



Physical Hazards Indoor Workplace Lighting

OSH Brief No. 3c

Why is lighting in the workplace important?

From the workers' perspective, poor lighting at work can lead to eye-strain, fatigue, headaches, stress and accidents. On the other hand, too much light can also cause safety and health problems such as "glare" headaches and stress. Both can lead to mistakes at work, poor quality and low productivity. Various studies suggest that good lighting at the workplace pays dividends in terms of improved productivity, and a reduction in errors. For example, in the ILO Manual, *Improving Working Conditions and Productivity in the Garment Industry*, it indicates that improved lighting in some factories resulted in a 10% increase in productivity and a 30% reduction in errors.

Improvements in lighting do not necessarily mean that you need more lights and therefore use more electricity – it is often a case of:

- making better use of existing lights;
- making sure that all lights are clean and in good condition (see below);
- ensuring that lights are positioned correctly for each task; and
- making the best use of natural light.

Most factories have a combination of natural and artificial lighting. However, it appears that little attention is paid to the type of work – it is as though all work in the factory requires the same degree of lighting.

Figure 1: Here is a strip light covered in cobwebs and never cleaned. It is a waste of electricity costs and provides poor lighting for the workers.



Improving lighting levels in the factory

Although there is often a need for shading windows to reduce heat inside a factory, there is also a need to make sure that all windows, skylights, etc., are clean and in the best position to allow the maximum amount of natural light into the workplace. *Companies can always use appropriate shading methods for reducing the temperature – they should not rely on the windows being dirty.*

Skylights and windows located higher up the factory walls let in a lot more light than lower windows which often get blocked with stock, raw materials, etc.

Figure 2: Use as much natural light as possible. Make sure that all windows, skylights etc., are clean

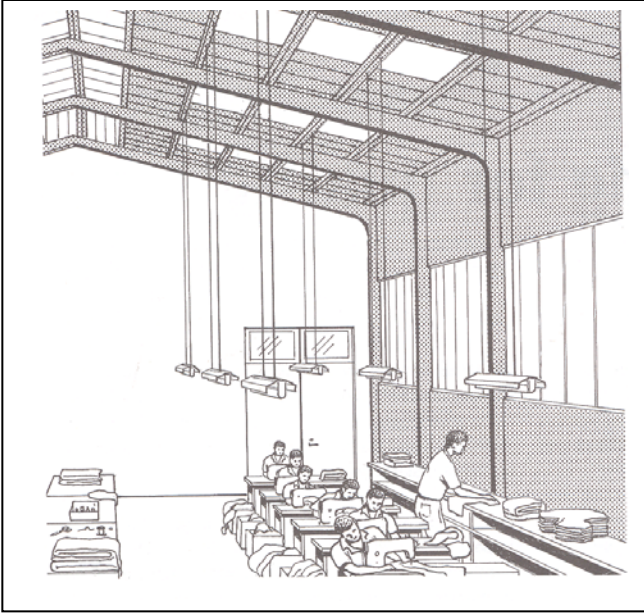
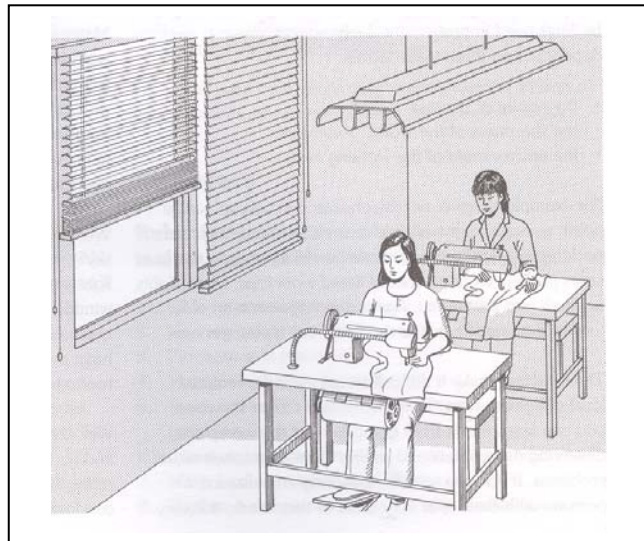


Figure 3: Clean windows will allow more natural lighting into the workplace. Blinds can be used to cut down direct sunlight and glare



Some companies introduce so-called “energy saving” programmes to reduce costs. In the case of lighting, “non essential” light bulbs may be removed or reduced in number, flickering fluorescent tubes which may need changing, may be left in place – this proves to be a false economy as quality and productivity fall.

One simple way to improve the lighting levels in the factory is to paint the walls and ceilings with light, pale, matt colours. The use of matt paint avoids reflection of light which can lead to problems of glare. The colour of equipment such as sewing machines,

workbenches, etc., should normally be matched with that of the walls and black, shiny paints should be avoided. Brightening up the workplace helps to produce a more pleasant place to work which can impact on the workers’ well-being and, ultimately, productivity.

Finding the best place for the light source

It may sound like common sense, but it is essential for the light to focus on the work at hand and not directly, or indirectly in the workers’ eyes. The more detailed the task, the more light that is needed for the workers to carry out the job efficiently.

Figure 4: For close-up work it is essential to have local lighting where the light shines directly on the task and not into the workers’ eyes.



It is also essential that lights are positioned in the correct place so that workers do not have to adopt poor working postures to see the task at hand. It is also important to have adequate lighting near any potential hazards such as steps, ramps, etc., and outside the factory for security at night.

Avoiding glare

Although lighting levels may be adequate in the factory as a whole, glare from a direct light source or reflected off equipment or shiny surfaces can cause discomfort, eye strain and fatigue, all of which contribute to an increase in errors, and a reduction in quality and productivity. Glare has been described as “light in the wrong place” and comes in three different kinds:

- **Disability glare** can dazzle and impede vision,

and therefore may be a cause of accidents. It is the result of too much light entering the eye directly.

- **Discomfort glare** is more common in work situations. It can cause discomfort, strain and fatigue, especially over long periods. It is caused by direct vision of a bright light source and background.
- **Reflected glare** is bright light reflected by shiny surfaces into the field of vision.

Figure 5: Avoid direct light into the eyes – use a shade.

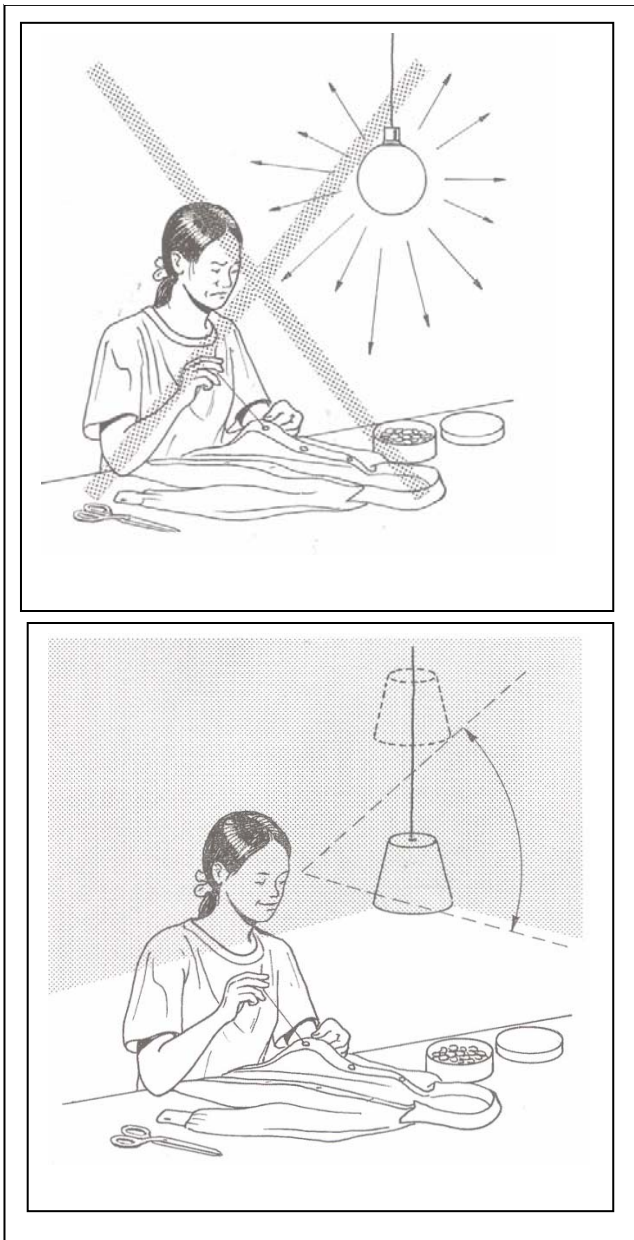


Figure 6: The correct positioning of lights avoids **discomfort glare** but care should be taken to avoid shadows on the working area. Look at the worker on the right – the light is almost behind her head so that she is working in her own shadow.



Figure 7: Avoid polished surfaces – use matt finishes or move the work position by 90 degrees to the right or left to stop **reflected glare**.



Simple rules to avoid or reduce glare in the workplace

To reduce glare from windows

- use blinds, curtains, louvers, or shades;
- replace clear glass with opaque/translucent materials; paint glass with whitewash; and
- change the layout of workstations.

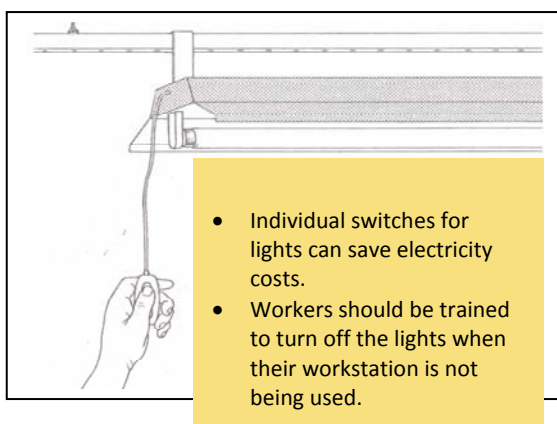
To reduce glare from lamps

- ensure that no naked lights are in direct view of workers;
- raise the light fittings (if suspended) providing this does not reduce the overall level of lighting; and
- use shades or shields but ensure that the work area is well lit.

To reduce reflected glare

- change position of the light source and reduce its brightness;
- cover reflecting surfaces with opaque, non-glossy materials; and
- change the layout of the workstations.

Figure 8: Saving electricity costs



How is light measured?

The level of light is measured in **LUX** using a light meter. The table below gives an indication of some typical light levels.

Table 1: Typical light levels measured in LUX

Illuminance	Example
1 lux	Full moon overhead
50 lux	Family living room
80 lux	Hallway/toilet
100 lux	Very dark overcast day
400 lux	Sunrise or sunset on a clear day. Well lit office area
1000 lux	Overcast day, typical TV studio lighting
10,000-25000 lux	Full daylight (not direct sun)
32,000-130,000 lux	Direct sunlight

Are there any lighting standards?

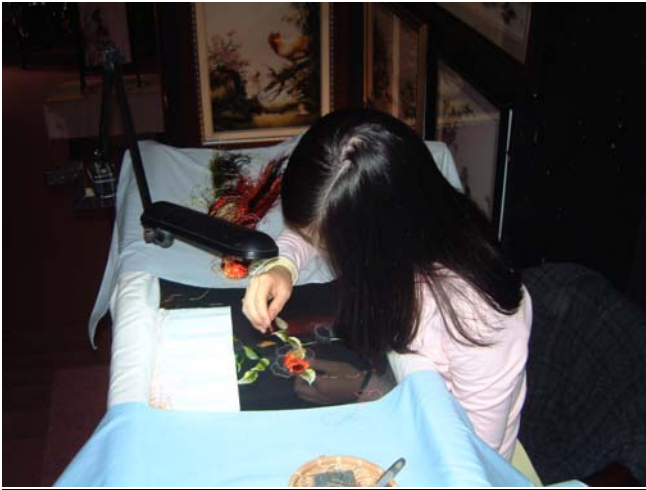
Table 2 gives some typical examples of the minimum lighting intensities required for different occupations and types of work.

Table 2: Minimum and average lighting intensities required for different types of work

Activity	Typical Location	Average Illuminance (lux)	Minimum Illuminance (lux)
Movement of people, machines and vehicles.	Lorry park, corridors, circulation routes.	20	5
Movement of people, machines and vehicles in hazardous areas; rough work not requiring any perception of detail.	Construction site clearance, excavation and soil work, loading bays, bottling and canning plants.	50	20
Work requiring limited perception of detail.	Kitchens, factories assembling large components, potteries.	100	50
Work requiring perception of detail.	Offices, sheet metal work, book binding.	200	100
Work requiring perception of fine detail.	Drawing offices, factories assembling electronic components, textile production.	500	200

REMEMBER -Where possible, natural lighting should be used as preference over artificial lighting. Lighting should be sufficient to enable people to work, use facilities and move from place to place safely and without experiencing eye strain.

Figure 9 and 10: Good lighting reduces errors and improves productivity, whether it is for the factory as a whole or for individual workstations.



Simple rules for lighting

1. Make full use of daylight in the factory.
2. Choose appropriate visual backgrounds for walls, ceilings, etc.
3. Find the best place for the light source to avoid glare, etc.
4. Use the most appropriate lighting devices and fixtures.
5. Avoid shadows.
6. Ensure regular cleaning and maintenance of lights and windows.

Checklist for lighting

	Yes	No	Action required
Is there good general illumination (with no glare) throughout the factory?			
Is there regular cleaning and maintenance of lights and windows?			
Where necessary, are windows or skylights whitewashed or shaded to avoid glare?			
Is there local lighting for close work to reduce eye strain and fatigue?			
Are "flickering" fluorescent tubes replaced as soon as possible?			
Are the walls and ceilings painted in light colours and kept clean?			
Is there adequate emergency lighting in all areas?			
Are outside areas satisfactorily lit for work, and access during hours of darkness, for security as well as safety?			