The Management of Construction Health and Safety Risk

Unit NCC1 Managing and controlling hazards in construction activities

Sample pages from

PRESENCE OF OVERHEAD AND BURIED SERVICES

Overhead services in the form of electricity cables present the obvious risk of electrocution through either making direct contact with the electricity cable or where arcing (discharge by spark 'jumping' to a near earth point) occurs. Overhead cables should be identified prior to site works and the risk factors determined. Construction sites may involve the use of various pieces of large, mobile plant and equipment (cranes, excavators, etc) and steel scaffold systems near to power supplies. If such equipment is allowed to come too close to an overhead cable it may provide a sufficient level of earth for the power to 'leap', making the particular item of plant live. If this occurs, subsequent 'arcs' are possible to other people or plant within close proximity of the original earth point.

Buried services (electricity, gas, water, etc) are not obvious and the likelihood of striking a service when excavating, drilling or piling is thus increased without a site survey to identify any service present. The results of striking an underground service are varied, and the potential to cause injury or fatality is high. Incidents can include shock, electrocution, explosion and burns from power cables, explosion, burns or unconsciousness from gas or power cables, and impact injury from dislodged stones/flooding from ruptured water mains.

2.2 - Appropriate general site control measures

Site planning

Following an initial site assessment that has identified hazards and risks associated with the works, control measures should be implemented to ensure the safety and well being of all those who are affected by the construction site and its activities. A plan must be assembled to take into consideration the following factors.

ARRANGEMENTS FOR SITE ACCESS

Access to a construction site must be planned to minimise any hazards identified during the initial assessment. When a suitable location for site access has been identified, this must be controlled at a point or points that are designated as authorised access point/s and the remainder of the construction site boundary must be secure against unauthorised access. Site safety information should be displayed at access points to inform all attendees of contact names, rules and emergency procedures. Barrier systems are normal on complex undertakings, accompanied by procedures for admittance and exit of people and plant. Special rules for site safety induction and issue of any site security identification are often used to maintain control.

Figure 2-11: Site access. *Source: RMS.*

Figure 2-12: Site controls - access and roadways. *Source: RMS.*

ROADWAYS

Public roadways often extend or continue into construction sites and are subject to pedestrian and vehicular traffic. Construction site roads should be subject to site safety rules such as speed limits, safety restraints (seat belts), direction of flow (one way systems where possible), and there should be segregation of pedestrian and vehicular traffic similar to that used on the public highway. Adequate space should be provided for parking and to allow vehicles and plant to manoeuvre safely and the area should be well lit as required. Vehicles and mobile plant should never be allowed to block roadways or access points as this may prevent emergency vehicles and crews gaining access in the event of a major incident. Site slurry/mud on the road surface that can create skid hazards for site plant and vehicles should not be allowed to accumulate and there should be a system for inspection and cleaning of the surface and vehicles' wheels.

STORAGE

The storage requirements are dependent on the type of material to be stored. Different material types should be stored separately, to avoid cross contamination and the potential for a harmful adverse chemical reaction. If combined storage is permitted, it is advisable that different materials be kept separated for easy identification and retrieval. In addition to authorised access of site operatives, the storage area should be designed to allow

- Review any measure taken to comply with the regulations.
- Consider assigning the employee to alternative work.
- Ensure continued health surveillance.
- Provide for a review of the health of any other employee who has been similarly exposed.

Employees must, when required by the employer and at the cost of the employer, present themselves during working hours for health surveillance procedures.

9.2 - Vibration

The effects on the body of exposure to vibration

Occupational exposure to vibration may arise in a number of ways, often reaching workers at intensity levels disturbing to comfort, efficiency and health and safety. Long-term, regular exposure to vibration is known to lead to permanent and debilitating health effects such as vibration white finger, loss of sensation, pain, and numbness in the hands, arms, spine and joints. These effects are collectively known as hand-arm or whole body vibration syndrome.

In the case of whole body vibration it is transmitted to the worker through a contacting or supporting structure that is itself vibrating, for example, the seat or floor of a vehicle (for example, dumper truck or road preparation/laying machine).

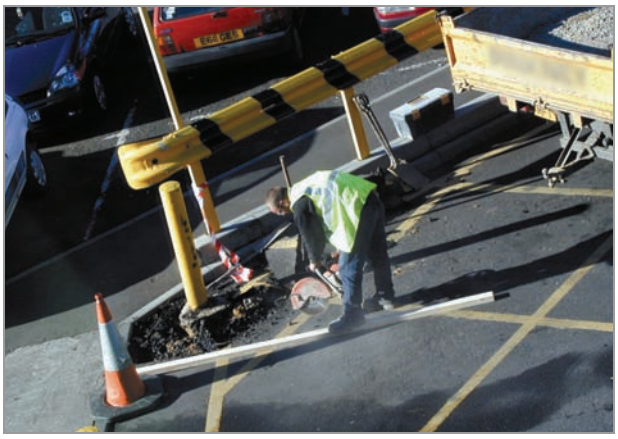

Figure 9-13: Use of circular saw - vibration. *Source: RMS.*

By far the most common route of harm to the human body is through the hands, wrists and arms of the subject - so called segmental vibration, where there is actual contact with the vibrating source.

HAND-ARM VIBRATION

Prolonged intense vibration transmitted to the hands and arms by vibrating tools and equipment can lead to a condition known as ***Hand-arm Vibration Syndrome (HAVs).*** These are a range of conditions relating to long term damage to the circulatory system, nerves, soft tissues, bones and joints. Probably the best known of these conditions is known as vibration white finger (VWF). Here the fingers go white and numb (known as ***Raynaud's phenomenon***), leading to sharp tingling pains in the affected area and an often painful deep red flush. This seems to occur in response to a change in metabolic demand in the fingers induced, for example, by temperature change. It seems that the blood vessels are unable to dilate either at all or rapidly enough because of the thickened tissues that then become anoxic (lacking in oxygen).

Contributory factors

As with all work-related ill health there are a number of factors which when combined result in the problem occurring. These include:

- Vibration frequency - frequencies ranging from 2 to 1,500 Hz are potentially damaging but the most serious is the 5 to 20 Hz range.
- Duration of exposure - this is the length of time the individual is exposed to the vibration.
- Contact force - this is the amount of grip or push used to guide or apply the tools or work piece. The tighter the grip the greater the vibration to the hand.
- Factors affecting circulation - including temperature and smoking.
- Individual susceptibility.

Examples of risk activities in construction

- The use of hand-held chain saws.
- The use of hand-held rotary tools in grinding, sanding or cutting.
- The use of hand-held percussive drills for drilling into concrete or similar materials.
- The use of vibrating compactors.
- The use of disc cutter/cut off saws and hand held saws or planners.
- The use of nail and other impact fixing guns.
- The use of scrabblers.
- The use of hand-held powered percussive drills or hammers.

The medical effects of sustained exposure to hand-arm vibration can be serious and permanent and are summarised in the following points:

- Vascular changes in the blood vessels of the fingers.
- Neurological changes in the peripheral nerves
- Muscle and tendon damage in the fingers, hands, wrists and forearms.

A loading platform is designed to withstand a weight that would be excessive on the normal working area of a scaffold.

Often this will be a separate scaffold structure, assembled adjacent to the main working scaffold, tied to both the building and the main scaffold and will consist of additional braces and sections to provide extra support.

The platform must be correctly signed as a loading area with a safe working load specified.

Workers must not be allowed to access the area directly below the platform where the loading and unloading will take place.

Figure 10-27: Loading platform. *Source: RMS.*

SCAFFOLD HOISTS (PERSONS, MATERIALS)

The hoist should be protected by a substantial enclosure to prevent anyone from being struck by any moving part of the hoist or material falling down the hoist way. Gates must be provided at all access landings, including at ground level. The gates must be kept shut, except when the platform is at the landing.

The controls should be arranged so that the hoist can be operated from one position only. All hoist operators must be trained and competent. The hoist's safe working load must be clearly marked.

If the hoist is for materials only there should be a prominent warning notice on the platform or cage to stop people riding on it.

Figure 10-28: Loading platform. *Source: RMS.*

The hoist should be inspected weekly, and thoroughly examined every six months by a competent person and the results of inspection recorded.

Inclined hoists are often used to transport materials. Inclined hoists should be erected and used by competent personnel. Additionally, there would need to be arrangements for its inspection, testing and regular maintenance and for ensuring the guarding of dangerous parts of the machinery and the integrity of any electrical installation.

Protection would need to be provided at the base and top of the hoist and means provided to ensure the security of the load as it travels to the top of the hoist. Relocation and or dismantling should only be carried out by competent persons.

See also - Element 4 - Musculoskeletal hazards and control - 'Lifts and hoists' - for further information.

ENSURING STABILITY

Effects of materials

Scaffold systems are a means of providing safe access when work at height cannot be avoided. They are not designed for storage of materials for long periods. It is however, acceptable to situate materials on scaffolds in small quantities to reflect the usage rate of the materials by the people using the scaffold. Provided the safe working load specified for the scaffold is not exceeded materials may be distributed evenly on the working platform.

Care should be taken to ensure the working platform is not reduced to a width that compromises access around the scaffold, the materials are distributed evenly and the safe working load specified for the scaffold is not exceeded.

Materials (bricks, mortar, timber, etc) when placed on scaffold systems tend to be placed on the outer edge of the scaffold, creating an uneven balance and placing greater forces on the mechanical joints. These factors can contribute to failure of the joints, or buckling of the tube sections which may ultimately lead to a full or partial collapse of the structure. If this occurs, a host of other hazards become present (falls from height, falling materials).

All loading of scaffolds with materials should be well planned to prevent uneven loading and carried out under supervision. The scaffold should be checked to ensure the safe working load is adhered to at all times.

Weakened or split boards may be caused by damage by occupants, loss of natural preservatives and the effects of corroded nails. The main 'natural' causes of decay are pest attacks, such as dry root or hidden cavities caused by death watch beetle.

Roof defects

Common defects of roof tiles include corrosion of nails that fix the tiles to battens and rafters, the decay of battens, and the cracking of tiles caused by harmful growth. Another aspect to be considered is the mortar applied for ridge tiles, which tends to decay or flake off over the years. Roof light materials often deteriorate on exposure to sunlight and become brittle, lose structural strength and are easily fractured. Often they are covered with felt to prevent leaks or become obscured from the rest of the roof by the growth of moss. Hidden roof lights present a risk to workers of falling through.

Unstable foundations

Most of the common problems associated with foundations depend on the geology of the ground upon which a building stands. For example, settlement or subsidence may result if it is built prematurely on made up ground or the water table height is causing the ground to expand or contract.

The leaning Tower of Pisa is perhaps the most famous example of building subsidence. The tower began to sink after construction had progressed to the second floor in 1178. This was due to a shallow three-metre foundation, set in weak, unstable sandy subsoil, a design that was flawed from the beginning.

Unstable foundations may occur due to traffic vibrations, deterioration of building materials and through change of use, for example, increased floor loading. Problems with unstable foundations may lead to an unstable building structure, which increases the risks of premature collapse during deconstruction or demolition.

Figure 12-26: The leaning tower of Pisa, Italy. *Source: Marshaü.*

Review of factors affecting the structure

DRAWINGS, STRUCTURAL CALCULATIONS, HEALTH AND SAFETY

Before work commences every effort should be made to find the original design drawings, together with the calculations made by the architect. If the building is of recent construction these will be found in the health and safety file related to the structure.

This will provide information on how the structure was built, for example, reinforced concrete frame or steel frame. If it is a large structure, it will be important to identify any pre-stressed or post-stressed concrete beams present within the structure and whether any floor slabs or piles were involved in the build. It is also important to determine the age of the structure and its previous use.

It is the client's responsibility to provide such information to the contractor. Prior to deconstruction/demolition, any structural alterations that might affect the load bearing capacity of walls and floors should be reviewed to avoid premature collapse.

STRUCTURAL ALTERATIONS CARRIED OUT ON THE STRUCTURE IN THE PAST

The pre-demolition survey should consider past alterations. This is particularly important to identify any changes, for example, the addition of doors or windows or the removal of walls, which may have compromised the building's original structural stability.

12.4 - Method statements

Control measures that a method statement should include

After completion of the survey it is possible to consider how the work is to be carried out and to establish a method statement to define and manage the work.

The method statement should include consideration of:

- Services.
- Soft strip requirements.
- Working at height.
- Protection of the public and neighbours.
- Emergency arrangements.
- Asbestos.
- Control measures for identified hazards.
- Plant and equipment.
- Access and egress from site.
- Training and welfare arrangements.