

Occupational Health and Safety in Construction Industry (Continued)

Demolition, dismantling and structural alteration

Demolition, dismantling and structural alteration are high-risk activities whose safe execution is complex and technical and where expertise is vital. They require careful planning and execution by contractors who are competent in the full range of demolition techniques.

During demolition and dismantling, workers are injured in falls from edges and through openings and fragile surfaces. Workers and passers-by can be injured by the premature and uncontrolled collapse of structures or parts of structures and by flying debris. Effective traffic management systems are essential to avoid workers being put at risk of being hit by slewing or reversing plant. Dust, noise and vibration are also significant problems that need to be considered and controlled when planning any demolition work.

A systematic approach to the demolition process starts with responsible clients who have a legal obligation to appoint adequately resourced and competent duty holders such as structural engineers, planning supervisors and principal contractors. It is vital that clients also fulfill their legal obligation to provide information about the structure to be demolished and this often means commissioning a pre-demolition structural survey from a structural engineer.

The expertise of a structural engineer must be used in the following cases:

- in the design of a façade retention scheme;
- where there is doubt over the building's stability;
- where there is doubt about the proposed method of demolition;
- where there is doubt about the capacity of the building to take loadings.

It is good practice to consult a structural engineer at the planning stage of demolition to avoid uncontrolled collapse.

The principal contractor, who may also be the demolition contractor, must be able to co-ordinate and manage the health and safety issues during the demolition works. References must be sought and pertinent questions asked by the client to establish the credibility of the demolition contractor, especially if it is intended to appoint the demolition contractor as the principal contractor for the demolition phase of the work. A genuine and competent contractor will supply the name of the client for whom their last contract was carried out. They can be asked for information about the size and scale of the works, whether any problems were encountered, how the contractor performed and whether they would use the contractor again.

The client should also determine:

- whether the contractor employs a safety advisor or uses the services of a safety consultant and whether they have experience in the requirements of demolition;
- how often the safety advisor will visit the site;
- whether they will be provided with a copy of the site visit report to enable them to monitor the health and safety performance of their preferred contractor;
- what the contractor's safety statistics are in respect of injuries, near misses and dangerous occurrences;
- whether they have been issued with any improvement or prohibition notices or been prosecuted ; and
- whether it is their intention to use subcontractors and if so, for what elements of the job and how will the subcontractor be selected and managed.

Ask the planning supervisor for their advice and input during the selection process.

The gathering and provision of information, careful planning and effective site management are essential elements for safe and successful demolition and structural alteration.

The key to developing a safe system of work is choosing a work method that keeps people as far away as possible from the risks. Proposed working methods may be best detailed in a health and safety method statement . Everyone involved in the work needs to know what precautions are to be taken. They should be supervised so that these precautions are put into practice.

It is essential that demolition is planned and carried out by trained demolition operatives under the supervision of a competent person. Supervisors should have knowledge of the particular type of demolition being carried out, its hazards and how to control them. In particular, they should understand and follow any demolition method statement and know of any particular demolition sequence required to avoid accidental collapse of the structure.

Before work starts, the site should be surveyed for hazardous material and structural condition. This is the responsibility of the client and must not be left for the demolition contractor to organize.

Consider the following:

- What is the age of the structure and what was its previous use?
- What was the type of construction (eg reinforced concrete frame or steel frame)? Are there any pre-stressed or post-stressed concrete beams present within the structure? Are floor slabs or piles involved? What materials are for reclamation and what precautions are required to carry out this work safely? This is particularly important during roof work when falls from height must be prevented.
- Can a method that keeps people away from the demolition be used, eg by using a high-reach machine? Machine cabs should be protected to safeguard drivers from falling materials.

- Will the demolition sequence make the structure itself or any nearby buildings or structures unstable? Is temporary propping required? What are the separation points? The advice of a structural engineer may be needed.
- Will the method of work require the floors to support the weight of removed material that may build up on them, or the weight of machines, eg skid-steer loaders used to clear the surcharge? Again, expert advice may be needed.
- Are there still any live services? Gas, electricity, water and telecommunication services need to be isolated or disconnected. Where such disconnection is not possible, pipes and cables should be clearly marked to ensure they are not disturbed during the work.
- Has all the asbestos in the building been identified, such as asbestos on pipe work, boilers and wall and ceiling panels ? The client must ensure that an invasive asbestos survey has been carried out and evaluated, and that any asbestos identified has been removed before demolition or major structural alteration work starting.
- Is there any leftover contamination from previous use of the building, eg acids from industrial processes, lead paints, flammable liquids, unidentified drums? Have microbiological hazards in old hospitals or medical buildings been identified? Hazardous materials need to be removed and disposed of safely before demolition. The precautions needed for working with hazardous materials are set out in earlier paragraphs.
- Will the proposed method minimize the need for operatives to use vibrating hand tools, which can cause hand-arm vibration syndrome (HAVS). The precautions necessary to avoid the risk of HAVS are set out in later paragraphs.
- Can anyone who is not involved in the work be kept away by the provision of an exclusion zone around the work area? This should be clearly marked, where necessary, by barriers or hoardings. Do not allow materials to fall into any area where people are working or passing through. Fans or other protection such as covered walkways may be needed to provide protection where materials can fall. Keep operatives segregated from site plant to ensure people are not at risk from reversing vehicles or slewing excavators. Where possible, use vision aids and zero tail swing machines (see earlier paragraphs).

Adequate toilets, washing facilities (including showers where necessary), rest facilities etc must be provided on site. Where there is more than one contractor on site, contractors may come to an agreement to share these facilities.

Fire is also a risk, especially where hot work is being carried out, so make sure the necessary precautions (see earlier paragraphs) are in place. During structural alteration it is vital that the fire plan is kept up to date as the escape routes and fire points may alter, and that an effective means of raising the alarm in the event of a fire is available.

Occupational health risks

Safety risks in construction have been recognized for some time. Occupational health risks have only recently started to be addressed. The main health risks in construction are:

- musculoskeletal disorders: back and other muscle and joint injuries;
- hand-arm vibration syndrome: pain and numbness in the fingers and hands caused by the

use of vibrating tools (see later paragraphs);

- dermatitis: redness and inflammation of the skin related to exposure to hazardous substances such as cements and solvents (see later paragraphs);
- noise-induced hearing loss: deafness or ringing in the ears caused by exposure to high levels of noise;
- asbestos-related diseases (see later paragraphs).

Hazardous substances and processes

Any hazardous substances that are going to be used, or processes which may produce hazardous materials, should be identified. The risks from work that might affect site workers or members of the public should then be assessed. Designers should eliminate hazardous materials from their designs. Where this is not possible, they should specify the least hazardous products which perform satisfactorily.

Contractors often have detailed knowledge of alternative, less hazardous materials. Designers and contractors can often help each other in identifying hazardous materials and processes and suggesting less hazardous alternatives.

If workers use or are exposed to hazardous substances as a result of their work, the government regulations make it a legal duty to assess the health risks involved and to prevent exposure or else adequately control it.

Identification

People may be exposed to hazardous substances either because they handle or use them directly (eg cement and solvents), or because the work itself results in the creation of a hazardous substance (eg scabbling concrete generates silica dust). Identify and assess both kinds of hazard.

If hazardous substances are going to be used, manufacturers and suppliers of such substances have a legal duty to provide information in the form of Material Safety Data Sheets (MSDS). Read the label on the container and/or the material safety data sheet. Approach the manufacturer or supplier directly for more information if necessary.

Some hazardous substances may be on site before any work starts, eg sewer gases or ground contaminants. Assess these risks in the same way as for other hazardous substances. Information to help identify these risks may be available from the client, the design team or the principal contractor and should be contained in the pre-construction-stage health and safety plan.

Risk Assessment

Look at the way people are exposed to the hazardous substance in the particular job that they are about to do. Decide whether it is likely to harm anyone's health. Harm could be caused by:

- **Breathing in fumes, vapours, dust:** does the manufacturer's information say that there is a risk from inhaling the substance? Are large amounts of the substance being used? Is the work being done in a way that results in heavy air contamination, e.g. spray application? Is

the work to be done in an area that is poorly ventilated, e.g. a basement? Does the work generate a hazard, e.g. hot cutting metal covered with lead causes lead fumes to be given off?

- **Direct contact with skin:** does the manufacturer's information say there is a risk from direct contact? How severe is it, e.g. are strong acids or alkalis being used? Does the method of work make skin contact likely, e.g. from splashes when pouring from one container to another, or from the method of application?
- **Swallowing or eating contaminated material:** some materials can contaminate the skin and hands. The contamination can then be passed to a person's mouth when they eat or smoke. This is a particular problem when handling lead and sanding lead-based paint. Make sure people do not smoke or eat without washing first.

While identifying the Personal Protective Equipment (PPE) in the risk assessment sheets, ensure that full details of the type of PPE are given. Generally, it has been observed that as a control measure only PPE is mentioned without detailing the type of PPE.

Once a full risk assessment has been completed and where the same work is being done in the same way under similar circumstances at a number of sites, the risk assessment does not have to be repeated before every job but you should check it to make sure there are no real differences. You should continuously look out for new safer ways of working and new products, which could be safer substitutes.

If, however, there are many processes that result in different hazardous substances being used in a wide range of circumstances, a fresh risk assessment may be needed for each job or set of similar jobs. This will make sure the risk assessment is relevant to the job being done and the circumstances in which it is being carried out.

Remember to assess both immediate risks, e.g. being overcome by fumes in a confined space, and longer-term health risks. Materials like cement can cause dermatitis. Sensitising agents like isocyanates can make people using them have sudden reactions, even though they may have used the substance many times before.

Prevention of Risk

If harm from the substance is possible, the first step to take is to try and avoid it completely by not using it at all. This will mean either:

- doing the job in a different way, e.g. instead of using acids or caustic soda to unblock a drain, use drain rods; or
- using a substitute substance, e.g. instead of using spirit-based paints, use water-based ones, which are generally less hazardous. However, always check one hazard is not simply being replaced by another.

Risk Control

If the substance has to be used because there is no alternative, or because use of the least hazardous alternative still leads to significant risk, the next step is to try and control exposure. Some of the ways this could be done include:

- transferring liquids with a pump or siphon (not one primed by mouth) rather than by hand. Keep containers closed except when transferring;
- rather than spraying solvent-based materials, use a roller with a splash guard or apply by brush;
- using as little of the hazardous substances as possible – don't take more to the workplace than is needed;
- using cutting and grinding tools and blasting equipment fitted with exhaust ventilation or water suppression to control dust;
- ensuring good ventilation in the working area by opening doors, windows and skylights. Mechanical ventilation equipment might be needed in some cases.

Personal protective equipment

If, **and only if**, exposure cannot be adequately controlled by any combination of the measures already mentioned, you will need to provide personal protective equipment (PPE).

Any PPE must be selected with care. Choose good quality equipment which is CE or IS marked. Let the user of the equipment help choose it – they will be more willing to wear it. Explain to the user why the equipment has to be worn and the hazard(s) the equipment protects against.

Respiratory protection

Respirators can protect against dusts, vapours and gases. There are many types of respiratory protective equipment (RPE), including:

- disposable face mask respirators;
- half-mask dust respirators;
- high-efficiency dust respirators;
- positive-pressure powered respirators;
- ventilator visor or helmet respirators;
- compressed air line breathing apparatus;
- self-contained breathing apparatus.

Make sure the respirator is the correct type for the job; dust masks may not protect against vapours or vice versa. If the respirator has replaceable cartridges, make sure the correct type is fitted, that they have not become exhausted or clogged and are still in date (many filters have a limited shelf life). Have replacement filters available.

A competent person should select RPE that is both suitable for the user and the job, as this choice will depend upon a number of factors, including:

- the nature of the hazards and materials;

- the measured level of the contaminant;
- the period of exposure;
- if working outdoors, the prevailing weather conditions;
- suitability for each user, such as field of vision, provision for communication and the ease of movement in cramped working places, e.g. confined spaces.

It is essential that respirators fit well around the face. Make sure the user knows how to wear the equipment and check for a good face seal. Respirators do not seal well against a beard, so when the user has a beard, alternative protection is needed, such as air-fed visors, which do not rely on a good face seal.

Users need to know how the respirator should be fitted and operated and what maintenance checks they should carry out. Supervise the user to make sure they are using the respirator properly and regularly checking it for damage.

Make sure the respirator does not become a source of contamination by keeping it clean. Store it in a clean box or cupboard – don't leave it lying around in the work area.

Skin protection

Dermatitis is an inflammatory skin condition caused by certain irritants contained in many industrial materials. There are two general types:

- irritant dermatitis: usually caused by the skin coming into contact with an irritant substance. Anyone can be affected and the strength of the irritant together with the duration of exposure will affect the seriousness of the complaint;
- sensitising dermatitis: where a person develops an allergic reaction to a substance. The reaction may follow weeks, months or even years of use without any ill effects but once it has occurred, any future exposure to the substance will produce an adverse reaction.

Reaction of the skin to an irritant varies from one individual to another. The reaction may be only a mild redness but this can develop into swelling, blisters and septic ulcers that are both unsightly and painful (see Figure below). In addition to dermatitis, some substances can cause other skin problems, such as oil acne from bitumen-based products and skin ulcers from corrosive substances.



Figure of a person suffering from dermatitis

In the course of their work, construction workers may come into contact with many skin irritants. The most common types include:

- cement, lime and plaster;
- paint;
- tar, pitch and bitumen;
- solvents, thinners and de-greasers;
- certain epoxy, acrylic and formaldehyde resins;
- mineral oils and grease.

Where protective clothing is provided (such as overalls and gloves), it must be of the right type to protect the wearer against the particular hazard they are going to encounter. All manufacturers offer advice on the most suitable gloves for specific types of hazard. When using gloves to help prevent dermatitis, users must avoid getting contaminants inside the gloves when putting them on and taking them off.

It is also essential to provide washing facilities, with a supply of hot and cold (or warm) running water, soap and a means of drying the hands, to help prevent dermatitis.

Advice on general PPE is contained in later paragraphs, and advice on measures to protect against noise and vibration can be found in the sections specific to those topics.

Personal hygiene

Substances can also be a hazard to health when they are transferred from workers' hands onto food, cigarettes etc and so taken into the body. This can be avoided by good personal hygiene, e.g. by:

- washing hands and face before eating, drinking and smoking and before, as well as after, using the toilet;
- eating, drinking and smoking only away from the work area.

In cases where clothing may become contaminated, people should change out of this clothing before eating and drinking.

Make sure those at risk know the hazards. Provide good washing facilities and somewhere clean to eat meals. Good clean welfare facilities can play an important part in protecting the health of everyone involved in the work.

Make sure as few people as possible are exposed to hazardous substances by excluding people not directly involved in the work from the contaminated area.

To be continued in next issue.

Readers may please note that D.L. Shah Trust brings out two e-journals on a fortnightly basis. These are mailed to those persons or institutions who are desirous of receiving them: These two e-journals are:

- 1. Safety Info**
- 2. Quality Info**

If you or your friends or colleagues wish to receive these journals, you may send us an e-mail requesting for the same. There is no charge for these journals. Our e-mail address is:

dlshahtrust@yahoo.co.in

or

haritaneja@hotmail.com

or

dlshahtrust@gmail.com

You can also access these journals on our website: www.dlshahtrust.org

**Published by : D. L. Shah Trust,
Room No. 16, 1st Floor, Gool Mansion,
Homji Street, Mumbai 400 001
email: dlshahtrust@yahoo.co.in
Ph: 022-22672041
Subscription: Free on request
(soft copy only)**

**Edited by : Hari K Taneja, Trustee,
D. L. Shah Trust
email: dlshahtrust@gmail.com
Phone: 022-2309 6529
Subscription: Free on request
(soft copy only)**