ILO CONSTRUCTION OS&H

A free, comprehensive, international, digital training package in occupational safety and health for the construction industry

THEME SUMMARY 9:
PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT (PPE)

Photo: Richard Neale.
PPE provided by S&M, Cardiff, UK; www.sandmdecorating.co.uk

Summary of content	
1.	Preface
2.	The need for personal protective clothing and equipment (PPE)
3.	General review of personal protective clothing and equipment
4.	Clothing
5.	Harnesses and similar devices
6.	Lifting and handling devices
7.	Specific characteristics of individuals
8.	Summary photos of safe working
9.	Relevant elements of the Knowledge Base

1 PREFACE

This Theme Summary follows the relevant structure and content of the "ILO Code of Practice: Safety & health in construction" (the "Code"). The following passage is taken from this Code:

"1. General provisions

1.1. Objective

1.1.1. The objective of this code is to provide practical guidance on a legal, administrative, technical and educational framework for safety and health in construction with a view to:

> *(a) preventing accidents and diseases and harmful effects on the health of workers arising from employment in construction;*
>
> *(b) ensuring appropriate design and implementation of construction projects;*
>
> *(c) providing means of analysing from the point of view of safety, health and working conditions, construction processes, activities, technologies and operations, and of taking appropriate measures of planning, control and enforcement.*

1.1.2. This code also provides guidance in the implementation of the provisions of the Safety and Health in Construction Convention, 1988 (No. 167), and the Safety and Health in Construction Recommendation, 1988 (No. 175)."

Other passages from this Code are included in this Theme Summary, and they are shown in the same format as above.

This Theme Summary also includes extracts from the ILO's "Safety, health and welfare on construction sites: A training manual" (the "Manual"). Further details of this manual and the Code are given in Section 9 below: "Relevant elements of the Knowledge Base".

This Theme Summary follows the sections shown in the table above.

2 THE NEED FOR PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT (PPE)

General provisions of the Code

18.1.1. Where adequate protection against the risk of accident or injury to health, including exposure to adverse conditions, cannot be ensured by other means, suitable personal protective equipment and protective clothing, having regard to the type of work and risks, should be provided and maintained by the employer, without cost to the workers, as may be prescribed by national laws or regulations.

18.1.2. Personal protective equipment and protective clothing should comply with standards set by the competent authority, taking into account as far as possible ergonomic principles.

18.1.3. Employers should provide the workers with the appropriate means to enable them to use the individual protective equipment and should require and ensure its proper use.

18.1.4. A competent person having a full understanding of the nature of the hazard and the type, range and performance of the protection required should:

> *(a) select suitable items of personal protective equipment and protective clothing;*
>
> *(b) arrange that they are properly stored, maintained, cleaned and, if necessary for health reasons, disinfected or sterilised at suitable intervals.*

18.1.5. Workers should be required to make proper use of and to take good care of the personal protective equipment and protective clothing provided for their use.

18.1.6. Workers should be instructed in the use of personal protective equipment and protective clothing.

18.1.7. Workers working alone on construction sites in confined spaces, enclosed premises or in remote or inaccessible places should be provided with an appropriate alarm and the means of rapidly summoning assistance in an emergency.

Extracts from the Manual

Point to remember

It is safer and in most cases cheaper to eliminate hazards
than to provide personal protective equipment

"The working conditions in construction are in most cases such that, despite all preventive measures in project planning and work design, some personal protective equipment (PPE), such as a helmet, hearing and eye protection, boots and gloves, is needed to protect workers.

However, there are disadvantages in using PPE:

- *Wearing some forms of PPE may involve discomfort to the user and slow down their work*
- *Extra supervision is called for to see that PPE is worn*
- *PPE costs money*

Wherever possible, it is better to try to eliminate the hazard rather than providing PPE to guard against it.

However, some PPE such as safety helmets and footwear should be used on all construction sites. The need for other PPE will depend on the sort of work being done. Remember, too, that proper work clothes will provide protection for the skin."

The Construction OSH view of PPE

PPE has developed and improved remarkably during the past few decades. When first introduced, many items were uncomfortable to wear and got in the way of the work and their use was often resisted. Various factors have led to a general acceptance and use of PPE in many countries, including:

- Legislation which requires the use of appropriate PPE
- Trade Union pressure
- An acceptance of the need by employers
- Improved design of PPE

In many countries it is now quite rare not to see everyone on a construction project site wearing helmets, safety boots and a 'hi-viz' jacket. In addition, many employers insist that workers also wear proper overalls and other work gear, rather than their own clothes, and provide changing and secure locker rooms. This is to be commended.

3 GENERAL REVIEW OF PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT

General provisions of the Code

18.2.1. Where necessary, workers should be provided with and wear the following personal protective equipment and protective clothing:

(a) safety helmets or hard hats to protect the head from injury due to falling or flying objects, or due to striking against objects or structures;

(b) clear or coloured goggles, a screen, a face shield or other suitable device when likely to be exposed to eye or face injury from airborne dust or flying particles, dangerous substances, harmful heat, light or other radiation, and in particular during welding, flame cutting, rock drilling, concrete mixing or other hazardous work;

(c) protective gloves or gauntlets, appropriate barrier creams and suitable protective clothing to protect hands or the whole body as required when exposed to heat radiation or while handling hot, hazardous or other substances which might cause injury to the skin;

(d) footwear of an appropriate type when employed at places where there is the likelihood of exposure to adverse conditions or of injury from falling or crushing objects, hot or hazardous substances, sharp-edged tools or nails and slippery or ice covered surfaces;

(e) respiratory protective equipment, suitable for the particular environment, when workers cannot be protected against airborne dust, fumes, vapours or gases by ventilation or other means;

(f) a suitable air line or self-contained breathing apparatus when employed in places likely to have an oxygen deficiency;

(g) respirators, overalls, head coverings, gloves, tight-fitting boiler suits, impermeable footwear and aprons appropriate to the risks of radioactive contamination in areas where unsealed radioactive sources are prepared or used;

(h) waterproof clothing and head coverings when working in adverse weather conditions;

(i) safety harnesses with independently secured lifelines where protection against falls cannot be provided by other appropriate means;

(j) life vests and life preservers where there is a danger of falling into water;

(k) distinguishing clothing or reflective devices or otherwise conspicuously visible material when there is regular exposure to danger from moving vehicles.

4 CLOTHING

Safety helmets

From the Manual

"Falling objects, overhead loads and sharp projections are to be found everywhere on construction sites. A small tool or bolt falling from 10 or 20m high can cause serious injuries or even death if it strikes an unprotected head. Head injuries often occur when moving and working in a bent position, or when arising from such a position."

"Safety helmets protect the head effectively against most of these hazards, and you should wear a helmet whenever you are on site and particularly when you are in an area where overhead work is going on. These areas, known as "hard-hat areas", should be clearly marked with safety signs at entrances and other suitable places. The same rule applies to managers, supervisors and visitors. Only safety helmets which have been tested to national or international standards should be used. A chin-strap on the helmet prevents it from failing off and should be used when appropriate."

"Hard-hat" areas – all or most parts of construction sites should be marked by signs as "hard-hat" areas

Point to remember

Your safety helmet protects you only if you have it on

(Photo: Fiona Murie, BWI)

The Construction OSH view of helmets

Safety helmets are easy to obtain and relatively cheap. The example below is a typical design.

Photo: Richard Neale.
PPE provided by S&M, Cardiff, UK; www.sandmdecorating.co.uk

It has reinforced ribs on top for impact strength, a rain gutter round the side and rear to guide water away, and can be fitted with a chin-strap. This helmet also has a built-in safety visor, which can be easily pushed up out of the way if required. The whole helmet is light and quite comfortable.

There are many different designs available, made for specific purposes. For example, many trades - such as scaffolders - find that helmets with a very short peak are easier to wear because they do not get in the way. Some helmets contain Kevlar fibres giving them great resilience and resistance to impact.

Eye and face protection

From the Manual

"In industry many eye injuries occur as a result of flying material, dust or radiation when the following jobs are being carried out:

- *Breaking, cutting, drilling, dressing or laying of stone, concrete and brickwork with hand or power tools;*
- *Chipping and dressing painted or corroded surfaces;*
- *Cutting off or cutting out cold rivets and bolts;*
- *Dry grinding of surfaces with power grinders;*
- *Welding and cutting of metals.*

In some industrial processes there may also be a risk from the spillage, leakage or splashing of hot or corrosive liquids.

Some of these hazards can be removed permanently by proper machine guarding, exhaust ventilation or work design. For many hazards, for example, stone cutting or dressing, personal eye protection (goggles, safety glasses or shields) is the only practical solution. Sometimes workers are aware of the danger they run and the consequences if their eyes are damaged, but do not wear eye protection. This is because the type chosen interferes with vision or is uncomfortable to wear, or is not immediately at hand when needed."

Eye protection must be suitable, comfortable and available to encourage workers to wear it

Point to remember

Ninety per cent of all eye injuries can be prevented
by suitable eye protection

From the United States Department of Labour
Occupational Safety and Health Administration
(http://www.osha.gov/SLTC/etools/eyeandface/ppe/selection.html)

"Personal protective equipment (PPE) for the eyes and face is designed to prevent or lessen the severity of injuries to workers. The employer must assess the workplace and determine if hazards that necessitate the use of eye and face protection are present or are likely to be present before assigning PPE to workers.

A hazard assessment should determine the risk of exposure to eye and face hazards, including those which may be encountered in an emergency. Employers should be aware of the possibility of multiple and simultaneous hazard exposures and be prepared to protect against the highest level of each hazard."

An example of an assessment

Hazard Assessment		
Hazard type	**Examples of Hazard**	**Common Related Tasks**
Impact	Flying objects such as large chips, fragments, particles, sand, and dirt.	Chipping, grinding, machining, masonry work, wood working, sawing, drilling, chiseling, powered fastening, riveting, and sanding.
Heat	Anything emitting extreme heat.	Furnace operations, pouring, casting, hot dipping, and welding.
Chemicals	Splash, fumes, vapors, and irritating mists.	Acid and chemical handling, degreasing, plating.
Dust	Harmful Dust.	Woodworking, buffing, and general dusty conditions.
Optical Radiation	Radiant energy, glare, and intense light	Welding, torch-cutting, brazing, soldering, and laser work.

(The ILO is grateful to OSHA for the use of this quotation. It is 193 words long, so has been used under the convention of 'Fair Use' which allows a maximum of 400 words to be used without seeking formal permission.)

The following is a useful classification of eye and face protection equipment taken for the web site: http://www.ataltus.com/ppe/ppe-eyes-and-face.asp.

"Safety spectacles – can protect eyes from low energy impacts and depending on the lens characteristics glare, UV and IR radiation. The lenses are usually made of toughened glass or polycarbonate. They are available in a range of styles and most frames have possibilities for adjustment, so that they can be matched to the wearer. Most manufacturers can supply safety spectacles with prescription lenses, and some designs can be worn over prescription spectacles."

The spectacles below are light, adjustable and comfortable to wear.

Photo: Richard Neale.
PPE provided by S&M, Cardiff, UK; www.sandmdecorating.co.uk

"Goggles – can protect eyes against medium impacts and depending on design and marking against droplets and coarse dust, as they form a seal around the entire periphery of the face. The lenses are usually made of anti-fog coated polycarbonate or toughened glass."

Photo: Richard Neale

"Face shields – Depending on design and markings they can protect eyes and face against medium or even high-energy impacts, liquid splash and hazards like molten metal splash or electric arcs etc. They usually have an adjustable headband or harness fitted with either a one-piece ear shield protecting the entire face, a metal mesh screen or an opaque shield into which lenses are fitted. There is a number of designs that integrate head, eye and respiratory protection in one unit.

The Construction OSH view of eye and face protection

Eyesight is an absolutely prime human sensory ability. Loss of sight can destroy the quality of a person's life, so all measures must be taken to protect it. As the examples above and below show, there is a range of reasonably priced items available and modern materials and design make them comfortable to wear, so there can be no reason for employers not to provide them and for employees to wear them.

Photo: Richard Neale.
PPE provided by S&M, Cardiff, UK; www.sandmdecorating.co.uk

Protection for the eyes but not the ears
(Photo: Fiona Murie, BWI)

Protection against noise

From the Manual

If you are working at or near a noisy machine:

- *Ask if noise levels have been measured, and what those measurements are;*
- *Remember that noise which is continuous at a level of 85-90 decibels (dB(A)) or more is injurious to hearing;*
- *Ask for appropriate earmuffs or ear plugs if you work with or near a noisy machine and make sure they fit properly and are comfortable;*
- *Wear them all the time you are in a noisy part of the site;*
- *Keep your hearing protection clean and in a safe place when you are not using it;*
- *Insert ear plugs with clean hands;*
- *Look out for damage: if the earmuffs no longer fit properly or the seals have become hard or damaged, ask for a replacement.*

It is not true that ear protectors make it more difficult to understand speech or hear warning signals, as they reduce both unwanted noise and alarm signals equally; the signal can actually be heard more easily.

Point to remember

If you have to shout to make yourself heard by someone about 1m away there is a noise problem requiring action"

The Construction OSH view of protection against noise

Hearing is another vital human sense, so all efforts must be made to prevent noise form damaging the hearing of all those who are involved in a construction project. Furthermore, since many warnings from moving machinery are audible as well as visual, good hearing is necessary for people to heed the warning. Nevertheless, excessive noise from other machinery will drown out these warnings even for those with good hearing. So, both the level of noise and the effect on people within earshot must be considered.

Photo by Richard Neale

The photograph above shows good eye, ear and respiratory protection, but also illustrates the difficulty of wearing a safety helmet at the same time. Fortunately, some safety helmets have ear and eye protection built in, or are provided with additional fittings to allow them to be added, so providing the wearer with comprehensive protection in one item of PPE.

A good example of "all-in" design is shown below. This is a very strong helmet, the Kevlar fibes giving it great resilience and resistance to impact. The addition of the ear and eye protection provides the wearer with comprehensive protection for one item of PPE.

(Source: http://wesspur.com/safety/helmets.html. The ILO is grateful for permission to use these images and text)

Pacific Kevlar Helmet with Brim
Pacific kevlar helmets are made from hard resin with injected Kevlar fibers. 6 point webbing suspension and a ratchet adjustment at the back give it a customizable fit. This helmet is the most durable and long lasting helmet we have found. Available with attached face shield and/or ear muffs. Weighs approximately 1.2 lb.

Face Shield/ Ear Muff Kit
This kit offers ear and eye protection that snaps into standard hard hat and helmet attachment slots. Works with Vertex and Pacific helmets, and aluminum and plastic hard hats. Includes ear muffs, wire mesh visor, and visor sealer to keep out dust and rain.

Hand protection

From the Manual

"Hands are extremely vulnerable to accidental injury, and in construction more injuries are caused to hands and wrists than to any other part of the body. Open wounds, abrasions, fractures, dislocations, strains, amputations and burns occur. They are largely preventable by better manual handling techniques and equipment, and by wearing suitable hand protection such as protective gloves and gauntlets.

Among the common hazardous tasks where hand protection should be provided are:

- *Operations involving contact with rough, sharp or jagged surfaces;*
- *Contact with or splashes from hot, corrosive or toxic substances such as bitumen and resins;*
- *Working with vibratory machines such as pneumatic drills where some cushioning of the vibrations is desirable;*
- *Electrical work in humid and cold weather.*

Skin trouble is common in the construction industry. Contact dermatitis is the commonest type of skin disease. It feels itchy and looks red, scaly and cracked, and can become so bad that it affects your ability to continue working. Wet cement is one of the main skin hazards, but other substances include tar and pitch, which can cause skin cancer after prolonged exposure, paint thinners, acids for masonry cleaning and epoxy resins. In addition to gloves, use barrier creams and wear long-sleeved shirts, full-length trousers and rubber boots."

The Construction OSH view of hand protection

Gloves are one of the cheapest and most obvious items of PPE yet they can serve an important function in OS&H. Nevertheless, many workers are not supplied with gloves so they have to work with their bare hands.

The photograph below shows a worker making concrete blocks in a simple manual process. He is in close and continual contact with concrete and cement, a highly corrosive material to human skin. He should be wearing waterproof gloves. In addition, although his face has been obscured so that he cannot be recognised, he was not wearing safety glasses, which would have protected his eyes from the cement.

(Photo: Richard Neale. "Professional development for the field staff of UNRWA". International Labour Office, Geneva, 1993. ISBN 92-2-108972-X.)

Some examples of protective gloves are shown below:

1 Lightweight fabric gloves with hard-wearing plastic palms. They can be used even for work that requires dexterity, such as bricklaying.

Photo: Richard Neale.
PPE provided by S&M, Cardiff, UK; www.sandmdecorating.co.uk

2 Heavier fabric gloves with plastic palms for more rugged use.

Photo: Richard Neale.
PPE provided by S&M, Cardiff, UK; www.sandmdecorating.co.uk

3 Fully coated, waterproof gloves for rugged use in wet conditions or with materials such as concrete.

Photo: Richard Neale.
PPE provided by S&M, Cardiff, UK; www.sandmdecorating.co.uk

4 Heavy duty leather gloves for steel fixing and similar work

(Photo: Fiona Murie, BWI)

Further examples can be seen on the web site of “Protec”:
http://www.protecdirect.co.uk/Hand-Protection/Builders-Grip-Gloves.htm

Footwear

From the Manual

“Foot injuries fall into two broad types: those due to penetration of the sole by nails which have not been knocked down or removed, and those due to crushing by falling materials, which can be minimized by wearing protective footwear. The type of safety shoes or boots to be used will depend on the nature of the work (e.g. the presence of ground water on construction sites), but all safety footwear should have an impenetrable sole and uppers with a steel toe-cap.

There are many types of safety footwear now available such as:

- *lightweight, low-cut leather safety shoes for climbing jobs;*
- *normal safety shoes or boots for heavy-duty work;*
- *rubber or plastic safety wellingtons or gumboots which provide protection against corrosive substances, chemicals and water.”*

The Construction OSH view of footwear

(Photo: Richard Neale. "Professional development for the field staff of UNRWA". International Labour Office, Geneva, 1993. ISBN 92-2-108972-X.)

The photo above shows how necessary it is to wear protective footwear even for simple tasks. The column cramps are quite heavy and could cause broken bones in the feet if dropped on them.

(Photo: Fiona Murie, BWI)

A lovely photograph of a hod carrier but she is wearing footwear that is totally unsuitable for working on a construction site. But can she get safety footwear in her size? And if she could, would she be happy to wear footwear that has essentially been designed for men?

The photograph below shows three examples of safety boots. There are two main requirements of a safety boot: resistant to crushing and penetration through the sole. They may also be resistant to heat and/or chemicals. Boots should have labels to identify their specification.

Photo: Richard Neale.
PPE provided by S&M, Cardiff, UK; www.sandmdecorating.co.uk

Waterproof and conspicuously visible clothing ('hi-viz')

Clause 18.2.1 of the ILO Code requires:

> *(h) waterproof clothing and head coverings when working in adverse weather conditions;*
>
> *and*
>
> *(k) distinguishing clothing or reflective devices or otherwise conspicuously visible material when there is regular exposure to danger from moving vehicles*

Provision of waterproof clothing makes economic sense to the employer because it allows work to continue in wet conditions (assuming of course that workers are not forced to work in these conditions without protective clothing). Modern fabrics 'breathe' so allowing moisture to escape and avoid condensation. Modern fabrics are also light and strong, so they are much easier to work in than those available a couple of decades ago.

Modern waterproof clothing is also usually high visibility ('hi-viz). An example is shown below. This is a very comfortable, warm and weatherproof jacket. It is in hi-viz yellow with additional hi-viz reflective bands. It is also relatively cheap.

Photo: Richard Neale.
PPE provided by S&M, Cardiff, UK; www.sandmdecorating.co.uk

The example below shows a lightweight hi-viz waistcoat for use in warm weather.

Photo: Richard Neale.
PPE provided by S&M, Cardiff, UK; www.sandmdecorating.co.uk

Happy to be visible!
(Photo: Fiona Murie, BWI)

Respiratory equipment

From the Manual

"On construction sites there are often tasks where harmful dust, mist or gas may be present, such as:

- *rock crushing and handling;*
- *sandblasting;*
- *dismantling buildings containing asbestos insulation;*
- *welding or cutting materials with coatings containing zinc, lead, nickel or cadmium;*
- *paint spraying;*
- *blasting*

Whenever there is doubt about the presence of toxic substances in the atmosphere, a respirator must be worn. The correct type of respirator will depend upon the hazard and the work conditions, and you need to be trained in its use, cleaning and maintenance. Advice on suitable types of respirator and filter should be sought from appropriate safety and health authorities.

The simplest masks are disposable paper types. Remember that these are only effective against nuisance dusts.

There are three types of half-face masks with filters:

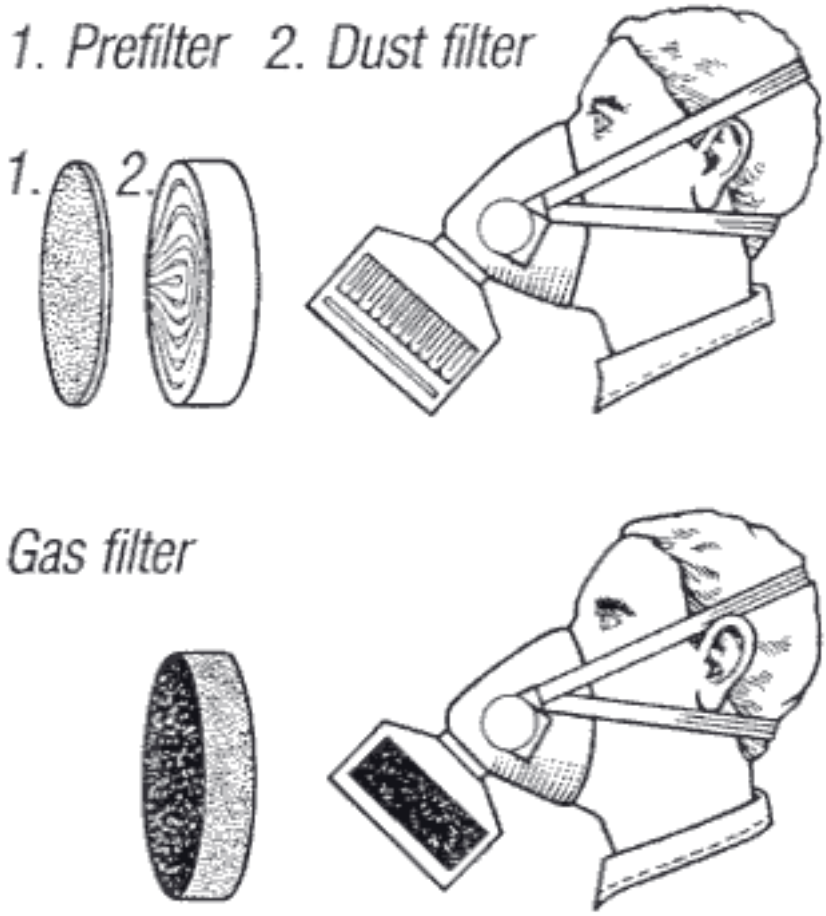
- *for protection against airborne particles, e.g. stone dust, with a coarse filter fitted in the cartridge (note, these filters have a specific lifetime and should be changed as necessary);*

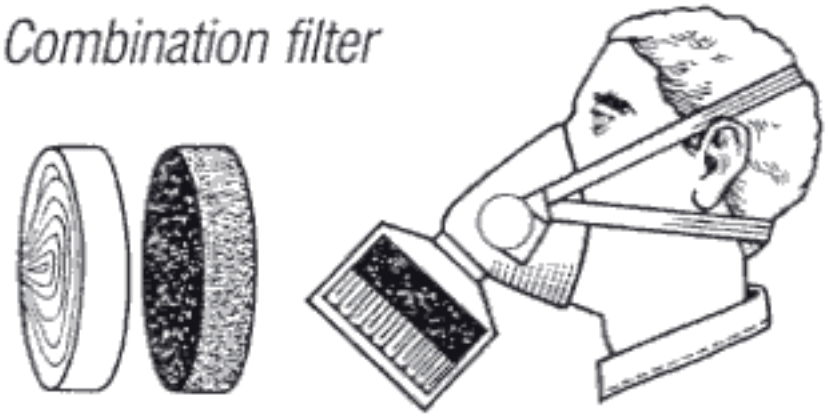
- *for protection against gases and fumes, e.g. when using paints containing solvents, with a filter containing activated carbon;*

- *a combination filter containing both a dust and a gas filter. Cartridges must be replaced regularly.*

A full-face mask can be fitted with the same types of filter, and it also protects the eyes and face."

Three types of half-face mask with filters





Eye and respiratory protection, but no hearing or hand protection
(Photo: Fiona Murie, BWI)

5 HARNESSES AND SIMILAR DEVICES

From the Manual

"The majority of fatal accidents in construction are due to falls from heights. Where work cannot be done from a scaffold or ladder, or from a mobile access platform, the wearing of a safety harness may be the only way to prevent serious injury or death.

Another common situation in which a safety harness may be used – sometimes supplemented by the use of a safety net – is maintenance work on steel structures such as bridges and pylons.

There are many types of safety belt and safety harness available. The manufacturer or supplier should be asked for advice on suitable types for the intended purpose and for instructions on use and maintenance. A full safety harness should always be used in preference to a safety belt.

A safety harness and its lanyard must:

- *limit your fall to a drop of not more than 2m by means of an inertia device;*
- *be strong enough to support your weight;*
- *be attached to a strong structure through a firm anchorage point above the place at which you are working."*

Point to remember

Make a habit of using the safety harness provided"

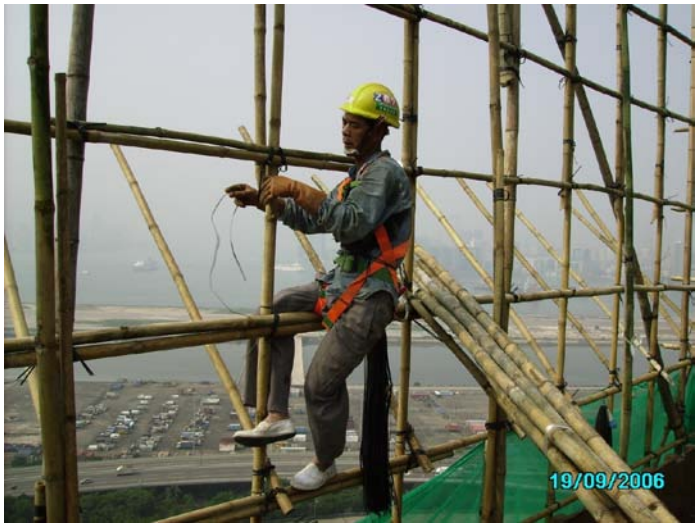
From the Code

18.2.1. Where necessary, workers should be provided with and wear the following personal protective equipment and protective clothing:

> *(i) safety harnesses with independently secured lifelines where protection against falls cannot be provided by other appropriate means;*

The Construction OSH view of safety harnesses

An example of the use of a harness is shown below, although this remains a highly dangerous operation. Note also: helmet with chin-strap and gloves.



"Hong Kong's bamboo scaffolders continue to work at ever-increasing heights – but they now have to follow government safety codes and design guidelines"
[From the paper "Hong Kong-bastion of bamboo scaffolding", by M Ramanathan, Proceedings of ICE-Civil Engineering, Volume: 161, Issue: 4, November 2008.
Photograph by the author of the paper, Muthukaruppan Ramanathan}

A huge range of safety harnesses (sometimes called 'fall arresters') is available and expert advice is required to select the most suitable. A typical example is shown in the photographs below.

(Photo: Fiona Murie, BWI)

(Photo: Fiona Murie, BWI)

6 LIFTING AND HANDLING DEVICES

From the Manual

"Almost one-quarter of work injuries occur during manual handling, most of which are strains to the hands, legs, feet and back. Much construction work involves heavy manual labour and workers not in good physical condition tire easily and are more susceptible to injury."

The Manual provides very good detailed advice on lifting and carrying.

Point to remember

Correct lifting and carrying calls for training and practice

There is also a good example of a lifting and carrying device in Theme Summary 8: "Welfare and project site".

7 SPECIFIC CHARACTERISTICS OF INDIVIDUALS

One of the most significant impediments to the widespread use of PPE is that it is not generally available in a sufficiently large range of sizes and is not generally adapted to fit women's bodies. Most of it seems to have been designed for quite sturdy males, whereas in many countries of the world males can be quite lightly built. Women have special difficulties, as is shown in the following passage from a study by OSHA (osha.gov) in the USA: Women in the Construction Workplace: Providing Equitable Safety and Health Protection.

Many women in non-traditional jobs, such as the construction trades, complain of ill-fitting personal protective clothing (PPC) and equipment (PPE). Clothing or equipment that is not sized, or does not fit properly can compromise personal safety. It may also not function effectively in the manner for which it was designed.

Poor fit compromises the protection offered by the garment or equipment. The lack of appropriate PPC and PPE can cause serious safety and health risks for women, and men of smaller sizes, who rely on protective clothing and equipment to help them keep safe. Having inadequate or ill-fitting clothing, boots, gloves, or safety equipment presents a safety hazard for any worker.

Studies by NIOSH and the U.S. Department of the Army found that most tools, equipment, and clothing are not designed for a women's physique. When asked if they could easily find protective clothing to fit, 46% of women in the second NIOSH study said "no" with respect to work shoes and 41% with respect to finding work gloves. One survey of manufacturers of protective equipment, taken at a National Safety Council Annual meeting, found that only 14% offered ear, head, and face protection in women's sizes. The highest percentage, 59%, was manufacturers who offered foot protection in women's sizes.

Ill-fitting personal protective equipment may be due to unavailability (i.e., manufacturers don't make or distributors don't stock), limited availability, or lack of knowledge among employers and workers about where equipment designed for a woman's body structure can be obtained. Personal protective equipment intended for use by women workers should be based upon female anthropometric (body measurement) data.

A recent NIOSH review found that few tools, equipment, or clothing are designed for a woman's physique. A recent study commissioned for the U.S. Army had similar findings.

"Most of the personal protective equipment and tools used worldwide are designed based on male populations from Germany and the United States. Significant variability exists among these two working populations and those from other countries; this means that many workers cannot perform their duties adequately. Women workers and those workers who are not in the upper levels of height and weight, as for example Asian workers, are therefore not properly equipped for their protection."

Source: Information Note on Women Workers and Gender Issues on Occupational Safety and Health (http://www.ilo.org/public/english/protection/safework/gender/womenwk.htm#intro)

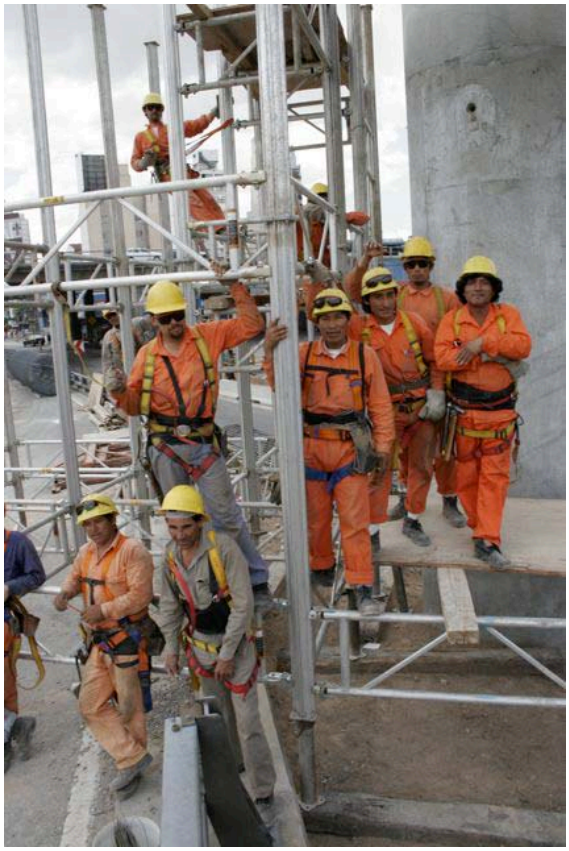
(The ILO is grateful to OSHA for the use of this quotation. It is 369 words long, so has been used under the convention of 'Fair Use' which allows a maximum of 400 words to be used without seeking formal permission.)

This quotation illustrates that a major problem with currently available PPE is that most of it seems to have been designed for quite strongly built males. Smaller people are not well provided for; to give an example, safety boots size Eu 36 are difficult to obtain, and available safety clothing and especially safety harnesses are often unsuitable for women's physique.

8 SUMMARY PHOTOS OF SAFE WORKING

The picture below shows a worker properly provided with PPE: helmet, boots, gloves and hi-viz waterproof clothes, using handling equipment to move a heavy concrete paving slab. The public and workforce are separated by a substantial fence.

Worker paving a street in Cardiff UK
(Photo: Richard Neale. Skanska is the contractor)



A group of well-equipped workers
(Photo: Fiona Murie, BWI)

Must wear PPE!
(Photo: Fiona Murie, BWI)

8 RELEVANT ELEMENTS OF THE KNOWLEDGE BASE

Title	ILO Code of Practice: Safety & health in construction
Type of source	Code of practice, 174 pages
Publication or other source details	ILO Publications http://www.ilo.org/global/Publications
Date & ISBN/ISSN	1992. 92-2-107104-9
Summary of contents	*"It goes a long way in mapping out the agenda for health and safety professionals in this most dangerous and populous industry."* Content: 1. General provisions 2. General duties 3. Safety of workplaces 4. Scaffolds and ladders 5. Lifting appliances and gear 6. Transport, earth-moving and materials-handling equipment 7. Plant, machinery, equipment and hand tools 8. Work at heights including roof work 9. Excavations, shafts, earthworks, underground works and tunnels 10. Cofferdams and caissons and work in compressed air 11. Structural frames, formwork and concrete work 12. Pile-driving 13. Work over water 14. Demolition 15. Electricity 16. Explosives 17. Health hazards, first aid and occupational health services 18. Personal protective equipment and protective clothing 19. Welfare
Comments on relevance	This Code of Practice is fundamental to this training package. It has influenced the structure and informed the content.
Other information	Downloaded as “ILO Code of Practice”

Title	ILO Safety, health and welfare on construction sites A training manual
Author(s)	ILO
Type of source	Training manual, 134 pages
Publication or other source details	ILO Geneva, International Labour Office Can be downloaded from: http://www.ilo.org/public/english/protection/safework/training/english/download/architecture.pdf
Date & ISBN/ISSN	1995. ISBN 92-2-109182-1
Summary of contents	Preface 1. Introduction 2. Safety organization and management 3. Site planning and layout 4. Excavations 5. Scaffolding 6. Ladders 7. Hazardous processes 8. Vehicles 9. Movement of materials 10. Working positions, tools and equipment 11. The working environment 12. Personal protective equipment (PPE) 13. Welfare facilities Annexes 1. Safety, health and welfare on construction sites: Check-list 2. The Safety and Health in Construction Convention, 1988 (No. 167), and Recommendation, 1988 (No175)
Comments on relevance	This is a comprehensive manual, which follows the contents of ILO C167 very closely. Extracts have been used in Construct OS&H, especially in the technical sections.
Other information	It has been Downloaded as ILO Safety, health and welfare on construction sites: A training manual