relevant, all three should be included.



Image 102. Options for respiratory protection. (From left) Disposable FFP-style mask rated N95 with a fibre filter; washable mask with fibre filter cartridge rated EN149-FFP2 and an exhalation valve; half-face respirator with replaceable cartridges.

INTRODUCTION

A worker's exposure to most workplace hazards is accidental, e.g., exposure to mechanical hazards, such as falling objects, is intermittent and hard-hats are worn to prevent injury in case a worker happens to be standing in the trajectory of a falling brick; Respiratory Protection Equipment (RPE), on the other hand, protects workers from exposure to a hazard that is known to be present *all the time*; if the air is contaminated, then a worker without appropriate RPE is constantly exposed to the hazard.

§ AIRBORNE HAZARDS

Airborne hazards may be categorised as follows:

DUSTS. Particles that are formed or generated from solid organic or inorganic materials by reducing their size through mechanical processes such as crushing, grinding, and chipping.

FUMES. Particles formed when a volatilized solid, such as a metal, condenses in cool air. This physical change is often accompanied by a chemical reaction, such as oxidation. A fume can also be formed when a material such as magnesium or zinc is burned during gas cutting of galvanized steel. Exposure to fumes is rare in SWM jobs; workers in the ship-breaking industry are exposed to iron oxide fumes from gas-cutters. (Also see EYE PROTECTION. → [306].)

MISTS. A mist is formed when a finely divided liquid is suspended in the air. These suspended droplets can be generated by condensation from the gaseous to the liquid state or by breaking up a liquid into a dispersed state, such as by splashing or atomizing, i.e., with the use of devices like sprayers. Typical examples are acid or alkali mists created during various cleaning operations.

GASES. Airborne hazards which are encountered *primarily* as gases, and not liquids or mists, include acetylene, carbon monoxide, and hydrogen sulphide.

VAPOURS. Vapours are the gaseous form of substances that are normally in the solid or liquid state at room temperature and pressure. They are formed by evaporation from a liquid or solid. Commonly encountered examples include solvent vapours and ammonia.

SMOKE. Smoke consists of carbon or soot particles resulting from the incomplete combustion of fuels, such as coal or oil. Smoke generally contains droplets of oils and water as well as dry particles of carbon and ash.

OXYGEN DEFICIENCY. An oxygen-deficient atmosphere has, by definition, an oxygen content below 19.5% by volume. Oxygen deficiency may occur in confined spaces, which include, but are not limited to, storage tanks, process vessels, towers, drums, tank cars, bins, sewers, septic tanks, underground utility tunnels, manholes, and pits.

§ RESPIRATORY PROTECTION EQUIPMENT

Respiratory Protection Equipment have two principal components: a mask that serves as a barrier between the ambient air and the user, and a source of clean air, which could be a filter that purifies ambient air, or an air-line or tank that supplies clean air. RPE is usually classified based on whether it is powered or not:

NON-POWERED AIR-PURIFYING RESPIRATORS: This category includes:

1. Filtering face pieces (FFP, commonly called ‘disposable masks’ in which the filtering material is an integral, inseparable part of the mask. Masks that are commonly called ‘N95 masks’ are FFP-style masks.).
2. Half masks or full-face masks with replaceable filters.

POWERED AIR-PURIFYING RESPIRATORS: A powered air-purifying respirator (PAPR) uses a blower to force air through a cartridge or filter. PAPR respirators are more comfortable since they do *not* require a tight-fit—the blower creates a positive pressure of clean air inside the mask that can escape from the sides of the mask. PAPR systems may consist of full or half masks with attached filters, or they may have helmets and hoods connected by an air-hose to a powered filter attached to the waist.

RESPIRATORS WITH AN INDEPENDENT AIR-SUPPLY: These are used in environments in which the oxygen concentration is less than 19%; they provide uncontaminated air from an independent source such as an air-line or an air-tank.¹

A more straightforward classification of RPE based on the physical state of the hazard (from which it protects the user) is used in the handbook since it is easier to explain and is better suited to hazards commonly found in most SWM jobs:

PARTICULATE-REMOVING RESPIRATORS are designed to reduce inhaled concentrations of nuisance-dusts, fumes, mists, toxic dusts, or any combination of these substances, by

¹ Specialist jobs, such as the cleaning of sewage tanks, pipes, and biogas digesters, require the use of breathing apparatuses. They are also recommended for jobs that require workers to spend extended periods in confined spaces, especially those from which a quick exit (or rescue) is not possible. Skip the section on breathing apparatuses if the participants do not perform such jobs.

filtering most of them from the inhaled air. Particle filters do not protect against gas or vapour. These respirators may be either non-powered or powered.

VAPOUR- AND GAS-REMOVING RESPIRATORS are packed with sorbent² elements that adsorb or absorb vapours or gases from contaminated air before they can enter the breathing zone of the worker. A catalyst may be used to accelerate the sorption of the contaminant. The most widely used material for removing gases and vapours is activated carbon. Vapour- and gas-removing cartridges do not protect against particulates.

COMBINATION CARTRIDGES are available to protect against particulates, as well as vapours and gases. These too may be powered or non-powered.

§ STANDARDS FOR RESPIRATORY PROTECTION EQUIPMENT

Various standards define requirements for the important components of RPE—the mask and the filter—are listed below:

Standards for respirators and filters

FFP stands for ‘filtering face piece’ and refers to a ‘half mask’ made entirely of the filter material or a face piece in which the main filter can be detached from the face piece. The EN 149:2001+Ar:2009 standard classifies particulate-filtering half masks as FFP1, FFP2 and FFP3. The suffixes 1, 2, and 3 indicate filtration efficiency in ascending order; other suffixes may be used: NR (not reusable), R (reusable), D (anti-clogging), V (fitted with one or more valves), and L (suitable for liquid paraffin mist). The level of protection offered by different FFP-style masks are shown in TABLE 34→[278]. Indian Standard IS:9473 uses the same classification system that is used in EN149.

EN 143 specifies requirement for particulate filters (usually replaceable filters or cartridges) that are used in RPE. Particulate filters are classified P1, P2, and P3 in ascending order of filtration efficiency. The level of protection offered by different P-type particulate filters are shown in TABLE 34→[278].

EN 14387 specifies requirements for gas filters and combination gas+particulate filters. TABLE 36→[281] lists the different filters defined by this standard. Cartridges are also rated in increasing order of their useful life as Class 1, 2, 3 (column 4 in TABLE 36), e.g., a brown-coloured filter marked A2 is a medium-capacity filter for organic gases and vapours. NIOSH classification of particle filters is better known. Particulate filters are classified as N, P, or R depending upon the presence of oil mists in the air. Suffixes 95, 99, and 100 indicate the percentage of particulate matter that the filter will block—an N95 filter will block 95% of all particulate matter (larger than 2.5µm in diameter), it is not resistant

² Adsorption is the process by which a solid holds molecules of a gas or liquid or solute as a thin film. The adsorbed particles adhere, physically, only to the surface of the sorbent; absorption, on the other hand, is the accumulation of particles inside the sorbent and are held there chemically. Activated charcoal is the most common adsorbent and it is used primarily to remove organic vapours, although it does have some capacity for adsorbing acid gases. Activated charcoal also can be impregnated with other substances to make it selective against specific gases and vapours, e.g., it is impregnated with iodine to remove mercury vapour, with metallic oxides to remove acid gases, and with salts of metals to remove ammonia gas. Other sorbents that could be used in vapour- and gas-removing respirators include molecular sieves, activated alumina, and silica gel.

to oil; an R filter is Resistant to oil; a P filter is oil-Proof. Colour coding of cartridges is specified in ANSI Z88.7 (2010). The protection offered by an N95 mask is approximately the same as an FFP-2 class mask.

EN371 and EN 372 define requirements for filters designed for specific kinds of low-boiling organic compounds (AX filters) and specifically named compounds (SX filters).

Other standards

EN 140 defines requirements for half-masks and quarter masks (not the filter, but the mask itself). EN 136 defines requirements for full face masks.

CLASS	FILTER TYPE	FILTER PENETRATION LIMIT (FPL) (AT 95 L/MIN AIR FLOW)	INWARD LEAKAGE	ELASTIC BAND [#]
FFP1	Mask	≥ 80% of airborne particles	< 2%	Yellow
FFP2		≥ 94% of airborne particles	< 8%	Blue or White
FFP3		≥ 99% of airborne particles	< 2%	Red
P1	Attachment	≥ 80% of airborne particles	n/a	n/a
P2		≥ 94% of airborne particles	n/a	n/a
P3		≥ 99.95% of airborne particles	n/a	n/a
N95*	Mask	≥ 95% of airborne particles		
N99		≥ 99% of airborne particles		
N100		≥ 99.97% of airborne particles		


Table 34. Filtering efficiency of different classes of particulate filters. *Filtering efficiency of NIOSH N-, P-, and R-class filters are the same. # FFP-rated masks may be distinguished from the colour of the elastic band used. This feature is not standardized. Always check the SDS of the mask to determine the FPL.

§ SELECTING APPROPRIATE RPE

Respiratory Protection Equipment is uncomfortable to wear in hot and humid weather; it may interfere with work, and it makes verbal communication difficult. Only select and use RPE when a hazard remains *after* having implemented suitable engineering controls or for short-term or infrequent exposure.

Selection procedure

STEP 1. Identify the physical state of the hazard. Hazardous substances can be present in the air as particles (both solid or finely-dispersed liquid droplets), vapour and gas. If the hazard is a gas or a vapour, then an appropriate gas cartridge is required; if the hazard is a solid (including smoke), or a mist or fume, then an appropriate particulate filter is required; combinations of both hazards (which is possible in certain jobs, such as spraying solvents), call for a combination cartridge.

 **STEP 2.** (This is the recommended procedure. For a simpler, less-rigorous procedure that is suitable for most SWM jobs, skip this step and go to STEP 3.) Determine the level of protection required. The protection factor for RPE is defined as the ratio of the concentra-

tion of the airborne hazard outside the facepiece to its concentration inside the facepiece. A protection factor of 1 indicates that the RPE that allows a contaminant to readily enter and offers no protection to the wearer. A protection factor of 100 represents indicates that the RPE allows 1% or less of the contaminants to enter. However, the actual protection also depends upon the fit of the facepiece (which can change when the user moves, or sweats), the concentration of the airborne contaminant, the nature of the job (light sorting work vs. strenuous labour), and the condition of the RPE, i.e., whether its seals and other perishable parts have been replaced regularly, and so on; the subject of determining the protection factor of RPE is beyond the scope of the handbook (see @y6jc4de4 and @y6ow26oa).

TYPE OF RESPIRATOR	FFP- STYLE	HALF MASK	FULL FACE PIECE	HELMET, HOOD	LOOSE-FIT- TING FACEPIECE
1. Air-Purifying Respirator	5	10	50		
2. Powered Air-Purifying Respirator	n/a	50	1,000	25 or 1,000	25
3. Air-line Respirator					
• Demand mode	n/a	10	50		
• Continuous flow mode	n/a	50	1,000	25 or 1,000	25
• Pressure-demand or other positive-pressure mode	n/a	50	1,000		
4. Self-Contained Breathing Apparatus (SCBA)					
• Demand mode	n/a	10	50	50	
• Pressure-demand or other positive-pressure mode (e.g., open/closed circuit)	n/a	n/a	10,000	10,000	

Table 35. Assigned Protection Factors of different respirators.

The recommended procedure is to select RPE based on its Assigned Protection Factor (APF) as shown in TABLE 35, [279]. The Assigned Protection Factor (APF) of a respirator or class of respirators is the respiratory protection that it is expected to provide to users *at their workplace*; APF is calculated on the assumption that the employer implements a continuing, effective respiratory protection programme that includes regular fit-testing and training for workers and a maintenance programme for RPE to keep them in optimal working condition. There are only a few APF ratings used, so RPE will be rated either 4, 10, 20, 40, 200, or 2000. Check the SDS of the airborne hazard for the recommended safe limit of exposure to it. The exposure limit is normally the OSHA Permissible Exposure Limit (PEL), the American Conference of Governmental Industrial Hygienists TLV, or the NIOSH Recommended Exposure Limit (REL). This information may also be looked up online or in the NIOSH *Pocket Guide to Chemical Hazards*.³

APF calculations assume that the mask fits properly in actual work-conditions; it cannot practically account for factors such as movement of the head while working, sweat, humidity, and other factors that may disturb or break the seal between the mask and the face.

3 The book may be downloaded here: @y77w5h3p. It is also available as an app for mobile devices.

STEP 3. Select RPE depending upon the SWM job.

Selecting a disposable FFP-style mask for sorting jobs

N95 masks (or FFP 2 masks) are appropriate for tasks, such as sorting and segregation of dry waste and housekeeping and janitorial jobs. The series (N) and rating (95) is a pragmatic balance between comfort and protection. N99 masks offer higher protection at the expense of comfort. Regardless of series or rating, masks must be properly fitted to be effective—the procedure to wear a disposable FFP-style mask is shown in IMAGE 104. Perfect fit is



Image 103. Appropriate respiratory and eye protection when cleaning floors—cheap FFP mask, TYPE WW dish-washing gloves and shoes. IMAGE 106 shows the same worker (notice that the background is identical) diluting the concentrated disinfectant solution prior to cleaning. ♻️

essential. N95 masks should not be used when excessively soiled with dirt and sweat which, in the case of sorting jobs, usually happens in a day or two. Do not wash and reuse disposable masks. These masks are made from non-woven fabrics which release lint. These fine strands of fibre can irritate the nose. Recommended usage is 8 hours or until the filter becomes moist, whichever is earlier. Some disposable masks are fitted with an exhalation valve. Stuffiness is reduced by valves, which vent humid exhaled air outside the mask. The optimal location of exhalation valves is just under and a little to the side of the nostrils on either side of the face. Masks with valves are more expensive and more comfortable. A washable, waterproof mask fitted with an exhalation valve and a replaceable filter⁴ should be the first choice, if available at a fair price. Such masks are cheaper to use and maintain because filters are cheap, and the mask itself can be washed everyday with mild detergent and water. These masks often have a rubberised face-seal area, which maintains the seal better than a normal FFP-style mask.

Selecting a respirator for handling chemicals

A half-face respirator (see IMAGE 102 → [275]) or, when necessary, a full-face respirator is needed to work safely in environments that contain hazardous gases or vapours. Methane, ammonia, hydrogen sulphide, and chlorine are the common hazards encountered by SWM workers. The first three may be found in hazardous quantities in biogas plants and sewers; chlorine, is a hazard found in works that process wet-waste into compost, and use bleaching powder (or other chlorine-releasing compounds) to disinfectant the workplace. Workers in house-keeping jobs may require protection from acid gases, chlorine and ammonia, especially if they mix cleaning solutions in-house. (See ④ HOUSEKEEPING AND CHEMICALS → [169] for more information on chlorine and other cleaning chemicals.)

4 ➡ End, any questions about RPE used for specialist work. Skip discussion on cartridges and respirators entirely if participants do not need to use them for the jobs that they do. A detailed list of appropriate cartridges made by 3M® for different hazards is available here: @ty7q7a6.

HAZARD	TYPE	COLOUR	CLASS		
Organic gases and vapours with boiling point >65°C as recommended by the manufacturer	A	Brown	A1	A2	A3
Inorganic gases and vapours, with the exception of carbon monoxide, as recommended by the manufacturer	B	Grey	B1	B2	B3
Sulphur dioxide and other acid gases and vapours as recommended by the manufacturer	E	Yellow	E1	E2	E3
Ammonia and its organic derivatives as recommended by the manufacturer	K	Green	K1	K2	K3
Organic compounds with boiling temperature <65°C as recommended by the manufacturer	AX	Green	AX	–	–
Particular gases specified by the manufacturer	SX	Violet	SX	–	–
Nitric oxide NO (NO ₂)	NO	Blue and white	NO		

Table 36. EN 14387 cartridge types, classes and colour codes.

Use the information in IMAGE 105→[283] to select an appropriate respirator for handling chemicals⁵. The process is described in EXERCISE 22→[286].

EXERCISE 21: HOW TO WEAR A DISPOSABLE FACE MASK

Objective

- Know how to wear an FFP-style mask and perform a User Seal Check.

Equipment required

- Two or more good quality N95 (FFP2 or better) disposable masks without exhalation valves made by a reputable manufacturer (such as 3M).
- Two or more good quality N95 (FFP2 or better) disposable masks with exhalation valves.
- Two or more cheap 'surgical' masks.

Steps

1. Ask a volunteer to join you and demonstrate how to wear a FFP-style mask as shown in IMAGE 104→[282].
2. Ask the volunteer to perform the User Seal Check.
3. Repeat the demonstration with the cheap surgical mask. Discuss the importance of a pliable nose-clip to create a proper seal—cheap masks do not have a nose-clip and cannot be sealed; good quality masks have a pliable, comfortable nose-clip.
4. Ask a second volunteer to join you and then ask the first volunteer to demonstrate the process to her.
5. Demonstrate the correct procedure to remove the mask.
6. Repeat the demonstration with another volunteer using a mask with an exhalation valve.
7. Discuss the advantages and disadvantages of the different kinds of disposable FFP-style masks using the material in→[280] as a guide.

Notes

1. Do not ask volunteers to try on the same mask. Use a new mask for each volunteer; give her the mask at the end of the demonstration.

⁵ Only if participants handle chemicals regularly. If dust and other airborne particles are the principle hazard, initiate EXERCISE 21.

WEARING AN FFP-STYLE DISPOSABLE RESPIRATOR



Position the respirator in your hands with the nose piece at your fingertips.



Cup the respirator in your hand allowing the headbands to hang below your hand. Hold the respirator under your chin with the nosepiece up.



The upper strap (on both single and double-strap models) should rest at the top back of your head. The lower strap is positioned around the neck and below the ears. Do not criss-cross straps.



Place the fingertips of both hands at the top of the metal nose clip (if present). Slide fingertips down both sides of the metal strip to mould the nose area to the shape of your nose.

USER SEAL CHECK PROCEDURE



Place both hands over the respirator, take a quick breath in to check whether the respirator seals tightly to the face.



Place both hands over the respirator and exhale. If you feel leakage, the respirator is not properly sealed.



Re-adjust the straps and the nose-clip until a proper seal is achieved.



If you cannot achieve a proper seal, ask for help or try a different size or model.

REMOVING AN FFP-STYLE DISPOSABLE RESPIRATOR



DO NOT TOUCH the front of the respirator! It may be contaminated. Remove by pulling the lower strap over the back of the head followed by the upper strap. Dispose off the mask and wash your hands.

Image 104. Using an FFP-style disposable respirator. The procedures shown above are recommended by the US-CDC. (Photo credit: CDC. @t5c3wve.)

RECOMMENDED RESPIRATOR











































Contaminant		Color Code on Cartridge/Canister		Disposable Mask		Reusable		Powered		With Air Supply	
Acid gases Chlorine gas Organic vapors (Paints etc.) Ammonia gas Acid gases and ammonia gas Carbon monoxide Acid gases & organic vapours Acid gases, organic vapours, and ammonia P100 P95, P99, R95, R99, R100 N95, N99, or N100			White								
			White with yellow stripe								
			Black								
			Green								
			Green with white stripe								
			Blue								
			Yellow								
			Brown								
			Purple								
			Orange								
		Teal									
HAZARD		TASKS									
Particulates	Low hazard	Grinding, sanding, dusting									
	High hazard	E-waste processing lead, cadmium, etc.									
	Severe hazard	Asbestos removal									
	Welding fumes	E-waste, welding									
	Microbials	Cleaning dry mould, bird droppings									
		Half face Full face									
Gases, Vapours	(1) Organic Vapours	Using solvents or paints, cleaning water tanks									
	(2) Ammonia	Cleaning toilets, biogas tanks, septic tanks									
	(3) Acid gases	Cleaning toilets, diluting cleaning products									
	(4) Chlorine	Cleaning toilets, cleaning water-tanks									
	(5) Carbon monoxide	Working in generator rooms, HVAC rooms, exhaust vents									
	Unknown	(1)-(4) in high concentrations or in confined spaces Unknown concentrations, known severe biohazards.									



Image 106. The worker seen in IMAGE 103 uses a quarter-face respirator with a disposable filter and exhalation valve, and overalls when handling concentrated chemicals. She also wears protective goggles and to protect her face from accidental splashes. ♻

§ RECOMMENDATIONS

1. A disposable N95 (or FFP2-style) mask is adequate for most SWM jobs. While a half-face respirator provides additional protection, the discomfort (caused by heat and humidity while wearing such a filter may force workers to remove it while they work. A properly-fitted, comfortable, FFP-style mask is the practical recommendation.
2. Washable N95 masks in the Indian market are made with inferior materials and methods—poor quality elastic bands, coarse-nylon face-pieces and substandard stitching—and are marketed to penny-pinching contractors. However, a good quality washable mask (if available) is cheaper in the long run and should be preferred.
3. Surgical masks are often distributed to SWM workers by well-meaning but ill-informed NGOs. These are not recommended for use by SWM workers because they allow entry of dust and other fine particles. While surgical masks do offer a little (but not enough) protection from allergens, dust, and airborne pathogens, their use gives a false sense of safety to workers.
4. Gas/vapour cartridges and respirators are not needed for most SWM jobs. If required for the job at hand, a branded (3M or similar) respirator is the recommended long term investment. Such a mask costs around ₹2000 and will last a decade or more if it is adequately maintained (see MAINTENANCE OF RESPIRATORY PROTECTION EQUIPMENT → [288]); the filters may be replaced as and when required.

§ DISPOSABLE MASKS FOR USE DURING EPIDEMICS

The following general guidelines for health workers were issued by WHO during the Covid-19 epidemic of 2020:

1. Place the mask carefully, ensuring it covers the mouth and nose, and tie it securely

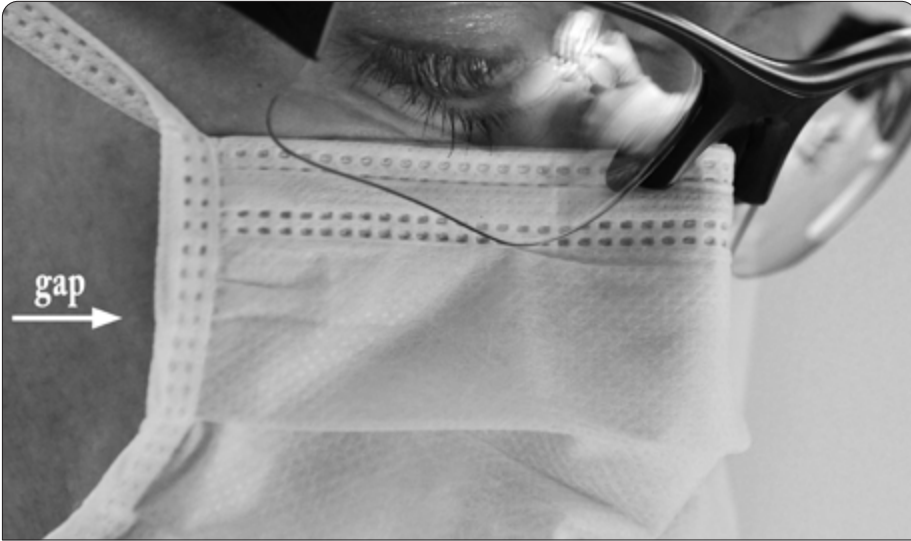


Image 107. Surgical masks are not appropriate for most kinds of SWM work. They give workers a false sense of security. They are appropriate only for jobs that require brief exposure to airborne particulate hazards.

- to minimize any gaps between the face and the mask.
- 2. Avoid touching the mask while wearing it.¹
- 3. Remove the mask using the appropriate technique: do not touch the front of the mask but untie it from behind.
- 4. After removal or whenever a used mask is inadvertently touched, clean hands using an alcohol-based hand rub or soap and water if hands are visibly dirty.
- 5. Replace masks as soon as they become damp with a new clean, dry mask

¹ The correct procedure to wear an N95 mask is shown in IMAGE 104.

EXERCISE 22: CHECKING RPE FOR PROPER FIT

Objective

- Establish that protection provided by a respirator depends upon an air-tight seal between it and the face of the user.
- Establish that surgical masks do not offer protection against airborne hazards.

Equipment required

- One essential oil diffuser [These are available online.]
- A dozen or more small, medium and large sizes of an N99 or N100 mask. Bring samples from different brands. If most participants are women the large size might not be required.
- One half-face respirator (small and medium) made by a reputed manufacturer. [3M 6200]
- Two P100 filters that fit the respirator [3M 2091].
- Two N99 (FFP-3) masks.
- Two cheap surgical masks.
- Two test-solutions of sodium saccharin [@y5l7l6gs on Amazon, @y5ccl3g3 on Flipkart] 830mg in 100mL of distilled water for the fit test, and 415mg in 100mL of distilled water for sensitivity test. These may be prepared before the workshop begins and stored in separate, labelled air-tight containers.

Steps

1. Demonstrate how to attach the particulate filter to the mask. Follow the manufacturer's instructions.
1. Ask a volunteer to join you at the front and wear the half-face respirator. Demonstrate how to adjust the length of the straps so that the mask fits comfortably and properly. Remove the mask.
2. Place a few drops of the weaker saccharin solution on the wick of the diffuser. Hold the diffuser approximately 30cm below the volunteer's mouth. Ask her to breathe in through her mouth so that air passes over her tongue. She should be able to 'taste' the saccharin in the air. Ask her to describe the taste to the participants—is it sweet? Is it slightly bitter or metallic.
3. Move the diffuser away. Ask the volunteer to sip some water and rinse her mouth. Then ask her to wear the mask again; she should adjust the straps until she is satisfied that the mask is fitted properly and is comfortable.
4. Place a few drops of the stronger solution on the wick of the diffuser. Hold it below the volunteer's mouth as ask her to breathe in as she did earlier.
5. If the mask is fitted correctly, she should not be able to detect the saccharin in the air.
6. Ask her to move her head from side to side, and up and down; the seal between the volunteers skin and the mask should not be disturbed if the mask is properly fitted. Ask the volunteer to bend over and touch her knees. This should not affect the fit of the mask.
7. Repeat the test with another volunteer, with an FFP-style mask (N99, FFP-2 or better). Discuss the results.
8. Repeat the test yet again with a surgical mask and with a piece of cloth (such as a dupatta) wrapped around the head. Discuss the results.

Notes

- Your assistant should fill the tank of the diffuser with distilled water and pre-heat it.
- The protection offered by non-powered RPE depends on an air-tight seal between the mask and the user's skin. Since people's faces vary significantly in shape and size, it is unlikely that one type or size of an RPE facepiece will fit everyone in the workplace. Inadequate fit will significantly reduce the protection provided to the user and might increase exposure to the hazard since the user assumes that he or she is protected.
- Use N99 or P99 masks for this exercise; do not use N95 masks.



Image 108. Qualitative fit test of a respirator. The tester is holding a bulb filled with an irritant vapour that induces an involuntary cough reflex in the wearer. The use of a diffuser is more convenient even though the test is not precisely repeatable. (Photo credit: Daniel J. Meshel.)

DISCUSSION

There are two types of procedures to check if an RPE fits a user properly.

QUANTITATIVE FIT TESTING requires a laboratory test-chamber and equipment; it provides an objective measure of fit (called the ‘fit factor’).

QUALITATIVE FIT TESTING is a pass/fail test.

The test described in this handbook is adapted from a research paper and is not a substitute for a proper qualitative test; however, it demonstrates the importance of a properly fitted respirator; it also demonstrates that rigid masks with detachable filters offer a consistently higher level of protection than FFP-style masks.

☞ Ask volunteers to evaluate a surgical mask’s efficacy as a suitable means of protecting the user. Ask them to evaluate the efficacy of using a piece of cloth as a mask.

EXERCISE 23: MAINTENANCE OF RESPIRATORY PROTECTION EQUIPMENT

Objective

- Know how to identify the different components in a respirator.
- Know which components must be checked.

Equipment required.

- One half-face respirator. [3M 6200, with a pair of 2091 filters.]
- One used particulate filter.

Steps

1. Ask all participants to form a circle around you.
2. Point out each component of the respirator shown in IMAGE 109 → [289]. Then, go through the checklist below, one by one.
 - Demonstrate how to disassemble the respirator into its sub-assemblies.
 - Check the facepiece for cracks, tears and dirt. Ensure that the face-seal of the facepiece is not distorted.
 - Examine the inhalation valves for signs of distortion, cracking or tearing.
 - Make sure that the head straps are intact, supple and elastic. Examine all plastic parts for signs of cracking or fatigue.
 - Make sure that the filter gaskets are in good condition.
 - Remove the exhalation valve cover and examine the exhalation valve and valve seat for signs of dirt, distortion, cracking or tearing.
 - Demonstrate how to reassemble the respirator.
3. Ask one of the participants to disassemble, then reassemble the respirator.

Notes

- During the exercise, encourage participants to touch the face-seal area and other components, such as gaskets and exhalation valves that need to be supple and flexible to work correctly. They should be able to determine if a valve or face-seal has perished by touching it.
- Initiate EXERCISE 24 → [290] immediately after this exercise.
- Cleaning guidelines for sub-assemblies are described in EXERCISE 25 → [292].

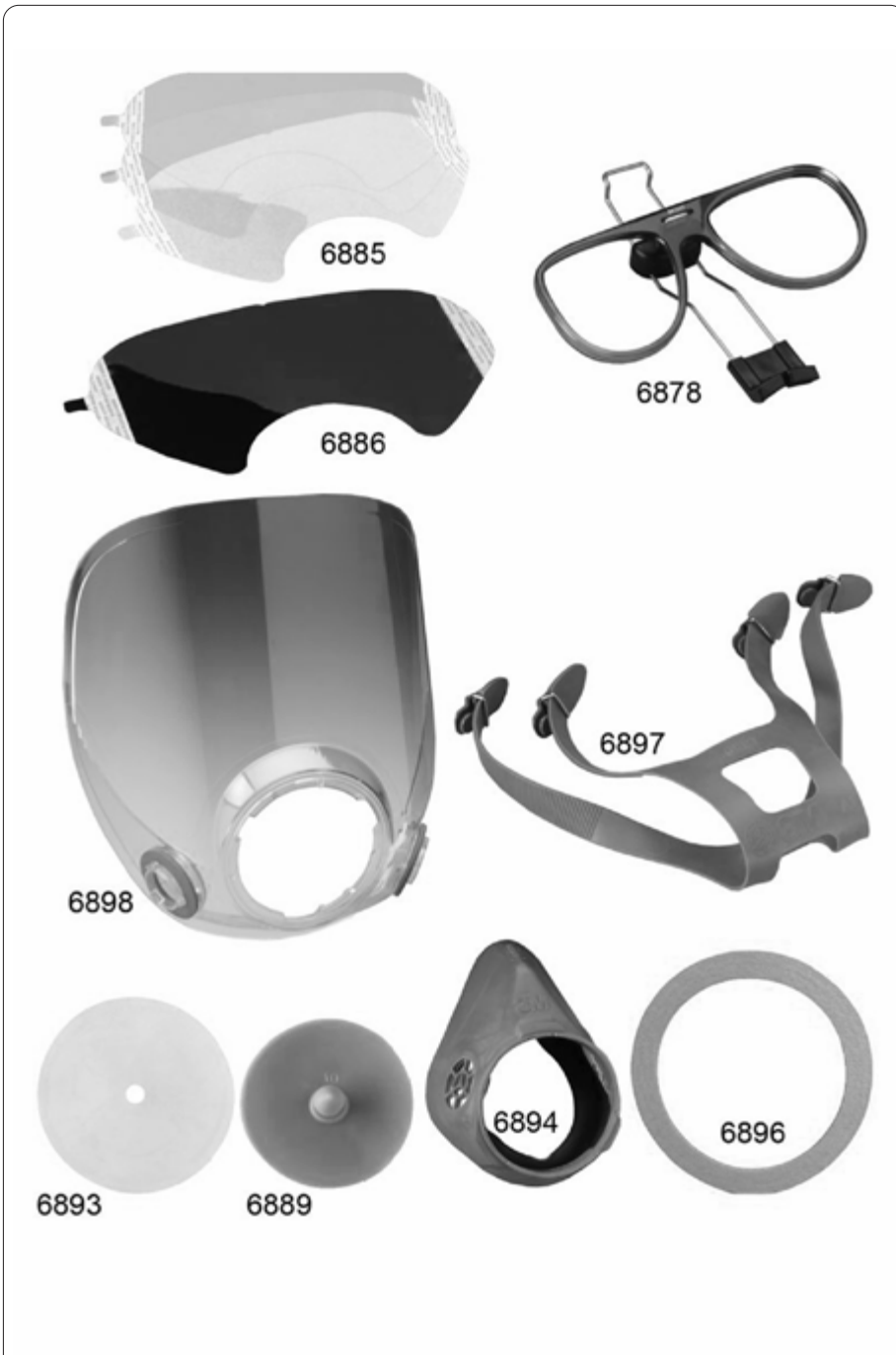


Image 109. Spare parts and part-numbers for a 3M 6000-series respirator. 6885 and 6886 are half-face visors (face-pieces), 6898 is a full-face visor; 6878 is a spectacle-kit; 6897 is the head-harness assembly. This part creates the all-important seal between the user's face and the ambient air; 6893 is the inhalation valve; 6889 is the exhalation valve; 6894 is the nose-cup assembly; 6896 is the centre adapter gasket. All these parts are washable and can be disinfected.

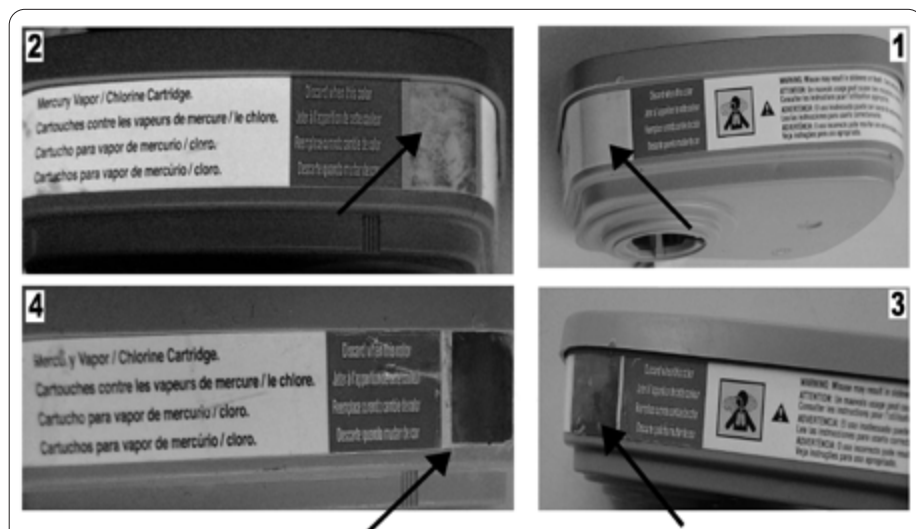


Image 110. End of Service Life Indicators on gas/vapour cartridges. (1) new, unused cartridge, (2) partially spent cartridge, (3) an almost entirely spent cartridge close to the end of its service life, (4) a completely spent cartridge that should be discarded. (Photo credit: Alex Chirkin.)

EXERCISE 24: HOW TO CHANGE FILTERS

Objective

- Know when a filter should be replaced.
- Know how to replace the filters and cartridges on a respirator.

Equipment required.

- One half-face respirator. [3M 6200, with a pair of 2091 filters]
- One spent particulate filter.
- One spent and one new, factory-sealed gas/vapour cartridge.

Steps

1. Explain the general rules: Mark the filter (both gas and particulate filters) visibly with the date it was taken out of the packaging and fitted to the RPE; always change before the marked expiry date or if indicated by the End of Service Life Indicator (ESLI), as shown in IMAGE 110; never use expired filters even if they are factory-sealed; never use filters that appear damaged.
2. Ask participants to inspect the spent particulate filter and compare its appearance to a new filter. Particle filters should be changed as soon as breathing becomes difficult.
3. Chemical cartridges should be changed if the user can smell or 'taste' the airborne hazard—change the cartridge even if the ESLI indicates that the cartridge is not fully spent.¹
4. Ask participants to compare the ESLI of a spent gas/vapour cartridge with that of a new one.
5. Demonstrate how to remove the filter and attach a replacement.

¹ Hot and humid workplaces with airborne hazards require forced ventilation and circulation of ambient air (also see Heat Stress) or the use of powered respirators.

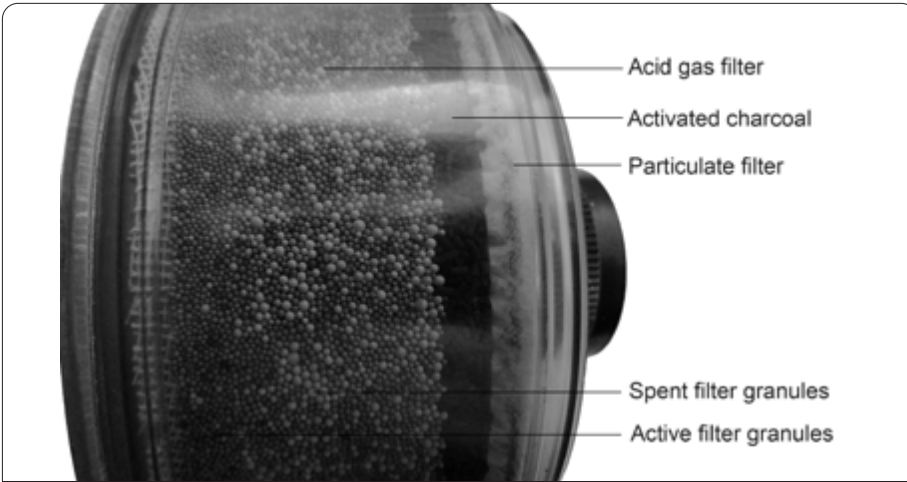


Image III. Acid gas filtering canister. The transparent canister contains adsorbent granules that change colour when they are spent. (Photo credit: Alex Chirkin.)

DISCUSSION

A particulate filter could become clogged within minutes if the air contains large quantities of smoke or dust or if the ambient air is humid; an FFP-style mask may become unusable if it absorbs sweat. In such environments, appropriate engineering controls should be implemented first. An FFP-style mask that is damp, but otherwise clean, may be dried and used. Do not scrub or wash a disposable FFP-style mask.

Gas/vapour filters have a limited holding capacity, so after a time the gas or vapour will pass straight through. This is known as breakthrough. When breakthrough occurs, the RPE offers no protection. The usable life of a filter or cartridge is very difficult to predict because it depends on a large number of factors. Some cartridges have an ELSI (End of Service Life Indicator) mechanism that indicates when a cartridge must be changed.

If an ELSI is not present on the cartridge, it should be replaced according to the following schedule:

FILTER CAPACITY 1: Change at least every two days or as instructed by the manufacturer; but if the filter is used for protection against a carcinogen, respiratory sensitiser, potential carcinogen, any substance or sensitizer that may cause allergy or asthma symptoms or breathing difficulties if inhaled, then change every day, or as instructed by the manufacturer.

FILTER CAPACITY 2: Change at least once a week or as instructed by the manufacturer.

FILTER CAPACITY 3: Change as instructed by the manufacturer.

EXERCISE 25: CLEANING RPE

Objective

- Know how to clean a respirator.

Equipment required

- One half-face respirator. [3M 6200, with a pair of 2091 filters].
- Any mild liquid detergent.
- Dettol or a 5–8% solution of any hypochlorite bleach.
- A transparent bucket, large enough to immerse the respirator.
- A toothbrush with soft nylon bristles.
- Water.

Steps

1. Ask a participant to remove both filters from the mask.
2. Immerse the mask in a warm detergent solution at a temperature not more than 50° c. Do not use cleaners containing lanolin or other oils.
3. Scrub with a soft brush until clean.
4. Disinfect the respirator by soaking the respirator in an appropriate disinfectant, which should be selected depending upon the job being done. A quat-based disinfectant (such as Dettol®, 5mL in 500mL of water) is suitable for jobs not involving bio-medical waste. For jobs involving bio-medical waste, a sodium hypochlorite (10mL of a 5% standard bleach solution in 1L of water) is recommended. Leave the respirator immersed in the disinfectant for 20 minutes.
5. Rinse in fresh water and air dry in a non-contaminated area.

Notes

- If the respirator has been used during a job associated with bio-medical waste, it must be disinfected after use. Disinfection procedures for a specific model of respirator will be described in the SDS for that respirator. STEP 4, described above, should be adequate for the 6200 model described here. However, the worker should wear an N95 (or better) mask and nitrile surgical gloves while cleaning and disinfecting the respirator. The gloves and mask should be discarded after use. The proper technique for handling infected articles is described in PPE FOR HANDLING BIO-MEDICAL WASTE → [335].
 - The cleaned respirator should be stored away from contaminated areas when not in use.
-

Further reading

- CDC. 2010. How to Properly Put on and Take off a Disposable Respirator. See @t5c3wve.
- O'Kelly, Eugenia, Anmol Arora, Charlotte Pearson, James Ward, and P. John Clarkson. 2020. "Performing Qualitative Mask Fit Testing without a Commercial Kit: Fit Testing Which can be Performed at Home and at Work". Disaster Medicine and Public Health Preparedness. 1–12.
- 3M Corporation. Comparison of FFP2, KN95, and N95 and Other Filtering Facepiece Respirator Classes. See @uelfc4u
- HSE, UK. Controlling airborne contaminants at work: A guide to local exhaust ventilation See @yxv8phe9.
- HSE, UK. The dust lamp: A simple tool for observing the presence of airborne particles. See @y5h4wzfd.
- HSE, UK. 2013. Respiratory protective equipment at work. A practical guide. HSG-53. See @y64xmzwm.
- HSE, UK. 2019. Guidance on respiratory protective equipment (RPE) fit testing. See @y2oex3tx.
- NIOSH. 1987. Guide to Industrial Respiratory Protection.
- OSHA. 2009. Assigned Protection Factors for the Revised Respiratory Protection Standard. OSHA 3352-02-2009. See @ydh2cceq.

ACTIVITY 6

Safety shoes and helmets

Objective

- Know how to select appropriate safety shoes.
- Know how to select an appropriate safety helmet.

Slides

- [S]1: Different kinds of safety shoes.
- [S]2: Rated safety helmets, from least expensive to most expensive.
- [S]3: How to read the stamps on the shell of a helmet.

Steps

- Display the different styles of safety shoes available in the market.
- Demonstrate the correct fitting procedure for safety shoes.
- Initiate a discussion on safety shoes using the P2P method.
- Display the different models of safety helmet.
- Demonstrate how to evaluate the quality of a safety helmet.

Notes

- Do not include this activity unless you have an adequate number of shoes to demonstrate the difference between 'correct' and 'incorrect' fit.
- Bring one pair each (sizes 7-10) of SRA-rated safety shoes with an S1P toecap for men for this activity. Encourage participants to try them on for size. Bring a few pairs of cotton running socks. Safety shoes are designed to be worn with thick, comfortable cotton socks. They should not be worn barefoot or with thin socks.
- Bring one pair each (sizes 5-9) of SRA-rated safety shoes for women for this activity. Encourage participants to try them on for size.

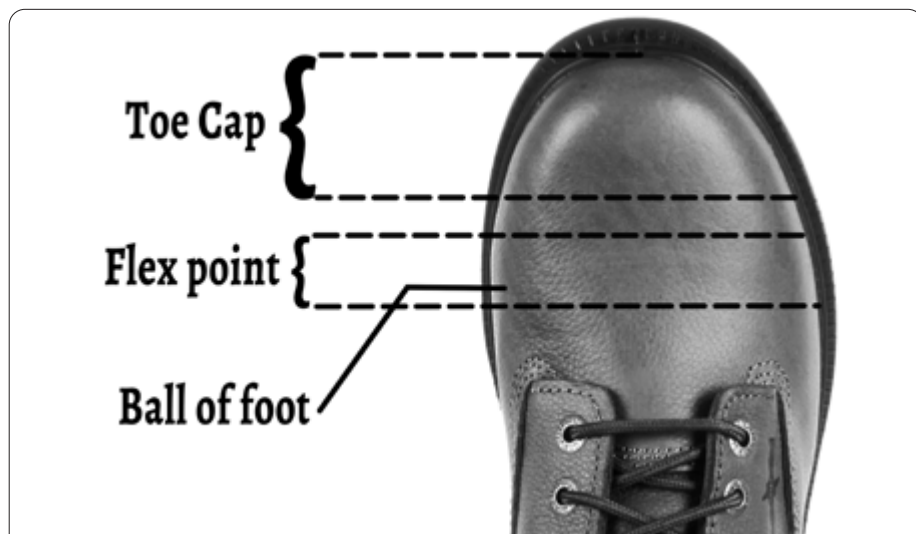


Image 112. Properly fitted safety boots are essential. Poorly fitted boots and shoes are not PPE, they are a safety hazard. The exact location of the flex point in a safety shoe varies. It is a small zone that is roughly 1cm wide. Safety shoes will flex comfortably only along this axis and will feel uncomfortable if the ball of the foot is not aligned correctly to it—the shoe will tend to ‘move’ to the front or back when the user walks.

DISCUSSION

Safety shoes are available in wide variety of styles and sizes. Unfortunately, most SWM workers do not wear safety shoes or boots because the footwear made available to them by their employer rarely fits properly, which makes it almost impossible to walk comfortably in ill-fitting boots.

SWM workers who work with dry waste do not need to use knee-high safety boots. Ankle-length safety shoes which are rated to the specifications that follow are appropriate:

1. Slip resistance of SRA, SRB or SRC (the third is a combined certification to both SRA and SRB).
2. Crush protection of SB (the minimum requirement).
3. Mid-sole penetration rating of S1P (the minimum requirement).
4. Higher safety ratings for these criteria are unnecessary for the average SWM worker working with dry-waste. SWM workers may also ignore other criteria, such as electrical safety.
5. Workers who load and unload wet waste, mixed household waste from garbage lorries and tippers, may require knee-high safety boots depending upon the material handling procedures. Safety codes for footwear are shown in TABLE 37. Slip resistance ratings are not listed in the table since all safety footwear must pass the SRA test.



Image 113. (Slide 1) Safety shoes. (from left) Standard SRA rated safety shoe with S1P toe cap, women's safety shoes SRA+SB, safety boots SRC+S4.

SAFETY FOOTWEAR CODES AND RATINGS.	FOOTWEAR MADE FROM NON-POLYMER MATERIALS.						ALL POLYMER, 100% WATER PROOF.		
RATING	SB	SBP	S1	S1P	S2	S3	SB	S4	S5
200 J TOE CAP IMPACT PROTECTION	•	•	•	•	•	•	•	•	•
CLOSED SEAT REGION (ENCLOSED HEEL)			•	•	•	•		•	•
ENERGY ABSORPTION AT SEAT AREA			•	•	•	•		•	•
ANTISTATIC PROPERTIES (SEE DESCRIPTION)			A	A	A	A		A	•
WATER PENETRATION AND ABSORPTION RESISTANCE					•	•		•	•
PENETRATION RESISTANT MIDSOLE		•		•		•			•
CLEATED OUTSOLE						•			•

Table 37. EN 345 safety footwear codes and rating. •Indicates that the property is tested. Antistatic footwear carries the suffix A , e.g., S3A.

Those working with wet waste in places such as compost or vermicompost plants, biogas plants, landfills, and primary sorting depots of municipal corporations require waterproof knee-high boots certified SRC+S4. They should be kept on site and worn when needed. These must have perfect fit—slips, trips and falls cause more injuries than those caused by penetration or impacts.

👏 How many purchase shoes without trying them for a proper fit? How many have attempted to use gumboots given to you at work? Did they fit properly and comfortably? Do you know anyone who has injured their feet while at work?

§ FITTING GUIDE FOR SAFETY SHOES.

- Safety shoes and boots should always be tried for size while wearing thick socks. Safety shoes and boots are designed to be worn with thick socks. Unlike uncapped leather shoes, safety boots will not stretch out to accommodate your feet. The boot should fit perfectly when new.
- The boot should fit snugly except at the heel, which should be free to move 2.5 cm up and down. If the foot slips or moves inside the boot while walking, it is either too wide or too long.
- Seek optimal protection, not over-protection. Do not use safety boots when safety shoes offer adequate protection.
- The ball of the foot should line up with the broadest part of the boot. This will properly align the flex point of the boot with the toe joints.
- A gap of 3 cm between the toes and the tip of the boot is optimal. A longer gap will not reduce comfort but will reduce the protection afforded by the reinforced toe-cap.
- Arch support is only required if the user has high arches *and* if the orthopaedic arch supports ‘feel’ more comfortable¹. Not all workers with high arches feel comfortable with arch supports; only those who find them comfortable should use them. These are relatively expensive when compared to the price of the boot itself but are worth the investment.

Safety shoes and boots must *always* be worn with thick cotton socks, and never with thin or ‘formal’ socks. Cotton is recommended because it absorbs sweat and grips the insole. Nowadays manufacturers of superior quality safety footwear offer different designs for men and women for any given shoe size, i.e., a size 7 safety shoe of a particular model will have gender-appropriate width, length, cushioning height and weight.² Laxmi is shown wearing SRA-rated shoes in IMAGE 114. They are virtually indistinguishable from ordinary shoes.

In environments with high fire hazards, such as biogas plants, safety shoes with conductive soles (rated s4a) *may* be advisable to prevent accidental sparks caused by static discharge. Recommend these only if you are certain that the fire-hazard is high enough.

☹ What kind of shoes is Laxmi wearing in IMAGE 114? Are they safety shoes?

ISO standards for safety shoes are listed in EN ISO 20345. The most important norms are in EN ISO 12568, which defines requirements for foot and leg protectors, and EN ISO 13287, which defines standards for slip-resistance for conventional safety-shoe out-soles, EN 13832, (1-3), which defines various standards for shoes meant for working with chemicals, and ISO 20345, which defines standards for protective toe-caps.

1 Arch support requirements can be tested as described here: @scmobz3. Dr. Abraham— one of the doctors who contributed content for this manual—demonstrated this procedure at a P2P workshop in Bangalore.

2 II①③ PERSPECTIVE PLAYBACK → [57] can be modified to explain the importance of a correct fit. Play the game with two volunteers—the first character is a worker who is being asked to wear s4 safety boots by the other characters: her employer, an NGO worker, a safety shoe saleswoman, and so on. Do not attempt to explain the fitting procedure without s4 boots! If a demonstration is required, bring two pairs of boots — one that fits you perfectly and a second larger pair.



Image 11.4. Laxmi is shown wearing SRA rated safety shoes made for women.

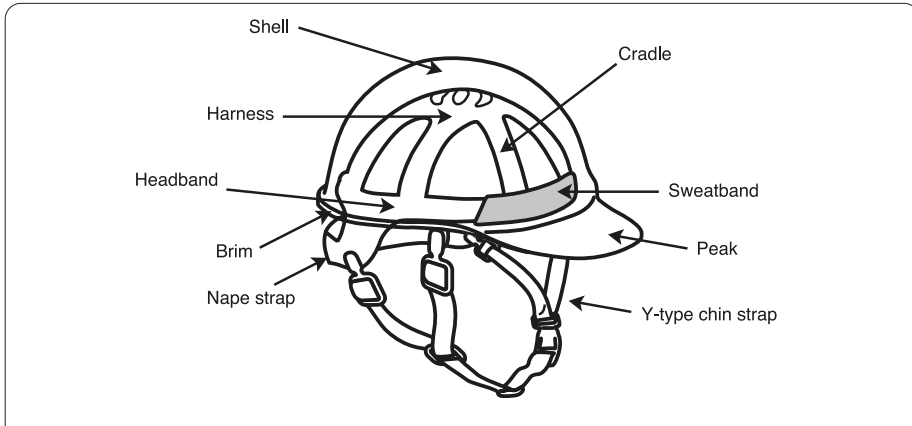


Image 115. Parts of a safety helmet

SAFETY HELMETS.

Safety helmets, also called ‘hard hats’ are used to protect the head from injury due to falling objects, impact with objects or surfaces, and electric shock. Safety helmets (unlike motorists’ helmets) are not designed to protect the user from falls. Indian standards for industrial safety helmets are defined in IS2925.¹

Imported helmets may be certified to European EN397 and North American ANSI/ISEA Z89.1 ratings. Safety helmets that protect from impact and penetration are of two types: ANSI TYPE 1 (or EN397:2012) designed to reduce the force of impact resulting from a blow to the top of the head and ANSI TYPE 2 (or EN397:2012+EN14052), designed to reduce the force of impact resulting from a blow to the top, front, back, and sides of the head. There are electrical-protective classifications for helmets as follows:

1. ANSI CLASS G, (General): Designed to reduce exposure to low voltage conductors, proof tested at 2200 volts (ANSI) or 1000 volts AC and 1500 volts DC (EN397:2012+EN50365).
2. ANSI CLASS E (Electrical): Designed to reduce exposure to high voltage conductors, proof tested at 20,000 volts
3. ANSI CLASS C (Conductive): Helmet made with conductive materials (such as metals), which do not protect from electrical hazards.

EN397 includes protocols for several optional tests to certify helmets that claim additional protection, such as very high or very low temperatures, splashes of molten metal, electrical voltages up to 40kV, and lateral deformation. Each of these categories includes tests to prove the helmet’s suitability for protection against these hazards.

§ PARTS OF A SAFETY HELMET

A safety helmet consists of three primary components: the shell, a suspension or harness,

¹ Not IS4151, which defines standards for motorists’ helmets. These are not appropriate for use as industrial safety helmets. A cheap ‘safety helmet’ may bear a sticker that claims compliance to IS4151—the manufacturer has merely bought stickers for a motorists’ helmet and pasted these on his product.

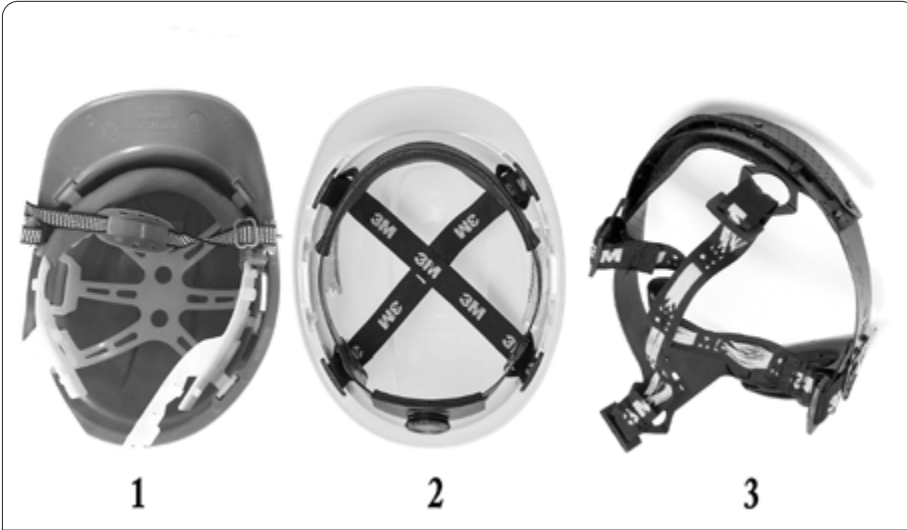


Image 116. (Slide 2) (1) An inexpensive PVC shell helmet with LDPE suspension is safe and easy to clean. It does not have a ratcheted headband. (2) Branded helmet with a comfortable, nylon fabric suspension, and ratcheted headband. (3) Removable suspension and headband of the helmet shown in (2). The kink in the joint that links the headband to the suspension allows it to fit the contours of the head better. Both helmets show in (1) and (2) have sweat absorbent headbands.

and a safety strap (see IMAGE 115.) The shell is a dome-shaped covering for the head, and is made of hard and durable materials. The shell should have a smooth surface finish. Good quality shells are made of polyethylene (both LDPE and HDPE), ABS, and polycarbonate. Depending on its design, the shell can have a peak, a brim or a rain gutter, ventilation openings, or attachment devices for eye and face protection and ear protectors.

The harness is the assembly that maintains the helmet in position on the user's head and absorbs kinetic energy within the shell during an impact. It consists of a cradle, which is the suspension system of the helmet, and the point-of-contact with the head. The cradle should keep the shell at a distance of 25–50mm from the top of the head; it must also maintain a distance of 5–10mm between the headband and the shell (see IMAGE 119). The harness may include a nape strap that secures the helmet to the back of the head,

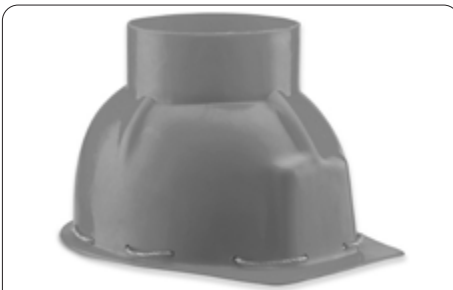


Image 117. Poor-quality HDPE helmet made in India for unskilled construction labourers. Compare this abomination with the inexpensive, but functional helmet, also made in India, shown in IMAGE 116.

a sweatband, and a chin strap, which fits under the chin to help secure the helmet on the head of the user, and prevents it from being dislodged. The most common styles of chin straps are the Y-type or the T-type. Both styles are suitable; the former allows the use of ear-protection.

Beware of sub-standard safety helmets (see IMAGE 117) are made for the construction industry. This helmet does not meet the requirements for construction helmets made in India (specified in IS2925) but it, nevertheless, finds buyers—unscrupulous contractors seeking merely to comply with

the regulations that require the use of hard-hats on construction sites.

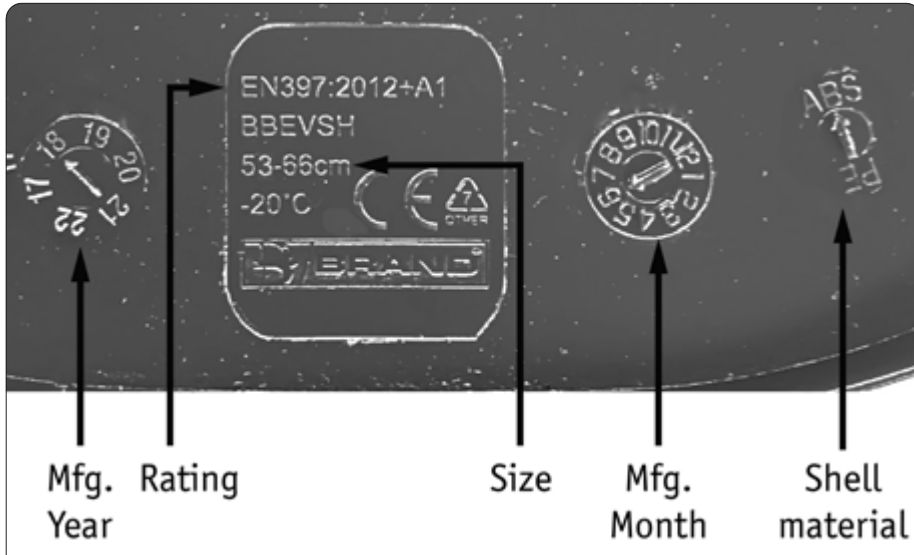


Image 118. (Slide 3) Safety ratings embossed on a helmet manufactured in June 2018. The outer shell is made from ABS; it will fit head-circumferences of 53–66cm.

§ SELECTING A SAFETY HELMET.

1. Head protection that is either too large or too small is inappropriate for use, even if it meets all other requirements.
2. A good helmet will have an adjustable nape strap to ensure a proper fit (many are adjustable in 3 mm increments). A proper fit should allow sufficient clearance between the shell and the suspension system for ventilation and distribution of an impact.
3. The chin-strap should be fastened such that the helmet does not move when the worker bends over. The chin strap in high quality helmets is made from soft nylon that does not chafe or irritate the skin. Inferior helmets may not have chin-straps at all; if present, straps will be made from cord or moulded LDPE. Hard straps are functional but very uncomfortable.
4. The suspension should be flexible but it should not stretch more than a few millimetres and should not snag the wearer's hair. Prolonged exposure to sunlight damages substandard PVC shells, which are identifiable by discolouration and 'chalkiness'. While the PVC retains its tensile strength, its impact-resistance—the purpose of the helmet—deteriorates significantly. A used or old-stock shell cannot be tested without compromising the impact-resistance of the helmet. Avoid PVC shells if you suspect that it might have been stored incorrectly.
5. A simple test (in the absence of noticeable discolouration) to check for UV damage or low-quality PVC shells is to flex the brim of the helmet. A good quality shell will flex by a few millimetres and silently spring back to shape without visible creasing; a faint white crease may appear on a compromised shell; if the shell squeaks or creaks when flexed, or if it deforms, then it should not be used.

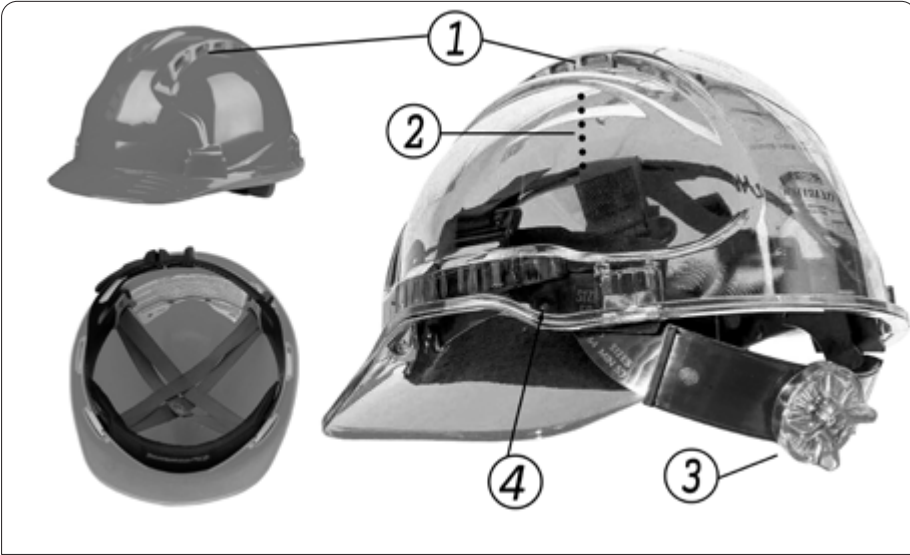


Image 119. Recommended safety features for SWM work. (1) Ventilation, (2) adequate clearance between harness and shell, (3) ratcheted nape strap, and (4) chin-strap (or provision to attach a chin-strap.)

§ RECOMMENDATIONS.

1. A helmet is not required in all workplaces. While working outdoors, a bandana to shield against dirt is usually adequate; while working in harsh sunlight, a ventilated cap or hat may be worn over the bandana to prevent heatstroke. If there is no danger from falling objects a bump-cap may offer adequate protection.
2. Helmets should be used when there is danger from falling objects. They are usually not required outdoors for SWM handling and transport jobs.
3. Avoid inferior products and materials. ABS and polyethylene shells (both LDPE and HDPE) are recommended, followed by PVC.
4. The recommended features in a safety helmet for most SWM jobs are shown in the image above. A ratcheted nape strap will hold the helmet in place even when the user bends her head; most helmets with such a strap will also have a chin-strap, either fixed or detachable.



Image 120. A good-quality helmet may save your life and should be considered to be an investment, not an expense.

ACTIVITY 6A

Do you need arch support?

Objective

- Know if an arch-support insert or mid-sole is required.

Equipment required

- A bucket of water.
- A few drops of food colour.
- A few sheets of white A4 paper.

Steps

1. Pour approximately 1L of water into the bucket or just enough to form a 1mm layer of water at the bottom.
2. Add a few drops of food colour and stir.
3. Ask for volunteers to check if they need arch support.
4. Place a sheet of A4 paper on the ground.
5. Ask each volunteer to dip her foot into the bucket, then raise it and wait till the excess water drips off.
6. Ask the volunteer to place her foot on the sheet of paper. She should be careful not to smudge the footprint.
7. Ask her to raise her foot, then carefully remove the paper.
8. Examine the footprint and discuss whether the volunteer needs arch support.

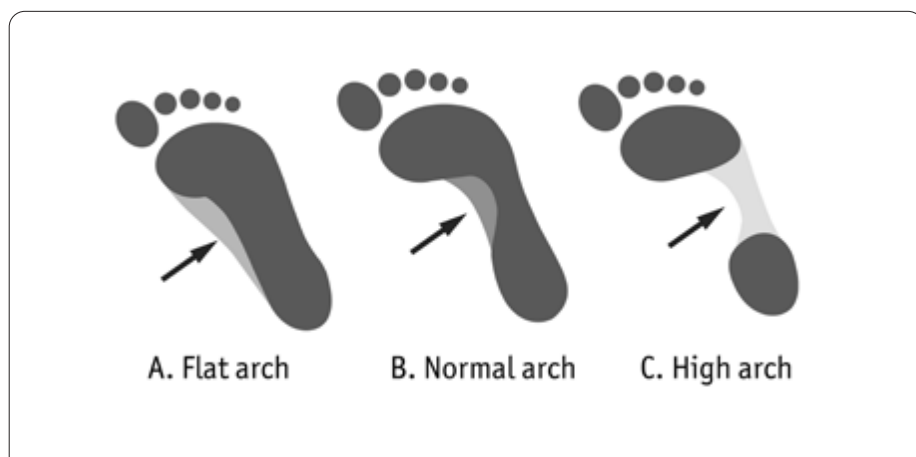


Image 121. Footprint left by flat, normal and high arches.

DISCUSSION

A person with a footprint that looks like a complete foot (as shown in the image above), should use a shoe with a straight mid-sole, i.e., one that does not have an arch. A person with feet that have a normal arch should wear shoes with a flat or slightly curved arch. Most shoes are designed for normal arches. Only a person with feet that have high arches may benefit from arch support, and even then he or she should try on an orthopaedic mid-sole for comfort before deciding to use one.

Comfort is the primary goal. If the safety shoes under test feel comfortable after a day of use, then arch-support is not required irrespective of the results of this demonstration.

Dr. Abraham—one of the medical doctors who contributed material for Module IV—demonstrated this procedure during a P2P workshop in Bangalore in 2018.

ACTIVITY 7

Safety glasses and ear-protection

Objective

- Know how to select and use appropriate eye protection.
- Know how to select and use appropriate ear protection.
- Know the advantages and disadvantages of the different kinds of ear protection.

Steps

- Initiate a discussion using the P2P method. Use the material in this Activity during the discussion. WORKSHOP PROGRAMME (below) contains guidelines on the agenda (what material to include depending upon the participants' jobs)

Workshop Programme

- With non-technical participants, demonstrate the different kinds of eye protection. Discuss the situations that require the additional protection afforded by safety goggles. Initiate USING MOLDABLE EAR PLUGS → [308] only if participants work in high-noise environments.
- With technical participants who work in mechanised waste-processing units, demonstrate the different kinds of eye-protection, initiate USING MOLDABLE EAR PLUGS → [308], then initiate ② © MECHANISED SWM OPERATIONS → [154] and discuss ways to reduce noise in their workplace.



Image 122. (1) Look for a z87.1 stamp or mark embossed on the lens or on the packaging. (2) Safety glasses; (3) Side-shields attached to prescription glasses. (4) Safety goggles. Premium products have a durable scratch resistant coating, and offer 100% protection from uv light.

EYE PROTECTION.

SWM workers require protection from dust, dirt, metal or wood chips entering the eye. Safety glasses also protect from accidental splashes of fermented liquids and foods. Safety glasses of a good brand, such as 3M®, are appropriate and cost-effective in the long term. Safety glasses¹ should be compliant to EN166 or ANSI z87.1-2-10. The word *glasses* is misleading since safety glasses are all made from polycarbonate plastic.

All safety glasses will get scratched over time and will need to be replaced long before the glasses break. Premium safety glasses have a durable anti-scratch coating; cheap safety glasses do not.

Workers operating wood-chippers may choose to use safety goggles, which completely cover the facial area immediately surrounding the eyes.

Worker who wear spectacles can attach ‘side-shields’ to their glasses. Prescription safety glasses that correct vision can be made to order; these are expensive but convenient. Large-sized goggles that fit over spectacles are also available. For jobs, such as driving, where peripheral vision is especially important, glasses with side shields may be more appropriate than over-sized goggles.

§ RECOMMENDATIONS FOR EYE PROTECTION.

1. Eye-protection is cheap. A pair of high-quality protective eyeglasses will last a year or more and costs ₹100.
2. Prescription eye-glasses do not offer adequate side-protection. Use ‘side shields’ to protect the sides of the eyes.
3. Protective eye wear can be worn above prescription glasses.

¹ The catch-all term ‘safety glasses’ is misleading since protective eye-wear is usually made from polycarbonates—thermosetting polymers that are ten times more resistant to impacts than optical glass. Indeed, nowadays prescription lenses too are made from polycarbonates.



Image 123. ♻ Kokila and her colleagues use appropriate PPE suited to the job at hand. Compare with IMAGE 65 → [148] and IMAGE 76 → [166]. They use TYPE DW gloves, ear-plugs, safety glasses and masks when operating the wood-chipper.

HEARING PROTECTION.

Safe noise levels are specified in industrial safety laws. Exposure to sound longer than these durations requires the use of hearing protection. Decibels are measured on a logarithmic scale—silence is 0 dBA, a sound perceived to be 10 times louder is 10 dBA, a sound that is 100 times (i.e., 10^2 times) louder is 20 dBA, a sound 1000 times (10^3) louder than silence is 30 dBA and so on. An 80 dBA sound not twice as loud as a 40 dBA sound; it is 10,000 times louder!

DAILY EXPOSURE	MAXIMUM PERMISSIBLE LEVEL IN dBA
8 hours	90
6 hours	92
4 hours	95
3 hours	97
2 hours	100
90 minutes	102
60 minutes	105
30 minutes	110
15 minutes	115

Table 38. OSHA standards for Permissible noise levels.

Industrial noise is typically a combination of sound frequencies from several sources. The ear is more sensitive to some of these frequencies than others, mainly the upper middle range from about 1000 Hz to about 6000 Hz; the total range of sound frequencies audible to the human ear is from about 20 Hz to about 20 kHz. Sound-level meters



Image 124. (From left) Disposable, mouldable foam ear plugs; flanged silicone-rubber washable ear plugs, and ear muffs.

are calibrated to bias the decibel reading slightly to emphasize the frequencies from 1 kHz to 6 kHz; this biased reading is called the A-weighted scale, and the resulting readings are abbreviated dBA instead of simply dB. OSHA recognizes the A-scale, and OSHA Permissible Exposure Limits (PEL) are expressed in dBA. The OSHA exposure limits listed in TABLE 38 should be treated as the *maximum* allowable level, and not a safe level.

85% of persons exposed to the OSHA limits of $L_A, 8h^1 = 90$ dBA for 8 hour/day, 5 days a week, for about 10 years, will not develop significant hearing impairment. The other 15% exposed to these limits would probably have various levels of hearing impairment depending upon their susceptibility. Wherever feasible, hearing conservation measures should be extended to reduce exposure levels below these limits, e.g., requiring the use of hearing protectors at, say, 85 dBA. —from the Handbook of Occupational Safety and Health. p 291.

The mathematical relationship between sound pressure, intensity, and power is beyond the scope of this handbook. The numbers can be deceptive—consider a machine that emits sound at an acoustic power output of 1 W. It might look low, but it wouldn't sound low! When placed on the ground in a room without any sound-treatment, this machine would create a sound pressure level of approximately 90dB at a distance 10m. Therefore, if a specialist noise-audit of the workplace is not feasible, problems should be solved 'by ear'—if the environment sounds loud or if in doubt, recommend ear-protection.

EXERCISE 26: USING MOLDABLE EAR PLUGS

You will need

- A selection of moldable, foam earplugs.
- A selection of silicone-rubber earplugs.

1 Average sound level measured in dBA, for a duration of 8 hours

Steps

- Ask two volunteers to join you at the front of the room.
- Demonstrate the correct procedure to insert moldable ear-plugs, as shown in IMAGE 125.
- Demonstrate the procedure to test for correct-fit:
 1. Ask the second volunteer to speak normally to her colleague from a distance of ½ metre; the participant wearing ear-plugs should be able to hear her colleague from this distance.
 2. Ask her to listen carefully to the quality of her colleague's voice—she should listen to its tone and timbre, and disregard the volume; then ask her to repeat the test with her hands cupped around her ears. If the ear-plugs are properly fitted, a human voice should sound more or less the same; if the quality of the voice changes, i.e., it sounds more muffled or unclear, then the ear-plug is incorrectly fitted. Check if it is protruding as shown in IMAGE 125 → [310], and repeat the test.
- Discuss the advantages and disadvantages of moldable foam ear-plugs and silicone-rubber, flanged ear plugs.
- Repeat the test with other volunteers and the silicone earplugs. Give each volunteer a set of ear plugs.

§ DISCUSSION

Silicone ear plugs have the benefit of longevity and are easier to maintain; they can be washed in mild soap and water without affecting their fit and acoustic properties; silicone is unlikely to cause an allergic reaction, unlike foam-rubber ear plugs. Foam ear plugs (especially memory-foam plugs) lose their elasticity after a few washes and have to be replaced more frequently than silicone ear plugs; they are usually more expensive but will equal or (in most cases) exceed the acoustic performance of properly-fitted silicone ear plugs. Foam ear plugs will fit most ear canals; silicone ear plugs do not expand and must be tested for proper fit²—ear canals are rarely identical in diameter.

Pushing earplugs into the external ear canal may cause the air pressure to rise in it causing pain. The recommended technique for moldable earplugs avoids this hazard since they are compressed before they are inserted (STEP 1). Similarly, when pulled out, the resultant negative pressure pulls the eardrum. Therefore, earplugs should be carefully screwed out rather than pulled out of the ear.

EXERCISE 27: EAR PLUGS VS. EAR MUFFS

You will need

- A selection of moldable ear-plugs
- A pair of ear-muffs.
- A recording of pink noise and a speaker to play it (a mobile phone could be used.)

Steps

- Ask two volunteers to join you at the front of the room. Ask one to wear ear-plugs and test for proper fit as described in the previous exercise; the other volunteer should wear ear-muffs. Ensure that the ear-muffs fit properly, as shown in .
- Once both volunteers are satisfied that their ear-protection fits properly, ask them to stand shoulder-to-shoulder, facing the rest of the participants.
- Stand in front of the volunteers and play a recording of pink noise at full-volume from a distance of 50cm; walk back slowly from them.
- Each volunteer must indicate when they are no longer able to hear the recording. Continue moving backwards, step by step until neither volunteer can hear the recording.
- Compare the distances. Are they the same?

² Manufacturers of 'earbud-style' headphones will often include 3 or more silicone ear-pieces with their headphones to ensure that at least one will fit the user properly.

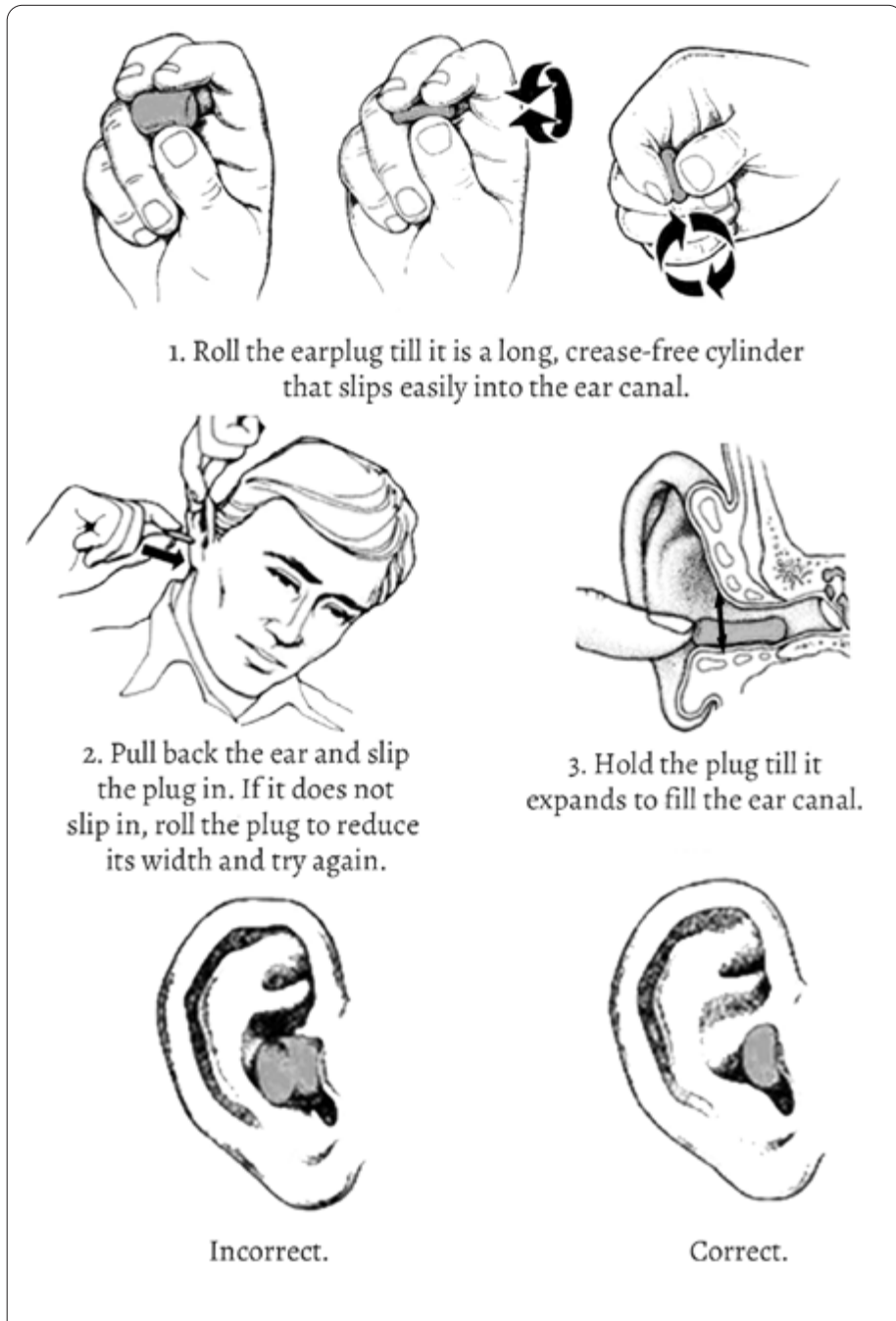


Image 125. Recommended technique for inserting mouldable ear-plugs. Notice the change in diameter of the ear-plug shown in Step 1, which allows the ear-plug to slip into the ear-canal with minimal force during Step 2. At Step 3, the ear-plug is held in place to prevent it from slipping out of the ear-canal as it expands. Expansion takes around 15 seconds. Ask someone to speak normally from a distance of $\frac{1}{2}$ metre; listen carefully to the quality of the voice (its tone and timbre, not the volume); repeat the test with your hands cupped around your ears. If the ear-plugs are properly fitted, the *quality* of the voice should be more or less the same.

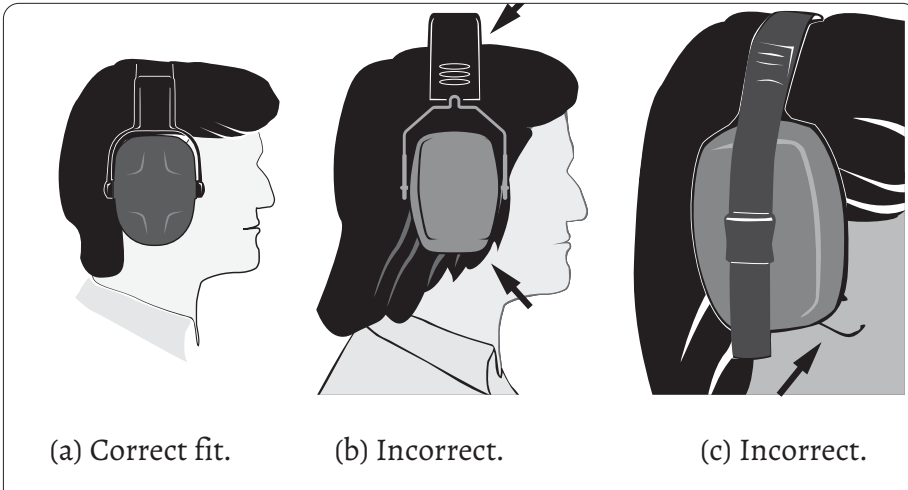


Image 126. Proper fitting for ear-muffs. (a) Correct. The wearer's hair is arranged so that the ear cup makes a proper seal against the skin, and the length of the headband has been adjusted correctly to fit the head. (b) Incorrect. Ear-muffs should not be worn over hair, the headband is too loose; (c) Incorrect. The wearer's ears should be fully enclosed by the ear-cup.

§ DISCUSSION

For most SWM jobs, a pair of silicone-rubber ear plugs are adequate and offer the best value for money. Workers at mechanised units may require the additional protection offered by mouldable ear-plugs, ear-muffs and, in some cases, both. However, an SWM unit should not have such high noise levels in the first place! (See ②③ MECHANISED SWM OPERATIONS → [154].)

🔊 How noisy is your workplace? The noise emitted by a wood-chipper recorded at a distance of 1 m (the typical working distance for the operator) is 105-110 dBA depending upon the physical properties of (such as hardness) of the material being processed, c.f. a jet engine at the same distance emits noise at 110 dBA. Granulators, pelletisers, agglomerators, (and any machinery that is operated by high-speed motors), commonly used in plastics-processing plants can emit 100 dBA of noise.

F3: What did Kokila say about the noise at her workplace?³ How many of you face the same problem?

👂 Do you hear a high-pitched ringing sound that persists even when there is no source of noise?

Tinnitus is sound in the head that is not caused by an external source. The sound may seem to come from one ear or both, from inside the head, or from a distance. It may be constant or intermittent, steady or pulsating. Many people worry that tinnitus is a

³ Kokila suffered from frequent headaches and nausea caused by operating a wood-chipper. The symptoms disappeared when she began to use ear-plugs.

sign that they are going deaf or have another serious medical problem, but that is rarely the case. Tinnitus is common in people over the age of 55 and strongly associated with hearing loss. —Harvard Health Publishing (online).⁴

§ RECOMMENDATIONS.

1. Workers in mechanised plastic-processing units and composting units require hearing protection. Hearing protection is mandatory in environments where the noise levels exceed 90 dBA.
2. Silicone ear-plugs are a comfortable and economical long-term solution.
3. Workers in high-noise environments should use ear-muffs that fully enclose the ear. Ear-muffs should have replaceable liners.
4. Certain styles of protective eye-glasses and ear-muffs are incompatible; in such cases, goggles with elastic straps may be used. Select a safety helmet with a Y-style chin strap if you intend to use ear-muffs (see IMAGE 115→[298]). T-style straps may obstruct the ear-muff. Alternatively, select a helmet with a ratcheted nape-strap that fits comfortably.

⁴ See @yczbufk5 for the entire article.

ACTIVITY 8

Body protection

Objective

- Know how to select appropriate body protection, including selection of appropriate materials for work uniforms.

Steps

- Ask three volunteers to join you and ask them to wear one of the three jackets shown in IMAGE 127 → [314].
- Discuss the advantages and disadvantages of each type of jacket: Is it comfortable to wear in hot weather? Is it durable enough to be washed everyday? Will it dry quickly?

Workshop Programme

- Include this activity in all programmes.
- For participants who handle bio-medical waste, combine this exercise with ⑧⑧ HEAT STRESS → [316].
- For technical participants who work with tools, discuss the usefulness of a jacket with tool-holding straps. Does it make their jobs easier or do they prefer to arrange their tools on the workbench?



Image 127. Different kinds of safety jackets. (From left to right) basic high visibility vest without pockets, Hi-vis vest with pockets, hooks and tool straps, and a canvas jacket with pockets. Notice that the second jacket has a transparent breast pocket suitable for an identity card. This is for reasons of safety—an ID card dangling from a lanyard can get snagged in moving machinery when the operator leans over.

JACKETS, APRONS AND OVERALLS

Workers' jackets are used for the following reasons:

1. To make the presence of a worker conspicuous.
2. To carry tools and equipment safely.
3. To protect clothing from dirt.

A high visibility (HI-VIS) jacket is made with vividly fluorescent material (coloured yellow, orange or red) with strips of reflective tape on the front and back. HI-VIS jackets improve visibility during daytime. Requirements for high visibility clothing as part of PPE are listed in EN ISO 20471, which was derived from EN 471. A suitable tool-carrying jacket should be equipped, as shown in the image above, with sturdy pockets, ring clasps, and belts to carry various tools and equipment safely and ergonomically. Such jackets may also be made to comply with high visibility requirements.

For more than a century, a sturdy denim or canvas jacket (usually dyed indigo) or denim overalls have been the standard work-wear for factory workers. The phrase 'blue-collar worker' is a direct reference to the jackets and boiler-suits worn by them. The fit of jackets should be comfortable but not so loose that it may snag or become trapped in machinery or equipment.

Safety jackets should be secured appropriately—buttoned-up, fastened with Velcro® or zipped—to avoid snag hazards. Workers who wear saris should drape the *pallu* under the safety jacket, and tuck it in at the waist. Scarves, *dupatta*, veils or any items of clothing that dangle from the body should be avoided or taken off while at work. An apron made of a washable, stain-resistant material may be used to protect clothes from dirt and to secure loose clothes to the body.

Overalls are the best work attire because they cover the entire body, do not have loose hems and provide adequate storage area for tools and equipment. Workers who wear *salwar-kameez* should consider using work-overalls.



Image 128. SWM workers at a fully mechanised biogas plant wearing appropriate SRC+s4 boots, properly fitting jackets, masks and TYPE WW nitrile gloves. When loading the conveyor, they wear PVC aprons (kept hanging on pegs just out of sight on the right) Both are trained to operate all the machinery in the plant. ♻

SWM companies should also consider giving uniforms for all their employees for the following reasons:

CREATE TEAM SPIRIT. Work uniforms promote a sense of unity and belonging, especially if all employees in the organisation wear the same work gear (or at least the same basic uniform). This, in turn, can improve worker productivity. Work uniforms can help instil a sense of pride and responsibility. All workers (including managers) in many Japanese companies wear a uniform at work.

PROMOTE A BRAND AND IMPROVE CUSTOMER RELATIONSHIPS. Workers are identified with the company's logo and name; SWM workers and field-staff at SWaCH, in Pune, and Hasiru Dala in Bangalore all wear overalls with the company's logo, name and helpline number. They are instantly recognisable from a distance and, during the 2020 Covid-19 pandemic, these overalls allowed them to go about their jobs (SWM workers are categorised as 'essential workers' in many Indian cities) without hindrance from the police.

§ RECOMMENDATIONS.

1. A HI-VIS jacket with pockets and straps is recommended for all SWM workers. It can be used to carry gloves and other equipment and conveys a professional appearance.
2. Jackets and aprons should be made of a material that is easy to wash and quick drying.
3. A water-proof apron is recommended for workers who handle wet-waste.

ACTIVITY 8A

Heat stress

Objectives

- Know the recommended safe durations for working with full-body protection.

You will need

1. A cotton-fibre mask.
2. A full-body PPE suit (of the kind used by workers who handle bio-medical waste).
3. A full bucket of water.

Steps

1. Turn off all fans in the room!
2. Ask a volunteer to wear a mask and the PPE suit. The correct procedure is described in EXERCISE 31 → [335].
3. Ask her to lift the bucket, walk around the room once and then place the bucket on a table. She must do this 10 times, or till she is unable to continue.
4. Ask the volunteer if she is feeling comfortable!
5. Switch on the fans. Ask the volunteer if there is any difference in comfort.
6. Discuss the subject of protection vs. heat-stress.

Notes

- The participants and the volunteer will, inevitably, start laughing during this activity. Don't let it get out of hand! Ask participants who laugh to volunteer. That usually does the trick.

Workshop Programme

- This activity may be initiated in ⑨ BIO-MEDICAL WASTE → [324], or the material may be merged into the discussion during PPE FOR HANDLING BIO-MEDICAL WASTE → [335], or it may be merged with the previous activity ⑧ BODY PROTECTION → [313].
- Do not skip this activity even if the participants are administrators (or desk-workers) who supervise workers that need to wear full-body PPE. Administrators (and NGO employees) often force SWM workers to wear uncomfortable PPE in poorly-ventilated rooms. This activity will help them understand a worker's reluctance to wear PPE. Be wary of causing accidental injury when initiating the exercise with desk-workers—they might not be fit enough to lift the bucket!



Image 129. Hospital workers in full PPE suits during the Covid-19 epidemic. (Photo credit: Javed Anees.)

DISCUSSION

A heat-related illness occurs when there is an increase in the worker's core body temperature above healthy levels. As core temperature rises, the body is less able to perform normal functions. As core temperature continues to increase, the body releases inflammatory agents that are associated with damage to the liver and muscles. This process may become self-sustaining and generate a run-away inflammatory response, the *systemic inflammatory response* syndrome that often leads to death¹. Exposure to extreme heat can result in occupational illnesses caused by heat stress, including heat stroke, heat exhaustion, heat syncope², heat cramps, heat rashes, or death. Heat can also increase workers' risk of injuries as it may result in sweaty palms, fogged-up safety glasses, dizziness, and may reduce brain function responsible for reasoning ability, any of which can create additional hazards. Other heat injuries, such as burns, may occur as a result of contact with hot surfaces, steam, or fire.

§ ARE ENGINEERING CONTROLS THE SOLUTION?

☞ The rate of heat gain depends on (1) the temperature difference Δt between the ambient temperature (t_a) and the skin temperature (t_{sk}), and (2) air velocity (V_a). $\Delta t = t_a - t_{sk}$. If $t_a < t_{sk}$, then heat is lost from the body; the rate of loss is dependent on Δt and air velocity. Engineering approaches to enhancing convective heat exchange are limited to modifying air temperature (t_a) and air movement. In addition, if long as $t_a > t_{sk}$, air speed should be reduced to levels that will still permit sweat to evaporate freely but will reduce convective heat gain. Spot cooling (artificially creating a local area around the worker where $t_a < t_{sk}$) can be a practical approach to controlling convective heat exchange, espe-

¹ See OSHA Technical Manual, Chapter 4, Heat Stress. @y62hls2s.

² *Syncope* is the medical term for *fainting* or *passing out*. It is caused by a temporary drop in the amount of blood that flows to the brain.

cially in large workshops where the cost of cooling the entire space would be prohibitive. Evaluating the conditions in a workplace requires the use of a wet- and dry-bulb thermometer and the training to use it correctly. The approach is well-documented by OSHA (see @y62hls2s) and others. However, it requires specialist training and is not practical in SWM workfloors in India. In most cases, however, subjective evaluations of workers' comfort in workplaces that are obviously hot may be used to decide if a heat stress programme is required. The tables that follow list engineering and administrative controls that are easiest to implement. Heat stress is a situation that calls for reduction or elimination of PPE by applying controls to eliminate the hazards that require the use PPE.

ENGINEERING CONTROLS	
Reduce body heat production	Reduce physical demands of the work; use powered assistance.
Reduce radiative load.	Interpose line-of-sight barrier; use wall insulation, metallic reflecting screens; cover exposed parts of body.
Reduce convective load	If air temperature (t_a) > 35°C, reduce air temperature, reduce air speed across skin; If t_a < 35°C, increase air speed across skin
Maximise evaporative cooling by sweating (E_{max})	Increase cooling by decreasing humidity and/or increasing air speed; Wear lighter clothing; use engineering controls to reduce or eliminate the need for full-body PPE.

ADMINISTRATIVE CONTROLS	
Acclimatization	Gradually increase exposure time in hot environmental conditions over 7–14 days; For new workers, the schedule should be no more than 20% of the usual duration of work in the hot environment on day 1 and no more than 20% increase each day; For workers with experience with the job, the regimen should be no more than 50% of the usual duration of work in the hot environment on day 1, 60% on day 2, 80% on day 3, and 100% on day 4.
Work schedule	Shorten duration of each exposure; more-frequent short exposures are better than fewer long exposures; Schedule strenuous jobs for the cooler parts of the day when possible.
Hydration	Encourage water intake at frequent intervals to prevent dehydration (1 cup every 15–20 minutes).
Rest and recovery	Shaded or air-conditioned space nearby.
Heat wave	Heat alert programme to monitor workers' health.

Table 39. Engineering and administrative controls for hot working conditions.

Administrators tend to assume that most workers' complaints about the comfort of PPE are excuses to wiggle out of work. This activity will force them to empathise with their workers.

The schedules listed in TABLE 40, are made with the assumption that workers are heat-acclimatized, under the age of 40, physically fit, well-rested, fully hydrated, and wearing Tyvek® coveralls (see @yy38pkrk), gloves, boots, and a respirator; adjustments must be made when additional protective gear is worn. Safety is essential, and some SWM jobs (such as handling infectious waste and hazardous chemicals) require the use of full-body PPE. However, the hazard of heat stress is often ignored by SWM workers and their employers. Protecting workers with PPE from against one hazard must not expose them to another hazard.

Temp	LIGHT WORK			MODERATE WORK			HEAVY WORK		
	Sunny	Cloudy	Shade	Sunny	Cloudy	Shade	Sunny	Cloudy	Shade
24 °C	✓	✓	✓	✓	✓	✓	35/25 [‡]	✓	✓
26 °C	30/40	✓	✓	20/40	✓	✓	10/50	40/20	✓
29 °C	15/45	40/20	✓	10/50	25/35	✓	⚠	15/45	40/20
32 °C	⚠	15/45	40/20	⚠	⚠	25/35	✗	⚠	15/45
35 °C	✗	✗	15/45	✗	✗	✗	✗	✗	✗

Table 40. Safe schedules for workers wearing full-body PPE. *Sunny* means outdoor work in the sun, *Shade* means that no shadows are visible, or the work is indoors, or at night. ✓: No work restrictions required, ⚠: Warning, ✗: Stop Work. [‡] The ratio of work-minutes to rest-minutes in one hour. In this case: 35 minutes of work followed by 25 minutes of rest, each hour. (Credit: NIOSH. 2016. See *Further reading*, below, for citation.)



Further reading

- Forsberg K., Mansdorf SZ. 2007. Quick Selection Guide to Chemical Protective Clothing. John Wiley & Sons. 5th ed. New York 203 p.
- Lamarche, D. T., Meade, R. D., D'Souza, A. W., Flouris, A. D., Hardcastle, S. G., Sigal, R. J., Boulay, P., and Kenny, G. P. 2017. The recommended Threshold Limit Values for heat exposure fail to maintain body core temperature within safe limits in older working adults. *Journal of occupational and environmental hygiene*, 14(9), 703–711. <https://doi.org/10.1080/15459624.2017.1321844>
- Meade, R. D., Poirier, M. P., Flouris, A. D., Hardcastle, S. G., & Kenny, G. P. 2016. Do the Threshold Limit Values for Work in Hot Conditions Adequately Protect Workers?. *Medicine and science in sports and exercise*, 48(6), 1187–1196. <https://doi.org/10.1249/MSS.0000000000000886>
- NIOSH (Government Agency). 2016. Criteria for a recommended standard: occupational exposure to heat and hot environments. DHHS Publication Number 2016-106. <https://www.cdc.gov/NIOSH/docs/2016-106/default.html>
- Venetta-Richard, Anne, M., Colippi, Ralph, Jr., 2019. Mansdorf, S. Z (editor). Handbook of occupational safety and health. Wiley. New Jersey. pp 335-357
- Ximena P. Garzón-Villalba, Yougui Wu, Candi D. Ashley, Thomas E. Bernard, Ability to Discriminate Between Sustainable and Unsustainable Heat Stress Exposures—Part 1: WBGT Exposure Limits, *Annals of Work Exposures and Health*, Volume 61, Issue 6, July 2017, Pages 611–620, <https://doi.org/10.1093/annweh/wxx034>

ACTIVITY 8B

Other safety procedures

Objective

- Know the different kinds of fire extinguishers.
- Know how to operate a fire extinguisher.
- Know the general rules of workplace safety.

Notes

- You must demonstrate the use of a fire extinguisher; merely showing participants the video does not prepare them for the energetic reaction that can unnerve the first-time user. If the workshop is indoors, step outside.

Steps

- Demonstrate how to use a fire extinguisher as described in EXERCISE 28 → [321]
- Discuss the general fire safety guidelines that are applicable to all workplaces.

Workshop programme

- With non-technical participants, skip the discussion on the selection of appropriate fire extinguishers.
- Include this activity in the workshop only if you can demonstrate how to use a fire extinguisher. Skip this activity if the demonstration is not possible.

EXERCISE 28: USING A FIRE EXTINGUISHER

Objective

- Know the different kinds of fire extinguishers.
- Know how to operate a fire extinguisher.

You will need

- One 6kg, TYPE ABC fire extinguisher.

Steps

- Play the video that shows how to use a fire extinguisher.
- Step outside the venue to an open area and demonstrate how to use a fire extinguisher. Explain the PASS mnemonic during the demonstration.
- Discuss the do-s and don't-s of fire safety.

Slides

- [5]1 : Video. (Youtube video @y6j7rkvn)¹.

DISCUSSION

Fires are created and sustained by the presence of the following conditions:

1. Fuel: Anything that can combine with oxygen, and 'burn.'
2. Heat: The fuel should be hot enough to burn. If it is not hot enough, it cannot burn. The minimum temperature at which a fuel will burn is called its ignition temperature.
3. Oxygen. The oxygen present in air is enough for most substances to burn if they are hot enough.

A fire may be extinguished by removing one or more of the ingredients listed above. Fire extinguishers, depending upon their design, may target one or more of these conditions.

IS THE FIRE EXTINGUISHER THE CORRECT TYPE? There are four kinds of fires:

- Class A fires—Fires involving solid combustible materials of an organic nature such as wood, paper, rubber, plastics, etc. The cooling effect of water is required to lower the temperature of the material without which the fire would simply re-ignite.
- Class B fires—Fires involving flammable liquids or liquefied solids (such as grease or fat), where a blanketing effect to starve the fire of oxygen is essential.
- Class C fires—Fires involving flammable gases under pressure including liquefied gases, where it is necessary to inhibit the burning gas at fast rate with an inert gas, powder or vaporising liquid. This blocks the fuel from feeding the fire.
- Class D fires—Fires involving combustible metals, such as magnesium, aluminium, sodium, potassium, etc. When burning, these metals are reactive to water and water containing agents and, in some instances, even with carbon dioxide, halogenated hydrocarbons and ordinary dry powders. These fires require special media and techniques to extinguish.

1 The link leads to a video on Youtube. It is in English. Search for a video in the local language if possible.

§ WHEN TO USE A FIRE EXTINGUISHER?

IS THE FIRE EXTINGUISHER LARGE ENOUGH? A fire extinguisher with 1kg of propellant will exhaust its contents in 8 seconds! A 6kg extinguisher will be spent in 30 seconds. If the fire has spread to a large area, leave immediately.

IS THE FIRE EXTINGUISHER SUITABLE? Check the colour of the stripe on the body of the fire extinguisher (see IMAGE 130). Dry-power types are indicated by a blue stripe. These are also called TYPE ABC fire extinguishers since they may be used on A-, B-, and C-CLASS fires. Foam and carbon dioxide (CO₂) extinguishers are also safe to use on most fires; fire extinguishers with a red stripe (containing water) can only be used when there is no risk of electrocution.

Don't jump to conclusions: an electrical fire may spread to other parts of an area. However, a dangerous electrical shock hazard is present in the room. Spraying the area might put out the fire, but may electrocute you.

IS IT SAFE FOR YOU? If you cannot see the source of the fire, leave the area immediately; if you cannot hold your breath for more than 10 seconds, leave the area. Firefighters have a better chance to extinguish a fire if they are sure that no one is trapped inside.

DOES IT WORK? Check the pressure indicator if one is present. The dial should be inside the green sector; pull out the safety pin, remove the trigger guard if one is present, and squeeze the handle for ½ second. Powder (or the active material) should squirt out immediately.

ARE YOU STRONG ENOUGH? A first-responder should be able to lift the fire extinguisher, walk a distance (say, 10m) while holding the extinguisher, and then calmly extinguish a fire². Safety managers often ignore the strength required to operate a fire extinguisher. The capacity of a fire extinguisher refers only to the weight of the propellant and the active material, and not to the weight of the fire extinguisher. An extinguisher of 4kg capacity may weigh 10kg or more. It is better to equip a site with 4 fire extinguishers of 3kg capacity instead of 2 extinguishers of 6kg capacity. Staying calm while operating the extinguisher is extremely important.

Fire provokes fear in all living things. The urge to flee is a protective instinct that has evolved over millions of years and can be overcome only through training and a conscious effort to ignore the immediate danger to one's life. If you do not have the physical strength to use the fire extinguisher that is available or the mental strength to calm your natural flight-response, leave the area.

Point out the consequences of dropping the extinguisher on one's feet, and also the protection offered by a steel toe-cap.

PASS: When using a fire extinguisher, use the PASS mnemonic: PULL the safety pin; AIM at the base of the fire; SQUEEZE the lever; SWEEP the stream of powder along the base of the fire.

² Watch for participants who laugh during the demonstration and ask them to volunteer.



Image 130. Different types of fire extinguishers. A dry-powder model (identified by a blue stripe on the body) is suitable for A-, B-, and C-CLASS fires.

§ FIRE EXTINGUISHER STANDARDS IN INDIA

Indian standards for fire extinguishers are laid out in IS 15683³. The types of extinguisher that are appropriate for different classes of fire are listed below:

1. Class A fires—Water, foam, ABC dry-powder, and halocarbons.
2. Class B fires—Foam, dry powder, clean agent, and carbon dioxide extinguishers.
3. Class C fires—Dry powder, clean agent and carbon dioxide extinguishers.
4. Class D fires—Extinguishers with special dry powder for metal fires. These will be marked to indicate that they are meant for chemical fires.

§ GENERAL FIRE SAFETY

☞ Have you seen a fire extinguisher? How many have operated one? How many of you know the fire-brigade emergency number⁴?

1. Fire-detection equipment should be installed in all rooms. Point out the nearest smoke detector in the venue.
2. All workers must know the location of the fire-exit nearest to them and an evacuation location where they must assemble; emergency numbers to be called in case of a fire, as well as a map with a route from its location to the point of assembly should be placed in prominent locations around the workfloor. Use the fire-safety plan at the venue of the workshop as an example.
3. No smoking indoors.

³ See @y3mxh7bc for the full text of IS 15683.

⁴ Do you know the emergency number? If you cannot remember it, mention this at the workshop. The national fire-emergency number is 101.

ACTIVITY 9

Bio-medical waste

-Objective

- Know how to identify and safely handle bio-medical waste.
- Know how to select and use appropriate PPE for handling bio-medical waste.

Notes

- The scope of this activity is limited to hazards faced SWM workers involved in the following jobs: cleaning, waste-handling, housekeeping, and janitorial jobs during periods of epidemics, and transport of bio-medical waste from a healthcare facility to an authorised bio-medical waste disposal facility. It deals with the hazard of accidental contact with bio-medical waste.
- This activity does *not* address the health risks of SWM workers who process (collect, pack, disinfect, incinerate, recycle, or bury) bio-medical waste in healthcare facilities or in authorised bio-medical waste disposal facilities. A future edition of the handbook will include material for such workers.

Steps

- Initiate each exercise in the order that it appears. See WORKSHOP PROGRAMME for more information.
- Discuss the Red Dot protocol.

Workshop programme

- This activity, if part of the programme, should be preceded by EXERCISE 21 → [281] and EXERCISE 22 → [286]. Repeat the exercises with different volunteers.
- Include EXERCISE 29 → [325] with all categories of participants. The exercise teaches SWM workers to train others in the correct procedure for handling *packed* hazardous bio-medical waste.
- EXERCISE 30 → [326] is useful only for SWM workers in companies that transport bio-medical waste generated in hospitals, pathology laboratories, veterinarians, and other healthcare service providers.
- EXERCISE 31 → [335] deals with the procedure for donning and doffing (putting on and removing) a full-body PPE kit with an FFP-style mask for protection against infectious health hazards.

EXERCISE 29: IDENTIFY NON-SEGREGATED BIO-MEDICAL WASTE


Objectives

- Know how to identify bio-medical waste disposed incorrectly in household waste, mixed waste or commercial waste.


Steps

- Display  and point out each item shown. Discuss how to handle such items if they are encountered in household waste or commercial waste.

Slides

-  : Bio-medical waste that is often disposed incorrectly.

DISCUSSION

SWM workers should be wary of handling bio-medical waste, especially if they have door-to-door collection jobs; unfortunately, workers often ignore their safety to complete the job on time. Using a full-body PPE suit to collect household waste is impractical; using appropriate gloves is part of a long-term solution, which requires supervisors to educate individuals who do not know how to segregate their waste and take appropriate coercive action against those to refuse to segregate their waste. After explaining the different categories of household bio-medical waste shown in  [327], discuss the following:

1. SWM workers should never attempt to segregate or sort mixed waste while collecting it; if dry- and wet-waste are mixed, they should inform their supervisors who can discuss the matter with the offending individual or business.
2. Workers should explain the Red Dot procedure to women; the procedure may also be used for other items of household bio-medical waste.
3. Fully-coated TYPE DW gloves (see STANDARD GLOVE-KIT  [149]) should be used when handling mixed-waste.
4. People who refuse to segregate their household waste should be informed about their violation of the Supreme Court's mandatory guidelines on the subject. Organisations should discuss and implement strategies for dealing with individuals and businesses that refuse to segregate their waste. Hasiru Dala offers financial incentives (discounted collection charges) for clients who segregate their waste.

EXERCISE 30: IDENTIFYING SEGREGATED BIO-MEDICAL WASTE

Objective

- Know the four categories of segregated biomedical waste that are handled by SWM workers.

Steps

- Display each slide listed below and explain what items of waste are included in that category.

Slides

- [S]1 : Bio-medical waste, Yellow Category. Non-recyclable waste, including waste that is contaminated by cytotoxic drugs.
- [S]2 : Bio-medical waste, Red Category. Plastic and rubber waste, excluding any waste contaminated by cytotoxic drugs, that can be recycled after appropriate disinfection procedures.
- [S]4 : Bio-medical waste, White Category. Contaminated waste that presents cut and puncture hazards, excluding broken glassware and cytotoxic waste.
- [S]4 : Bio-medical waste, Yellow Category. Broken glassware and metallic body implants, excluding cytotoxic waste.

Notes

- Appropriate PPE for handling bio-medical waste is discussed in EXERCISE 31 → [335].
- The mandatory bio-safety procedures that are required for SWM jobs at healthcare facilities and bio-medical waste processing facilities are beyond the scope of this handbook. Therefore, the discussion should be limited to the following: safe loading, transport and unloading of bio-medical waste, and disinfection procedures of equipment and vehicles used to transport such waste.

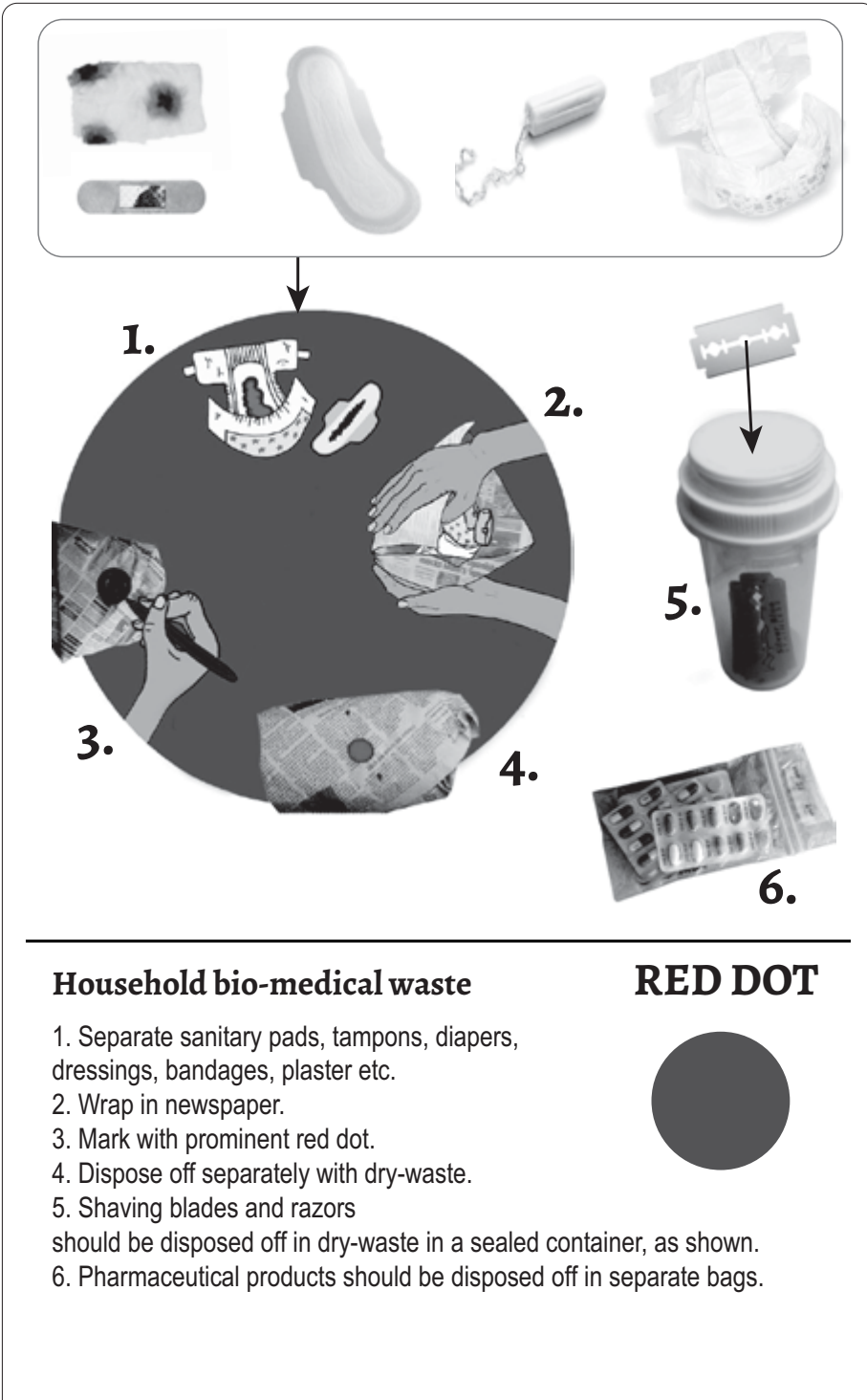


Image 131. Household bio-medical waste. Correct procedure for segregation and disposal.

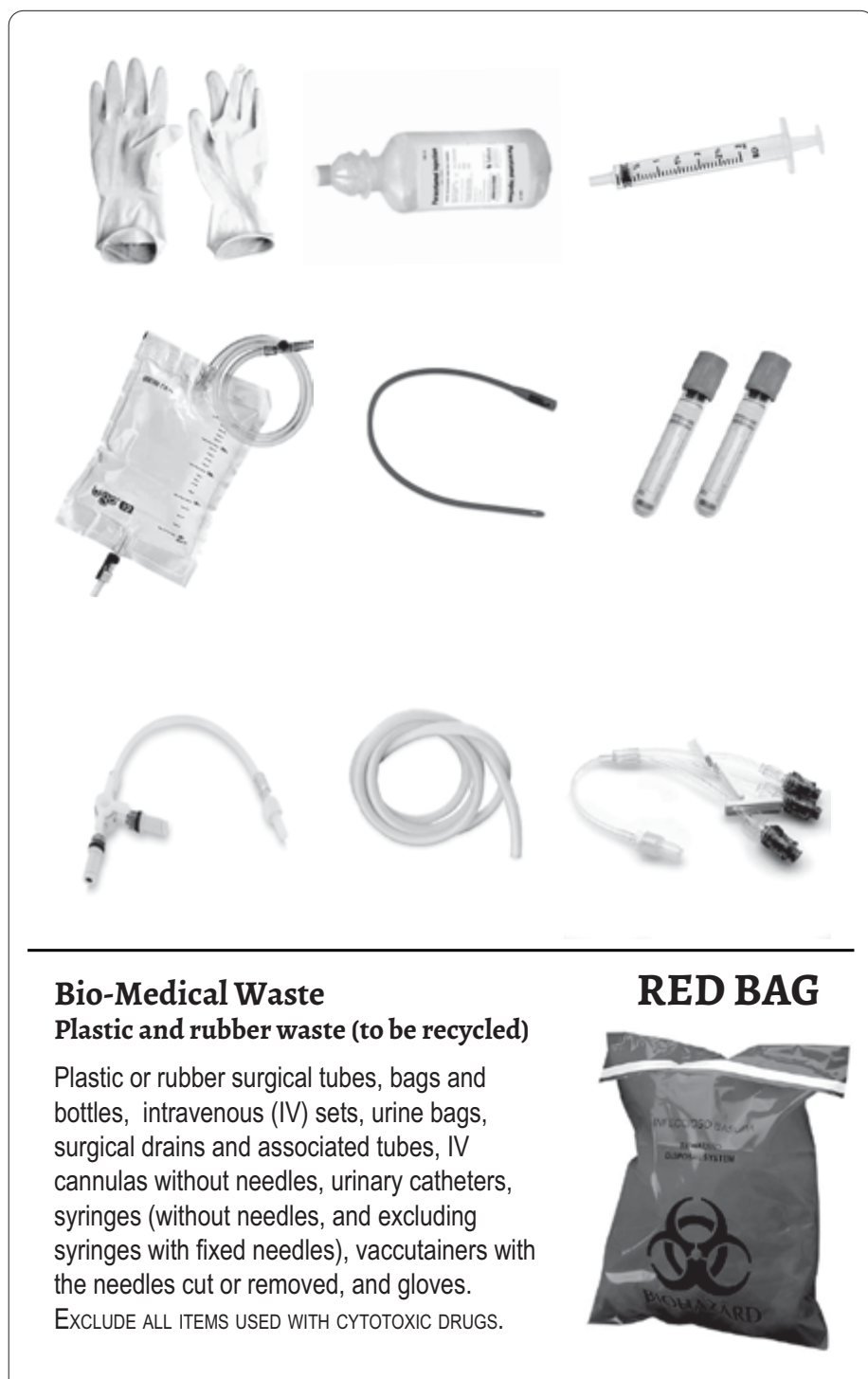


Image 132. Different types of bio-medical waste that should be disposed of in a red bag.



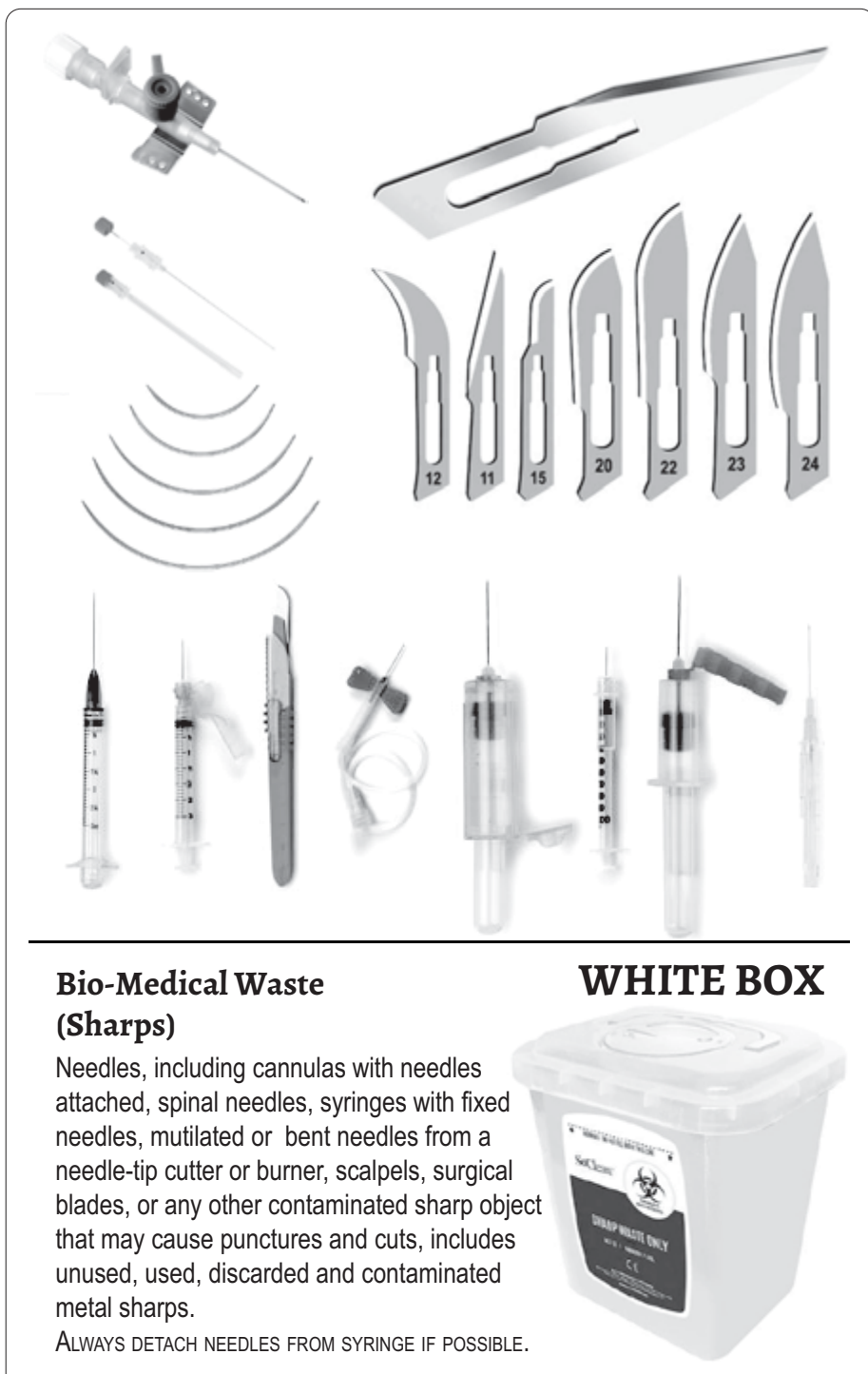
Bio-Medical Waste

YELLOW BAG

(a.) Human, or (b.) animal anatomical waste;
 (c.) Items contaminated with body fluids like dressings, plaster casts, cotton swabs and bags containing residual or discarded blood and blood components. (d.) Pharmaceutical waste including all items contaminated with cytotoxic drugs along with glass or plastic ampoules, vials, etc.; (e.) Used or discarded chemicals and disinfectants; clinical or laboratory waste. (g.) Discarded bedding and linen.



Image 133. Different types of bio-medical waste that should be disposed off in a yellow bag. Glass vials (or any items) contaminated with cytotoxic drugs are included in this category.



Bio-Medical Waste (Sharps)

Needles, including cannulas with needles attached, spinal needles, syringes with fixed needles, mutilated or bent needles from a needle-tip cutter or burner, scalpels, surgical blades, or any other contaminated sharp object that may cause punctures and cuts, includes unused, used, discarded and contaminated metal sharps.

ALWAYS DETACH NEEDLES FROM SYRINGE IF POSSIBLE.

WHITE BOX



Image 134. Bio-medical waste that present cut or puncture hazards should be disposed of in a translucent white puncture-, tamper-, and leak-proof box.



Bio-Medical Waste (Glass and metal)

(a) Glassware: Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes.

(b) Metallic body implants.

GLASSWARE USED FOR CYTOTOXIC DRUGS AND ASSOCIATED PLASTIC EQUIPMENT SHOULD BE DISCARDED IN YELLOW BINS OR BAGS.

BLUE BOX



Image 135. Glass and metallic bio-medical waste should be disposed of in a cardboard box with a bold, blue-trim, which should be visible from all sides of the box.

DISCUSSION

An internet search for ‘disposal of the different categories of bio-medical waste’ will throw up incorrect or irrelevant information. The subject, in the Indian context, is described in detail in Schedule I of the Bio-medical Waste Management and Handling Rules, 2016 (BMWMHR).¹ When buying posters and warning signs, check the information against provisions specified in BMWMHR. Incorrect packing or labelling of bio-medical waste creates a severe health hazard for SWM workers.

CATEGORY COLOUR AND CONTAINER	DESCRIPTION	TREATMENT
Yellow. Non-chlorinated plastic bags.	(a) Human, or (b) Animal anatomical waste; (c) Dressings, cotton-swabs etc.; (d) Expired or discarded medicines; (e) Used or discarded chemicals and disinfectants; clinical or laboratory waste; (g) Discarded bedding and linen. ²	Incineration or plasma pyrolysis or deep burial* * Only in rural areas as per guidelines specified in Schedule III of BMWMHR.
Red. Non-chlorinated plastics bags or bins.	Waste that can be recycled: plastic tubes, bags and bottles, intravenous sets, catheters, syringes (without needles, and excluding syringes with fixed needles), vacutainers with the needles cut or removed, and gloves.	Autoclaving or microwave treatment to sterilise, followed by shredding. Sent for recycling
White or semi-transparent. Leak-, tamper-, and puncture-proof boxes or bins, e.g., HDPE bins.	Waste sharps: Needles, syringes with fixed needles, mutilated needles (from aneedle-tip cutter or burner), scalpels, blades, or any other contaminated sharp object that may cause punctures or cuts.	Autoclaving or dry-heat sterilization followed by shredding or mutilation or encapsulation; combination of shredding+autoclaving also possible.
White cardboard boxes or bins with blue trim and lettering.	Glassware: Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes ³ . Metallic body implants.	Disinfection by autoclaving, or microwaving; then sent for recycling

Table 41. Correct packing and handling of bio-medical waste (Schedule I of BMWMHR).

§ EXPLANATORY NOTES (FROM PART II OF BMWMHR)

1. All plastic bags shall be as per BIS standards as and when published. Till then the prevailing Plastic Waste Management Rules shall be applicable.
2. Chemical treatment using at least 10% sodium hypochlorite having 30% residual chlorine for twenty minutes or any other equivalent chemical reagent that should demonstrate $\log_{10}4$ reduction efficiency for micro-organisms as given in Schedule III.
3. Mutilation or shredding must be to an extent to prevent unauthorized reuse.
4. There will be no chemical treatment before incineration, except for microbiological, lab and highly infectious waste.

¹ See @y5g8zcve for the full text (Ministry of Health Research, GoI); Also see @y4k4x48w.

² Items in different subcategories should not be mixed; the bag must be labelled to indicate its contents. Category (f.) is not mentioned here. It lists those liquid wastes that must be treated before their release into municipal sewage.

³ Cytotoxic drugs are used in the treatment of cancer; they destroy cancer cells. See @y3lz7sbg

5. Incineration ash (from the incineration of any bio-medical waste) shall be disposed through hazardous waste treatment, storage and disposal facility, if toxic or hazardous constituents are present beyond the prescribed limits as given in the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008 or as revised from time to time.
 6. Dead foetus below the viability period (as per the Medical Termination of Pregnancy Act 1971, amended from time to time) can be considered as human anatomical waste. Such waste should be handed over to the operator of the common bio-medical waste treatment and disposal facility in a yellow bag with a copy of the official Medical Termination of Pregnancy certificate from the obstetrician or the Medical Superintendent of hospital or healthcare establishment.
 7. Cytotoxic drug vials shall not be handed over to unauthorised persons under any circumstances. These shall be sent back to the manufacturer for appropriate disposal at a single point. As a second option, these may be sent for incineration at common bio-medical waste treatment and disposal facility or TSDFs or plasma pyrolysis at a temperature $>1200^{\circ}\text{C}$.
 8. Residual or discarded chemical wastes, used or discarded disinfectants and chemical sludge can be disposed at hazardous waste treatment, storage and disposal facility. In such case, the waste should be sent to hazardous waste treatment, storage and disposal facility through operator of common bio-medical waste treatment and disposal facility only.
 9. On-site pre-treatment of laboratory waste, microbiological waste, blood samples, blood bags, etc., should be disinfected or sterilized as per the Guidelines of World Health Organisation or National AIDS Control Organisation and then given to the common bio-medical waste treatment and disposal facility.
 10. Installation of an in-house incinerator is not allowed. However in case there is no common biomedical facility nearby, an incinerator may be installed at the facility after taking authorisation from the State Pollution Control Board.
 11. Syringes should be either mutilated or needles should be cut and or stored in tamper-proof, leak-proof and puncture proof containers for sharps storage. Wherever the occupier is not linked to a disposal facility it shall be the responsibility of the occupier to sterilize and dispose in the manner prescribed.
 12. Bio-medical waste generated in households during healthcare activities shall be segregated as per these rules and handed over in separate bags or containers to municipal waste collectors. Urban Local Bodies shall coordinate actions with the common bio-medical waste treatment and disposal facility to pick up this waste from the Material Recovery Facility (MRF) or from the household directly, for final disposal in the manner as prescribed here..
-

§ WORKING IN A CONTAMINATED AREA

PPE MUST BE WORN BEFORE ENTERING A CONTAMINATED AREA. It must be taken off and discarded just before leaving the area; if a worker is forced temporarily (for any reason, whatever) to leave a contaminated area then she must doff before leaving, and don a fresh set of PPE before re-entering the area. This ensures that exposure to her contaminated PPE does not infect others who are not similarly protected.

FULL-BODY PPE SUITS ARE NOT DURABLE. They are designed to be discarded at the end of a shift: the fabric will tear easily if stretched and it is prone to accidental snags. Straps might break when they are unfastened. Workers should not expect PPE to withstand the rigours of common tasks such as loading and unloading heavy material; therefore, discarded bags of all categories of medical waste should not weigh more than a few kilograms—light enough to load and unload into bins (or a van) without using the body to support its weight. If the bag weighs more than, say, 5kg, it is likely that a worker will be forced to hold the bag close to her body.

Never lift a medical waste bag on your shoulders or let it touch your body. If the bag is too heavy, use a trolley or ask a colleague to help and inform the healthcare staff that they are overfilling the bags. Do not let the bag touch your PPE suit. You should be able to handle the bag using only your hands

ASSUME THAT FULL-BODY PPE SUITS ARE NOT WATER-TIGHT. The trousers have heat-fused seams that come apart when pulled, which happens all too often; their backs are open and are held together by flimsy cords, which can tear and or loosen without the knowledge of the wearer.

If a yellow bag bursts and leaks fluid on your suit, disinfect yourself immediately and change into a fresh PPE kit.

BE WARY OF HEAT-STRESS. Working in a hot and humid environment will cause the body to dehydrate rapidly. Follow the work-shift timings listed in TABLE 40→[319] when working in a full-body suit.

PPE KITS ARE USUALLY SOLD WITH FLIMSY EXAMINATION GLOVES. These are used by doctors examining a patient and are discarded between patients: they are not designed to be used for more than 5 minutes! When handling packed with bio-medical waste, workers should use appropriately-rated, sturdy gloves. These are discussed in PPE STANDARDS FOR BIO-MEDICAL WASTE→[341].

PPE IS THE ONLY DEFENCE DURING AN EPIDEMIC. Even in normal jobs—normal, before Covid-19 epidemic of 2020—an SWM worker's exposure to infectious waste is 1000 times higher than average. The high rate of Covid-19 infections threw this statistic into sharp contrast when people realised the risk of stepping out without a mask and not keeping a safe distance away from others.

EXERCISE 3 I: PPE FOR HANDLING BIO-MEDICAL WASTE

Objective

- Know how to wear and remove PPE for handling bio-medical waste or working in infected areas.

You will need

- Two or more PPE kits that include a full-body suit, shoe covers, a face-shield, gloves, and an N95 or FFP-style mask rated FFP2.

Steps

1. Explain the 4-step donning sequence as shown in IMAGE 136.
2. Demonstrate the procedure by wearing one of the PPE kits. The correct procedure for wearing an FFP-style mask was described in HOW TO WEAR A DISPOSABLE FACE MASK → [281].
3. Ask for a volunteer, and ask her to wear a PPE kit. She must follow the order shown in IMAGE 136 → [336]; she must perform a User Seal Check before she wears the face shield; the cuffs of the body suit should be tucked into the gloves. Point out any errors she makes. Then ask her to help another volunteer to wear a PPE kit—point out that it is easier if two people help each other wear PPE. They can tie the straps on each other's gown and ensure that the two sides overlap.
4. Explain the 5-step PPE doffing sequence shown in IMAGE 137 → [337] and the glove-doffing sequence shown in IMAGE 138 → [338].
5. Discuss, at each step, how the procedure reduces the risk of exposure to infection. Why is the mask removed at the end of the doffing sequence?
6. Discuss the advantages and disadvantages of the PPE kit using the material in WORKING IN A CONTAMINATED AREA → [334].

Notes

- Participants must know how to perform the User Seal Check described A properly fitted mask is a critical component of a full-body suit.
- Printable cards, formatted for A5 paper, (see APPENDIX 5: CARDS → [A-51]) for the donning and doffing sequences are included in the companion USB drive. These may be printed and given to participants.

DISCUSSION

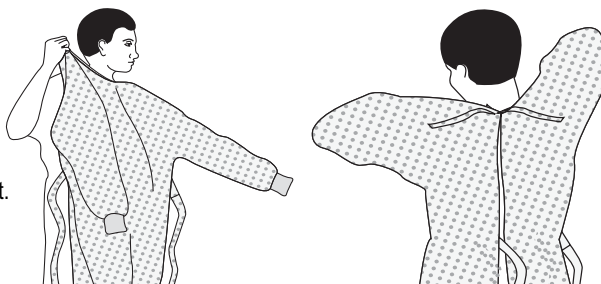
The glove doffing procedure ensures that the outsides of the gloves are never touched by bare hands; gloves are always removed last, so that all other PPE, which may be contaminated, are also never touched by bare hands

Workers must wash their hands using the recommended procedure (see IMAGE 139 → [339]) after doffing their PPE.

Gloves must be discarded at the end of the job when dealing with bio-medical waste. There is no alternative to this protocol. Therefore, cleaning and disinfection of a half-mask respirator (described in CLEANING RPE → [292]) should be done *after* the worker has washed her hands at the end of STEP 5 of the doffing sequence described above. She must then wear a fresh set of nitrile gloves and a fresh N95 mask, clean and disinfect her respirator, and then discard the gloves and the N95 mask. This is wasteful and takes time. When working with bio-medical waste it is easier to use an FFP-style mask (N95 or better) while on the job, and simply discard it instead of using a half-face respirator that would require cleaning and disinfecting at the end of each shift, and would require a fresh cartridge at the beginning of every shift.

1 GOWN

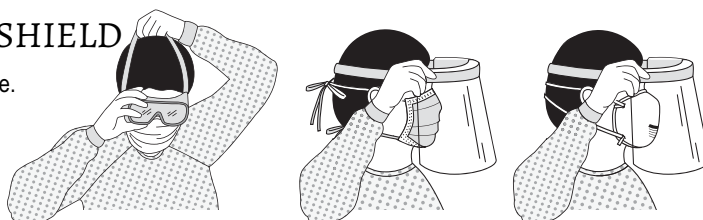
1. Fully cover torso from neck to knees, arms till the wrist.
2. Fasten at neck and waist.

**2 MASK**

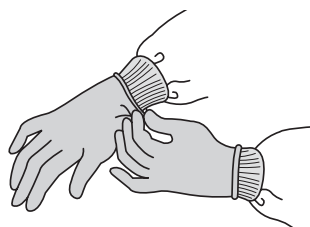
1. Secure ties or elastic at the middle of the back of the head and around the neck.
2. Contour flexible band to the bridge of the nose.
3. Ensure mask fits snugly to face and below the chin

**3 FACE SHIELD**

1. Place over face.
2. Adjust fit.

**4 GLOVES**

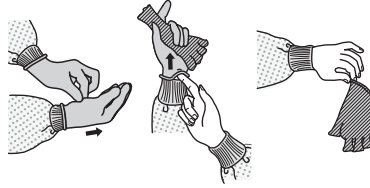
1. Extend the glove to cover the wrist of the gown.

**PPE WEARING (DONNING) SEQUENCE**

PPE shown here may be used by SWM workers to handle chemical-contaminated waste, appropriately sealed bio-medical waste, working in environments with hazardous particulate waste and for zero-contact collection of waste during epidemics. Additional specialised PPE (doubled gloves, disposable outer apron, enclosed hoods etc.) is needed for workers who handle unsealed bio-medical waste or work near infected persons. (See <https://www.cdc.gov/niosh/> for more information.)

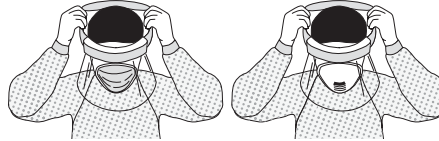
1 GLOVES

(1) With a gloved hand, pinch the palm area of the other glove and peel off the glove. (2) Hold it in the gloved hand. (3) Slide fingers of ungloved hand under remaining glove at wrist and peel off second glove over first glove, (4) Discard gloves.



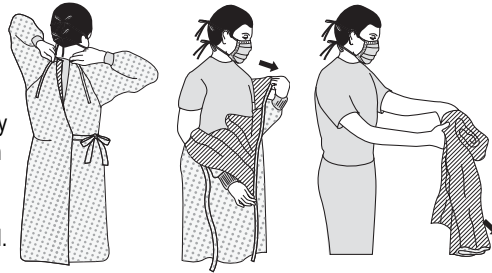
2 FACE SHIELD

(1) Remove face shield from the back by lifting head band (2) If the item is reusable, place in designated receptacle for reprocessing. Otherwise, discard in a waste container.



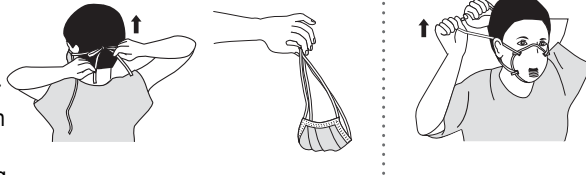
3 GOWN

(1) Unfasten gown ties, taking care that its sleeves don't touch your body when reaching for ties. (2) Pull gown away, touching only the inside of the gown (3) Turn gown inside out (4) Fold or roll into a bundle and discard.



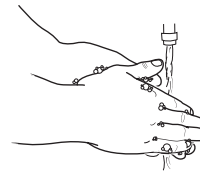
4 MASK

(1) Grasp bottom ties or elastic of the mask, then the ones at the top, and remove without touching the front (2) Discard in a waste container.



5 WASH

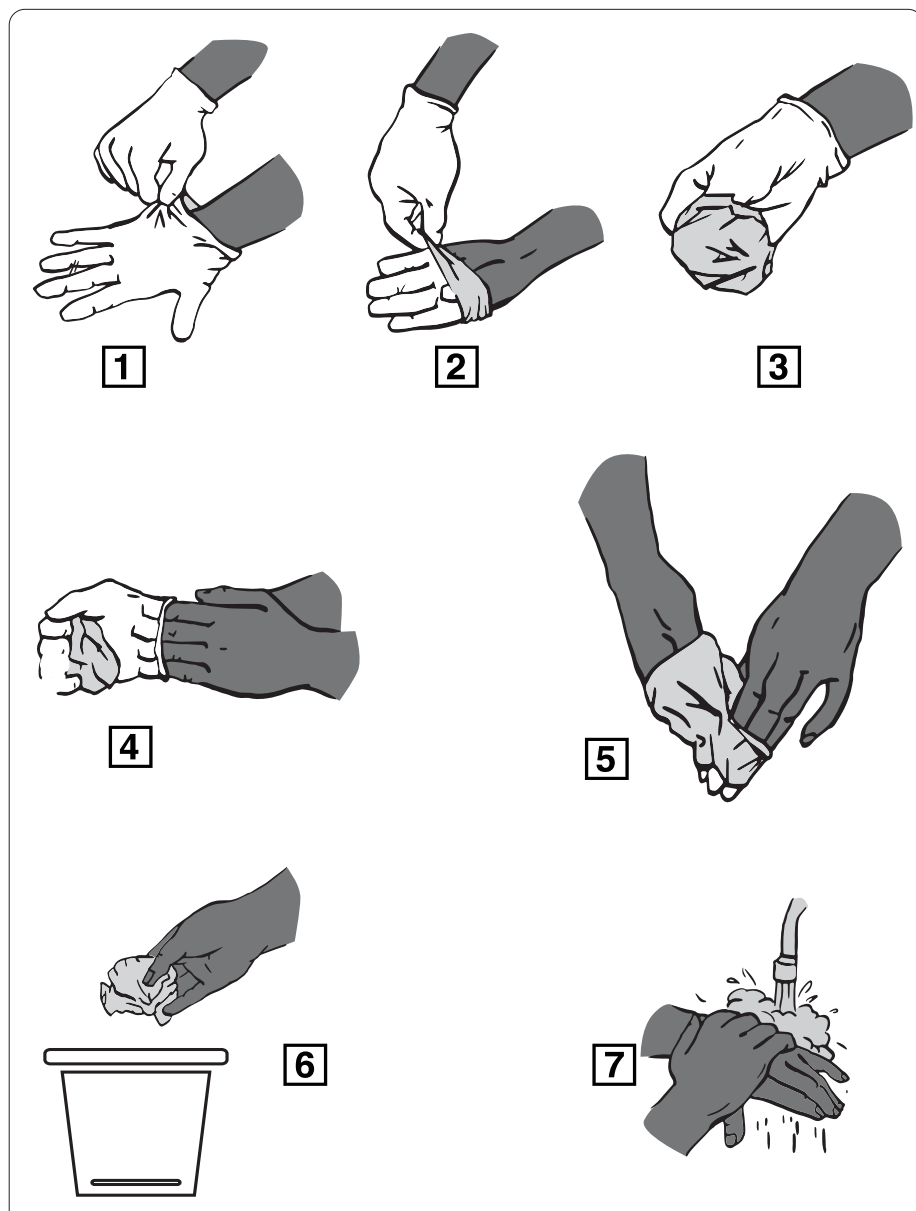
(1) Wash your hands.



PPE REMOVAL (DOFFING) SEQUENCE

Worker in jobs that require the processing of unsealed bio-medical waste, contact or proximity to infected persons etc. will require additional equipment; the doffing protocol in such cases includes mandatory intermediate disinfection steps, such washing of hands; removal of PPE that has been used when handling infected medical waste should be done in the presence of a trained observer and assistant. (See <https://www.cdc.gov/niosh/> for more information.)

Image 137. Doffing sequence. The procedure to remove gloves safely is critical since they are most likely to be contaminated. See the companion USB drive for a printable file)



CDC protocol

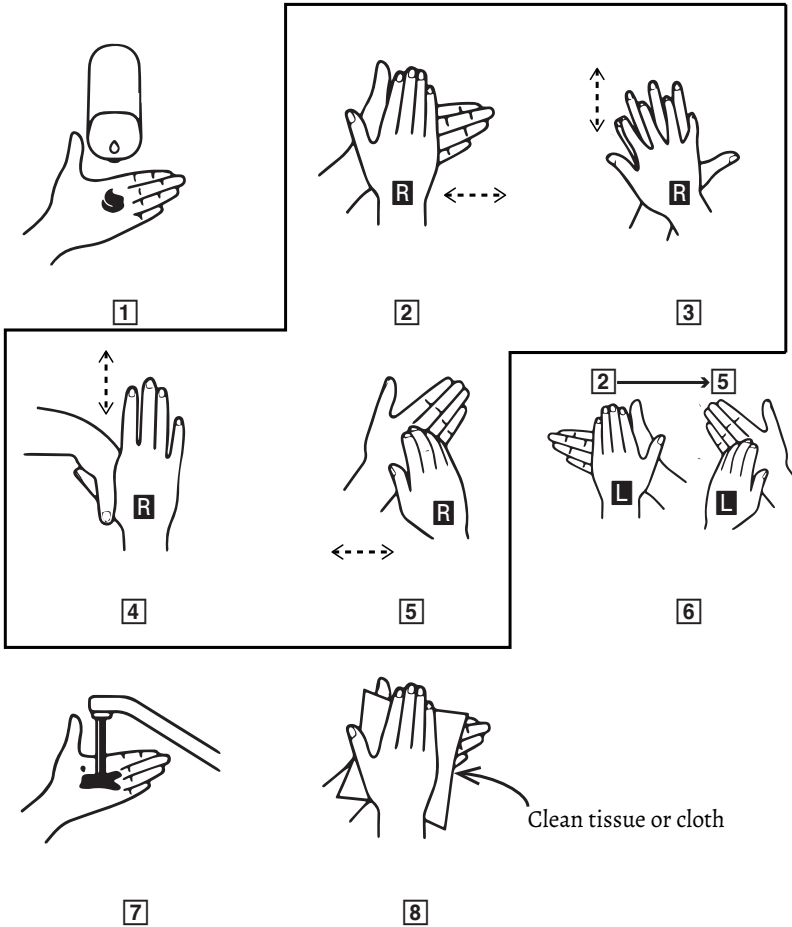
HOW TO REMOVE GLOVES

1. Pinch the glove from the outside.
Do not touch your skin.
2. Peel the glove away, turning it inside-out.
3. Hold the glove in your gloved hand.
4. Insert your fingers under the glove.
5. Peel the glove away, over the first glove. Do not touch the outside.
6. Discard both gloves. Wash hands.

Image 138. Safe removal of contaminated gloves. (Image credit: CDC.) See the USB drive for a print-ready file.



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WASH YOUR HANDS

- | | | |
|--------------------|-----------------------------------|---------|
| 1. Use liquid soap | 4. Between thumb and palm | 7. Wash |
| 2. Palm to palm | 5. Fingernail to palm | 8. Dry |
| 3. Between fingers | 6. Repeat 2-5 with the other hand | |

Image 139. Protocol for washing hands. See the usb drive for a print-ready file.



Image 140. Maintaining properly-clipped fingernails, using gloves, and washing hands before meals and after using the lavatory reduces diarrhoea-related deaths by 50%.

EXERCISE 32: HOW TO WASH HANDS

Steps

1. Display □ 4.¹
2. Place the bucket, water and soap on the table and ask the participants to gather around you.
3. Demonstrate the correct procedure as shown in □ 4.
4. Ask a volunteer to wash her hands as shown by you.
5. Ask everyone to wash their hands, at a washing station or rest-room before having lunch.

The primary reason for a standard hand-washing technique is to ensure that all parts of the hand are in contact with soap for 15–20 seconds. Mention the importance of maintaining short finger-nails (see IMAGE 174→[405].)

Long nails trap dirt. The effectiveness of washing one's hands is significantly reduced if one's nails are dirty. Keep your nails short. In addition to improved hygiene, short nails improve dexterity and reduce the chance of accidentally tearing thin rubber and nitrile gloves.

¹ This exercise can also be initiated during IV© FIRST-AID→[395] when explaining the various first aid protocols, since the knowledge of correct hand-washing technique is essential for first-responders, especially when treating wounds and burns.

§ WHO TRAINING GUIDELINES

WHO recommends the following specific training instructions for workers on the following subjects:

On sharps containers:

- When $\frac{3}{4}$ th full, close and remove container.
- Check all sides for any holes or protruding needles before lifting container.
- If there are holes in the container, carefully place the container inside a larger puncture-resistant container.

On contaminated linen:

- Check contaminated linens for any sharps.
- Handle all used linen using gloves, arm sleeves, and coveralls.
- When removing soiled linen, gather the linen so that the contaminated area is on the inside.
- Wash contaminated linen in hot water (at least 88°C) for at least 20 minutes.

On cytotoxic or radioactive waste:

- Written procedures for safe working methods for each drug including separate collection in leak-proof containers and labelling, disposal methods, decontamination of reusable equipment, and treatment of spillage
- Establish an emergency response procedure
- Return of outdated drugs to supplier
- A designated-person in charge responsible for safe storage and inventory

On personal hygiene, including hand hygiene

- Convenient washing facilities (with warm water and soap) should be available to all workers, including cleaning staff and waste-workers.¹
- Personnel should be trained on personal hygiene issues that reduce the risks of handling hazardous waste.
- Cover cuts/abrasions with waterproof dressing to help reduce exposure of the affected area.
- Donning, removing and cleaning PPE

§ PPE STANDARDS FOR BIO-MEDICAL WASTE

The EN374 suite of standards specify the protection capabilities of gloves against various chemicals and micro-organisms. Parts 1-4 of the standard deal with chemical protection. These were discussed earlier in EN374-1:2016 [260]. Part 5 of the standard defines the requirement for protective gloves against microbiological agents. For bacteria and fungi a penetration test is required following the method described in EN374-2:2014: air-leak and water-leak tests. For protection against viruses, compliance to ISO 16604:2004 (method B) standard is necessary. Gloves that protect against bacteria and fungi may display the relevant EN:374 pictograms; gloves that protect against viruses (most of which are smaller than bacteria and fungi²) may display the EN:374 pictogram with the word 'virus' underneath as shown in the image. Rated EN374-5 virus gloves are suitable (and recommended) for handling waste infected by the 2019-nCoV virus, commonly known as the *coronavirus*. Gloves rated as per specifications in ASTM F 1671 (the US standard for PPE for handling infectious waste) are tested for permeation by hepatitis B and hepatitis C viruses, and HIV. These too are suitable for handling waste that is infected by the 2019-nCoV virus.

¹ WHO specifically includes the term 'waste-workers' in this category and, in doing so, acknowledges that SWM workers are in the high-risk category of this hazard.

² The largest viruses are similar in size to the smallest bacteria, but the distinction is not relevant in this context. When dealing with waste that is known to be contaminated by viruses (such as Covid-19), EN374: virus is the recommended PPE.

Recommendations for SWM workers

Manufacturers of good-quality disposable surgical and examination gloves seek EN374-5 certification; however, these gloves are not suited for material handling jobs. Some work gloves may include an inner lining that stops penetration of viruses, however, these are expensive and, therefore, not suitable for SWM work.

SWM workers need *safe* gloves that are (a) cheap, therefore disposable at the end of the shift, or (b) durable, and easily disinfected on site after work. Durable and cheap is an impossible combination. Therefore, double-gloving is recommended for material handling jobs while transporting bio-medical waste. A disposable surgical glove rated EN374-5, which can be disposed at the end of the shift is worn inside a sturdy, *unflocked* TYPE WW nitrile glove. Before doffing at the end of the shift, the worker can drop both outer gloves into a vessel containing freshly prepared 1% hypochlorite solution; the gloves should be allowed to soak, fully submerged (ensuring that the insides of the gloves are filled) in the solution for 30 minutes and then hung out to dry in a clean environment. The outer gloves may then be worn, the following day, after the worker has donned PPE.

Note that a 1% hypochlorite solution—not the 0.1% solution recommended in ④ HOUSEKEEPING AND CHEMICALS, [169] for disinfecting clean, non-porous surfaces—is to be used for disinfecting the outer gloves. Also note that this recommendation is for SWM jobs involving loading and transport of packed bio-medical waste. Protocols for jobs involving direct contact with bio-medical waste such as contaminated linen, are beyond the scope of this handbook.

Further Reading

- Ansell. EN ISO 374-5 virus and ASTM F 1671 standards overview. (@yynag2f5)
- ASTM F1671 / F1671M-13.2013. Standard Test Method for Resistance of Materials Used in Protective Clothing to Penetration by Blood-Borne Pathogens Using Phi-X174 Bacteriophage Penetration as a Test System, ASTM, West Conshohocken, PA.
- Honeywell. Data Sheet. Revised Standard for chemical protective gloves. (@y4xxadkp)
- Datta, P., Mohi, G. K., & Chander, J. 2018. Biomedical waste management in India: Critical appraisal. *Journal of laboratory physicians*, 10(1), 6–14. https://doi.org/10.4103/JLP.JLP_89_17

Using the P2P method

Objective

- You, the moderator, understand how the P2P method works and can use it to solve problems.
- Establish that most of the hazards in a workplace (that people usually try to solve with PPE) can be solved by applying engineering or administrative controls, i.e., a simple technical or procedural solution exists for most problems that does not require the use of special PPE.
- Motivate participants with examples of colleagues who changed their lives by changing how they worked.

Slides

- [5]I: Laxmi with a mobile phone making a movie.

Steps

1. D → D. Your assistant should queue up DEFER questions by subject, in order, as they are posed. When a participant asks a question that calls for the P2P method, check the DEFER chart and merge all queries related to the one that was just asked. You now have a group of participants who all want a solution to a very similar problem—use this group to create the problem-statement in the next step.
2. Create a problem-statement jointly with the person who posed the problem and the other participants. Ask them to comment on each other's statements: *Do you agree with Anita? Will you describe your problem to Anita?*¹
3. Propose solutions to the problem—start with objective, technical and procedural solutions, then subjective solutions, and finally motivational solutions. Try the easiest solution (in each category) first.
4. Stop when the person is happy with the solution! Pragmatic solutions are better than ideal solutions.


Notes

- This activity is a tool and should be initiated whenever necessary. Read MALL TALES EPI: ANITA HAS A PROBLEM → [I89], which shows how an experienced moderator applied to P2P method.
- The activity uses the HOC extensively and assumes that you familiar with various engineering and administrative controls discussed earlier.
- This activity is placed at the end of Module III, even though it may (and should) be initiated at any time after Module II. Activities III① to III⑨ contain the technical information required to apply the P2P method—this activity shows you how to do so with the help of case studies and exercises.


¹ Always refer to participants by their names. You can see their name tags; their names are listed beside the tag number on your clipboard, see CLIPBOARD PROTOCOL → [A-20].

GENERAL TECHNIQUES


INVOLVE ALL PARTICIPANTS IN THE PROBLEM-SOLVING PROCESS. You need three sides for the discussion—the person who raised the query, a small group of persons who raised a similar query (but were put on DEFER), and the rest of the participants, especially the AP and EP. Before offering your inputs always ask for comments from each side. In many cases you will merely need guide to the participants towards a solution that they find!


 How many of you work in a plastic-processing plant?


Anita has problem using PPE at work. She that her gloves slip on her hands when she tries to load bins on her van. Should we discuss her problem?¹ I noticed that a few of you have already mentioned a similar problem at your workplace. Remember I said we would postpone discussion for a while? Shyamala [the first person on DEFER] said that her gloves are too stiff; Bindiya [next on DEFER] said that she wants a comfortable pair of gloves. All three of you also work at a plastic-processing plant. About 5 other participants work at a similar plant. So let us solve all these glove-related problems at once.


 Anita's gloves slip when she loads bins. Do any of you also load bins at work?


 [Bindiya, from the DEFER chart] Yes. But I prop the bin on my waist first.

 Doesn't that give you back pain?


 [Shyamala] Yes. I have back pain. But I can manage.

 [Bindiya] But I can't lift the bin with gloves. The sides of the bin are slippery.


 [Anita]. Exactly. That's the same problem I face. The glove slips on the bin. Without gloves I can grip the side of the bin properly.

 Anyone else facing the same problem?

 [Someone in the audience] Yes. But its not that bad.

 Ok. So clearly the bin is the problem. [And so on...]

Notice that Shyamala has introduced a new problem, but the moderator ignores it because Shyamala does not mind the back pain. The moderator is looking for someone in the second group who faces the same *problem* that Anita does. She finds this person in the form of Bindiya. You will usually find more than one person amongst the participants who have faced the same problem. They might not consider it a 'problem' but they will have been in the same situation.

 How would you proceed? What is the problem-statement for the matter at hand?

When searching for *technical or procedural solutions*, rephrase the problem-statement into

¹ Ask for a vote on the subject. Participants will rarely veto a call for discussion of a fellow worker's problem



Image 141. Reduced dexterity and discomfort is usually caused by inappropriate choice of gloves. The worker on the left is wearing TYPE DW 3131 gloves; the one on the right is wearing nitrile surgical gloves. Who is likely to be more comfortable when handling dry plastic waste?

one of the following standard categories and then explore solutions.²

§ DEXTERITY-RELATED PROBLEMS.

1. The most common reason for reduced dexterity is an improper fit and wrong choice of gloves. Ensure that the appropriate type of gloves (or PPE) are being used by the worker and that they fit properly. (See ① GUIDELINES FOR DETERMINING CORRECT FIT → [121].) Properly fitted gloves are comfortable and do not reduce dexterity. This should be demonstrated, always. (See A TEST OF DEXTERITY → [118].)
2. Dexterous work should not be strenuous. If it feels strenuous the problem might be related to the ergonomics of the job.
3. Incorrect implementation of procedures and work-flows should be suspected. If so, explore ways to improve the work-flow.

🧠 Consider the following situation: Sorters at a conveyor belt who are assigned to remove metals from mixed-waste do not need to be particularly dexterous if the material to be extracted is ferromagnetic — a hollow plastic tube filled with magnets suspended an inch above the belt will extract most of the ferrous waste; the remainder may be fished out by a worker holding a strong magnet inside a leather pouch. Ferrous waste can be removed from the plastic tube by sliding out the magnets. Large non-ferrous scrap that snags on the tube should be removed first. Such changes not only increase safety but also improve the speed and efficiency of the workstation. (Also see ②Ⓢ MECHANISED SWM OPERATIONS → [154].)

Sorting workstations should be designed for workers using the right tools and wearing appropriate PPE. Segregation, sorting, and micro-sorting stages should not be combined

² Remember that participants may not perceive their problem to be technical even though the solution might be technical or procedural. It is your job to unpack the problem-statement into its components to understand whether a technical solution is feasible.



Image 142. ♻️ Workers at the mixed-waste sorting station in ELCITA are able to work without fatigue for longer because their sorting workstations are ergonomic and the sorting procedures are properly designed — they use a conveyor, workers use appropriate gloves depending upon what they sort, they do not need to bend, notice that their hands remain at waist level at all times, even when transferring sorted material to the bins.

into a single job or workstation.³ These should be done one after another with the appropriate PPE. Using appropriate tools can increase profits by improving the quality of micro-segregated waste.

§ ERGONOMICS AND DISCOMFORT.

Establish that the worker is using appropriate PPE and that PPE is required for the job at hand⁴ then investigate the reasons behind the discomfort, starting with known causes.

1. TYPE WW gloves do not allow sweat to evaporate because they are airtight. They should only be used when the job requires waterproof or chemical-resistant gloves.
2. Wet-waste should be handled by two or more workers or teams; one wears TYPE WW gloves while the other perform tasks that do not require them.
3. Some wet-waste handling procedures may be refined to eliminate the need for rubber gloves—rubber or flexible plastic scoops could be used to transfer waste, in which case the worker could use PVC-coated TYPE DW gloves instead of rubber gloves. Discuss these options.
4. Sweaty hands are a major problem, and the response was discussed earlier, in II③→[96]. Also, sweaty hands cause less discomfort when working in a well-ventilated room with a fan. Perspiration is reduced significantly if the surroundings are cool.

³ A job that forces one worker simultaneously to perform all three operations is poorly designed. Safe work under these conditions is slower, which reduces productivity and working at an productive pace greatly increases the risk of injury.

⁴ Check your notes for earlier responses to IMAGE 141→[345]. Both workers are wearing gloves. The worker to the left is wearing TYPE DW gloves; the worker on the right is wearing TYPE WW nitrile gloves. Both are sorting PVC and nylon scrap. Nitrile gloves are not appropriate to this job—they will cause the worker's hands to sweat, and will tear easily. The first worker is both comfortable and safe; the second is neither comfortable nor safe. If PPE is required for the job at hand, always establish that a participant is using the appropriate PPE for the job and that it fits properly before investigating motivational solutions (See KARTHIK AND HIS HELMET→[32]).

5. Respirators are uncomfortable in hot and humid weather. Working with respirators is more comfortable during the cooler hours of a day; forced ventilation or fans that direct air across and away from the face make it much easier to work. (See ⑤ RESPIRATORS → [274].)
6. Ill-fitting knee-length rubber boots are a common cause of muscular pain. Contractors often purchase boots that are too large for women. Their feet slide inside the boots; when they walk, or lift and move a load; they often twist their ankles because their feet tend to brace themselves or find purchase against the outer sides of the boot.
7. Full-body PPE suits cannot be worn for extended periods. See ⑧④ HEAT STRESS → [316]. Forced ventilation is usually effective; reducing the duration of work-shifts or including rest-periods is also recommended. If you attempt to scare workers into using full-body suits, *you* have failed to understand the essence of the PPE method—*you* must understand the problem as it is perceived by workers and offer various solutions from which they can choose.

Sometimes PPE is not the problem at all. Simple changes to work-flow, positioning of workstations and division of labour can greatly reduce discomfort or chronic musculo-skeletal problems⁵:

- Reduction of movement (or an increase in intervals between movements, especially when carrying a load) significantly reduces fatigue and stress, which in turn reduces the rate of increase of body temperature, which reduces sweating and dehydration. It is far more efficient to bend and lift a 5 kilogram mass to an elevation of 1 metre once every 10 minutes than to stay in a bent or crouched position and throw a 10 gram mass 500 times, i.e., around once a second.
- Matching elevations between workstations with the use of pits, tables, and conveyors reduces the energy expended by workers. Lifting up a 5 kilogram mass to a height of 1 metre in 1 second (picking up a bucket of wet-waste and loading it into another container or a conveyor) requires 50 watts of power. Every time the task is performed, which in the case of a worker at a composting unit could be 500 times per day, a proportional amount of energy is wasted in the form of heat (the average thermodynamic efficiency of our bodies is approximately 25%). Instead, if the activity takes place at an angled conveyor placed in a 1 metre trough, the energy is saved and the worker does not experience heat stress.
- Optimisation of processes is not always intuitive. Sorting while seated cross-legged or on a chair when analysed as a biomechanical process is found to be more stressful and inefficient than sorting in a standing position. Small and repetitive reaching or grasping motions especially to the left and right (to a distance of, say, ½ metre) are effortless when a worker is standing; the same motions in a seated position require a worker to twist and bend her torso around the waist using relatively weaker muscles in the back.⁶ The same argument applies to those operations that require repetitive bending.
- Small changes can result in large improvements to the comfort and effi-

5 See THE P2P METHOD, APPLIED TO BACK-PAIN → [348].

6 This is a good time to teach participants a simple back exercise. See APPENDIX 4: DOCUMENTS AND TEMPLATES → [A-27] for a card that shows simple workplace exercises.



Image 143. A worker who operates a label-peeling station at a PET processing plant. She wears gloves on her left hand, not on her dominant right hand—only TYPE WW gloves and TYPE GP canvas gloves are available at the plant. She would use a TYPE DW polyurethane glove on her right hand if she knew about the pros and cons of the various gloves available in the market.

ciency of workers. In most cases these changes are inexpensive to implement. These changes often increase worker comfort to the point where the reduction in dexterity and efficiency (caused by TYPE WW gloves) becomes insignificant.

- Some optimisation processes can be initiated by the workers themselves, though very few will have the confidence or inclination to do so even if they identify a potentially beneficial tweak here and a little improvement there. Encourage AP to talk about their workplaces and procedures.

✦ THE P2P METHOD, APPLIED TO BACK-PAIN

Ensure that you understand a problem before exploring options and solutions. Always ask for clarifications. It is *your* job to define the problem statement accurately and comprehensively. The following exchange between you and a participant illustrates the process. Assume that a participant asks you the following question during module IV⁷:

[Q] I have back-pain. What medicines should I take?

It is easy to recommend an over-the-counter medication or a couple of back exercises but these are reactive measures. To find an effective solution, you need more information.

[M] *What work do you do?*

⁷ Health, nutrition and first-aid are discussed in Module IV. However, the solution to a participant's problem may lie elsewhere. Perhaps her back-pain is the result of lifting excessive loads at work? It is your job to find out.

[P] *I am a sorter in a private company.*

[M] *What do you sort and how long is your shift?*

[P] *I sort plastics. Mixed plastics mainly. We work for two to three hours in the morning and then take a break. We resume after lunch.*

[M] *How many people work with you?*

[P] *There are three of us.*

[M] *Do all of them have back pain?*

[P] *Yes. But mine is the worst. My younger colleagues do not suffer as much as I.*

The participant's answers indicate that her back-pain may be the result of a small repetitive stress. It could also be caused by lifting heavy weights. More information is required to establish the nature of the stress.

[M] *I assume that you sit on the floor when you sort?*

[P] *Yes.*

[M] *Can we have two volunteers to help us? Thank you. [Name], can you please show me how you sit and where you keep the incoming and sorted piles. If anyone wants a closer view, please come forward.⁸*

Observe their posture while they work. Ask yourself:

- Do they have to twist their torso repeatedly?
- Do they bend over while reaching for material or equipment?
- Do either of these motions cause a slight pain now, i.e., in the workshop?
- For how long are they seated in the same position?

👏 Does anyone else work in this position? Do you also have back pain like [Name]?

Proceed down the hierarchy of controls.

Can the procedure be eliminated? (No. Sorting is the primary job at hand.)

Can the procedure be modified to reduce its impact? Yes.

Twisting and bending can be eliminated by asking the volunteers to stand around a table or tables. Incoming and outgoing material can be placed inside a large shallow tray on the tables; sorted outgoing material can be placed in deep bins or buckets placed on either side of each sorter. Since these changes can be demonstrated, do so.

8 Demonstrate! Always demonstrate. Involve participants in the demonstrations.

- Is there space for a table?
- Is there a spare table available? Can one be purchased? Can a table be requisitioned temporarily for the job?
- Is the owner open to changing procedures at his or her workplace?
- Is the owner amenable to making an expenditure to improve workers' welfare and efficiency?

[P] *Yes. Our proprietor is a good person and would gladly buy a table for us.*

Note that the process of unpacking the problem with the participants has already demonstrated the relative effectiveness of different changes. Once the technical and procedural aspects of the problem have been clarified, re-state the problem and ask for consensus on the new problem-statement. As usual, begin with the most straightforward recommendations:

[M] *I think I understand now. [Name] has back problems because of [reasons: poor ergonomics or the workstation, incorrect working posture, and so on]. These can be addressed by [solutions found during the demonstration]. However, they do not have enough tables and they do not use an appropriate number of bins for outgoing material. But, it seems that the proprietor of the business is an amenable person and would be willing to change the procedure. [Other participant's names] also face similar problems. Is that correct?*

[P] *Yes.*

[M] *We still have to solve the problem of [Name's] back pain, which was her original question. The back exercise called planks⁹ will strengthen your back muscles and improve your posture.*

Demonstrate the exercise. Check if the participant can perform it correctly. If she is unable to do so, recommend that she rest her weight on the knees instead of her toes for the first two weeks. Recommend (and demonstrate) the appropriate yoga posture (*yogasana*). Massage and physiotherapy may also prove beneficial to the participant. A standard dose of paracetamol (400mg) or an anti-inflammatory like ibuprofen (200mg) will be effective and is safe to take for a day or two if the pain is unbearable; always recommend that participants consult a doctor before taking any medication, even for over-the-counter medicines.

Finally, establish that the participant feels that her problem was solved. Ask all participants if the process of solving her problem could be applied to solve similar problems that they might have.

§ PROCEDURAL AND COST-RELATED PROBLEMS.

1. Employers do not want to spend money on workers' safety and comfort: workers are often forced to work in the open, or indoors with no electricity; they performing sorting and micro-segregate operations while sitting on the floor requiring them to stretch and bend often, which results in fatigue and chronic pain.¹⁰

⁹ See APPENDIX 5: CARDS → [A-51].

¹⁰ The root of the problem is not a poor knowledge of ergonomics, but the penny-pinching work-culture of small busi-

2. They do not have easy access to drinking water or toilet facilities—PPE is often blamed for stress and fatigue when the root of the problem lies in inadequate facilities at the workplace. A supply of cold, clean drinking water, a comfortable ventilated rest-area, and clean toilets will alleviate some of the stress and fatigue faced by SWM workers. Good facilities improve workers' morale.
3. Breaks are essential to prevent chronic health problems; breaks improve morale.

✦ BE OPTIMAL, NOT FASTER OR SLOWER

P *My employer is insensitive, especially when it comes to improving working conditions.*

This thought is in the minds of many participants regardless of the actual working conditions or the attitude of their employer.¹¹ However, the fact that the participants are at the workshop indicates that their employer or organisation wants to change.

M *It is possible that your employers do not care. It is more likely that they do not know what to do to improve working conditions at their workshops. There also has to be an economic motive for them to invest in your comfort. Such employers, however, would not send you to this workshop!*

(The moderator decided to initiate EXERCISE 34 → [356] to demonstrate that working conditions can usually be made more comfortable without additional expense if the employer knows what has to be done. But first she tried to understand the nature of the problem.)

M *Can you describe the working conditions so that all of us understand the problem? Maybe someone here has a solution.*¹²

P *I work in a plastic-recycling plant. I cannot bear the heat. Our employer has given us ear-muffs to wear, but I cannot wear them for long because they are uncomfortable. If I don't wear them, I get headaches.*

M *Anybody else facing this problem. (A few participants raise their hands. Some do so reluctantly, because their supervisor is present.)*

M *It looks like all of you need a break every hour.*

P *You should say that to my employer.*

M *Not all of you at once. I am sure that the machinery can be adjusted to reduce the noise and heat. We can discuss that later, but I am certain that if each team-member takes a 15-minute break every hour, you can manage. How many people work in your team? How long do you work?*

nesses and knowledge from common-sense: owners do not invest in appropriate workstations; in the second case, workers often choose to sit on the floor even when there is a table available because they believe that *sitting is more comfortable*.

11 Focus on finding solutions instead of assigning blame. Initiate II①③ PERSPECTIVE PLAYBACK → [57], if required.

12 The moderator involves all participants in the discussion. When defining a problem statement, always involve the group.

[P] *There are four of us at the label removal machine. We have a three-hour morning shift, followed by lunch, and then another three hours before tea.*

[M] *(The moderator speaks to the supervisor) How many bottles does your team process in one hour? What exactly is the job being done by them?*

[P] *The machine does not always remove the label. We have to inspect the bottles that are ejected by the machine, check and remove the plastic ring¹³ which is missed by workers on the sorting conveyor, then send the bottle for crushing. If the label has not been removed, we put the bottle into the loading bin so that it can be passed through the machine again. The team must process about 20 bottles every minute.*

[M] *Why can't you ensure that the process to remove the cap and ring is 100%. Can you check this before feeding the label remover?*

[P] *That might be possible. But it would require an additional worker...*

[M] *What if we reduce the speed of the machine so that it spits out only 15 bottles a minute? That would allow one team member to take a 20-minute break every hour and work away from the machine. She could inspect the process output from the cap-removal line.*

[P] *But we have to meet the quota of 20 bottles a minute! (The supervisor looks nervous; the workers can barely hide their smiles.)*

[M] *Let's see what happens. If the machine speed is reduced, the number of failures, i.e., labelled bottles coming out of the machine will also be reduced. The rejection rate will then depend solely on the efficiency of the label-removal process inside the machine. Overall, I think the quota should be achieved.*

The supervisor agreed to test the moderator's solution. This case study shows the importance of understanding the process and the problem-statement in the context of the workplace and they can be fully understood only in context. The following exchanges between a moderator and participants illustrate the importance of understanding the context in which a problem exists:

[?] *I don't think these gloves will help me for the work that I do. I prefer not to use PPE.¹⁴*

RECOMMENDATION: Use the P2P method, as usual. Is she wearing appropriate gloves? Do they fit correctly? Is the problem linked to dexterity or discomfort or is it purely subjective—awkwardness, peer pressure and so on. Whenever you are faced with a question that is vague on details but confident that PPE is the cause, apologise for failing to find a solution and involve AP in the discussion:

[M] *We could not find a solution for [name]. Can anyone suggest options that [name] prefers?*

13 The HDPE ring attached to the base of the cap.

14 At the end of the P2P process if a participant insists that he or she cannot work with appropriate gloves, do not argue with them. They probably have a valid reason but are unable to explain it.

❓ I do not need gloves for the work I do.

RECOMMENDATION: Ask for details. It is possible that the work at hand does not require safety gloves. Woven cloth gloves might be enough. If you are certain that the work at hand is not dangerous it is correct to say that a particular job can be done without gloves but always add that cloth gloves would keep hands clean. (See A MOTHER'S TOUCH.→[355].)

❓ Our employer only buys one size or one type of gloves.

RECOMMENDATION: Encourage participants to engage with supportive employers.¹⁵ It is good that the employer buys gloves. Explain (or remind) participants that the purpose of buying gloves is different for the employer. Initiate II①④ PERSPECTIVE PLAYBACK→[57].

It is good that your employer buys gloves. But, it is always better to offer your employer a solution instead of confronting him with a problem. During lunch or after the workshop we can find the right size of gloves for you. Take them with you and ask your employer to get you the same kind of gloves. Remember that all gloves of a given EN rating cost roughly the same. Your employer should not object to purchasing gloves that fit your needs. These [name of brand or type or specific coating or texture] gloves are not easily available. This size is not available.¹⁶

RECOMMENDATION: This is a genuine problem caused by lack of demand. Branded gloves (3M® Handyman®, Mechanix®, Kutlass® etc.¹⁷) are of excellent quality but may not be stocked by sellers because they are relatively expensive. However, all these gloves are made by Chinese OEM manufacturers, all of whom invariably sell surplus stock of the same product stamped with their own brand. Several Indian manufacturers (Midas®, Gripwell® and others) make excellent gloves. As long as the glove has the appropriate EN 388 rating, it should be safe to use. The gloves in your kit might not be available in the city where you are or where the participant works.¹⁸ In such cases, speak to a local organisation or contact a pan-Indian resource centre like Hasiru Dala Innovations. Your assistant should quickly search the large online stores to check if the gloves are available and whether the seller offers discounts for bulk purchases. Availability of gloves of the right size and quality will improve in Tier II and Tier III cities as the SWM sector is modernized. The following categories of PPE, ordered by decreasing price and quality are available in India:

1. GENUINE, 'REPUTED-BRAND' PPE: Certified quality, relatively expensive.
2. FACTORY SURPLUS: Surplus produce is usually sold under the OEM factory's own brand at a lower price. 'Reputed-brand' quality at a lower price.
3. FACTORY SECONDS: PPE that meets safety standards but has cosmetic or other minor defects that are not acceptable to the brand-owner. Best value for money.
4. FACTORY REJECTS: A batch that fails certification for one or more *safety* reasons is

¹⁵ Always pivot the discussion towards finding solutions instead of assigning blame.

¹⁶ 📄 Unavailability of particular brands in the city. Your assistant should check online for availability during this discussion.

¹⁷ Hasiru Dala does not recommend any particular brand. Any brand that is certified to the EN388 standard, should be adequate. However, you must be practical. If your experience suggests that a brand should be recommended, then do so.

¹⁸ See @y7j2hzak. Your assistant should check the site for availability while you discuss the problem with the participant. Hasiru Dala has not received any money or other consideration for mentioning this site. It is listed because it has an extensive catalogue available for sale in India. The site loads fast and is easy to navigate.

diverted to the consumer market in developing countries. These are the cheapest branded gloves available and are suitable for material handling and other non-hazardous work.

5. **NON-CERTIFIED GLOVES:** Bottom rung, unbranded PPE that does not meet EN, ANSI or BIS safety standards. Made on cheap machines, with cheap materials for cheap consumers, these might be usable for material handling but should never be recommended for waste-handling.

[P] *Are these gloves any good for the work that I do?*

This question is very common. Wait for it, then ask all participants if they too have brought any PPE for inspection. Applying the P2P method results in a 5-stage process.

1. **INSPECT THE GLOVE.**¹⁹ Ask the participant about the specific tasks that she does at work. Ask if she faces any specific problems with the glove. If she does, discuss the problem as described earlier and formulate a problem-statement. Continue to step 2, below. If the worker does not face any problems, she is concerned about her safety. Keep this in mind and go to Step 5.
2. **VERIFY THAT THE GLOVE IS SUITED TO THE TASK.** If it isn't, recommend the appropriate TYPE DW, TYPE WW or TYPE GP glove for the task using the GLOVE RECOMMENDATION PROCEDURE → [146]. Proceed to Step 5 if the glove is suitable for the job at hand.
3. **IF THE GLOVE IS BRANDED** (and appropriate for the task), then it is likely to be a factory-reject. Recommend continuing with the same brand but purchasing from a different (larger, better stocked) shop. Go to Step 5.
4. **IF IT IS NOT A REPUTED BRAND,** Recommend a low-cost alternative from (2) to (4), above; else, recommend a reputed brand.
5. **Recommendation:** Ask if short-term costs are a limiting factor.²⁰ You should know the current prices of all types of gloves available *in the city* in which the participants work. This is easily done online.²¹ Recommend the cheapest glove that is adequate for the job at hand; mention the difference in price between the cheapest glove, and a branded, more durable glove in the mid-price range. Let the participant decide.

¹⁹ Usually the problem is caused by incorrect choice of gloves. Thin, nitrile TYPE WW gloves are often used for work that is better suited to a TYPE DW polyurethane glove, which is more durable.

²⁰ Never dismiss the influence of prices. Businesses must run to a budget; hard choices must be made sometimes. Your job is to help workers and business make informed choices. If the budget for gloves is too low, say so and recommend a minimum viable product. Remember that the glove manufacturing business is extremely competitive and it is highly unlikely that an appropriate glove for job at hand does not exist in every price-segment.

²¹ Many online business portals list the telephone numbers of manufacturers and retailers. Check the website and ring a few PPE retailers who sell in the city.



Image 144. Baida Gaikwad is a retired waste-worker from Pune, India.

EXERCISE 33: A MOTHER'S TOUCH.

Steps

- Ask a few participants in turn if their palms are rough or calloused.
- Explain that rough hands are common among people who work with their hands. Ask if they would prefer to have softer hands.
- Narrate the story of Baida-bai and her daughter.
- Ask participants if they have faced a similar situation.
- Explain that an inexpensive pair of TYPE GP canvas gloves will reduce calluses. These should be part of every worker's kit.

Baida Gaikwad's young daughter was half-asleep in her lap. The mother stroked her daughter's cheeks, which woke her up.

The young girl said, "Ma. Your hands are so rough. They woke me up."

Do not be melodramatic while telling this story. Waste-workers have many avatars—they are bread-winners, bread-makers, mothers, wives. The worker has rough hands, while the mother wishes her child would not flinch at her touch. In Module V, you will have the opportunity to discuss personal stories. **D**→**V**① **BEING LAXMI**→[V-3]: stories that the participants wish to tell.





Image 145. This worker separates polyethylene (mostly made out of HDPE) caps from PET bottles before she sells them. She also segregates clear PET bottles before sale. She gets a better price per kilogram for both PET and HDPE than her colleagues who sell whole bottles..

EXERCISE 34: KNOWLEDGE EQUALS PROFIT

Knowledge equals profit shows the importance of professional knowledge with an example of how professionals earn more money.¹ This exercise may also be included in VI@.

You will need:

- Two or three carbonated beverage PET bottles.
- A nipping tool.
- A pair of TYPE DW polyurethane gloves.
- Two pairs each of TYPE DW nitrile and TYPE GP cloth gloves.

Steps

1. Describe the different materials used in the bottle. (PET, LDPE etc)
2. Explain how micro-segregation increases the sale price per unit mass of waste.
3. Demonstrate how it impossible to perform the different actions required to separate the various components of a PET bottle without using tools and the wrong kind of glove.
4. Demonstrate a solution using three people, each performing a specific action—one removes the cap, the second nips the base, the third removes the base and strips the label.
5. Demonstrate the jobs is easier and faster if it is done standing at a table instead of seated, on the floor.

§ DISCUSSION

🗣️ Ask participants if they know of colleagues or co-workers who seem to earn more than them. Ask them if they know of colleagues and co-workers who started out as waste-pickers but are now running small scrap shops with employees of their own. * The difference in income is not merely the consequence of harder work or longer hours

¹ Also see IMAGE 152 → [363].



Image 146. The swm sector should adopt tried and tested assembly-line practices regarding tool-usage, workstation design and proper storage practices, all of which have been optimised over two hundred years, and can be adapted to swm workflows. The photograph shows a workstation that is part of a engine manufacturing line. Washers, nuts and bolts of different sizes are kept in different containers arranged in a matrix according to size.

but is achieved by the application of professional knowledge and information — those who earn more often work smarter, which usually means they have the energy to work harder as well.

In the hands of a professional, tools and equipment have greater value. A knife in the hands of a waste-picker is worth its weight in steel; in the hands of a cook it becomes more valuable; in the hands of a surgeon, it saves lives. Similarly, information and opportunity generate higher profits for a professional.





Image 147. MESSAGE 1: PROFESSIONALS THRIVE ON CHANGE. Laxmi and her husband live in Bengaluru. They have four children. She used to be a road-side scrap collector but wanted to do something better; she enrolled herself in a training course at Hasiru Dala and now she works at a composting plant in an apartment block in the same neighbourhood where she collected road scrap.

✦ FROM PERSON TO PROFESSIONAL

This case study consists of five motivational messages for participants and should be initiated at the end of the workshop by which time you should have refocused the central issue: *to use or not to use PPE is one of many decisions that SWM workers must make to survive in a rapidly changing field.* You may also use these messages as case studies when explaining motivational components of a solution.

§ WHAT DOES IT MEAN TO BE A PROFESSIONAL?

The most common definitions or descriptions of a professional rely on objective indicators: *'a professional has an advanced degree or works in a specialized field, or files taxes in such and such ITR form etc.'* Such definitions of professionalism can result in the incorrect attribution to a person, a quality that he or she does not possess. There is more to professionalism than a professional degree even though most professionals do possess one. Other definitions of the word are circular *'a professional is a person who displays the qualities of professionalism.'* The P2P workshop adopts an inclusive description of a professional that emphasises the agency and ability of individuals to change themselves. Hasiru Dala Innovations uses the following maxims to define a professional:

- Work, by definition, cannot exist unless something needs to be done; and *if something needs to be done, it ought to be done properly.*
- A professional strives *continually* to improve her knowledge and skills so as to do her work better— more efficiently, more economically, more elegantly, more profitably and so on. She never stops trying to improve and, consequently, the outcome of *work done properly* improves as she improves her skills.



Image 148. MESSAGE 2: SWM IS CHANGING NOW AND FAST. The photograph is of a PET bottle processing plant operated by Hasiru Dala Innovations. It processes 4 tons of PET, HDPE and LDPE every day. All workers in the plant are provided with appropriate PPE and must use it for the plant to remain compliant with various BIS and ISO safety regulations. Not using PPE is not an option.

- In the pursuit of continual improvements, a professional uses, adapts or invents appropriate tools, equipment, techniques, and procedures.¹

The ability to adapt to changes increases a person's options in a changing world. Professionals do not fear change because it brings with it new opportunities for applying their skills and improving their lives. They trust their ability to adapt to change faster than others.

§ THE SWM SECTOR NEEDS PROFESSIONALS.

☞ **F3:** Ask participants if any of them are qualified to work at the PET aggregation plant that they saw in the film. Ask if they would want to work in such a plant. Discuss the following:

Increased mechanization is inevitable. Jobs will be available only to those who can operate machines and use the correct equipment. Nowadays, even mundane jobs such as sweeping streets are done with the help of machines; in some cities, drains are cleaned with motorized equipment, housekeeping staff in shopping centres, hotels and offices must use machinery to complete their jobs efficiently and on schedule. Such options and opportunities are there for the taking and, as waste-workers, participants will be first in line to grasp these opportunities and benefit from the possibilities that they offer.²

¹ A layperson is not expected to know the difference between a Phillips screw, a Pozidriv® screw, and a JIS screw, all of which look similar. A professional, however, knows that a Phillips screwdriver will strip a Pozidriv® head; a professional will look at a stripped screw-head and wonder if she is using the correct tool.

² Decades of hard work by social-sector reformers and NGOs has resulted in government policies that give preferential employment to waste-workers in SWM initiatives.

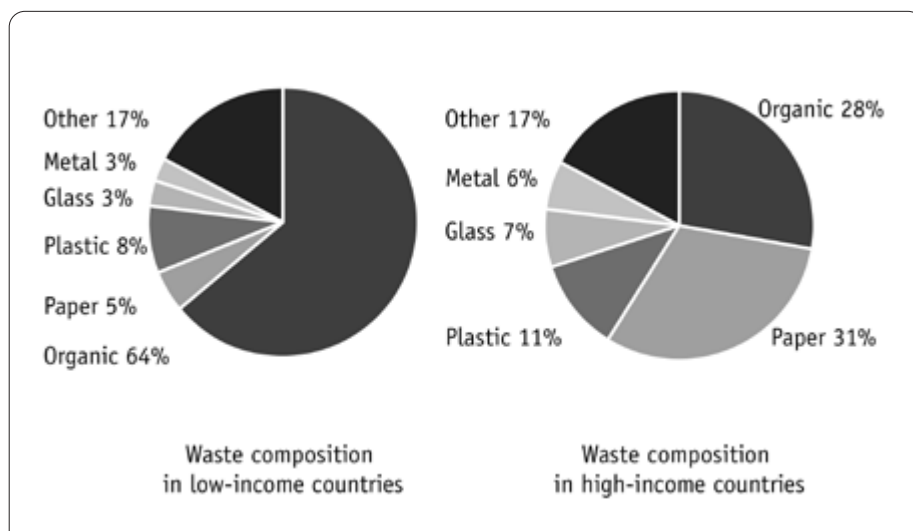


Image 149. MESSAGE 3: THE COMPOSITION OF WASTE IS CHANGING. One food delivery company in India made 1,400,000 deliveries every day in 2020, packed in aluminium foil, paper and cardboard boxes; the company did not exist in 2015. The composition of waste changes when average incomes rise. The figures shown are from a study done by the World Bank in 2019.

Opportunities exist for all categories of SWM professionals. Supervisors and managers with proven track records of improving efficiency will find better jobs—those with an entrepreneurial mind can establish their businesses; those who enjoy technical matters can become consultants and help others improve efficiency. The market is immense, and the technical expertise required to solve engineering problems is dispersed in the traditional engineering sector. (See *BE OPTIMAL, NOT FASTER OR SLOWER*, [351] for an example of how a consultant can improve efficiency in a mechanised plant, and earn a decent living in the process.) The best-paid technicians in the market are practical problem-solvers. Since the mechanised SWM industry is a relatively new field of work and is still considered a ‘lowly job’, ambitious self-taught technicians will not have to compete with their brothers and sisters who have engineering degrees. The SWM industry must and will embrace the expertise available in the fields of engineering and finance.

The knowledge and support from social-workers and NGO-s will remain important. The image of the poor waste-picker scrounging for scraps has already become outdated and the number of NGO-s that continue to promote the idea that they work with ‘marginalised women, etc.’ continues to diminish. NGO-s that have kept up with the changes in the SWM sector realise that SWM workers want more than solidarity—they want to be partners in a billion-dollar industry, and not beneficiaries of a thousand-dollar grant.

The economic space for itinerant scrap dealers, landfill waste-collectors and road-side waste-pickers is shrinking fast. These workers must learn new skills to remain relevant and employable in a changing SWM sector. Low-value waste is no longer economical to collect—even the poorest people do not collect road scrap.

Increased awareness of recycling among the middle class will lead to differences in the quality, quantity and availability of waste in cities. The quantity of thin plastics and polystyrene foam will decrease, the amounts of aluminium cans, cardboard, PET, paper, and e-waste will increase.



Image 150. (from Film 3) When caught watching tv on duty, Laxmi grumbles that Mrs. Annoying Voice is an ignorant, self-centred customer who does not segregate her household waste. However, she knows that the reprimand was deserved. So, she wears her gloves and goes back to work.

Source-segregation of waste and composting on-site will increase. Consequently, waste collected at source will be more valuable, by weight.

For numerous reasons—security, environmental regulations and tax benefits, among others—waste-collection from flats, offices, and business or retail complexes will be restricted to professional, accredited organisations working on contracts. These organisations will, in turn, require trained and certified swm professionals at all links in the value chain—handling, logistics, processors and so on—to get such contracts. E-waste processors will become suppliers of raw materials; swm workers skilled in the use of mechanised sorting equipment, and chemical- and mechanical-salvage methods will find new areas of employment.

Demand for professional consultants and specialised waste-handling service-providers from the government and private contractors will increase. Early adopters of professional methods and procedures will have the first movers' advantage. They will, literally, 'write the book' on new ways to integrate the knowledge from traditional finance and engineering to processes in the swm industry.

Today, anyone on the job market can become a waste-worker; an unskilled worker can be replaced by younger, desperate job seekers. It will not be this easy in the future. Consequently, wages will increase in the organized swm sector simply because a trained professional can only be replaced by a similarly trained professional.³

☪ Does anyone remember Mrs. Annoying Voice?⁴ Discuss the difference between Laxmi's reaction to Mrs. Annoying Voice in **F** 1 and **F** 3.

Some people do not care if a waste-worker is working hard under difficult conditions.

³ The link between knowledge and profit was discussed earlier in to demonstrate the economic advantage of professionalism. If the finance modules are part of the programme, the material in V1② COST, PRICE, AND VALUE → [443], may be included in this discussion.

⁴ Use the name given by the participants to Mrs. Annoying Voice in the first activity.

Saralam Shek	Site Helper	General	9:00 am to 5:30 pm
Amir Shek	Site Helper	General	9:00 am to 5:30 pm
Mathi Shek	Site Helper	General	9:00 am to 5:30 pm
Babul Dewan	Site Helper	General	9:00 am to 5:30 pm
Lakshmi Babu	Sorter	General	9:00 am to 5:30 pm
Sagaya Merry	Sorter	General	9:00 am to 5:30 pm
Ponni	Sorter	General	9:00 am to 5:30 pm
Nagamani	Sorter	General	9:00 am to 5:30 pm

Lakshmi Devi K	Sorter	General	9:00 am to 5:30 pm
Lakshmi Ramachandramma K	Sorter	General	9:00 am to 5:30 pm
Annapurna	Sorter	General	9:00 am to 5:30 pm
Maheswari	Sorter	General	9:00 am to 5:30 pm
Ramesh Govardhan	Composting	General	9:00 am to 5:30 pm
Rajal	Composting	General	9:00 am to 5:30 pm

Image 151. MESSAGE 4: PROFESSIONAL SWM WORK IS A PROPER JOB. At ELCITA in Bengaluru, waste-workers have fixed work-shifts, appropriate designations, salary slips, PPF accounts, annual paid leave and health insurance.

All they care about is that their waste is handled properly.

Does it matter if people feel sorry for you? Mrs. Annoying Voice will not change her attitude towards your work even if she feels sorry for you as 'a poor person.' But if you can take care of yourself and do your job like a professional, her attitude will begin to change.

☞ Imagine that you have two clients.⁵ The first segregates her waste correctly according to the law, pays your fees on time, but does not engage in small-talk or even look at you. The second talks with you nicely, asks about your health, and occasionally offers you a cup of tea; however, she refuses to segregate her waste and never pays you on time. Which of these clients would you prefer as a working professional? A waste-worker's relationship with society (including people like Mrs. Annoying Voice) is, essentially, a relationship between a client and a service-provider. It is transactional. There is nothing wrong with such a relationship as long as both parties behave cordially with each other. A professional should not expect to be treated with compassion merely because she is poor; interpersonal relationships are a different matter. (Also see II④③ TRYING TO STEREOTYPE→[108].)

In **■1** Laxmi was perfectly within her rights to ignore Mrs. Annoying Voice. It is not Laxmi's job to take care of the woman's dog. However, in **■3**, Mrs. Annoying Voice is correct. While her manner is crude and boorish, she is within her rights to berate Laxmi in this situation. Laxmi's response is also correct. She stops watching the TV, puts on her gloves and goes back to work. She does so even as she explains that Mrs. Annoying Voice does not segregate her household waste, which is mandatory by law.

5 An opportunity to use II①④ PERSPECTIVE PLAYBACK→[57].



Image 152. MESSAGE 5: THERE IS MONEY TO BE MADE IN SWM. Baida Gaikwad (not her namesake, in Image 48) was once a door-to-door waste-collector. She did not have any technical skills but she had a sharp nose for profit, was fast at arithmetic and had access to 200 ft² of storage space in front of her house. She figured out the relationship between available storage space at local scrap shops, the monthly rentals for transport and the variations in purchase prices of various kinds of scrap. She now owns two waste-collection vans, one rickshaw, and a scrap sorting yard with rain-proof storage. She employs 14 people. She did not relinquish her door-to-door job either. She has sub-contracted the work to a family member! [Author's note: Baida Gaikwad passed away during the Covid-19 epidemic of 2020, a few days before the first edition of the handbook was published.]

*Laxmi behaves like a professional—she does her duty properly even if others do not.
Most of you are like her.*

The interaction between clients and workers changes when the latter are perceived as professionals. Mrs. Annoying Voice's attitude would also change if Laxmi worked for a large waste-management company. She would, in this case, be told by the supervisor that the company was not being paid to clean up after the dog.

§ SWM PROFESSIONALS AS ENTREPRENEURS.

Professionals earn more than wage-workers doing the same job. The price of unskilled labour is determined by time spent on the job. In contrast, a professional worker earns a higher hourly (or daily) rate in addition to a flat surcharge that is determined by the knowledge, experience and the equipment required to carry out that job.

Professionals have the ability to start and perpetuate a cycle of learning and earning. They learn new skills, use the skills to earn more per hour, invest the extra time into learning more skills and so on. 'Rags to riches' is literally true in the case of many professionals in the SWM sector. Professionals like Baida Gaikwad (see IMAGE 152) are job-creators. This is not to say that all SWM professionals have the ability or the desire to become entrepreneurs, but merely that they have the opportunity to do so.



Image 153. MESSAGE 6: PROFESSIONALISM CHANGES HOW YOU INTERACT WITH THE WORLD. The photograph is of Satvashila Potekar and her mother. Up until two years before the photograph was taken, both used to collect waste from the streets. (Also see IMAGE 154.)

§ PROFESSIONALISM IN THE SWM SECTOR.

What does it mean to be a professional? Ask participants if they noticed that the workers at ELCITA are all given designations. (See IMAGE 151→[362].) Would it matter to them? Do they feel that Karthik, the man on the motorcycle, is a professional?⁶

F3: Ask participants to compare the attitude and appearance of the workers at ELCITA to those who work at Lokman's shed. They all do the same job, but is there anything different?

Being willing to work is not enough, one must know how to work; knowing is not enough, one must apply this knowledge; being called a professional is not enough, one must be a professional.

☹ Invite OPINION ON IMAGE 153→[364]. Is there any difference between the mother and daughter?

Ignore the uniform. Look at their expressions. Look at the expression on the woman in IMAGE 152→[363]. Look at Laxmi's expression on the cover of this book and on the back. The quiet confidence on their faces is unmistakable. They believe in their ability to change and it shows. You will meet all kinds of workers in P2P workshops and while interacting with AP is fun and rewarding, do watch out for EP with an expression of quiet confidence. You might meet them again: with a résumé in hand, asking them to commission a P2P workshop for their employees.

6 Recall the case study of Karthik. Imagine him complaining about poor dexterity at the workshop...What might he say?



Image 154. Satvashila Potekar is a garbage-lorry driver working for a private waste-collection company in Pimpri Chinchwad, India—she was the first woman to complete the training programme. At home she is a soft-spoken, shy single mother of two boys; behind the wheel, she transforms into a confident person, expertly manoeuvring her large lorry through narrow streets. Satvashila's mother still collects waste on the streets....



Image 155. This young man was happy to receive free gloves from his employer. He does not know that his gloves are the wrong type for the work he does; he does not seem to care or know that his left glove is one size larger than his right glove... At a P2P workshop, he might complain that he cannot work with gloves and you would find a simple, technical solution to his problem. Imagine his smile when you do so!

IV. Laxmi falls ill



Objectives of this module

- Establish that prevention of disease and accidental injury (by using PPE and taking appropriate precautions) is the most effective health-care system.
- Establish that diseases can be more harmful than a physical injury.
- Participants know how to use a first-aid kit.
- Strengthen the idea of Laxmi as an SWM professional.

Indicators

- Consensus that prevention is better than cure.
- Consensus that PPE is cheaper than a visit to a hospital.
- Consensus that basic knowledge of first-aid and nutrition saves money.

Notes

- LAXMI FALLS ILL is about health and safety at work. It establishes that safety and income are linked.
- At the end of this module, Laxmi's story is at a crossroads. She uses PPE and she is aware of its benefits. However, she devalues the importance of keeping herself healthy both as a professional and a person. She still considers her health solely in the context of short-term costs. The consequences of her attitude are discussed in this module.

Workshop Programme

- This module contains all health-related topics to be discussed at the P2P workshop.
- If you decide to skip this module but not the finance modules (V, VI and VII), the film *Laxmi falls ill* is optional. You may skip the film, initiate IV ① INJURY → [369], then proceed to V ① BEING LAXMI → [415].
- If the finance modules are not included at all, include all activities in this module except IV ② THE COST OF INJURY → [373]; after these are completed, screen the film *Laxmi tells a story*, and conclude the workshop with VII ② GOODBYE, LAXMI → [503].
- If a medical doctor is present during the workshop, begin with ③ AM I ILL? → [380], then ⑥ FIRST-AID → [395], ⑤ A BALANCED DIET → [391] and, optionally, end either with III ⑥ ④ DO YOU NEED ARCH SUPPORT? → [213] or the exercise HOW TO WASH HANDS → [266]. Allow the participants to interact with the doctor as much as possible.
- If most of the participants do not cook their meals, skip ⑤ A BALANCED DIET → [391]; you may skip this activity at a workshop whenever time is running short.

ACTIVITY 1

Injury

Objectives

- Establish that workplace injuries are unforeseen and that PPE is the first line of defence against injury.
- Establish that preventing an injury is less expensive than paying for treatment.

Slides

- [S]1: Foot injury caused by glass.
- [S]2: Loss of finger due to gangrene.
- [S]3: Puncture wound caused by metal fragment.
- [S]4: Puncture caused by nail.
- [S]5: Injury from e-waste.
- [S]6: Loss of all fingers from shredder.
- [S]7: Screen-grab of Lokman.¹

Steps

1. Display [S]1 - [S]6 and discuss each injury.
2. Display [S]7 and discuss the comparative costs of PPE vs. treatment.

Notes

- [S]1 - [S]6 each shows an accidental workplace injury suffered by a waste-worker in India. In each of these cases, inexpensive PPE would have saved them from injury.² In all cases, an appropriate engineering control would also have worked.
- After displaying each slide, ask participants if they have seen an injury similar to the one shown. If a participant mentions that she was injured, ask her to narrate the incident—What happened? What did it cost?
- Ask skilled swm workers and other participants with technical training to apply the HHC to the problem shown in each slide.

Workshop programme

- Try to include this activity be included in all workshops, even if health and OHS are not part of the workshop programme.

¹ Add as many extra slides as needed for this discussion.

² While showing these do not mention that PPE would have prevented these injuries. Let participants decide.



Image 156. (Slide 1). The worker moved a stack of fluorescent tubes which shattered and slashed his feet. He had to pay for medical treatment and could not work for two weeks.

DISCUSSION

☐1: A worker wearing slippers cut his feet while handling a stack of fluorescent tubes. He was wearing gloves, which protected his hands; he was not wearing safety shoes. The waste-worker did the right thing by seeking medical attention immediately. He returned to work in a few days. Twisted ankles caused by trips and falls are common. These cannot be prevented by PPE and are best handled by administrative and engineering controls; the severity of foot injuries (including crush injuries) can be reduced or prevented by appropriate PPE. (See III⑥ SAFETY SHOES AND HELMETS →[203].)

☐2: A worker employed as a door-to-door waste collector was injured by a small piece of glass in the mixed waste that he was sorting. It was not a major injury and the worker continued working without paying any attention to the wound. It remained untreated all day. The worker did not bandage the wound, nor did he protect the wound with surgical gloves the next day. The wound became infected. By the time the worker decided to get treatment, the flesh had become gangrenous. Gangrene is the medical term for the death of tissue caused by lack of blood supply. It is a common consequence of untreated wounds. The finger had to be amputated to save the rest of his hand.¹

🕒 Why did the worker shown in ☐2 not visit a doctor?²

🕒 Was it because the injury was minimal?³

Thousands of SWM workers sustain minor nicks and cuts everyday. Most of them heal within a few days with minimal care. Washing the wound with antiseptic and covering it with plaster is enough in most cases. However, SWM workers face the additional

¹ See @cfqwpc.

² ➡④: All questions about first-aid or, initiate ⑥ FIRST-AID →[395] immediately after the question.

³ The cost of treatment as well as any resultant loss of income are consequences of injury. This topic is also discussed in VI②, with an emphasis on finances.



Image 158. (Slide 2). Ignoring a small injury can lead to severe disabilities.

hazard of infection, which can transform a minor wound into a life-threatening disease.

☐3: A worker was sorting plastic packing material. A sharp nylon band snapped and slashed her hand. She needed stitches, and could not work for a week. She was extremely lucky because the band could have slashed her face and damaged her eyes. She had been sorting this kind of plastic waste for more than a decade and had never been injured.

☐4: A worker got nicked by a sharp object while sorting—it could have been a nail or a piece of glass or something else: he does not remember because he did not notice the injury. The wound is similar to the one shown in ☐2. Luckily, he attended a health camp and was treated before the infection spread any further.

☐5: A contract worker at a micro-segregation facility was stripping metal bases from fluorescent lamps. His grip failed, and a metal shard sliced through the palm of his hand. He was unable to work for months and will probably never regain full dexterity. The severity of such injuries can be avoided by wearing the correct PPE and using the appropriate tools and jigs for the job at hand.

☐6: This worker's hand was pulled into a wood-chipper. He is right-handed. His working days are over. Machinery such as chippers and composters must always be operated with the correct tools. Push sticks should always be used when working with wood-chippers; composters and other machinery that is prone to frequent



Image 157. (Slide 6). This worker was temporarily blinded by a wood-chip. His fingers were pulled into the wood-chipper.

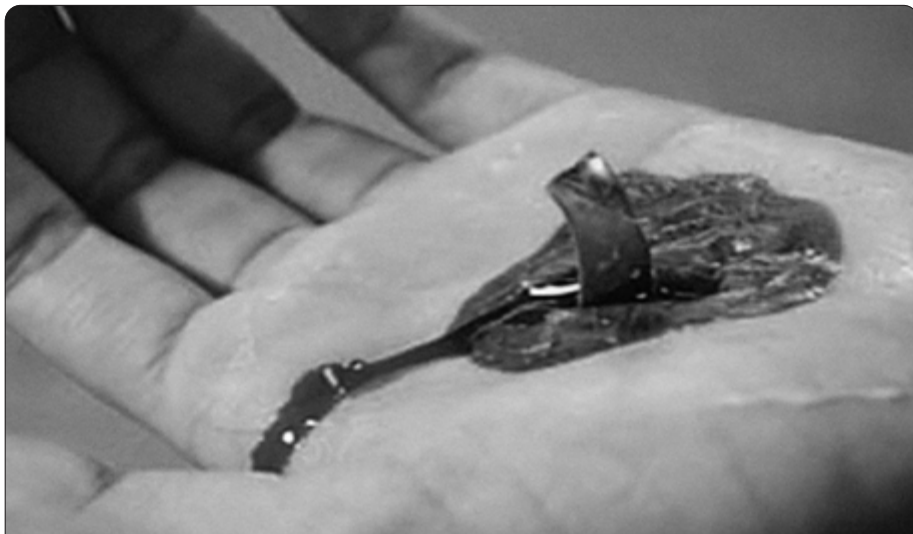


Image 159. (Slide 5). Accident at an e-waste unit. The worker was exposed to a small amount of mercury present in the fluorescent tube that he was dismantling.

jamming should be turned off before clearing the blockage. Appropriate lock-out, tag-out devices should be used while performing maintenance. (See III②⑥ MECHANISED SWM OPERATIONS → [45] and II①④ THE HIERARCHY OF HAZARD CONTROL → [79].)

§ WHO IS RESPONSIBLE FOR INJURIES?

❓ In the case of 55, was it the employer's fault or the worker's fault? Does assigning blame solve the problem? Whatever the case, loss of income should be included when calculating the cost of accidental injury and illness.⁴ In the case of the unfortunate worker in 56, what might this cost be?

■ 3: Does anyone remember what Lokman said in the film? “*I do not want others to suffer my fate.*”

Lokman's hand was injured while loading. Treatment cost him ₹20,000. He was unable to drive his van and had to pay a replacement driver. He lost goodwill because the replacement was not a good worker. The cost of Lokman's injury to his clients was the price he charged for his work plus the hassle of uncollected garbage for two days; the value of his health (or the negative value of injury) to him was far more than the hospital cost. Loss of goodwill has far reaching consequences.

⁴ Check your notes from II①. If someone had mentioned that she was injured, ask her to narrate how much it cost to treat the injury. Also ask if he or she agrees with Lokman.

ACTIVITY 2

The cost of injury

Objective

- Realise what the concepts of cost, price and value mean in the context of personal health and safety.
- Explore the overlap between personal responsibility and financial liability in the context of health and safety.

Steps

1. Initiate Perspective Playback¹ with 5 volunteers.
2. They are to play a waste-worker, an injured waste-worker, a company owner, and Laxmi.
3. Discuss the participants' responses to each perspective.

Notes

- The value of a worker's health and safety is discussed purely as a function of the *cost* of PPE to different actors. The *value* of health and safety is discussed in VI②④ THE VALUE OF HEALTH → [451], in which prudent expenses to stay healthy are shown to be an investment. The difference is important to make, but there might not be the time to do so.
- This may be a post-lunch session and attention spans will be low at this point. Watch out for flagging attention and droopy eyelids. Initiate a simple stretching exercise to perk up the participants if necessary.
- This activity is placed before the activities on treatment. Do not change the order unless the workshop is specifically focussed on First Aid and a medical doctor is present at the workshop, in which case you should allow participants to interact with her as much as possible. Helping participants understanding the long-term impacts of ignoring their health is far more important in the context of this workshop. Participants should realise that a healthy body is an economic asset.

Workshop Programme

- This activity is the first of two that address the financial aspects of illness. The second one is VI②④ THE VALUE OF HEALTH → [451]. You may choose to skip this activity if the financial modules are not included in the workshop.

1 See II①④ PERSPECTIVE PLAYBACK → [57] for the rules of the game. If you have used the tool previously, you need not explain the rules, merely refer to the earlier activity and mention that the characters have changed. As is usual, write down the names that participants give to their characters.



Image 160. (from Film 3) Laxmi has injured herself but does not want to consider wearing gloves.

DISCUSSION

The dialogue for Perspective Playback is as follows:

1. *Good-quality TYPE DW dry-waste sorting gloves cost ₹30 each. I can have three cups of tea if I do not buy gloves.*
2. *The doctor's fee is ₹300. If I had gloves, I would have saved ₹270.*
3. *I have forty workers. It will cost me ₹3000 every month to buy them gloves. If someone gets injured, I'll just pay the doctor's fee of ₹300. What is wrong with that?*
4. *I could not work for 1 month because I injured my hand. The employer paid the doctor's fee and even paid me a month's wages. But he gave my job to someone and she is not willing to leave... My employer says that my replacement is a good worker who is willing to work overtime. He does not want to fire her. Why should he? If I was in his place, I might do the same.*
5. *I'm lucky to get this job. Someone got injured. She was careless. I had better be careful and buy some sturdy leather gloves. I don't want to lose this job!*

Ask the participants to identify and describe each character according to the rules of Perspective Playback. Discuss the following about the different *values* of a pair of TYPE DW gloves that *costs* ₹30 (average-quality gloves) and ₹70 (premium gloves):

- To someone who is not injured, it is the equivalent to the value (lost enjoyment?) of drinking 7 fewer cups of tea. Or 3 cups in the case of an average 4121 glove¹ that cost ₹30.

1 What does 4121 mean? See ② EN388 AND OTHER GLOVE STANDARDS [125].



Image 161. Lokman, spent ₹20,000 on treatment and lost ₹100,000 in income. “Do not hire Lokman. He worked for one week and then disappeared. My garbage piled up for three days... I will not renew his contract.”

- To an employer, the cost per worker per week to buy gloves is the same—around ₹20 or less if the gloves are durable. However, the cost he is willing to pay is ₹300 to a doctor, which is $\frac{1}{8}$ of the cost of gloves for all workers. Remember that the worker was unskilled, and was easily replaced! If the worker was skilled, the cost of replacement would be in the thousands—the cost of gloves for *all* workers may be a hundred times lower than the value (lost) if a *single* skilled worker is injured.²

(Situation 1, where cost of gloves to the employer < value of the employee.) Laxmi doesn't have any skills. If she's injured, I'll hire someone else. It doesn't matter. I don't care.

(Situation 2, where value of the employee >> cost of gloves.) If Maheshwari gets injured then I have to find someone else who knows how to operate the compactor. It's cheaper to buy good PPE for everyone than to risk the loss of a worker like her.

The cost of a glove-kit that is appropriate for Laxmi's work is ₹30–₹150 (see STANDARD GLOVE-KIT_→[40]). However, Laxmi claims that she is tough and does not need gloves!

❓ What is the value of Laxmi's injury *to her* compared to the cost of gloves?


Laxmi is willing to pay the cost of injury to gain the benefits of being perceived as tough. Only Laxmi should decide whether or not the cost was justified because she is the one paying the price. Cross reference their responses here with what they said in II①.

🕒 Do participants also agree that the cost is justified? Laxmi's perspective on the cost ought to be accepted as valid — participants may disagree with her valuation, but establish consensus that it is Laxmi's decision. If the discussion on this matter engages $\frac{1}{4}$ of the participants, you have done well!

2 **D**_→ VI②: Any questions that require a dive into the economics of cost, price and value.

- ☹ How much does a waste-worker earn every month?³ If she cannot work for a month because of injury, she has effectively *lost* this money.⁴
- ☹ Imagine Laxmi in the place of the worker who lost her job. Then imagine a twin-sister of Laxmi in the place of the new worker. What would they say to each other?


A different perspective changes ones opinions. This idea was seeded in II④. Water the seed by using of the word 'avatar' instead of 'perspective': it will subtly establish the concepts to be explored later in Module V.

 Laxmi the waste-worker, Laxmi the wife, Laxmi the mother and Laxmi the woman are all the same person.


When you discuss cost, price and value (different perspectives of the same object), provoke the participants to evaluate the cost of criticism.


I do not want to criticize Laxmi. She's a fine person. But what about Laxmi the Professional? Can we discuss her choices critically? She is just a character in a film — Yes, she is a real person, and a waste-picker and a professional. But now that you accept her as one of your own you are unwilling to criticize her! Do you see the importance of perspective?

This activity introduces the concept of long-term thinking which you should raise during the discussion.

 A decision might seem good now and OK in the near future but it could be disastrous in the long-term. Describe five examples of such decisions.

II②③ THE ACCIDENT → [377] can be used to demonstrate that a low-risk job or task done often enough should be considered a high-risk job.

3  Note down the range of values. These will be useful in V② and VI② to show that there is an aspect of negotiation contained within the definition of cost, price and value.

4  The participants' names and their income.

ACTIVITY 2A

The Accident

Objective

- Know that if a hazard exists, someone will get hurt.

You will need

- A broken bulb (use the one from II①LAXMI'S CHALLENGE→[51].)

Steps

1. Ask the participants to stand in a semi-circle as shown in IMAGE 162→[378].
2. Hold the broken bulb in your right hand pointing towards the participants and explain that it represents an accident that might happen.
3. Slowly move the bulb in a semi-circle from right to left or from the middle to either side and back. Ask a volunteer to close her eyes (or turn away from you) and start counting aloud: she must begin at one and count up to any number between one and ten. Do not let her see where the bottle is pointed when she begins. She should say "Stop" out loud and may then open her eyes.
4. See if the bulb is pointing at the volunteer.
5. Ask for another volunteer and repeat the experiment.

Notes

- Wear TYPE DW gloves for this activity. Participants should all stand in a semi-circle in front of you.
- This activity can be used whenever you wish to explain a statistical concept. Chance events, set theory, conditional probabilities, and other inferences that require the use of Bayes' theorem can be explained using this activity.
- Variations of the activity can be used for different scenarios, e.g., suppose you wish to demonstrate the difference in the risks, as a group, faced by team of 10 people who use PPE, and a selection of 20 individuals in which only a random selection of ten people choose to use PPE. First, play the game 5 times and note down who was selected (by the broken bottle); then ask participants to re-arrange themselves in an arc on either side of the centre—those with even numbered name tags on the left, those with odd-numbered name tags on the right. Play the game 5 times again. Explain the results.



Image 162. THE ACCIDENT is useful to explain that the probability of an accident at work is higher for waste-workers.

DISCUSSION

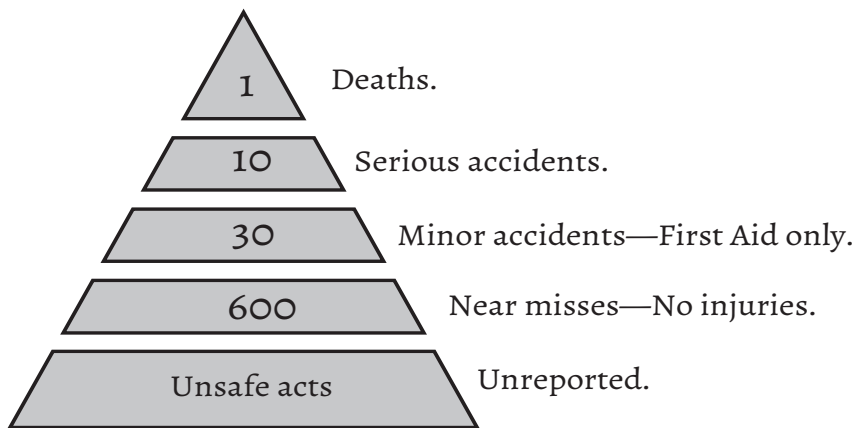
This activity demonstrates that the probability for an accident increases both with the number of people involved, and the number of days a person is at risk:

- It is difficult to predict who will get hurt.
- Someone always gets exposed to a hazard. If the game were repeated over and over, everyone would get hurt.
- The chance of getting hurt is not the same as the chance of exposure to the hazard.

There are thousands of swm workers in a city like Bangalore or Pune; around 100 people are involved with a work-related accident *everyday*. In most cases, they are not injured and these accidents are rarely reported; around 10% of these accidents result in minor or negligible injuries. Note that a 'minor injury' as defined by an swm worker or any manual labourer in India, may not be considered 'minor' by a doctor or someone at a desk-job. IMAGE 158 → [371] shows the consequences of ignoring a minor injury. This is not to say that all minor wounds will become gangrenous; the probability of this outcome depends on whether the wound was cleaned and taped before resuming work, and whether the wound was shielded from infection while it healed. This might sound like too much of a fuss but you must remember that swm workers handle potentially infectious waste for many hours everyday! Washing an injury with antiseptic and applying sticky-tape reduces the risk of infection; the use of appropriate gloves and tools reduces the risk of injury...

- ☹ Why do you think the people in these slides did not use PPE?
- ☹ Why did the worker in [5] have to suffer because his employer did not provide him with gloves? Can the employer argue that the worker could have bought TYPE DW gloves with D-rated¹ cut-resistance (which cost around ₹120) for his use and claimed reimbursement? What about the worker in [6]?

1 See IMAGE 50 → [129].



Heinrich-Bird Accident Triangle

Image 163. The Accident Triangle was first proposed by in 1931 by Herbert William Heinrich in his book *Industrial Accident Prevention: A Scientific Approach*. He found that the relative ratio of the severity of accidents (major to minor to no-injury) was 1:29:300. Frank Bird extended Heinrich's research in 1966. His results are shown in the image. See @r34vy2x.

📖 The Heinrich-Bird Accident Triangle shows that for every serious injury or death caused by a (potentially fatal) hazard there are approximately 600 incidents that do not cause any injury, e.g., many workers may stumble on a trip hazard at the workplace without injury, a few may fall and suffer minor bruising or a sprain, one worker may fall and break her foot. Heinrich also found that 80-90% of accidents were caused by human error; a 1996 study by Salimen and Tallberg (see @yckz38es) pushed this figure to 84-94%. Heinrich's work made the bold claim that reducing the number of high-frequency accidents (that result in no injury) automatically lowers the number of high-severity injuries, i.e., there was a common 'hazard' resulting in both low- and high-severity injuries. This claim has been disproved by data collected over the decades after his findings were first published. Unfortunately, many ohs professionals remain obsessed with low-severity risks in the hope that the high-severity incidents will magically disappear. However, the ratio of 1:10:30:600 is generally held to be accurate and indicates that if a single minor or serious injury has occurred at a workplace there are likely to be numerous cases of accidents (both related and unrelated to the injury) that occurred but were not reported. The situation is particularly true of the swm industry in India, which does not use ohs systems and lacks any safety culture.

ACTIVITY 3

Am I ill?

Objective

- Know the symptoms and signs of common diseases.
- Know basic treatment.
- Know when to visit a doctor.

Slides

- [5]1: Laxmi lying in bed with fever

Steps

1. Explain the difference between a disease and its signs and symptoms.
2. Explain what to do when symptoms appear.
3. Explain how PPE usage can reduce the frequency of illness.

Notes

- This is not a medical guide; you are not a doctor. You will lose the attention of the participants if you begin to talk about, say, aerial pathogens or water-borne diseases. Concentrate on symptoms and initial home-treatment. You do not have to read out the list.

Workshop Programme

- If a medical doctor is present at the workshop, begin with this activity. Allow as much time as needed, or follow the doctor's lead.
- If a medical doctor is not present, wrap up this activity in 5-10 minutes.



Image 164. (from Film 4) Both Laxmi and Kutty showed the signs and symptoms of severe influenza, which can be fatal if the patient is malnourished, elderly or has weak immunity. Covid-19 (the epidemic of 2020) presents with symptoms similar to the ones shown in the film.

DISCUSSION

🗨️ The difference between a disease, a symptom and a sign:

A **DISEASE** is a condition that causes illness. It could be an infectious disease (like pneumonia), or it could be a disease caused by a disorder of organs (such as diabetes), or the wear and tear of body parts (such as heart disease, arthritis, etc).

A **SYMPTOM** is what the person with the disease experiences as a consequence of the disease. Examples are: pain, nausea, dizziness, fatigue, bad taste in the mouth, blurred vision, etc. It is a subjective manifestation of the disorder that is reported by the patient because only they experience it.

A **SIGN** is an objectively verifiable symptom. High temperature, high blood pressure, fast pulse, red skin, excessive perspiration, a broken bone in an x-ray image are examples of signs.

When you have a high temperature, it could be a sign of influenza.

Dizziness could be a symptom of, say, an ear infection or simply dehydration.

Chicken pox is a disease caused by a virus, its most common sign is the presence of distinctive blisters accompanied by symptoms of fatigue and headaches.

Most people refer to a symptom or a sign as the disease itself. 'Diarrhoea' and 'stomach pain' are a sign and symptom (respectively) of gastroenteritis. Stomach pain on its own can be a symptom of something else. Medical science can cure most diseases; it can reduce or control the effects of many incurable disease. However, there are some diseases that can neither be controlled nor cured.



Image 165. (from Film 4) The first sign of Laxmi's trouble began with a sneeze. She fell ill; Kutty fell ill and had to be hospitalised; Shahrukh and Kutty both missed school; Laxmi has to incur a debt to pay for Kutty's treatment.

F4: Why does the film not show Laxmi cutting her hand in this module on health?

We have all seen colleagues who have terrible wounds and injuries. All of you have been injured, some of you have been injured seriously. But this film shows a sneeze. Just one sneeze and everything falls apart. Do you find it odd?

A severe illness can be as bad as a deep wound. Unlike a wound, however, illness can be treated effectively if it is detected early; in many cases, PPE can help to prevent diseases entirely. Explain the concept of infection and re-introduce the idea of long-term thinking:

Infection does not always begin with a spurt of blood or unconsciousness. In most cases, the first sign of serious infection is a sneeze, or a runny nose or a mild fever. Bacteria are transferred to your hands whenever you touch waste. If you wipe your face, the bacteria are relocated to the skin near your nose and mouth. This can cause infection — and this is why SWM workers should wear gloves. Some infections such as Covid-19 are transmitted by airborne droplets, which is why you ought to wear masks.

A healthy body can ward off invading bacteria or viruses 998 times out of 1000—which is why the average person does not fall ill all the time even though everyone comes into contact with harmful pathogens daily. Consequently, the average person is ill perhaps once or twice every 1000 days. The risk of contracting a disease is proportional to duration of exposure to a pathogen. The average SWM worker's daily exposure to pathogens is approximately 100 times that of the average office-goer. (See ②③ THE ACCIDENT → [377].) Indeed, anyone who lives and works in unhygienic environments is at risk.

You have to think about preventing disease as a long-term project. Your gloves, masks and aprons will reduce the chance of disease transmission. They protect you in the long-term.

☹ How many times, during the past year did you fall ill?

Explain briefly the symptoms and signs of common diseases. Begin by asking participants if they have shown the following signs and symptoms:

1. Stuffy nose
2. Sore Throat
3. Coughing
4. Sneezing
5. Nausea

Explain that these are all symptoms of easily preventable diseases. Use the vernacular term (*dast*, *abishar* and so on) even if the term describes a symptom or a sign. Clarity is more important than medical accuracy. *Bukhaar*, *jadr*, and so on all mean ‘elevated temperature’ and are a sign of influenza and many other diseases, but they usually refer to influenza. *Sardi*, *jhukham* and so on refer to a ‘stuffy nose’ or a ‘runny nose’ and could be symptoms of many conditions but usually refer to the common cold.

§ COMMON COLD

A runny or stuffy nose, sore throat, coughing and sneezing are typical symptoms. Fatigue, a slight fever and headaches may also occur. Common cold is caused by a family of viruses and is usually spread through water and mucus droplets containing the virus, which live in the patients respiratory tract and are released into the air when the patient exhales.

§ COVID-19

Fever, followed by a dry cough, fatigue and the loss of smell and taste are the early symptoms. In most cases, the patient recovers within a week. If the disease progresses, the patient may experience body ache, shortness of breath and pressure in the chest. At this stage medical intervention is essential, since the patient may need oxygen or other breathing support. Covid-19 is caused by is caused by different strains of the nCoV-2019¹ virus and is usually spread through water and mucus droplets containing the virus, which live in the patients respiratory tract and are released into the air when a patient exhales; sneezing and coughing spread the virus even further, which is why wearing a mask is recommended.

§ INFLUENZA

Influenza (commonly called ‘the flu’, viral fever, H1N1) is similar to the common cold and Covid-19 but the early symptoms are usually more severe. In addition to typical cold symptoms, influenza often causes muscle aches and a high fever (>101°F, >38.4°C). Influenza is caused by a family of viruses. They are transferred from person to person in the same way as the common cold. The disease is seasonal and severity of illness depends on the overall health of the patient and the virulence of the infecting virus.

¹ Usually called the coronavirus.



Image 166. Injury caused by a wood splinter that has embedded itself under the thumbnail. Such injuries are very common, very painful and can take a few days to heal after the splinter is removed. However, they do not look debilitating and might be brushed aside by a particularly brutish employer as a niggle that is undeserving of medical care.

§ PINK EYE

Pink eye (or conjunctivitis, *aankh-aana* and so on), occurs when the white part of the eye, called the conjunctiva, is inflamed. The conjunctiva becomes dark pink or red and the eye can appear slightly swollen. There is no treatment for viral pink eye, but bacterial pink eye is treated with antibiotic eye drops.

§ STREP THROAT

Strep throat (commonly called ‘tonsils’) is another disease similar to the common cold, but a sore throat is the most prominent symptom. Strep throat usually causes a moderate to high fever. The tonsils become red and swollen and may have white spots on their surface. Antibiotics, such as penicillin, shorten the duration of infection and recovery.

§ GASTROENTERITIS

Gastroenteritis (commonly called a ‘stomach flu’, or an ‘upset stomach’ or ‘diarrhoea’) is characterized by loose motions, nausea, vomiting and abdominal pain. A fever may be present as well. The virus is spread by infected stools. People become infected when they directly touch the stools of an infected person or when they consume food or water contaminated by the virus.

§ VIRAL HEPATITIS

Viral hepatitis (commonly called ‘jaundice’, *piliya* and so on—sometimes the vernacular term might distinguish between hepatitis and yellow fever, so check in advance) occurs



Image 167. A nasty injury is dangerous but is rarely ignored. A fever or a cold, however, can be ignored until it is too late. The first signs of a Covid-19 infection (which claimed many lives in 2020) are a fever and a sore throat. Again, this is not to say that one should panic at the first sign of elevated temperature. Illness should be treated appropriately.

when a virus infects the liver resulting in inflammation and destruction of liver cells. There are 3 main types depending on the virus: hepatitis A, hepatitis B and hepatitis C.

When symptoms are present, they typically include fatigue, fever, nausea, vomiting, poor appetite, pain in the right upper abdomen, dark urine and jaundice—yellowing of the skin and white part of the eye.

Hepatitis A is transmitted from person to person in the same manner as viral gastroenteritis. There is no cure for this type of viral hepatitis. It typically resolves within 2 months.

Hepatitis B is transferred by contact with body fluids, including blood, semen and saliva. Sharing eating utensils, sneezing and coughing and physical contact will not transmit hepatitis B.

Sometimes hepatitis B causes no symptoms at the time of the initial infection, but the virus can remain in the body and cause chronic hepatitis, which may eventually lead to liver failure or cancer. There is no cure for hepatitis B.

Hepatitis C is primarily transferred by direct contact with the blood of an infected person. A lack of initial symptoms and the development of chronic hepatitis are more common than with hepatitis B.

§ MALARIA AND DENGUE

Malaria is caused by a protozoan and is transmitted by mosquitoes. Dengue and chikungunya are viral illness, also transmitted by mosquitoes. Malaria and other mosquito-borne diseases can be confirmed by a blood-test.

Treatment of viral diseases

❓ I have a fever and body ache; my temperature is 38.4°C. What medicines should I take?

This question is asked often, especially if a doctor is present! Of all the diseases mentioned earlier, only strep-throat requires the use of antibiotics. Common viral infections such as influenza and the common cold can be treated at home. Initial treatment for most cases of covid-19 is identical to the recommended treatment for other respiratory diseases that are caused by viruses. The following guidelines are recommended:

CALL A DOCTOR IMMEDIATELY: if the fever is accompanied by a severe headache, stiff neck, shortness of breath, or other unusual signs or symptoms; if you have been in contact with a person who has Covid-19; if the symptoms persist for a week or worsen after two days.

IS IT MALARIA OR DENGUE?: If you (or someone in your neighbourhood) has contracted malaria or dengue in the past, get a blood test. The treatment of malaria requires prescription medicines which are available for free at all government-run healthcare facilities; with a doctor's prescription, they may also be purchased at most chemists'.

REST AND HYDRATION: Physical and mental exertion should be minimised. Stay at home, sleep and let your body fight the virus. Drink plenty of fluids

MEDICATION: As such, medication is not required and should only be taken if the symptoms of fever and body ache make you uncomfortable and unable to rest. Take paracetamol (generic, Crocin®, etc.) to reduce fever, and ibuprofen (generic, Brufen®, etc.) to reduce body-ache. Combination drugs containing both paracetamol and ibuprofen (Combiflam®) may also be taken. These medications relieve the symptoms associated with the infection; they do not fight the virus.

❏4: What do you think was Laxmi's illness? Was it caused by the coronavirus?²

💡 Discuss the pernicious nature of a disease like influenza or covid-19. It is easily prevented.³ However, it is easily spread and can knock out an entire family; a lot of time and energy is wasted in recovery and nursing. It all begins with one sneeze: which is why the film showed just one sneeze as an indicator of illness and not a large wound. A large wound can quickly become infected, but is never ignored by a patient; a sneeze and fever can be ignored till it is too late — it will spread and weaker members of the family, especially children might require hospitalization.

A large wound is a known enemy but you will never know what a sneeze and fever might indicate unless you visit a doctor. I am not telling you to rush to the doctor every time you sneeze. But be aware of the signs and symptoms of common illnesses!

² The films were made in 2019, before the Covid-19 epidemic: Explain the reason why neither Laxmi nor her children are shown without masks.

³ Emphasise the value of appropriate measures: Maintaining cleanliness at home and work and eating a balanced diet is much easier and cheaper than treatment; wear a mask and stay isolated if you suspect that you have Covid-19.

ACTIVITY 4

Exposure to chemicals

Objective

- Know that chronic undiagnosed health problems in swm workers may have been caused by chronic (long-term) exposure to small amounts of hazardous chemicals.
- Recognise the symptoms of an acute (short-term), high-dosage exposure to a hazardous chemical.

Steps

1. Ask for a vote: How many participants know of a colleague who has chronic liver or kidney problems or has been diagnosed with cancer? Discuss the kind of work they did (or do) and the precautions that they take. Do they handle cleaning solvents everyday? Do they use RPE?
2. Explain the need to visit a doctor if they have been handling hazardous chemicals everyday for a year or more.

Notes

- This is not a medical guide; you are not a doctor. Do not diagnose symptoms associated with chronic exposure: headaches and fatigue are more likely the result of long hours on the job than cancer! Discuss only those symptoms associated with acute exposure.

Workshop Programme

- Skip this activity in workshops with non-technical participants. You may incorporate some of the material in this activity into the finance modules, e.g., when discussing health insurance or the value of health and safety.
- Include this activity in workshops with supervisors, administrators, and technical participants who handle any of the hazardous categories of chemicals listed in TABLE 42. You could also initiate this activity as an introduction to III ⑤ RESPIRATORS → [182], since RPE is essential for workers who are exposed to hazardous gases and vapours everyday. Also consider including III ④ ③ SAFE STORAGE OF CLEANING CHEMICALS → [169].
- If a medical doctor is present at the workshop, include this activity for all categories of participants.

DISCUSSION

The symptoms of the chronic exposure to chemical hazards can be slow and might present in an organ that might seem unconnected to chronic exposure to a hazardous chemical, e.g., absorption of chemicals, such as household insecticides and solvents, through the skin can occur without being noticed by the worker and, within a few years, become manifest as liver disease. Sometimes, workers have erroneous beliefs about the route of entry of a chemical, based on its chemical properties. In the case of pesticides that have a strong smell, workers might think that the main route of entry is via inhalation. They mistakenly believe that wearing a mask would protect them from exposure to pesticides. However, pesticides (many of which are fat soluble) are mainly absorbed through the skin and mucous membranes. Workers often incorrectly assume that particulate filters (or FFP-style masks) offer adequate protection from chemicals. Protection from hazardous organic vapours (including paints) requires the use of respirators with the appropriate filter. These are coloured either black or brown. (See IMAGE 105→[283].)

Some chemicals cause both acute and chronic effects, e.g., breathing solvent vapours might make you dizzy right away. This is called an acute effect. Breathing small volumes of the same vapour daily for many years might eventually cause liver damage (a chronic effect). For some chemicals, the larger the amount, the greater the risk, e.g., acetone, which is an industrial solvent that is used in nail polish remover is more dangerous as an acute hazard than a chronic hazard, i.e., a worker who handles 500L of acetone over the course of a single day is at greater risk (during that day) than a person who uses a little nail polish remover every month for decades. Some chemicals are harmless in small quantities but build up in the body over the years. These present a greater risk as a chronic exposure hazard.

MINERAL OR CHEMICAL GROUP	COMPOUNDS AND THEIR USES	POTENTIAL HEALTH EFFECTS
AROMATIC HYDROCARBONS	Benzene, Ethyl benzene, Toluene, Xylene. Used as solvents and precursors for chemical synthesis.	All cause: Central Nervous System (CNS) depression: decreased alertness, headache, sleepiness, loss of consciousness. Benzene suppresses bone-marrow function, causing blood changes. Chronic exposure can cause leukaemia.
ASBESTOS	Asbestos. Used in fireproofing, roof tiles, and automobile brake-pads.	Chronic effects: Lung cancer, Asbestosis, Gastrointestinal malignancies.
HALOGENATED ALIPHATIC HYDROCARBONS	Carbon tetrachloride, Chloroform, Ethyl bromide, Ethyl chloride, Ethylene dibromide, Ethylene dichloride, Methyl chloride, Methylene chloride, Tetrachloroethane, Tetrachloroethylene (perchloroethylene), Trichloroethylene, Vinyl chloride. Commonly used as solvents and industrial precursor chemicals.	Central Nervous System depression: headaches, sleepiness, loss of consciousness. Kidney changes: decreased urine flow, swelling (especially around the eyes), anaemia. Liver changes: fatigue, malaise, dark urine, liver enlargement, jaundice. Vinyl chloride is a known carcinogen.

HEAVY METALS	<p>Arsenic, Beryllium, Cadmium, Chromium, Lead, and Mercury.</p> <p>Industrial and commercial uses including batteries and e-waste.</p>	<p>All are toxic to the kidneys. Each heavy metal has its own characteristic cluster of symptoms, e.g., lead causes decreased mental ability, weakness (especially in the hands), headache, abdominal cramps, diarrhoea, and anaemia.</p> <p>Lead toxicity can cause permanent kidney and brain damage; cadmium can cause kidney and lung disease. Chromium, beryllium, arsenic, and cadmium are known carcinogens. Skin lesions and hard patches on the palms and soles are a sign of chronic arsenic exposure.</p>
HERBICIDES	<p>Chlorophenoxy compounds (often used in weed killers):</p> <p>2,4-dichloro-phenoxy acetic acid (2,4-D), 2,4,5-trichloro-phenoxy acetic acid (2,4,5-T) Dioxin, which is a trace contaminant in these compounds, poses the most serious health risk.</p>	<p>Chlorophenoxy compounds can cause chloracne, weakness or numbness of the arms and legs, and may result in long-term nerve damage. Dioxin causes chloracne and may aggravate pre-existing liver and kidney diseases.</p>
ORGANO-CHLORINE INSECTICIDES	<p>Chlorinated ethanes: DDT (<i>banned</i>)</p> <p>Cyclodienes: Aldrin, Chlordane, Dieldrin, Endrin.</p> <p>Chloro-cyclohexanes: Lindane</p> <p>Used for pest-control</p>	<p>All cause acute symptoms of apprehension, irritability, dizziness, disturbed equilibrium, tremor, and convulsions. Cyclodienes may cause convulsions without any other initial symptoms. Cyclodienes and chlorocyclohexanes cause liver toxicity and can cause permanent kidney damage.</p>

Table 42. Chronic and acute effects on health from chemical hazards in landfills. (*From the NIOSH Pocket Book Guide to Chemical Hazards.*)

1. Toxicity.	The more toxic the chemical, the more likely it will cause health problems, even in small amounts. Asbestos and cyanide are considered highly toxic because a very small quantity can cause health effects.
2. Route of exposure.	The way a chemical enters your body affects your risk. Some chemicals, like the pesticide parathion, are very toxic whether they get into the body through the skin, by breathing, or by swallowing. On the other hand, asbestos is only harmful when inhaled or swallowed. A house may have asbestos insulation, but unless the asbestos is disturbed and becomes a dust in the air, it can't be breathed in, and won't cause harm.
3. Dose.	For some chemicals, the higher the amount, the greater the damage, e.g., acetone is an industrial solvent that is also found in nail polish remover. The risk is higher to a worker who uses large amounts than to the person who uses a little nail polish remover.
4. Duration.	The longer the exposure, the greater the danger, e.g., someone may work with a chemical for half an hour per day, while another person is exposed for eight hours a day. Also, someone may be exposed for one month, while another person may have 20 years of exposure.
5. Reaction with other chemicals.	Some chemicals in combination can create a different chemical that is more hazardous than the original ones (reaction). For example, ammonia and chlorine bleach used together can produce a highly toxic gas that can be fatal. The same quantities of each chemical, individually, are far less hazardous.
6. Individual differences.	Chemicals can be more harmful to some people than to others. Lead is much more harmful to small children than adults because it affects their developing brain and nervous system. If two people work with asbestos and one of them smokes, the smoker is more likely to develop asbestos-related lung cancer than the non-smoker.

Table 43. Factors that affect the risk of chemical hazards.

Participants should recognise the symptoms of acute exposure:

A small exposure (short duration, low dose) to a toxic chemical can cause watery eyes, and a burning sensation in the eyes nose, throat, chest and skin. It may cause headache, sweating, blurred vision, stomach aches and loose motions. Sudden onset of dizziness, and blurring of vision should always be treated as a medical emergency.

A large exposure (longer duration and/or higher dose) may additionally cause more serious effects such as difficulty in breathing, chest pain, coughing, wheezing, dizziness, profuse sweating, anxiety, or weakness. The worst effects from the most harmful chemicals are sudden collapse, convulsions, and even death.

The most common acute inhaled chemical hazard faced by SWM workers is from acid gases and chlorine. Exposure to these chemicals at low doses will cause a burning sensation in the eyes and respiratory tract.

1. Take the victim away from the site of exposure to a well ventilated room.
2. The victim's eyes should be rinsed with clean water
3. The symptoms should subside in a few hours, during which the victim should be monitored for any signs of distress or worsening of symptoms. Call for a doctor or ambulance immediately if symptoms worsen.

In *all* other cases—if the chemical hazard is unknown or cannot be detected (some chemicals are colourless and odourless)—the sudden onset of any of the symptoms described earlier should be treated as an emergency:

1. Take the victim away from the site of exposure and call for an ambulance immediately.

Further reading

- Barsan, M.E. 2007. NIOSH pocket guide to chemical hazards. (See @yd979j25)
- Gorguner, M., and Akgun, M. 2010. Acute inhalation injury. The Eurasian journal of medicine, 42(1), 28–35. <https://doi.org/10.5152/eajm.2010.09>

ACTIVITY 5

A balanced diet

Objective

- Know the ingredients of a balanced diet.

Slides

- [S]1: A balanced diet
- [S]2: Variety of lentils

Steps

1. Discuss what the participants had for lunch.
2. Display [S]1 and explain the importance of a balanced diet.
3. Display [S]2 and explain that healthy food can be cheap.
4. Discuss what they and their children like to eat and how to make them healthier.

Notes

- In a full day workshop, schedule this activity right after lunch. This activity should be concluded in no more than 10 minutes. Just prior to lunch, initiate EXERCISE 30: HOW TO WASH HANDS → [266].

Workshop Programme

- Skip this activity with administrators and NGO workers.
- Skip this activity or include the material into ③ AM I ILL? → [380] if time is short.
- Skip this activity if participants do not cook their meals.



Image 168. (from Film 3) Laxmi prepares dinner. She eats simple, inexpensive food which is easy to cook and provides adequate nourishment.

DISCUSSION

Discuss what the participants had for lunch at the workshop venue.¹

☛ Was the food tasty? Was it filling? Was it similar to what participants eat at home? Did anyone bring their own lunch?

Explain the subjects in slides 53-7 quickly in about 5 minutes using the following as reference²:

§ THE IMPORTANCE OF A BALANCED DIET.

A balanced diet contains adequate amounts of nutrients to supply the body with the energy that it needs to function properly. Food also provides vitamins and minerals that the body's cells need to function. Calories are the amount of energy stored in food. An SWM worker burns around 3500 kcal of energy everyday. In everyday usage 1000 calories, i.e., 1 kcal, is referred to as '1 calorie.' People who eat a well-balanced diet have better physical endurance and clarity of thought than those who do not.

§ HEALTHY FOOD IS NOT NECESSARILY EXPENSIVE.

Starchy foods like potatoes and rice are a cheap source of energy (calories) and should make up about 1/3 of a balanced diet. Potato-skins contain useful minerals and should be eaten, if possible.

¹ Cross reference any discussions that might have happened during I① LAXMI AND HER FRIENDS [41] when you discussed the relative ease of cooking. Ask participants who responded what they like to cook for their children. Ask if they have a simple recipe to share and so on. Keep the conversation light.

² Keep this discussion short and conversational. While this topic is important, it requires you to do most of the talking, which is counter-productive.

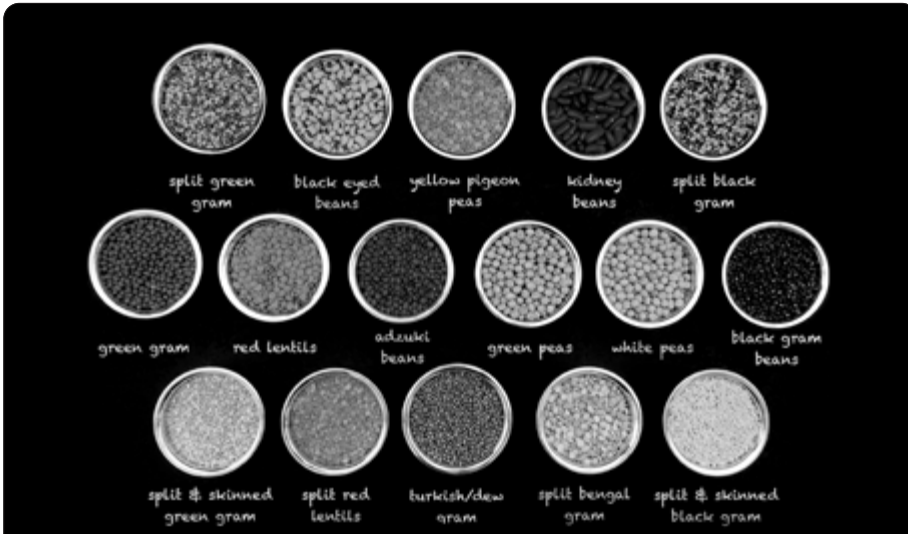


Image 169. India has a rich variety of inexpensive and wholesome food—cereals, lentils, green vegetables, fish and dairy are available across the country. A properly balanced mix of these foods is enough for most people.

All types of edible mushrooms contain varying degrees of protein and fibre. They also contain B-vitamins as well as selenium, which helps to support the immune system and prevent damage to cells and tissues. White button mushrooms are one of the few vegetarian sources of vitamin D. Certain varieties of mushrooms have been shown to have potential in protecting against cancer. Mushrooms can be added to any meal; they can be eaten as a curry, or as an accompaniment with rice and *daal*. They are cheap and easy to cook. Soyabean is a good source of protein too. There are five food groups:

1. Vegetables and legumes or beans.
2. Grains or cereals foods.
3. Fruits.
4. Meats and poultry, fish, and eggs.
5. Milk and milk products.

Whole-grain cereals contain more fibre, vitamins, minerals and antioxidants than refined cereal foods such as white bread or rice, because many of the important nutrients occur in the outer layer of the grain which is lost during processing. Whole-grain foods are particularly important in vegetarian diets because they are a good source of iron and zinc.

***** Wheat is usually easily available in whole-grain form, which is usually called *atta* (use the vernacular term); the refined variety, usually called *maida* (use the vernacular term), is not whole-grain. Traditional brown rice is whole-grain; polished rice and boiled rice is not whole-grain. The nutrients provided by grains include carbohydrates/starch (energy), protein, fibre and a wide range of vitamins and minerals including the important B vitamins—folate, thiamin, riboflavin, and niacin— and iron, vitamin E, zinc, magnesium and phosphorus.

F3: After Laxmi's film was shown, did you notice that she was chopping vegetables?

- ☹ Do you eat vegetables everyday? Do you feel that your diet is healthy?
- ☹ What do your children like to eat? Do you cook for them?

The most common reason for fatigue in the workplace is dehydration. Working in the sun can result in water-loss through sweat to the order of 1L every hour. This needs to be replenished every hour. Explain the importance of a quick drink of water every hour or so.

Take a 30 second break to have a glass of water every hour or so. Or half a glass every half-hour. This is more useful than drinking a lot of water every three hours and it takes very little time — a supervisor will not mind if you take 30 seconds off to drink a glass of water.

Fatigue sets in much faster if the body is dehydrated; productivity drops too if the body is dehydrated. Dizziness is the first sign of heatstroke. If this happens, use the ORS packet in the first-aid kit to prepare 1L of solution and sip it over the next half-hour. Sit in the shade or indoors under a fan to cool down.

ACTIVITY 6

First-aid

Objective

- Know the basic first-aid techniques.

Slides

- [S]1: A first-aid kit.
- [S]2: A series of pictures that describe the protocol for treating cuts.
- [S]3: A series of pictures that describe the protocol for treating burns.
- [C]1: Protocol for treating cuts and wounds.
- [C]2: Protocol for treating burns.
- [C]3: Protocol for treating snake-bite.
- [C]4: Protocol for washing hands.
- [C]5: Protocol for CPR.

Steps

1. Display [S]1 and explain the importance of a first-aid kit.
2. Display [S]2 and explain the use and function of each item in the kit.
3. Circulate copies of [C]1, [C]2, [C]3, [C]4, and [C]5 which explain different treatment protocols.
4. Display [S]3 and explain the protocol for treating cuts.
5. Display [S]4 and explain the protocol for treating burns.

Notes

- Only a doctor can decide if a wound needs more than first-aid treatment. Always mention that participants should seek medical advice if a wound appears infected or if they have any doubts about treatment.

Workshop Programme

- If a medical doctor is present at the workshop, merge the material in this activity into ① INJURY → [369].
- HOW TO WASH HANDS → [266] may also be initiated during the discussion.



Image 170. Standard workplace first aid kit for construction sites. This kit is appropriate for 25 persons. It is better to have two small kits rather than one large kit.

DISCUSSION

A First-Aid Kit (FAK) is used to treat an injury before seeking professional medical assistance. If given properly, first-aid is enough to treat most cuts and wounds at a workplace.

An FAK used at a workplace should contain all the medical equipment and disposables that a trained first-responder will require. It should be air-tight and be placed in the shade in an easily accessible, well-marked location. Every workplace should have one or more FAKs with enough equipment and disposables to provide first-aid to $\frac{1}{4}$ th of the workforce or 150 workers (whichever is greater) without being replenished.¹ The Indian Red Cross Manual on First Aid can be downloaded from @we4teq7.

A personal FAK should be small enough to carry in the pocket of overalls. It contains a subset of equipment and disposables in the Work Area FAK. It could be a small, water-proof plastic bag (a ZipLoc® bag or similar) or an airtight box.

Remind participants of ②③ THE ACCIDENT → [377] or initiate the activity.

¹ See @vtfao4b.

	WORKPLACE FAK	PERSONAL FAK
CONTACT INFO <i>(Mobile or telephone number)</i>	Ambulance service Emergency physician on call Local chemist who stocks vaccines Nearest hospital with polyvalent anti-venom	Ambulance service Local chemist (should be obtained and written down by user)
EQUIPMENT	Scissors Tweezers Safety pins Syringes and needles Wooden splints Ready-made slings Digital thermometer	Tweezers Digital thermometer
DISPOSABLES	Cotton balls, ear buds and sterile gauze pads Antiseptic wipes Sterile gloves Syringe and needle packs	2-3 cotton balls 2-3 ear-buds 2 sterile gauze bandages 1 pair of sterile gloves
BANDAGES	Adhesive tapes Assorted adhesive bandages Elastic bandages	2 adhesive bandages
MEDICINES	Soframycin ointment for burns Mupirocin and Betadine® ointments and Neosporin® powder for wounds Combiflam® for inflammation Paracetamol for fever Loperamide for diarrhoea Lævo-ceterizine for allergies Ofloxacin eye drops 100mL bottles of IV normal saline ORS packets (Electral® or similar)	Betadine® ointment Neosporin® powder 25mg Hand sanitizer 20mL
ANTISEPTICS	Savlon® 250mL or larger bottle Antiseptic soap Povidone Iodine Standard Solution (Betadine® 5% or similar)	Savlon® 50mL Antiseptic soap 10g

Table 44. Contents of basic personal and work-area first-aid kits.

FIRST AID FOR WOUNDS AND CUTS

Display 53 and demonstrate the protocol:

1. Wash your hands with soap. This greatly lowers the chance of infection when you dress the wound.^{2,3} If you cannot wash with soap, rub your hands under running water, then disinfect them with an alcohol-based hand-sanitizer. The hand-sanitizer should wet your hands for 30 seconds or more. Do not wipe off the excess sanitizer—let your hands air-dry.
2. Stop the bleeding. Minor cuts and scrapes usually stop bleeding on their own. Apply gentle pressure with a clean bandage or cloth, and elevate the wound until bleeding stops. If the wound is bleeding profusely seek medical attention at once. The wound may need to be stitched.
3. Clean the wound. Wash the wound with water, preferably running water, to reduce the risk of infection. Wash around the wound with soap. Do not apply soap on the wound. Remove any stubborn dirt or debris lodged in the wound with a pair of disinfected tweezers. Tweezers may be disinfected by dipping the tips into a hand sanitizer solution for around 30 seconds.
4. Apply a thin layer of antibiotic ointment to keep the skin moist. The cream also acts as a physical barrier to dirt and bacteria—this must *only* be done with clean hands. If washing is not possible, do not apply any ointment, and avoid touching the wound. Some ointments may cause a mild rash in some people. If a rash appears, stop using the ointment.
5. Cover the wound. Apply a bandage, sticky tape, or some rolled-up gauze held in place with paper tape. Covering the wound keeps it clean. If the injury is just a minor scrape or scratch and will not be exposed to dirt and potentially infected material, you may leave it uncovered; if you handle waste, always cover the wound with bandage and shield it with a disposable surgical glove when you work.
6. Change the dressing. Do this at least once a day or whenever the bandage becomes wet or dirty.
7. Get a tetanus shot if you haven't had one in the past five years and if the wound is deep or dirty.
8. Watch for signs of infection. See a doctor if you see signs of infection on the skin or near the wound, such as redness, increasing pain, drainage, warmth or swelling.

You do not need to see a doctor if the wound begins to heal and there are no signs of infection — this should be obvious within 24 hours. Deep wounds might require stitches. If in doubt, visit a doctor.

2 All procedures discussed here have one purpose: to disinfect the wound and keep it that way.

3 The correct technique to wash hands is shown in EXERCISE 30 → (266).

§ ANSWERS TO FREQUENTLY ASKED QUESTIONS

? When do I need to call a doctor?

- You have a second or third degree burn or are unsure about the category of the burn. Infection is the most common complication of a burn, and these should be treated using aseptic technique (see @yaxhy63e). Therefore if you are unable to wash your hands using soap and water (see)it is advisable to visit a doctor.
- The wound is deep, long, or the edges are jagged. You may need stitches and a tetanus injection⁴.
- The cut or scrape is from a dirty or rusty object. You may need a tetanus shot.
- The injury is from an animal or snake bite.
- You can't stop the bleeding with direct pressure.
- You can't get dirt out of the wound.
- The wound gets infected.

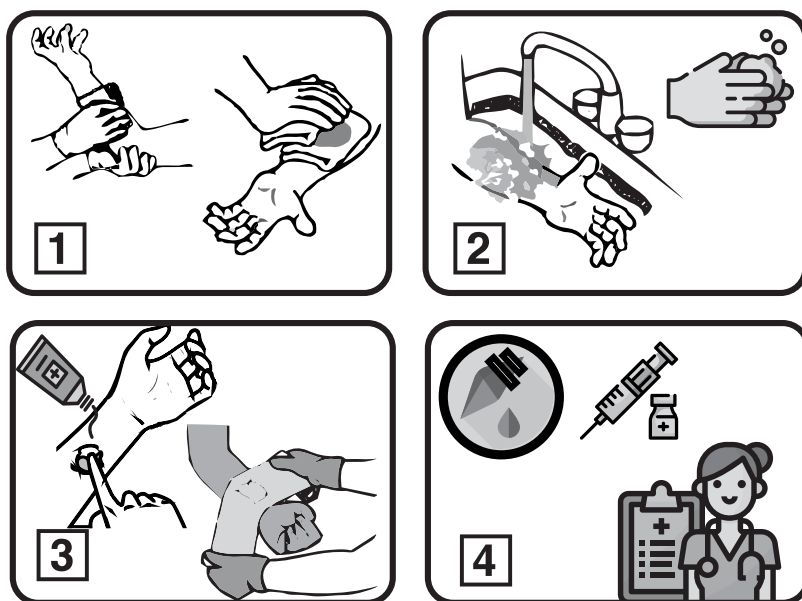
? What are the signs of infection?

- A fever of more than 100.4°F (38°C).
- Redness, increasing pain, pus or drainage, warmth or swelling near a wound.

Bacterial and fungal infections are easily cured with oral and topical antibiotics, or antifungals if the infection is detected early. Almost all wounds become infected—the warmth and swelling are a sign that the body's immune system is fighting the infection—and these symptoms are normal during the first day or two after the injury. The symptoms should begin to subside after two days if the wound is not infected. If these symptoms persist or worsen, visit a doctor. You may require an oral antibiotic; severe infection may require intravenous (i.v.) antibiotics.

Note that in the case of an animal bite, the wound may become infected by a pathogen in the animal's saliva—such infections might not respond to over-the-counter antibiotic creams. (See First Aid for animal bites →[403]).

⁴ A local chemist may be trained to administer a tetanus injection; stitches, however, require the skills of a doctor or a nurse.



First aid for cuts

1. Stop the bleeding. Elevate the wound above the heart and apply gentle pressure with a sterile bandage. If it becomes soaked with blood, apply a second bandage over it. Do not remove the bandage to check if bleeding has stopped.
2. Wash the wound with clean water. Wash hands thoroughly before proceeding.
3. Apply a thin layer of antibiotic cream on the wound. Cover with a sterile bandage.
4. A large, ragged wound may need stitches and a tetanus injection: visit a doctor. A tetanus injection can be administered by a trained chemist.

Image 171. Protocol for treating cuts and scrapes.

FIRST AID FOR BURNS

Burns are categorized as follows:

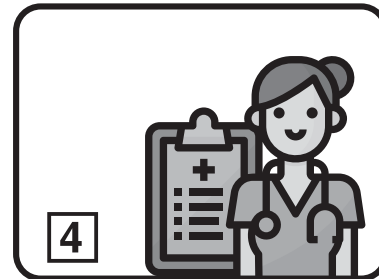
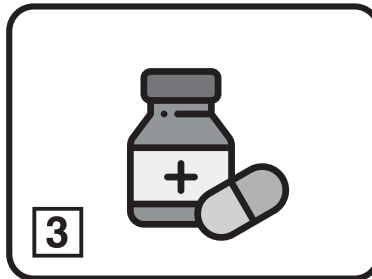
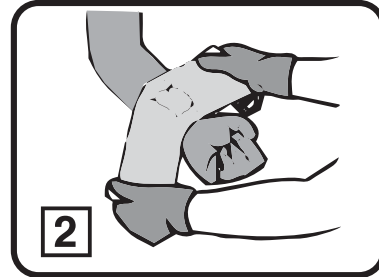
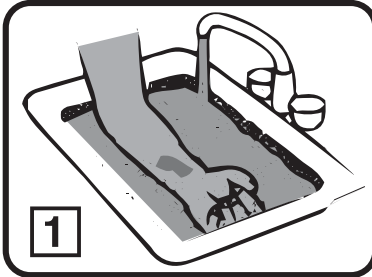
- First-degree burns are painful but are not serious injuries. They turn red and may swell.
- Second-degree burns form blisters. The skin may be very red and painful.
- Third-degree burns make the skin look white or charred. The burns may not hurt because nerves have been damaged.

Serious burns need to be treated by a doctor or in a hospital. Call for medical help if:

- You have a third-degree burn or are unsure about the category.
- The burn is larger than two to three inches.
- The burn is on the face, hands, feet, or over a joint like the shoulders ankles or the knees.
- The burn goes all the way around a limb.
- The pain gets worse the next day.
- The burn was caused by electricity or a chemical.
- Fluid or pus oozes from the burn.

Minor first- and second-degree burns can be treated at home:

1. Place the burned area under running cool water for at least 5 minutes to reduce swelling.
2. Wash your hands with soap and water. If someone is helping you, they should wash their hands as well. Do not proceed to the next step unless you have washed your hands.
3. Apply a thin layer of antibiotic ointment over the burn using your fingers. If it is not possible to wash your hands, do not apply antibiotic cream or anything else to the burn.
4. Wrap a gauze bandage around the burn.
5. To relieve pain, take a tablet of paracetamol.



First aid for burns

1. Hold under running water for 20 minutes.
2. Wrap with a loose, clean bandage with clean hands. Do not touch the burn with unwashed hands! Do not tie the bandage tight!
3. Take a tablet (500mg) of paracetamol for pain, speak to your doctor if you have never taken this medicine before.
4. Visit a doctor if you have **any** doubts about treatment, or if the burn is larger than 6cm (2 inches) on any side, or if the burn has been touched or dirty.

Image 172. Protocol for treating first-degree of minor second degree burns.

REMOVING SPLINTERS

Splinters are more of an annoyance than a health problem. How you remove a splinter depends on how deep it is.

If the splinter is sticking out of the skin:

1. If the skin near the splinter is dirty, wash around the splinter with soap and water.
2. Clean a pair of tweezers with a cotton swab dipped in hand sanitizer.
3. Grab the end of the splinter with the tweezers.
4. Pull it out at the same angle as the splinter went in.
5. Clean the skin again with soap and water.

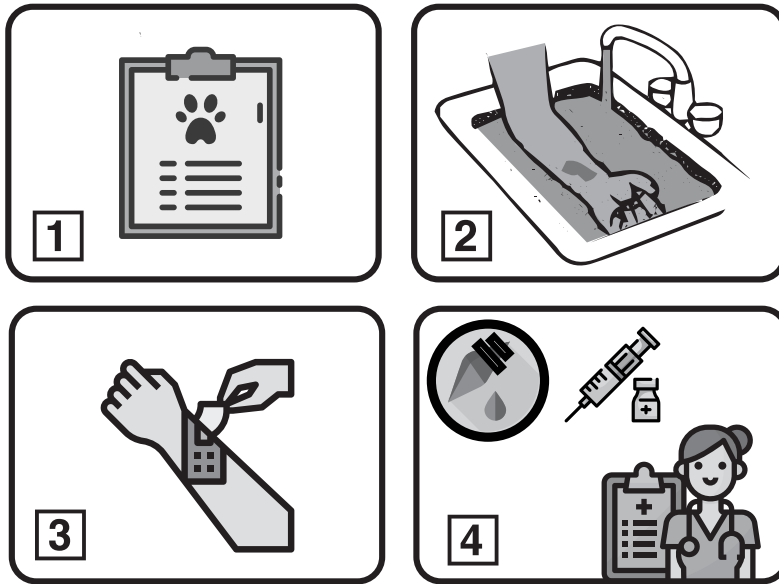
If the splinter is under the skin:

1. Wash the skin around the splinter with soap and water.
2. Clean a needle and tweezers with alcohol.
3. Gently scrape away the skin above the splinter with the needle until you can see the top of the splinter.
4. Grab the end of the splinter with the tweezers and pull it out at the same angle it went in.
5. Clean the skin again with soap and water.
6. Visit a doctor if a splinter is embedded under a fingernail.

FIRST AID FOR ANIMAL BITES

1. Hold a towel or gauze to the area to stop the bleeding.
2. Wash your hands, then clean the wound with soap and water.
3. Apply a layer of antibiotic cream.
4. A sticky plaster or band-aid is adequate for a small puncture wound; if the wound is large or there are many bite marks, cover the area with a clean, loose-fitting bandage.
5. Watch for signs of infection over the next few days.

If possible, ask the owner if the animal has been vaccinated. If the animal has not been vaccinated or if it is a stray, then a rabies vaccine might be required. Speak to a doctor. Rabies is fatal if it is left untreated.



First aid for animal bites

1. If the animal is a pet, ask the owner if it has been vaccinated. If it has, continue to the next step; if it has not been vaccinated, or if the animal is a stray, visit a doctor.
2. Wash the site with clean water. Follow the protocol for wounds.
3. Bandage with sticky plaster or gauze.
4. A large, ragged wound may need stitches: visit a doctor. If the vaccination record of the animal is not known, inform the doctor who will decide whether you need a rabies injection.

Image 173. Protocol for treating animal bites.

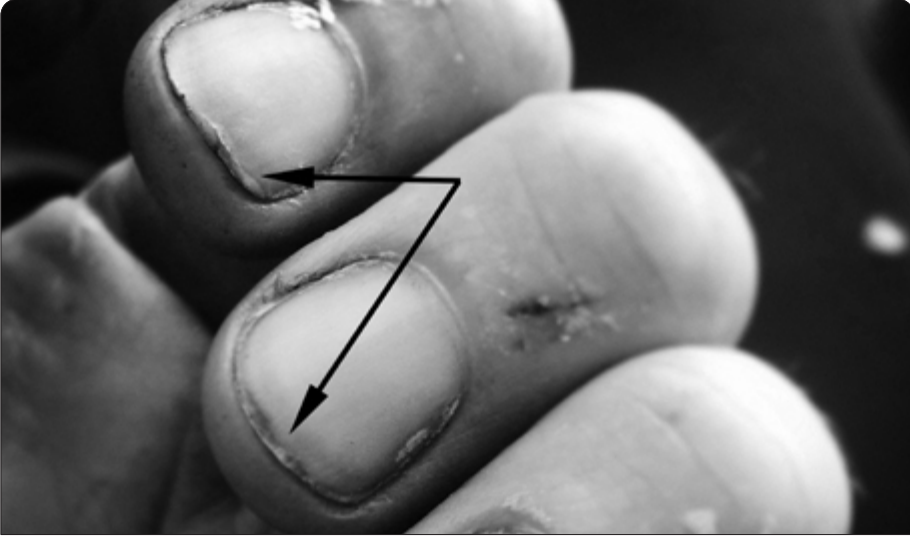


Image 174. Dressing or cleaning an injury with unclean hands and dirty fingernails greatly increases the chance of infection. WHO recommends that application of ointments, etc to burns and wounds should not be done with unclean hands.

§ ANSWERS TO FREQUENTLY ASKED QUESTIONS

❓ Is anti-bacterial soap better than normal soap?

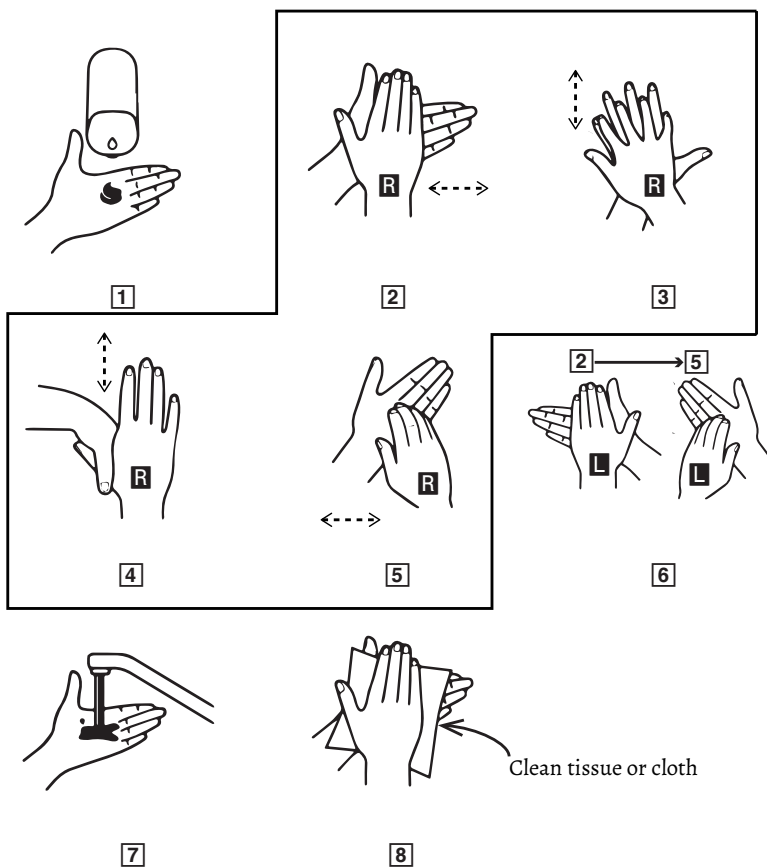
According to the U.S. Food and Drug Administration (FDA), there isn't enough science to show that over-the-counter (OTC) antibacterial soaps are better at preventing illness than washing with plain soap and water.¹

❓ Is it really necessary to wash to my hands in this way? It takes so long!

20–30 seconds is the time it takes to wash properly. That time allows soap to form lather that contains pin-like surfactant molecules with two ends. One is a hydrophilic one that likes to interact with water. The other end is a hydrophobic one that avoids water but readily interacts with other similar biological materials, such as oils, fats — and the makeup of the outer membrane of bacteria and viruses. Surfactants encapsulate and carry the viral debris away, with the help of water. Since our hands have many surfaces and parts to clean individually (and the lather needs to cover the entire surface) 20 seconds allows for enough time for soap molecules to do their job on the entire hand.²

¹ For more information, including the use of antimicrobials such as triclosan, see @vpqmqzp

² Read the article @y7qtaf36.



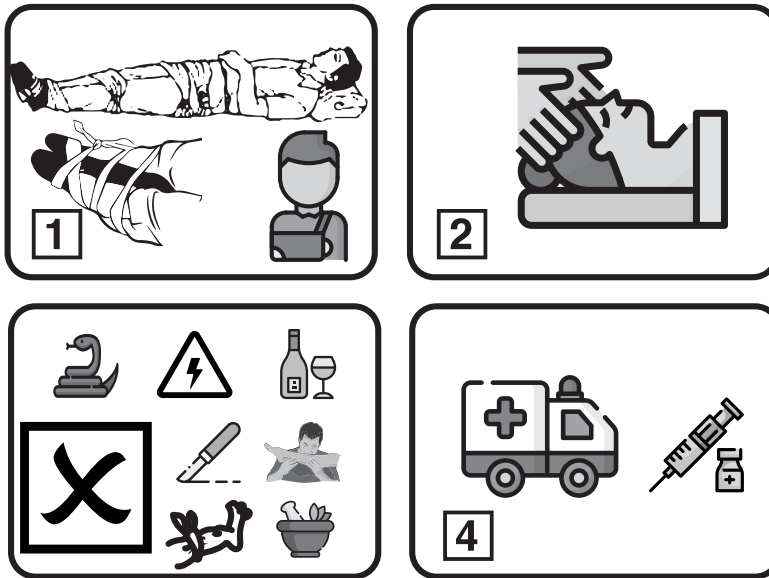
WASH YOUR HANDS

1. Use liquid soap
2. Palm to palm
3. Between fingers

4. Between thumb and palm
5. Fingernail to palm
6. Repeat 2-5 with the other hand

7. Wash
8. Dry

Image 175. Correct hand washing technique.



First aid for snake bite

1. Make the victim lie down and immobilize the limb.
2. Reassure the victim to keep him or her calm. The snake is most probably non-venomous; or it can be treated successfully with anti-venom.
3. Do no attempt to catch the snake. Do not give electric shock or liquor to the victim. Do not attempt to suck out venom. Do not apply a tourniquet or cut the wound. Do not consult a snake-charmer, or a practitioner of traditional medicine such as avurveda or unani.
4. Rush the victim to a hospital where anti-venom is stocked. Most government hospitals do. Be prepared to give CPR if the victim stops breathing.

Image 176. Protocol for snake-bites.

FIRST AID FOR SNAKE BITES

Most snakes are non-venomous. Most fatalities in India are caused by four venomous species: spectacled cobra, saw-scaled viper, Russell's viper, and common krait. The only treatment is a polyvalent anti-venom, which is available for free at most government hospitals. Every first-aid kit should contain the contact details of the nearest hospital that keeps anti-venom in stock.

Do the following:

1. Make the victim lie flat with the bitten limb below the heart.
2. If possible, immobilize the victim's limb using a splint. Cover the bite with a light, *loose-fitting* bandage.
3. Reassure the victim that death is not imminent and medical care is on its way. Anxiety will increase heart rate and accelerate the spread of venom.
4. Remove shoes, rings, watches, jewellery and tight clothing from the bitten area.
5. Be prepared to give cardiopulmonary resuscitation (CPR, □5).
6. Rush the victim to the nearest hospital where anti-venom is in stock.

Do not do the following:

1. Do not apply a tourniquet.
2. Do not wash the bite site with soap or any other solution.
3. Do not make cuts or incisions on or near the bitten area.
4. Do not use electrical shock.
5. Do not apply ice to the area of bite.
6. Do not apply any kind of herbal or folk remedy.
7. Do not attempt to suck out venom with your mouth.
8. Do not give the victim alcohol or other drugs.
9. Do not attempt to capture or kill the snake.
10. Do not take the victim to a herbalist, tantric healer, homoeopath, or snake charmer.

□ Why is a doctor who practices [any form of traditional, or alternative medicine] unable to help a victim of snake-bite?

Ayurveda, unani, naturopathy, reiki, homœopathy and other alternative schools of medicine cannot treat an envenomated bite: they are incorrectly assumed to be effective because (a) most snakes are not venomous, i.e., most snake bites are, essentially, animal bites, and (b) even if a snake is venomous, the injection of venom (envenomation) is voluntary because venom production is a slow process and snakes try not to waste venom on a target that is obviously too large to eat. This is called a 'dry-bite'. An envenomated snakebite can only be treated with anti-venom. Administering the correct dose requires the skills and experience of a trained doctor. Since anti-venom must to be administered as soon as possible, do not waste time by taking the victim to a doctor who practices any form of alternative medicine.

If the venom is hæmotoxic (vipers), the tissue surrounding an envenomed bite will

begin to swell and blister. Neurotoxic venom (cobras and kraits) will cause varying degrees of dizziness, loss of consciousness, slurring of speech, and impaired motor response. The severity and time take for the onset of symptoms depends upon the volume of venom injected. In either case, the onset of one or more of these symptoms will confirm that the snake was venomous. However, by the time these symptoms appear you should already be on your way to a hospital that keeps anti-venom.

Most victims will show signs of anxiety and elevated heart-rate even if bitten by a non-venomous snake — if in doubt, take the victim immediately to the nearest government hospital. It is better to wait at the hospital for an hour or so instead of waiting elsewhere till the onset of symptoms.

HOW TO GIVE CPR?

Hands-only CPR, without rescue breaths

NHS UK recommends the following procedure for cardiopulmonary resuscitation (CPR):

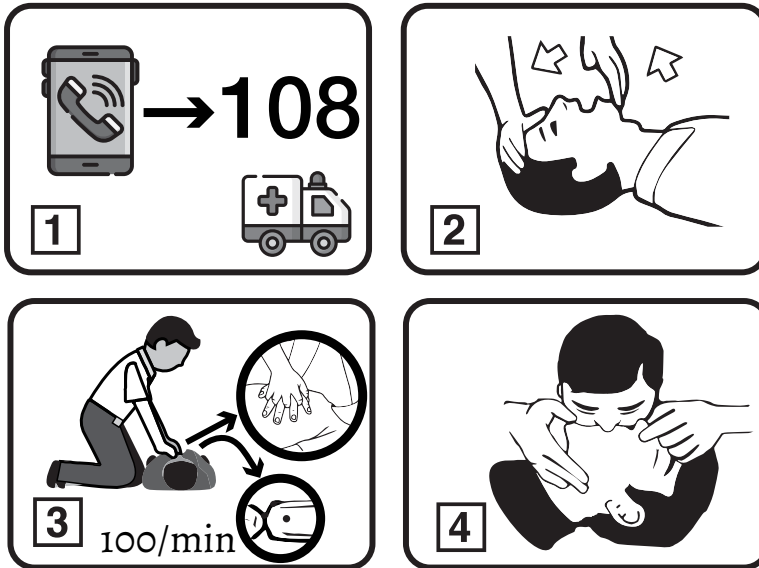
1. Place the heel of your hand on the breastbone at the centre of the person's chest. Place your other hand on top of your first hand and interlock your fingers.
2. Position yourself with your shoulders above your hands.
3. Using your body weight (not just your arms), press straight down by 5 to 6cm (2 to 2.5 inches) on their chest.
4. Keeping your hands on their chest, release the compression and allow the chest to return to its original position.
5. Repeat these compressions at a rate of 100 to 120 times a minute until an ambulance arrives or you become exhausted.

CPR with rescue breaths

If you feel confident using your skills, you should give chest compressions with rescue breaths. (If you're not completely confident, attempt hands-only CPR instead.)

For adults

1. Place the heel of your hand on the centre of the person's chest, then place the other hand on top and press down by 5 to 6cm (2 to 2.5 inches) at a steady rate of 100 to 120 compressions a minute.
2. After every 30 chest compressions, give 2 rescue breaths: tilt the casualty's head gently and lift the chin up with 2 fingers. Pinch the person's nose. Seal your mouth over their mouth, and blow steadily and firmly into their mouth for about 1 second. Check that their chest rises. Give 2 rescue breaths.
3. Continue with cycles of 30 chest compressions and 2 rescue breaths until they begin to recover or emergency help arrives.



CPR

1. If the person does not appear to be breathing, call an ambulance.
2. Open the airway. Tilt the head back slightly to lift the chin. If the person does not begin breathing in 10 seconds, begin CPR.
3. Push hard, push fast. Place your hands, one on top of the other, in the middle of the chest. Use your body weight to help you administer compressions that are at least 5cm deep and delivered at a rate of at least 100 compressions per minute.
4. After every 30 compressions, give rescue breaths. Pinch the nose shut and place your mouth over the person's mouth to make a complete seal. Blow into the person's mouth to make the chest rise. Deliver two rescue breaths, then continue compressions. If you cannot give rescue breaths, continue compressions.

Image 177. Protocol for CPR. If you are unable or unwilling to provide rescue breaths, pause for 5 seconds and then continue compressions.

For children over 1 year old

1. Open the child's airway by placing 1 hand on their forehead and gently tilting their head back and lifting the chin. Remove any visible obstructions from the mouth and nose.
 2. Pinch their nose. Seal your mouth over their mouth, and blow steadily and firmly into their mouth, checking that their chest rises. Give 5 initial rescue breaths.
 3. Place the heel of 1 hand on the centre of their chest and push down by 5cm (about 2 inches), which is approximately one-third of the chest diameter. Achieving the correct depth of chest compressions is very important. Use both hands if you can't achieve a depth of 5cm using one hand.
 4. After every 30 chest compressions at a rate of 100 to 120 a minute, give 2 breaths.
 5. Continue with cycles of 30 chest compressions and two rescue breaths until they begin to recover or emergency help arrives.
-

V. Laxmi tells a story



Objectives of this module

- Establish that pragmatic planning is required to reach one's goals.
- Know the arithmetic of loans.
- Introduce the idea of financial planning.¹

Indicators

- Consensus that Laxmi's decisions alone will determine her success or failure.
- Consensus that some decisions require planning, and cannot be taken intuitively.
- Consensus that the consequences of ignorance about financial planning are ruinous in the long term, and are not readily understood in the short-term.

Notes

- This is the first module on the subject of finance.
- *Laxmi tells a story* was scripted to allow its use at the end of a workshop on PPE. Separated from the narrative arc, the film is about an SWM worker telling a story to her daughter. The proverbial message of 'slow and steady,' etc., is universal; the discussion may be skipped. The film is also appropriate to begin a workshop focussed solely on finance. See WORKSHOP PROGRAMME (below) for details.

Workshop Programme

- For finance-only workshops, begin by screening *Laxmi tells a story*, move on to V ① BEING LAXMI → [415], ③ THE PAWNBROKER → [425]. Before starting ② FINANCE AND THE P2P METHOD—I → [421], you could, optionally, screen *Laxmi falls ill* so that participants are aware of Kutty's story. Screening the film is not essential since you can narrate the story to the participants.
- If you wish to introduce all the characters in the films in finance-only workshops, screen *Laxmi and her friends*, initiate ① LAXMI AND HER FRIENDS → [41], then proceed according to the agenda listed above.
- Use the characters of Laxmi, Bahubali the Tortoise, and an 'evil' pawnbroker as an ice-breaker using II ① a PERSPECTIVE PLAYBACK → [57]. Dialogue for the characters is listed in Discussion.

¹ The Pawnbroker demonstrates the systematic analysis of a problem. It is used to introduce modules VI and VII. However, it can be skipped in workshops on OHS.

ACTIVITY 1

Being Laxmi

Objective

- Introduce the concept of planning as a tool to make informed decisions
- Realise that adverse circumstances can force choices upon a person.


Notes

- This activity allows participants to take a break from technical and procedural information. Participants are encouraged to interact with each other, share stories and realise that all of them have similar dreams, aspirations and fears.

Slides

-  1: Reasons to take a loan.

Steps

1. Summarize Laxmi's story till now.¹
2. Display  1 and call out each of the cases listed in it. Ask participants to raise their hands if they have taken a loan for this reason.
3. Ask participants with unpaid loans to raise their hands.
4. Announce that all participants have to help Laxmi with her loan. Ask for suggestions and discuss these.

¹ Since this may be the first activity in a workshop on financial planning, specifically point out that Kutty fell ill and that Laxmi pawned her earrings to pay the hospital.

DISCUSSION

After STEP 4, use II①③ PERSPECTIVE PLAYBACK_→[57]¹, to continue:

§ SCENE 1. (LAXMI'S HOUSE. TWO CHARACTERS)

c1. Look at my little child. She looks so calm. She is growing so fast. I am glad that she recovered from her illness

c2. I am a tortoise. I am talking tortoise called Bahubali. This is so embarrassing. But Laxmi and Kutty are dreaming about me so that is nice. I like talking to them.

§ SCENE 2. (THREE CHARACTERS)

c1. Oh. She's such a good girl. Don't worry about money. I'm always here to help. I helped you with the hospital bills, remember? You can repay me whenever you want as long as you pay the interest... at 10% per month.

c2. Laxmi. Listen to me. I know that you have a tough life, but I also know that you are a tough woman. Right now you are not facing any emergencies. Right now you can decide how you will earn enough to pay for Kutty's education; if you don't plan now, the future will make the decision for you. Is that what you want?

c1. I am always there. Don't listen to the stupid tortoise. I am your friend in need.

c3. I am healthy now. I am still young. What does he mean by saying that I should take care of my health? How is that important?

F5: Ask the participants to recollect the scene where Kutty is asleep in Laxmi's lap. Laxmi has returned home, cooked for the family, washed the dishes and has a tiny bit of energy left. She spends this to tell Kutty a bed-time story. BEING LAXMI allows participants objectively to analyse the process of decision-making by shifting the focus to Laxmi. Make the distinction explicitly — participants are to imagine that they are in Laxmi's house.

Discuss the following:

1. Do you think Laxmi's decision to pawn her earrings was correct?
2. Was there any other avenue for credit?
3. Should she have tried to take care of Kutty's illness on her own?
4. Are savings more important than health?
5. Is it Laxmi's fault that Kutty fell ill? What do you think was the illness? Was it Covid-19? How could Laxmi have prevented transmission of the disease to Kutty?
6. Why are Laxmi and Kutty both dreaming about Bahubali?

¹ In finance-only workshops, this will be the first time you initiate Perspective Playback. Explain the rules of the game to the participants and make the first session light-hearted as indicated in the dialogue. Note that Bahubali is now a tortoise, and not a super-hero!



Image 178. Laxmi tells Kutty a familiar bedtime story about the race between a rabbit and a tortoise.

7. What is the difference between Laxmi's dream and Kutty's dream?
8. What would you say to Laxmi if she was here?
9. What do you think of Laxmi's choice—she's saving small amounts of money every-day, like a tortoise?
10. Do you feel that Laxmi has lost hope?
11. Who is responsible for Laxmi's situation?
12. Who is responsible for finding a solution?
13. Is it fair for her to expect someone else to help out?
14. Would it be fair if the money was a small amount?
15. Is there a solution to her credit problem? A financial solution?

Use II①⑥ FROM SPECTATOR TO SPECT-ACTOR_→[62] to allow participants speak directly to Laxmi. You are to play the role of Laxmi.

F4: When Kutty was ill, in bed, Laxmi was fighting to save her daughter. She was looking for solutions and she found one—she decided to pawn her earrings. Now, she wants to find a solution to getting her earrings back. Set this scene with a line of dialogue and ask participants to speak to you as if they were speaking with Laxmi. (Your assistant should volunteer so that participants understand what is expected of them.)

Six re-enactments from the rehearsals of a P2P workshop are listed below, followed by the moderator's analysis of each re-enactment. Laxmi's dialogue is repeated at the beginning of each re-enactment. The moderator plays the role of Laxmi in all six scenes, the assistant volunteers (as if he were a participant at the workshop) in the first two scenes and in the sixth scene. In the fourth scene, the assistant plays the role of the pawnbroker.

§ SCENE 1: LAXMI'S HOUSE.

Laxmi: Oh dear. I have to repay ₹16,000 to the pawnbroker. I barely manage to save enough to pay the interest. What should I do?

Assistant: Don't worry, ma'am. Everything will be alright.



Image 179. Laxmi and Kutty, dreaming. Are their dreams the same?

Ma'am? I'm not the moderator in this scene! I am Laxmi. What should I do? Tell me what to do. Have you faced a similar situation in your life? Have you ever pawned something to pay for medicine? I am sure that you have... Tell me about how you got your jewellery back.

§ SCENE 2. LAXMI'S HOUSE

Laxmi: Oh dear. I have to repay ₹16,000 to the pawnbroker. I barely manage to save enough to pay the interest. What should I do?

Assistant: You went to that pawnbroker. Now you have to find a way to repay the loan.

I think my assistant is being polite. He wants to say that since I decided to take a loan at an absurd rate of interest so it's my problem. But he is being polite! Do you agree? I understand that you don't want to criticize me, but you are not criticizing me, personally. You are merely talking to Laxmi. Remember that she is just a character in a movie!

§ SCENE 3. LAXMI'S HOUSE

Laxmi: Oh dear. I have to repay ₹16,000 to the pawnbroker. I barely manage to save enough to pay the interest. What should I do?

Participant: I am really sorry to hear that. I don't know how to help you but I too have faced this problem and I know you will manage somehow.

(The participants applaud.)

Thank you! [Name of the participant] came forward and supported Laxmi. That might not solve Laxmi's problem but it gives her hope because she now knows that someone else like her — another SWM worker — managed to get out of a similar financial mess. Thank you.

§ SCENE 4. LAXMI'S HOUSE

Laxmi: Oh dear. I have to repay ₹16,000 to the pawnbroker. I barely manage to save enough to pay the interest. What should I do?

Pawnbroker (Assistant): Don't worry about the principal. As long as you pay the interest, your earrings are safe with me.

Participant (an AP): You are a crook. Nobody charges 10% per month. You are taking advantage of a poor woman. You filthy [expletive deleted].

(The participants cheer.)

Thank you. All of you calm down. [Name of the AP] has been an enthusiastic participant in all the activities today as you all have seen today. Thank you. She feels that Laxmi is being exploited by the pawnbroker. How many of you agree with her?

§ SCENE 5. LAXMI'S HOUSE

Laxmi: Oh dear. I have to repay ₹16,000 to the pawnbroker. I barely manage to save enough to pay the interest. What should I do?

Participant: I am really sorry to hear that. We are all poor waste-pickers and we must face this problem together.

(The participants applaud)

Laxmi (the moderator does not pause the scene. Instead she continues the conversation): Yes. We are poor. But being poor is neither a problem, nor a solution. I want a solution.

Participant: I don't have a solution.

(The participants wait to see what happens next. The moderator stops the re-enactment.)

Thank you [Name]. Now we are moving forward. Why did Laxmi react like this? I think it's because she is tired of being told that she is poor. [Name] already expressed solidarity with her situation. Now Laxmi wants a solution. Do you understand her attitude? If someone came to you everyday and said, 'You are poor. So you must suffer,' you might feel irritable too. Also think about this situation: Suppose you are ill and went to a doctor to get medicine. She says, 'You are poor. How would you react? I need medicine!'

Anyway. Thank you [Name] for your intervention.

The moderator remains in character to oppose the fatalistic argument made by the participant. This is important. Immediately disagree (as Laxmi) with any suggestion that waste-workers are fated to live perpetually in debt and poverty.

Using the re-enactment allows you to oppose the participants using Laxmi's character as a buffer. Notice that the moderator says, "Why did Laxmi react[...]" instead of saying "Why did I react." This is intentional and should be kept in mind. If Laxmi is, indeed, tough, she would never give up and she would grasp any opportunity to change her future, as would anyone like her.² Always analyse the spect-actors' interaction with

² Nobody doubts Laxmi's courage and toughness. Therefore, is it correct to assume that she would resign herself to her fate? If the OHS modules were part of the agenda, cross-reference your notes from II①LAXMI'S CHALLENGE → [51]. Ask AP if their response in this activity concurs with their prior assertion that Laxmi was tough. What would a tough person do?

Laxmi (i.e., with you) out loud so the participants can hear you:

Is the volunteer sympathizing with Laxmi?

Is she offering a valid suggestion? Is it a solution?

Is it OK to speak the truth to Laxmi, i.e., to be critical about her choices?

I have put you inside Laxmi's World so that you could talk to her. What would happen if Laxmi was in our world?

Always remind participants that they must speak to you as if they are talking to Laxmi and that you will respond as if you were Laxmi and not the moderator.

§ SCENE 6. LAXMI'S HOUSE

Laxmi: I have to repay ₹16,000. I barely manage to save enough to pay the interest. What should I do?

Assistant: The problem is the interest rate?

Laxmi: Yes. I have to pay nearly ₹2000 just to roll-over the loan to the next month.

Assistant: OK. Why don't you take another loan that has a sensible interest rate. I know a place where the rates are around 3% a month.

Laxmi: How do I get a second loan? I don't have anything to pawn.

Assistant: We can think about that. But if you could get around ₹18,000, you can settle the loan with the pawnbroker, and then concentrate on repaying the ₹18,000 at 3% interest. That should be simpler.

Laxmi: Oh. Thank you. You are indeed Goddess Laxmi herself! (The participants laugh and cheer.)

All right. So my assistant has found a solution. I am not sure if it is possible. But Laxmi seems to like the idea.

My assistant has offered a powerful insight: The state of being poor is not equivalent to the state of being powerless. A poor person's solution may not be ideal, but there is always a solution. 3% interest per month is 36% per annum. That is also quite high... We will discuss the details of this new loan later.³ First we must try to understand the arithmetic that is involved.

3 ➞ VI②.: Any questions about loans.

Finance and the P2P method—I

Objective

- Know how to formulate a problem-statement using P2P method and apply it to solve financial problems.
- Establish the importance of seeking information about a problem: both to verify the validity of the problem statement and to solve the problem.

Slides

- [5] I: Laxmi smiling

Steps

1. Discuss the situation in which Laxmi finds herself.
2. Create a problem-statement for Laxmi with your assistant playing the role of Laxmi.
3. Discuss how Laxmi solved the problem she faced.

Notes

- This activity serves as an introduction for ③ THE PAWNBROKER → [425]. It is the first of two activities on using the P2P method to solve financial problems. In Part I, participants are shown how to analyse a problem and create a problem statement. In VI ③ ④ FINANCE AND THE P2P METHOD—I → [460], the P2P method is used to analyse and solve financial problems.
- Establish the following rules using scripted role-plays with your assistant:
 1. Formulating a problem statement can be done without information.
 2. Validating the accuracy and completeness of the problem statement requires additional information.
 3. Creating a solution might require additional information.
- Do not explain these concepts theoretically during discussions with SWM workers.

Workshop programme

- If Module IV was not part of the programme, Kutty's illness is not known to the participants. You could, optionally, screen *Laxmi falls ill* just before starting this activity or narrate the story to the participants. The notes for discussion assume the participants know that Kutty fell ill and Laxmi took a loan to pay for her treatment.

DISCUSSION

The participants have seen Laxmi play with danger, and survive. She has recovered from a serious hand-injury, a week-long illness and has nursed her daughter back to health. She is healthy for now, but she is indebted to a money-lender.

Let us go back to the point when Kutty fell ill and Laxmi is desperate to help her. I will ask my assistant to play the role of Laxmi; I will ask her a series of questions. You must hear her answers and decide if Laxmi would have given the same answers.

[M] *Laxmi what's the problem?*

My daughter, Kutty, is very ill. Some new virus.

[M] *That is terrible news. But why are you worried. The doctors will take care of her.*

No. I couldn't find a bed in a government hospital. She is in a small private nursing home. They charge quite a lot.

[M] *And?*

And I don't have the money for her treatment tomorrow onwards.

[M] *I see. So what will you do now?*

I will pawn my earrings and take a loan.

[M] *But isn't that extremely expensive? How will you pay the interest?*

I don't care. Kutty's life is more important. If I lose the earrings, so be it.

Discuss Laxmi's responses one by one:

☹ Notice how Laxmi first defines her problem. She says that Kutty is severely unwell. What information does she have about Kutty's illness?

She has no information about Kutty's illness apart from what the doctor at the private hospital told her. Clearly we have trust doctors — even doctors in a private hospital! But the point I am trying to make is that Laxmi does not know that Kutty is severely ill. She knows that Kutty is ill; she knows that Kutty has a fever. Laxmi fell ill first, then Kutty fell ill. Laxmi recovered, but Kutty was too weak to recover on her own, so she had to be hospitalised. Laxmi's information about the severity of the illness comes from the doctor.

When you evaluate a problem, you should be aware of what information you have, and what information is received from someone else. You should know if you are guessing. There is nothing wrong with guessing or trusting someone else. But you should know the limits of your information.

How does Laxmi do about the only bit of information she has? She has to trust it. Medicine is a specialist discipline. You have to trust a doctor because only she has the training to diagnose a patient. It takes 10 years of study after Class XII to obtain an M.D. Laxmi has studied till Class X. She decides, correctly, to trust the doctor — because she has no other choice. Kutty is severely ill and something has to be done.

- ☯ How does she act upon this information.

She has tried to look for a bed in a government hospital. She couldn't find a bed there and Kutty's treatment had to continue in the private hospital. Now I am not saying that you should look for the cheapest treatment possible. That would be stupid.

But what if it was not a life and death matter? What if it was a matter of deciding to buy one kind of work glove or another? Always look for options. Laxmi looked for options and did not find any.

The nature of the problem has changed. Now it has become a financial problem.

- ☯ How much does Laxmi know about the financial problem. How much information does she have? Does she know how much it will cost?

She does not know how much the treatment will cost. If she knew, then she could explore other options. Information is important.

- ☯ What would you do in her situation. Imagine your daughter is severely ill and is admitted in a private hospital. Imagine that you have 3-tolas of gold. How much would you borrow?

The problem is becoming more and more complex. But let us approach it one step at a time. This is important. Always solve a problem one step at a time. Learn to ignore the 'what-if' scenarios. Never let regret and guilt get in the way of your decisions.

For once I will let my assistant be the moderator. Now I will play the role of Laxmi. Listen to our conversation now:

- ☐ *What if you had been careful and not allowed Kutty to play near the waste?¹*

Correct. I should have been careful. But Kutty is already ill. Being careful is something for the future and I will remember it. But it does not help me now.

- ☐ *What if you had taken medical insurance?*

I don't know about medical insurance. I have heard about it and I will think about it. I does not matter now.

1 In the conversation that follows, the assistant plays the role of the moderator.

[M] *What about your husband Chandu? Why doesn't he do something?*


I know my husband better than you. He works at a construction site and is putting in all his earnings to pay Kutty's bills. Don't speculate about what he can or cannot do.

[M] *What about your earrings?*

Yes! I have my earrings. This is exactly why I keep my earrings with me at all times. I have a way of getting money...


Thank you, dear assistant! I think I should resume my role of being a moderator!

Laxmi knows that she will get a loan of at least ₹100,000 if she pawns her earrings. She might be able to get a little more than that if she sells her earrings. She knows all of this because she purchased the earrings as a form of savings, and not just for their aesthetic value as jewellery.

 How many of you think Laxmi went out one day and bought earrings made from 3-tolas of gold?

The decision to purchase them was made *long before* Kutty fell ill! Did any of you see her earrings closely? Maybe she made her first earrings after saving enough for 1-tola of gold; the dangles are made from two different parts that were added later. Her earrings were not a one-time purchase. They were life savings, and the decision was not made overnight. Laxmi had the time to plan for her savings and she was certain that in an emergency her earrings would come in handy.

Compare the decision she took about her earrings to the decision she made about Kutty being severely ill. In the second case, she knew that she was unqualified to decide whether Kutty was ill; in the case of the earrings, are we sure that she took the right decision.

 How many of you feel that she took a wise decision? I know the value of having your life savings with you. Sometimes you have to pick up your child and leave if you have your savings with you at all times.

ACTIVITY 3

The Pawnbroker

Objective

- Recognise financial situations in which poor cash-flow is the central problem.

Notes

- The P2P method of creating a problem-statement can be applied to real-world financial problems, especially those have complex, dependent variables.
- Participants will lose the game again and again without realising what they are doing incorrectly; your job is to help them understand why they lose repeatedly, and not necessarily to help them win.

Slides

- [S]1: Reasons to take a loan.
- [S]2: List of avoidable and unavoidable expenditures.

Steps

- Display [S]1.
- Describe the rules of the game. Ask for a volunteer to play the role of Laxmi.
- Play the game till the loan is repaid or Laxmi goes bankrupt.
- Discuss the results.
- Initiate CALCULATING EMI-S → [433].

Workshop Programme

- Refer back to the participants' responses in the previous Activity.
- In workshops with SWM workers who cannot read English, ensure that at least one member in group that you create during CALCULATING EMI-S → [433] can read and write English fluently. Alternatively you could translate the worksheet (IMAGE 184) into the local language. The companion USB drive contains a printable version (PDF) of the worksheet. This may be exported to a word-processing format and translated, as required.
- Managers and administrators in NGO-s that handle credit savings groups should be able to recognise if the members of their group are struggling with a cash-flow problem. Allot enough time for multiple iterations of CALCULATING EMI-S → [433], which is a paper-and-pen version of The Pawnbroker.
- Skip the exercise if participants are not members of a credit group or are unwilling to deal with arithmetic. Do not skip THE PAWNBROKER. The activity was created specifically to explain the arithmetic of loans without turning the workshop into a classroom!

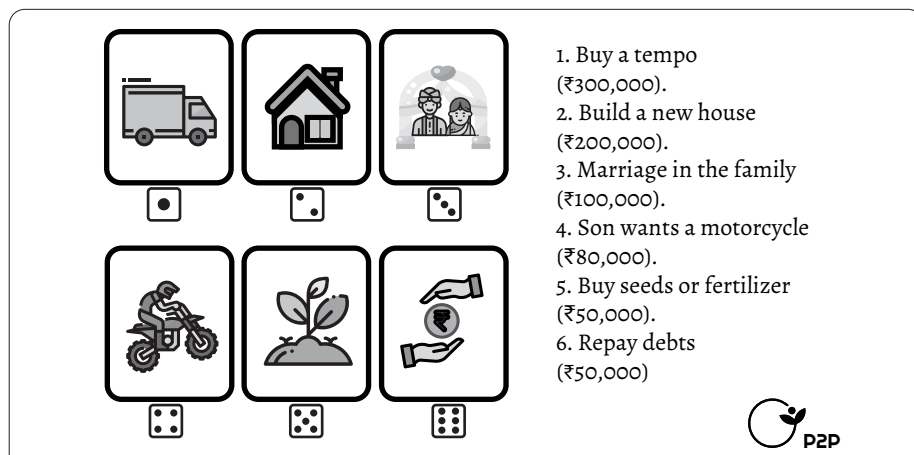


Image 180. Reasons to take a loan. See the companion USB drive for a printable PDF file.

§ RULES OF THE PAWNBROKER.

The Pawnbroker is a role-playing game. You are a greedy pawnbroker, a participant plays the role of Laxmi (and is referred to as Laxmi), and your assistant represents “income and expenditures”—he takes or receives money from Laxmi as required. The Pawnbroker Kit is required to play this game. You should wear a pawnbroker’s cap during this activity.

- Ask participants to pick, from the list shown in [51 (IMAGE 180), a reason for taking a loan.
 - Then, ask them to decide what they think Laxmi earns every month and how much she saves. They must also decide how much money Laxmi has already saved. The amount could be any value not exceeding ₹50,000.
 - Then, ask them to assign a rupee-value to each item in the list of expenses written down (or projected) on the white-board ([52, IMAGE 181). They are allowed to change these figures at each turn, but they must evaluate each cost once before the game begins—this is important and prevents the player from changing these values to absurdly low numbers.¹
 - Finally, they must agree on the pawnbroker’s interest rate of 5% per month.
1. Ask for a volunteer to play the role of Laxmi. The game lasts 10 turns. For the first nine turns, Laxmi must pay the interest due on her loan. On the tenth turn she must pay interest as well as the entire principal. If Laxmi begins the game with savings that are double (or more) of her monthly income then the game may be extended to 20 turns or until Laxmi runs out of money
 2. From the second turn onwards, Laxmi must also deal with problems that result in additional expenditure. These problems are listed on the white-board. The roll of a die will determine whether she faces an avoidable or unavoidable expense. Laxmi

¹ [52: Note down the cost; refer to these in Module VI during the discussion on cost vs. value.

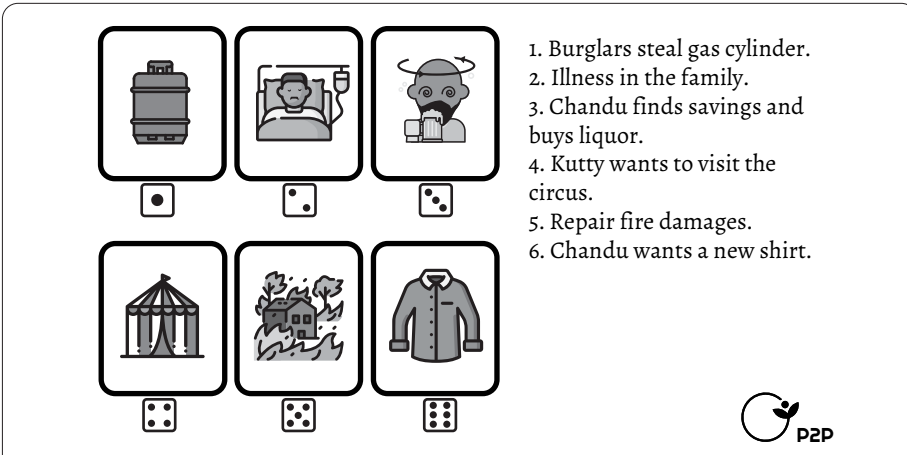


Image 181. Expenditures. Avoidable expenditures are 4 and 6; the rest are unavoidable. (See the companion USB drive for a printable PDF file.)



must decide whether she can avoid expenditure. If she decides to avoid expenditure, she must offer a solution that satisfies all the participants, or pay up. (Participants may decide to change the expenditure amount at each turn. But they must start the game by agreeing on an amount.)

3. Payments to the pawnbroker are unavoidable.
4. Laxmi's income and expenditures are shown by having her transfer money to or from your assistant. You, the pawnbroker, will receive monthly payments from Laxmi.
5. The game ends when the loan is repaid, or if Laxmi is bankrupted.


Reasons to take a loan.

- Building a new house (₹200,000).
- Marriage in the family (₹100,000).
- Purchasing a motorcycle (₹80,000).
- Buying seeds or fertilizer for farming (₹50,000).
- Sending money home (₹50,000).
- Repaying debts (₹50,000)

Examples of expenditures

There should be at least six (or multiples of six) expenditures on the board with avoidable and unavoidable problems listed alternately. Add as many problems as you like to the list. The problems should be written down before the game starts. Either write the following on the whiteboard or display  1 at the start of each game  2 :

- Burglars steal gas cylinder.²
- Illness in the family.

² The list shown here can be changed as required to suit the participants. Use the blank template (APPENDIX 4: DOCUMENTS AND TEMPLATES  [A-27]) to make a customized list.

- Chandu finds savings and spends it on liquor.
- Kutty wants to visit a circus (*mela*, or use the colloquial word).
- Floods or fire damage the house.
- Chandu wants a new shirt.

§ PLAYING THE GAME.

- Ask for a volunteer to be Laxmi. Give her the die, the set of earrings, which have a nominal value of ₹100,000, and the necklace also valued at ₹100,000³. Announce that you will play the role of the moneylender. Wear the Pawnbroker's Cap. Your assistant plays the roles of Laxmi's employer, a banker and the 'expenditure', i.e., a shop or a hospital or tradesman etc. He stands with the flip-calendar and makes a running list of income and expenditure on the white-board.
- Ask the participants to pick a reason for a loan. They choose ₹100,000.
- Ask the participants to choose Laxmi's monthly income. They choose ₹10,000.
- Ask the participants to choose savings. They choose ₹3,000.⁴
- Announce that the monthly interest rate is 5%.
- Laxmi chooses to pawn her necklace and gives it to the pawnbroker.
- Laxmi receives ₹100,000. Announce that the marriage is celebrated at a lower cost of ₹90,000! Give Laxmi the "Married" placard. Your assistant takes ₹90,000 from her.
- Ask Laxmi to place the savings of ₹10,000 in the Savings Bottle.
- Announce that one month is over; your assistant flips the calendar and gives Laxmi ₹10,000.
- Announce that Laxmi has spent money on regular expenses and has saved ₹3,000. She gives ₹7,000 to your assistant and places the rest in the Savings Bottle.
- Ask Laxmi to roll the die. She rolls 5.
- Announce that the problem is unavoidable (the odd numbered problems are unavoidable, the even ones are not) and ask participants whether they wish to change their initial valuation of the expenditure.⁵ They agree upon ₹3000.
- Ask Laxmi to pay ₹3,000 for house repairs.
- Ask her to pay you, the pawnbroker, ₹5,000 as interest. Then ask her to count the savings left (₹5,000).
- Announce that another month has passed... (and so on)
- Ask Laxmi to roll the die. She rolls 6.
- Announce that problem might be avoidable. Ask Laxmi to solve it—she must convince her husband Chandu that he must make do with his old shirt, or perhaps another solution?

🎭 Ask the audience if Laxmi's answer might have convinced Chandu. If so, she need not pay. If the participants are not convinced, ask the audience what she must pay...

3 All props required are in the Pawnbroker kit. See PROPS CHECKLIST → [A-38]

4 When asking participants to make a choice, offer them options. AP will usually answer. Once they do, ask for a show of hands for consensus: 🙋 "Is 2,000 a good estimate of savings?" "What about 3,000?" and so on. Ask Laxmi to hold her hands such that the participants can see her count the money. Ask participants if Laxmi has counted properly. When Laxmi rolls the die, hold it up for participants to see and read the number out loud. A little showmanship will make the game immersive!

5 📝 Note down the new estimate if they do. Check if the participants are playing fairly by agreeing upon reasonable estimates or if they are trying to help Laxmi by lowering their estimates. Do not interfere!

(And so on.)

At the end of the game, Laxmi will either go bankrupt or (if she is incredibly lucky) manage to repay the loan. Discuss the results.

1. Is there any other expenditure that should be added to the list?
2. Do you agree with Laxmi's answer?⁶ Why? Why not?
3. Does your husband drink?
4. Does someone in your family steal your savings?
5. How do you hide your savings?
6. Why is Laxmi unable to repay her loan?
7. Did anyone calculate how much Laxmi actually pays, in total? Did the marriage cost ₹90,000 or did it cost a lot more than that?

DISCUSSION

P *The game is not realistic.*

M *What should we change about the game to make it more realistic? Interest rate? Loan amount? Laxmi's earnings?*

P *I can ask the moneylender to take the balance the next month.*

Allow participants to make changes. Most suggestions will not influence the result, which is the whole point of the game! Ask the participants if the suggested change is acceptable and continue the game. After 15 turns, ask if the change made any difference. The Pawnbroker is a good example of a debt-trap: the borrower despite her best efforts cannot possibly repay the loan.

P *This cannot be realistic. Laxmi is getting bankrupt too fast.*

M *OK. What else can we change? Remember, you want to make the game realistic, so whatever you change should be realistic too! You cannot give Laxmi a salary of ₹500,000 just so she may win the game!*

If nobody offers a suggestion for changing the rules, do so yourself. Offer to continue the loan repayment beyond 10 turns if the participants feel that would affect the outcome. Then, after a few rounds, point out on the chart how much Laxmi has already paid as interest and ask participants if continual payments that never end are realistic.

P *What can we do? There's nothing we can do to influence the result!*

(Always deflect such statements to Laxmi.)

M *Let's help Laxmi first. What can Laxmi do? What should she do?*

⁶ In this instance, 'Laxmi' refers to the volunteer playing the role of Laxmi.



Image 182. (from Film 6) Laxmi saves for eight months to repay the loan she took for Kutty's treatment.

Mention that Laxmi too was faced with the same dilemma and the same options. She decided to invest in gold; she decided to go to a moneylender. Discuss the pros and cons of her decision. When a participant is asked to help Laxmi, she will invariably use her own experiences with money-lenders (or debt) to offer a solution. Allow them to narrate their experiences.

*Laxmi has already taken a loan. How do we help her? This is about helping Laxmi!
We will discuss your problem separately.*

§ THE PAWNBROKER: LESSONS LEARNT.

1. Some problems can take a long time to fix once they emerge. Debt traps are an example. No amount of twiddling (with interest rates, repayment duration, and so on) can solve this problem. If monthly interest payable is 50% or more of your monthly savings, the loan is a debt trap. Laxmi decision to invest in gold and borrow *from a pawnbroker*⁷ is the problem. Once this decision is made, it is forgotten and assumed to be correct. This attitude must change.
2. A regular bank charges 1% to 2% interest per month, but they require collateral or an assurance of regular income. Banks will not disburse an immediate loan, but beginning a relationship with the formal bank is first step to solving credit-related problems in the long-term.
3. An accurate assessment of income, expenditure and cash flow is essential to understand how much you can or cannot repay. This is discussed later in VI⑤ INCOME AND EXPENDITURE → [479].⁸

Explain that everyone in the room can enter the banking system to get credit—emphasize the word *credit*.

⁷ Gold jewellery is a poor financial investment. The subject will be discussed in the next module.

⁸ 🗣️: If participants want to discuss income and expenditure, initiate VI⑤ INCOME AND EXPENDITURE → [479]. If, instead, participants wish to discuss credit options (always the more popular choice), continue as normal.

* Compare the self-estimated value of a waste-worker's earnings that the participants discussed during IV①⑥ → [IV-11] (in the context of lost income) to the one assessed for Laxmi during this Activity.



Image 183. A sapling growing beside a tree.

I am not talking merely about opening a bank account with your Aadhar card. Anybody can do that and we will discuss this if you want. I am talking about getting credit. And I will show you how to do this. D → VI③

Explain the various options of collateral that are available to regular employees of a company or D → VI③,④.

F3: The women working at ELCITA and other regular employees all get pay-slips. They can get a loan based on their income.

If you have the time, you could stage an alternative version of *The Pawnbroker* featuring two volunteers. The first plays Laxmi; the second plays Maheshwari a professional, employed full-time and earning the same as Laxmi. The difference is that the first volunteer gets a loan from a bank at 1.5% to be re-paid over five years, instead of 5% over 10 months. The difference between the debt of the two and the time it takes to repay is brought into sharp contrast in this case.

Keep in mind that many participants will have unpaid loans. Some may be stuck in a debt trap. Most will hesitate to discuss their personal financial problems publicly. Be sensitive. Offer options as if Laxmi might have them and ask participants to imagine what Laxmi might choose to do; ask them to imagine what is going in Laxmi's mind because then they can speak about their problems as if these were Laxmi's problems. If a participant specifically mentions a specific problem in her life that is similar to one that Laxmi faced, you can try to find a solution for the participant:

P *"I have the same problem. I have taken a loan from a money-lender...(etc.)"*

P *I too have saved money in the form of jewellery.*

P *"This is exactly what I am facing now, the money-lender has allowed me to extend my loan period for another year as long as I pay interest every month... (etc.)"*

M *OK. Let us pause and try to find a solution for Kantabai here who has a similar problem. Should we try to solve her problem?*

(The answer will always be “yes.” If you are lucky, you might have an AP among the participants who will encourage others to follow her lead and speak about the financial problems that they face.)

☹ Will Laxmi repay her loan? Explain that everyone will know the answer in the next film but also mention that there is a twist in the story!

F5: When Kutty has fallen asleep, Laxmi continues to narrate the story. Is she also thinking about her loan? Has she lost all hope?

THE PAWNBROKER is realistic. It merely appears unrealistic because the time taken for Laxmi to become bankrupt is compressed, while the income does not rise during the period.

Plants do not grow so fast, but they do grow. We do not perceive their growth simply because it is slow. Similarly, we do not realize that we are paying exorbitant interest rates because it is a slow process. Even if someone successfully repays a loan, they literally pay a high price for it.

EXERCISE 35: CALCULATING EMI-S

Objective

- Know the arithmetic of loans.

Steps

- Divide the participants into groups of four. Give a copy of the worksheet for this exercise to each group.
- Write down the initial state of Laxmi's finances on the white-board including her income the collateral she has, and the amount and terms of the loan, including interest and duration. Each group must fill in the worksheet in 5 minutes.
- Change the initial conditions before each round. You could also allow the groups to make assumptions about some of the conditions, e.g., let them make assumptions about the fixed and discretionary expenses that Laxmi might have (D → VI⑤ INCOME AND EXPENDITURE → [479], in which these expenses are calculated and discussed), payout conditions that might be acceptable to Laxmi—is she willing to pay an equal amounts of principal and interest as a trade-off for a longer repayment duration?

Notes

- Solve the first problem to explain the process and give the participants a second set of initial conditions as an exercise.


DISCUSSION

The relationships between the different inputs and boundary conditions are as follows:


- Collateral (c) > Loan amount (L) + 10% of the loan amount; $c \geq 1.1L$.
- Loan duration (D) ≤ 60 months.
- Simple Interest per month (SI) ≤ 10%.
- $EMI = L/D + SI$.
- Payout ratio (P) = $L/(SI \times D)$
- Loss conditions: If $P > 1/0.9 \times c$, Laxmi is better off selling the collateral to raise money instead of taking a loan.

Discuss the following:

- Is there any correlation between a person's net income (gross income - fixed expenses) and the maximum amount of loan that she can take?
- Compare how the groups calculated fixed and discretionary expenses.
- Compare the assumptions that the different groups made. What was the maximum and minimum payout ratio?
- Discuss why the pawnbroker does not ask for EMI-s and only wants the monthly interest to be paid? (Hint: What happens if Laxmi defaults?)



LOAN WORK SHEET



Income	Expenses ¹		Loan taken ²			EMI ³		Payout ⁴		
	Fixed	Disc.	Collat.	Amnt.	S.I. %	Princ.	Int.	< 0.5	=	> 2

Space for calculations

1: Fixed and discretionary expenses per month

2: Loan details: collateral value, loan amount, monthly simple interest.

3: Monthly payment. calculate principal portion and interest portion.

4: Ratio of the total interest paid to the loan taken.

1	2	3	4	5	6	7	8	9	10	11	12

Image 184. Loans worksheet. See the companion USB drive for a printable PDF file.

VI. Laxmi's earrings



Objectives of this module

- Establish the difference between long-term and short-term plans.
- A rudimentary understanding of what is meant by wealth, inflation, and depreciation.
- Participants without a bank account are aware of the usefulness of entering the formal banking sector.
- Participants understand the rules of prudent financial thinking.

Indicators

- Consensus that Laxmi's dream (or nightmare) is a possibility that was not exaggerated in the film.
- Consensus on the importance of financial planning.
- A progressively fewer number of turns are required to win VI⑥ RANGASWAMY THE PROVIDER → [484].

Notes

- Laxmi has managed to save enough money to redeem the earrings that she had pawned. She hopes that the earrings will pay for her daughter's wedding in the future. However, something goes wrong....*Laxmi's earrings* picks up the threads after *THE PAWNBROKER*. Once participants realise that gold-loans taken from a pawnbroker is a poor decision, they must decide how to create better options for credit in the future. The process may take many years, but ought to be initiated right away. In the meantime, they must learn how to analyse their finances and make prudent decisions about income and expenditure.

Workshop programme

- You may rearrange the order of the activities in this module.
- If the OHS modules were excluded, do not refer to PPE.

ACTIVITY 1

Laxmi's dream?

Objective

- Learn to assess the future.
- An introduction to the concept of inflation.

Slides

- [S]1: Laxmi with her earrings.
- [S]2: Movie poster.
- [S]3: Kutty is an SWM worker in the future.

Steps

1. Discuss Laxmi's dreams and Kutty's life.
2. Use II①⑥ FROM SPECTATOR TO SPECT-ACTOR → [62]. Ask participants to react to Laxmi's daydreaming.
3. Explain, with examples, the consequences of inflation.

Notes

- Do not skip STEP 2. Participants should have the time to assess their financial health before they are ready for a discussion on inflation and the creation of a financial plan. The role-play gives EP the time to ponder while the AP have their fun.



Image 185. (from Film 6) Laxmi repays her loan and gets her earrings back.

DISCUSSION

§ ASSESSING THE FUTURE

The section is called *Assessing the future*, and not *Planning for the future*. The latter can only begin after an honest and objective assessment of a possible future. Laxmi's earrings were not a wasted investment: they were used, but not for Kutty's wedding, which was their intended purpose! Instead, Shahrukh used them to get a technical education, and a job. Kutty did not get married. It is unclear if she finished school, but she seems happy (she says she is happy) with her work. Discuss the following topics with a view to explain the difference between short-term and long-term thinking. Switch to the role-play (see the facing page) after discussing one or two subjects from the list below and use the remaining topics during the role-play. Use *OPINION* as and when needed:

- Do you have children? How many? What do you want them to do with their lives?
- What plans did your parents have for you? Have you lived up to their expectations?
- Did Kutty look like a professional? Does she act like one?
- Kutty says she is happy. Maybe waste-workers will have fair pay and a good quality of life in the future. Do you think it is possible?¹
- Could waste-management in 30 years be respectable work?
- Laxmi was saving for Kutty's wedding; instead Shahrukh became an automobile engineer. Was the money well spent? Do I have enough information to take this decision?
- Would it have been better if Kutty had used the money to marry and Shahrukh taken up an unskilled job instead of a skilled one?
- What if Kutty had got an education and Shahrukh became a waste-worker?

¹ Long-term thinking requires one to factor in changing realities. The whole world has changed! A popular film-star has become the Prime Minister of India.

- What if both had happened? And more... Laxmi and Shahrukh both got an education and settled down with their lives? Why did this not happen?
- Do you ever dream, or daydream about such things? Could this dream become real someday in the far future?

☹ Did Laxmi's dream reveal a constant fear on her mind? Why? Is it OK if your children become swm workers?

☹ Is it possible that three *tolas* (30g) of gold might not be enough for both Kutty's wedding and Shahrukh's education? Why? Why not?

F6: If you saw Laxmi dreaming like the narrator did in the movie, what would you say to her?

Initiate II①⑥ FROM SPECTATOR TO SPECT-ACTOR_→[62]. The scene is Laxmi's house from Laxmi tells a story. She is sitting on the floor, head to her knees fast asleep! Your assistant should play the role of Laxmi; ask for volunteers to become spect-actors. Ask them to mull over what was just discussed and speak to Laxmi. The first re-enactment (is surreptitiously pre-scripted) to set the tone for the rest of the spect-actors:

M *Laxmi, you should be glad that your children are happy. Why do you look so shocked?*

Kutty is a waste-worker. After all my hard work, she is still a waste-worker! Isn't that shocking?



Image 186. Scene from *Laxmi's earrings*. Laxmi is dreaming again! What would you say to her?

M *But Shahrukh used your earrings to get an education! Kutty managed with whatever she had left. You should be proud of her.*

Oh deva. I wish I had saved more. I didn't know that 3-tolas would not be enough.

M *But you did not know Laxmi. You can only plan for the future if you know what to expect. We cannot see the future, but we can make intelligent guesses about it.*

Allow spect-actors to ask Laxmi about her dream. Be wary of boisterous AP derailing the scene with flippant questions. Intervene immediately. Request shy EP to tell you what they wish to say to Laxmi.

Your assistant should remember to reply using the name of the participant. The following conversation shows how this may be done.



Image 187. (Slide 2) Poster of the movie *Howrah Bridge*, released in 1958. One of the characters in the movie is a 'lakhpati'—someone worth ₹100,000 or more—a fabulously wealthy person in that decade. A lakhpati is commonplace in 2020.

[M] *[Name] is feeling shy. That is fine. I think she has a very interesting question to ask Laxmi. I am going to speak to Laxmi on her behalf.*

[M] *Laxmi, it was just a dream. You can still make a difference.*

Oh. Thank you [Name.] I will start thinking about it. I don't know how I change the future. How much money is required?

[M] *[Name], do you have a reply for Laxmi? (And so on.)*

Keep the discussion on track. Give participants time to assess their future. Defer the following subjects that will be taken up later:

➤➔VI④ BANKING BASICS➔[466]: Any questions about the process of opening a bank account and getting a loan.

➤➔VI⑤ INCOME AND EXPENDITURE➔[479]: All queries on the arithmetic of planning. Discuss only the concepts of planning in this activity.

➤➔VII① DEATH IS A PART OF LIFE➔[497]: Planning for one's children and planning for oneself should be separate activities. The hope of children taking care of their parents is good (and it is part of our culture) but children cannot take care of their parents if there is not enough money to do so.

§ QUESTIONS AND ANSWERS

② We could make intelligent guesses about the future. What does that mean?

The film refers to something called inflation. We will discuss this concept in detail in



Image 188. (Slide 1) Does Kutty look happy? Compare her expression that of Laxmi's when she gets her earrings back from the pawnbroker in IMAGE 185 → [438].

about 10 minutes.² We cannot see the future, but we know about the past. What was the cost of a cup of tea 30 years ago? When I was in college, our canteen used to sell tea at 50p for a cup. Today, the same cup of tea — with the same ingredients, made by the canteen owner's son³ — costs ₹10. If I had put away 50p safely somewhere, it would not be worth anything today. That is inflation.

The price of gold increases over the years. But does it increase at the same rate as the cost of food? We know the price of gold and food 30 years ago, and we know the price of gold and food today. So we can guess what might happen in the future.

👏 Display □ 2. Has anyone seen this movie? Does anyone remember the word lakhpati being used to describe a wealthy person?

In the movie Howrah Bridge that was made in 1968, the villain, played by the legendary actor K.N. Singh is a lakhpati.

In 2018, Laxmi, an SWM worker is also a lakhpati — her earrings are worth slightly more than ₹100,000 — but is considered a poor person. The reduction in the value of money is called inflation.

🌀 We all dream of a promising future for our children? Do you feel that you have the power to make those dreams come true?

² If a participant asks this question after the role-play is finished, you may initiate ② COST, PRICE, AND VALUE → [443] immediately. If the role-play has just begin, put the question on DEFER till four or five spect-actors have intervened in the scene, take up the DEFER and initiate ② COST, PRICE, AND VALUE → [443].

³ This is a true story. The canteen-owner's son had never seen a 50p coin; in his father's day, the cash drawer at the end of the day would contain at least ₹200 worth of 50p coins!

We have started to explore how to assess the future; before we proceed to the next step of planning for the future, we must believe that we have the power to improve it, if only ever so slightly.

For those who claim that they feel powerless, follow up by asking them to elaborate. If the central question is about money, then $\text{D} \rightarrow \text{VI} \textcircled{2}$. If the central question is about helplessness, address it immediately:

Right now, in this room, all of you are more powerful than I. My job is to give you information and tell you about the options you have... But it is you who have the power to decide. I cannot force you, and I do not want to. Similarly, I'm going to show you exactly how to plan for the future, but it is entirely up to you to use this information.

I have to answer your questions; I have to ensure that you are not dissatisfied with my answers. I have to make you feel satisfied and happy that you attended the workshop. Keep that in mind.


F 6: Laxmi gets her earrings back (IMAGE 185 \rightarrow [438]), she looks into the mirror as she wears her earrings:

How does Laxmi feel? Does she look happy? Compare her expression with that of Kutty in the film, when she says that she is happy (Image 188 \rightarrow [441]). Does Kutty look happy?

Kutty was not particularly impressed with the value of Laxmi's earrings! Call for a vote:

 What do you think Kutty earns, 30 years in the future?

Tally the results⁴ and initiate the next activity.

4  Note down the range of estimates and the names of participants whose estimates were the lowest and the highest.

ACTIVITY 2

Cost, price, and value


Objective

- Participants understand the concepts of cost, price, value, depreciation and inflation.


Slides

- 1: Pictures of a seller, a buyer and a bystander.

Steps

1. Display 1 and explain the definitions of cost, price and value. Close any defers.¹
2. Ask 3 volunteers to join you. Give each volunteer a small slate and a piece of chalk. Begin role-play (the rules are described in Discussion; examples are also listed in Discussion).
3. Demonstrate how valuation of the same commodity changes depending upon who is defining it. What about water? What about waste that waste-pickers collect?
4. Discuss how the motivation of v_3 influences her valuation using the examples provided in Discussion.
5. (Optional) Finally, v_3 is a banker, v_1 a seller and v_2 a buyer. Explain credit, cash-flow and banking with examples.²

Workshop programme

- This activity contains theoretical topics marked . Discuss these only at workshops with supervisors and managers trained in finance (those with B.Com or similar degrees).
- At workshops with SWM workers, explain the subject matter using role plays.

¹ Observe carefully the participants' reaction to a theoretical approach to this topic. Concentrate on the role-playing activities if you find their attention drifting.

² The role-play at step 6 is beneficial for members of an SHG or those who work at an NGO. Wage-workers might not find this topic particularly engaging.

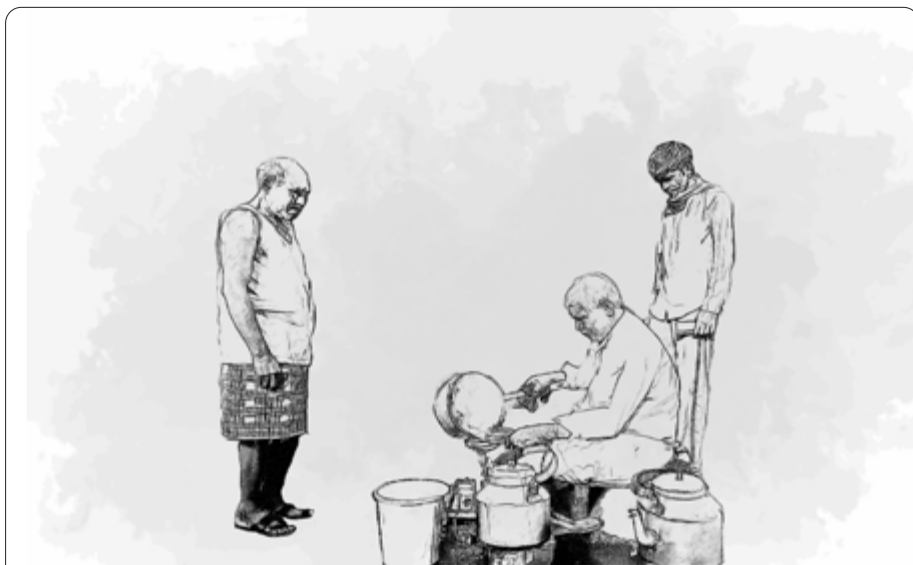


Image 189. (Slide 1) Understanding cost, price and value using a tea shop as an example.

DISCUSSION

Begin with a vote, then initiate the role-play.

- ✎ What are three *tolas* of gold worth today? What is the cost of a cup of tea today?
- ✎ What were 3 *tolas* of gold worth 10 years ago? What was the cost of a cup of tea then?

📖 Cost is the amount of money and (value of) time spent to acquire, purchase or produce something such as a commodity or service; price is the money that is charged by the seller of the product or service; value is the price that one is willing to pay for a product, or a perceived measure of its economic benefit .

AT STEP 2: Begin the role play. During each role-play¹, the seller (v_1) must decide an appropriate selling price for the commodity and write it on her slate (which only she can see); the buyer (v_2) determine what the cost ought to be and writes it down on her slate (which only she can see); v_3 is told an initial condition and must write down a value for the commodity under the influence of this condition; v_1 and v_2 are then asked to display their slates to the participants; v_3 is asked to reveal the condition and display her valuation and show it to all the participants. v_3 is then asked if she wants to change her valuation after having seen the valuations of v_1 and v_2 .

To explain the game, start with a simple example of tea. You are v_3 :

- v_1 : Decides to sell at ₹10.
- v_2 : Wants to buy at ₹6.
- v_3 (you)²: is given the condition that you do not drink tea. Your valuation is ₹0.

Reveal the initial condition set for you and your valuation and explain the situation:

¹ Ask for fresh volunteers every time the topic of the role play changes.

² You should play v_3 in the first role-play to help volunteers understand what to do.

Pay close attention to the motivation of each volunteer's valuation. v_1 and v_2 must think about each other's valuation. v_1 wants to maximise the price, but if it is too high then v_2 will not buy; v_2 intends to buy at the lowest price, but if she sets her budget too low, she might not be able to buy! If she gets tea at a low price, it might be of poor quality because it was made with cheap ingredients.

The motivation of v_3 is largely free of shopkeeping arithmetic. I am negotiating with myself. How much is something worth to me? ³ In the real world, v_2 and v_1 might haggle over the price (they certainly would negotiate over something more expensive than a cup of tea) and come to a settlement. v_3 meanwhile, does not care. My valuation (i.e., v_3 's valuation of the tea) is zero. My valuation of tea remains zero even after seeing the valuations of v_1 and v_2 . I don't want tea.

Make the role-play progressively more complex. Use a bottle of water as an example:

- v_1 : Decides to sell at x .
- v_2 : May decide to buy, coincidentally, at the same price x .
- v_3 : Is given the condition that she is extremely thirsty.


Sometimes, when the market price of a commodity is known, the valuation could be the same. v_1 and v_2 put down the same number simply because they know what a bottle of water costs! More specifically, they know what it costs today.

Add other role plays⁴ if required. Discuss the aspect of negotiation in the definition of these concepts. Cost and price and negotiable—even when assessing one's prices or service-fees. For example, if one wants to set a price for a service one provides, one might add a little extra as a negotiating tactic. However, when it comes to value, the negotiation is with one's own self:

In each case, think about v_3 . Let us assume that v_1 is a doctor, v_2 is the employer of a waste-processing company who wants a 'package deal' for all her workers and v_3 is a worker in the company. How much is my health worth to me? How much is it worth to my family?

Use the valuation of household waste as an example:

- v_1 : Throws it away.
- v_2 : Collects it, segregates it, packs it, and takes it to v_3 .
- v_3 : What is v_3 willing to pay if she runs a scrap shop?

 Explore the cost, price and value of waste.⁵ Discuss the cost of labour. Compare it with the price of the commodity produced by that labour: in this case, what is the difference in price between mixed-waste, segregated-waste, and micro-segregated waste? The

³ Cross-reference the self-assessed income mentioned here with the one from V③ THE PAWNBROKER → [425]. If there are discrepancies discuss the reasons with participants.

⁴ Add as many role plays as required. These role plays are short, and each should take no more than 90 seconds from start to finish. You must, however, prepare your explanations in advance.


⁵ This discussion is most useful if there is an AP who is 60 years of age or older among the participants. Ask her to recall prices of waste from the nineties and two-thousands.

difference between the economic value of mixed-waste and segregated waste should be equal or more than the cost of labour. Is this the case? The participants should realize that their labour can create more value if they are ready to upgrade themselves and become professionals.

Introduce and explain the concept of inflation with following characters:

- v1 is a tea seller from the year 1990.
 - v2 is a tea seller from the present.
1. v3 is an SWM worker who loves to drink tea from the year 2000.
 2. v3 is the same SWM worker in the year 2019.
 3. v3 the same SWM worker in the year 2040.

The volume of each of the ingredients that go into a cup of tea—leaves, milk, sugar and condiments such as ginger or cardamom— has not changed.⁶ Their prices have doubled or tripled over the past twenty years; the price of a cup of tea, however, has increased ten-fold.

 The reason is complex and depends on a number of factors: the cost of labour is the most important. As time flows into the future, population increases and an increasing number of people manufacture a growing number (and variety) of products and services. These people need to be paid and, consequently, the prices of all commodities must increase. The average increase in the prices of all commodities being sold in the market, is called inflation and it is usually expressed as a yearly percentage.⁷ The increase in price of a particular commodity may be less or more than the rate of inflation.


AT STEP 4: Change roles. v1 is now the seller of a motorcycle, v2 is a buyer who has different roles that change depending on the situation. During this role play, v2 must write down the valuation of the motorcycle depending upon how he or she intends to use the motorcycle. Ask for 4 volunteers to play the following characters (give them each a slate and describe their character):

1. a young man or a young woman who wants to travel to college.
2. the mother of the college-going young man or young woman.
3. a milk-seller who wants to hasten his or her morning deliveries
4. a person who has been offered the job of a courier.

After the role-play discuss how the 'money value' associated with a commodity changes depending upon who is evaluating it; at the end, invite v1, the seller, to assess her choice. Did she set the correct price?

Introduce the concept of depreciation. The seller's valuation also depends on his or her financial condition and may be affected by depreciation. Ask for volunteers to play the following roles as v1:

1. Someone who has just purchased a new motorcycle for ₹50,000 and desperately needs ₹50,000 within a few days.

6 If participants quickly grasp the idea of inflation, discuss the connection of inflation to income. : Have their incomes risen proportionally over the years?

7 When fewer people are employed, manufacturing costs of goods remain the same, but sales prices decrease because there are fewer employed people to purchase these goods; when sales prices fall, manufacturers must reduce costs, and more people lose their jobs. The wheel of prices, costs, inflation, jobs keeps turning.

2. A mother whose son (the user of the motorcycle) has just died.
1. A student who wants to use a motorcycle for 6 months, then sell it.
2. A door-to-door salesperson who has moved from a village to a big city.

Wage-earners are hit the hardest by inflation and depreciation. The first victims are those employed in what are called 'unskilled' jobs, i.e., jobs that require little or no training. Conversely, not only do trained professionals earn more, they also have greater financial security.

F2: It is not easy to replace Maheshwari and her colleagues. It is easier for her employer to give Maheshwari a raise of ₹1000 per month than to find and train someone to match her skills and experience, which (to an employer) may be valued at ₹100,000 or more. Experienced workers make fewer mistakes and are more efficient than freshers. The increase in the value of an unskilled worker, however, has an upper limit.

An unskilled worker with ten years of experience can be replaced by another unskilled worker with, say, 2–3 years of experience. In the case of a skilled worker, however, their experience can multiply the value of their services without limit. Seniority should not be equated with experience: the former is accumulated as a matter of course while the latter denotes agency, effort and improvement.

Inflation affects employers as well. The key to earn like a professional is to be a professional—know your job, wear and use the right equipment, continually upgrade your skills, and be proud of your abilities. The money will follow. You may, optionally, initiate EXERCISE 34→[356] at this time.

Knowledge can enhance the price of a commodity; it can enhance productivity. In the context of SWM, knowing how and what to segregate efficiently, what to store, where and when to sell and so on, might result in the same unsorted scrap fetching ₹10 per kilogram instead of ₹4 per kilogram—an additional 250% of profit. A borrower's knowledge and skills determine their value as a customer and affect the price and accessibility to a bank's services: banks seek out such customers and, indeed, a basic understanding of the banking system and a little financial discipline will enable any worker to access credit from a bank.

D→VI④ BANKING BASICS→[466]: Any questions about the process of opening a bank account and getting a loan.

AT STEP 5: Explain how banks make money. When someone deposits money into a bank, they are usually assured 4% or more per year as interest. The bank has to pay this interest to the account-holder. They raise money by lending the account-holder's money to other people. They are guessing about the future too—they assume that there are borrowers in the market who will come to them for loans. If their guess is wrong, they lose money, because they have to pay their depositors. Contrary to popular belief, banks must lend money to be profitable.

Banks are on a continual search for people who can take and repay a loan. If you want a loan, a bank will first check if you are a skilled worker and if you are a full-time, salaried employee in a proper company. Only then will they evaluate your loan. It is easier if you have an organization to back your loan. We will discuss this in great detail in the next activity.



Image 190. Maheshwari is a semi-skilled worker. The better her skills, the harder she is to replace. Once her skills reach a certain level she can begin to explore options in other companies—a practice that is common in the private sector.

Initiate a role-play with the following characters to explain how banks rely on credit-worthy borrowers to remain in business:

1. v1 is a business-person wishing to buy land to expand her shop.
2. v2 is a banker looking for customers. It must decide on the rate of interest to charge v1 for a loan.
3. v3 is also a banker looking for customers. It too must decide on the rate of interest to charge v1 for a loan.
4. v4—the moderator—has a bank deposit with both v2 and v3. Both banks offer interest on deposits at a yearly rate of 4%.

v2 and v3 are competing with each other to give v1 money! It is far fetched, but true. If v2 offers a loan at a lower rate of interest, they will get v1's business and use the profit to pay me; v2, on the other hand, will have to pay me without having earned any money. However, v2 cannot charge an interest rate lower than 4%; neither can v3.

If v3 cannot get any customers, it may lower its interest rates for loans to 3.5% as well as the interest paid to its deposit holders to, say, 3%, which might persuade me —v4— to move my deposit to v2...

Now it is v2 that must find additional customers. It has an extra depositor and is competing with v3 that offers lower interest rates. The wheel of finance never stops rolling.

Explain why a pawnbroker and a bank offer different interest rates and each prefers a different category of loan seeker. This last role-play uses II①ⓐ PERSPECTIVE PLAYBACK→[57].

- v1 is a loan-manager in a small branch of large public sector bank; his branch has 350 account-holders.
- v2 is a pawnbroker with 2 customers currently paying interest on loans.
- v3 is Maheshwari. She works in an SWM company and wishes to buy a computer for her daughter.
- v4 is Laxmi desperately in need of money for Kutty's treatment.

The dialogue is as follows:

You can get a loan at 1% per month with collateral. I also have a plan for salaried workers... I have 14 different plans for different categories of loan plans. Why don't you read what's written on the wall? Also 12:30 to 13:30 is my lunch break.

Welcome! Welcome. How can I help you? Interest rates? Why worry about that. First, tell me what is the problem? Are you here to pawn gold? How much gold do you have? I am open 24 hours a day to serve you!

I work in a plastic-processing company in Bangalore. I want to buy a computer for my daughter. I have ₹20,000 in my bank and my employer, ELCITA, pays me ₹15,000 every month. The computer costs ₹50,000. I need a loan of ₹30,000, and I want to repay over six months.

I am desperate. My daughter is in hospital, and I need as much money as I can get. I have 3-tolas of gold.

- ☞ Who is more likely to give Laxmi a loan? Why?
- ☞ Who is more likely to attract the salaried SWM worker? Why?

Pawnbrokers and large banks serve a specific kind of customer. The former have very high interest rates compared to a large bank, but will approve a loan instantly. Pawnbrokers prefer customers who are unlikely to repay their loans so that they can liquidate the collateral, i.e., they can wait for gold prices to rise and sell any gold that has been forfeited to them. Since they have very few customers at any given point in time, they raise working capital — money to loan out — by selling forfeited gold and from the exorbitant interest payments.

On the other hand, banks raise working capital from the cash deposits of their account holders; they prefer credit-worthy customers who can repay their loans on time — the repayment is used to pay interest to their account holders. Banks do not need (or want) the hassle of liquidating forfeited collateral deposits.

In simple terms: banks prefer customers who are financially stable in the long-term; pawnbrokers prefer customers who have assets like gold, land or cattle but are otherwise broke!

- ☞ Did the dialogue of the salaried worker in the role-play sound familiar? She works

at ELICITA, and we saw her in *Laxmi makes a film*. Does anyone remember her name?⁸

►→VI④ BANKING BASICS→[466]: Any questions about a person's credit-worthiness and how to improve it.

⁸ Volunteers must name their character during Perspective Playback. Participants will recognise Maheshwari only if *Laxmi makes a film*, from Module III was screened.

ACTIVITY 2A

The value of health

Objective

- Explore different valuations of illness in the family.

Slides

- [S]1: Laxmi puts her hand into a waste-bin with broken glass.
- [S]2: Composite of screen-grabs from *Laxmi falls ill*: Shahrukh nurses Laxmi; Laxmi nurses Kutty.

Steps

1. Display [S]2 and explain the situation in the film. Ask participants to assess the situation and assign a cost—a rupee value—to each situation.
2. Initiate II①⑥ FROM SPECTATOR TO SPECT-ACTOR→[62] with the characters of Shahrukh, Kutty and Laxmi.

Notes

- This is the second activity that addresses the financial aspects of illness. The first was IV② THE COST OF INJURY→[373], in which the cost of PPE was compared to the cost of illness and the loss of income; this activity explores the intangible costs of lost opportunities.
- This activity makes references to two scenes from *Laxmi falls ill*. If Module IV was not part of the programme, do not show the film. Instead, explain the situation when you display [S]1



Image 191. (Slide 1) Laxmi is not a cautious person. If she were all by herself with no financial obligations to other, her attitude towards her health may be callous but it affects no one else. “It’s my life.” (See KARTHIK AND HIS HELMET. →[16]).

DISCUSSION

Costs and price are always consciously evaluated by a person. You see a price-tag and wonder if you are willing to pay the price to acquire a commodity. These are negotiable as well. However, a commodity may possess intangible long-term value, which should be evaluated. Sometimes, this value is not apparent because it can only be perceived if one changes one’s perspective...

Describe the financial situation of Laxmi and her family as shown in the following scenes.

F 1: Laxmi is not concerned with her health. All she can think of is getting Kutty out of the hospital. She is willing to do anything to help Kutty. She has one option — to pawn her earrings, and get back to work as fast as she can.

Laxmi’s situation requires her to assess costs over the short and medium terms. She has incurred an expensive debt in the short term, which she knows she can repay. However, if she does not solve the problem of frequent illness, the costs of repeated hospitalisation will overwhelm the family. Does she assess her long-term costs?

F 4: In Slide 2 (Left), Laxmi is nursing Kutty. Laxmi cannot work, she is losing income and she now has a debt to pay. But her thoughts are fixed on Kutty. Her options are dwindling and she is now vulnerable. If she falls ill again, the family might spend many years struggling to repay their debts. Kutty helps her mother sort waste from time to time, but she is too ill to do anything at the moment. She hopes that everything goes back to normal soon; she wants Laxmi to be healthy again and play with her.

F 4: In Slide 2 (right), Shahrukh is nursing his mother. His mother is ill, he looks directly at the audience in a mute plea for help. He has skipped school to take care of Laxmi; he

is alone because when Laxmi is ill, Kutty replaces her at work. He wants Laxmi to get better and remain healthy.

Shahrukh and Kutty pay long-term costs. By skipping classes Shahrukh is lowering his chances of a better income in the future. Kutty, it seems, is the regular stand-in for her mother and may already have given up any hope of an education.

It would be accurate to say that Laxmi is forcing her children to pay the cost of her illness; both of them lose the value associated with a good education. The value is notional, and cannot be properly evaluated, but should not be ignored.

The price of prevention was the cost of a mask (to prevent the transmission of the viral illness) and the knowledge of preventive medicine (wearing gloves, masks and washing hands). Both of these measures were discussed in IV② THE COST OF INJURY→[373]. Laxmi did not pay the price of prevention, so she had to pay the cost of treatment and lost income. This would not have happened if she had valued her health as the children value her health.

The value of Laxmi's health, when assessed in terms of the cost paid by Shahrukh and Kutty is different from Laxmi's self-valuation. Financial value is not always reducible to an amount of cash, and different valuations of the same commodity (health, in this case) cannot always be compared.

Long-term costs are like deficiency diseases — they can be cured if detected early, but, after a time, the incremental damage is irreversible, e.g., if Shahrukh continues to skip lessons he too, like Kutty, will forfeit the option of completing school.

F3: If the OHS module was part of the programme, remind the participants of Lokman.¹ He had to pay ₹20,000 once on treatment, and lost business worth ₹100,000 when customers cancelled their waste-collection contracts. He is young and fit, and even though he runs a scrap businesses he does not (and never did) handle waste directly. He injured his hand while his truck was being unloaded, and the wound got infected. He makes sure that his employees are protected when they work. He has learnt the value of being healthy.

Initiate a role-play using II①⑥ FROM SPECTATOR TO SPECT-ACTOR→[62]. Ask your assistant to play the role of Laxmi in the first round; you will play the roles of Kutty and Shahrukh. Ask Laxmi (your assistant) to react to the following statements:

§ SCENE I (LAXMI'S HOUSE)

Laxmi is lying on the floor; Shahrukh (or Kutty) enters the room and speaks to her. At this stage, spect-actors may intervene and play the role of one of the children. The

¹ Lokman incurs an average cost of approximately ₹150 per month towards purchasing PPE to maintain his health, which he values at ₹120,000. The annual cost of PPE—a price that Lokman now pays gladly—is 0.6% of the money he lost when he fell ill. Some waste-workers spend more, every month, on tea.



Image 192. Lokman, spent ₹20,000 on treatment and forfeited ₹100,000 in income.

moderator takes the first round. Use one of these lines:

Amma ('Ma' or 'Aai'—use the vernacular for 'mother') why do you keep falling ill? I do not know what to do when you are ill. I can't go to school.

Amma, I failed my examination. But don't worry, I will take care of you.

Amma, please do not fall ill. Baba ('father,' in the vernacular) goes to work, Shahrugh goes to school.... I cannot take care of you all alone.

After the first round, ask volunteers to become spect-actors and play the role of one of Laxmi's children. Ask volunteers to recall their emotions when they saw the scene in **F** 4. Laxmi is in a vulnerable position—she is lying on the floor—while her children stand tall above her. Visually the scene shows the power-relationship between the characters at that moment. Illness has made the mother helpless, and she depends upon her children.

☞ What does the image of Laxmi lying helpless on the floor say about her situation?

Discuss each spect-actor's intervention and remind them, before each round, that they may chose to intervene either as Kutty or Shahrugh. Analyse both the tone of the inter-action as well as the message:

- Are the spect-actors playing the part of Kutty or Shahrugh? Or are they merely talking to Laxmi as a peer?
- Are they struggling to switch perspectives to that of a confused child wondering what to do or say?
- In their role as Laxmi's children do the spect-actors try to help Laxmi by offering to do her work while she is ill?



Image 193. Is Bahubali a great warrior because of his kavach? Or is the kavach merely an essential part of any warrior's battle kit?

- Are they complaining about her illness?

Your interaction with Laxmi during this role-play shows how you expect your children to respond to your illness. You would want them to show courage and be patient; you would want them to know that you are trying to get well soon so that you can resume your duties as a parent.

I understand if you say nothing more than "Get well soon, Ma." A child can hardly do anything else. In some cases, a child can fill in for her mother or father. Kutty does this regularly. When Laxmi falls ill or injures herself at work, Kutty works at the scrap shop. That is admirable, but is that what you want?

Nobody wants to fall ill and no one contracts a disease on purpose. But is there an extra amount of personal responsibility that a parent must bear to ensure that the illness does not affect the child's education?

- ☉ Whose assessment of health is the correct one? Discuss the reactions of the participants. Oppose any fatalistic reactions.

I know Laxmi is poor, but so are all of you. Something has to be done. Preventive health-care has a cost, as does treatment. Information is free, and it gives you options. You can choose to value your health as you wish; you can choose to pay the price of prevention; you can negotiate with your employer to pay these costs as part of your services; you can play a game of chance — if you save ₹140 per month you can have 14 extra cups of tea. If you do this for 15 years, you will have consumed a tanker-load of tea, but if you fall ill you will find yourself in debt.

Evaluating the value of lost opportunities can be a complicated process since there are far too many variables involved over a very long period; similarly evaluating the benefits of a good education can also be complicated—a person may squander away his or her life even if she has a college or university degree.

Is a good education useful? Does everyone need to have a college education? I don't know. The decision is not mine to make. My duty is to ensure that my children can choose to educate themselves; the decisions that I take today, about my health, will enable my children to make that choice.

☯ Reverse the roles. Would anyone want to play the role of Laxmi and speak to Kutty and Shahrukh?

If five out of the 40 people sitting in front of you have begun to believe that their labour, skills *and* health are all vital ingredients of their value as professionals, then your job is done.

F 6: How can Bahubali be a great warrior as well as a slow tortoise?

Do not write off the tortoise without a thought... He lives for 200 years because he is protected by his armour. Imagine someone who is 200 years old. She would be alive when the British came to India; she would have fought in the wars for Independence; she would have cheered when the Indian flag was first unfurled in 1947 on the Red Fort; Nehru and Gandhi would have been like children to her... Imagine what good health can do!

ACTIVITY 3

Gold and savings

Objective

- Know the advantages and disadvantages of different savings options.

Slides

- [S]1: Pictures of gold jewellery, a pile of cash and a bank.

Steps

- Display [S]1. Explain what each picture represents.
- Invite 3 volunteers to join you. v1 is someone who believes in gold as an investment, v2 saves in cash, v3 saves in the bank.
- Present different financial situations to each volunteer and ask them to respond to various financial crises.
- Discuss pros and cons of gold, cash and a savings bank account in the light of how easy (or difficult) it is to solve a problem when a participant decides to put all her savings into one of these savings-baskets.

Notes

- People save so that they (or their children) can spend the savings. The focus of this activity is to discuss the relative ease (or difficulty) of a person's access to her savings. Growth and inflation in the context of savings are discussed in greater detail during the next activity.



Image 194. Different options for saving. Each has its advantages and disadvantages..

DISCUSSION

The chances are that every participant is wearing gold jewellery—a small nose-ring, a pendant on her *mangalsutra* or a set of earrings—of some kind. Ask participants if there is anyone in the room not wearing jewellery.

It is good to see an exception to the rule that everyone loves gold!

Call for a show of hands on the following questions. Ask one or two respondents to explain their choice:

- ☞ [1 AP] Who prefers to save money in the form of gold?
- ☞ [1 AP] Who likes to save cash and hide it somewhere?
- ☞ [1 AP][#] Who has a bank account? How many use it to save money? How many use it merely to deposit their pay cheques?

The third question will evoke many responses because almost everyone nowadays has a basic bank account. Ask respondents if they save money in the account; to clarify the matter, ask them if they have any other form of savings. Pick AP from each category and ask them to join you in the front. Arrange them in the same order shown in 51—Gold, cash and bank. Narrate the following situations to the participants. Ask *each* volunteer to assess the financial implications (in the context of savings and the mode of savings, i.e., if their savings are in the form of gold, cash, or in a bank).

1. Your son is injured. His foot is fractured. He needs medical care that will cost a lot of money—you are unsure how much money you might need.
2. Your husband has incurred gambling debts and is looking for money.¹

¹ If savings are in the form of gold, the third situation does not pose any problems, especially if the gold is hidden. Gold

3. Your husband drinks liquor. He usually spends his own earnings, but today he doesn't have any money. He can be violent if he gets drunk, but he can also be violent if you deny him his evening dose of liquor.
4. You want to buy a sari for your mother. Not too expensive, but not too cheap. You want to save some money just for this expense.
5. You have just received some cash from your parents. It is a considerable amount. You want to use it bit by bit over the next few months. The neighbourhood gossip-queen has spread the word that your parents sent you money, and suspicious characters were watching your house yesterday.
6. Your daughter is in Class x. Her teachers are sure that she will clear the medical entrance exams if she studies hard for the next two years. She is a good student and is eager to be a doctor. The medical entrance test costs ₹2000; the first year's college expenses will be at least ₹100,000 and will increase gradually every semester to ₹200,000 in 5 years.
7. You want to keep ₹50,000 aside for emergencies—the reasons can vary, and they do not matter. The money should be safe, but instantly available.

Each of these situations presents a case where one form of saving is better than the others. The following aspects of savings are covered:

- Liquidity, advantages and disadvantages
- Physical security
- Interest on savings
- Saving for the long-term
- Saving for emergencies
-

Situations that require ready availability of cash will favour those who save in cash; paying for long-term expenses and security is easier with money in bank. Each example will demonstrate that savings should be distributed among different baskets depending upon what one wants to do now, and in the future, with the savings. Help participants to quantify their financial requirements (and suitable liquidity) in different situations. They know they need some cash, some gold and something in the bank. But how much of each?



is useless in the first situation because the sale of jewellery always incurs a loss, which can be as high as 30% of the prevalent book-value of gold. The fourth situation is also problematic because gold can only be purchased in fixed quantities. Be prepared to supply quick responses to questions from participants.

Finance and the P2P method—II

Objective

- Know how to evaluate financial problems and solve them using the P2P method.
- Financial plans for common situations and goals.

Notes

- The purpose of this activity is similar to that of III@ USING THE P2P METHOD → [343]. It shows you how the P2P method can be used to solve specific problems; typical problems are selected, as case-studies, to illustrate the general principles of applying the P2P method. The first step of the P2P method requires you to create a precise problem-statement; when applied to finance, the first-step is to define the current financial state, and the desired financial state for a person. Once these are defined, the rest is a matter of arithmetic and common sense.¹ You will find that most problems are purely financial, and are similar to those OHS-related problems that may be solved with an engineering control or appropriate PPE.
- Do not waste time calculating interest, especially compound interest, on the white-board. Pre-calculate the values before the workshop.
- The activity also includes problems that do not yield to the P2P method. You must know how to identify such problems immediately and recommend the appropriate way to solve them.

Workshop programme

- Initiate this activity whenever a participant describes a specific financial problem.

¹ Students of chess often find the phrase, 'and white (or black) is winning. The rest is a matter of technique,' in games that are annotated by strong chess grandmasters. The cryptic annotation merely indicates that the average player should be able to win from that position unless he or she commits a gross strategic or tactical error.

DISCUSSION

You will be expected to provide *rapid* answers to very specific situations. All the information required to create a viable financial plan for the participant may not be available. You must learn to identify missing information and ask the participant to furnish it. As an exercise, create a financial plan for each of the following situations using the P2P method. The solution to the last question is described in the case-study that follows.

- When is it advisable to change one form of saving into another? I have a gold necklace for my daughters. Should I sell it and put the money into a fixed deposit?
- My drunkard husband knows all the places where I hide my cash. I need cash for everyday expenses. What should I do?
- My husband is very supportive. We pool our income. But he is a spendthrift—he loves taking the children to watch movies and buys them clothes. How can I stop him spending money unnecessarily?
- My son is the apple of my eye. He always asks for money to do this or that. He never steals money from me. But if I have money, I cannot bear to say no to him.
- I am saving for my daughter's wedding. It will take place after six years when she is 18. How much should I save and how often?

+ A DAUGHTER'S WEDDING.

PROBLEM: I am saving for my daughter's wedding. It will take place after 6 years when she is 18. How much should I save and how often?¹First, question all the assumptions—

- Why do you assume that your daughter will get married when she is 18? It is legal for her to marry at 18, of course, but why assume that she will?²
- If she is good in studies and clears the medical entrance exam, you might have to spend on her education. Have you considered that?

The rest is a matter of arithmetic and common sense. Write down all wedding related expenses for which the participant want to save—use one column of the white-board for this purpose. Then assume a 10% inflation of costs per annum and write down future costs. Explain how inflation can reduce the value of savings (also see VI② COST, PRICE, AND VALUE_→[443]).

- Ask the participant how much she earns and how much she saves. How much she keeps aside for emergencies. Discuss a realistic amount of savings based on her income. Simple arithmetic will tell you how much she needs to save every year for the next six to ten years. The range is important. Compound interest will yield higher returns every year. Money doubles in approximately 10 years when invested in a compounded fixed deposit.

1 Always ask for numerical data from the participants instead of using your own. Remember that participants' decisions are based on the information they have, which may be very different from your data.

☞ Is anyone else saving for a daughter's wedding?

☞ Does anyone here have a daughter who was married recently? What did the wedding cost?

☞ Does anyone remember the cost of their own wedding?

Responses and follow up questions will give you enough data for this discussion.

2 The government is considering a proposal to raise the minimum age of marriage of girls to 21.

- Discuss liquidity. Is there any money (or gold) already saved. If there is gold saved *solely* for the purpose of the wedding, it might be prudent to convert it to cash (or a gold bond) and invest it in a locked ten-year deposit.
- A lot of young, salaried persons in fancy clothes might not have as much money saved as some of the participants in the room! Many of them live from pay-cheque to pay-cheque, and many more live on credit, which is alright as long as they are able to repay their loans. Banks do not care how someone looks; all they care about is a person's credit-worthiness.

There is nothing wrong with being in debt. Many of the richest companies and businesses around the world all have extensive loans. Reliance Industries, run by the Ambani family is indebted to the order of tens of thousands of crores, but it is considered a profitable, credit-worthy company. On the other hand, companies like Kingfisher went bankrupt over a debt of around three thousand crores. For the banking system, a person's (or company's) ability to repay debt in a systematic and timely fashion and regular payments are more important than the amount of money owed.

§ RECOMMENDATIONS

- Having three *tolas* (30g) of gold around your neck will not help you get credit; having three *tolas* worth of gold in a fixed deposit in the bank gives you instant access to the value of 2.3 *tolas* of gold in cash at 12% yearly interest.
- A loan against gold is different from a loan against a fixed deposit. Banks will accept gold as collateral but will prefer a more liquid asset. Gold is bulky; it requires secure storage; it needs to be auctioned if the loan (for which it serves as security) is not repaid. A fixed deposit is just a number in their ledger. It is already liquid and immediately available to the bank. They are willing to lower interest rates or offer easier repayment terms for fixed deposits of the market value of an equivalent mass of gold.
- If you have jewellery, consider converting it a deposit. Wear imitation jewellery that looks identical. Nobody will know the difference!
- Do not store gold in a safe-deposit box. As an asset, it might as well be buried under a tree—invest gold for best returns.
- Deposit money into your daughter's account. Accounts created for minor girls get good benefits (marginally better interest rates, education funds, and so on) from central and state governments.³
- Money should be put into her account as and when it is available—₹50 to ₹100 or so every week can accrue to ₹200,000 over 15 years. It is good practice to take young children to the bank every week and let them observe how money is deposited. Children may be entrusted with the safe-keeping of the account's passbook and ATM card, while the parent keeps the PIN number—this arrangement builds mutual trust since both account-holders must consult the other to access the account.⁴
- Avoid buying gold for long-term savings unless you need to save a large sum in an easily transportable form and are willing to take a loss.

3  VI④: Any questions asking for specifics on how to create an account for minors.

4 Further, depositing money into a child's account acts as a psychological deterrent against impulsive or non-essential expenditure.



Image 195. Gold may be a solid investment. A sovereign gold bond might be better. The appropriate savings basket varies according the requirements of the individual.

I am not recommending that you run out and sell your gold tomorrow! Gold has a few advantages too. It can be carried with you at all times for use in emergencies.⁵ In some situations, the difficulty to convert gold into cash can be an advantage, e.g., it eliminates impulsive expenditures.

- The *nominal* price of gold usually matches inflation. But, there is always a loss incurred by the seller when gold is traded for currency—even more so if it is in the form of jewellery. When selling gold jewellery, its cash equivalent is only about 70% of the current value of its weight in gold, i.e., if the prevalent price of 10g of gold is ₹30,000, the sale price of a 10g gold necklace, will be approximately ₹21,000. Also, gold prices refer to pure gold (also called 24 carat gold). Gold jewellery is made with an alloy of gold and copper, and the composition of the alloy can vary. The amount of gold in a piece of jewellery is indicated by its carat-rating, which may not be embossed on the item. In such cases, it must be calculated⁶. Jewellery made with 18 carat gold contains between 75–79% of pure gold; 22 carat jewellery contains 92–96% of pure gold. Disreputable jewellers may try to pass off 22-carat gold as 18-carat.
- **F 6:** When Laxmi refers to gold as a ‘solid’ investment whose value increases with time, she is partially correct—it would be entirely correct if she had invested in a Sovereign Gold Bond. The argument *does not* apply to jewellery.
- Entering the formal banking sector involves more than opening a savings bank account. There are also options like Public Provident Fund, National Savings Certificate, Fixed Deposits and so on, which you will discuss in the next activity.

⁵ The reason is simple: the reassurance afforded by a small, easy-to-hide, high-value asset is very important to some women. If she wants to be able to pick up her child and leave her house at a moment’s notice, she might not be able to withdraw her money from a bank. However, her earrings are ready to travel with her at all times.

⁶ Archimedes is famous for discovering the method, which bears his name, to compare the densities of identical volumes of a substance.

- If this module is part of a full-day workshop that includes PPE modules, sneak in the usefulness of PPE. Banks require some form of non-financial assurance (in addition to collateral) of a person's credit-worthiness—if you work in a factory that uses PPE, your credit worthiness improves.

Once you have explored all the options, participants can decide what they want to do. Always wrap up specific case studies and solutions offered to a participant by generalizing the important bits of information for all participants. End by stating that the solution was always present as an option. Knowing about these options is empowering; ignorance can lead to powerlessness. One of the scenarios discussed above might seem counter-intuitive, e.g., saving in the form of gold.

Do you feel that Laxmi feels secure carrying her life-savings with her at all times?

Do not assume, imagine or judge the realities of the participants' lives. Discuss all options objectively and dispassionately as if they are numbers in a formula. The case study of a daughter's wedding shows the chain of logic and information that is common to all cases of financial planning—the P2P method can be applied to all kinds of situations that involve decision-making and problem-solving. It is easy to do if you practice and know your fundamentals. Create a plan for each of the situations in the list given earlier. Practice by standing in front of a mirror and explaining the plan to yourself.

- ☹ Sometimes, making a plan in this way will tell you that your goals are too ambitious. Is it better to know this in advance or would you prefer to be unreasonably optimistic about your chances?
- ☹ Would Kutty be a waste-worker instead of, say, a doctor, if Laxmi knew about financial planning?





Image 196. swm workers are eligible to apply for educational loans, micro-finance, term loans and business seed loans under many government schemes.

ACTIVITY 4

Banking Basics

Objective

- Know the advantages of being part of the formal banking system.

Slides

- [S]1: A government bank.
- [S]2: A child getting a bank passbook.
- [S]3: An scholarship programme for girls.

Steps

1. Display [S]1 and explain the procedure to open a bank account.
2. Display [S]2 and explain the procedure to open a bank account for minors.
3. Explain methods to improve chances to get a loan using the case study of Laxmi.
4. Explain the advantages and disadvantages of different financial savings instruments.
5. Display [S]3 and discuss the various government schemes useful to waste-workers.
6. Discuss various sources of credit.

Notes

- Do not force the participants to accept the importance of the formal banking system. Allow them to realise its importance when they are ready to evaluate its benefits in the context of their personal lives.
- During this activity, your assistant should set up the Income-Expenditure chart which will be used in the next activity.

Workshop programme

- EXERCISE 35: CALCULATING EMI-S → [433] may be included in this activity.



Image 197. State Bank of India is a safe, reliable bank that offers a wide range of banking services, including the option to open a basic Jan Dhan account.

DISCUSSION

Begin with a exciting teaser. You had promised to show the participants how to get loans at sane interest rates, and now is the time to do so.

☞ What is a sane interest rate?

When a money-lender says 10% (use the colloquial term for percent, such as *takka*, *pratiksbat* or *fisadi*), he means that if one borrows ₹1000, one pays back ₹1000, and ₹100 for each *month* of the loan period. When a bank says 10% it means that if one borrows ₹1000, one pays back ₹1000, and ₹100 for each *year* of the loan period. Banks might offer the option of EMI, which is a monthly lump sum that includes interest (calculated per annum on the unpaid principal) and a portion of the principal—this is not the same as monthly interest. (See EXERCISE 35: CALCULATING EMI-S, [433].)

Banks rarely mention monthly interest rates unless they are referring to credit card interest rates, in which case it is always specified as such. In almost all other cases interest rates, when mentioned without a period, are per annum. The repayment terms are also far better—banks usually allow a considerable grace period before the applicant must begin to repay. In the case of student loans, the repayment begins only after the student has completed the course—so, if a person take a student loan for their daughter's medical education, she would be liable to begin payment five years after the loan was taken. Once the benefits are established, explain that a few basics must be ironed out, which you will do before laying out the credit options available to participants. Banks will *not* disburse a loan in cash. They will require you to open an account into which the loan is disbursed—this is true of small value loans too.

👉 How many have deposited money during the previous month?¹

📄 Did they try to open an account? Do they have all the documentation that is required to open an account?

§ HOW TO OPEN A BANK ACCOUNT?

The applicant needs *proof of identity* (Voter ID card and Aadhar are the most common), *proof of address*, a *PAN card*, and *two passport-sized photographs*. Often, a Voter ID card will not mention the complete postal address of the applicant.² An Aadhar card is more likely to contain the proper postal address. Check that the participants understand how to verify that their listed address is complete before you continue.

🕒 How many participants know their proper postal address? Do they have documents to prove their address. Is this address correct? If there is confusion about how to identify if a given address is valid, initiate ④③ YOUR HOME VS. YOUR ADDRESS → [476].

Some proof of address is essential to use the formal banking system. This document is required to open a bank account but if the address listed is incorrect or incomplete then essential documents may not reach the account holder. Since the bank will insist on using the address listed in the document, it is essential to correct the address on the document before applying to open an account.

👉 Any participant who does not have a valid identity and address proof.³

✱ Beware of touts who promise to give you a new Aadhar card. Documents sold by touts are fakes. Only a verified Aadhar application centre can create a genuine Aadhar record. If the applicant does not have a PAN card, he or she will have to fill in an additional form (also available at the bank). Explain that it might be useful to apply for a PAN card as well, since it improves the chances of getting a loan. With these documents and ₹1000, the applicant should visit the nearest public sector bank. The applicant will be asked to fill in a form (someone at the bank will help) and make an initial deposit of ₹1000. An important decision to make while filling in the form is whom to appoint as the nominee—someone who may claim access to the money in the account in case the applicant passes away. The nominee can be anyone—a spouse, a parent or a minor child. If the nominee is a minor when the account is opened, the applicant must also provide the name of a person who will submit an application on behalf of the minor. The applicant is given a passbook immediately upon opening an account. An ATM/debit card and a PIN are subsequently sent to the applicant by registered post.

The process of opening a joint account is exactly the same with one difference—the applicant provides the name(s) of one or more persons who may operate the account. Their identity documents are also required at the time of application. Joint accounts may

1 ✱ Check the number of participants who have a bank account in your notes and cross-check with the current vote. If most participants have active bank accounts, skip the next vote, briefly explain the procedure for STEP 1, then move on to STEP 2. If not, proceed as usual

2 Examples of a Voter ID containing an incomplete address can be found online.

3 ➡ [After workshop]: information on how to apply for these documents and how to rectify incorrect information.



Image 198. The government has several financial programmes for minor girls. (Photo by S.S. Kumar, *The Hindu*, 12.02.2015).

be held with minors as well. Applicants may also choose to open an additional Public Provident Fund (PPF) account at the bank. This is a form of pure savings at an interest rate set by the Government of India. It is usually around 8% and changes marginally every four months, but the Government sometimes offers special interest rates for women. The advantages of PPF accounts will be discussed later, in STEP 4.

§ HOW TO OPEN AN ACCOUNT FOR A MINOR

State Bank of India offers two options to minors to operate an account—Pehla Kadam and Pehli Udaan.⁴ Each of these offers the benefits of savings in addition to other schemes. The procedure is similar to opening a savings bank.

CASE STUDIES

Close defers → by specifically asking participants to ask for clarifications as you speak. Continually ask them if they are able to follow what you explain. This is the part in which most participants will be interested—how to improve one's credit-worthiness. First, lay out the fundamentals with case studies. Use the second white-board to write down the figures mentioned in the case studies.

✦ BUILD CREDIT-WORTHINESS.

Credit-worthiness is not the same as 'worth'; it is a way of determining the risk of someone not repaying a loan.

4 For more information on these schemes see @zoqc7b5.

Assume Laxmi has opened an account with, say, ₹100,000 then she is worth ₹100,000, but her credit-worthiness remains zero.⁵ If she wants to take an immediate loan of ₹20,000 from the bank she is unlikely to get it. The bank will ask itself why someone would open an account and immediately take a loan. Or, they will say, "We will loan you up to ₹75,000, but you must convert your savings of ₹100,000 into a fixed deposit, which must remain with us till you repay the loan."

On the other hand, let us assume Laxmi opens an account with only ₹1,000 and continues to deposit, say ₹8,000 every month and withdraws ₹3,000 every month for a year. This means she is worth ₹61,000 at the end of the year. Then, she applies for a loan of ₹20,000.

How does the bank evaluate Laxmi's application? The bank knows that she earns ₹8,000 every month and saves ₹5,000. This shows that she is a diligent saver. It is highly likely that she will continue to save ₹3,000 every month, which is higher than the total interest on the loan at 10% per annum. She has applied for a loan that is less than 1/2 of her net worth.

Laxmi will get the loan, and she will have access to her capital of ₹61,000 while she repays the loan. The bank evaluates Laxmi's financial behaviour in addition to her net worth. Indeed, the requirements for establishing credit-worthiness for loans that are ₹20,000 or less are often less stringent than the case study discussed, but the general rules are similar. A thorough understanding of the process of applying for a loan and the documentation required to do so is not required. Far more important is establishing one's credit-worthiness. If the applicant is deemed worthy of credit, the bank will go out of its way to help with the documentation.

✚ HELP BANKS GIVE YOU A LOAN.

Loans taken for business are evaluated differently than loans taken for personal use and the bank, unlike the money-lender, will want to know why Laxmi applied for the loan. Assume that Laxmi has saved as usual for 2 years. She has repaid her previous loans on time and her monthly income has increased by ₹2,000. Her expenditures have also increased—she spends more money on her children and herself. (Why not?) She now has ₹140,000 in the bank. She diligently deposits ₹4,000 every month into her account. Now, to set up a scrap transport business, Laxmi wants to buy a small, second-hand lorry from an authorized Tata Motors® dealer.⁶ The lorry (a Tata Ace®) costs ₹200,000. She knows that she can earn an additional net income of ₹10,000 per month. (Net income is the amount left after paying for all the running costs of the lorry.) She applies for a loan of ₹150,000, which is ₹10,000 more than her net worth. She wants to repay the loan over a period of 5 years.

☞ Will she get the loan? How many are unsure if her application will be successful?

5 The figures used in this example should be provided by participants. Cross-reference with their self-assessment of income. Ask for consensus. ☞ Is ₹10,000 a fair estimate of Laxmi's income?

6 Note that Laxmi's usage of funds is traceable and the asset's valuation is reliable—She will purchase a lorry by cheque from an authorised dealer. On the other hand, if she wanted to purchase the same lorry from the neighbourhood garage, the bank would insist on an inspection of the lorry by one of their accredited evaluators.

Tally the results, then explain how a bank will evaluate Laxmi's application for a loan.

How do banks evaluate a loan application?

- The bank will own the lorry till Laxmi repays the loan—therefore it is an asset they own till the loan is repaid. If the lorry is in good condition, its book-value will not depreciate more than 30% over the period of the loan.
- The seller is an authorized distributor of a reputable company.
- Data shows that the estimated monthly profit of ₹10,000 is reasonable.
- If Laxmi repays the loan with 50% of the projected profit, she will repay her loan within 3 years, which is less than the 5 year loan period.
- Therefore, it is reasonable to say that Laxmi has excellent credit-worthiness with respect to this loan and it is likely that her application will be successful.⁷

Do not think about the numbers. She will get the loan. Banks give people personal car loans using a very similar formula.

Credit-worthiness is the beginning. Banks also consider the usage of the loan:

- Is it a personal loan, i.e., is the money being used on personal expenditure?
- Is it a loan being used to purchase an asset, like a house or a motor-vehicle?
- Will the asset be used to generate income, i.e., is the loan being used to start or expand a business?
- Is the business likely to succeed with the applicant in charge of it?

Loans for personal expenditure almost always incur a higher interest. In the case of credit-cards, which are designed to service personal expenditure, the interest rate could be 24% per annum or more.

We are discussing a financially cogent reason for a bank to give a loan of a financially valid reason for Laxmi to ask for a loan, which are not the same. If Laxmi applies to buy a Royal Enfield Bullet® motorcycle for Shahrukh, she might not get the loan because the motorcycle does not generate any revenue in addition to Laxmi's current earnings.

👏 How many participants have sons who want to buy a motorcycle?

✚ GOVERNMENT CREDIT SCHEMES.

swm workers are eligible to apply for credit and loans from National Scheduled Caste Finance and Development Corporation (NSCFDC), National Backward Classes Finance and Development Corporation (NBCFDC), and National Safai Karamchari Finance and Development Corporation (NSKFDC).⁸

⁷ Continue to use the figures for income and savings that the participants agree are valid estimates. Establish that if, indeed, Laxmi's income was greater while her savings remained the same, the bank's reasoning would not change. Any person who saves 10% or more of their income is considered to be a prudent saver.

⁸ At the time of publication, the following links contained information of these schemes: @slfuok4, @rxbnjib, @wm2cwhp, @ur3y9go, @vpp4taz, and www.pmjay.gov.in/

1. The Mahila Samridhi Yojana (of both NSKFDC and NBCFDC) offers loans of up to ₹60,000 to women. Repayment starts three months after the loan is disbursed at a rate of 3.5% per annum. Both organizations also offer term loan up to ₹500,000 (90% of the cost of the project) at an interest of 3% per annum.
2. The Nari Arthik Sashastikaran Yojana of NBCFDC also offer loans specifically for the purpose of establishing small businesses.
3. Children of SWM workers can apply for educational loans to attend courses offered by Indian and foreign institutions. Loans up to ₹1,500,000 are available at 3.5% per annum for girls and 4% for boys.
4. All school-going children (students of classes I to X) of waste-workers are eligible for annual educational scholarships of ₹225 per month for ten months every year. These scholarships are disbursed by the Social Justice Department of the Government of India.

SWM workers can also avail benefits under the Ayushman Bharat programme.

☹ What might have happened if Laxmi knew about the this programme? What if she had taken a loan for Shahrukh and Kutty's education from NSKFDC instead of saving in the form of gold?

✚ TRUST, ACCORDING TO BANKERS

Explain the difference between a relationship with the banking system and a personal relationship with the people who run the bank:

Many of us have bank accounts (call out names of people in the audience as examples) and we usually meet the same person at the local bank. They know us and are friendly. Often they help with paperwork and other formalities. Let us assume that I have a savings account with ₹20,000. I do not save much. I have a gold chain weighing three tolas of gold that I got as a gift from my wife. It is worth around ₹100,000 at today's prices. I do not have a receipt for it and I am not sure if it is 24 carat gold or 22 carat gold.

☞ Will a bank accept my necklace as collateral for a loan of ₹70,000? Tally the results. The participants will be divided or unsure.

Those of you who said "yes" are correct, but it is not easy. I can get a loan from my bank only because they know me. And even then, they are bending rules slightly by doing so because I do not have any proof that I own the necklace. What will happen after five years? The old staff that knew me may have retired and be replaced by new staff. They do not know me personally. They will want a receipt for the necklace. If the receipt is still in the house, it will be in my wife's name. So they will ask to see our marriage certificate.

Banks are not moneylenders. The banking system relies on financial records, not on personal trust.⁹

9 Specifically, the banking system does not know the value of items stored inside a locker.

Even if I keep a gold necklace in a bank locker, the banking system does not care. It does not care what is inside the locker. Earlier today, we discussed the various reasons why gold could be a good investment in some cases. However, it does not fit particularly well into an impersonal banking system: this is a reality that we must accept. We will now discuss the various sources of credit and different savings instruments. We will try to understand which is appropriate for a given situation.

Discuss the relative advantages and disadvantages (ease of access, interest rates, inflation, long-term savings) of the following savings instruments:

1. Savings Bank Account.
2. Fixed Deposits.
3. Recurring Deposits.
4. Gold Bonds.
5. Public Provident Fund.
6. Self Help Group.

Use the following descriptions to prepare a two-minute talk on the different savings instruments available and the relative merits of each:

1. Savings Bank Accounts are designed for savings and expenses faced by a household or an individual. Their primary purpose is to keep your money safe and easily accessible. The interest rates are approximately 2-4% per annum, i.e., a deposit of ₹100,000 in a Savings Bank Account will accrue approximately ₹3,000 in a year if there are no withdrawals. The actual interest paid depends upon a weighted average sum of money maintained in the account.
2. Fixed Deposits (FD) are a sum of money kept for a predetermined period in a bank. They may be linked to a Savings Bank Account. The interest rates are directly proportional to the tenure of the deposit, which is usually calculated in multiples of a year. An FD offers interest rates of around 6-7.5%, which is usually compounded quarterly. An FD of ₹100,000 would accrue ₹6,100 in a year, but a five-year tenure would accrue around ₹40,000, i.e., an average of ₹8,000 per year.
3. Recurring Deposits allow the account-holder to make periodic deposits, and build a corpus of money. Such an account is most beneficial to those who have a fixed (or predictable) regular income.
4. A Sovereign Gold Bond (SGB) is for those who want to keep pace with inflation—with the assumption that gold prices will, indeed, keep pace with inflation over the savings horizon. This instrument allows an investor to save in multiples of the cost of 1 gram of gold, i.e., approximately ₹3,000 (if the price of gold falls more than 2.5% below this threshold, it becomes worthless at that time) every time such a bond is purchased. The instrument allows the bearer to avail a loan of 80% of the current price of the bond, i.e., if Laxmi, instead of purchasing 30 gram earrings, had bought an SGB worth 30 grams of gold, she would have access to approximately ₹70,000 of credit at any time. She could also convert the bond into currency at any time.
5. Public Provident Fund (PPF) is a government-backed scheme that gives a return of approximately 8% per annum. It allows a minimum deposit of ₹500 and a maximum deposit of ₹150,000 every year; it is essentially a 15-year investment. There are



Image 199. Poster for the government's Beti Bachao programme. The government offers financial incentives for girls who chose to study and earn a college degree..

- options to withdraw from this account but workers in the SWM sector should not invest in PPF if they plan to withdraw funds from it before it matures in 15 years. PPF is, perhaps, the best way to save for a child's education. After the third year, 25% of the current investment will be available as a loan at the rate of 2% more than the current payable interest, i.e., if Laxmi has ₹100,000 invested in a PPF account and the current rate of interest she earns is 8%, she can avail a loan of ₹25,000 at 10% interest.
6. A Self Help Group (SHG) is the most accessible savings scheme to join, and is the least effective financially. It is a peer-to-peer, savings- and credit-group, in which all members contribute an amount of money regularly to the SHG. Loans can be taken for any reason but must be approved by the other members of the group, and not all members may avail a loan at the same time. Interest rates are usually around 24% per annum, payable monthly.

Participants should stay away from chit funds (use the appropriate colloquial term, '*bhisi*' etc.,) and similar rotating savings plans. If they are already invested in such a fund, they should complete their financial obligations for the current tenure, withdraw their money and deposit it in a proper bank.

- 🗒️ [🗒️: #, name]: How many of you save with an SHG?
- 🗒️ [🗒️: #, name]: How many of you save with a chit fund?
- 🗒️ How many feel comfortable to start saving in a proper bank?¹⁰

What I described is not nearly enough to explain the various aspects of financial planning. It is a complex subject that requires specialist knowledge. People who earn ₹500,000

¹⁰ If none of the participants are visibly enthused about re-evaluating their financial choices, do not press the issue. Summarize STEP 4 and move on.

per month might not know all the details of financial planning either. Many of them do not know anything about it, but they can afford to hire a professional who knows.

- Get a bank account in a large public-sector bank. If you need help with the paperwork, talk to your colleagues, your employer, or your supervisor. If nobody is willing to help you, call Hasiru Dala—their contact details are on your badge.¹¹

✦ BANKED SAVINGS AND SHORT-TERM CREDIT.

🗣️: Has anybody taken a loan of ₹15,000 on interest? Did you know that for small amounts, it is financially safe to get a one-month interest free ‘loan’ from your bank? Explain the question, if necessary.

This is how credit cards work: The first month is interest free. If you repay the entire amount within a month, you are not charged interest. If you cannot pay within the first month, the interest clock starts ticking at 3% per month! But the first month is free.¹²

Powerlessness was defined, in Module II, as the lack of options. It is time to refine that definition. Young, salaried people face a curious situation—their financial problems are often the consequence of extremely easy access to credit.

A youngster gets a job that pays ₹20,000 per month. Within a few months they get access to a credit-card that allows them to borrow ₹25,000 per month at an interest of 3% from the second month.¹³ They get excited by this access to credit and spend more than they can afford. Obviously they cannot repay the entire amount in the interest-free period and they fall into a debt-trap.

While the lack of options is a sign of powerlessness, a preponderance of options is not power in itself. Self-empowerment is achieved by the ability to choose wisely from available options!

Right now you do not have access to easy credit, so you are “financially weak”, but remember that having access to easy credit without understanding how to use it can and does make people “weak.” The banking system gives people options. They do not care if one is a waste-worker or a driver or a vendor of potatoes. If one deposits money into the system, one gets increasing access to credit through various options.

¹¹ Workers at Hasiru Dala speak English, Hindi, Tamil, Malayalam, and Kannada.

¹² However, credit cards must only be used for making a purchase and never for withdrawing cash, which attracts immediate interest at 3% per month. Beware! Another caveat: a ‘month’ begins on the date that the credit card bill is generated. The interest-free period is usually 30 days after the date on the previous bill—check the terms and conditions of a credit card to know how the interest-free period is determined.

¹³ Many salaried persons are hesitant to keep a credit card at hand. Can anybody guess why? Participants should be able to guess the reason. Remind them that easy access to credit is empowering only if it is used wisely.

ACTIVITY 4A

Your home vs. your address

Objective

- Know the components of a valid postal address.

Steps

- Explain the different components of a valid postal address.
- Ask participants to check their Aadhar cards (or other identity documents) and verify if the address is valid.
- Diagnose reasons for non-delivery of mail.

Workshop programme

- Skip this activity with managers and administrators.

DISCUSSION

Debit cards, ATM cards, PIN numbers, cheque books and so on are sent as registered letters. If an address is incomplete or incorrect, or the recipient is unable to furnish any proof of his or her identity, a postal-worker (and private couriers) must, according to regulations, return the mail to the bank. Consider the following address:

Kutty,
D/o Laxmi Narayan,
P-381, Keyatala Lane,
Calcutta—700029.

	MINIMUM INFORMATION	ANY CLARIFICATIONS	DATA
WHO?	Name of recipient	Family names, Company name.	Kutty, Daughter of Laxmi Narayan.
WHERE?	PIN code	Name or location of the Post Office that will deliver mail to the person, name of the state and city.	700029 Sarat Bose Rd, Post Office. Calcutta, West Bengal.
	Street name	Landmarks.	Keyatala Lane.
	Plot Number, Survey Number, Name of residential society.		P-381.
	Name of the building, Floor number.		
	Flat number, House number.		
PHONE			9876543210

Table 45. Necessary and optional components of a complete postal address.

The postal department will deliver mail to Kutty if her address contains all the minimum information: Kutty, P-381, Keyatala Lane, 700029 provides adequate information. The inclusion of the name of the city and state confirms the validity of the PIN code and should be included as a courtesy to the sorting clerks. Ask participants who have brought with them their voter ID or Aadhar card to check if it has a correct and valid address.¹

§ THE PROCESS OF MAIL DELIVERY.

- I. If you have been living in the same area for a long time and have received a mail recently, your address is probably all right.

¹ ➡ [After workshop]: Information on how to apply for a Voter ID and other documents and how to rectify incorrect information in these documents.


2. As long as the PIN is correct, the letter will reach the correct post office. If the address is in a rural location, mentioning the name of the post office hastens the sorting process.
3. At the post office, a postal worker will check the address and assign the letter to the postman in whose 'beat' (delivery route) the address falls. Suffixing the beat code to the PIN code may help a new employee at the post office, but it is not necessary and might confuse those who are not aware of the existence of beat-codes!
4. It helps to provide a landmark, usually done using 'near', followed by the landmark. Usually, courier services and most government forms will ask for a mobile number, which the delivery-man can ring if he cannot find an address or the addressee is not available to collect mail.
5. In the case of a minor, the name of either parent should be used in the address. In the case of rented accommodation, the name of the owner of the house could be added to the address.

§ WHAT TO DO IF MAILS ARE NOT DELIVERED.

1. The pin is incorrect. Ask a neighbour or your postman.
2. You have recently moved into a rented house in a new locality. Whilst your postman knows the address, he is unaware that you live there. An inexpensive name plate or letter box will solve the problem.
3. You do not have a street address. You only know the name of the neighbourhood. This is common in poor neighbourhoods and irregular settlements. In this case, check the address of the nearest large shop on your street (a chemist, a milk booth, a xerox shop—any shop that has a permanent electric connection—and use their street name, mention the shop's name as a landmark. In some cases, this might not be possible either because many people in the SWM sector live in unregistered slums.

 It might be possible to generate an address.²

4. Your postman refuses to deliver or cannot reach your address. This happens in poor neighbourhoods that have a large migrant population and areas that are prone to flooding. In such cases, you should visit the nearest post office with a copy of your Voter ID and request them to either deliver to a convenient location near your house or hold the letter in the post office for you to collect.
5. * Election season is the best time to obtain proof of residence from your local MLA, Municipal Corporation Representative or Gram Panchayat Member. These public servants have the power to provide you with an affidavit stating that you are a resident of their constituency. This can be used to obtain a voter ID card, which in turn can be used to get an Aadhar card and other documents.

 *My address is incomplete but the local postman knows me!*

 *What happens if your postman retires or is transferred?*

2 All citizens of India ought to have an address. For more on generating addresses, see: @y5o4v2g3

ACTIVITY 5

Income and Expenditure

Objective

- Know how to calculate the income and expenditure of a family.

Slides

- [S]1: Income-Expenditure Chart
- [C]6: Income-Expenditure Chart

Steps

1. Display [S]1 and explain the procedure to track expenditure. Distribute copies of [C]6 among the participants.
2. Ask for a volunteer to be Laxmi. Fill in the chart as described in Discussion. .
3. Discuss Laxmi's income and expenditure.

Notes

- Do not ask the volunteer to provide details of her income and expenditure; she must determine *Laxmi's income and expenses, which* allows the participants to discuss what these values might be and what they ought to be. The discussion is more important than actual figures, e.g., participants can freely argue about whether any expenditure on liquor should be budgeted; on the other hand the subject of liquor may not be discussed if the volunteer does not drink, or if she chooses not to discuss the subject because she or her spouse is an alcoholic.

Workshop programme

- This activity may also be initiated during V③ THE PAWNBROKER → [425] or immediately after it.



	Details	Total	%	Total	
Rent					Primary income
Electricity					
Water					
School fees					Sec. income
Other Ed. exp.					
Medical exp.					
Telephone					
Cable, Dish TV					
Petrol					
Gas					
Other fuel					
Sanitation					
Clothing					
Kitchen					
Rice, dal, oil					
Potatoes/Onions					
Vegetables					
Tea, coffee					
Liquor					
Hotel					
Travel					Debt ? <i>Is it an income?</i>
Int. payment					
Recreation					
Other expenses					Other income

Cash Flow

D	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
W							
1							
2							
3							
4							
5							



Image 200. (from Film 6) Kutty and Chandu are fast asleep while Laxmi dreams about the future.

Image 201. (Facing Page) Income-Expenditure Chart (See the companion USB drive for a printable file.)

DISCUSSION

☞ Does anyone here write down their daily expenditures in a notebook?¹

If someone maintains a log of her income and expenses, ask her to speak about why she does it and how it helps. Do not ask for specific details of income and expenditure unless these are offered without prompting.

AT STEP 1. Display [S1](#). A basic income-expenditure chart helps to evaluate the financial status of a family. It shows when shortages occur and when there is a surplus:

NO EXPENSE IS MISSED. It is not so easy to ‘forget’ incidental spending or blow off small expenses when expenses are written down.

ESTIMATED LIVING COSTS. After three to six months, the family will have an idea of its average monthly expenditure. This is really useful if you need to save for an emergency fund, or are planning a big purchase.

SEEING THE UNKNOWNNS. Even if a family has a balanced day-to-day budget, a sizeable irregular expenditure can ruin a financial plan: a visit, repairs, a school Activity that needed extra money. A visual representation of the commonality or frequency of such expenses, prevents the disappointment or panic associated with them.


IDENTIFYING POTENTIAL SAVINGS. If the family is in the red every month, the reduction

¹ If you discussed income and expenditure in *The Pawnbroker*, skip all references to it. However, do cross-reference information from that Activity and discuss any discrepancies.

required is immediately evident—the chart shows if the problem is rooted in cash-flow or with expenditure. Knowing where and when one's money is spent makes it easier to decide where it might be saved.

 Before you begin, ask for a rough estimate of Laxmi's income and expenditure.

AT STEP 2. Ask for a volunteer to play the role of Laxmi and ask her the following questions. Proceed slowly, pausing between each question to check that the participants understand the arithmetic on the board.²

- How much does Laxmi earn per month? Should we use the same number from THE PAWNBROKER?³
- How much does she spend on gas? On electricity?
- How much do Shahrukh's glasses cost? Do you think he will break them this month?
- Is Laxmi a strict parent? Would she buy Kutty a dress this month?
-  6: It does seem that Chandu loves his little girl. Remember how Kutty was sleeping on his arm. Do you think Chandu buys a bar of chocolate for Kutty once or twice a month? Maybe a frock sometimes? Or a hair-band?
- Chandu doesn't have any hair, so he has no haircutting expenses. What about Shahrukh? How often does he get a haircut? And Kutty? How often does Kutty get a hair cut?
- They have a TV, but do you think they have a cable connection? How much does that cost? What channels does the family watch?
- Laxmi has a mobile phone. Do you think her husband also has a phone? What is their phone bill? If you think they have prepaid numbers, how much do they recharge every month? Does this amount change every month?
- How much is the combined school fee for both Kutty and Shahrukh?
- Do you think Shahrukh takes extra tuition? Is it worth the cost?
- How often does Laxmi buy a new sari? She's always in the same green sari!
- How do Laxmi and Chandu travel to work? Do they walk? Take a bus? Does her husband have a motorcycle? Do you think he has already paid for it or is he paying an EMI every month for it?
- Do you think Laxmi and family go out to the movie theatre? What would it cost?
- What about days when they go out to the local park or to the seaside to spend a day outdoors with their children? Would she do that?

AT STEP 3: After the chart is filled. Evaluate the family's operating costs.

- Discuss where the family can reduce expenditure.
- Discuss the difference between 'needs' and 'wants'. The former category contains items or services that are essential. The latter contains non-essential or discretionary items or services.
- Discuss the overlaps—Laxmi needs three or four "regular" saris and maybe one "special" sari. But why?

2  Is the volunteer's estimate of Laxmi's expenditure realistic? Use OPINION if necessary.

3 Cross-check the amount with your notes from previous activities.

☹ How many saris does Laxmi need?

The idea here is, again, to make participants prioritise their expenditures. One fewer sari would free up money for two good-quality work aprons.... Is it worth it?

She has to wear a sari everyday. Maybe she does not have time to wash her saris everyday. Or maybe she does not need to wash them? If she does not, then all the waste she touches at work will be taken home... Maybe that's why she fell ill?

It would be impractical to change into a fresh sari everyday. What about a good quality synthetic apron that will cover her sari while she works? She can wash the apron every day after work and it will dry in an hour.

But anyway, you must decide for Laxmi... Two new saris for Deepavali or three?

There can never be enough saris. More saris are always better! But how many more? Wanting more is fine. We are human; our desire for more gives us ambition, it gives us energy, it fuels our spirit.

Is greed, for lack of a better word, good?⁴

Establish the central point—if a family spends more than it earns, it must cut back. The chart makes this evident to see. The chart also shows that cash-flow should be managed wisely—the lure of discretionary expenses is greater when income has just arrived. Compare the two situations that follow:

I have this money now. I want to go and watch Rajnikant from the VIP balcony seats. It is only ₹100 more. I can afford it!

The opposite is true when cash flow is zero or negative—important expenses are postponed or benchmarks are lowered.

Shahrukh needs a geometry box. The good one costs ₹200 more than the cheap one. It is too much. Let him use the cheap one.

Do not expect the participants to understand the underlying economic theory of household budgets. Do not try to explain it. The purpose of this activity is to explain that expenditure and income can and should be tracked. The Income-Expenditure Chart shows how much money should be put aside to prevent problems with cash-flow, and when this should be done. Once the method of tracking expenditure has been established, it is time to analyse the decisions that influence expenditures—the subject of the next activity.

4 Gordon Gecko's famous line from the film *Wall Street* always evokes a response from participants.

ACTIVITY 6

Rangaswamy the Provider

Objective

- Know how to assess when an expenditure is prudent; know when an expenditure is actually an investment.

Slides

- [S]1: Rangaswamy appears.
- [S]2: Expenditure options.
- [S]3: Investment options.

Steps

- Before the start of the game, cover the copper pot with a piece of cloth and place it on the table. (Do not let the participants see what is under cloth.) Dim the lights in the room, if possible or draw the curtains. Your assistant should stand behind the DEFER chart or the white-board and wear the Old Man Mask (or an Old Woman Mask) and wait for his cue to appear. He should keep with him the bag of large and small marbles and the set of Goal Cards. When your assistant is ready, announce the start of the game.
- Ask a volunteer to join you at the front of the room.
- Play one round of the game and discuss the decisions made by the volunteer.
- Repeat as many times as needed to drive home the objective.

Notes

- Your assistant plays the role of Rangaswamy the Provider. Change his name to a familiar local name, if required—Irfan, Raghu, Amartya, and so on. If your assistant is a woman, use an appropriate female name—Romila, Sonia, Menaka, and so on.

Workshop programme

- This activity builds upon the concepts discussed in V③ THE PAWNBROKER → [425], ② COST, PRICE, AND VALUE → [443], and ⑤ INCOME AND EXPENDITURE → [479].

THE STORY OF RANGASWAMY.

Rangaswamy is a mysterious old man who lives inside a pot! A waste-worker who loved to scrub all her utensils till they shone bright once found a dirty old pot thrown away in the garbage, and decided to use it. She took it home and, as she was polishing it, Rangaswamy appeared before her.

Rangaswamy offers the owner of the pot the chance to make her wishes come true. However, Rangaswamy is not a regular Provider. He grants as many wishes as a person wants, but not immediately. Rangaswamy takes his time.... Sometimes he grants their wish within a few days; and sometimes he makes them wait for years. The rumour is that the last person to summon Rangaswamy lost all her money! Rangaswamy disappeared and was not seen again till the old waste-worker found the pot in which he lived.

Who wants to take the help of the mysterious Rangaswamy? Do not worry, your savings will not be lost!

§ THE RULES OF THE GAME.

Rangaswamy, like Laxmi, he does not speak. He watches over your savings, your options and your choices.

The first time he appears before you, he presents you with a list of goals. You choose one of them (either by rolling a die or making a direct choice), and he promises to watch over your savings for you, till you reach that goal.

At every turn you are faced with an option to either spend some money or save it. The item of expenditure is selected by the moderator either by rolling a die or by direct selection — you must decide either to spend money or save it. Rangaswamy will observe your decision and then disappear.

Sometimes, Rangaswamy may offer you new options that you do not have listed on the chart. As usual, you are free to choose.¹

After a certain number of turns, Rangaswamy gives you your wish. Sometimes, he disappears for ever. In either case, the game ends.

After explaining the rules, invite the volunteer to lift the cloth to reveal the pot. Ask her to rub the pot. While she is rubbing it, play the Rangaswamy Theme Tune on your phone². This is the cue for your assistant to appear.

Rangaswamy appears before the volunteer, bows ceremonially and shows the volunteer a fanned-out deck of Goal Cards. The game begins...

¹ See RANGASWAMY'S LOGIC → [491] for the rationale behind Rangaswamy's decisions.

² A 2-second tune is included on the companion USB drive.



Image 202. Rangaswamy appears!

§ PLAYING THE GAME

The volunteer chooses a scooter as her wish. Remind the participants that this is the only time that the volunteer will have a free choice from an array of options. Ask the volunteer to give the pot to Rangaswamy. He bows as he receives the pot. Then, he takes out a large marble from his pocket shows it ceremoniously to the volunteer, and puts it inside the pot. Point out that Rangaswamy has put a large marble into the pot, and that at this rate, only five or six marbles are needed to fill the pot completely.

Rangaswamy is pleased that you have allowed him to take care of your savings and has added some money to the pot. It looks like all you have to do to get your wish is to make Rangaswamy fill the pot with marbles!³

Rangaswamy bows again and retreats behind the screen. Announce that it's time to make the first decision. Display [§ 2](#), and read out a few items on the list. Pick one item from the list and ask the volunteer to choose.

Shahrukh's glasses need to be repaired. Do you want to spend money on it?

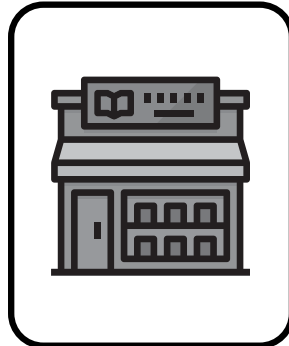
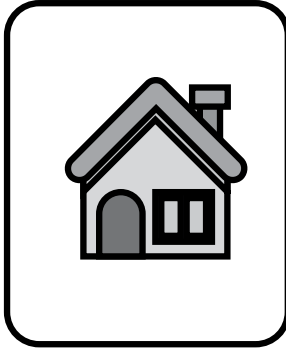
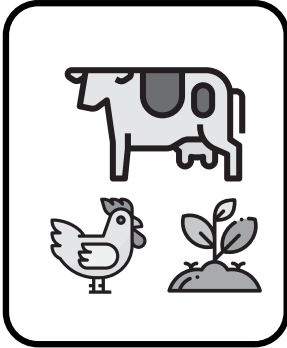
Ask the participants and volunteer to choose whether to make the expenditure or not if (and only if) the expenditure is discretionary. Encourage contrary views; encourage dissent. In the end the volunteer must assess all the inputs from the participants and make a choice.

Rangaswamy is watching you make a choice.

³ Clarify that the choice made by the volunteer influences Rangaswamy's decision to put a marble into the pot. Clarify that filling the pot with marbles appears to be the objective of the game. Do not mention the small marbles yet.



GOALS



1. Buy farmland.
2. Buy or build a house.
3. Save for child's wedding.

4. Save for child's education.
5. Go on a pilgrimage.
6. Buy a shop in the city.

Image 203. Rangaswamy the Provider. Goal Cards. (See the companion USB drive for printable PDF files of each card. Print and laminate each card.)

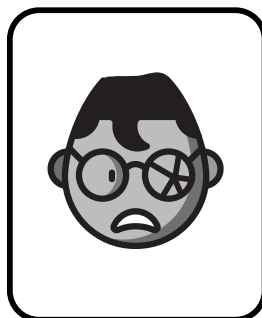
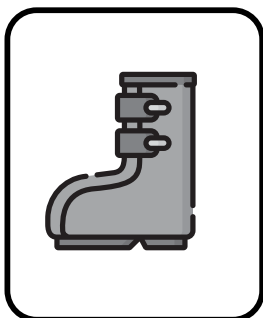
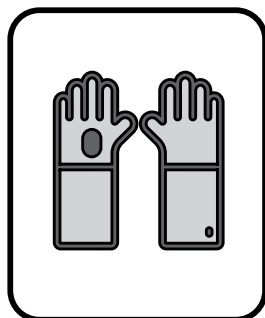
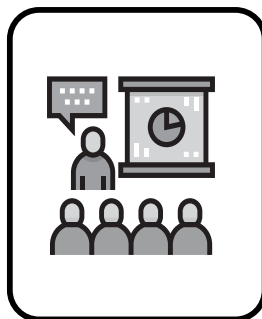
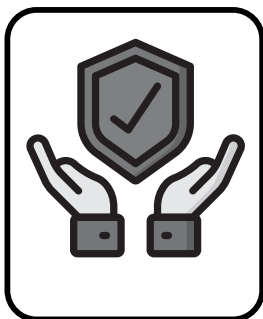
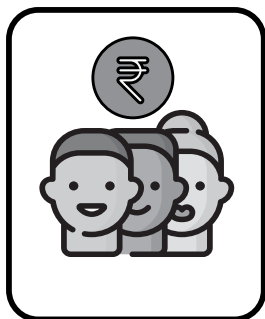
Image 204. (Facing page) List of expenditures. These may be selected either by rolling a pair of dice, or printed out as cards, or projected on the screen. The PDF files do not mention the words 'expenditure' and 'investment' at the top for obvious reasons.

EXPENDITURES



2. Shahrukh wants Coca-Cola.
3. Gold Jewellery sale!
4. Vacation to Taj Mahal.
5. Kutty wants a dress.
6. Laxmi wants tea.
7. Electric Bill
8. New TV
9. Shahrukh wants a cycle.
10. Ice cream!
11. TV Bill.
12. Tandoori chicken!

INVESTMENTS



1. Join SHG.
2. Buy Life Insurance.
3. Enrol for training programme.

4. Replace torn gloves.
5. Buy new work-boots.
6. Shahrukh needs new glasses.



Image 205. List of investments. These may be selected either by rolling a pair of dice, or printed out as cards, or projected on the screen. The PDF files do not mention the words 'expenditure' and 'investment' at the top for obvious reasons. If decide to use a projector then you should add a further six investments to the 'investments' slide. (Use the template in the companion USB drive.)

Rangaswamy is watching you make a choice.

This statement is your assistant's cue—Rangaswamy puts his head around the white-board and looks at the volunteer. After the volunteer makes her decision, Rangaswamy retreats behind the white-board and puts a marble into the pot according to the following rules:

1. If the volunteer picks a discretionary expenditure, Rangaswamy has three options:
 - Put a small marble into the pot. (Sometimes it is good to spend.)
 - Put nothing into the pot. (The expenditure was avoidable.)
1. Remove a marble from the pot if the expense is large⁴ or if it was a poor decision.
2. If a necessary expenditure is made, Rangaswamy puts a large marble into the pot.
3. If Rangaswamy wishes, he can offer a second choice—display \boxplus_3 which lists 'investment' options. These are all carefully chosen expenditures, which result in a medium- or long-term increase in income for the spender, or are an investment that improves the life of her children. However, they are, at face value, all expenditures.

*It looks like Rangaswamy wants to give you some more decisions to make.*⁵

Pick an 'investment' and ask the volunteer to choose. Two examples follow:

- Spend ₹500 for a voluntary training programme.

You can choose to spend some money to get training. Today's training is free. But in this scenario you're being asked for money. You don't have to spend, but do you want to spend this money or save it?

- Join SHG group. Invest ₹1000 or more.

The SHG will give you loans at much better rates than a money-lender, but you will have to invest every month for at least a year to get access to a loan. But you have to spend ₹1000 right now! Do you want to spend this amount or save the money?

Ask the participants and volunteer to choose whether to make the investment.

Rangaswamy is still watching you make a choice.

After the volunteer makes a choice. Invite comments from the participants and encourage contrary views. Rangaswamy retreats again. He now has three choices:

1. If the volunteer chooses to invest, he puts a large marble into the pot.
2. If she chooses not to invest, he removes a large marble!
3. If she chooses not to spend, but has invested earlier (or is low on money), he does nothing—sometimes one has to turn down a good investment because of cash-flow problems.

⁴ The assistant can hasten the game along, if necessary, by adding or removing more than one marble.

⁵ Use eye contact to indicate to your assistant that you want to offer the volunteer a second option.

4. Repeat the process—pick an expenditure (discretionary, necessary, or an investment)—till the pot is full. Once the pot is full, Rangaswamy emerges, bows and gives the potful of marbles to the volunteer as well as the Goal Card that the volunteer chose. He then retreats behind the white-board. Announce that the volunteer has won the game!

The game usually lasts about fifteen turns. Allot about 10 minutes for the first two rounds of the game. Once the participants are familiar with the rules each round will last around three to five minutes. If the game persists more than 15 turns, Rangaswamy can stop appearing—resulting in failure and loss of all savings. After the first game, ask the volunteer to give you the pot, then empty the marbles on the table. Comment on the size and number of marbles as well as the number of turns.

Rangaswamy has put 7 small and 3 large marbles in the pot. I wonder what made Rangaswamy put these marbles in? Did he take out any marbles? The game lasted 12 turns and there are only 10 marbles in the pot. How did your choices influence his reward? Let us play again and see what happens!

§ RANGASWAMY'S LOGIC

Play the game a few time with different volunteers, then discuss the results. The actual count of large vs. small marbles is not important—clearly, Rangaswamy puts in a large marble for some choices and a small marble for others; also, Rangaswamy rewards some choices by putting in a large marble, which fills up the pot faster, while other choices are rewarded with a small marble. But which choices? Keen observers will notice that the number of marbles in the pot does not always equal the number of choices made by the volunteer, therefore Rangaswamy probably adds or remove marbles from the pot when he disappears behind the curtain. Apart from the first marble, the participants do not see the consequences of their choices. Therefore, to win this game, participants have to figure out Rangaswamy's rules! Discuss how this might be done.

☯ Why do some people win in a few turns while others take many more? Ask leading questions, if necessary:

- Is it possible that some expenditures are necessary and that Rangaswamy rewards you even if you spend money?
- Is it possible that some expenditures might increase your income and that Rangaswamy rewards you for recognising that this expenditure as an investment?
- Is it possible that Rangaswamy punishes a frivolous expenditure by taking money away from your savings?
- Why did you decide to join (or not join) the SHG?
- Why spend money on gloves when you might get them for free? Would Rangaswamy reward this expenditure?
- Does Rangaswamy rewards *the effort* taken to analyse a decision to save (or spend)? Would he reward a woman who pondered over her choices and took the wrong decision or a woman who took the right decision without giving it much thought? Why should Rangaswamy punish an intuitive approach to decision making?

§ RANGASWAMY REVEALED.

After an hour of playing the game, demystify the objective of the game.

Rangaswamy does nothing that you cannot do on your own. Rangaswamy is you; he is the way you think; he represents your choices.

Everyone has to spend money every day. Nobody can prevent expenditure. However, everyone ought to make the effort to evaluate their options and make informed choices about income and expenditure:

Suppose Shabrukh's glasses are scratched, but not broken, should you buy him new glasses? If you do not, the scratches will affect his eyesight and give him minor headaches. You may postpone the purchase, but you will have to buy him new glasses at some point in the future.

Now, think about it from a different perspective — spending some money on new glasses sends a strong message to Shabrukh: "Your education is important to me. It is a priority for me. Because I want you to study without any distraction."

A wise expenditure is rewarded with a large marble — the actual cost of glasses is minor, the effort and the ability to evaluate facts, opinions and suggestions from a variety of sources before you make a choice is what counts. Indeed, a discernible clue to Rangaswamy's logic was his first contribution in the form of a large marble — a reward for your decision to save methodically to achieve a financial goal.

This is Rangaswamy's real gift to you.

Explain the idea with other examples. Purchasing a good-quality apron for use at work is an expense. The apron itself is a minor cost and will serve the user for a year or more. The effort taken to analyse the consequences of purchasing an apron is rewarded by Rangaswamy.

The apron protects my sari, it protects my health, it reduces healthcare costs for minor illnesses, it makes me look professional while I work. So if my employer does not give me an apron, perhaps I should buy it? Note that I said "perhaps". It is your choice.

Always putting money into a savings bank account is neither good nor bad.

As we discussed earlier, your methods of savings should be appropriate to your needs. A combination of saving methods is usually the way to save. Rangaswamy rewards a thoughtful approach to saving, not the act of saving.

* Think of more such examples. Refer to the DEFER chart and the questions asked by participants during the workshop.

🕒 Training programmes can improve skills and, therefore, increase income. Some

training programmes are useful, some are useless. How do you decide? There is no easy answer to this question. Thinking about your options and making a choice is not easy but it has to be done.

Over the course of the workshop Laxmi's life has seen ups and downs. She thinks and acts like a professional nowadays—she wears PPE, she manages the family budget, saves for the future and even puts aside a little money to pamper her children.

She has her earrings, she is working again, everyone is healthy... It looks like the family have some money left over from to splurge on a few gifts and spend some time with each other. Let us see what happens...

§ LESSONS LEARNED

Learning how to save for a specific goal is extremely important and knowing how to identify prudent and imprudent expenditures is essential to do so.

The list of expenditures and incomes (□2 and □3) can be expanded as you see fit. Spend some time pondering the subtleties of each option. You will notice that most options lie in the grey area between certainty and doubt. Explore the grey area with the participants. Sometimes it is all right to make a discretionary expenditure for the sake of happiness in the moment; sometimes it is not OK. If participants realise that financial decisions can be evaluated using common sense, you will have succeeded.

Always pick at least one expenditure linked to PPE.⁶ Discuss the choices made by the volunteer. Ask leading questions, if necessary:

- Why has Rangaswamy given you this option?
- We have discussed earlier that a good employer will give you PPE for free. How should you take advantage of such a situation?
- We have discussed that in the future PPE usage will be mandatory. Is there any reason you would want to spend money on it today?

There are no right or wrong choices in financial planning or, indeed, in life. All choices are, however, either well-informed or poorly-informed. In making a choice, one either accepts its consequences with full knowledge of what will (or might) happen, or one stumbles into the future.

Rangaswamy does nothing that you cannot do on your own. Rangaswamy represents the consequences of your decision and he shows you how you think.

6 Even if none of the OHS-modules is part of the programme, do use at least one example of PPE.



Image 206. Hasiru Dala's Bengaluru team. The organisation works in Mysore, Davangere, Hubballi Dharwad, Rajamahendravaram, Tumakuru, and Chikballpur

VII. Laxmi is all alone



Objectives of this module

- Establish the importance of financial planning.
- Know the different government-sponsored credit programmes for SWM workers.
- Know the difference between term-insurance plans and pension plans.

Indicators

- Consensus that being prepared for the death of a loved one is important.
- Consensus that some form of life insurance is useful, if only as one-off financial support for a short period.

Notes

- LAXMI IS ALL ALONE explores the financial consequences of the death of an earning spouse or parent. Preparing for the death of a loved one can be a painful process.
- The names and requirements of government-run pension programme change every few years. Always check government websites (links are provided) for the recent information before the workshop.
- The film *Laxmi is alone* also hints at a common cause for concern for many working women—an alcohol-dependent spouse. The subject of domestic violence and alcoholism may be included in future editions of the handbook. Always be mindful about the feelings of the participants during this module.

Workshop programme

- The second activity in this module VII② GOODBYE, LAXMI → [503] is designed to be the last activity at *all* P2P workshops, even if the modules on finance and social security were excluded from the agenda. If the health module (IV) or financial modules (V, IV, and VII) are not included, screen *Laxmi tells a story* after you finish the last activity on the agenda from Module III, and conclude with VII② GOODBYE, LAXMI → [503].

ACTIVITY 1

Death is a part of Life

Objective

- Know how to plan for the death of an earning spouse or parent.

Slides

- [S]1: Chandu learns a lesson.
- [S]2: Laxmi mourning the death of her husband.
- [S]3: Interior of Laxmi's house.
- [S]4: A poster for a government pension plan.

Steps

1. Discuss what happened in the film.
2. Discuss Laxmi's options.
3. Explain the difference between a pension plan and term insurance.
4. Explain how to evaluate the returns of a pension plan against inflation.



Image 207. (From Film 7) A happy family.

DISCUSSION

Display □1. Laxmi's husband (who everyone assumed had died) has woken up from a drunken stupor and got a lesson from his wife. The audience will laugh during this scene because of the silliness of the situation and also in relief—the first part of the film is traumatic. Once the laughter subsides, discuss first the emotions associated with a happy family and time spent together and then the emotions associated with bereavement.

F7: The film begins on a happy note. The family has gone to a photo-studio.

🕒 Nowadays people have mobile phones with cameras. Very few people dress up in new clothes and go to a studio. Have you ever gone to a studio? What about a family picnic? What was it like? When did you last go to a movie together?

Establish that happiness is one of the reasons to live. Reminiscing a happy moment is a source of happiness too.

Today we have discussed choice, options, PPE, health, and professionalism.¹ All these are, ultimately, steps taken in the pursuit of happiness for us and our loved ones. Remember Rangaswamy the Provider? He rewarded women who set aside some money to spend on activities and objects that made them happy—a visit to the circus, or a dress for the daughter and so on.

Display □2. Discuss the emotions associated with the *sudden* loss of a loved one. **F**7: The film suddenly becomes sad.

We all know that one day we will die. Everybody knows this and to some extent everyone is prepared for the loss of an elderly relative. It is an untimely death that causes much greater pain and suffering. But it happens. And it can happen at any time. At

¹ If none of the PPE modules was part of the workshop, skip references to PPE during this discussion.

these times, dealing with the loss takes up all our energy.

F7: Notice that Laxmi's thoughts are fixed on the loss of her husband. She does not respond to the Narrator at all.

Death is a part of life. It is simply the end, just as birth is simply the beginning. Rangaswamy may be watching us so let us discuss if Laxmi may have saved some money.

👏 Has Laxmi saved any money?

🌀 How much money do you think she would have saved? How much do you think she would need?

Let us assume that Laxmi is 45 years old and her husband is 50 years old. Let us also assume that her husband earned the same amount that Laxmi did. Now, after his sudden death, Laxmi has to earn enough to support three people with half the family income. Food costs will be reduced by $\frac{1}{3}$, their mobile recharge will be reduced by $\frac{1}{2}$, but the rest of the household expenses remain more-or-less the same.

Ask if there are any single-mothers in the group and discuss their options.

All of you know someone who is raising her children alone. Husband is dead, or maybe he has left.... It is possible to raise a family alone. I think we can all agree that Laxmi can do this. What she needs is a little time to grieve and get back on her feet. Maybe she will require a little extra assistance for a while, but she will manage.

§ MONEY AND CASH-FLOW

Display **S**3.

🌀 What do you think Laxmi's husband did for a living and how much did he earn? How much does the family earn?²

F All: Think back to the moments in the films where we saw the interior of Laxmi's house. We have discussed Laxmi's income and savings many times. Now add the husband's income to this amount. All we know is that he works at a construction site for a living and he was a nice person who cared for his family. We also know that he liked the occasional drink — he is only shown drinking excessively in the last film.

While participants almost always agree, unanimously, that Laxmi can take care of herself, most are unsure about the specific financial responsibilities that Laxmi must now bear on her own? Discuss the following:

🌀 How much money does she need immediately while she deals with the loss? Three


2  Note down the median of Laxmi's earnings. This is the last time to change their minds! Once there is consensus on the amount, start crunching the numbers.



Image 208. (Slide 2) Unlike the other films, Laxmi does not interact with the narrator in F7. Did anyone notice that her earrings are missing again?

months of her husband's income? Five months? What extra support will she need to supplement her income after this initial period is over? Do you think Laxmi has parents? Will her parents help her?

Laxmi falls back upon her only financial asset in a time of crisis: her beloved 3-*tola* gold earrings.

F7: Did anyone notice that in the last scene Laxmi's earrings are missing?

Display **S4**. Before the workshop, check the names, eligibility criteria, application forms etc. of government schemes relevant to SWM workers.

§ TERM INSURANCE PLANS.

A term insurance plan acts as a buffer to the financial shock of an untimely death. It is not a pension plan. Term insurance provides a one-time payment. The government-run term insurance plan is called the Pradhan Mantri Jyoti Bima Yojana³:

- The policy provides life coverage for 1 year.
- It is to be renewed every year for a sum of ₹330.
- The policy offers a maximum assured sum of ₹200,000 in the event of death.
- The claim settlement process offered by the policy is very simple.
- The maximum age for insurance is 55 years.

Explain how term insurance would have helped Laxmi:

- She would get ₹200,000 within a week to ten days after she applies for the money. Chandu's death certificate, which might take two weeks to apply for and receive,

3 **D** → [After workshop] Questions about purchasing term insurance or subscribing to a pension plan.



Image 209. (Slide 3) Laxmi and Chandu's house in Bengaluru. How much do you think does the family earn?

must be attached to the application form. The sum received would be equivalent to x months⁴ of income of the husband— x months to find a better paying job (or reduce her expenditures) without having to take a loan from friends, family or a pawn-broker for immediate expenses.

- The process for claiming the insured amount takes a few day—so Laxmi would have to spend for the funeral from the family savings. Perhaps this was why she pawned her earrings again? After the insured amount is deposited in her bank account, she can immediately redeem her earrings, paying interest only for a few days. Laxmi understands cash flow!

§ PENSION PLANS.

Pension plans give a person regular income after he or she stops working. A person pays a fixed amount every year into a pension fund while he or she is employed (or has a regular income) for a predetermined number of years; after retirement, the pension fund disburses to the person a predetermined amount, every month till the person dies.⁵

- Even if Laxmi manages to get a better paying job after Chandu's death, she might still struggle to make ends meet. A shortfall of even ₹2000 per month will lead to debt. One option is to invest the sum received as term-insurance into a monthly-income scheme. Government-run schemes are available at most large post-offices.
- A pension plan is the other option. In 2020, government plans offer around ₹2000 per month (post-retirement or upon reaching the age of 60) for a 40-year old person.
- Take inflation into account when deciding to invest in such a plan. Twenty years down the line, a monthly income of ₹2000 might not be worth much⁶!

⁴ x can be calculated from participants' estimates of Laxmi's family income.

⁵ Private companies are allowed to run pension funds in India. Discuss these options if appropriate. However, government-run funds offer incentives to economically and socially weaker sections of society. SWM workers, therefore, are better served by a government-run fund.

⁶ Remind participants about the tea-sellers in VI② COST, PRICE, AND VALUE → [443].

- Atal Pension Yojana (APY)⁷ is a pension scheme for workers in the unorganised sector, which includes most SWM workers.
- The pension amount payable depends upon the individual's age upon death and the individual's cumulative contribution to the pension plan. The maximum pension a person can get is ₹5000 per month.
- The contributor's spouse can claim the pension upon the contributor's death. Upon the death of both the contributor and his/her spouse, the nominee will be given the accumulated corpus.
- However, if the contributor dies before completing 60 years of age, the spouse is given the option to either exit the scheme and claim the corpus or continue the scheme for the balance period, i.e., till the year that the contributor would have attained the age of 60 years.
- The Government of India makes a co-contribution of 50% of the total contribution made to APY, or ₹1000 per annum, whichever is lower.

§ CHANDU'S PENSION.

Let us assume that Chandu has invested in a pension plan.

- If he dies before the age of sixty but before the age of fifty five, Laxmi will have the option to continue paying the annual contribution or withdraw all the money already invested in the pension plan as a lump sum. This can then be invested in a fixed deposit, or a monthly-income scheme—these financial instruments are offered by most large banks, such as SBI.
- If he dies after the age of fifty five but before he is sixty, there will be no payment as term insurance and no pension either—Laxmi will have to choose between taking a lump sum from the pension plan, or pay the annual subscription for an additional five years. This is a tough choice.
- If Chandu dies after the age of sixty, Laxmi will get up to ₹5000 per month till her own death.

Ultimately, the best insurance is to keep yourself healthy and save wisely.

⁷ * The names of government-run insurance and pension plans can change. In January 2020, the Government of India's term insurance scheme was called Pradhan Mantri Jeevan Jyoti Bima Yojana; its pension plan was called Atal Pension Yojana.

ACTIVITY 2

Goodbye, Laxmi

Objective

- Learn about Laxmi, the SWM professional.

Slides

- [S]1: The family photograph of Laxmi's family.
- [S]2: Laxmi composite, as a person and professional.

Steps

1. Discuss what happened during the workshop and in Laxmi's life.
2. Close all matters on DEFER.
3. Distribute any leaflets and other material—Pension plans, Term Insurance, Contact information, First-Aid material, PPE samples and so on.
4. Display [S]2: Ask the audience, to review the vote they cast during II④ VOTE FOR LAXMI→[48].

Notes

- Prepare to wrap up proceedings. Your assistant should collect cards and props from participants during this activity. Once this is done, she should check that completion certificates for all participants are ready. These should be arranged in order, and kept ready for the moderator to present to each participant.

Workshop programme

- This activity should always be the last item on the programme.



Image 210. P2P workshop in progress. 2018, Bengaluru.

DISCUSSION

☪ Discuss Laxmi's future: What do you think will happen to Laxmi in the future? What does she need to do to improve her life and her prospects?

I am not responsible for Laxmi's choices. I am not responsible for your choices either. All I can do is tell you about the options you have.

Urge participants to seek options and search for solutions using the P2P method. "What can we do, we are poor waste-workers?" is not an option, it is surrender. Remind them of how Laxmi took a decision:

I don't have all the solutions. We encountered many problems today for which there are no ideal solutions. Bahubali can't be here to protect you either. Don't be afraid to make a wrong choice. If you are unsure about a situation, evaluate it to the best of your ability, just as Laxmi did:

What is the problem? The problem is that Kutty needs medical care; And, What then? I don't have the money for it.

What do you have? I have my gold earrings and I know that the local pawnbroker will give me money if I pawn the earrings.

Do you know anything other option for getting money?

No. And I don't have the time. Kutty needs medical care now.

All of us evaluated Laxmi's choice to go to a pawnbroker; it was a poor financial decision, but she took a decision. And it worked. If she hadn't taken a loan, Kutty would not have received medical care. Doing something to solve a problem is better than to do nothing at all.



Image 211. (Slide 2) Participants are given a chance to change their vote.

A poor person's solution may not be ideal, but it exists—there are always options available to a professional.

We have discussed many kinds of options today—you know how to select appropriate PPE, which is safe and comfortable, how to decide when PPE is required and when it is not required, what equipment to buy on different budgets, how to change your work flow to reduce injuries and increase your profits, and much more. Instead of giving you solutions or telling you what to do, we learned how to solve a problem. My work is done.

Before we end, I would like to give all of you all a chance to change your vote. I'm sure you remember the vote we conducted earlier today. If anyone wishes to change their vote, now is the time to do so!

Mention the following and encourage participants to comment on whether Laxmi's life was accurately portrayed. Reveal Laxmi's identity:

- Laxmi is an swm professional. She used to pick waste on the streets of Bangalore but now works at a residential composting unit. She wants her children to be well educated; she wants them to be professionals. Her name, in real life, is Laxmi.
- Laxmi's choices are similar to choices that every participant makes or has made. She understood what was happening during the shooting. Her reactions in the film are genuine. When she cried in *Laxmi is all alone*, she was thinking about her husband and of what she would do if he died suddenly.
- She uses a glove kit at work.
- Shahrukh and Kutty, in real life, are the children of waste-workers who are members of Hasiru Dala—they are not Laxmi's children. Their names are Raju and Jessie.
- Raju and Jessie both go to school. They have bank accounts into which their parents deposit money regularly. They are both eligible to receive a monthly scholarship from the government for which they plan to apply.
- Laxmi is planning to get term insurance for herself and her husband. When this handbook was written, they had not yet decided on an appropriate amount.

§ WRAP UP

- Close all matters on DEFER.
- Display the image of Laxmi in her three avatars on the screen.
- Give each participant a Certificate of Attendance.
- Take a group photograph with all the participants and include it in your report to your client.



VIII. Laxmi, the Specialist



Objectives of this module

- Appreciate that finding appropriate, practical solutions to OHS-related problems faced by SWM professionals requires specialist training or hands-on experience in the SWM sector.
- Realise the advantages of practical solutions over ideal solutions.

Indicators

- Consensus that OHS is a specialist discipline and should not be treated like a charitable donation of free masks and gloves to SWM workers.

Notes

- LAXMI AND THE SPECIALISTS contains activities for NGO administrators, technicians, managers and others who are not familiar with the various processes in the SWM industry. It contains three activities.
- Each activity begins with a short story that describes a problem faced by SWM workers. Participants are asked to solve the problem as if they were the characters in the story.

Workshop programme

- Skip this module at workshops with non-technical SWM workers.

ACTIVITY 1

Mall Tales. Ep. 2

Objective

- See the P2P method applied to solve a real-life problem at a shopping mall.
- Understand process-thinking.
- Know how to analyse a work-flow.

Slides

- [S]1: A food court at a busy mall
- [S]2: Job Analysis Worksheet filled by an NGO administrator
- [S]3: Job Analysis Worksheet filled by an engineer.

Steps

- Display [S]1 and tell the story of Karthik's first day on the job.
- Explain each character's view of the Karthik's situation using II①ⓐ PERSPECTIVE PLAYBACK→[57] and discuss how Karthik's problem may be solved from each character's perspective.
- Begin EXERCISE 36: JOB ANALYSIS→[512].
- Discuss the participants' solutions and compare them to [S]2 and [S]3. Discuss how the objective analysis of a job (or process) can help improve its efficiency.

Workshop Programme

- EXERCISE 19: INVENTORY MANAGEMENT→[178], or EXERCISE 1: RECYCLING SHOES→[77] may be included during this activity.

DISCUSSION

Narrate Karthik's story.

Karthik cleans tables at the food court in a shopping mall in Bangalore. This is his first job. He is employed by a housekeeping services company that has the contract to maintain all public spaces and washrooms in the mall. When the fortnightly job rota came up for discussion Karthik had enthusiastically volunteered to be posted to the food court — he hated the thought of cleaning washrooms. His experienced colleagues Marwan, Nirmala, Nalini and Shekar smiled knowingly at each other when they saw Karthik's energy. They knew better.

Day One. Lunch-time. Karthik found himself rushing from one table to another without a break. He was often called to remove oily streaks from a table that he had mopped not a minute earlier; when Karthik scrubbed a table with disinfectant, customers posted nasty reviews on social media. Some were objective: 'There is a strange smell on the tables.' Some were not quite objective. A user called OrganicKudi, tweeted: 'I couldn't enjoy my organic rajma chawal because the cleaning staff smelled of toxic chemicals.' Another user called ShashiGaaru said, 'The waiter disinfected the empty table next to mine... Twice, in 30 minutes. I applaud his attitude!' The mall's management made frantic phone calls to the supervisor, Nirmala, to solve the problem immediately.

Karthik's colleagues finished work by 10 PM. As they sipped the free Naught-Tea® tea that the stall-owner handed out (he had to clean the machine every day) they watched Karthik with mixed feelings. Marwan, the hard worker (capable of working harder than everyone else) started a betting pool. He bet ₹500 that Karthik would quit in five days. Shekar is a master of efficiency — he always has time to spare, whatever the job. His experience at the food-court guided his bet of ₹1000: Karthik will suffer a meltdown on the next Saturday, during rush-hour dinner. Nirmala hates the callous schadenfreude shown by her colleagues. She is the work-supervisor and has to evaluate Karthik's work. She is tough but fair, and wonders if Karthik should be sacked or sent for training. Also, she wonders if it would be fair to place a bet if she decides to sack Karthik. Nalini feels sorry for Karthik. She refused to place a bet and, instead, decided to help Karthik survive till the next monthly rota when the food court posting came up for reassignment.

While Nirmala grappled with a problem of ethics, Karthik was busy with elementary chemistry — does stainless steel remained stainless when covered with vomit? He sprayed Colin on the vomit and stared in horror as the congealed mess revealed its true form. It was far worse than vomit; it was rajma-chawal.

Meanwhile, only Nalini was sympathetic to Karthik's plight. She refused to place a bet and, instead, decided to help Karthik survive till the next rota; he would have learnt a lesson and the food court posting would properly be assigned by lottery.

Use II①③ PERSPECTIVE PLAYBACK_→[57] to describe Karthik's problem from the perspective of each character. Do all the characters understand what Karthik does?



Image 212. Slide 1. A busy food court. (Photo by Biswarup Ganguly). Faces have been blurred to protect privacy.

☯ What are the problems that Karthik faces? Split the ‘problems’ into three categories:

- Lack of technical knowledge. (How to select and use appropriate cleaning products for each job, and so on.)
- Inexperience. (How to work efficiently, how to manage time, how to work according to the Pareto principle, and so on.)
- Personal safety (identifying and avoiding potential hazards).

☯ Other topics for discussion.

- How can Nalini help Karthik? Note that ‘solve’ in this case means doing his job well-enough to pass Nirmala’s daily inspection and not provoke negative feedback from customers for the next fifteen days.
- Examine if Nalini’s solutions might be different from those of a technical consultant.
- Discuss the advantages and disadvantages of each.
- Should Nirmala sack Karthik? Create a list of pros and cons to help her decide.
- Would Nirmala benefit from sacking Karthik? After all, he would be replaced by someone equally inexperienced. She would have to train the recruit.
- What makes Shekar an efficient worker? Is there an efficient way to clean rest-rooms? Is it better to create a detailed list of tasks for each job or to teach workers how to identify improvements that might make a job easier, safer, and quicker?
- How does a ‘hard’ worker like Marwan evaluate a problem? What is their attitude towards safety?
- What motivated OrganicKudi’s feedback? How should a housekeeping service address the adverse reaction from some people towards demonstrably safe chemicals? Define ‘organic’ and find a suitable disinfectant that fits the definition. Discuss whether this material may be used by a housekeeping service. Use the opportunity to discuss dwell-times, residues, and so on.
- How should management evaluate ShashiGaaru’s feedback? The customer is happy, after all! Should workers in a mall appear to be hard at work even if they aren’t actually cleaning?

JOB ANALYSIS					
Description of the job: <i>Clean and disinfect dining tables at the food court</i>					
Initial State	Task	Prerequisites	Final State	Cleaning Products & equipment	Hazards and mitigation
<i>Tea stains on a table in a semi-sticky state</i>	<i>Wetting</i>	<i>Tea stains are partially dry</i>	<i>Table is moist enough to wipe stains</i>	<i>Spray can with water</i>	<i>None</i>
	<i>Scrubbing</i>	<i>moist surface</i>	<i>Table surface does not show tea stains</i>	<i>Scourer/bush soap spray</i>	<i>Reactions to cleaner-Gloves</i>
	<i>Mopping</i>	<i>no visible dirt on table</i>	<i>Dry table top with no soap</i>	<i>Mop cloth</i>	<i>Gloves</i>
	<i>Disinfecting</i>	<i>table that looks clean visibly</i>	<i>Disinfected table top</i>	<i>Disinfectant spray Wipe cloth</i>	<i>Goggles Gloves</i>
	<i>Drying</i>	<i>Disinfected table</i>	<i>Dry table ready to use by next customer</i>	<i>Wipee Super absorbent cloth</i>	<i>Gloves</i>

Image 213. (Slide 2.) A Job Analysis worksheet filled in by P1, who is an NGO administrator. Compare with Slide 3 on the facing page.

EXERCISE 36: JOB ANALYSIS

Distribute printouts of the Job Analysis Worksheet. (The worksheet assumes that participants understand the difference between jobs and tasks. Ask participants to fill in the worksheet. Use one or more of the following jobs, which are listed in order of difficulty:

1. Cleaning tables in the food-court
2. Cleaning a restroom.
3. Cleaning the common areas of an office.

Discuss the participants' analyses¹. Compare the participants' worksheets to the ones in IMAGE 213 AND IMAGE 214, WHICH show the worksheets of two volunteers: P1 is an NGO administrator with a decade of experience in solid waste management; P2 is an instrumentation engineer with no SWM-related experience.

§ AN ENGINEER VS. AN NGO ADMINISTRATOR

P2 displays a better understanding of the concepts of state and task. He has defined two tasks, which he calls 'Clear', which is explicitly defined, and 'Mop', which can be modified depending upon the initial state of the table; he has defined six states, including one ambiguous state (s₅) and the end state (s₆); he has defined, in measurable terms, the different kinds of leavings, waste and other residues that a worker might encounter

¹ You should print and fill in a worksheet before you continue reading. The worksheet contains explanatory notes. The jobs listed above are trivial. If participants were not challenged by the jobs listed above, ask them to separate (into its component tasks) the job of door-to-door collection of household waste from a building with 60 flats within one hour. Work-hardened participants, especially those with experience in logistics, will not be exerted much by this task either—they realise that for a useful analysis of such a task must take into account the handling and storage of tools and equipment, waste-disposal logistics, task scheduling with time-constraints, ergonomics, supervisory tasks, and protocols to provide feedback to eliminate errors or to correct them while the job is being done. Such participants will prefer a question-and-answer session to discuss specific problems that they face.



JOB ANALYSIS

Description of the job: *Clean and disinfect dining tables at a food court*

Initial State	Task	Prerequisites	Final State	Cleaning Products & Equipment	Hazards and mitigation
<i>as required</i>	MOP 1. Wet the surface (with C1, C2 or water) 2. Scrub with C3 and pad if needed 3. Mop surface with wet cloth 4. Dry surface with dry cloth or tissue		S5	Standard Kit: 1. Wet cloth for mopping surface with water 2. Small bucket to hold dirty water. 3. Dry cloths for drying water 4. Disposable tissues for drying wet surfaces and applying disinfectant. 5. Scouring Pad (scotch brite)	Standard PPE: Nitrile gloves, hair net or cap, hand-sanitiser
S1. FOOD LEFTOVERS + S2 + S3 and/or S4	CLEAR Leftovers, + MOP		S3 or S6	Transfer leftovers to B1, Transfer disposables to B2 CLEAN surface with Water or W+	
S2. TISSUE + CUPS etc. (+ S3 and/or S4)	CLEAR Tissues, cups etc. +MOP		S3 or S6	Transfer disposables to B2, + Mop with C1, Water, or W + Mop with C3 (if state includes S3)	
S3. Dry food residue or tough stains on surface	MOP		S6	Mop scrub surface with C3 + Mop with water C2, or C1 as needed.	
S4. Oily, wet, stained surface.	MOP		S6	Mop with C1, water + Mop with C2 if needed + disinfect with D1	B1. WET BIN (or bag) B2. DRY BIN
S5. Bare, dry surface, no residue.	DISINFECT	Surface must be clean and dry!	be clean	Apply D1, wait 10 minutes and dry with tissue OR Spray D2 and let it dry	C1. Aq. Detergent or cleaner C2. Degreaser (dil. NaOH?) C3. Abrasive cleaner (Vim)
S6. Disinfected, dry surface	Ignore	Some indicator that the surface is disinfected.		"WELCOME" or some notice placed on the table to show that it has been disinfected.	W. Water (alk. cleaner like cotin.)
S6 + Dust	DUST			Dust as required	D1. Liquid chlorine bleach D2. 70% IPA solution.

Explanatory notes.

Task: What are the discrete steps required to do the job, e.g. disinfecting a surface may be broken down into the following tasks: (1) wetting (the surface), (2) scrubbing (away the dirt), (3) mopping (up residue), (4) wetting, and (4) drying (the surface), (5) applying disinfectant to the surface.

Initial and Final State: Describe (in measurable terms) the physical appearance or properties of the object or surface that indicate the need to carry out a task, e.g., a 'used' table may differ from a 'dirty' table, e.g., compare a table at which a customer had a cup of coffee to one where a family of four with two children had dinner. Therefore, the initial states of this table might be described as "No visible residues" and "Visible, wet and dry stains." The initial state determines the task at which the job may be started: the job to clean a dirty table must begin at Task 1; a used, but 'clean' table may be cleaned from Task 4. The distinction increases efficiency, reduces costs and exposure of workers and customers to chemical hazards, and improves customer-experience. In a large food court imagine pushing a cleaning cart around while wearing nitrile gloves vs. a worker wearing polyethylene gloves with cleaning supplies stored in the pockets of overalls.

Prerequisites: Are there any conditions or requirements that must be fulfilled before the task can begin? List all prerequisites that should be considered e.g., can a table top be disinfected while diners are at an adjacent table?

Cleaning products and equipment: Are any cleaning products required to do the job? List all of them used for the task e.g., (1) Water, (2) Detergent, and (3) Used micro-fibre wipe. Can disinfection of a surface be followed by drying it with a used wipe? Should the surface be allowed to dry naturally or should it be mopped dry? Consider the costs of using consumables such as disposable disinfectant wipes--'used' vs. 'unused' clarifies the condition of the mop that is adequate for the task.

Hazards and mitigation: Are there any hazards associated with the task? How should these be eliminated?

Image 214. Slide 3. Job Analysis worksheet filled in by P2, who is an engineer. Compare with Slide 2.

on a table in a food court; he has also created a list of tools and equipment needed for the job. The engineer's solution is impressive but it is presented in the form of a complex algorithm that is likely to be incomprehensible to a layperson. Also, his solution assumes that an SWM worker is a brainless robot that must be programmed for every contingency.

P1 has simplified the job into a case-study. She imagines a table with spilt tea and proceeds to list the tasks required to clean the table. Her solution is not 'complete' but it exceeds Pareto requirements for this job. She has correctly identified the chemical hazards at the workplace and her solution is appropriate. Most importantly, she has created a task-based workflow that a human being can modify, as required, to complete the job; she also assumes that the worker would have been trained to use segregated waste-bins and trusts their ability to work out solutions to all situations from the information provided in the single case-study of spilt tea. P1's solution, however, cannot be scaled up or modified to suit other housekeeping tasks. She would have to start from scratch if the job was, say, cleaning restrooms in the food court. P2's solution, on the other hand, could be modified for the new job merely by the addition a couple of additional states and cleaning products. Unfortunately, only a person who can comprehend algorithms could implement these changes.

§ PROCESS-THINKING APPLIED TO SWM SYSTEMS

Before you proceed to discuss the participants' worksheets, ensure that the engineer's cryptic algorithm is understood by all participants. The logical reasoning used which engineer is an excellent example of process-thinking applied to a simple problem:

An engineer thinks in terms of the 'state of an object or system'—a set of variables that define the system for the purpose at hand. Changing a state variable, by definition, changes the system.

In this example, the job requires that the table (the system) be maintained in a certain pre-defined state that is defined by the following variables: clean (absence of any kind of debris and dust), dry (absence of any residual food, water or oil) and disinfected (safe pathogen load on the surface). The engineer notes that the third variable is not measurable in the scope of the job at hand and that it begins to change as soon as it is set to its desired value. However, he also notes that as long as at table remains unused after it was last disinfected, its state is assumed to be 'disinfected.' While designing Karthik's table-cleaning workflow, the engineer asks himself the following questions: *Is the table in its optimal state? What is the minimum input required to change the state of the table to its optimal state?* He notes down each unique task. After six iterations, he has exhausted the most common system states of the table that Karthik would be able to change back to optimal²:

1. He suggested a practical solution to the time-variant state $s_6 \rightarrow s_{6A}$, which deals with dust on a disinfected table.
2. He inserted a note on error-control (S_3 should never happen under normal conditions), and has added an indicator mechanism, to prevent Karthik from disinfecting tables again and again in an infinite loop.³

² The engineer does exactly what is asked of him—no more and no less. He does not concern himself with states that Karthik will not encounter, e.g., 'Broken table' does not feature in his list.

³ Engineers prefer to assume that people are robots—it makes their life simpler.

3. He redefined each task to remove overlaps. (Note that the tasks for S₁, S₂, and S₃ refer to S₄, which refers to S₅.)

Table states

The process described by the engineer is shown in TABLE 46. Karthik can identify each state from the visual indicator, then perform the predefined task associated with that state.

NO.	STATE	VISUAL INDICATORS (WHAT DO I SEE?)	TASK (WHAT SHOULD I DO?)
S6.	Disinfect.	I see a sign on the table that says 'welcome' and it has not been moved from its proper position.	A customer at that table would have to move the sign to sit at the table. System is in optimal state. Go to standby.
S6a.	Dusty, unused.	I see a welcome sign and it has not been moved. The table looks a little dusty.	Wipe the table with disposable tissue till it is free of visible dust; put the tissue in the dry-waste bin.
S5.	Used, but clean.	It looks clean but someone has moved the welcome signs to one side.	<i>Spray one squirt of detergent on disposable tissue so that it is damp to the touch.</i> Wipe the table with it and put it into the dry bin. Wipe the table again with a dry disposable tissue and put it in the dry bin. Reposition the welcome signs and spray the table and signs with 70% w/v IPA and let it dry.
S4.	Dirty.	Welcome sign moved. I can see residue, some streaks and some stains on the table.	CLEAN THE TABLE: <i>Wet the surface, apply a degreasing spray</i> , mop the table with a damp cloth, wait a few seconds till it dries a bit, mop up any streaks with a dry cloth. DISINFECT THE TABLE: Spray disinfectant till the table is wet, then wait 10 minutes; if you have other work, then place a 'cleaning' sign on the table before you leave. After 10 minutes, remove the cleaning sign. Wipe up any remaining disinfectant with disposable tissue. Perform task S6a.
S3.	Dirty. (Error.)	Welcome sign is in its proper place. I can see spots of dry food residue. (Job not done properly.)	Wet the spots. Apply a little scouring powder and scrub till the spots are removed. Perform task S4.
S2.	Dirty, dry waste.	Welcome sign moved. I can see tissues and some empty cups.	Put the tissues and cups in the dry-waste bin. Perform task S4 if there were no tissues left on the table, or S5 if it is dusty, or S6 if the table needs to be 'properly' disinfected.
S1.	Dirty, mixed waste.	Welcome sign moved. I can see a mess. Food, tissues, disposable plates, and spilt coffee.	Transfer the food to the wet-waste bin, mop up the spilt coffee with a disposable tissue and dispose of it in the wet-waste bin. Perform task S4.

Table 46. The job of cleaning a table broken down into states and tasks. Notice that the engineer has defined 'damp to the touch.' Given enough time and space, the engineer would have added precise definitions of 'wet the surface,' 'apply a degreaser,' and so on. Excessive standardisation is counter-productive.

§ LESSONS LEARNT

GOOD WORKFLOWS INCLUDE FEEDBACK MECHANISMS. The food-court has 50 tables, all identical. Many customers, nowadays, conscientiously clear away tissues and disposables from their table when they leave it. The table, nevertheless, must still be disinfected especially now that we share our world with Covid-19. How would Karthik remember if he had cleaned and disinfected a table that *looks* clean? A safe workflow would minimise Karthik's exposure to any potentially hazardous chemicals that might be required for the job. The engineer suggested the use of a 'welcome sign' that could be placed on each table. The sign provides immediate feedback that the table had been used even if it appeared to be clean. (This table state is defined in S5.)

GOOD WORKFLOWS ARE MODULAR AND SCALABLE. The usage of disposable tissues can be reduced or increased; if the maintenance-level of disinfection must be raised, then the task associated with S6a could simply be done at predetermined intervals; if disinfection levels seem excessive, then S5 could be redefined and so on without the changes affecting the rest of the workflow. The engineer is aware of this requirement—see his suggestions in S2. The engineer's solution allows for two or more people to work as a team on the job to deal with rush-hour diners—tasks are defined in a manner that will allow teams to leave a table either in S3, S5 or S6. One team clears away bulky waste, while a second team deals with everything else. This allows workers to share workloads efficiently when required, without confusion. It also allows teams to use a modular cleaning cart (See INVENTORY MANAGEMENT \rightarrow [178]).

DOCUMENTATION OF WORKFLOWS IS IMPORTANT. Workflows should be documented by workers in a manner that allows a new employee to understand what is to be done; basic documentation procedures can be started with a questionnaire for workers. '*Describe your workflow*' will not elicit a useful response. Vague questions will elicit equally vague responses; the precision of the question will influence the precision of the answer. Process-thinking allows you to draft a questionnaire that will get useful data:

What is the state of the (material or input) when it arrives at your workstation? What is the state of the (material or output) when it leaves your workstation? How would you describe the change? How would you identify a failed operation or job or task? What tools do you use? Can it be done without a tool? What PPE do you use? And so on.

DOCUMENTATION SHOULD BE USABLE. Neither the pedantry of ISO 900x (see @yy3lv5jx), nor the stringent requirements of a technical body, such as ASTM, should serve as templates for documentation. Management consultants can generate tons of useless paperwork from which the rare nugget of useful information (if it exists at all) is difficult to extract; NGO-s struggle with proper documentation because the job is treated as busy-work whose only purpose is to be stapled to a project report. The work is usually assigned to the most junior member of the team or organization. The engineering industry's total reliance on a long series of specifications and standards (that can be traced back to the industrial revolution) coupled with their reluctance to change something that works (*if it is not broken, don't fix it*) can make the documentation of engineers incomprehensible to laypersons. A pragmatic combination of the strengths of these styles of documentation is the best solution.

Never entrust engineers with *client-facing* documentation:

Manager: Why do the boxes for our new electric bike say horsepower instead of watts?

Engineer: Because the engineering specifications use horsepower.

M: I thought we were switching to metric for all documentation...

E: Our vendor makes three motors that fit the flange mount on our bike. The 1kW motor would be overpowered for the job; 500W would be underpowered. 1HP is just right and is cheaper because the vendor sells that model by the hundred to pump-manufacturers. What's the problem?

M: It's not about the mounting flange, or the flanging mount. The kids who will use this bike don't know what horsepower means. The bike is called the Watt-Rider. What part of 'use metric' do you not understand?

E: Let's change the text to 746W or 750W if you want a nice, round number.

M: The boxes and the user-manual have already been printed.

E: Let us paste a label on the box that says 1 HP = 746W. We could also put a QR-code that links to the wikipedia article on power, so the kids learn something about engineering. Problem solved?

(The manager faints.)



ACTIVITY 2

Mental Models

Objective

- Understanding the role of mental models in the decision-making process.

Slides

- [S]1: Mental models and the decision-making process.
- [S]2: Mental models used in a learning environment like P2P.

Steps

- Display [S]1 and explain how mental models may be applied to the decision making process.
- Display [S]2 and explain how mental models are used in the P2P method.

Notes

- This activity is essential for participants who wish to use the P2P method in their training programmes and should be included in most programmes. However, most role-playing activities require participants consciously to think 'as if' they are someone else. During these activities you should ask them if they are merely imposing their mental model on the character or whether they have tried to understand how their character thinks.

Workshop Programme

- Skip this activity unless participants wish to learn about the P2P method and its philosophy—for all other participants, you may use the material in this activity during discussions or exercises that might require participants consciously to access other mental models, e.g., EXERCISE 15: WHAT WOULD YOU DO IF...→[155], VI© RANGASWAMY THE PROVIDER→[484], II①© THE JOB AT HAND→[69]and V① BEING LAXMI→[415] and on every occasion that you employ II①③ PERSPECTIVE PLAYBACK→[57].

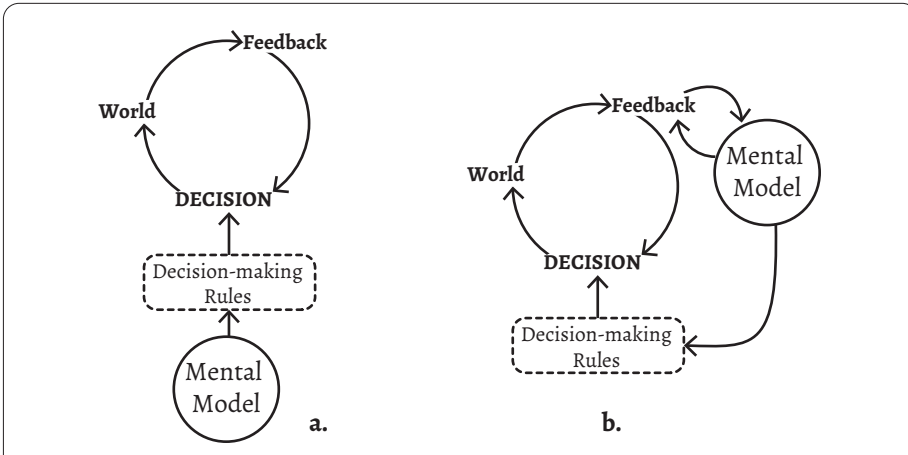



Image 215. Slide 1. Mental models in the decision-making process. (a) single-loop thinking, also called specialist thinking and (b) double-loop thinking.

DISCUSSION

You must know the big ideas in the big disciplines and use them routinely — all of them, not just a few. Most people are trained in one model — economics, for example — and try to solve all problems in one way. You know the old saying: ‘To the man with a hammer, the world looks like a nail.’ This is a dumb way of handling problems. —Charles Munger.

Do people perceive the same problem in a given situation? Can a social worker (with a M.A or an M.S.W), a technician (with a B.TECH), a company manager (with an M.B.A), and an SWM worker (with no formal education) intelligently discuss the same problem? It turns out that if they learn how to think (and in some cases, act) like each other they can have meaningful discourse.

The P2P method was inspired by the work of many people from a diverse range of fields, including George Polya, a mathematician, Paolo Freire, a social reformer, Augusto Boal, a dramatist and actor, Kaoru Ishikawa, an industrial engineer, Richard Feynman, a physicist, and others. All of them created novel ways to analyse a problem and taught others how to use their methods. The core principle of the P2P method is that people must step outside their area of expertise and use the tools from other disciplines to find solutions (or better solutions) to a problem at hand; sometimes they must do so to realise, in the first place, that a problem exists. The quote at the top of this page is from Charles Munger, the vice-chairman of Berkshire Hathaway. He has been applying multidisciplinary mental models to his chosen field — investment banking — for decades and he has the money to prove that the method works.

Display  1 and explain how the concept of mental models can be applied to the decision-making process. Simple, feedback-driven thinking models can be described as follows: you want to achieve something, you do something to achieve it, you see if it was achieved, if it wasn't then you try something else and you continue till you have achieved

what you wanted or you give up. Education and experience adds a layer of finesse and efficiency to the process. It gives you problem solving tools such as general principles or specialist knowledge. Increasing the amount of one's education and specialisation gives one better tools to use and so on. However, specialisation does not train a person to recognise problems or solve problems that lie outside their sphere of expertise—it is possible to imagine that a physicist with a Ph.D and thirty years of experience may be unable to determine, from a balance sheet, if a company is in good financial health while a 2nd year B.Com student might do so at a glance. In such cases, intelligent people fall back upon FIRST-PRINCIPLES THINKING, i.e., to analyse the problem using fundamental rules, reasonable assumptions, and the tools of logic, e.g., the physicist may try to deduce what each entry might mean. Imagine a physicist looking at a Balance Sheet for the first time. She knows that it is supposed to represent a company's financial status but does not know the jargon of finance. Here is how she might use first principles to decipher it:

Let me assume that assets are things that the company has and liabilities are things that it has to pay¹. So if the company is in good health assets must be equal to or more than liabilities. Look like they are balanced. Wait a minute. I vaguely remember that they are always balanced, which is why this called a balance sheet. OK. What about this one here. The profit this year is slightly less than what it was last year. That's not good, but then I've read news reports that the economy is slowing down... Hmm... (And so on.)

If the physicist searched for information on the web and spent a while applying first principles to the problem she will eventually solve it. However, the process might take some time... In this case, the physicist knows immediately that she does not have the information and training required to solve the problem.

Let us give her a second problem, but this time one that appears to yield easily to the application of first principles.² Let us also give her a name — Laxmi (why not?). Laxmi the Physicist.

Is it better to put your savings into gold or in a fixed deposit in a bank?³

Easy! A fixed deposit gives better returns and is easier to liquidate either into either cash or into a current account. I assume there must be a penalty for withdrawing money from a fixed deposit but surely that is less than the losses I would incur both when buying or selling gold. Besides, gold prices fluctuate all the time, whereas I would know exactly how much money I had if it was in a fixed deposit. Also, gold is dangerous to carry around. It's a lot safer to have money in a bank. If I put the gold in a bank, then I'd still have to go to the bank...

The same question is then put to a manager of an SHG. Laxmi, the Manager doesn't offer a definite answer, but it is clear that she understands the nuances of savings and what the word means to different people:

1 The student of accounting would enjoy watching a physicist trying to decipher a balance sheet.

2 This case is discussed during VI③ GOLD AND SAVINGS → [457].

3 You could ask for 3 volunteers and voice the dialogue that follows. Perspective Playback is not required.

It depends on what you mean by better and the nature of the emergency. Fixed deposits offer better returns but what if I don't have access to a bank during the emergency? What if I need cash? What if I have to travel with the money? What if the difficulty to convert gold into cash is considered a benefit instead of a disadvantage?

Finally, the question is put to Laxmi, the SWM professional. Laxmi, like her namesake who is a physicist, also has a definite answer.

For me gold is the only option. My husband drinks and I need to keep my savings hidden from him. I also want to be able to take my savings with me and leave at a moment's notice. I could leave right now if something went terribly wrong at home.

The same question evokes three different answers! Clearly all three 'avatars' of Laxmi showed an basic understanding of the problem and obviously they have different abilities and financial requirements. The differences in the manner in which they perceived the problem and their prioritisation of the components of the problem is what we must focus on. The first mode of problem-solving (shown in IMAGE 215, a) is displayed by all three avatars of Laxmi. All of them have a fixed mental model and the ability to use first-principles; all of them solved the problem to their satisfaction. However, each solution is neither universally correct or incorrect since each avatar has different goals and priorities. Indeed, even though Laxmi the Manager correctly recognised the various nuances of the problem, she was only able to do so because her mental model is equipped through training and experience to solve such problems. If she had been asked to diagnose an OHS-related problem (See MALL TALES EP.I: ANITA HAS A PROBLEM → [64]) she might not have been successful.

DOUBLE-LOOP LEARNING (IMAGE 215 b) recognises that the way a problem is defined (and solved) can be the source of the problem. In a learning environment like a P2P workshop, the concept is expanded as shown in IMAGE 216. Here the principles of peer-education and modern product-development techniques ('take feedback from the end user during the design phase') are applied to the double-loop learning system. The innovations come from the work of Paolo Freire and many modern industrial designers, including Donald Norman, who have created the field called human-centred design. The central concept of human-centred design is that while the users of a product (or a procedure or technique and so on) may not have the expertise to create that product, their ability (or inability) to use it effectively ultimately determines if a design (or innovation or technique) is good or bad. In other words, if the end-user cannot use or does not want to use a product then the product will fail to sell. The end-users' feedback during the design of the product is essential. Clearly this idea has applications in the P2P workshop, at which SWM companies and NGO-s are seeking ways to improve OHS.

Freire's book *Pedagogy of the Oppressed* is a critique of traditional modes of teaching and the formal learning environment—he called it a 'banking model' of education, in which students are seen as empty vessels into which teachers poured their idea. Stripped of its political context (he argued that the acts of teaching and learning were political acts) his innovation was to propose a learning environment in which education happens without the distinct roles of a teacher or a student, and the idea of praxis—learning through the application, and not merely the transfer of information. Freire's concept

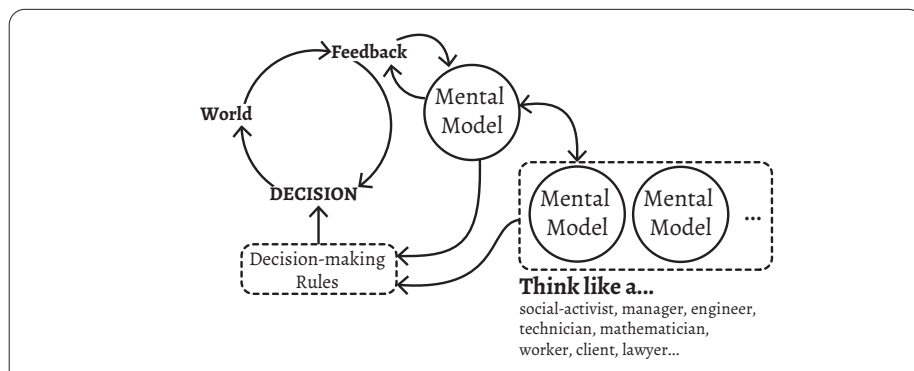


Image 216. Slide 2. Mental models in a P2P workshop. Participants are asked to think ‘as if’ they someone else. The process creates new ideas that are useful in a learning environment, especially if specialists from different fields at the workshop are encouraged to think like each other—the process can provide the feedback required to turn a wild idea into a practical solution.

of praxis is used (or practiced) in the form of theatre called *Forum Theatre* or *Theatre of the Oppressed*, which was created by Augusto Boal. (II①⑥ FROM SPECTATOR TO SPECT-ACTOR → [62] was inspired by Boal’s application of Friere’s praxis.)

The ideas of Feynman, Polya, and Ishikawa were used in different parts of the P2P method—how to use first principles effectively, how to identify cause and effect, how to evaluate the validity and completeness of a solution, and so on. None of these ideas should be discussed as theoretical abstractions. They should be learnt by applying them to real-world problems as shown in IMAGE 216 → [522] by following a few simple rules. This is the P2P method! Participants at the workshop are encouraged (and required, in many activities) to think and act ‘as if’ they have access to the thinking styles of specialists in different fields; swm workers are urged to think ‘as if’ they are field-supervisors; engineers who are comfortable with systems and abstract processes must try to think and act ‘as if’ they were social workers or managers; they must do so in the presence of social workers and managers and swm workers. Their actions are met with immediate feedback from other specialists in the room. Coherent focus is maintained by centering all activities is a shared external context—Laxmi’s World. All participants solve Laxmi’s problems first and, in doing so, they learn how different mental models may be effectively applied: first to gain a broad perspective of the problem, and then to solve it.

Further reading

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Links to websites

Links shown in the handbook use the syntax @abcdefg. These are listed here in alphabetical order.

Substitute '@' with 'https://www.tinyurl.com/'

Thus, @2nvaubeb is the link https://www.tinyurl.com/2nvaubeb

It redirects to: https://www.ncbi.nlm.nih.gov/pubmed/12775931

When using redirect links, some web browsers may display a warning message. This is normal.

@ CODE	URL
2nvaubeb	https://www.ncbi.nlm.nih.gov/pubmed/12775931
3y9n8mmv	https://www.pmjay.gov.in/
7a9xpoj	https://en.wikipedia.org/wiki/Stereotype
7vjb2yb	https://en.wikipedia.org/wiki/QWERTY
c2g7acq	http://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx
d64cmp8	https://en.wikipedia.org/wiki/Pyrophoricity
hobpzx8	https://en.wikipedia.org/wiki/Surfactant
jgdz2xy	http://www.imo.org/EN/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx
jhf99g	https://en.wikipedia.org/wiki/Polyethylene_terephthalate
kaxxzuy	https://en.wikipedia.org/wiki/Identity_(social_science)
lrggvd	https://www.osha.gov/Publications/OSHA3170/osha3170.html
mzryfrtd	https://en.wikipedia.org/wiki/Fibre-reinforced_plastic
o5dwl9t	https://en.wikipedia.org/wiki/Latex
q4l5pqv	https://www.osha.gov/Publications/OSHA3514.html
rxbnjib	https://nbcfdc.gov.in/loan-schmes/EN
scmobz3	https://heelthatpain.com/foot-arch-type-test/
slfuok4	https://nscfdc.nic.in/EN/content/lending-policies-and-guidelines
t5c3wve	https://www.cdc.gov/NIOSH/docs/2010-133/pdfs/2010-133.pdf
t7beyhf	https://www.cdc.gov/NIOSH/topics/hierarchy/default.html
ty7q7a6	https://multimedia.3m.com/mws/media/407440/3m-respirator-cartridge-and-filter-selection-poster.pdf
ur3y9go	http://socialjustice.nic.in/SchemeList/Send/24?mid=24541
vpp4taz	http://socialjustice.nic.in/writereaddata/UploadFile/Pre-Matric_Scholarship_haz.pdf
vpqnqzp	https://www.fda.gov/consumers/consumer-updates/antibacterial-soap-you-can-skip-it-use-plain-soap-and-water
vtrq46r	https://oshwiki.eu/wiki/Main_Page
vvfa04b	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3482701/
we4teq7	https://www.indianredcross.org/publications/FA-manual.pdf
whjfp6s	https://www.glovesnstuff.com
wm2cwHP	https://nsfdc.nic.in/schemes/
wztwwmp	https://projectimplicit.net
y27cs7g8	https://www.ilo.org/dyn/icsc/showcard.display?p_lang=EN&p_card_id=0058&p_version=2

A-2 From Person to Professional

y2943gvf	https://www.ilo.org/dyn/icsc/showcard.display?p_lang=EN&p_card_id=0087&p_version=2
y2dtg596	http://chdtransport.gov.in/Forms/CMVR_1989.pdf
y2krjp83	https://www.OSHA.gov/pls/oshaweb/owadisp.show_document?p_id=10673&p_table=STANDARDS
y2op55ro	https://www.OSHA.gov/combustible-dust/standards
y2vtjcmt	https://adrdangerousgoods.com/eng/substances/all/
y33e6z4l	https://en.wikipedia.org/wiki/Filler_(materials)
y33e6z4l	https://en.wikipedia.org/wiki/Filler_(materials)
y37cwdy4	https://www.youtube.com/watch?v=ibGAEt7aOH4
y3cga3jh	https://www.OSHA.gov/dsg/hazcom/ghoshacomparison.html
y3dnn7et	https://www.ilo.org/dyn/icsc/showcard.display?p_lang=EN&p_card_id=0624&p_version=2
y3lmpvz	https://law.resource.org/pub/in/bis/S03/is.3594.1991.pdf
y3lz7sbg	https://en.wikipedia.org/wiki/Cytotoxicity
y3mxh7bc	https://law.resource.org/pub/in/bis/S03/is.2190.2010.html
y3okjpjq	https://kkpkp-pune.org/timeline-of-change.html
y3pwmg6t	https://www.instructables.com/id/How-to-open-a-light-bulb-without-breaking-it/
y3szhwlp	http://moef.gov.in/wp-content/uploads/201%08/SCHEDULE-I.html
y3zpx62q	http://www.ehso.com/TCLP.htm
y4a723ew	https://www.nbcnews.com/news/us-news/deadly-accidental-mix-acid-bleach-blamed-buffalo-wild-wings-man-ager-n1078866
y4b3x5c5	https://www.firepedia.in/indian-standards-on-fire-safety
y4dslwu8	https://www.OSHA.gov/laws-regs/regulations/standardnumber/191%1910.147
y4flgfva	https://pubs.er.usgs.gov/publication/rp137
y4jn74ov	https://www.youtube.com/watch?v=Uhd3glJn034
y4k4x48w	https://www.aiims.edu/EN/departments-and-centers/central-facilities/265-biomedical/7346-bio-medical-waste-management.html
y4kgqktt	https://www.nacnkanpur.gov.in/download3.inc.php?rid=178
y4mstbd5	https://www.ilo.org/dyn/icsc/showcard.display?p_lang=EN&p_card_id=0076&p_version=2
y4vngjul	https://ehs.unl.edu/sop/s-health_hazards_haz_assessment_risk_min.pdf
y4xxadkp	https://www.honeywellsafety.com/Supplementary/Documents_and_Downloads/Corporate/429500131%1033.aspx
y4ywc3az	https://www.OSHA.gov/Publications/Mach_SafeGuard/chapt1.html
y55kqpb9	https://medlineplus.gov/ency/article/000127.htm
y55kqpb9	https://medlineplus.gov/ency/article/000127.htm
y576p8vu	https://www.unece.org/ru/transport/areas-of-work/dangerous-goods/opasnye-gruzy-glavnaja-stranica.html
y57l7ydq	https://www.epa.gov/nutrientpollution
y595gtnp	https://www.sigmaaldrich.com/MSDS/MSDS/DisplayMSDSPage.do?country=IN&language=EN&product-Number=W4502&brand=SIGMA&PageToGoToURL=https://www.sigmaaldrich.com/catalog/search_term=7732-18-5&interface=CAS.No.&N=0&mode=match_partialmax&lang=EN&region=IN&focus=product
y59c2nys	http://moef.gov.in/manufacture-storage-and-import-of-hazardous-chemical-rules-1989/
y5e7nh68	https://home.howstuffworks.com/magic-eraser.htm#pt1
y5erltqm	http://www.imo.org/EN/Publications/IMDGCode/Pages/Default.aspx
y5erltqm	http://www.imo.org/EN/Publications/IMDGCode/Pages/Default.aspx
y5g8zcve	https://dhr.gov.in/document/guidelines/bio-medical-waste-management-rules-2016
y5mcrvvg	https://www.unece.org/fileadmin/DAM/trans/danger/publi/unrec/rev20/Rev20e_Vol1.pdf
y5myhvh8	http://www.dc.engr.scu.edu/cmdoc/dg_doc/develop/material/overview/a3000002.htm

y504v2g3	https://www.addressingtheunaddressed.org/
y504v2g3	https://www.addressingtheunaddressed.org/
y62hls2s	https://www.OSHA.gov/dts/osta/otm/otm_iii/otm_iii_4.html
y67hdp75	https://en.wikipedia.org/wiki/Bleach_activator
y69jeodr	https://en.wikipedia.org/wiki/Organic_peroxide
y6broevv	https://www.unece.org/trans/danger/publi/adr/adr2019/contentse.html
y6gkpuum	https://www.mayoclinic.org/diseases-conditions/latex-allergy/symptoms-causes/syc-20374287
y6j7rkvn	https://www.youtube.com/watch?v=58naKHqCW0
y6jwvxuz	https://www.safetyinfo.com/safe-chemical-storage-OSHA-requirements-free-index/
y6wffjct	https://iscrapapp.com/metals/
y77w5h3p	https://www.cdc.gov/NIOSH/npg/default.html
y7j2hzak	https://www.moglix.com
y7qtaf36	https://news.northeastern.edu/2020/3/20/heres-why-washing-your-hands-with-soap-for-20-seconds-protects-you-from-covid-19/
y7sedmnk	https://www.iso.org/ISO-45001-occupational-health-and-safety.html
y7x8gzt	https://www.OSHA.gov/dsg/hazcom/ghsguideoct05.pdf
y82tkxos	http://www.wcoomd.org/en/topics/nomenclature/overview/what-is-the-harmonized-system.aspx
y83okomo	oshwiki.eu/wiki/Main_Page
y8cpw78y	https://pubchem.ncbi.nlm.nih.gov/compound/22311
y8tcdlgw	https://en.wikipedia.org/wiki/Huarache_(running_shoe)
y8yrvhk7	https://en.wikipedia.org/wiki/Mental_model
ya4bx5ld	https://www.mcrcsafety.com/en/gloves/cut-protection
ya5btczb	https://dhr.gov.in/sites/default/files/Bio-medical_Waste_Management_Rules_2016.pdf
ya5qqkav	https://www.ncbi.nlm.nih.gov/pubmed/9233870
yaby7bss	https://www.bmj.com/content/339/641/429/rapid-responses
yaewgj5w	https://www.ncbi.nlm.nih.gov/pubmed/21678349
yaqauwcj	https://www.indiatoday.in/mail-today/story/swachh-bharat-reality-a-death-every-third-day-in-gutter-1349272-2018-09-26
yaxhy63e	https://www.healthline.com/health/aseptic-technique
yb4osded	https://en.wikipedia.org/wiki/Insecticide
ybcxvc5p	https://www.coleparmer.com/safety-glove-chemical-compatibility
ybev9zuc	https://osha.europa.eu/
ycrttupp	https://www.ncbi.nlm.nih.gov/pubmed/19952790
ycj3m6t5	https://blog.esurance.com/seat-belt-history/
yczbufk5	https://www.health.harvard.edu/diseases-and-conditions/tinnitus-ringing-in-the-ears-and-what-to-do-about-it
yx8v86cf	https://www.iata.org/en/publications/dgr/
yxb2sr75	http://www.lawsindia.com/Industrial_Law/a_07.htm
yxfyw2sq	https://www.chemstore.co.uk/en-14470/
yxg294ds	https://worksafe.govt.nz/topic-and-industry/manufacturing/safe-use-of-machinery/
yxs3w6ya	http://www.fao.org/3/Bo465E05.htm
yxswe9k9	https://en.wikipedia.org/wiki/Sulfonic_acid
yxtukyvp	https://www.steelguardsafety.com/products/safety/sound-shield-curtains/
yxwle6xv	https://www.cdc.gov/NIOSH/docs/87-116/pdfs/87-116.pdf?id=10.26616/NIOSH PUB87116

A-4 From Person to Professional

yy2wyj3e	https://www.worldcat.org/search?q=au:Niitsu%2C+Haruko.&qt=hot_author
yy38pkrk	https://www.indiamart.com/proddetail/dupont-tyvek-suit-8743591112.html
yy3lv5jx	https://dilbert.com/strip/1995-11-07
yy479x4n	https://www.services.bis.gov.in:8071/php/BIS/bisconnect/pow/is_details?IDS=NjlyOQ==
yyey3us3	https://www.ilo.org/dyn/icsc/showcard.display?p_lang=EN&p_card_id=0554&p_version=2
yyfxgj4p	https://www.britannica.com/science/eutrophication
yyj25htv	https://www.youtube.com/watch?v=OfMwdMcgTuw
yy nag2f5	https://www.ansell.com/-/media/projects/ansell/website/pdf/covid/overview-of-regulatory-standards-for-gloves-that-protect-against-viruses-pdf.ashx?rev=e8b82c53033b49b08292d806ac347314
yyph9ora	https://multimedia.3m.com/mws/media/639110O/3m-respirator-selection-guide.pdf
yyvn37sj	https://en.wikipedia.org/wiki/Partition_coefficient
yyw3fbh	http://www.unece.org/trans/danger/publi/GHS/ghs_rev0%files_e.html
zoqc7b5	https://www.sbi.co.in/portal/web/personal-banking/savings-bank-accounts-for-minors
zqn5spq	https://en.wikipedia.org/wiki/Implicit_stereotype
zuoj5tu	https://www.washingtonpost.com/national/health-science/tamika-cross-is-not-the-only-black-doctor-ignored-in-an-airplane-emergency/201%io/2%3f59ac08-9544-11e6-bc79-af1cd3d2984b_story.html

Appendix 1: About SWM

SWM and waste-work

WHAT IS SWM?

Solid Waste Management (sWM) is the discipline associated with the generation, storage, collection, transport or transfer, processing and disposal of solid waste materials in a way that best addresses the needs of public health and the environment. The primary goal of solid waste management is to reduce or eliminate adverse impacts of waste materials on human health and environment. There are six functional components of waste management systems:

1. Waste generation refers to activities involved in identifying materials which are no longer usable and are either gathered for systematic disposal or thrown away.
2. On-site handling, storage, and processing are the activities at the point of waste generation which facilitate easier collection. For example, separate waste bins for each type of waste (plastics, metals, paper organic) at home, apartments and at other sites which generate sufficient waste.
3. Waste collection, a crucial phase of waste management, includes activities such as placing waste collection bins, collecting waste from those bins (door-to-door in some cases), and transferring it to a location where the municipal waste collection vehicles are loaded. Waste is usually transferred in large bins loaded on push-carts.
4. Waste transfer and transport are the activities involved in moving waste from the local waste collection locations to facilities that process and recover recyclable waste, and subsequently to disposal sites.
5. Waste processing and recovery refer to the facilities, equipment, and techniques employed both to recover reusable or recyclable materials from the waste stream, and to improve the effectiveness of other functional elements of waste management.
6. Disposal is the final stage of waste management. It involves the activities aimed at the systematic disposal of waste materials in locations such as landfills or waste-to-energy facilities.

CATEGORIES OF WASTE.

Familiarize yourself with these categories as well as the local words or phrases for each. See I①④ PET OR KADKADI? → [45] for recycling codes of waste, and common local phrases used by SWM workers for different types of waste.

§ PLASTICS.

The six most commonly found types of plastic waste in India are:

- PET (*polyethylene terephthalate*): water, soft drink bottles.
- LDPE (*low-density polyethylene*): garbage bins, and ‘plastic’ bags.
- PVC (*plasticized polyvinyl chloride or polyvinyl chloride*): water pipes, squeeze bottles.
- HDPE (*high-density polyethylene*): shampoo containers, caps of PET bottles.
- PS (*polystyrene, thermocol*): foam hot drink cups and plates.
- PP (*polypropylene*): transparent fruit and food containers.

Waste-workers use different terms for the various kinds of plastics, and these they can vary from city to city: *Phugga, mix-phugga, kadi, kadak, mix-kadak, parachute, khasta* and so on. Learn and memorize the local nomenclature. If someone mentions that she sells *dikrosin*, you should know that she is referring to polystyrene, which is often used in banners and decorations. *Dikrosin* = decoration = polystyrene = thermocol.

Currently, only plastic products made of PET, HDPE, and PVC are recycled properly. PS, PP, and LDPE are typically not recycled for various reasons. Basic plastic recycling processes involve collecting, sorting, shredding, washing, compacting, melting, and pellet-making. Collection and sorting is considered unskilled work; the rest of the jobs mentioned are done by skilled and semi-skilled SWM workers at mechanised plants. Processing and recycling of plastic is profitable only if done by vertically-integrated operations.

Problems with plastic waste

- Plastic bottles require a lot of storage space. The caps and cap-ends are made from HDPE, the body is made from PET and the label is usually made from LDPE. These must be separated before the bottle can be compacted or shredded.
- Polystyrene is difficult to recycle profitably. However its popularity as a packing material means that door-to-door collectors are often forced to collect and process it. Some municipal corporations will not collect dry-waste if it contains polystyrene; some have banned its use entirely. Polystyrene must be segregated and disposed of on specified days of the month.
- PET bottles have a ready market, but the process of removing the label and cap is labour-intensive.¹
- It is easy to mistake one kind of plastic for another especially if fillers are used. Fillers like chalk, talc, gypsum, and glass fibre are added to change the physical properties of plastics. Plastics of the same type but with different fillers must be segregated by an SWM worker. The sale price is reduced significantly if such plastics are not segregated.²
- Broken plastics such as PP and PET can have razor sharp edges.
- The dust from glass-impregnated plastics (such as those used in electronic circuit boards and consumer electronics boxes and cabinets, see @mzryfrtd) is hazardous. Long-term exposure to fibreglass dust (a hazard faced by SWM workers at e-waste processing units) causes irreversible damage to the lungs.

¹ See @jhfw99g.

² See @y5myhvh8 and @y33e6z4l.

§ METALS

1. **FERROUS SCRAP.** *Ferrous* refers to metal alloys that are predominantly made of iron in combination with carbon and other metals. Cast-iron pots and pans, cutlery, steel and stainless-steel furniture, nuts, and bolts are common examples of ferrous scrap.
2. **NON-FERROUS SCRAP** consists of (in order of availability) aluminium, copper, alloys of copper, lead, zinc, and tin. Again, kitchen utensils are the most common source of non-ferrous scrap. Another common source of non-ferrous metals are furniture fittings, such as door-knobs, hinges, latches and locks and plumbing fittings. Insulated wire and transformers are rich sources of copper, but to recycle them safely requires skill and training.
3. **OTHER METALS**, such as gold, platinum, silver, iridium, germanium and palladium are only found (in microscopic quantities) in electronic waste. These can only be separated using chemical processes.
4. **ELECTRONIC WASTE** yields neodymium, lithium, nickel and zinc, which are *relatively* harmless, and sulphur and heavy-metals such as lead, chromium, cadmium, mercury, and beryllium, which are hazardous.

Waste-workers do not usually find metals in quantities that are profitable to recycle as scrap. Metal furniture is usually sold to local craftsmen who repair and re-sell them. Some articles like spring mattresses contain a significant quantity of steel, but are too bulky to transport profitably.

Problems with metal waste

- Aluminium used in foil and food containers is usually mixed with plastics and paper, and is difficult to segregate profitably.
- Metal scrap, while profitable, is difficult to handle and is often bulky.
- Regular unprotected contact with metals like lead (and e-waste) is hazardous.
- Insulated copper wires are often burned in open flames to remove the plastic insulation, which is usually made from pvc that contains flame retardant additives. The process releases toxic fumes.
- Handling any sharp metal object is risky. Apart from the risk of infection, some metallic salts commonly found in e-waste (such as copper sulphate) are toxic even in small quantities, if they enter the blood.

§ PAPER AND PAPER-PRODUCTS

SWM workers often categorize paper products as follows:

1. **PLAIN PAPER.** Waste-workers sort paper into different grades depending on type, colour and weight—white plain, white printed, glossy, coloured, brown and so on. In some cities, white paper (with or without writing) is simply called ‘white,’ while all other kinds of uncoated coloured papers are called ‘plain.’ Check the local terminology. Shredded paper is not easily recycled.
2. **NEWSPRINT**, usually called *paper*, is either coated or uncoated. Micro-sorting into separate grades is done by scrap dealers. The price of waste newsprint depends upon the weather and the proximity to a paper mill that uses recycled paper. Damp newsprint fetches a lower price

3. **BOOKS AND MAGAZINES.** Coated, glossy paper is processed separately. Books are usually given a second chance in the used-books market. Paperbacks are bought by paper-mills, and recycled in-house.
4. **CARDBOARD** is most commonly used (either plain or corrugated) as packing material. Cardboard is usually flattened to improve handling, and reduce storage space. Every ton of recycled cardboard saves three tons of wood.

Problems with paper waste

- Paper prices vary depending on the season. Newsprint, cardboard and other uncoated paper products absorb moisture and purchase rates/kg decrease during the wet season. They cannot be stored outdoors.
- Moist paper is a breeding ground for fungi and a source of spores.

§ GLASS

Very little waste is generated in the processes of glass recycling and manufacturing. Recycled glass can be used to produce the same product over and over. Scrap shops and waste-workers categorize glass as follows:

1. **WHITE GLASS** (clear glass bottles and containers).
2. **COLOURED GLASS** (medicine bottles).
3. **BEER BOTTLES** (all scrap dealers have fixed rates per 750 mL bottle).
4. **BROKEN GLASS** (incandescent bulbs, fluorescent tubes).
5. **OTHER GLASS** (decorative glass, lead-glass, borosilicate glassware).

The carbon footprint of glass can be reduced by the use of recycled glass. Every kilogram of recycled glass displaces the need to extract 1.2 kilograms of virgin raw materials.

Problems with glass waste.

- Glass is hazardous to handle even while wearing gloves. Broken glass in mixed waste is a common cause of injury.
- Scrap dealers only purchase certain kinds of glass.
- Fluorescent lamps contain mercury, which is hazardous, but is often disposed with household glass waste.

§ TEXTILES

OLD CLOTHES are the most common source of different textiles. The most common are cotton and polyester (PET fibre). These are commonly bought by industries for use as disposable cleaning rags. Environmental regulations require proper disposal of used cleaning rags, which may contain hazardous chemicals. However, adherence to these rules is poor. Most waste-workers do not bother collecting textiles because profits from the sale of used fabric are low. Consequently, most textile waste ends up in landfills.

§ ORGANIC WASTE

KITCHEN AND GARDEN WASTE are the most common types. Organic waste ought to be composted on site; composting on site is mandatory in the case of certain types of residential flats (the classification depends on the municipal corporation). Apart from compost and vermicompost, organic waste can be mulched for use as fertilizer.

Problems with organic waste

- Poor source segregation of household waste makes it nearly impossible to separate organic matter from waste that can be recycled. Most plastics cannot be processed if they are contaminated with organic waste.
- Disposal of organic waste in plastic bags.
- Partially decomposed organic waste is a health hazard.

§ BIO-MEDICAL WASTE

Needles, syringes, used cotton-swabs with or without bodily fluids, discarded samples of blood, and other bodily fluids are called bio-medical waste. Healthcare facilities such as hospitals, blood-banks, fertility clinics, dental clinics and so on are required to dispose bio-medical waste according to environmental guidelines specified by the Pollution Control Board. Such waste must be handled and processed only by trained professionals. Household medical waste ought to be marked and discarded separately from other waste.

Problems with bio-medical waste

- Severe risk of exposure to disease.
- Sanitary towels and diapers are often discarded, unmarked, with household waste.

§ OTHER WASTE

Everything else falls under this category:

1. CERAMICS (crocery, fired unglazed pottery, glazed pottery, plaster of Paris figurines).
2. SHOES (all kinds of footwear that cannot be re-used).
3. LEATHER (bags, belts, jackets).
4. ELECTRICAL AND ELECTRONIC WASTE (consumer goods, bare and populated circuit boards, wires, electronic components, electrical fittings, LED bulbs) Also called e-waste.
5. LEAD-ACID BATTERIES (automotive open and sealed cells and sealed or gel-based inverter cells).
6. DRY CELLS (mainly zinc, alkaline and Ni-MH).
7. LITHIUM BATTERIES (computer and mobile batteries, coin-cells).
8. TETRA-PAK (some scrap dealers purchase tetra-pak, most do not).
9. Dry cells are electronic waste. However, since they are of a standard size and mass, some scrap dealers will purchase dry cells but not other kinds of e-waste.

Appendix 2: Guides

Guidelines for moderators

Teach, do not lecture

The interaction between the narrator and Laxmi (as shown in the films) should guide your interactions with the participants. Teach, do not lecture; help, do not patronize. Err on the side of oversimplification instead of pedantry. For example, the handbook recommends that the hand-washing activity be done just before the break for refreshments. If you feel that the participants are too tired to be shown the proper technique it is OK just to say ‘wash your hands for at least 20 seconds’. Use humour whenever possible.

You are not mediating a negotiation between SWM workers, and their employers or those stakeholders who insist that all SWM workers must wear PPE. Your objective is to change the way the participants perceive PPE and OHS in the context of their lives. Adopting PPE is an informed decision that they must take—or not take and face the consequences. However, keep in mind that even in a negotiation, the ‘ideal’ compromise made by each party need not be symmetrical—in many cases the participants might have to give up very little in return for a lot more.

Active Participants (AP) will give you the option to stay silent and move the focus of attention on the participants. Encourage AP to face the other participants while they answer. Begin role-play activities with AP. Ask AP to sit at opposite ends of the semicircle so that their conversations can be heard by everyone.

There will be people in the audience who are thinking about the matter at hand, but are uncomfortable to speak in public, and might not volunteer to participate in an activity. Try to identify these Engaged Participants (EP) as early as possible. They may open up if you encourage AP in the room to interact with them. For example, in a role-play activity such as Perspective Playback you could pick an AP and then (as if picking someone at random) ask an EP to interact with the AP.

Ask questions. Let the participants offer answers. Ask other participants to comment on the answer. Encourage discussion.

Every activity has at least one slide associated with it. This should be displayed at the beginning of the activity. Do not leave the screen blank during the workshop.

Be firm, but fair

If a single participant is steering the discussion off course, ask the participants if they want to allow the speaker to continue speaking for, say, one more minute. The participants will agree. Allow the speaker to speak for a minute and then ask them to let someone else join the discussion. Be firm and fair when required. Encourage AP to interact with each other, and not compete for attention or admiration from the rest of the participants.

No ultimatums

Do not offer a choice in the form of an ultimatum at the beginning of the workshop. This is counter-productive. Let the participants first invest energy and time in the process before you confront them with ultimatums—e.g., the saying that the use of PPE is mandatory to get employment is an ultimatum. Do not discuss these topics at the beginning of the workshop. Instead, raise the issue in Module III (or later) when you speak about professional work in a modern, mechanised SWM facility.

Use the P2P process to find a solution

Do not dismiss or challenge a participant's mental model especially during II③; the activity was designed to help *you* try to understand the problem from the participants' perspective. Therefore, it is OK to say the following during II③ (and even later):

If you do not need PPE, do not use it. The choice is yours. You do not have to convince me. We are only discussing what you want.

Making such a statement does not validate the mental models of those who do not care for PPE. Instead, it reinforces the message that using PPE is their choice to make.

In Laxmi's World, insensitive employers, cheapskate contractors and other annoyances are all represented by an unseen character called Mrs. Annoying Voice. Laxmi's reaction to this character should guide your responses when discussing problems caused by such people. Remember that Mrs. Annoying Voice is to be given a name during II①② PERSPECTIVE PLAYBACK_→[57]. Use this name whenever you refer to the character.

Know that you have limited authority

You cannot force participants to wear PPE where it matters the most—outside the workshop, or at the workplace. Never try to force participants to wear PPE during the workshop.

Challenge notions that are self-fulfilling

Consider the following train of thought:

1. Waste-workers are convinced that gloves are inconvenient.
2. Therefore, they do not try to use them long enough to overcome the inconvenience.
3. Therefore, they find gloves inconvenient to use when forced to do so, which proves that gloves are inconvenient.

This is a self-fulfilling prophecy; it is a circular argument. You cannot explain this concept to the participants, but you can show examples (of Laxmi, in the films) where these notions are shown to be untrue. Use the chain of solutions recommended in the P2P method—technical, subjective, and motivational. Self-fulfilling notions are subjective and become irrelevant if a suitable technical solution is found. If you solve, say, ten problems in this manner then the participants will begin to question their mental models without any intervention from you.

Provoke dialogue among participants

Point out examples from the films (marked **F**) to evoke opinions and initiate discussion. In Module IV and onwards, the connexions between health, resources, family ties and choosing to use PPE are shown, but not spelled out explicitly. Make these connexions by asking leading questions where necessary. In a workshop on financial planning, skip references to PPE.

Do your homework

Ask the organizers to send you a list of participants and their job-descriptions well in advance. A list of additional reading material is included with most activities. These will help you prepare for discussions with veteran NGO workers, social activists, shop-floor supervisors, engineers, business managers and so on. Each activity begins with a section called Workshop Programme that will help you prepare a suitable agenda for the participants.

Preparations and documentation

VENUE FACILITIES AND REQUIREMENTS.

The room for the workshop should be large enough to seat 40 people in a semicircle, or two arcs of 20 people inside 70% of the longer end of the room. Visit the location and check that the chairs can be arranged in a semi-circle. It should have fans, adequate lighting, and windows with shades or curtains. The location should have adequate rest-room facilities and drinking water for 40 people. For workshops longer than two hours, there should be catering facilities to serve tea, light refreshments, or a suitable mid-day meal. The room should have:

1. 40 chairs or more.
2. 3 tables 1m x 60cm or similar.
3. 2 white-boards 1m wide or similar with stands.
4. 1 projector screen.
5. 1 video projector.
6. 1 computer and sound-system capable of playing HD video and running presentation software.

If you plan to carry a laptop with you, ensure that it has the appropriate output connector for the projector and the sound-system. Check that the projector, computer and sound system work properly. If the participants cannot see or hear the films properly, they will not understand many activities in the workshop. Do *not* conduct this workshop in a room without chairs—many activities and demonstrations require the use of props and a table, and these will not be visible to participants if they are seated on the floor.

VENUE FACILITIES	Y/N	NOTES
40 Chairs		
3× Tables		
2× White-boards		
1 projector with screen and sound-system		
1 computer, with projector cable		
Curtains or blinds present		
Catering facilities		
Restrooms, drinking water etc.		

Table 47. Checklist for venue facilities.

PREPARING FOR THE WORKSHOP

Ask your client (or the organization that has called you to conduct the workshop) to provide you with a Master List of participants with the following information:

1. Name of the participant. (Required.)
2. Description of his or occupation (sorter, loader, door-to-door collector and so on). (Required)
3. Affiliated organization.
4. Address, if known or locality or neighbourhood when she lives.
5. Telephone number, if known.

§ THE DAY BEFORE THE WORKSHOP

See the companion USB drive for printable PDF files of all documents mentioned below. Most files are formatted for A5 or A4 sheets and may be enlarged if required. See APPENDIX 4: DOCUMENTS AND TEMPLATES → [A-27].

1. Take two printouts of the Master List.
2. Take thirty five printouts of the Attendance Certificate (or the number of participants + five) on good quality paper. Do not use cheap paper. Participants will take this document home and keep it only if it looks professional. If the certificate looks like a cheap printout, it will be used the next day to line a garbage bin or to wrap soiled diapers. For best results, have the certificates printed on parchment by a professional printer.
3. Use the information in the Master List to prepare Name tags for each participant and an extra five name-tags. Name-tags must have numbers printed on *both* sides—if the tag is flipped over during the workshop, the number will remain visible. Hand-written labels are fine if you have neat handwriting, else use the label format provided to make the tags look professional—if the tags look amateurish you will not be taken seriously. (See NAME TAG → [A-28].)
4. Prepare two printouts of a Participant List. Do not print out the names of the participants on this list. This list, used with carbon-paper on a A4-sized clipboard will be used to link tags to names. You will carry a copy of the Participant List at all times during the workshop, your assistant will carry the carbon-copy. (See PARTICIPANTS' LIST → [A-32].)
5. Take ten printouts (or photocopies) of the Note Sheet.
6. Draw or print a DEFER chart on A2 paper. If you prefer to draw the chart on a white-board—always the preferred option—pack a ruler.
7. Draw or print an Income-Expenditure Chart on A2 paper. If you prefer to draw the chart on white-board, pack a ruler and 3-4 white-board markers of different colours.
8. Prepare a suitable workshop programme. Take into account the organization's needs, the time available and the nature of work done by participants.
9. Check that all the props and cards required for the activities are in good repair. Print a Props Checklist if needed.
10. The only props you need to prepare beforehand are a bulb and dry waste, both required in II⊙. A bulb can be safely de-pressurized by following the procedure shown here: @y3pwmg6t. Dry waste should be a mix of shredded paper, shredded

fabric, cardboard, torn and crumpled paper, two or three 250mL PET bottles, a few paper cups and a few sheets of newspaper. The shredded paper and fabric are essential.

PRINTOUTS AND STATIONERY	Y/N	NOTES
2× Master Lists		
35× Attendance Certificates		
40× Numbered name-tags		
40× Labels		
2× Participant Lists		
10× Information Sheets		
1 x carbon paper		
1 x clipboard		
White-board markers and eraser		
DEFER chart, Income Expenditure chart		

Table 48. Checklist for preparations on the day before the workshop.

§ THE HOUR BEFORE YOU BEGIN

Arrange chairs in a semi-circle or in two arcs. Place one table in the centre of the room between the projector screen and the first row of participants. This table will be used during activities. Place the other tables to one side of the room. Props and cards may be placed on these. Keep a chair near these table for your assistant. Arrange one white-board on each side of the projector screen. One of these will be used for DEFER, the other for registering votes. Prepare the white-board for DEFER as described earlier.

Ensure that drinking water and glasses are available and that the rest-rooms are clean. Check that the projector and computer work properly. If you are using your own laptop, make sure it works with the projector. Prepare the Participant List (two copies of blank list with carbon-paper in between) on your clipboard. As and when participants arrive, mark their attendance as follows:

1. Verify that the participant is on the Master List. If a participant is not listed, direct her to speak with the organizers of the workshop.
2. Participants might bring colleagues with them. Use the extra tags and add their names to the Master List as well as the Participant List.
3. Give each participant a name tag and note down their name *beside the tag number* on the Participant List. Names of unregistered participants should be added to the Master List as well. (See MASTER LIST → [A-30] for detailed instructions.)
4. Tell participants to return the name tag at the end of the workshop to receive their Attendance Certificate.

Allow 10 minutes for late arrivals before you begin. Your assistant should keep the carbon-copy of the Participant List and one copy of the Master List.

PRE-WORKSHOP CHECKS	Y/N	NOTES
Chairs and tables arranged		
Props ready		
DEFER chart pasted/drawn		
Projector checked and set up		
Drinking water, refreshments and restrooms ready		
Attendance taken		

Table 49. Checklist, before you begin the workshop.

§ AFTER THE WORKSHOP

Request each participant to step forward, one by one, as you call out their name. Present them with an Attendance Certificate, and mark it on the Participant List. They should deposit their name-tags with your assistant. Take a group photograph with all the participants. If a participant has left without his or her certificate, give it to the organizer of the event. Take a photograph of the DEFER chart. If you have printed the chart, remove it. The chart contains useful information and should be given to the organisation that has hired you. Check that all props and cards have been accounted for. Clean the venue. Leave it cleaner than you found it.

POST-WORKSHOP CHECKS	Y/N	NOTES
All DEFERS are cleared		
Chairs and tables arranged		
Props collected and accounted for		
All participants have received certificates		
Venue is clean		

Table 50. Checklist, after the workshop.



Appendix 3: Protocols

Clipboard protocol




You should be able to see each participant's name-tag from the centre of the room.

When you wish to speak to someone, check your clipboard for their Tag Number beside which you will find their name. Address participants by their name followed by the appropriate honorific—*Laxmi-ji*, *Laxmi-tai* and so on. When you want to note down a reference to them in the Notes Sheet, simply write their tag number.

Use the same process when using DEFER and OPINION. Refer to them by name, but write down only their tag number on the your Notes Sheet and on the DEFER chart.

Both you and your assistant should keep a clipboard with the following:

- Participants' List
- Notes Sheet

The symbol  in the handbook indicates that you should note down the tag number of participants involved in the discussion on the subject at hand. This subject may discussed later in a different context and you should keep track of those participants who change their minds over the course of the workshop, e.g., note down the tag numbers of participants who spoke about the cost of PPE during II①LAXMI'S CHALLENGE→[51]; then, during VI② COST, PRICE, AND VALUE→[443], see if they change their minds—ask them, or invite them to comment on their arguments in the light of new information.

Defer protocol



$\mathbf{D} \rightarrow$: An arrow point away from the icon indicates a postponement of discussion. It is always followed by a reference to a module and activity $\mathbf{D} \rightarrow xy$: x is the module, and y is the activity in that module. $\mathbf{D} \rightarrow \text{III} \textcircled{1}$ means DEFER to Activity $\textcircled{1}$ in Module III.

$\rightarrow \mathbf{D}$: An arrow pointing at the icon means re-open all postponed discussions pertinent to the current activity.

DEFER is used to ensure that discussion on a given topic takes place at the appropriate time during the workshop. The protocol also ensures that all ideas get recorded and participants do not feel like they've been ignored. Whenever a issue is mentioned that is not relevant to the discussion at hand, DEFER discussion about it by writing down the number on the participant's name tag in the appropriate space on the DEFER chart, as shown in TABLE 5 \rightarrow [A-23].

Always use the CLIPBOARD protocol when referring to participants. Re-open deferred topics at the appropriate time, i.e., when it is to be discussed as per the workshop programme. You could also DEFER some issues to be discussed during lunch or after the workshop. Feel free to use DEFER whenever you wish, especially if you use the activities in a different order or include additional activities not described in the handbook.

You must know the appropriate activity to which an issue may be deferred.

$\mathbf{D} \rightarrow \mathbf{D}$: indicates that similar questions on the same topic be merged into a single discussion. The discussion may take place later, if necessary.

HOW TO DEFER

$\mathbf{D} \rightarrow xy$

1. Acknowledge that the matter is important:

$\boxed{\text{M}}$ *Laxmi-ji, that's an important point you have raised. We will discuss this later. I'm putting your number down here. Is that alright?*

2. Write down the participant's tag-number in the appropriate location (x,y) on the DEFER chart and thank her for the idea or comment.
3. If someone else wants to discuss the same (or similar) subject at this time, or at any other time in the future before you reach the appropriate activity, append that participant's number to the other numbers on the chart.

WHEN TO DEFER A TOPIC

DEFER all discussion of topics that will be discussed later during the workshop.

1. Specific questions that can be answered in 15 seconds or less *should not* be deferred. Even if the topic is to be discussed later, answer the question briefly and mention that it will be discussed in greater detail later. Thank the participant. Do not add her number to the DEFER chart.
2. Discussion of topics that are academic in nature should be deferred till the end of the workshop.
3. Use your experience. Be firm, but fair.

HOW TO OPEN A DEFERRED TOPIC

→ D

1. At the start of each activity, check the DEFER chart and open any pending topics. For the first activity in each module, re-open deferred topics only *after* the film is screened. You will find, with most topics, that Laxmi has encountered a similar problem. Establish this connection.

[M] *It seems that Laxmi-tai (and name, or list of names on the DEFER chart) had the same idea (or did the same thing). Is this right? Is this similar to what you asked?*

2. Acknowledge that a pending topic first raised by (the name of the participant) can now be discussed, and ask this person on the list to re-state her comments. Merge the DEFER if necessary (see how to merge, below.)
3. Discuss the matter at hand.

HOW TO MERGE DEFERRED TOPICS

D → D merge

1. If you have deferred inputs from more than one participant on the same topic, ask the first person to re-state the matter.
2. Ask all the others, by name, if they feel that the topic is essentially the same.
3. Do the others agree with how the first speaker described this matter?
4. If they agree (which is usually what happens) discuss the matter. If not, ask them to clarify.
5. Discuss the matter at hand.

HOW TO CLOSE A DEFERRED TOPIC

D → close

1. Ask the participants, if the deferred topic raised by (name) was discussed adequately.
2. Thank the participant for his or her patience.
3. Strike out the participant's number from the DEFER chart. Do not erase the number.

USING THE DEFER CHART

The companion USB drive contains a PDF of the DEFER chart formatted for A4 paper. You could print it, then enlarge it to A3 or A2 as required. You could also draw the chart on a white-board before the workshop begins. It should be large enough to be visible from where you would normally stand during the workshop, i.e., if you follow the recommended arrangement of a semi-circle, you should be able to read the numbers from the centre of the circle.

The rows and columns in the DEFER chart refer to modules, and activities in that module, respectively. In the example below, you have deferred a matter raised by participant 27 to VI③, i.e., Activity ③ in Module VI. A similar question was also asked by Participant 3, earlier. Therefore, when you wish to close the DEFER, first evaluate whether the topic raised by participant 27 is similar to the one raised by Participant 3. If the topic is similar, merge the discussion. If it is substantially different, first answer Participant 3, then move on to Participant 6.

You have also deferred discussion of the following questions from three different participants (wearing name tags numbered 3, 27, and 14) to III①, then closed the DEFER, shown crossed out in the table below.

- “How do I know what size glove is right for me?”
- “I have no control over what gloves the supervisor hands out.”
- “This brand fits well, but is too expensive. What do I do?”

Finally, you have also deferred discussion on finances with participants 12 and 3 to lunchtime.

MODULE / ACTIVITY	I	II	III	IV	V	VI	VII	VIII
1			3,27,14					
2								
3						3,19		
4								
5								
6								
7								
8								
9								
LUNCH								
END							3,12	

Table 51. Sample DEFER chart.

The DEFER chart will help you identify AP. You will also be able to help the organization identify people who are pro-active and inquisitive. The table, above, indicates that Participant 3 is an AP. She might be an ideal candidate for advanced training, or a leadership role in her organization.

Opinion protocol



The OPINION protocol is used to gauge the group's OPINION on a topic. It helps to identify not only consensus, but also the level of interest of the participants on the subject at hand. It helps you involve EP in the discussion because they prefer to respond to their peers.

WHEN TO USE OPINION

1. If a participant mentions or suggests something that is important and you want others to engage in a discussion with her.
2. If you want to say something important, but do not want to tilt the discussion or sway opinions, i.e., you would rather have a participant say what you want to say. These moments are indicated in the handbook with ☯.
3. To get consensus. ✋ is used in the handbook to ask for a simple agree/disagree vote with a show of hands. Feel free to ask for a full discussion if necessary.
4. To provoke a discussion. These moments are indicated in the handbook with ☯.

HOW TO USE OPINION

1. Re-state, *briefly*, the matter at hand, then ask for a voice-vote.

✋ *Laxmi-di just said that she prefers to save in the form of gold because it is not easy quickly to convert gold into money. Do you all agree?*

2. Alternatively, specifically ask another participant to respond to an OPINION, then ask everyone if they agree by voice-vote.

☯ *Kokila-di says that she prefers to save money in cash at home. Nirmala-di, said earlier that her husband steals your savings to buy liquor. Nirmala-di, tell us about the problem, please respond to Kokila-di.*

☯ may be combined with, or replaced by ✋:

[M] *We have all heard what Laxmi-di said about her savings. Does Laxmi-di's preference to save in gold make sense to you? Who else agrees or disagrees with Laxmi-di said?*

Provoke participants to judge Laxmi's choices, in their minds, with a leading rhetorical question if necessary:

[M] *Was Laxmi being brave when she refused to wear gloves? Or was she being silly. I think it is brave. But it's not my hand that got cut. What do you think?*

[M] *I didn't make the films, nor did I write the scripts for these films. I wonder why Laxmi did this? Does it feel correct to you?*



Transfer/Summarise Protocol



TRANSFER serves as a quick recapitulation of the module just completed and a reminder of Laxmi's story as it stands.

Before the participants view the next episode of Laxmi's adventures, remind them of what has happened and what to expect. The story arc between IV, V, and VI shows Laxmi working hard to repay a loan, for which she has pawned her gold earrings. When you TRANSFER between V and VI you could, e.g., ask participants whether Laxmi will be able to repay her loan. You could ask them if the tortoise in the story, walking slowly, step by step towards the finish line is actually Laxmi herself, telling her own story to her daughter...

The Discussion section contains many suggestions for TRANSFER. This protocol is required when your workshop programme does not include all modules in the handbook, e.g., transfer should be used between Module III and Module VII when skipping the modules on health and finance. The workshop programme section at the beginning of each module contains specific guides on how to transfer between modules.



Appendix 4: Documents and Templates

Name Tag

The Name Tag should be photocopied to *both sides* of an A5 sheet to enable you to see a participant's tag number even if it is flipped over.

The companion USB drive contains a printable name tag template. A PDF reader (Adobe Acrobat® or similar) will be needed to open the file. The template is formatted for an A4 page, with two name tags on each page. Print one page, then flip the printed sheet and print again. These may be placed in a re-usable plastic pouch fitted with a lanyard.

The template has a large space for handwritten numbers, a smaller space for participants' names, and a marked hole to be punched out for fitting a lanyard.

A more professional option is to create a set of 40 laminated name tags with preprinted numbers. Participants' names may be written or printed on single-line labels, which can be pasted on the laminated tag and peeled off after the workshop.



P2P

From Person to Professional

Workshop Participant

Name

Participant Number



info@hasirudalainnovations.com
+91-974 211 2362

Master List

Photocopy the facing page to fit an A4 sheet, or print the A4 template on the companion USB drive.





SECTION	DESCRIPTION
№	Serial number. The companion USB drive contains two templates—with and without printed serial numbers.
NAME	Names of participants provided by your client.
<input checked="" type="checkbox"/>	Whether present or not—tick when giving the participant her Name Tag. All participants must be given a Name Tag.
	<p>This column is used for NAME TAG information.</p> <p>Procedure:</p> <ol style="list-style-type: none"> 1. Write down his or her name on the PARTICIPANTS' LIST. 2. Write down the tag number (from the PARTICIPANTS' LIST) in this column. 3. Create a NAME TAG as described earlier and give it to the participant. 4. NAME TAGS should be issued in the order in which participants arrive.
	<p>ATTENDANCE CERTIFICATE information to be filled in <i>after</i> the workshop. Before you give a participant her certificate:</p> <p>Take her NAME TAG.</p> <p>Tick this column.</p> <p>Cross out the participant's tag number in the previous column.</p>
	Address. The full postal address is not needed. The name of the locality and a landmark is enough.
	Mobile number, if the participant wishes to share her number.

Table 52. Master List. Legend and explanatory notes.

No	NAME	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1					1	
2					2	
3					3	
4					4	
5					5	
6					6	
7					7	
8					8	
9					9	
10					10	
11					11	
12					12	
13					13	
14					14	
15					15	
16					16	
17					17	
18					18	
19					19	
20					20	
21					21	
22					22	
23					23	
24					24	
25					25	
26					26	
27					27	
28					28	
29					29	
30					30	
31					31	
32					32	
33					33	
34					34	
35					35	
36					36	
37					37	
38					38	
39					39	
40					40	
MASTER LIST		Date:		Signature		

Participants' List

A copy of this list should be on the top of your clipboard during the workshop. Remember that the numbers on the left refer to the participants' Name Tags, which they wear around their necks and should be visible at all times. Therefore, it is easy to quickly find a participant's name during the workshop.

SECTION	DESCRIPTION
1	The number on the participant's Name Tag.
NAME	The participant's name.
DEFER	<p>DEFER reminder. Put in a dot when a topic is on defer for a given module.</p> <p>Refer to the defer, if necessary, when you speak with the participant, e.g., assume that a participant has raised a matter which was put on defer to module VII; if you speak to her during module IV, you might say, "By the way, I haven't forgotten that you have a question to ask later."</p> <p>Note that this space is not a substitute for the defer chart. If in doubt, consult the defer chart or ask the participant if their query was answered.</p>
NOTES	Miscellaneous notes.

Table 53. Participants' List, Legend and explanatory notes.

1	NAME	DEFER	NOTES
		1 2 3 4 5 6 7	
1			1
2			2
3			3
4			4
5			5
6			6
7			7
8			8
9			9
10		1 2 3 4 5 6 7	10
11			11
12			12
13			13
14			14
15			15
16			16
17			17
18			18
19			19
20		1 2 3 4 5 6 7	20
21			21
22			22
23			23
24			24
25			25
26			26
27			27
28			28
29			29
30		1 2 3 4 5 6 7	30
31			31
32			32
33			33
34			34
35			35
36			36
37			37
38			38
39			39
40		1 2 3 4 5 6 7	40

Note Sheet

To be used by the moderator and assistant at the workshop. Use as many sheets as required.



SECTION	DESCRIPTION
	Tag numbers of participants who wish to speak with you or to whom you wish to send additional information after the workshop.
AP	Active Participants.
DP	Disengaged Participants.
	Participant's tag number. (Not serial number.)
M-A	Module and Activity in progress when the note was made.

Table 54. Information Sheet. Legend and explanatory notes.



1				10
11				20
21				30
31				40

CALL BACK REQUESTED



AP



DP

1

M-A

Notes, activity cross-refs, glove requests, etc., Use tag no.



NOTE SHEET


Defer Chart

The rows in the DEFER chart are of different sizes, which are proportional to the number of DEFER requests that are likely to be made. The DEFER chart may be printed or you could draw the chart on a whiteboard.

A blank column for additional activities has been added. Take a photograph of the chart at the end of the workshop.

SECTION	DESCRIPTION
I–VIII	Module to which topic was deferred.
①–⑥	Activity to which topic was deferred.
Ⓐ, Ⓔ, Ⓟ	Deferred to Lunch break, End of the workshop or later, by Post or Telephone.

Table 55. Defer Chart. Legend and explanatory notes.

Act. Mod.	1	2	3	4	5	6		L	E	P
II										
III										
			7	8	9	10				
IV										
V										
VI										
VII										
VIII										
<div> Venue: Date:</div> <div>Moderator's Signature</div>										

Props Checklist

SECTION	DESCRIPTION
I–VII	Module
①–⑤	Activity
ⓐ–Ⓩ	Description of props.
K	The prop is a kit.
!	The prop is essential.
<input type="checkbox"/> <input checked="" type="checkbox"/>	Number boxes and checkboxes (<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> [3])

Table 56. Props Checklist. Legend and explanatory notes.

The lower half of the page is a matrix of props that are required for a given activity; the upper left describes the items and kits that correspond to props ⓐ–Ⓩ; the upper right lists items inside kits.

§ USAGE EXAMPLE

If you plan to demonstrate activity ① of Module III, the corresponding cell in the matrix shows props Ⓚ and ⓐ. Check the list. Ⓚ is a set of 5 sewing needles; ⓐ is a kit, which is indicated by [K!] in the list; also note that the exclamation mark indicates that the kit is essential, i.e., one you must take for every workshop that includes modules on PPE. Check the kit description on the right. ⓐ is a kit of different gloves. Write down the number of pairs of gloves of each type that you pack in the box on the left; at the end of the workshop, check that all pairs are accounted for.

Check in procedure:

1. Tick the first box beside Ⓚ and pack the sewing needles.
2. Write the number of pairs of each type of glove in the appropriate number box.
3. Repeat the check-in process for all props.

Check out procedure:

1. Count and pack the 5 sewing needles then tick the second box.
2. Repeat the process for all props that were checked in.

- ☐ ☐ a 2x bins (!)
☐ ☐ b 10 note
☐ ☐ c 50 note
☐ ☐ d 2x bags of dry waste (!)
☐ ☐ e Defused bulb
☐ ☐ f Small hammer/stone
☐ ☐ g 100ml acetone
☐ ☐ h Red food colour
☐ ☐ i Paint brush
☐ ☐ j 6" string
☐ ☐ k 5x sewing needles
☐ ☐ l Nipping tool
☐ ☐ m Soap
☐ ☐ n The Pawnbroker (K)
☐ ☐ o 3x slates and chalk
☐ ☐ p Rangaswamy (K)
☐ ☐ q Set of gloves (K!)
☐ ☐ r Set of masks (K!)
☐ ☐ s Set of PPE (K!)
☐ ☐ t Work Area FAK
☐ ☐ u Personal FAK
- (d)
 ☐ ☐ Shredded Paper(!)
☐ ☐ Shredded fabric(!)
☐ ☐ Bits of cardboard
☐ ☐ Crumpled paper(!)
☐ ☐ Paper cups
☐ ☐ News paper
- (s)
 ☐ ☐ Helmet
☐ ☐ Hi-vis jacket
☐ ☐ Overalls (O)
☐ ☐ Boots (O)
☐ ☐ Eye-protection
☐ ☐ Ear-protection
- (n)
 ☐ ☐ Pawnbroker's cap
☐ ☐ Reading glasses
☐ ☐ 2x packets of money
☐ ☐ Dice
- (q)
 ☐ ☐ DW
☐ ☐ WW
☐ ☐ OT
☐ ☐ Fitted
- (p)
 ☐ ☐ Old man mask, cap and beard
☐ ☐ 20x marbles (8L, 12s)
☐ ☐ Copper pot for marbles
☐ ☐ Empty jam bottle 250ml
☐ ☐ Goal Cards Set []



M/A	I	II	III	IV	V	VI	VII	VII
①		a b c d e f g	k q	e q				
②			g h i j q		n	o		
③			q r s					
④			d l q r m	q t u				
⑤						p		
⑥								

Income & Expenditure chart

Basic income and expenditure chart.

SECTION	DESCRIPTION
DETAILS	Monthly expenditures listed in this column. Expenses are listed by category in decreasing order of importance—rents and bills, education, utilities, fuel, kitchen expenses, food, discretionary expenses and miscellaneous expenses.
TOTAL	The total for each category, expenditures and incomes.
%	The expenditure under each category as a percentage of total family income.
PRIMARY INCOME AND SEC. INCOME	Primary incomes are salaries, wages and net business incomes. Secondary incomes are earnings from part-time jobs.
DEBT	Total debt incurred over the previous month. Place this under incomes and discuss if a loan can be considered an income.
CASH FLOW	Daily cash expenditure. Week 1-4, Sunday to Saturday.

Table 57. Income & Expenditure chart. Legend and explanatory notes.

Instead of printing this chart, you could project its image on a whiteboard and write in the spaces. Take a photograph of the filled-in chart at the end of the activity.



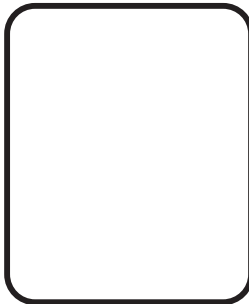
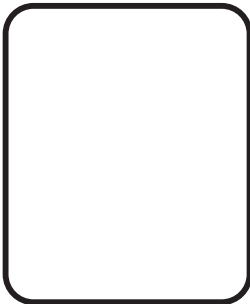
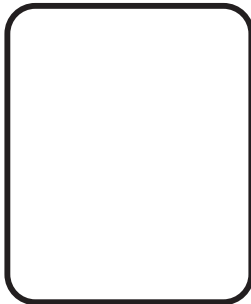
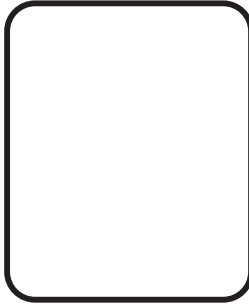
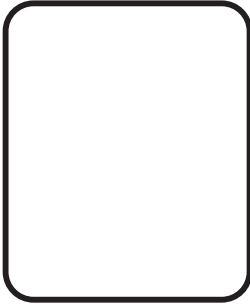
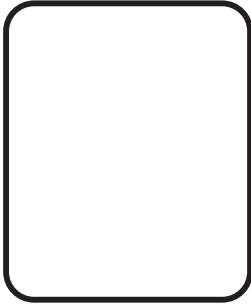
	Details	Total	%	Total	
Rent					Primary income
Electricity					
Water					
School fees					Sec. income
Other Ed. exp.					
Medical exp.					
Telephone					
Cable, Dish TV					
Petrol					
Gas					
Other fuel					
Sanitation					
Clothing					
Kitchen					
Rice, dal, oil					
Potatoes/Onions					
Vegetables					
Tea, coffee					
Liquor					
Hotel					
Travel					Debt ? <i>Is it an income?</i>
Int. payment					
Recreation					
Other expenses					Other income

Cash Flow

D	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
W							
1							
2							
3							
4							
5							

Templates

Blank templates of the various cards used in the workshop.



Certificate of Attendance



Hasiru Dala
INNOVATIONS

From a Person to a Professional

This is to certify that

has attended a **P2P** workshop
and received training on Work Safety,
Health, Financial Planning and Social Security.

Date

Venue

Workshop Moderator

S. Prabhakar

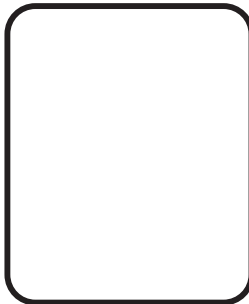
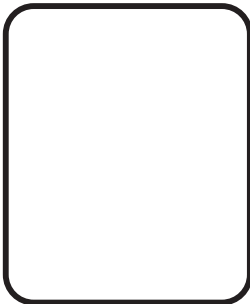
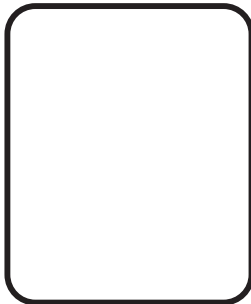
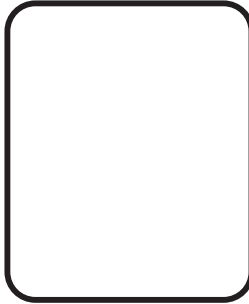
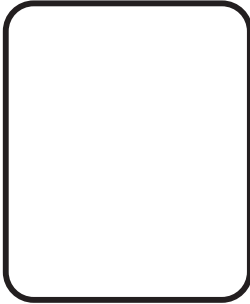
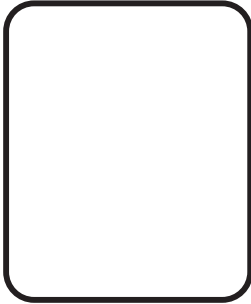
Shekar Prabhakar
Co-Founder and Director
Hasiru Dala Innovations



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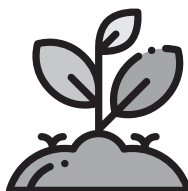
[illegible]

CHECKLIST P2P

A 10x10 grid of squares. The top row consists of 8 squares with thick black borders. The remaining 9 rows consist of 10 squares each with thin gray borders.

Appendix 5: Cards

THE PAWNBROKER: LOANS AND ESTIMATED COSTS



1. Buy a tempo or small lorry (₹300,000).
2. Build a new house (₹200,000).
3. Marriage in the family (₹100,000).
4. Son wants a motorcycle (₹80,000).
5. Buy seeds or fertilizer (₹50,000).
6. Repay debts (₹50,000)

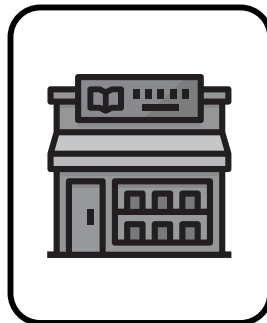
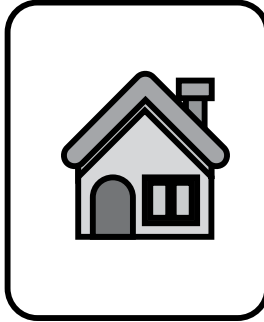
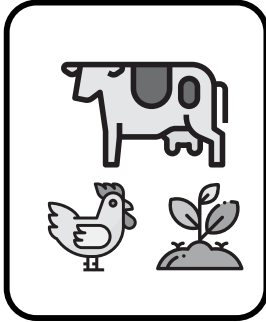
THE PAWNBROKER: EXPENDITURES



1. Burglars steal gas cylinder.
2. Illness in the family.
3. Chandu finds savings and buys liquor.

4. Kutty wants to visit the circus.
5. Repair fire damages.
6. Chandu wants a new shirt.

RANGASWAMY THE PROVIDER : GOALS



1. Buy farmland.
2. Buy or build a house.
3. Save for child's wedding.

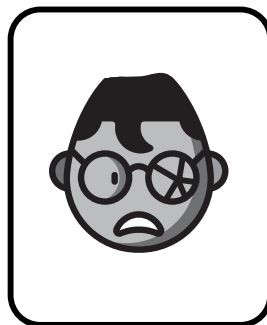
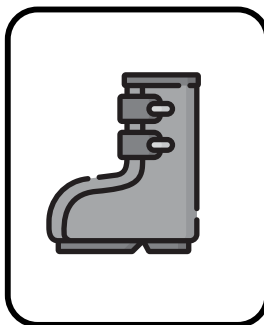
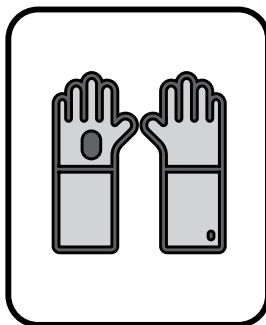
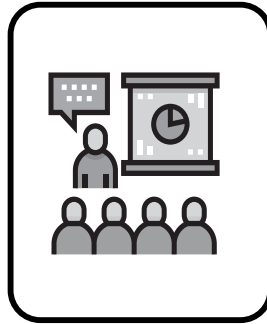
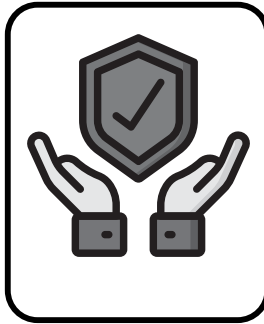
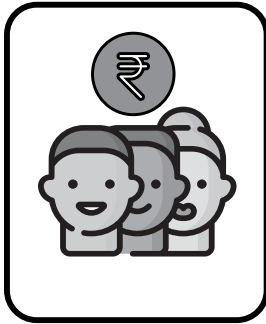
4. Save for child's education.
5. Go on a pilgrimage.
6. Buy a shop in the city.

EXPENDITURES



- | | | |
|------------------------------|---------------------|----------------------------|
| 2. Shahrukh wants Coca-Cola. | 6. Laxmi wants tea. | 9. Shahrukh wants a cycle. |
| 3. Gold Jewellery sale! | 7. Electric Bill | 10. Ice cream! |
| 4. Vacation to Taj Mahal. | 7. Water Bill. | 11. TV Bill. |
| 5. Kutty wants a dress. | 8. New TV | 12. Tandoori chicken! |

INVESTMENTS



1. Join SHG.
2. Buy Life Insurance.
3. Enrol for training programme.

4. Replace torn gloves.
5. Buy new work-boots.
6. Shahrulkh needs new glasses.



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1



2



3 A



3 B

Glove Kit

1. Type DW x4x4D or similar (4343, ANSI A4 shown) for mixed waste handling.
2. Type DW 3x3x (3141 shown) or Type GP waxed canvas for loading, sorting etc.
- 3a. Type DW 3121 or 4142 (3121 shown) PU coated for dexterous work.
- 3b. Type WW 3121 or 4122 (3121 shown) for wet-work, composting etc.



RECYCLING CODES

PLASTICS

N	ABBR.	CHEMICAL/COMMON NAME	COMMONLY SEEN IN
1	PET(E)	Polyethylene Terephthalate	Water/soft drink bottles, food containers, polyester cloth
2	HDPE	High-density Polyethylene	Milk containers, plastic bags, bottle caps
3	PVC, V	Polyvinyl Chloride	Chairs, bottles for chemicals, plumbing pipes
4	LDPE	Low-density Polyethylene	Shopping bags, buckets, squeeze bottles, plastic tubes
5	PP	Polypropylene	Bumpers, industrial fibers, microwave food containers
6	PS	Polystyrene	Disposable cups, thermocol/styrofoam packaging
7	O	Other plastics	Polycarbonate bottle caps, nylon, acrylic
9	ABS	Acrylonitrile Butadiene Styrene	Cell phones, calculators, most computer-case plastic

CELLS AND BATTERIES

8	LEAD	Lead Acid	Automobile and UPS/inverter batteries
9	ALKALINE	Alkaline	TV remotes, torches (usually AA, AAA size)
10	NiCD	Nickel Cadmium	Some cameras and RC toys
11	NIMH	Nickel metal-hydride	Rechargeable batteries (AA, AAA)
12	Li	Lithium	Mobile phones, coin-cells, cameras
13	so(Z)	Silver oxide	Coin cells in clocks and watches
14	CZ	Zinc Carbon	Regular (AA, AAA) and similar batteries

GLASS

70	GL	Clear Glass	Jars, transparent bottles
71	GL	Green Glass	Beer bottles
72	GL	Brown Glass	Beer bottles, medicine bottles, wine bottles
73	GL	Dark-sort Glass	Medicine bottles, wine bottles, other dark-brown bottles
74	GL	Light-sort Glass	Light-brown bottles
75	GL	Light leaded Glass	Televisions, some calculators
76	GL	Leaded Glass	Older televisions, ash trays, older beverage holders
77	GL	Copper-mixed/backed Glass	Electronics, LCD displays in clocks and watches
78	GL	Silver-mixed/backed Glass	Mirrors
79	GL	Gold-mixed/backed Glass	Computer glass, glazed crockery

PAPER

20	PAP	Corrugated cardboard
21	PAP	Cardboard, non-corrugated
22	PAP	Paper
23	PPB/PBD	Paperboard
24	PPB	Paperboard, white cardboard

ORGANICS/BIOMATTER

50	FOR	Wood
51	FOR	Cork
60	COT	Cotton
61	TEX	Jute
62-69	TEX	Other textiles

METALS

40	FE	Iron/steel
41	ALU	Aluminium

PAPER COMPOSITES

81	PAP/PET	Paper + Plastic
82		Paper + Fibreboard/Aluminium
83		Paper + Fibreboard/Tinplate
84	C/PAP	Paper + Cardboard/Plastic/Aluminium
87	CSL	Card Stock Laminate, Biodegradable plastic
90	C/LDPE	Plastics + Aluminium
91	C/LDPE	Plastics + Tinplate

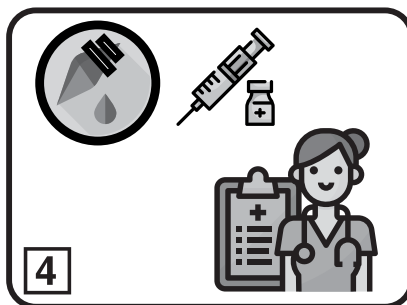
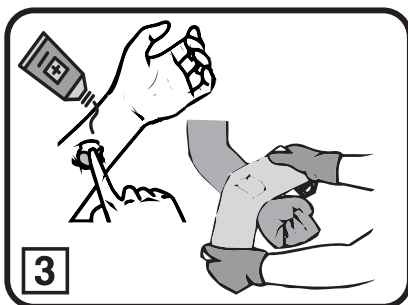
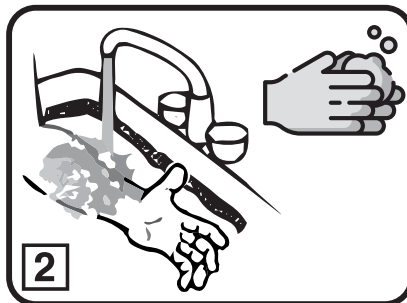
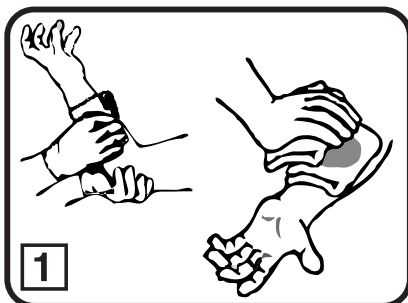


ABBR.



ABBR.

(ASTM, 2013 RIC only)



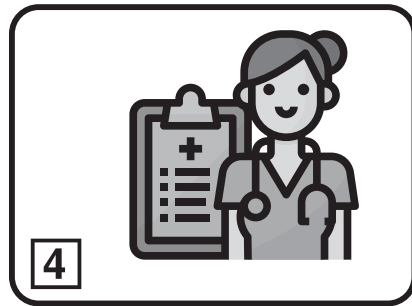
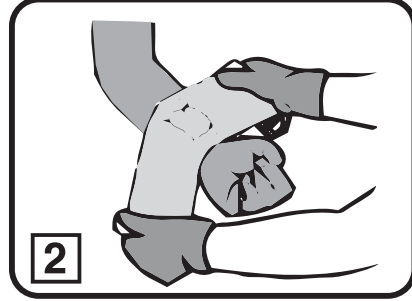
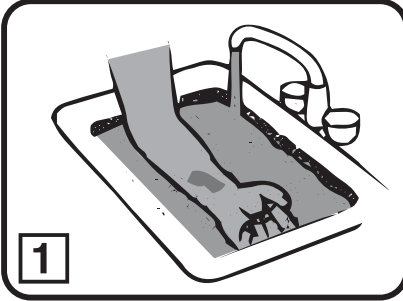
First aid for cuts

1. Stop the bleeding. Elevate the wound above the heart and apply gentle pressure with a sterile bandage. If it becomes soaked with blood, apply a second bandage over it. Do not remove the bandage to check if bleeding has stopped.
2. Wash the wound with clean water. Wash hands thoroughly before proceeding.
3. Apply a thin layer of antibiotic cream on the wound. Cover with a sterile bandage.
4. A large, ragged wound may need stitches and a tetanus injection: visit a doctor. A tetanus injection can be administered by a trained chemist.



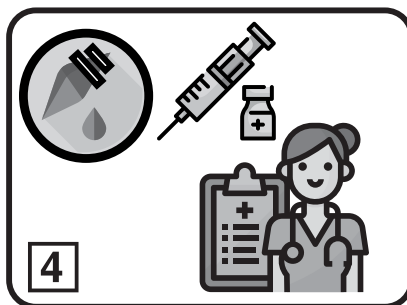
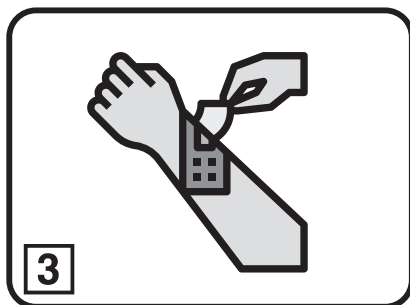
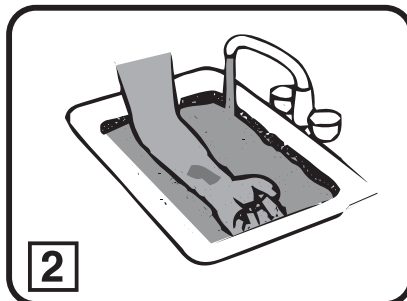
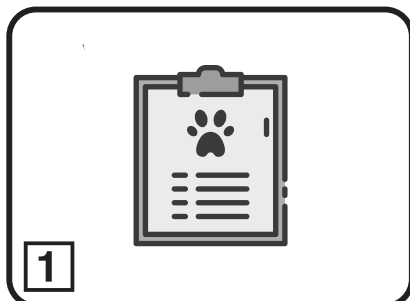
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First aid for burns

1. Hold under running water for 20 minutes.
2. Wrap with a loose, clean bandage with clean hands. Do not touch the burn with unwashed hands! Do not tie the bandage tight!
3. Take a tablet (500mg) of paracetamol for pain, speak to your doctor if you have never taken this medicine before.
4. Visit a doctor if you have **any** doubts about treatment, or if the burn is larger than 6cm (2 inches) on any side, or if the burn has been touched or dirty.



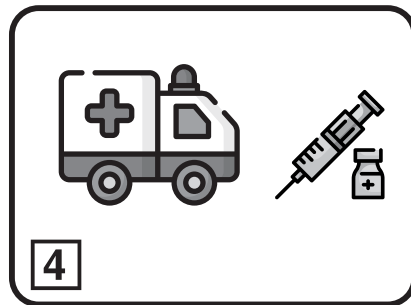
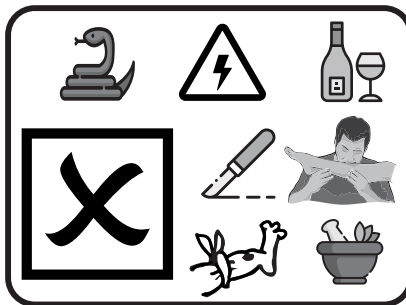
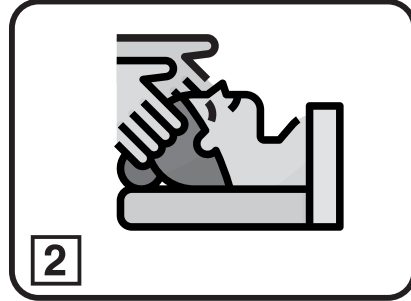
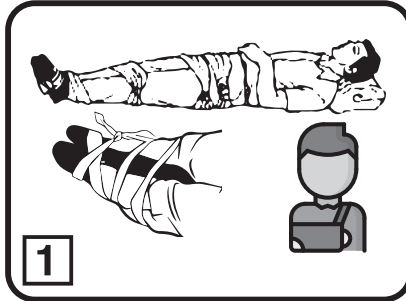
First aid for animal bites

1. If the animal is a pet, ask the owner if it has been vaccinated. If it has, continue to the next step; if it has not been vaccinated, or if the animal is a stray, visit a doctor.
2. Wash the site with clean water. Follow the protocol for wounds.
3. Bandage with sticky plaster or gauze.
4. A large, ragged wound may need stitches: visit a doctor. If the vaccination record of the animal is not known, inform the doctor who will decide whether you need a rabies injection.



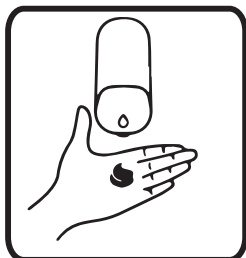
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First aid for snake-bite

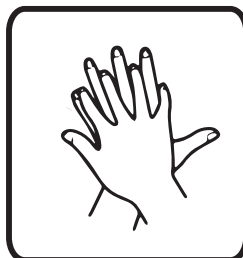
1. Make the victim lie down and immobilize the limb.
2. Reassure the victim to keep him or her calm. Most snakes are non-venomous.
3. **DO NOT** attempt to catch the snake. Do not give electric shock or liquor to the victim. Do not attempt to suck out venom. Do not apply a tourniquet or cut the wound. Do not consult a snake-charmer, or a practitioner of traditional medicine such as ayurveda or unani.
4. Rush the victim to the nearest hospital where anti-venom is stocked. Most government hospitals keep anti-venom. Give CPR if the victim stops breathing.



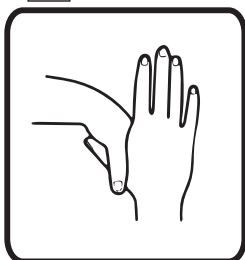
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2



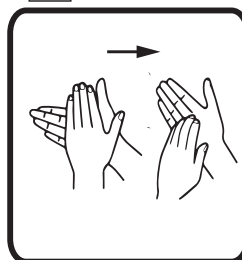
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4



5



6



7



8

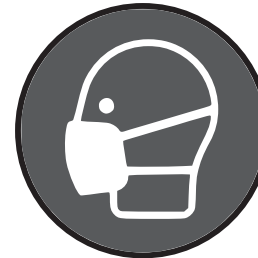
Wash your hands properly

- | | | |
|--------------------|-----------------------------------|---------|
| 1. Use liquid soap | 4. Between thumb and palm | 7. Wash |
| 2. Palm to palm | 5. Fingernail to palm | 8. Dry |
| 3. Between fingers | 6. Repeat 1-5 with the other hand | |



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ISO 7010 PPE Signs

- | | | |
|-----------------------|--------------------|---------------------------|
| 1. Hearing protection | 4. Safety Gloves | 7. Hi Visibility Clothing |
| 2. Eye Protection | 5. Face Protection | 8. Face Mask |
| 3. Safety Shoes | 6. Safety Helmet | 9. Protective Apron |

Appendix 6: Worksheets

Credits and Acknowledgements

§ LAXMI'S WORLD

CAST

Laxmi: as herself
Kutty: Jessie
Shahrukh: Raju
Chandu: Karthik Natarajan
Bahubali: Marwan Abubaker

VOICE ACTORS

Laxmi: Laxmi Menon
Narrators: Pinky Chandran, Nirmala Shekar
Mrs. Annoying Voice: Nalini Shekar
Newsreader: Lakshmi Karunakaran
Bahubali: Marwan Abubaker, R. Rangaswamy

LOCATION SHOOTING: Ginger's House, Bengaluru
RECORDED AT Radio Active Community Radio, Bengaluru

WRITTEN AND DIRECTED BY

A.K. Thavaraj

PRODUCED BY

Hasiru Dala Innovations
with support from Veolia (Module III),
and
Hasiru Dala,
with support from NSKFDC (Modules VI and VII).

§ FROM A PERSON TO A PROFESSIONAL

Dedicated to my mentor Gautam Bose.

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Acknowledgment is gratefully made to Dr. S. Abraham of St. Martha's Hospital, Bangalore and Dr. S. Kapahtia of ICMR, New Delhi (for their suggestions on Module IV), N. Shekar (for inputs to Modules I, II, and III), T. Premkumar (for inputs to GHS classification, Module III), S. Joshi and R. Rangaswamy (for inputs to Module VI).

Thanks are also due to all the volunteers who participated in the P2P workshop trials and to the numerous reviewers of the first edition. This edition would not have been possible without your suggestions.

§ GRAPHICS

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