

For information on the series of safety information bulletins, see <http://energyinst.org.uk/humanfactors/sib>

OVERVIEW: *Workers in the petroleum industry have been injured during manual and mechanical handling operations. Guidance on how to assess materials handling work is readily available; it's based on sound research and practical application. You should use this guidance if you or members of your crew are required to move a heavy or awkward load – even if it's 'only' an item of office equipment, as shown in the case study on this page. Dropped loads can lead to personal injury or more seriously to the release of hazardous substances or damage to essential systems. This safety information bulletin is intended as a brief guide and indicates where you can find further information and guidance.*

manual and mechanical handling

If you need to move a piece of equipment into or out of a facility - to install, maintain or replace it for example - you will need to handle it manually or use a trolley, truck, crane or other mechanical device. Moving loads is not always easy. The facility or piece of equipment itself may not be designed for the type of move required. This could be inefficient *and* unsafe.

Materials handling studies are methods to help determine how best to move loads around the workplace. Typical loads are hardware being installed or removed for maintenance; or equipment brought in for conducting maintenance at a site.

Regulations, such as Regulation 4(1) of the *Manual Handling Operations Regulations (MHOR)* 1992, set safety standards for manual handling, but there are no legally binding maximum weight limits for manual handling in the UK. HSE *Manual handling assessment charts (MAC)* suggests that one person can safely handle loads of 20 kg and below. If you need to move heavier loads than this, you should consider using more people to lift the load or using mechanical lifting devices.

A materials handling study is useful for designers, operators and maintenance crew. It helps ensure that the facility, and the materials handling tasks associated with it, are designed for efficient and safe handling. A study will identify suitable handling equipment and will consider how much space will be required in the work area and along the movement route for a safe, efficient move. The route may be a walkway, in the case of trolleys or trucks, or overhead in the case of cranes and lifting beams.

The basic method in a materials handling study comprises three steps:

- Record the following details of each item that you may need to move weighing over 20 kg or of an irregular size:
 - A description of what it is
 - Its weight
 - An identifier (label, where it is located, its name, a drawing)
 - Its dimensions
- Consider, item by item, the list you made in Step 1, and:
 - Identify the most suitable handling equipment to remove and replace the item
 - Identify the most suitable equipment for bringing maintenance equipment to the item
 - Make a note of the purchase, leasing or hire costs of the handling equipment

Note, Step 2 can be a long process as there may be: a wide choice of handling equipment; restrictions on what can be used to move an item of equipment; or restrictions on spending.

Case study - Office worker LTI (manual handling)

As systems and safety approaches in operational areas become more effective, office incidents show as an increasingly significant proportion of the total incident rate.

At an office location, an IT support contractor moved a personal laser printer; however, their back became progressively more painful. Although they felt they were using appropriate handling techniques, they had not been formally trained by the host company. Immediate action undertaken was to ban the lifting of equipment by anyone who had not attended the company manual handling course. Subsequent actions were to run this training for all those not covered and also to strongly reinforce the expectation that all operatives would seek help and lifting aids from Facilities where personal physical capacity was likely to be exceeded.

3. Assess the layout of the work area to determine whether there is enough:

- Space for people and equipment to move into and out of the area
- Clearance to carry out all likely movements (take out, put back, reposition and load/unload) in the area
- Space to move the handling equipment when it is loaded
- Clearance along all movement routes and no obstructions
- Storage space for materials handling equipment

Example:

Location	Module 7, Level 3
Name	Flow Valve
Identifier	ABC-123-X (on label)
Drawing	P&ID: XY-4567-00-1, Rev 3, Dated 17/01/02
Weight (kg)	32
Dimensions (mm)	750/650 (approx.)
Equipment required	Chain hoist (SWL 75 kg) to lift; hand truck type D to move
Comments	Lifting eyes above but clearance limited – need two people, one to lift, one to rotate valve, then lower onto truck. See method statement MP 371.

Who? Ideally, a team comprising members of a project group representing facilities, operations and maintenance groups plus a human factors specialist should conduct these studies. Team members should be familiar with the facility and how it is to be operated and maintained.

When? During design - when you have decided on the main items of equipment and an initial layout. Again, when the detailed design is available. When you add further items of equipment. In existing facilities - any time, but certainly when a campaign of maintenance is being planned.

Benefits Materials handling studies help you to make decisions about workplace layout for maintenance early in the design stage of a project. This means that plant does not have to be modified later. With enough space and suitable handling equipment, maintenance tasks will be easier, quicker and safer.

Manual and mechanical handling – further case studies

Provisional statistics from HSE show that in 2002-2003, there were four major and 18 'over three-day' injuries caused by handling, lifting or carrying offshore.

Source: HSE Offshore Injury and Incident Statistics 2002/2003 (provisional data) <http://www.hse.gov.uk/offshore/statistics/hsr1003/> (dated 10-03-04)

HSE *Well handled* provides a useful set of case study problems and solutions concerning offshore handling tasks. Generally, it provides a solution from one or more of the following five categories:

- Avoid manual handling (automate or change the process)
- Redesign the load
- Redesign the task
- Redesign the work environment
- Introduce mechanical handling aids

These solutions align with the *Manual Handling Operations Regulations (MHOR) 1992*, which specify the main duties as:

- So far as reasonably practicable, *avoid* the need for manual lifting
- Where it is not reasonably practicable to avoid manual lifting, *assess* to identify sources of risk
- Where there are risks, take steps to *reduce* those risks to the lowest reasonably practicable level

The following examples focus on one or more types of solution.

Chemical drum handling – Redesign the load; introduce mechanical handling aids

Task Chemical additives for cement were supplied in drums.

Problem Handling up to 50 drums from pallets to a mixing tank leading to back and shoulder muscle injuries.

Solutions The supplier repackaged the chemicals in 23 or 36 litre drums (weighing 25 and 40 kg respectively), which were easier to handle. They also supplied some of the chemicals in 227 litre (240 kg) drums that were too heavy to lift manually and had to be lifted using mechanical aids. The company also trained the crew in safe manual handling methods.

Underwater grit-blasting operation – Redesign the work environment; redesign the load

Task Carry 50 kg bag to a hopper; slit the bag; lift bag to the rim of the hopper (2.2 m above ground level); pour the contents.

Problem Strain on arms and upper body and back; grit moving about in bags making them unstable and difficult to handle. Some eye injuries caused by grit falling out of the bags when lifted.

Solutions Contractor made a platform for the pallets – the bags could then be lifted from waist level (with less bending). Made a ramp up to the hopper so that bags could be slit and poured at waist height. Arranged for bags to be reduced in weight to 25 kg.



Courtesy: Barloworld

Materials operations – Avoid manual handling; redesign the task, load and work environment; introduce mechanical handling aids

Task Receive, store and despatch items for use on offshore installations.

Problem Handling of loads of different size, shape and weight, mostly requiring lifting from floor level. Back and shoulder pain reported.

Solutions All items over 20 kg were put on pallets and moved by fork lift trucks. Those under 20 kg were received on a specially designed conveyor 1 m high. An electric roller conveyor was acquired for moving items from the receiving to despatch areas. Extra trolleys were used for moving smaller items. Drilling tools were moved by crane rather than manually.

Use of fork lift truck – Avoid manual handling; redesign the task; introduce mechanical handling aids

Task Handle and empty mud additives from a large number (>1500) of 25 kg sacks.

Problem Lost time injuries through handling problems. Could not use a proprietary forklift truck because of floor load limit and use in Zone 1 area. Could not be taken out of the area for recharging.

Solutions A low weight FLT was found that could be converted for use in Zone 1. Charging still a problem, but a safe area was found for recharging and some changes to the charging equipment ensured that this could be done safely. Turnaround time was reduced, better use could be made of the storage space and back problems were virtually eliminated.

References and further information

HMSO *Manual Handling Operations Regulations (MHOR) 1992*, SI 1992/2793, as amended by *The Health and Safety (Miscellaneous Amendments) Regulations 2002*, SI 2002/2174. See HMSO website: <http://www.hmso.gov.uk/>.

HSE *Manual handling assessment charts (MAC)*, HSE Books, INDG383 (2003), ISBN 0 7176 27411. See HSE *Musculoskeletal disorders* website: <http://www.hse.gov.uk/msdl/>.

HSE *Musculoskeletal disorders* website: <http://www.hse.gov.uk/msdl/>.

HSE *Well handled - offshore manual handling solutions*, HSE Books (1997) ISBN 0 7176 1385 2.

IP *Human factors briefing notes resource pack*, No. 8 *Ergonomics*, Energy Institute, ISBN 0 85293 400 9. See Energy Institute website: <http://www.energyinst.org.uk/humanfactors/bn>.