

**EXPLANATORY MEMORANDUM TO THE
CONTROL OF VIBRATION AT WORK REGULATIONS 2005**

2005 No. 1093

1. This explanatory memorandum has been prepared by the Health and Safety Executive on behalf of the Department for Work and Pensions and is laid before Parliament by Command of Her Majesty.

2. **Description**

The Regulations place a duty on employers to reduce the risk to their employees' health from exposure to hand-arm vibration (HAV), caused by using hand-held or hand-guided powered work-equipment or by holding materials which are being processed by machines, and whole-body vibration (WBV), caused by sitting or standing on industrial vehicles or machines.

3. **Matters of special interest to the Joint Committee on Statutory Instruments**

None.

4. **Legislative background**

The Regulations are made under the Health and Safety at Work etc. Act 1974, and implement Council Directive 2002/44/EC, the sixteenth daughter Directive of the health and safety Framework Directive 89/391/EC. A transposition note is appended. Vibration at work has not been the subject of specific regulation hitherto. The amended proposal for a vibration Directive proposed by the German Presidency in January 1999 was submitted and cleared by the Parliamentary Scrutiny Committees in March 1999, May 1999, November 2000, March 2001, November 2001 and April 2002.

5. **Extent**

These Regulations apply to Great Britain.

6. **European Convention on Human Rights**

Not applicable.

7. Policy background

- 7.1 The policy objectives of the Directive 2002/44/EC are to protect the health of workers from the risks arising from long-term exposure to high levels of HAV and WBV. The Directive allows for a limited amount of flexibility in its transposition, relating to transitional periods and derogations, and to the methods for setting action values and limit values for exposure to vibration. The Health and Safety Commission (HSC) has taken account of the results of public consultation in making its recommendations to the Minister in these and in all other respects. The Regulations fully reflect the Directive requirements.
- 7.2 The Regulations require employers to identify which of their employees may be at risk from HAV and WBV, to assess the degree of risk and to introduce reasonably practicable measures to eliminate or minimise the risk. The Health and Safety Executive is developing a strategic programme to improve the control of HAV and to reduce the number and severity of cases of disease over the next 10 years. The new Regulations will underpin the programme by setting new standards for industry to work to. WBV is also included in a broader programme to control the risks of musculoskeletal disorders.
- 7.3 Long-term exposure to HAV can lead to painful and disabling diseases such as vibration white finger, permanent loss of feeling in the hands, carpal tunnel syndrome and loss of grip strength. Some 2 million workers are estimated to be exposed at levels placing them at risk of developing such diseases. Vibration white finger and vibration-related carpal tunnel syndrome are prescribed diseases under DWP's Industrial Injuries Disability Benefit Scheme. Between 3,000 and 4,000 new cases are assessed under the scheme each year. Vibration white finger is also a leading cause for compensation claims according to the Association of British Insurers.
- 7.4 WBV is associated with back pain in drivers, although there may be other factors contributing to back pain such as manual handling of loads, poor vehicle cab ergonomics and prolonged sitting in a constrained posture. This mix of contributory factors can make it more difficult to pinpoint causes of back pain in drivers. Nevertheless, scientific opinion is clear that WBV is a risk factor and that it should be addressed. WBV is most severe for drivers of off-road machinery, vehicles and plant such as those used in agriculture, construction, mines and quarries. Other industrial vehicles driving across paved surfaces, but which lack suspension systems, for example some lift trucks, may also generate high levels of whole-body vibration. It is estimated that between 20,000 and 50,000 employees may be exposed at very high levels of WBV. Back pain is one of the leading causes of working days lost in Britain.
- 7.5 Trades unions have been successful in pursuing compensation claims from employers for vibration white finger in a number of industries, notably coal mining, the gas industry and the rail industry. HSC's proposed approach to complying with the Regulations in respect of HAV set out in the Consultation Document is to simplify risk assessment and control, and this has been widely welcomed by industry. In contrast to this, a number of industry bodies questioned the need for the WBV element in the proposed

Regulations, citing the lack of a quantifiable relationship between different levels of exposure and likely health effects. However, the TUC and some trade unions have expressed strong support for the regulation of WBV exposure as a major risk to health. HSC's proposed approach to WBV under the Regulations is to encourage employers to manage all the risk factors for back pain rather than concentrating solely on controlling WBV. Industry has generally supported this approach.

7.6 The results of the public consultation on the Regulations is briefly summarised in paragraphs 5 - 8 and 192 -196 of the attached Regulatory Impact assessment. A more detailed summary of the results can be found at HSE's vibration web page (www.hse.gov.uk/vibration).

8. **Impact**

8.1 A Regulatory Impact Assessment is attached to this memorandum.

8.2 The costs to the Exchequer are set out in paragraphs 76 and 161-162 of the Regulatory Impact Assessment.

9. **Contact**

Brian Coles at the Health and Safety Executive can answer any queries regarding these Regulations:

Tel: 020 7717 6893

E-mail: brian.coles@hse.gsi.gov.uk

Transposition Note for Directive 2002/44/EC on the minimum health and safety requirements regarding the exposure of workers to risks arising from physical agents (vibration) (Sixteenth individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC), transposed by the Control of Vibration at Work Regulations 2005

Article	Purpose	Implementation	Responsibility
1 paras 1-3	Aim and scope - to lay down minimum requirements for the protection of workers from risks to their health and safety arising from exposure to mechanical vibration at work, without prejudice to the operation of the Framework Directive 89/391/EEC.	The Control of Vibration at Work Regulations 2005 (CVWR 2005) reg. 3(1). Protection extends to others affected by the work and to the self-employed - CVWR 3(4) and (5). The Management of Health and Safety at Work Regulations 1999 implement Framework Directive 89/391/EEC and are applicable to the whole field where CVWR 2005 apply.	The Secretary of State by new Regulations, the Control of Vibration at Work Regulations 2005 (CVWR 2005). No action required for the Management of Health and Safety at Work Regulations 1999.
2	Definitions of hand-arm vibration (HAV) and whole-body vibration (WBV).	CVWR 2005 reg. 2(1) defines inter alia hand-arm vibration (HAV) and whole-body vibration (WBV).	The Secretary of State by CVWR 2005.
3 paras 1 and 2	Establishes exposure action values (EAVs) and exposure limit values (ELVs) for HAV and WBV	CVWR 2005 reg. 4(1) and (2) and Schedules 1 Part I and 2 Part I.	The Secretary of State by CVWR 2005.
4 paras 1-3	Levels of vibration to be assessed and if necessary measured. Assessment may be by means of observation of specific working practices and reference to relevant information. Assessment and measurement to be carried out by competent services, and data obtained therefrom preserved.	Assessment and measurement - CVWR 2005 reg. 5(1) and (2). Preservation of data - CVWR 2005 reg. 5(1). Competent services - CVWR 2005 reg. 8(4) and the Management of Health and Safety at Work Regulations 1999 reg. 7.	The Secretary of State by CVWR 2005. No action required for the Management of Health and Safety at Work Regulations 1999.

Article	Purpose	Implementation	Responsibility
4 para 4	Matters to be given particular attention in risk assessment.	Included in list in CVWR 2005 reg. 5(3).	The Secretary of State by CVWR 2005.
4 para 5	Recording and updating of risk assessment.	CVWR 2005 reg. 5(4) and (5).	The Secretary of State by CVWR 2005.
5 paras 1 and 2	Risk to be eliminated at source or reduced to a minimum, based on general principles of prevention in Framework Directive 89/391/EEC Article 6(2). If EAVs are exceeded, a programme of measures to reduce exposure to vibration to a minimum must be introduced, taking into account in particular a list of considerations.	Elimination and reduction - CVWR 2005 reg. 6(1) and Management of Health and Safety at Work Regulations 1999 Schedule 2. Programme of measures - CVWR 2005 reg. 6(2). List of considerations - included in list in CVWR 2005 reg. 6(3).	The Secretary of State by CVWR 2005. No action required for the Management of Health and Safety at Work Regulations 1999.
5 para 3	Workers not to be exposed above ELVs and immediate actions to be taken if an ELV is exceeded.	CVWR 2005 reg. 6(4).	The Secretary of State by CVWR 2005.
5 para 4	Measures taken to be adapted for workers at particular risk.	CVWR 2005 reg. 6(6).	The Secretary of State by CVWR 2005.
6	Workers to receive information and training in relation to findings of risk assessment, and particular subjects to be addressed.	CVWR 2005 reg. 8(1) to (4).	The Secretary of State by CVWR 2005.
7	Consultation and participation of workers in accordance with Framework Directive 89/391/EEC Article 11.	Implemented by Safety Representative and Safety Committee Regulations 1977 and Health and Safety (Consultation with Employees) Regulations 1996.	No action required.

Article	Purpose	Implementation	Responsibility
8 paras 1 and 2	Health surveillance of workers to be ensured where there is a risk to health of workers and health surveillance is appropriate, and individual health records to be kept of such surveillance.	Health surveillance in case of risk - CVWR 2005 reg. 7(1). Circumstances where surveillance appropriate - CVWR 2005 reg. 7(2). Personal health records - CVWR 2005 7(3).	The Secretary of State by CVWR 2005.
9	Transitional periods for operation of limit values available to member states for work equipment first provided before 6 July 2007- not to apply until 6 July 2010 for all equipment and until 6 July 2014 in agriculture and forestry, after consultation.	After consultation under Health and Safety at Work etc. Act 1974 section 50(3), Great Britain uses 6 July 2010 transition period for all equipment - CVWR 2005 3(2), and 6 July 2014 transition period for WBV only - CVWR 2005 3(3).	The Secretary of State by CVWR 2005.
10 paras 1 and 3	Derogation available to member states where it is impossible to comply with ELV for WBV in sea and air transport, after consultation.	Exemptions may be granted by Health and Safety Executive in case of air transport on conditions including consultation of employers and employees concerned - CVWR 2005 10(1) and (2). Maritime implementation of Directive will be by separate Regulations made by Maritime and Coastguard Agency.	The Secretary of State by CVWR 2005, in the case of air transport only.
10 paras 2 and 3	Derogation available to member states after consultation where exposure varies - usually below EAV but may occasionally exceed ELV, and risk from weekly average exposure is below that from exposure at ELV.	After consultation under Health and Safety at Work etc. Act 1974 section 50(3), Great Britain allows for weekly averaging, subject to conditions - CVWR 2005 6(5).	The Secretary of State by CVWR 2005.
10 para 4	Derogations to be listed to European Commission with reasons every 4 years.	Administrative action for Health and Safety Executive.	No legislative action required.

Article	Purpose	Implementation	Responsibility
11 -12	Procedure for technical amendments to Schedules and provision for Committee to assist Commission.	Administrative procedures at Community level.	No legislative action required.
13 - 16	Miscellaneous final provisions including transposition deadline of 6 July 2005.	Administrative actions for Health and Safety Executive, save that CVWR 2005 to come into force by date shown on instrument.	No legislative action required beyond coming into force of CVWR 2005.
Annexes A and B	Methods for assessment and measurement of exposure for HAV and WBV	CVWR 2005 sets out methods of ascertaining exposure levels in Schedule 1 for HAV and in Schedule 2 for WBV. Certain detailed provisions of the Directive Annexes are transposed in the main text of CVWR 2005.	The Secretary of State by CVWR 2005.

REGULATORY IMPACT ASSESSMENT (FINAL)
THE CONTROL OF VIBRATION AT WORK REGULATIONS 2005

ISSUE AND OBJECTIVES

1. The Regulations aim to protect workers from risks to their health resulting from exposure to vibration transmitted to the hand-arm (HAV) and whole body (WBV). They transpose into British legislation European Directive 2002/44/EC. The objective of the Directive is to ensure the health and safety of individual workers and to provide a minimum level of protection to workers across the European Union in order to avoid possible distortions of competition.
2. The Regulations will place a range of duties on employers including a requirement to assess the risks to their employees from vibration, to reduce their exposure to vibration and to provide them with information and training on the hazard. A wide range of industries and occupations are affected, in particular agriculture, construction, mines and quarries, engineering, forestry, public utilities and shipbuilding, aircraft and vehicle manufacture and repair.
3. Currently there are no British health and safety regulations that deal specifically with the risks from vibration. However, general health and safety legislation exists which covers this and other forms of health risk.
4. This Regulatory Impact Assessment looks at the requirements for HAV and WBV in separate chapters because the two hazards are quite different in the work processes and industries where they are found, the health effects they produce and the ways they can be controlled. The HAV chapter begins on page 2 and the WBV chapter on page 18. An overall summary with recommendations is provided at page 36.

Results of public consultation

5. *The Health and Safety Commission published two consultative documents on 17 November 2003 on the proposed vibration regulations, relating to hand-arm vibration and whole-body vibration respectively. The consultation period ended 31 March 2004.*

6. One of the main areas of concern raised by consultees was the potential for employers to conclude that they needed to undertake complicated vibration measurements, or to engage consultants to do this for them. Other concerns were that relevant published vibration data would be difficult to find and that risk assessments would take longer to do than HSE guidance suggested. Many wanted HSE to produce simple and practical guidance on the regulations and how to comply with them. There was also a demand for the guidance to employers to avoid any technical material, jargon or mathematical formulae.

7. Following the consultation exercise, HSE has reviewed its draft guidance, in particular on assessing risk using published vibration data, and measuring vibration exposure. It has concluded that the balance between cases where employers need to produce formal risk assessment using published data or on-site measurements and cases where the employer moves directly to control action should be adjusted significantly towards the latter. In practice, this means that HSE will expect far fewer employers to produce detailed assessments of vibration exposure. The justification for this is that it can be determined quite simply that a worker's exposure regularly exceeds the exposure action value; use of any powered hand-held tool on a regular basis is almost certain to exceed it. HSE believes that detailed assessment or measurements are not needed to confirm this or to produce a programme of risk reduction. This is already explained in the draft guidance, but will be emphasized much more strongly in the published guidance, and as a result, we expect the proportion of employers who will produce detailed vibration exposure assessments to be much smaller than set out in the earlier versions of the regulatory impact assessment. Additionally, the guidance for employers will be separated from the guidance for vibration and other specialists, which will ensure that it will not contain technical material unsuitable for a lay audience.

8. HSE recognizes that, despite HSE advice, some employers will wish to measure vibration exposure or to call in consultants to do this in order to protect themselves from the risk of civil claims. However, HSE will place greater emphasis on the production and implementation of an effective programme of control measures, which it believes, is of far greater importance in protecting workers' health than a detailed exposure assessment.

HAND-ARM VIBRATION (HAV)

PURPOSE AND INTENDED EFFECT

Background

9. In Britain, the HSE has for several years issued HAV guidance to employers, employees, occupational health and health and safety specialists. More recently, it has promoted management of the risk in a national campaign. The UK view is broadly that specific legislation on HAV will be helpful in improving management of the risk.

10. Employers may in many cases be able to develop alternative methods for particular tasks, which avoid use of hand-held vibrating tools. Or they may be able to replace high vibration tools with tools designed to reduce vibration exposure. If neither of these solutions is possible, they may need to limit the time spent by individual workers using high vibration tools. These approaches were advocated by HSE in its "Good Health is Good Business" campaign in the late 1990s, which promoted greater awareness of occupational health risks and a simple step-by-step approach to their management. The legal duties of employers were also drawn to the attention of employers and played a more prominent role in the final stage of the campaign when compliance with the law was a major theme.

11. HAV is subject to general British health and safety law and is specifically mentioned in the Supply of Machinery (Safety) Regulations 1992 as amended by the

Supply of Machinery (Safety) Amendment Regulations 1994 and in the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995.

12. While it would have been possible to continue to tackle the problem of HAV through campaigns and enforcement action using existing health and safety legislation, the new specific legislation on HAV will increase the pressure on employers to manage the risk and usefully strengthens the hand of HSE in seeking compliance.

Risk assessment

13. The link between exposure to HAV and diseases such as vibration white finger (VWF), vibration-related carpal tunnel syndrome, disorders of bones, muscle, joints and sensory nerves (collectively known as hand-arm vibration syndrome [HAVS]) is well established. It is estimated that exposure at HSE's current recommended action level may cause finger blanching in about 10% of the vibration-exposed population after 8 years. The Regulations set a more stringent action level together with an exposure limit value above which exposure is not permitted.

14. The effects of HAVS on the individual will depend on the severity and extent of the disease. It may restrict the ability to work with the hands, or to work in cold and/or wet conditions (which could trigger attacks of finger blanching).

15. Recent research suggests that around 2 million people in Britain are exposed to potentially harmful levels of HAV and that around 300,000 people may suffer from moderate to severe finger blanching linked to such exposure. VWF and vibration-related carpal tunnel syndrome are both prescribed diseases under the Department for Work and Pensions (DWP) Industrial Injuries Benefit Scheme. Under the Scheme over 3,000 new cases of VWF were assessed by the Department of Social Security (DSS - predecessor to DWP) in each of the years 1995-96 and 1996-97. The number of cases of vibration-related carpal tunnel syndrome assessed for those years was 265 and 297 respectively.

16. In recent years there have been several high-profile compensation awards for VWF. In one case an award of £200,000 was made to a tree surgeon who worked for a local authority. In another case, a recent High Court judgement will lead to compensation awards to over 140,000 retired coal miners and their families at a total cost of up to £3 billion.

Number of workers exposed

17. This appraisal uses information from a study carried out by the Medical Research Council (MRC) "Hand-transmitted vibration: Occupational exposures and their health effects in Great Britain" and combines it with HSE's "Self-reported Work-related Illness in 1995. Results from a Household Survey". Six firms with fewer than 50 employees were also consulted to assess the impact on small business.

18. MRC estimates that about 4.9 million workers are exposed to HAV in Great Britain. The following table provides an estimate of the number of people exposed between the personal daily vibration exposure (A(8)) break points of 0, 2.5 and 5 m/s².

19. The MRC survey provides a snapshot estimate of prevalence at the time of the survey but it does not provide a time series, which could indicate trends. However, the number of people exposed to hazardous levels of HAV may fall in certain heavy industries such as coal mining and shipbuilding/repair but these industries form a relatively small proportion of the overall numbers at risk. It is likely, therefore that any fall in the number of people at risk will be small over the next decade.

Table 1: Estimated number of employees exposed to proposed vibration ‘action values’

Vibration magnitude (m/s ²) A (8) ¹	0 - 2.5	2.5 - 5.0	>5.0
Number of exposed employees	2,120,000	750,000	900,000

Data missing²: 1,103,800

20. The Regulations include an exposure action value and an exposure limit value at which specified measures have to be introduced. However, the difficulty of measuring vibration could result in precautionary action at magnitudes that are lower than the specified values. The Regulations add new specific measures going beyond what HSE has formerly issued as guidance.

Estimating the Costs of HAV to Society

21. Costs and benefits are calculated in present value terms over a ten-year period³. The base year for appraisal and price base used is 2001/02. Most of the costs are recurrent, either annually or about every five years (year 0, year 5 and year 9).

22. The approach The Self-reported Work-related Illness (SWI) survey in 1995 gives an estimated 20,400 workers suffering from Vibration White Finger (VWF is the most common effect of HAVS). However we believe this to be a very low estimate. The MRC report estimates that the number of people with VWF is about 301,400, which is the estimated number with a condition serious enough to merit DWP compensation. There are many more (possibly hundreds of thousands) with a less severe condition. Based on evidence from the SWI, but related to the figure of

¹ Vibration magnitude is usually measured in terms of acceleration in metres per second per second (m/s²). The amount of vibration a person is exposed to in a day depends on the vibration magnitude and the length of time he is exposed to it. For convenience, the duration of exposure is represented in terms of an eight-hour period A(8).

²These 1,103,800 are exposed, but the level of exposure is unknown. In many cases this will be due to the complexity of the exposures, which suggests that they will fall in the higher categories of exposure. In the calculations that follow we assume this number (1,103,800) is divided equally between the two high categories of exposure. We have assumed 1,301,900 workers are exposed at levels between 2.5-5.0 and 1,451,900 workers are exposed above 5.0m/s²

³In arriving at ten year cost figures (throughout this RIA) adjustments are made. Firstly, earnings are assumed to rise by 1.8% per year in real terms, which is equal to the observed increase for the whole economy over the past twenty-five years or so (HSE calculations). Secondly, costs are discounted to present values using the Treasury recommended 3.5% discount rate. In arriving at ten-year benefit figures, health benefits are discounted at 1.5% discount rate, because they might be seen as having a broadly constant utility value over time, regardless of changes in income. Such benefits are therefore discounted at the component of the discount rate that represents pure time preference for "utility", i.e. 1.5%. This practice is mentioned in the Green Book.

301,400 sufferers, we have made the following assumptions⁴ relating to the economic effect per year of workers developing VWF:

23. Assumptions

- 21.5% take time off, at an average of 25 days each
- No workers leave their job⁵
- No workers leave the labour force altogether.

24. To estimate the costs of VWF to the economy we need to place values on these. The main costs will fall on individuals through loss of income and increased pain, grief and suffering but there will also be costs to employers and to society in general.

‘Costs’ to individuals who experience VWF

25. Assumptions

- 78.5% of VWF sufferers do not take time off but experience discomfort
- Figures based on HSE's published (1995/96) monetary values for different levels of pain, grief and suffering, in 2001/02 prices:
- A ‘minor’ case of ill-health (i.e. not involving taking time off) ‘costs’ around £177 per worker
- Costs to an individual of £30 for loss of income (net of sick pay) when taking a day off
- Costs for pain and suffering at around £2,200 for those taking time off.

26. ‘Costs’

- Annual ‘costs’ of around £236 million (2001/02 prices) comprising:
 - £42 million for pain and suffering for those not taking time off
 - £194 million for those taking time off.

Illness Other Than VWF

27. HAV can lead to debilitating effects other than VWF, which may lead to time off work or early retirement. The MRC report shows that the risk of sensorineural symptoms for a particular exposure level is similar to that for blanching. We can therefore assume that the number of people with sensorineural symptoms will be similar to the number with blanching. However, we do not know to what extent these two group overlap, so the total number of people with HAVS (blanching and/or sensorineural) is not available.

⁴The following percentages are the ratios between the number of people taking days off/forced to change job/forced to leave the labour force, respectively, and the total that worked at some time in the previous year.

⁵Some workers suffering from VWF have changed jobs in order to avoid exposure to vibration. However, our data source (SWI 1995) provides no figures for this eventuality for 1995. While we cannot quantify the scale of the problem, we would be happy to do so if more evidence comes to light

28. The SWI reports about 243,000 people suffering from work-related musculoskeletal disorders relating to the hand/arm/shoulder. However, again there is no evidence on how many of these cases are due to HAV.

29. If the number of sensorineural complaints and musculoskeletal disorders caused by HAV were, respectively, 50% of VWF sufferers and 10% of the SWI figures, an extra 175,000 individuals would benefit from these Regulations. By keeping the same assumptions used for VWF sufferers, this would mean a total benefit of £66 million for pain and suffering for those not taking time off and £307 million for those taking time off. Total benefits would then be equal to £373 million.

Costs to society

30. Wider costs to society include extra administration, medical costs and loss of future output. To estimate these costs we can apply the ratio of the total costs of work-related ill health to society (£10.4 billion, 1995/96 prices) to that relating to individuals only (£5.5 billion, 1995/96 prices) to our estimate of the total costs of HAV illness to individuals of £373 million.

31. Costs

- Annual undiscounted costs of over £700 million
- 10 year present value costs of £6.6 billion (2001/02 prices)⁶.

OPTIONS

32. The options for implementation of the Directive in respect of HAV were set out in paragraphs 19-40 of Consultative Document 190. This part of the RIA sets out the costs and benefits of the Regulations revised post-consultation as they apply to HAV. These options are to:

- Make available to all industry sectors the five year transitional periods for the exposure limit values (to 2010);
- Use the A(8) method for setting the daily vibration exposure action value for whole-body vibration;
- Make the transitional periods available to employers using existing equipment first provided to employees (including second-hand and hired equipment) before 6 July 2007;
- Delegate to individual employers the authority to use the weekly averaging of personal exposure rather than set up a central approval system administered by HSE;

33. The Health and Safety Commission has chosen to make use of all the options above.

⁶In arriving at present value figures over ten years, we make two adjustments. Firstly, since medical costs are likely to be small compared to the loss of future output, we allow for annual costs to rise by 1.8% per year in real terms, in line with the observed increase in real earnings over the past 25 years or so. Secondly, costs to society are discounted by 3.5%.

Transitional period options

34. These options mean that employers may continue to use, until 2010, equipment and work processes, which expose their employees above the ELV, provided:

- The equipment was first used by any employee before 6 July 2007; and
- They take into account the latest technical advances and organisational measures

35. Equipment or machinery bought or hired for the first time on or after 6 July 2007 does not qualify for the transitional periods and its use must therefore comply with the ELV as soon as it comes into use.

36. Equipment or machinery bought or hired before July 2007 is subject to the qualification that they “take into account the latest technical advances and organisational measures.”

37. This second condition implies:

- That employers should make use of any relevant risk-reducing modifications to the equipment as they become available and if they are reasonably practicable
- That employers should adopt any new methods of using the equipment, which will reduce risk where these are reasonably practicable.

38. The effect of the transitional periods is thus to allow employers a reasonable period to continue using existing equipment without incurring the costs of limiting the use of the equipment or even scrapping it.

39. During the transitional period it is expected that lower vibration designs of equipment and new work processes will become available, which would reduce exposures to below the ELV.

40. By the end of the transitional periods HSE would expect employers to replace existing higher-vibration equipment and work processes with lower-vibration equipment and processes during the normal replacement cycle. This would minimise costs for employers by allowing them to phase in new equipment over a 5 period (to 2010) or a 9-year period (2014 for WBV equipment in agriculture and forestry)

41. If full use had not been made of the transitional periods then employers would have had to take drastic action to reduce exposures below the ELV from July 2005. This would have meant immediate action to reduce daily equipment use or employing more people to use the equipment to reduce individual exposure, or scrapping equipment and buying lower vibration equipment, if it was available.

42. Unfortunately, It is not possible to quantify these costs due to lack of information on average equipment costs and quantity and type of equipment replaced. These costs would however be expected to be high.

Weekly averaging option

43. Weekly averaging of exposure is permitted for employers who may have occasional HAV or WBV exposures above the ELV provided:

- The weekly averaged exposure is less than the ELV

- The exposures on other days are generally below the EAV
- The risk is less than constant exposure at the ELV for a week
- Risk is reduced to as low a level as is reasonably practicable
- Employees are subject to additional health surveillance

44. This option is only likely to be available to emergency situations where long exposure may be unavoidable because of the circumstances (i.e. rescue work, car crashes, natural disasters etc). In non-emergency situations employers would normally be expected to spread the high vibration exposure work over several days to avoid the ELV being exceeded on any one day.

45. It is therefore unlikely to have any significant effect on costs to employers. However, it will allow emergency services to permit occasional exposure above the ELV, so it is helpful to them in dealing with emergencies.

COSTS AND BENEFITS

Business sectors affected

46. Exposure to HAV is most common in metalworking production and maintenance fitters, carpenters and joiners, electricians, motor mechanics, plumbers and builders. The Regulations will therefore affect several industries, in particular construction, motor vehicles maintenance, building maintenance, agriculture and manufacture metal products industries.

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Benefits

47. Overview of benefits:

- *Economic benefits:* None of the options is likely to increase exchequer revenue. It is quite possible that the proposals would stimulate technological innovation as firms seek ways of reducing their compliance costs. Investment would marginally increase even though its effect on productivity is unclear. Time lost due to ill health would also be reduced and this would likely have some positive effect on national income.
- *Social benefits:* The proposals would reduce both ill health and demands on health services.
- *Environmental benefits:* No significant environmental impacts are envisaged as a result of the proposed Regulations.

48. The costs to society estimated previously in the risk assessment section represent the total potential saving to society from eradicating HAV-related illness. A large part of this cost is an estimate of the monetary value of the pain and suffering to affected individuals (informed by standard estimates to assess Quality Adjusted Life Years (QALYs)). However, we cannot yet reliably estimate the cost of reducing exposure. The majority of the costs calculated here are not expenditure on reducing exposure and would therefore have little direct impact on benefits. It is assumed by

HSE experts that at most 10-20% of the potential savings might be realised as a result of the actions that have been costed in this RIA.

49. Over ten years, benefits are assessed at between £714 million to £1,428 million present value.

Costs to business⁷

50. Overview of costs:

- *Economic costs*: The proposals would create compliance costs for business. These have been estimated and are presented below.
- *Social costs*: No social impact has been identified.
- *Environmental costs*: No environmental impact has been identified.

Vibration assessments

51. Requirement Vibration assessments will be needed for workers exposed to vibration. Some form of record will be needed as workers and safety representatives could receive the results of the assessment. In practice most assessments will be fairly simple affairs made without measurements, often just a paper exercise. The assessment will need to be kept up to date. Some firms may need to hire consultants⁸.

52. As discussed earlier in the results of the public consultation section, HSE expect the proportion of employers who will produce detailed vibration exposure assessments to be much smaller than set out in the earlier versions of the regulatory impact assessment, as many will now move directly to control action. The new and improved published guidance will help employers to identify whether an assessment is required or not.

53. Assumptions

- Assessments are integrated with other management activities and the planning process. Reassessment is part of an ongoing control programme that should pick up any changes to the level of exposure as they occur, together with a paper review to be carried out every 2 years to ensure that ongoing reassessment is working.
- It will not be necessary to carry out an assessment for all workers exposed to vibration: firstly, an assessment is only required if the employers are unsure about the risks from exposure to vibration after reading the guidance; secondly, employers will undertake "collective" rather than individual assessments. Moreover, HSE considers that half of the workers exposed above 5 m/s² A (8) already receive such an assessment due to current HSE guidance. To calculate costs, it is assumed that vibration assessments are undertaken for 1 in 50 workers exposed below 2.5 m/s² A (8), 1 in 20 workers for those exposed

⁷ Familiarisation costs (the time lost by managers to familiarising themselves with the requirements of the regulations) are taken to be included in each compliance cost.

⁸ The use of consultants would be at the choice of the employer. Some employers may wish to do this if they believe it would be cost effective to bring in a consultant to assess many different tools and work processes. But many employers, particularly SMEs, should be able to do a broad assessment of risk and to introduce straightforward controls by following HSE guidance without needing the services of a consultant. HSE guidance will recommend the latter approach.

between 2.5 and 5 m/s² A (8), and 1 in 20 workers for half of those exposed above 5 m/s² A (8)(total of 180,090 workers)

- The initial assessment times (for one worker), following changes made to the guidance, have been revised since the earlier impact assessment and now reflect differences in the exposure levels.
- Low exposures (below 2.5 m/s² A (8)), will take 30 minutes as they can be assessed fairly quickly. Exposure levels between 2.5 and 5 m/s² A (8), will be split into 2 groups, those with the higher exposure would most probably move straight to control action and so would not require a detailed assessment, we assume 80% of this group will do this and will need only 15 minutes to consider this. The remaining 20% may still want to do a full assessment first and this will take 2 hours. Exposures over 5 m/s² A(8) will all undertake the full assessment.
- A manager's time costs £24.24 per hour⁹
- Consultants are brought in for 5 - 10% of the workers assessed. This will only happen in the very complex cases.
- An external consultant costs £68 per hour and takes two hours to assess each discrete job
- Reassessments take on average 10 minutes every 2 years and will be conducted by the in-house manager.

54. Costs

- first year costs of £6.2 - £7.4 million
- 10 year costs of £8.8 - £10.1 million.

Information for workers

Risks created by vibration

55. Requirement All workers exposed above the 2.5 m/s² A(8) action value will have to be informed about risks.

56. Assumptions

- talks to new recruits, followed up by periodic issue of leaflets
- workers¹⁰ spend 10 minutes per year reading or listening to the information¹¹.

57. Costs

⁹The 2002 New Earnings Survey gives the average hourly wage (excluding overtime) of a personnel, training and industrial relations manager of £18.64. Adding a 30% allowance for non-wage costs gives a cost per hour of £24.24.

¹⁰The 2002 New Earnings Survey gives the average hourly wage (excluding overtime) of a manual worker of £7.82. Adding a 30% allowance for non-wage costs gives a cost per hour of £10.17.

¹¹We assume that all workers exposed between 2.5 m/s² and 4 m/s² will have to receive this, but that half of those exposed above 4 m/s² already do.

- first year costs of £4.7 million
- 10 year costs of £43.4 million¹²

Working in Cold Conditions

58. Requirement Those who work in cold conditions, particularly outdoors, and who are exposed above 2.5 m/s² A(8) will need information on the arrangements to keep them warm.

59. Assumptions

- an additional 10 minutes per year of instruction¹³
- about 19%¹⁴ of those exposed above 2.5 m/s² A(8) are outdoor workers.

60. Costs

- first year costs of £0.9 million
- 10 year costs of £8.2 million.

Programme of control measures

61. Requirement Above 2.5 m/s² A(8) employers will have to establish a programme of control measures and, implicitly, keep a record to show to safety representatives and workers. Costs would vary according to size of firm. Small firms will be able to devise a simple programme following HSE improved new guidance.

62. Assumptions

- employers identify vibration sources and outline control programmes
- employers discuss programmes with workers
- initial modest short-term programmes followed by longer term measures that include more cost-effective remedies
- for 90-95%¹⁵ of employees, taking programmes affecting 50 workers as the average, it would take:
 - 1 day's¹⁶ work by a technician of at least HNC standard to prepare the programme, plus about 2 hours of a manager's time to approve it

¹² These costs are slightly higher than in our previous version of the RIA as the incorrect number of workers was used

¹³ See footnote 8.

¹⁴ This percentage is derived from the MRC study, table 13, by including the workers in the following SOC90 categories: 504,160, 500, 594 and half of those in 540.

¹⁵ Due to the availability of the improved HSE generic assessments/information, we are assuming relatively few consultants would be needed. Therefore since the previous RIA, the assumption for the numbers of consultants has fallen, with an equal rise for in-house experts usage.

¹⁶ In the previous RIA, 3 days were used in the costs for technicians. After considerable thought HSE believe this will actually be too long. This programme is an identification programme rather than one in which action needs to be taken. The improved guidance will further speed up the process.

- half a technician/day¹⁷ and 1 manager/hour¹⁸ per year thereafter keeping the programme up to date
- the programmes will be reviewed every 2 years
- outside specialists are hired for 5-10% of employees at £68 per hour for 3 days¹⁹

63. Costs

- first year costs of £12.9 - £16.9 million
- 10 year costs of £47.7 - £51.7 million.

Personal protection

64. Requirement Effective personal protective equipment shall be used when it becomes available. In the meantime, clothing and gloves may be used to keep warm.

65. Assumptions

- 2 pairs of glove per year for those working in cold conditions, at £13 a pair.
- Since workers working in cold conditions and using power tools should already have gloves, we assume the additional cost will only apply to 10% of the workers
- Around 520 000²⁰ workers working in cold conditions.

66. Costs

- first year costs of £1.4 million
- 10 year costs of £11.7 million.

Reducing vibration exposure

67. Requirement The Regulations require vibration reduction programmes to be introduced above 2.5 m/s² A (8). However, due to the particular difficulties involved, this cost cannot be quantified as it is impossible to assess the extent of the measures employers will have to take to comply with the new requirements. Some may be able to reduce vibration magnitudes of existing tools and machinery; some could substitute new, lower vibrating equipment while others prefer to control exposure times of workers.

¹⁷ The 2002 New Earnings Survey gives the average hourly wage (excluding overtime) of a scientific technician of £10.84. Adding a 30% allowance for non-wage costs gives a cost per hour of £14.09. The previous RIA misquoted the hourly wage of a technician as £18.06 – this has now been rectified in our costs.

¹⁸ The 2002 New Earnings Survey gives the average hourly wage of a manager and administrator of £18.14 (excluding overtime). Adding a 30% allowance for non-wage labour costs gives a cost per hour of £23.60.

¹⁹ It is assumed that thorough assessments are carried out when outside specialists are hired. HSE experts estimate that such a task requires 3 days.

²⁰ In the previous RIA we incorrectly quoted 385,000 workers; we have now rectified our costs to reflect this.

Impact of prohibition on exposures above 5 m/s²

68. Requirement Where vibration control has not reduced worker exposure below 5 m/s² A(8), employers will have to limit the length of time for which tools were used. New ways of working will have to be developed, at unquantifiable cost. A transition period for compliance with the limit value will be 5 years for existing equipment and 2 years for new equipment. The impact of this provision would depend on how far machinery makers could reduce vibration or whether new ways of working could be developed. It is likely that achieving sufficient reduction through improved machinery design would take several years for many types of machines. Personal protective equipment can be discounted as an effective means of controlling exposures.

69. Employers may have to buy lower vibration tools, where they are available and introduce job rotation where it is reasonably practicable to do.

70. Assumptions

- exposure time reduced for 10-15% of employees exposed above 5 m/s² A(8),
- there is a cost per job of £640 per year.

71. Costs

- 10 year costs of £365.6 million - £548.4 million.

Health surveillance

72. Requirement

Health surveillance will, in practice, have to be carried out for all workers regularly exposed above 2.5 m/s² A(8). Currently HSE recommends that health surveillance should be in place for all workers exposed above 4 m/s² A(8). Small firms will be relatively hard hit, especially those a long way from a medical centre, and will be more likely to hire occupational health personnel. The Regulations include the right of workers to be given the results of health surveillance but this is not expected to increase cost significantly.

73. Assumptions

- half of those exposed above 4 m/s² A(8) already have access to health surveillance; the other half to have it as a result of the proposal
- for those exposed between 2.5 m/s² A(8) and 4.0 m/s² A(8) all receive health surveillance
- Tier 1 health surveillance comprises an interview in-house with a responsible person, e.g. junior manager, using a simple questionnaire. who may refer individuals for further examinations
- interviews would be conducted at work
- an examination would be needed before employment, then annually
- typical cost lies between £12 and £24 per worker

- cost of annual reviews of between £3 and £6 per worker in 90% of cases where the worker has not changed job
- average time lost of ¾ of an hour per worker.
- 25% of workers are referred on to tier 2 health surveillance, which comprises an interview with a doctor or nurse. Interview costs £25 - £50, and takes ¾ of an hour per worker.

74. Costs

- first year costs of £54.9 million to £90.9 million
- 10 year costs of £353.5 million and £535.4 million

Total compliance costs

75. Total costs in present value terms over a ten-year period are equal to £0.8 billion to £1.2 billion, plus unquantifiable costs relating to reducing exposure. The largest costs are given by the impact of prohibition on high exposures and health surveillance.

Costs to HSE

76. HSE will publish guidance and will train inspectors on the new regulations. There will be some costs for HSE in training inspectors on the new Regulations which are estimated to be in the region of £65,000 but this will be accommodated within planned budgets. There will be costs for training Local Authority Environmental Health Officers dealing on the Regulations although these will not fall to HSE. The cost of printing the planned leaflets and booklets is estimated to be around £45,000. We have assumed the cost of these leaflets is to be shared equally between both the hand-arm and whole-body proposals.

Annual undiscounted costs

77. Table 2 below shows annual undiscounted costs in £ millions.

Table 2 Annual undiscounted costs

	Yr0	Yr1	Yr2	Yr3	Yr4	Yr5	Yr6	Yr7	Yr8	Yr9
min	80.9	49.8	50.9	50.6	51.7	144.3	145.6	145.2	146.6	146.2
max	122.18	69.0	70.1	69.8	70.9	209.9	211.2	210.8	212.1	211.8

Costs for a typical business

78. A typical business is assumed to employ about 100 workers, half of whom are exposed below the EAV of 2.5 m/s² A(8),, 25 exposed between 2.5 and 5.0 m/s² A(8), and a further 25 exposed above 5.0 m/s² A(8),. The measures taken to comply with the regulations consist of: in-house vibration assessments for 4 workers, information for all workers exposed above 2.5 m/s² A(8), establishment of an in-house programme

of control measures, reducing vibration exposure and in-house health surveillance of all workers exposed above $2.5 \text{ m/s}^2 \text{ A}(8)$. The cost over ten years is estimated to be around £7527 in present value terms.

EQUITY AND FAIRNESS

79. There no groups disproportionately affected HAV by the HAV provisions. The use of hand-held power tools generally involves their operation for short periods in between other work activities. Some employers may use them more intensively than others, but not to the extent that the Regulations would place any particular group at a disadvantage.

IMPACT ON SMALL BUSINESSES

80. Six companies were contacted in order to assess the impact on small businesses. One company was a shipyard, another was a weed controller, a third was an engineering company and three were builders. The shipyard and weed control companies stated that their workers had little or no exposure to vibration and therefore the Regulations would hardly have any impact. One company was unfamiliar with the measuring system for vibrations and was therefore not able to answer any questions on likely costs.

81. Only two firms returned our questionnaire. Both of them (an engineering company and a builder) stated that their workers have very little exposure to vibration, although one of them admitted that it would be necessary to hire an external consultant to confirm this. Both firms said it would take one day to establish a programme of control, and claimed they would not have to face costs to reduce vibration exposure. One of them explained this was due to the possibility of changing tools (mostly hired) at apparently no extra costs. Neither company would have high-risk jobs nor finally, none of their workers would require health surveillance because of very low exposure.

82. From the above, it seems that small firms would not face high and disproportionate costs due to the Regulations, mainly because of low vibration exposure. If the risk were very low we would assume, with the help of the guidance, the small firms could themselves be able to carry out the risk assessments and produce a programme of control. However, if small firms hire external consultants in order to assess risk they will, therefore, face higher costs compared to larger firms where the risk assessment will be carried out by an internal technician. However, as part of its guidance on the Regulations HSE will be listing available data on the vibration magnitudes of a range of common tools which should limit the need for small firms to hire consultants. Extra HSE guidance should significantly reduce the need to use external consultants.

Uncertainties

83. The benefits of preventing HAV-related illness depend on the estimated cost of a case of VWF. In this RIA it has been assumed that no worker will leave his job for a lower paid one as a result of VWF. There is evidence that workers have left their jobs, but since these cases have not been captured by HSE's most recent survey, the cost cannot be quantified. Should further evidence come to light, it will be possible to

estimate the loss of income associated with workers moving to lower-paid jobs, and the benefits of preventing these cases will increase significantly.

84. The number of people suffering from sensorineural complaints (and not, at the same time, suffering from VWF) and musculoskeletal disorders caused by HAV is highly uncertain. If our assumptions about the number of sensorineural complaints and musculoskeletal disorders caused by HAV are lower (higher) than the actual number of cases total benefits will be greater (lesser) than planned. Sensitivity analysis carried out in previous drafts of this paper showed that this uncertainty is not likely to affect the ratio between costs and benefits.

85. Total costs of reducing vibration exposure have also been underestimated, due to the difficulties of quantifying the action taken by firms to reduce vibration when the action value (2.5 m/s A (8),) is reached. Firms that rent most of their vibrating equipment may be able to substitute suppliers at little or no extra cost, while firms that need to control exposure times of workers may face production significant costs of changing work patterns.

SUMMARY

86. In present value terms, over a ten-year period, costs may be between 0.8 and 1.1 times the benefits. However, total benefits are underestimated, since the actual number of people affected by work-related sensorineural complaints and musculoskeletal disorders caused by HAV are not known. More significantly, there may be workers who do leave their job as a result of exposure to HAV; so unquantified benefits may be substantial, bringing total benefits level with the costs incurred by firms.

Table 3: Summary of costs and benefits for HAV (2001/02 prices) ²¹

	1st year cost (£m)	10 year cost (present value) (£m)	10 year benefit (present value) (£m)
Assessments (IC):	6 - 7	9 - 10	
Information (IC):	5	43	
Extra in respect of outdoor workers (IC):	1	8	
Preparation of programme (IC):	13 - 17	47 - 51	
Reducing exposure (prohibition) (PC)	-	366 - 548	
Personal protection (PC):	1	12	
Health Surveillance	55 - 91	354 - 535	

²¹ Due to rounding the constituent parts of this table may not sum to the total shown.

(IC):			
Leaflets & Booklets	0.023		
TOTAL:	81 - 122	839 – 1,209 Plus other unquantifiable costs relating to reducing exposure	714 – 1,428

IC – Implementation costs (those costs not directly related to the policy goal, and as such seen to represent the “red-tape burden”)

PC – Policy costs (those costs that are directly attributable to the policy goal)

COMPETITION ASSESSMENT

Industries affected by HAV hazards

87. There are some affected markets where there is a substantial concentration of suppliers, for example coal, rail, aircraft manufacture and public utilities such as telecom, water, gas and electricity generation and supply. The costs of the regulation should mostly be proportionate to the size of the firm and to the extent that vibrating equipment is used. Risk assessments/controls should be quick and simple for small firms with a small amount of equipment or where equipment use is less intense because small firms generally do a wider range of tasks per person than large firms. Large firms with a wide variety of processes might find the risk assessment more resource intensive than small firms, but should have the infrastructure to manage it more easily. There may be some cases where, say, a small company uses a large number of high hazard tools, or large risks call for a detailed risk assessment. However, HSE will simplify risk assessment for all employers by providing generic vibration data and risk assessments. Most employers are not expected to measure vibration.
88. Employers will need to consider risks from vibration and to manage them. This might involve changing work processes/managing equipment use differently, but the changes will be marginal and should not affect the market structure by putting firms out of business.
89. All firms, new and existing, will need to do risk assessments and to introduce suitable risk controls. New firms at startup will have the opportunity to buy new equipment of latest/better design to minimise vibration risks. Although the initial investment in equipment could in some cases be higher, there will be a longer term saving in not having to replace equipment early when the transitional periods end. Existing firms should replace high vibration tools, so far as is reasonably practicable, with lower vibration tools even before the transitional periods have expired.

90. Technological change in all the industries affected is marginal, particularly with respect to the processes that use vibrating equipment. Basic construction techniques in, for instance, the car and aviation industries are broadly stable.
91. Overall, the impact of the Regulations would be restricted to equipment selection, use, and maintenance and other risk controls. They would not substantially alter products, their cost, quality, range or where they are made or supplied.

Suppliers

92. Some British suppliers are reasonably big in the market, although a lot of suppliers are outside the Britain. No supplier is likely to have more than 10% market share. Costs will be incurred in the development of new designs. The few British are fairly large and should handle the costs.
93. All suppliers will try to produce lower vibration equipment to gain market share but vibration performance is unlikely to be the most important marketing factor. Price, quality, efficiency and after-sales service will be the dominant factors, so the Regulations will not have a major impact on the survival of suppliers, or on the structure of the equipment market. As far as hire firms are concerned, HAV power tools have a relatively high turnover, enabling firms to bring in state-of-the-art tools regularly.
94. New firms may enter the market with a new, patented system to reduce vibration, which might give them a market advantage, although this would involve development costs. Alternatively they might enter the market with tried and tested technology, thereby foregoing development costs but also the market advantage.
95. Technological changes are generally slow and evolutionary. New designs are often only marginal improvements. Power tool companies have been improving designs slowly over recent years not because of the regulations but because of pressures building from customer civil claims. The Regulations should encourage technological change.
96. Employers are able to choose equipment that will meet their needs. This will depend on the intended use. There may still be a need for low usage tools where the old technology is adequate, because the equipment will not be used for long enough to come near to the exposure limit value, particularly in small firms.

97. Overall, HSE expects no substantial impact on competition.

WHOLE-BODY VIBRATION

PURPOSE AND INTENDED EFFECT

Background

98. Exposure to whole-body vibration (WBV) occurs in drivers of many types of vehicle including those used on road, rail and sea and in the air, those used in industry and those used off road (e.g. tractors). In these cases, WBV is transmitted into the driver's body through the vehicle's seat. Some static industrial machines can transmit WBV into the body through the platform on which the operator stands. Regular exposure to WBV is associated with damage to the back and back pain. However, other factors, such as poor posture and heavy lifting, which drivers/operators may also be exposed to, are known to contribute to back pain. Currently, the relative importance of WBV as a cause of back pain is unclear. HSE's advice is to assume that people are at risk if they regularly drive or operate vehicles or machinery such as construction and quarrying vehicles and machinery, tractors and other agricultural and forestry machinery, industrial lift trucks, road haulage and rail vehicles, buses etc. HSE does not currently recommend an action level based on measurement of WBV exposure because of lack of clear evidence on what such a level should be and the difficulties in measuring exposure accurately.

99. HSE issued guidance on WBV in 1997 with the aim of raising awareness in industry and offering some simple measure that employers could take to reduce the risks of back injury to their employees. Given the uncertainty about the relative importance of WBV as a cause of back injury, this approach was believed to be the most appropriate in the circumstances.

100. Designing vehicles and machinery to reduce vibration exposure is another route to worker protection. For example, seats with built in suspension designed to reduce the driver's exposure to WBV are available for some vehicles. However, they can be ineffective or worsen vibration exposure if they are not correctly chosen for the particular vehicle, if they are incorrectly adjusted to the driver's weight or if they are broken or poorly maintained. General legislation exists which is relevant to this approach. The Supply of Machinery (Safety) Regulations 1992 require manufactures of most sorts of machinery and industrial vehicles to design them to achieve the lowest vibration levels possible in line with technical progress. The Provision and Use of Work Equipment Regulations 1998 require the employer to ensure that work equipment is suitable and properly maintained.

101. The Regulations require action to be taken by the employer when a specific value for vibration exposure is reached for a particular worker, and sets a higher vibration value above which exposure is not permitted. Accurate assessment of worker exposure to WBV is difficult to achieve because vibration varies according to

the terrain being crossed by the vehicle and the speed at which it is driven. This is likely to vary considerably throughout the working day.

Risk assessment

102. This appraisal uses information from a recent study carried out by the Medical Research Council (MRC) "Whole-body vibration: Occupational exposures and their health effects in Great Britain", and combines it with HSE's "Self-reported Work-related illness in 1995. Results from a Household Survey". Ten firms with fewer than 50 employees were also consulted to assess the impact on small business.

103. The MRC study estimates that about 9 million workers are exposed to WBV in Great Britain. The definition of occupational exposure here includes the use of industrial vehicles and machines, cars, vans, motorcycles, etc at work. The following table presents estimates of the number of people exposed between the A(8) break points of 0, 0.5 and 1.15 m/s².

104. The MRC survey provides a snapshot estimate of prevalence at the time of the survey but does not provide a time series, which could indicate trends. However, there is no evidence to suggest that the number of people exposed to WBV above the action and limit values is likely to change significantly in the foreseeable future.

Table 1: Estimated number of employees exposed to proposed vibration 'action values'

Vibration magnitude (m/s ²) A (8) ²²	0 - 0.5	0.5 - 1.15	>1.15
Number of exposed employees	6,011,400	>1,061,000	20,000 - 50,000 ²³

Data missing²⁴: 1,856,300

105. At present, there is no specific legislation on WBV. The general duties of the Health and Safety at Work etc Act 1974 and the Management of Health and Safety at Work Regulations 1999 apply.

106. The Regulations include an exposure action value and an exposure limit value at which specified measures would have to be introduced. However, the difficulty of measuring WBV could result in precautionary action at magnitudes that are lower than the specified values.

²² Vibration magnitude is usually measured in terms of acceleration in metres per second per second (m/s²). The amount of vibration a person is exposed to in a day depends on the vibration magnitude and the length of time he is exposed to it. For convenience, the duration of exposure is represented in terms of an eight-hour period A (8).

²³ New data has emerged to suggest number of exposed workers could potentially range from 20,000 – 50,000 (number used in previous RIA). We have updated our costs to reflect this

²⁴ These 1,856,300 are exposed, but the level of exposure is unknown. In many cases this will be due to the complexity of the exposures, which suggests that they will fall in the higher categories of exposure. In the calculations that follow we assume this number is distributed by 10% (185,630) in the highest category and 90% (1,670,670) in the range 0.6-1.15 m/s² A (8).

Estimating the Costs of WBV to Society

107. Costs and benefits are calculated in present value terms over a ten-year period²⁵. The base year for appraisal and price base used is 2001/02. Most of the costs are recurrent, either annually or about every five years (year 0, year 5 and year 9).

108. It is difficult to estimate the number of cases of back pain attributable to WBV. Although the MRC work shows prevalence risk ratios that are small, thousands of people can still be involved. HSE estimates that between 9,000 to 21,000 cases of back pain may be caused by WBV, with a further 13,500 to 31,500 cases made worse by WBV at work, giving an estimate in total of between 22,500 and 52,500. Based on evidence from SWI data on back-affected workers, but applied to the HSE figures, the following assumptions have been made relating to the economic effect per year of workers developing back pain attributable to WBV:

109. Assumptions²⁶

- 55.4% of sufferers take time off, at an average of 22.6 days each
- 9% leave their jobs
- About 2.6% leave the labour force altogether.

110. To estimate the costs of WBV to the economy we need to place values on these. The main costs will fall on individuals through loss of income and increased pain, grief and suffering but there will also be costs to employers and to society in general.

'Costs' to individuals who experience WBV

111. Assumptions

- 34% of WBV sufferers do not take time off but experience discomfort

²⁵In arriving at ten year cost figures (throughout this RIA) adjustments are made. Firstly, earnings are assumed to rise by 1.8% per year in real terms - the observed increase for the whole economy over the past twenty-five years or so. Secondly, costs are discounted to present values using the Treasury recommended 3.5% discount rate and benefits are discounted at 1.5%. A change in the treasury guidelines on discounting earlier this year means that the numbers quoted in this paper may differ from previous versions.

²⁶The following percentages are the ratios between the number of people taking days off/forced to change job/forced to leave the labour force, respectively, and the total that worked at some time in the previous year.

- Figures based on HSE's published (1995) monetary values for different levels of pain, grief and suffering (2001/02 prices):
- A 'minor' case of ill-health (i.e. not involving taking time off) 'costs' around £177 per worker
- Costs to an individual of £30 for loss of income (net of sick pay) when taking a day off
- Costs for pain and suffering at around £2,280 for those taking time off
- Costs to an individual of between £8,375 and £16,740 for leaving job
- Costs to an individual of £176,694 for leaving the labour force.

112. 'Costs'

- Annual 'costs' of between £158 million and £409 million (2001/02 prices). This comprises:
 - Between £1.8 million and £4.2 million for pain and suffering for those not taking time off
 - Between £36.8 million and £86.0 million for those taking time off
 - Between £17.0 million and £79.0 million for those who have to leave their job
 - Between £102.9 million and £240.1 million for those who have to leave the labour force.

Costs to society

113. Wider costs to society include extra administration, medical costs and loss of future output. To estimate these costs we can apply the ratio of the total costs of work-related ill health to society (£10.4 billion, 1995/96 prices) to that relating to individuals only (£5.5 billion, 1995/96 prices) to our estimate of the total costs of WBV illness to individuals of £158 million to £409 million.

114. Costs

- Annual costs of between £257 million and £665 million
- 10 year costs of between £2.4 billion and £6.0 billion²⁷.

OPTIONS

115. The options for implementation of the Directive in respect of WBV were set out in paragraphs 20 -48 of Consultative Document 191. This part of the RIA sets out the costs and benefits of the Regulations revised post-consultation as they apply to WBV. These options are to:

²⁷In arriving at present value figures over ten years, two adjustments are made. Firstly, since medical costs are likely to be small compared to the loss of future output, we allow for annual costs to rise by 1.8% per year in real terms, in line with the observed increase in real earnings over the past 25 years or so. Secondly, costs to society are discounted by 3.5%.

- Make available to all industry sectors the five year transitional periods for the exposure limit values (to 2010);
- Make available to the agriculture and forestry sectors the additional four years transitional periods for the whole-body vibration (to 2014);
- Use the A (8) method for setting the daily vibration exposure action value for whole-body vibration;
- Make the transitional periods available to employers using existing equipment first provided to employees (including second-hand and hired equipment) before 6 July 2007;
- Delegate to individual employers the authority to use the weekly averaging of personal exposure rather than set up a central approval system administered by HSE;
- Advise that formal health surveillance is not appropriate for whole-body vibration, but to recommend a voluntary, informal system of health monitoring for low-back pain.

116. The Health and Safety Commission has chosen to make use of all the options above, except that the second option is only accepted with regard to Whole-Body-Vibration exposure limit value, but not Hand-Arm Vibration.

Transitional period options

117. These options mean that employers may continue to use, until 2010, equipment and work processes, which expose their employees above the ELV, provided:

- The equipment was first used by any employee before 6 July 2007; and
- They take into account the latest technical advances and organisational measures

118. Equipment or machinery bought or hired for the first time on or after 6 July 2007 does not qualify for the transitional periods and its use must therefore comply with the ELV as soon as it comes into use.

119. Equipment or machinery bought or hired before July 2007 is subject to the qualification that they “take into account the latest technical advances and organisational measures.”

120. This second condition implies:

- That employers should make use of any relevant risk-reducing modifications to the equipment as they become available and if they are reasonably practicable
- That employers should adopt any new methods of using the equipment, which will reduce risk where these are reasonably practicable.

121. The effect of the transitional periods is thus to allow employers a reasonable period to continue using existing equipment without incurring the costs of limiting the use of the equipment or even scrapping it.

122. During the transitional period it is expected that lower vibration designs of equipment and new work processes will become available, which would reduce exposures to below the ELV.

123. By the end of the transitional periods HSE would expect employers to replace existing higher-vibration equipment and work processes with lower-vibration

equipment and processes during the normal replacement cycle. This would minimise costs for employers by allowing them to phase in new equipment over a 5 period (to 2010) or a 9-year period (2014 for WBV equipment in agriculture and forestry).

124. The agriculture and forestry additional temporary period for WBV is available because of the special problems of those sectors related to long day working (12-14 hours) during certain times of the year (i.e. harvest time). During these periods long day working is unavoidable because of the high workload (i.e. the need to gather the harvest before bad weather damages the crop).

125. If full use had not been made of the transitional periods then employers would have had to take drastic action to reduce exposures below the ELV from July 2005. This would have meant immediate action to reduce daily equipment use or employing more people to use the equipment to reduce individual exposure, or scrapping equipment and buying lower vibration equipment, if it was available.

126. Unfortunately, It is not possible to quantify these costs due to lack of information on average equipment costs and quantity and type of equipment replaced. These costs would however be expected to be high.

Weekly averaging option

127. Weekly averaging of exposure is permitted for employers who may have occasional HAV or WBV exposures above the ELV provided:

- The weekly averaged exposure is less than the ELV
- The exposures on other days are generally below the EAV
- The risk is less than constant exposure at the ELV for a week
- Risk is reduced to as low a level as is reasonably practicable
- Employees are subject to additional health surveillance

128. This option is only likely to be available to emergency situations where long exposure may be unavoidable because of the circumstances (i.e. rescue work, car crashes, natural disasters etc). In non-emergency situations employers would normally be expected to spread the high vibration exposure work over several days to avoid the ELV being exceeded on any one day.

129. It is therefore unlikely to have any significant effect on costs to employers. However, it will allow emergency services to permit occasional exposure above the ELV, so it is helpful to them in dealing with emergencies.

WBV health surveillance

130. This section estimates the cost savings to society of not implementing health surveillance for WBV. The calculations follow the same methodology as health surveillance for HAV, which are presented in paragraph 56. Assumptions on interview costs are the same. Costs are calculated in present value terms over a ten-year period²⁸. The base year for appraisal and price base used is 2001/02.

²⁸In arriving at ten year cost figures (throughout this RIA) adjustments are made. Firstly, earnings are assumed to rise by 1.8% per year in real terms - the observed increase for the whole economy over the

131. Requirement

Health surveillance is to be carried out for all workers regularly exposed above Exposure Action Value (EAV), i.e. 2.95²⁹ million workers.

132. Assumptions

- Tier 1 health surveillance comprises an interview in-house with a responsible person, e.g. junior manager, using a simple questionnaire, who may refer individuals for further examinations
- Interviews would be conducted at work
- An examination would be needed before employment, then annually
- Typical cost lies between £12 and £24 per worker
- Cost of annual reviews of between £3 and £6 per worker in 90% of cases where the worker has not changed job
- Average time lost of $\frac{3}{4}$ of an hour per worker.
- 25% of workers are referred on to tier 2-health surveillance, which comprises an interview with a doctor or nurse. Interview costs £25 - £50, and takes $\frac{3}{4}$ of an hour per worker.

133. Costs

- First year costs between £82.4 million and £136.6 million
- 10 year present value costs between £564.3 million and £866.9 million

134. As indicated above, not implementing health surveillance for WBV yields substantial savings to society over the appraisal period. The following table gives the Annual undiscounted savings to society of not having health surveillance for WBV:

Annual <u>undiscounted</u> <u>costs</u>	Yr 0	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9
Low range	82.37	59.16	60.23	61.31	62.41	63.54	64.68	65.84	67.03	68.24
High range	136.59	89.67	91.28	92.92	94.60	96.30	98.03	99.80	101.59	103.42

COSTS AND BENEFITS

Business sectors affected

past twenty-five years or so. Secondly, costs are discounted to present values using the Treasury recommended 3.5% discount rate and benefits are discounted at 1.5%. A change in the treasury guidelines on discounting earlier this year means that the numbers quoted in this paper may differ from previous versions.

²⁹ This estimates include missing data, thus 2.95 million = 1.1 million + 1.85 million. For more precision, please see footnote 23.

135. Exposure to WBV is most common in drivers of road goods vehicles, farm owners and managers, technical and wholesale representatives and sales managers, motor mechanics, managers in service industries and social workers. The Directive therefore affects several industries, in particular agriculture, forestry, extractive industries, construction, land transport, retail and wholesale trade, sale and maintenance of motor vehicles industries.

Benefits

136. Overview of benefits:

- *Economic benefits:* None of the options is likely to increase exchequer revenue. It is quite possible that the proposals would stimulate technological innovation as firms seek ways of reducing their compliance costs. Investment would marginally increase even though its effect on productivity would be unclear. Time lost due to ill health would also be reduced and this would likely have some positive effect on national income.
- *Social benefits:* The proposals would reduce both ill health and demands on health services. The value of these benefits is estimated below.
- *Environmental benefits:* No significant environmental impacts are envisaged as a result of the proposed Regulations.

137. The costs to society estimated in the risk assessment section represent the total potential saving to society from eradicating WBV-related illness. A large part of this cost is an estimate of the monetary value of the pain and suffering to affected individuals (informed by standard estimates to assess Quality Adjusted Life Years (QALYs)). However, we cannot yet reliably estimate the cost of reducing exposure. Many of the costs calculated here are not expenditure on reducing exposure and would therefore have little direct impact on benefits. It is assumed by HSE experts that at most 20% of the potential savings might be realised as a result of the actions that have been costed in this RIA.

138. Over ten years, benefits to society are assessed at approximately £521 million to £1,314 million in net present value terms.

139. No significant environmental impacts are envisaged as a result of the proposed Regulations.

Costs to business³⁰

140. Overview of costs:

- *Economic costs:* The proposals would create compliance costs for business. These have been estimated and are presented below.
- *Social costs:* No social impact has been identified.

³⁰ Familiarisation costs (the time lost by managers to familiarising themselves with the requirements of the regulations) are taken to be included in each compliance cost

- *Environmental costs*: No environmental impact has been identified.

Vibration assessments

Requirement

141. Vibration assessment would be needed for workers exposed to vibration. Some form of record will be needed as workers and safety representatives would be able to see the results. Although there is no formal requirement for an assessment at magnitudes between $0 \text{ m/s}^2 \text{ A (8)}$ and $0.5 \text{ m/s}^2 \text{ A (8)}$, assessments will be needed to provide workers with information on risks and to take action to reduce risks to the lowest reasonably practicable level. In practice most assessments will be fairly rough affairs made without measurements, often just a paper exercise. The assessment will need to be kept up to date. Some firms may need to hire consultants.

142. However, HSE will provide guidance which includes generic risk assessments which many employers will be able to use without needing the services of a consultant. As discussed earlier in the results of the public consultation section, HSE expect the proportion of employers who will produce detailed vibration exposure assessments to be much smaller than set out in the earlier versions of the regulatory impact assessment, as many will now move directly to control action. The new and improved published guidance will help employers to identify whether an assessment is required or not.

143. Assumptions

- Assessments are integrated with other management activities and the planning process. Reassessment is part of an ongoing control programme, which should pick up any changes to the level of exposure as they occur, together with a paper review to be carried out every 2 years to ensure that ongoing reassessment is working.
- It will not be necessary to carry out an assessment for all workers exposed to vibration: firstly, an assessment is only required if there are thought to be risks from exposure to vibration; secondly, employers will undertake "collective" rather than individual assessments. To calculate costs, it is assumed that vibration assessments are undertaken for 1 in 20 workers who are exposed to vibrations above 0.5 m/s A(8) .
- Workers exposed below 0.5 m/s A(8) will most likely be aware of this as such activities will be listed in the enhanced HSE guidance. Vibration assessments will therefore not be required in such instances³¹.
- The initial assessment times (for one worker), following changes made to the guidance, have been revised since the earlier impact assessment. HSE guidance describes activities, which are most likely to be above the action values, many will be encouraged to move directly to controls without the need for an assessment. We have assumed half of those exposed between $0.5\text{-}1.15 \text{ m/s A (8)}$ will do a full assessment and the remaining 50% will carry out a very rough assessment.

³¹ In the previous RIA, 1 in 50 workers were assessed if exposure levels were below 0.5 m/s A(8) . Enhanced and better-targeted guidance will ensure that such activities are clearly listed and explained, hence eliminating the need to conduct an assessment. Therefore in this RIA we have not included workers below 0.5 m/s A(8) in the calculations

- The initial full assessment will take 2 hours, whilst the rough assessment will take approximately 15 minutes of a junior manager's³² time.
- A manager's time costs £24.24 per hour
- An external consultant costs £68 per hour and takes two hours to assess each discrete job. Consultants are brought in for 5-10%³³ of workers assessed. This will only happen in the very complex cases.
- Reassessments are conducted in-house and take on average 10 minutes every 2 years, for all cases.

144. Costs

- First year costs of £4.07 - £4.84 million
- 10 year costs of £6.62 - £7.38 million.

Information for workers

Risks created by vibration

145. Requirement All workers exposed above the 0.5 m/s² A(8) action value will have to be informed about risks.

146. Assumptions

- Talks to new recruits, followed up by periodic issue of leaflets
- Workers³⁴ spend 15 minutes per year reading or listening to the information.

147. Costs

- First year costs of £7.47 - £7.57 million
- 10 year costs of £69.37 - £70.08 million.

Programme of control measures

148. Requirement Above 0.5 m/s² A(8) employers will have to establish a programme of control measures and, implicitly, keep a record to show to safety representatives and workers. Costs will vary according to size of firm. Often very little may be able to be done beyond carefully choosing tyres and suspension seats. HSE will issue improved generic vibration guidance for employers, which should help them assess and control risk simply and straightforwardly. However, expert help, for example from vibration consultants, may be needed in very complex cases.

³² The 2002 New Earnings Survey gives the average hourly wage (excluding overtime) of a personnel, training and industrial relations manager of £18.64. Adding a 30% allowance for non-wage costs gives a cost per hour of £24.24.

³³ The previous RIA used an estimate of 40% using consultants, however clearer guidance will ensure only the most complex of cases will now require external help

³⁴ The 2002 New Earnings Survey gives the average hourly wage (excluding overtime) of a manual worker of £7.82. Adding a 30% allowance for non-wage costs gives a cost per hour of £10.17.

149. Assumptions

- Employers identify vibration sources and outline control programmes
- Employers discuss programmes with workers
- For 90-95%³⁵ of employees, taking programmes affecting 50 workers as the average, it would take³⁶:
 - Exposure level data is available in very wide bands (0.5-1.15 m/s² A (8)) therefore the types of cases which fall into this would be very different and would require very different programmes. Lower order exposures, those unlikely to exceed 0.7 m/s² A (8), would require a minimalist programme. Those with exposure levels above 1.15 m/s² A (8) would need a detailed programme.
 - 50%³⁷ of workers exposed between 0.5 – 1.15 m/s² A (8) will need, 1 hours' work by a technician³⁸ of at least HNC standard to prepare a minimal programme, plus about 0.5 hour of a manager's³⁹ time to approve it
 - The remaining 50% of workers exposed between 0.5 – 1.15 m/s² A (8) will need 3 hours' work by a technician of at least HNC standard to prepare a slightly more detailed programme, plus about 1 hour of a manager's time to approve it
 - For exposure over 1.15 m/s² A(8), 1 day's⁴⁰ work (8 hours) by a technician of at least HNC standard to prepare a detailed programme programme, plus about 2 hours of a manager's time to approve it
- Outside specialists are hired for the remaining 5-10% of employees at £68 per hour for 3 days (24 hours)
- Maintenance will take place in-house every year thereafter. We have assumed this maintenance will take approximately half the time taken to do the initial programme for both the technician and manager

150. Costs

- First year costs of £7.70 - £18.74 million

³⁵ Due to the availability of the improved HSE generic assessments/information, we are assuming relatively few consultants would be needed. Therefore since the previous RIA, the assumption for the numbers of consultants has fallen, with an equal rise for in-house experts usage.

³⁶ The initial assessment times (for one worker), following changes made to the guidance, have been revised since the earlier impact assessment and now reflect differences in the exposure levels

³⁷ 50% are assumed to have lower order exposures and the remaining 50% have higher order.

³⁸ The 2002 New Earnings Survey gives the average hourly wage (excluding overtime) of a scientific technician of £10.84. Adding a 30% allowance for non-wage costs gives a cost per hour of £14.09. The previous RIA misquoted the hourly wage of a technician as £18.06 – this has now been rectified in our costs.

³⁹ The 2002 New Earnings Survey gives the average hourly wage (excluding overtime) of a manager and administrator of £18.40. Adding a 30% allowance for non-wage costs gives a cost per hour of £23.60..

⁴⁰ Due to enhanced guidance, time required to devise a programme has changed since the previous RIA. It is important to note that this is the writing up of a programme only – methods to control action are not included in the time or costs.

- 10 year costs of £14.66 - £25.91 million.

Reducing vibration exposure

151. Requirement The Regulations require vibration reduction programmes to be introduced above $0.5 \text{ m/s}^2 \text{ A (8)}$. We cannot yet reliably estimate the cost of control. Some will be partly subsumed by the effects of other Regulations, e.g. the Supply of Machinery (Safety) Regulations 1992. The control programme would need to reduce vibration exposure by either decreasing vibration magnitudes or the length of time workers use high vibration machines. Correct maintenance, buying lower vibrating machinery, fitting vibration-isolating seats or installing anti-vibration systems at or on fixed machines could make some improvements.

152. Assumptions

- As discussed earlier the cohort exposed between 0.5 and $1.15 \text{ m/s}^2 \text{ A (8)}$ is very large, we have assumed 50% are classified as a higher exposure risk and 50% a lower exposure risk.
- Those with a low risk would require very minimal action, perhaps extra information for their workers. We have assumed this to be of minimal cost
- The remaining higher risk workers will need to introduce procedures for the correct selection of machines for tasks, correct vehicle and roadways maintenance and training for operators. However, no replacement of machines will be expected immediately other than during the normal replacement cycle
- Machines giving high exposures, in some cases may, need to be replaced after 2010, where such high exposure cannot be managed by job rotation and other means of control, and only where suitable lower vibration designs are available
- Improvements can be made in 10% of higher exposure cases⁴¹ immediately, rising to 20% over 10 years, at an average cost of £640 to £1,277 per case.

153. Costs

- First year costs of between £100 million and £205 million
- 10 year costs of between £1,270 million and £2,585 million

Impact of prohibition on exposures above 1.15 m/s^2

154. Requirement Where vibration control could not reduce worker exposure below $1.15 \text{ m/s}^2 \text{ A (8)}$ employers will have to limit the length of time for which individuals used machines/vehicles. A transition period for compliance with the limit value will be 5 years for existing equipment and 2 years for new equipment. For agriculture and forestry equipment the transition period is 9 years. The impact of this provision will depend on how far machinery makers could reduce vibration or whether new ways of working could be developed. It is likely that achieving sufficient reduction through improved machinery design would take several years for many types of machines.

⁴¹ This is assumed to be 50% of the 0.5-1.15 cohort

155. Assumptions

- Exposure time reduced for 15% - 30% of employees exposed above 1.15 m/s² A (8)
- Compliance costs are deferred for 5 years (9 years for agriculture and forestry sector). In reality costs are likely to be incurred incrementally over the 5-year transition period in line with typical replacement cycles.
- There is a cost per job of £1,277 per year.

156. Costs

- 10 year costs of between £175.4 million and £402.1 million.

Personal protection

157. Personal protection is not available, so has not been costed.

Total compliance costs

158. Total costs in present value terms over a ten-year period are equal to between £1.5 billion and £3.1 billion. The largest costs are from measures to reduce vibration exposure.

Costs to HSE

Provision of guidance

159. HSE will publish guidance and will train inspectors on the new regulations. There will be some costs for HSE in training inspectors on the new Regulations but this will be accommodated within planned budgets. There will be costs for training Local Authority Environmental Health Officers dealing on the Regulations although these will not fall to HSE. HSE guidance will include generic risk assessments that many employers will be able to use without needing the services of a consultant. HSE will commission research, in collaboration with UK industry associations, to establish suitable vibration data (to an agreed measurement protocol) for as wide a range of equipment as possible. The data will be published in guidance in the form of generic risk assessments.

160. Provision of good vibration exposure data should help to identify where risk is likely to exist and encourage appropriate action to control risk and achieve compliance (especially by SME's).

Costs

161. There will be costs to HSE of around £300,000 allocated from the research budget for the WBV research on exposure levels. The cost of training HSE inspectors on the new regulations is expected to be around £65,000.

162. Additional administrative costs will be contained within existing resources. The cost of printing the planned leaflets and booklets is estimated to be around £45,000. We have assumed this to be split equally between both the hand-arm and whole-body proposals.

Annual Undiscounted Costs

163. Table 2 below shows the annual undiscounted costs.

Table 2 Annual undiscounted costs in £ millions.

	Yr0	Yr1	Yr2	Yr3	Yr4	Yr5	Yr6	Yr7	Yr8	Yr9
Min	120	119	133	142	156	208	222	232	247	256
Max	236	235	260	281	306	425	452	474	502	524

Costs for a typical business

164. A typical business is assumed to employ about 100 workers of whom 80 are exposed below the exposure action value of 0.5 m/s² A(8) and 20 exposed between 0.5 and 1.15 m/s² A(8). The measures taken to comply with the Regulations consist of: in-house vibration assessments for 4 workers exposed above the action value, information for all workers exposed above 0.5 m/s² A(8), establishment of an in-house programme of control measures and measures to reduce the vibration exposure. The cost over ten years is estimated to be around £1,700 in present value terms.

EQUITY AND FAIRNESS

165. During negotiations of the Directive it appeared that the group most likely to have been disproportionately affected by its provisions was the agricultural sector, and in particular agricultural contractors. The reason for this is that drivers of agricultural vehicles may have to drive them for particularly long days during the harvest season to get the crops harvested once they were ready and before they went to seed or bad weather could damage them. During the harvest period 12-14 hour working days were possible for vehicle drivers. Those who work for agricultural contractors would be likely to work these long hours throughout the harvest season (6-8 weeks) as they moved from farm to farm, working against the clock.

166. HSE policy staff gave this particular consideration and met with relevant trade associations such as the National Farmers Union and the Agricultural Engineers Association (AEA) to canvass their views. As a result, HSE delegates to the European Council Social Questions Working Group were able to put forward these issues and to negotiate for a more realistic exposure limit value for the WBV Exposure Limit Value (approximately doubled from the original proposal) and for an extended transitional period (extended by 4 years to 2014) specifically for agriculture.

167. Additionally, HSE funded collaborative research with the AEA to measure WBV levels on a range of typical farm vehicles to establish whether the exposure

limit value would, in fact, place restrictions on farm vehicle operations. The results are to be published on 17 February and these are expected to show that most agricultural tasks will be able to continue without exceeding the exposure limit value if HSE's guidance is followed. The transitional period to 2014 is expected to provide the opportunity for the agricultural sector and the agricultural machinery manufacturers to develop solutions to any remaining problem areas.

IMPACT ON SMALL BUSINESSES

168. Four out of ten companies confirmed having workers exposed to WBV. They represented the farming, quarrying and construction sectors. One firm stated that exposure was at a relatively low level, and therefore the Regulations would have a negligible impact on costs. However, the other three companies saw the Regulations affecting them disproportionately. Small farms operate high-vibration machinery 24 hours a day during harvest. Limiting the length of time a worker can operate vibrating machinery would mean hiring more labour at the height of the seasonal labour shortage, since it is generally not possible to rotate workers between activities on a small farm. Another firm suggested that increased paperwork (reading HSE guidelines, contacting the vehicle manufacturer about vibration levels, keeping records of assessments) would impose a disproportionate cost.

169. One of the companies suggested that most small businesses could not afford the expensive equipment that causes WBV, and usually employ a contractor to do this part of the work for them. This suggests that any contractors that are also small firms would be particularly affected. One such contractor said that the exposure limits would be very costly: again, since all workers are involved in the same activity, it would be impossible to rotate them. Regular vibration assessments would be very costly in terms of time.

170. Altogether, three firms said that external consultants would need to be called to conduct risk assessments. However, it is the view of HSE that, in practice, these costs will not be as significant a burden as suggested by respondents. HSE will issue generic vibration risk guidance that should eliminate the need to employ consultants in many cases. This simplified approach will also limit paperwork costs to basic record keeping, which will be proportionate to the number of workers in the firm. Costs such as designing a programme of control measures, and conducting vibration assessments will only recur if there is found to be significant vibration exposure. Other small firms will face these costs after long intervals. The overall impact on small firms will not be disproportionate.

Uncertainties

171. There is a large degree of uncertainty over the cost to business of reducing exposure. This cost depends on the measures employers will take to comply.

SUMMARY

172. In present value terms, over a ten-year period, costs may be between 2 and 3 times the benefits. Although we are unsure about the precise number of individuals who will benefit from the Regulations, it is extremely unlikely that the additional cost of these Regulations would be offset by health benefits.

Table 3: Summary costs and benefits for WBV (2001/02 prices)

	1st year cost (£m)	10 year cost (present value) (£m)	10 year benefit (present value) (£m)
Assessments (IC)	4 - 5	7	
Information (IC)	8	69 - 70	
Preparation of programme (IC)	8 - 19	15 - 26	
Reducing exposure (PC)	101 - 205	1,271 – 2,585	
Plus prohibition (PC)	-	175 – 402	
Personal protection (PC)	-	-	
Leaflets & Booklets	0.023		
TOTAL:	120 - 236	1,538 – 3,091	521 – 1,314

NB – totals may not add due to rounding

IC – Implementation costs (those costs not directly related to the policy goal, and as such are seen to represent the “red-tape burden”)

PC – Policy costs (those costs that are directly attributable to the policy goal)

COMPETITION ASSESSMENT

Industries affected by WBV hazards

173. The costs of the Regulations should mostly be proportionate to the size of the firm and to the extent that vibrating machines are used. Risk assessments/controls should be quick and simple for small firms with a small number of machines or where machine use is less intense because small firms generally do a wider range of tasks per person than large firms. Large firms might find the risk assessment more resource intensive than small firms, but should have the infrastructure to manage it more easily. HSE will simplify risk assessment for all employers by providing generic vibration data and risk assessments. Most employers are not expected to measure vibration.

174. Employers will need to consider risks from vibration and to manage them. This might involve changing work processes/managing machine use differently, but the changes will be marginal and should not affect the market structure by putting firms out of business.
175. All firms, new and existing, will need to do risk assessments and to introduce suitable risk controls. New firms at startup will have the opportunity to buy new machines of latest/better design to minimise vibration risks. Although the initial investment in machines could in some cases be higher, there will be a longer term saving in not having to replace machines early when the transitional periods end.
176. Technological change in all the industries affected is marginal, particularly with respect to vehicles.
177. Overall, the impact of the Regulations would be restricted to machine selection, use, and maintenance and other risk controls. They would not substantially alter products, their cost, quality, range or where they are made or supplied

Suppliers

178. Some UK suppliers are reasonably big in the market, although a lot of suppliers are outside the UK. No supplier is likely to have more than 10% market share. Some costs might be incurred in the development of new designs. The few UK firms are fairly large and should handle the costs.
179. Vibration performance is unlikely to be the most important marketing factor. Price, quality, efficiency and after-sales service will be the dominant factors, so the Regulations will not have a major impact on the survival of suppliers, or on the structure of the equipment market. As far as hire firms are concerned all the technological gains have already largely been introduced, so the Regulations will not alter the hire market.
180. New firms may enter the market with a new, patented system to reduce vibration, which might give them a market advantage, although this would involve development costs. Alternatively they might enter the market with tried and tested technology, thereby foregoing development costs but also the market advantage.
181. Overall, HSE expects no substantial impact on competition.

Summary of joint Costs and Benefits for HAV and WBV (2001/02 prices)⁴²

PC – Policy costs

	1st year cost (£m)	10 year cost (present value) (£m)	10 year benefit (present value) £m)
Assessments (IC):	10 - 12	16 - 17	
Information (IC):	14	120 - 121	
Preparation of programme (IC):	21 - 36	62 - 77	
Reducing exposure (Including Prohibition) (PC)	101 - 205	1,812 – 3,535	
Personal protection (PC):	1	12	
Health Surveillance (IC):	55 – 91	354 - 535	
Leaflets & Booklets	0.045		
TOTAL:	201- 358	2,377– 4,300 Plus other unquantifiable costs relating to reducing exposure	1,235 – 2,742

IC – Implementation costs

Note. The cost to benefit ratio for HAV and WBV jointly is in the range of 1:1 to 3.5:1.

⁴² Due to rounding, constituent parts of this table may not sum to the total shown.

Evaluation

182. Baseline data for Great Britain on numbers exposed to hand-arm and whole-body vibration, levels of exposure and ill-health are held in Contract Research Report 232/1999. This is broken down by industry, occupation, age and sex, tool and vehicle type.

183. In order to evaluate the Vibration Regulations, which will be introduced in July 2005, it is proposed to repeat the survey in 2009. This will enable comparisons to be made which should reveal the impact of the new regulations, taking into account any structural changes such as reduction or expansion in particular industries and occupations.

184. Additional data on employers' risk management of hand-arm vibration exposure is available in the form of the results of a survey of around 500 employers carried out during the "Good Health is Good Business" campaign in 1998. This survey looked at employer awareness of the hazard, whether risk assessments had been done, the effectiveness of risk control programmes and whether health surveillance programmes had been introduced. A similar survey will be carried out for both hand-arm and whole-body vibration in 2009 to compare employer knowledge and compliance.

185. The regulations are likely to place indirect pressure on equipment manufacturers, through customer demand, to design and market lower vibration equipment and it may be helpful to obtain data from manufacturers on the introduction of such new designs and their take up by employers, if it is available and they are willing to supply it.

186. Some small scale, intermediate surveys may be useful a couple of years after the regulations are introduced, say in 2007, to assess whether there are early signs of change as a result of the regulations and guidance and whether any further action is needed to stimulate improvement

Enforcement And Sanctions

187. Depending on the industry sector concerned, the regulations will be enforced by either the HSE or local authorities.

188. Non-compliance will be identified by responding to queries raised, investigating accidents and incidents, and routine checks by inspectors. Where appropriate enforcement action may be taken in accordance with the HSC Enforcement Policy Statement.

189. The Health and Safety at Work Act 1974, section 33 (as amended) sets out the offences and maximum penalties under health and safety legislation.

Summary and recommendation

190. The proposed regulations are expected to improve the management of risks from vibration, particularly from hand-arm vibration, which is known to cause disabling disease across a wide range of industries where hand-held power tools are used extensively. While the risks from WBV are less clear-cut, it is known to be one of a number of contributors to lower back pain in workers, one of the main causes of

working days lost in British industry. Better management of WBV should contribute to reductions in the numbers of workers affected by this widespread health problem.

191. The 10 year costs for these Regulations (see table on page 35), adjusted to take account of the results of the public consultation, are estimated to be between £2.4 and £4.3 billion while the 10 year benefits are estimated to be between £1.2 and £2.7 billion. The ratio between costs and benefits is between 1:1 and 3.5:1.

192. The concerns raised in the public consultation with particular regard to the practical difficulties and costs of measuring or assessing vibration exposure have been given careful consideration which has resulted in a substantially reduced estimate of how many employers would need to do such detailed assessments. Simpler and cheaper alternatives are available which are appropriate for the great majority of employers and these will be strongly promoted in HSE guidance. This re-appraisal has produced significant reductions in the costs likely to fall on industry.

193. Member States are required to implement the Directive fully. However there are several important areas where they have a choice about how they implement. The available options were set out in the Consultative Documents. The Regulatory Impact Assessment is based on the options that were chosen by the Health and Safety Commission, taking account of the results of that consultation. Broadly these options were to:

- Make available to all industry sectors the five year transitional periods for the exposure limit values (to 2010);
- Make available to the agriculture and forestry sectors the additional four years transitional periods for the whole-body vibration (to 2014);
- Use the A (8) method for setting the daily vibration exposure action value for whole-body vibration;
- Make the transitional periods available to employers using existing equipment first provided to employees (including second-hand and hired equipment) before 6 July 2007;
- Delegate to individual employers the authority to use the weekly averaging of personal exposure rather than set up a central approval system administered by HSE;
- Advise that formal health surveillance is not appropriate for whole-body vibration, but to recommend a voluntary, informal system of health monitoring for low-back pain.

194. These options provide industry with a reasonable period of time (5-9 years) to adjust their working methods to achieve the exposure limit values set out in the Regulations. They also avoid the need for unwieldy bureaucratic systems for authorising use of the various derogations described above. This does not mean that employees will be unprotected from vibration health risks during these periods. The other requirements of the Regulations, for example the risk control actions required of employers if the personal daily exposure action value is exceeded, will be in force from July 2005. These will ensure that employers introduce adequate controls and that they provide employees with HAV health surveillance from that date.

195. While not implementing the options mentioned would not have significant impact on the benefits, it would on the other hand create additional costs to society. If full use of the transitional period were not made, employers would have to take drastic action to reduce exposure levels. The immediate replacement of equipment

would create high costs to employers. Furthermore, HSE' decision not to implement health surveillance for whole body vibration provides substantial cost savings. Estimation for this option gives a cost of between £564.3 million and £866.9 million over ten years present value.

196. It is recommended that the Minister agrees the Regulatory Impact Assessment, including the options described above, which the Health and Safety Commission believes are the right ones in terms of practicality, effectiveness and avoiding unnecessary costs to industry.

Ministerial Declaration

I have read the Regulatory Impact Assessment and I am satisfied that the benefits justify the costs.

Signed by the responsible Minister

Chris Pond

Date 4 April 2005

Contact: Brian Coles

HSE Hazards and Technical Policy Division 2.

Floor 6, North Wing, Rose Court, London, SE1 9HS

Telephone: 020 7717 6893

Mail: Brian.Coles@hse.gsi.gov.uk