

SIP005 – GUIDANCE ON MOORING



DISCLAIMER

This guidance has been produced by the ports industry, with assistance from the Health and Safety Executive, to help those who owe duties under health and safety legislation to identify key risks. This guidance also gives examples of good practice, which dutyholders can use to inform their risk assessments and procedures.

Ports and the activities which take place there vary. Employers and any other dutyholders must comply with the legal duties imposed on them by health and safety legislation, including the Health and Safety at Work Act 1974. This will also involve careful and continuing risk assessments to enable dutyholders to plan, implement, manage and review policies and procedures which address the risks associated with the conduct of their business.

Although this guidance refers to existing legal obligations, dutyholders are not obliged to follow it. However, a dutyholder which does follow the guidance will normally be doing enough to help it to meet its legal obligations.

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1 INTRODUCTION

- 1.1 This guidance document has been developed for use by companies operating in the UK ports industry, with responsibility for the safe design, construction, operation and maintenance of port facilities and management of port activities. The guidance is not exhaustive, but is intended to make the reader aware of current regulation and best practice, and to support the production of company and site specific safety policies, safe systems of work, asset maintenance and renewal and ongoing training and competence.

2 REGULATORY FRAMEWORK AND GUIDANCE

- 2.1 The two principal statutes governing the application of health and safety law in the UK are the Health and Safety at Work etc Act (HSWA) 1974, and the Management of Health and Safety at Work Regulations (MHSWR) 1999, which set out the basic requirements to ensure, so far as is reasonably practicable, the health, safety and welfare of all involved.
- 2.2 Other port specific legislation includes the Docks Regulations 1988 (much of which has been repealed and replaced by more recent generic legislation), the Dangerous Substances in Harbour Areas Regulations (DSHAR) 1984 and the Loading and Unloading of Fishing Vessels Regulations 1988.
- 2.3 The guidance is aimed at routine operations and does not cover some of the specialised and high risk activities associated with handling dangerous goods and hazardous cargoes, or major hazards sites which are subject to the Control of Major Accident Hazards Regulations 1999.
- 2.4 Further advice and guidance on specific topics can be found on the HSE website at www.hse.gov.uk and includes specialised advice on the following:
- The Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) 2002
<http://www.hse.gov.uk/fireandexplosion/dsear.htm>
 - The Control of Major Accident Hazards Regulations (COMAH) 1999
<http://www.hse.gov.uk/comah/>
 - The Electricity at Work Regulations 1989 and guidance on electrical safety
<http://www.hse.gov.uk/electricity/index.htm>
- 2.5 Reference can also be made to the International Labour Organization's (ILO) Code of Practice on Safety and Health in Ports (ILO 152)
<http://www.ilo.org/public/english/dialogue/sector/techmeet/messhp03/messhp-cp-b.pdf>

3 HEALTH

- 3.1 The wide range of activities in ports can give rise to possible health risks such as exposure to dusty cargoes; back injuries, sprains and strains from lifting and handling, pushing and pulling; noise and vibration. There is specific legislation including the Control of Substances Hazardous to Health Regulations (COSHH) 2002, the Noise at Work Regulations and the Manual Handling Regulations.
- 3.2 While there is reference to some specific health risks in these guidance documents, it is not possible to cover all the issues. Further information and guidance on the identification, assessment and reduction or avoidance of such risks can be found on the HSE website at
- Ports web pages <http://www.hse.gov.uk/docks/index.htm>;
 - Control of Substances Hazardous to Health <http://www.hse.gov.uk/coshh/index.htm>;
 - Noise at Work <http://www.hse.gov.uk/noise/index.htm> and
 - Musculoskeletal disorders (MSDs) <http://www.hse.gov.uk/msd/index.htm>
 - Control of Vibration at Work Regulations 2005 <http://www.hse.gov.uk/pubns/indg175.pdf>
 - HSE Whole Body Vibration in Ports Information Paper <http://www.hse.gov.uk/vibration/wbv/ports.pdf>

4 RISK ASSESSMENT

- 4.1 Risk Assessments must be undertaken in accordance with the Management of Health and Safety at Work Regulations 1999. The risk assessment must consider the risks – not only to permanent employees but also to others including non-permanent employees (NPE's), ship's crew and anyone else that may be affected by the work activity. The appropriate control measures must then be put in place and should consider collective measures ahead of personal or individual measures.
- 4.2 Risk assessments must be reviewed regularly and immediately after any incident or when there are significant changes to the operation. Most accidents and near misses can be avoided if the risks from the work are suitably and sufficiently assessed and appropriate control methods are adopted.
- 4.3 The risk assessment should record the significant hazards of the operation together with the relevant control measures.
- 4.4 Planning and work execution is discussed in the HSE Publication HSG177, Managing Health and Safety in Dockwork.

5 RESPONSIBILITIES

- 5.1 The Master of the vessel has the overall responsibility for the safe mooring of his ship, safety of his crew and a duty of care towards shore-side workers. Included within this is the risk assessment of the shipboard operation, condition of the vessel's equipment, including mooring lines, competence of the vessel's crew and co-operation with other shore side organisations which may be involved in the mooring process.
- 5.2 The employer of the shore mooring team, is responsible for assessing the risks to the mooring operatives, their competence, number and the risk assessments & safe systems of work under which they should work. This also includes co-operating with the Master & crew of the vessel and those engaged in other adjacent port operations.
- 5.3 The owner of the shore fixtures, equipment or buoys for use in mooring should ensure that they are suitable for their intended use and of sufficient strength and well maintained, as well as proving a safe berth for the vessel.
- 5.4 A work boat used in mooring operations must be fit for purpose, suitably equipped, maintained and operated in accordance with any requirements imposed by the MCA, Harbour Authorities or any other safety requirement necessary for this operation.
- 5.5 The Port Marine Safety Code places a duty on Harbour Authorities to provide a safe harbour and competent personnel to undertake marine duties. The National Occupational Standards for mooring operations are available from Port Skills & Safety. Harbour authorities may also determine the number of personnel within mooring teams for a given vessel.
- 5.6 The berth operator must ensure that the intended berth is safe and in all respects, suitable for the vessel to be moored there. This should include ensuring that the berth is of suitable size to accommodate the vessel. All hazards and obstructions should be cleared, including: cranes, ship loaders or un-loaders, grabs or any other equipment. There should be no activity that could present a hazard to the vessel, such as hot work or other maintenance/repair work.
- 5.7 The berth must be clear of any other vessels and made clear of such vessels in plenty of time as to not impede the approach of a vessel onto that berth.
- 5.8 Shore moorings should be in good condition and ready for use.
- 5.9 Lighting should be such as to not impact on the night vision of the Master and/or Pilot as the vessel approaches the berth.

6 MOORING OPERATIONS

- 6.1 Ships will in most cases use ropes or wires to safely moor alongside a jetty, pier or berth. Such ropes and /or wires normally belong to the ship and remain on board the ship, they can be very large diameter and have a high breaking point in order for them to withstand the loads they will encounter during a mooring operation. Automated docking systems using hydraulics, vacuum or other methodology to maintain a ships position alongside when in port fall outside the scope of this guidance, as specialised equipment.
- 6.2 As the ship approaches the berth either weighted lines, known as heaving lines, will be thrown from ship to quay or vice versa. These light lines (circa 10mm diameter with a monkeys fist added to give the weight) will then be tied to the main mooring line or a messenger line then to the mooring line, to enable the heavy ships mooring ropes/ wires to be secured ashore.
- 6.3 Alternatively mooring boats maybe used. In which case the mooring ropes/wires will be lowered down to the boat to take ashore to the waiting mooring team, who will then make the rope/wire secure as indicated below.
- 6.4 Mooring lines are fitted with large eyes which are secured over a bollard, hook or through a ring/fixed eye. Once this has been done the ships will then heave on the ropes/wires to tension them and to pull and then hold the ship alongside.
- 6.5 When sailing from the berth, pier or jetty the ship will slacken the ropes/wires, which can then be released from bollard, hook or ring by the mooring team. The ship will recover the lines back onboard and depart.
- 6.6 The practice of using vehicles for mooring tasks is not recommended and should be avoided wherever possible. However, if vehicles are to be used then a Risk Assessment needs to be completed, staff need to be aware of the dangers involved and control measures put in place. The landside supervisor should have radio contact with the vessel. A means of quick release of the ropes should be provided.

7 VESSEL ACCESS

- 7.1 The requirements for safe access to and on vessels are contained within the Docks Regulations 1988 and Guidance, the Merchant Shipping (Means of Access) Regulations 1988 and The Merchant Shipping (Safe Movement on board ship) Regulations 1988.

8 HAZARDS

8.1 There are a number of hazards associated with mooring activities, these include:

- working near to or over water
- slips, trips and falls
- parting ropes or wires
- stepping over, passing under or standing in the bight of ropes or wires
- manual handling
- hit by flying objects
- crush injuries
- falling into the water –hypothermia, drowning
- working at height
- cuts and lacerations from damaged wires
- boat work

8.2 When a mooring line parts it releases a tremendous amount of stored energy and is similar to when a very large elastic band snaps. Any one who is in the “snap back zone” could be hit by the flying rope/wire resulting in serious or fatal injuries. The likely snap back zone may be seen in figure 1.

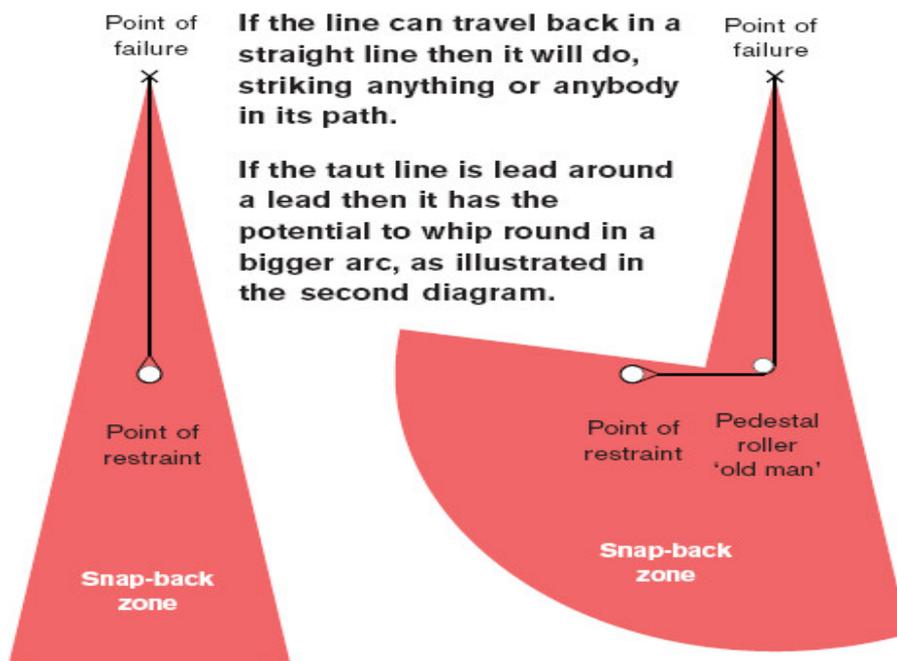


Figure 1 - Snap back zones

8.3 Flying objects are likely to take the form of heaving lines being thrown from the ship to shore or vice versa. The weighted end of the heaving lines, often referred to as a “monkeys fist” is a weighted rope knot. The weight should be sufficient to allow the line to be thrown into a wind but should not be sufficient to cause serious injury should it hit someone. Figure 2 shows a heaving line.



Figure 2- Heaving line with a monkeys fist

8.4 Work boats should be under the control of an experienced and suitably trained coxswain. During operations:

- work boats should keep clear of ships propellers, thrusters and anchors
- the ship’s Master/Pilot should know the work boat’s location during manoeuvring to take ropes
- when towing ropes there should be sufficient slack rope to prevent the work boat taking too much weight and possibly over turning

8.5 Wire ropes can deteriorate with use causing wire strands known as sprags to be present see figure 3. Sprags can injure the hands of people handling mooring wires even through gloves.



Figure 3 - Sprags

8.6 On no account should mooring lines be handled and in particular let go or cast off, without receiving instruction to do so from the person in charge of the mooring station on board the

ship; even if the lines appear to have been slacked off ready to be handled. Vessel movement on the berth or problems with vessel winches may cause lines to quickly become tensioned again, potentially placing handlers at risk.

- 8.7 Ship's lines should not be let go or cast off before the vessel is ready for this to take place as to do so might endanger the ship.

9 CONTROL MEASURES

- 9.1 The risk assessments mentioned in section 3 should have identified control measures to be adopted to reduce the risk of injury to personnel engaged in mooring activities. Such control measures will include but may not be limited to the following:

- guarding and fencing arrangements
- information, instruction and training
- safe use of work boats
- co-ordination with other dock activities, including suitable control of quayside operations and vehicle movement in the vicinity
- lighting arrangements
- communications between ship and shore
- manual handling techniques including use of mechanical aids
- PPE, such as lifejackets, safety helmets, high visibility clothing, gloves

- 9.2 More detailed information, guidance and advice on controlling these risks can be found in other documents in this guidance series eg SIP001 guidance on Lighting, and on the HSE website:

- Work at height <http://www.hse.gov.uk/falls/index.htm>
- Manual handling/ pushing and pulling <http://www.hse.gov.uk/msd/index.htm>
- Personal Protective Equipment <http://www.hse.gov.uk/pubns/indg174.pdf>

- 9.3 There is a heavy reliance on training of staff for mooring activities. Good handling techniques for ropes and wires are vital. Personnel must know where to stand as weight comes onto ropes and wires. At times when the weight of a manoeuvring ship is taken on a mooring rope, personnel must be away from the snap back zones as very high loads come onto such ropes. Similar loads can be produced by the ships mooring winches when heaving on ropes or wires, therefore whenever mooring lines are tensioned personnel must keep clear of the snap back zone.

9.4 Specific berths, jetties, quays and terminals may require specific additional control measures. Such areas will include petro-chemical facilities or other areas where hazardous materials and cargoes may be encountered.

10 COMMUNICATIONS

10.1 Safe mooring operations require the ship's crew and the shore or boat mooring teams to understand one another. In many cases this may be made difficult by language differences. Background noise and environmental conditions may create further difficulties. Radios will be useful and many ports require mooring teams to have radios. However hand signals can also be a reliable means of communication. There are a set of hand signals which are recognised and understood by crews of ships of all nationalities. Use of these signals and not carrying out any task until requested will improve the safety of mooring operations and reduce accidents.



Figure 4 - Vertical up and down movement of an outstretched hand means "slack away" or "slack off".

Note: Figures 4 to 8 from The Code of Safe Working Practice for Merchant Seamen (chapter 25)



Figure 5 - Arms crossed in front of the body or above the head means "make fast" or "is fast"



Figure 6 - Rotation of a hand held up means "heave away"



Figure 7 - Cupped movement of the hand upwards means "let go" or "cast off"



Figure 8 - Hands held up together means "stop" or "Hold on"

11 MOORING ARRANGEMENTS

11.1

Figure 9 - A conventional mooring bollard

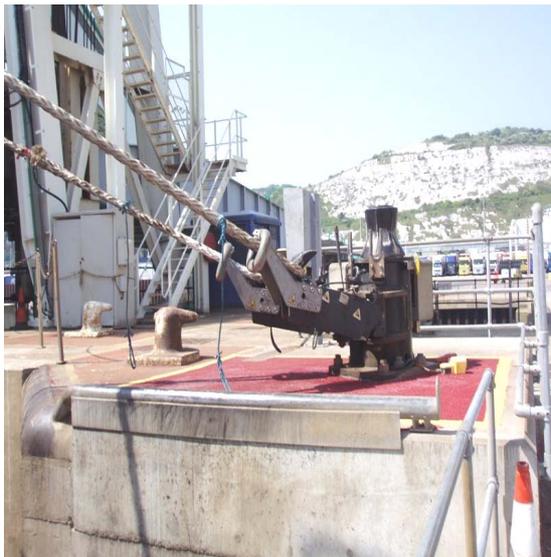


Figure 10 - Quick release hooks with capstan

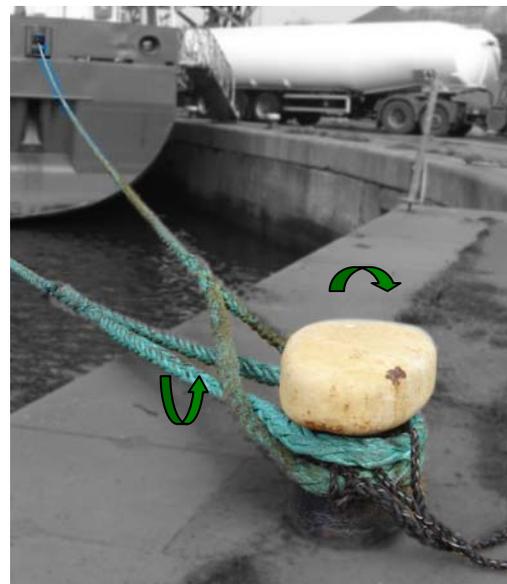


Figure 11 - Mooring lines on the same bollard with eyes "dipped"

- 11.2 Figure 11. Shows mooring lines on the same bollard with the eyes "dipped". Passing the eye of one rope up through the eye of the rope already on the bollard will enable either rope to be let go as required. This is known as dipping the eye. When letting go, even if the rope jams, it can be lifted over the standing rope and pulled clear by the ship's winch.

Ships will use differing numbers of mooring lines depending on the weather and tidal conditions. Mooring teams must work to the Masters instructions

- 11.3 Where shore moorings are used these should be regularly inspected to ensure they remain fit for purpose. Man made fibre mooring ropes such as polypropylene will deteriorate in sunlight or in contact with some hydrocarbons. Ship's moorings if noted as deteriorating should be reported to the ship and to the Harbourmaster or equivalent.

Any poor practices or unsafe acts by the ship's crew should immediately be reported to the Harbourmaster (or equivalent) and to the ship's Master.

- 11.4 Some quays, jetties, berths and terminals will have mooring dolphins that have access via a boat, up vertical ladders, or via other means that make access more difficult. Working areas on dolphins may be restricted and will have to have unguarded edges where the mooring lines lead from the bollards/hooks to the ship. They may also be at a considerable height above water level, which may vary at differing states of tide. It is important that the risk assessments required under the Management of Health & Safety at Work regulations 1999 take such factors into account.

12 PERSONAL PROTECTIVE EQUIPMENT

- 12.1 The personal protective equipment (PPE) that is required will be determined by the risk assessment described in the introduction and as required by the Management of Health & Safety at Work Regulations 1999. The PPE should include a lifejacket or buoyancy aid, safety helmet, safety footwear, high visibility clothing and gloves. PPE should be suitable for use, for example gloves should be waterproof, for handling wet ropes. PPE provided must also be compatible with the other required PPE. Some ports, terminals and berths may require other area specific PPE, such as eye protection in petro-chemical facilities.

13 USE OF MOORING BOATS

- 13.1 Mooring boats are widely used to assist in mooring operations. This generally takes the form of pulling lines ashore to other members of the mooring team, from the ship. This means that the lines are lowered down from the mooring stations on the ship (forward & aft ends) to the boat. The boat then pulls these mooring ropes, floating in the water to the shore. It is vital that there are good communications between the mooring boat and the ship's crew. Any excessive weight on one of the mooring lines can result in the mooring boat being over turned or dragged under water.

- 13.2 Additionally the use of mooring boats requires the boat to manoeuvre underneath the ships bow and stern to receive the lowered down ropes. The Ships Master and Pilot must be aware of the

boats position. Boats are vulnerable to any use of the ship's engines or bow thrusters which could easily produce a capsized. The ship must also be aware not to use its anchors, as an anchor lowered or dropped onto a mooring boat would sink the boat.

- 13.3 Mooring boats must be fit for purpose and the type of use for which they are intended. The Maritime Coastguard Agency (MCA) may need to certify the boat for use. Such boats should comply with the MCA publication *The Code of Practice for the Safety of Small Work boats and Pilot boats*.
- 13.4 Boats and crew training requirements are classified by the area in which they are intended to work, it is important that operators of such boats ensure that boats and its crew meet these requirements.
- 13.5 Mooring boats are sometimes used to help smaller ships manoeuvre. This effectively means they are acting as tug boats. Mooring boats that may be engaged to carry this out should be fit for this type of use and the crew should be appropriately trained.
- 13.6 Mooring boats used at petro-chemical facilities should be fit for use in such environments.

14 MOORING INFORMATION

- 14.1 Mooring operations must be properly planned. In some cases, particularly very large ships on tidal berths, mooring plans are developed and agreed prior to vessel arrival. Mooring teams should be aware of these requirements where they exist.
- 14.2 In any event mooring teams will need to follow the requests of the Master as to how many moorings are needed. It is the Master's decision to determine this and this may change depending on weather and tidal conditions or the condition of the ship.
- 14.3 Port operators may also have to consider the position of quayside equipment when vessels are berthing. There have been instances when ships manoeuvring alongside a berth have made contact with quayside cranes and other structures. Such contact has caused fatal incidents and resulted in the destruction of cranes. It may be appropriate to move cranes away from the area until the ship is along side or clear, or ensure cranes are in the ship's mid length area as the ship manoeuvres near to the quayside.

15 COMPETENCE, INFORMATION, INSTRUCTION, TRAINING AND SUPERVISION

- 15.1 All persons engaged in work must be trained and assessed as competent for the role that they are required to perform by a competent person. These persons must have their fitness for work assessed against the requirements for each task being performed and consideration should be

given to the requirement for a drug and alcohol monitoring system to be in place.

- 15.2 All persons involved in mooring operations must be provided with adequate information, instruction, training and supervision. This is particularly important where Non-permanent employees (NPEs) are utilised who may be generally competent but have limited experience of the particular operation, vessel or equipment.
- 15.3 All persons involved in mooring operations must know who is in charge. This is particularly important where NPEs are working alongside permanent employees.
- 15.4 Supervisors should be trained, competent and experienced in the safe working practices associated with the operations and/or have access to relevant competent advice and assistance.

16 RELEVANT LEGISLATION AND GUIDANCE

Relevant legislation and guidance includes:

- Health & Safety at Work etc. Act 1974
- Management of Health and Safety at Work Regulations 1999
<http://www.hse.gov.uk/pubns/priced/l21.pdf>
- Manual Handling Operations Regulations 1992
http://www.opsi.gov.uk/SI/si1992/Uksi_19922793_en_1.htm
- Provision and Use of Work Equipment Regulations (PUWER) 1998
<http://www.hse.gov.uk/pubns/priced/l22.pdf>
- The Code of Safe Working Practice for Merchant Seamen (chapter 25)
<http://www.mcga.gov.uk/c4mca/coswop-2.pdf>
- ILO Code of Practice on Security, Health & Safety in Ports (6.13)
http://www.imo.org/includes/blastDataOnly.asp/data_id%3D9179/ILOIMOCODEDRAFTmesshp-cp-aEnglish.pdf
- HSE Operational Circular OC730/17
http://www.hse.gov.uk/foi/internalops/fod/oc/700-799/730_17.pdf
- Mooring and Anchoring Ships Guidance by Nautical Institute
- Managing Health & Safety in Dock Work (HSG 177)
- A Code of Practice The Safety of Small Workboats & Pilot Boats
- Oil Companies International Marine Forum (OCIMF) Publication, Mooring Equipment Guidelines

- Safety of Small Workboats and Pilot Boats – A Code of Practice, MCA
<http://www.mcga.gov.uk/c4mca/brown-withpage8.pdf>
- Merchant Shipping (Small Workboats and Pilot Boats) Regulations 1998
<http://www.mcga.gov.uk/c4mca/mcga-mnotice.htm?textobjid=F088ED997C60507B>
- Port Marine Safety Code (PMSC) <http://www.dft.gov.uk/pgr/shippingports/ports/pmsc.pdf>
- Maritime Coastguard Agency (MCA) Working at Sea
<http://www.mcga.gov.uk/c4mca/mcga07-home/workingatsea.htm>
- International Labour Organization's (ILO) Code of Practice on Safety and Health in Ports (ILO 152) <http://www.ilo.org/public/english/dialogue/sector/techmeet/messhp03/messhp-cp-b.pdf>
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- Personal Protective Equipment at Work Regulations 2002
<http://www.hse.gov.uk/pubns/priced/l25.pdf>
- HSE Ports web pages <http://www.hse.gov.uk/docks/index.htm>;
- Noise at Work <http://www.hse.gov.uk/noise/index.htm>
- Musculoskeletal disorders (MSDs) <http://www.hse.gov.uk/msd/index.htm>
- Control of Vibration at Work Regulations 2005 <http://www.hse.gov.uk/pubns/indg175.pdf>
- HSE Whole Body Vibration in Ports Information Paper
<http://www.hse.gov.uk/vibration/wbv/ports.pdf>

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