

DANGEROUS SUBSTANCES AND EXPLOSIVE ATMOSPHERES **REGULATIONS 2002 (DSEAR)**

REGULATORY IMPACT ASSESSMENT (POST-CONSULTATION)

PURPOSE AND INTENDED EFFECT

Issue

1. This regulatory impact assessment looks at the implications of the Dangerous Substances and Explosive Atmosphere Regulations (DSEAR). These Regulations are intended to implement the safety aspects of Council Directive 98/24/EC - the Chemical Agents Directive (CAD) and the requirements of Directive 1992/92/EC - the Explosives Atmospheres Directive (ATEX).
2. CAD requires employers to protect workers from certain risks arising from chemical agents present in the workplace and from work activities involving chemical agents. The Directive is concerned with fire, explosion and health risks arising from chemical agents and applies to all industrial and commercial sectors. ATEX requires employers to protect workers from the risk of explosives atmospheres. As a flammable or explosive substance or dust must be present to create an explosive atmosphere there is considerable overlap between CAD and ATEX.

Risk assessment

3. DSEAR applies to any substance or preparation (mixture of substances) with the potential to create a risk to persons from energy releasing events. Many of the substances DSEAR applies to will also create a health risk, for example many solvents are toxic as well as flammable. DSEAR does not address these health risks, which are instead dealt with in the main by the Control of Substances Hazardous to Health Regulations (COSHH). COSHH is being amended to implement the health requirements of CAD.
4. DSEAR is primarily concerned with harmful physical effects arising from thermal radiation (burns), over pressure effects (explosion/blast injuries), and oxygen depletion effects arising from explosions (asphyxiation). The number of fatalities reported under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) over the past five years as a result of these three effects are shown in the table below. The fatalities average 18 per year over the period, however it should be noted that some of these incidents will not involve dangerous substances. This is addressed in more detail in the benefits section.

Table 1: Fatal injuries reported under RIDDOR, by kind of accident

Kind of accident	Year						Average
	95/96	96/97	97/98	98/99	99/00	00/01	
Exposure to fire	5	5	2	3	7	2	4.0
Exposure to explosion	8	7	6	6	2	1	5.0
Asphyxiation*	10	9	7	9	6	8	8.2
Total	23	21	15	18	15	11	17.2
* Note: the figures for asphyxiation also include drowning, which is not under scope of DSEAR							

5. There are also an average of 190 major injuries and 600 injuries resulting in over three days absence reported to HSE from the above effects each year. Allowing for under reporting using a scale factor based on RIDDOR reports and Labour Force Survey (LFS) injury estimates¹, these figures increase to an estimated 400 major injuries and 1,400 over 3-day injuries occurring each year. HSE also requires certain dangerous occurrences involving dangerous substances but resulting in no injury to be reported under RIDDOR. There is an average of 1,100 of these involving dangerous substances reported to HSE each year.
6. Incidents specifically involving explosive atmospheres are contained in the above totals, and continue to constitute a significant safety risk. HSE's incidents database shows that about 70-100 incidents are reported each year which involve explosive atmospheres. In a study of one year's incidents, for example, HSE investigated five fatal accidents involving an explosive atmosphere, 16 major accidents and 32 over 3 day accidents. In addition, there were 37 recorded dangerous occurrences that did not involve injury.

Objectives

7. The objective of the proposals is to control risks arising from dangerous substances and explosive atmospheres present in the workplace. DSEAR is intended to protect not only employees at the workplace, but also any other person whether at work or not who may be put at risk. This includes contractors, visitors to the site and others at the workplace, for example members of the public.
8. Current controls on many flammable and explosive substances and the activities in which they are used are contained in over 20 separate pieces of legislation, some of which have been in place for over 50 years. It is intended that DSEAR should replace previous sector specific legislation. This will significantly reduce the volume of legislation on dangerous substances and mean that controls on these substances will be covered by a single set of Regulations.

¹ The LFS indicates that, in 1997/98 there were 380,000 reportable injuries to workers, of which 341,000 injuries were to employees. Employers, however, made injury reports on only 164,000 employees. This suggests that employers reported around 47% of the injuries that should have been reported under RIDDOR in 1997/98.

9. The Regulations will be supported by an Approved Code of Practice (ACoP), incorporating and updating material which was previously covered in the old sector specific legislation. This will provide employers with clear practical guidance on good practice in complying with the Regulations.

Options considered and results of consultation

10. Both Directives will need to be implemented via secondary legislation, and the option of consolidating the existing regulations into a single set of regulations dealing with hazardous substances was broadly supported. There were also a number of options on the scope and interpretation of the new duties. Following the results of formal consultation and further consultation with stakeholders, it has been decided to retain the existing duties relating to the zoning of areas in which explosive atmospheres may occur. As a result, there will be no additional costs associated with any new requirements to do with zoning, although costs may be incurred through increased compliance (this is discussed in more detail in the cost section below).
11. The Health and Safety Commission has also decided that the current exemption from recording the significant findings of risk assessments for those firms with less than five employees will be carried forward into the new legislation. HSC also decided following consultation that the significant findings of the risk assessment should be recorded as soon as is practical after the assessment is made and before the work it relates to can commence.
12. Employers will be required under the current proposals to make information on emergency procedures available to employees and the emergency services. However, following consultation with industry and other government departments, the proposals do not include a proactive duty to do this.

Information sources and technical assumptions

13. Before consultation, a questionnaire was sent to a sample of firms and trade associations in sectors that HSE believes may be significantly affected by the Regulations. The questionnaire was also posted on HSE's website. Fourteen replies to the questionnaire were received (seven from individual firms and seven from trade associations), covering a wide variety of sectors affected by the Regulations.
14. The pre-consultation RIA was published in full in the Consultation Document and many comments were received (we are very grateful for this response). One respondent questioned why a comprehensive survey was not undertaken. This is not usual practice, since such research is better used to evaluate the impact of regulations already in place. The initial questionnaire was considered sufficient to build up key assumptions, which were then tested during consultation and by the small firms litmus test. The cost estimates have been changed accordingly, and all comments of substance are described in detail in the cost section below.
15. Costs are calculated in 2002-03 prices over a ten year period from when the proposals come into force (which is taken to be 2003 for simplicity, although existing workplaces will have until 2006 to comply with some requirements, depending on individual circumstances) and discounted back to present values using a 6% discount rate, in line with HM Treasury guidance. This discount rate still applies despite imminent revised

guidance from HM Treasury which will change these rates, since the consultation on these proposals has already been undertaken. Information on average wage rates was taken from the New Earnings Survey (NES). The NES gives the average hourly wage for managers and administrators of around £16 per hour, to this we add one-third non-wage labour costs to give a full economic cost of £21 per hour. The corresponding hourly rate for health and safety officers is £13 per hour and the full economic cost £17 per hour. We also use a full economic rate for self-employed persons, given self-employed business turnover figures, of £15 per hour. As we emphasise in the following paragraph, this does not reflect the call-out charge of a self-employed person, which would typically be three times as high (i.e. £45 per hour).

16. One respondent to consultation questioned these rates, compared to (for example) HSE inspector's 'charge out' rates of around £100 per hour. It must be emphasised that we use the marginal wage rate when costing the additional time taken to perform duties under most health and safety legislation, since they would generally be a small addition to the work of someone already in post. Any 'charge out' rate would typically be around three times the marginal rate. This is because only around one-third of an inspector's (or a health and safety consultant's) time can be devoted to inspection (or advice), with the remainder attributable to non-chargeable inspection related activity, management and administration, professional development, and other dealings with stakeholders (including meetings with HSE colleagues). However, if consultants need to be engaged, we use an appropriate 'charge out' rate of £800 per day, including report writing.

BENEFITS

Health and safety benefits

17. Many of the requirements of DSEAR are already present in current UK legislation. Where DSEAR goes further than current requirements it is likely there will be safety benefits, although they are difficult to assess. However, the introduction of DSEAR may also cause some companies to re-examine and improve their procedures for dealing with risks from dangerous substances. Compliance with existing legislation may also be increased through the provision of guidance and examples of good practice.
18. In the cost section, we estimate the total impact of the proposals, regardless of whether these costs are in fact attributable to existing legislation, or are prompted by the introduction of DSEAR. In this benefits section, we make a broad estimate of the total economic valuation of the current risk from dangerous substances. This is then compared with the total cost impact of the proposals in the 'comparison of costs and benefits' section at the end of the document. In effect, we are assessing the costs and benefits of *all* further action that may be prompted by DSEAR, including where this is simply increasing compliance with current Regulation.
19. We have identified the number of injuries and dangerous occurrences that are likely to have been due to energy-releasing events (fires and explosions) whether or not caused by dangerous substances in the risk assessment section above. We assume all explosions are under scope of the proposals; however the data on the number of asphyxiations caused by fires and explosions, and the numbers of fires caused (or made worse) by dangerous substances is not available. However, it is important to note that a fire not caused by a

dangerous substance (for example from smoking in a prohibited area) may spread to involve a dangerous substance and therefore significantly increase risks. With respect to asphyxiation, this is more likely to be caused by a dangerous substance in manufacturing than the service sector, simply because of the greater presence of dangerous substances in bulk in manufacturing. Of the injuries in the two sectors, 37% of asphyxiations and 48% of injuries from fires were in the broad industrial sector (the remainder in each case being in the service sector).

20. We therefore assume that 37% of all asphyxiations and 48% of all injuries from fires are relevant to DSEAR. On balance, we believe this provides a reasonable estimate of risks. From the data in the risk assessment above, this indicates that there are around 10 fatalities, 250 major and 800 over 3-day injuries occurring each year as a result of safety risks in which a dangerous substances *may be directly or indirectly involved*, and may either cause or increase the consequences of the event.
21. We convert injuries into equivalent fatalities using standard relative valuations². Given the pattern of non-fatal injuries, taken together these present a risk of the same order in valuation terms as the fatal injuries. The average of 10 fatal injuries and many hundreds of associated non-fatal injuries each year can be taken to be the same as 20 'equivalent fatalities' for valuation purposes. We apply the DETR current valuation of preventing the risk of fatal injury of £1.2 million in 2002 values. The total valuation of this risk is therefore £24 million each year. This is the total safety benefit from injury accidents which could be preventable by the proposals.

Damage only accidents

22. Previous work by HSE has found that the cost of damage only accidents is a very significant component of the total cost of accidents. When compared to the valuation we place on fatalities and injuries, losses in plant, material and production downtime from damage only accidents are estimated to be between one and three times as great, simply because non-injury accidents are far more numerous. Moreover, this range includes many accidents where no or very little loss occurs apart from the person injured (for example, a slip, trip or fall). Accidents involving dangerous substances are likely to be at the highest end of this range, since they will almost always involve some damage, downtime or clean-up. Given that we estimate the losses associated with injury accidents at £24 million each year, this would indicate that the damage only accidents under scope of these proposals would cost businesses a further £70 million each year. This is a maximum estimate of the potential benefit to employers from avoiding the non-injury accidents associated with the proposals.

Catastrophic accident risk

23. Both the monetary estimates above relate to what could be termed small scale events, even though they may result in a fatality. A large part of risk control at large premises involving dangerous chemicals will be aimed at the prevention of a very serious accident, which occurs infrequently, but has very serious consequences. The accident record is unreliable with respect to estimating safety risks, which are typically subject to quantitative risk assessment.

² "The costs to the British economy of workplace accidents...." C40 10/99, HSE Books.

24. The main Regulations applicable to sites with hazards from dangerous chemicals giving rise to these type of events are the Control of Major Accident Hazard Regulations (COMAH). Almost all (if not all) further action taken to control risks at these sites will be primarily attributable to COMAH. However, we include both the costs and benefits of any further action taken at these sites, since further action may be prompted – at least in part - by DSEAR.
25. Research on previous published estimates on the scale of losses incurred following high cost chemical/petrochemical accidents has been undertaken by HSE in conjunction with W S Atkins³. The report found a lack of reliable data in the public domain, and conflict between reported values in cases where data was available. These differences are ascribed to the wide scope of costs involved; commercial sensitivity; changes in monetary values over time; and simple clerical error.
26. However, the report estimated that the total cost of the 20 major chemical/petrochemical accidents since Flixborough was at least £500 million in 1996 prices. Included in these costs are the costs of reconstruction and lost production (as well as the costs associated with any legal action). Costs excluded from these incidents include indirect production costs (such as loss of business, or forced sale of raw material), off-site damage, personnel costs associated with injury events, civil emergency response, and public relation/legal costs (etc). Mitigating this to a certain extent is the fact that damaged plant and equipment would have been replaced at some point in the future. Nevertheless, these costs are equivalent to a figure of around £25 million each year at current values.
27. These published costs would tend not to include the full cost of business interruption. An analysis of 119 events at petrochemical, chemical and refinery sites⁴ concluded that the business interruption losses were on average 2.7 times the property damage losses (with wide variation between the individual cases). This would increase the yearly loss figure to around £50 million on a conservative basis, allowing for some overlap in the coverage of costs between the reports. This figure can be thought of to include the monetary valuation of any fatalities and injuries associated with these accidents, and are the maximum potential benefit from avoiding catastrophic losses associated with the proposals. This is a historical estimate, and in using this figure below we recognise that safety has improved over the last two decades. We assume that future losses (and therefore potential benefits) have already been reduced by half their previous totals, by action already taken over the past two decades.
28. Finally, action to mitigate risks will also benefit members of the public. We do not have details of incidents involving members of the public in sufficient detail to make estimates of the risk from smaller scale events, and we know that no member of the public has been killed off-site as a result of a serious incident in chemical/petrochemical manufacture in the UK since the Second World War. However, quantitative risk assessments do indicate the presence of significant risks, which would be mitigated to some extent by the proposals (or action prompted by the proposals).

³ P Fewtrell (WS Atkins) and I Hirst (HSE, CHID) “A review of high-cost chemical/petrochemical accidents since Flixborough (1974)”, IChemE Loss Prevention Bulletin, 140, 1998.

⁴ Loss Control Newsletter, January 1997.

Other benefits

29. CAD/ATEX will be implemented in all European Union (EU) countries. As a result, all companies operating within the EU who use dangerous substances will have to comply. UK companies may well be among those least affected by CAD/ATEX because many of its requirements are currently contained, at least implicitly, within existing UK legislation. Consequently, UK companies may be less affected than other Member States by the tightening of legislation on dangerous substances. Less stringent regulatory regimes may have provided the UK's competitors with cost advantages in the past, but without a detailed analysis of the current regulatory regimes of other EU countries it is not possible to quantify any benefit.
30. Finally, employers will benefit in the long term by having to refer to fewer (or even only one) sets of Regulations concerning the use of dangerous substances in the workplace rather than the many different sets at present. We are unable to quantify the administrative savings arising; however we expect that these will be sufficient to outweigh any ongoing additional costs of familiarisation or training bought about by specific requirements of DSEAR. All firms, but especially small firms, consistently point to the complexity of regulation as a barrier to compliance. Certain other Regulations will remain in place (for example at major hazard sites and harbours, and all sites with explosives). Nevertheless, we would expect real benefit from the consolidation of existing regulation, especially among small firms.

COSTS

Business sectors affected

31. All business sectors are potentially affected by DSEAR. Those where explosives atmospheres could be present or where there are particular hazards from dangerous substances are likely to be significantly affected. Although we class them as such, many of the requirements of DSEAR are already contained in existing legislation and in general we would not expect a large amount of extra action would be necessary under DSEAR. The sectors significantly affected are mainly in primary and secondary manufacturing industries and also contain companies in the service sector involved in the wholesale/bulk storage of dangerous substances.
32. We have attempted to identify industries that may be significantly affected from Standard Industrial Classification (SIC) codes. These are listed at **Annex A**. Examples of industries significantly affected include chemicals and petroleum products, extractive industries, agriculture, and manufacturers of basic metals. No comments were received on these estimates of employees, firms and workplaces affected, and these estimates are therefore unchanged from our pre-consultation assessment.
33. In terms of industries where the explosive atmospheres may be present (in addition to other hazards posed by dangerous chemicals), the main industries likely to be affected are garages, repair workshops, grain milling, dyestuffs, paints, adhesives, and synthetic

rubber. This is estimated to be around 65,000 firms with employees of which around 30,000 have less than five employees. The firms employ a total of around 2 million employees, although it should be noted that only a small proportion of these employees will actually work in potentially explosive atmospheres. From Census of Employment data, we estimate that these firms operate around 69,000 workplaces with potentially explosive atmospheres, comprising one workplace for some 58,000 small firms, and some 11,000 workplaces for the remaining 7,000 medium and large firms (these estimates allow for known cases where an organisation has many small outlets, such as petroleum retailing, and for very large organisations with many sites).

34. In addition, we estimate that some 106,000 self-employed persons work in these industries. If each self-employed person occupies or shares a workplace, this would add a further 100,000 workplaces to the total, allowing for some cases where self-employed persons will work in partnership. The total number of workplaces with potentially explosive atmospheres is therefore 171,000. This total will largely exclude temporary worksites, such as construction sites.

Table 2 : Numbers of firms with potentially explosive atmospheres

	Self – employed	Firms with employees, by number of employees				Total Employment
		Micro (one to 5)	Small (6-49)	Medium (50-249)	Large (250 +)	
Totals	106,000	32,000	28,000	4,000	1,250	2,200,000

35. Including other firms significantly affected, HSE’s estimates of the total number of firms (including the self-employed) significantly affected by DSEAR are shown in table 3 below. They amount to a total of 180,000 businesses, with around 3.5 million employees, and a further 245,000 self-employed persons. Again, only a proportion of these employees or self-employed will actually work with the dangerous substances.

Table 3 : Numbers of firms significantly affected by DSEAR

	Self - employed	Firms with employees, by number of employees				Total Employment
		Micro (one to 5)	Small (6-49)	Medium (50-249)	Large (250 +)	
Numbers of firms	245,000	98,000	70,000	7,000	1,700	3,770,000

36. There will also be certain sectors where the introduction of DSEAR will have a less significant effect, principally resulting from the introduction of the safety aspects of CAD. Sectors which are slightly affected by DSEAR could include those storing and displaying flammable goods, such as paint and lacquers, in the retail sector or those who may occasionally use flammable solvents as cleaning agents.
37. We also classify as ‘slightly affected sectors’ the transport and construction industries as a whole. Some activities carried out in these industries are likely to be significantly affected but it is impossible to identify them from SIC codes. We assume that the risk to the majority of employees from dangerous substances is slight across the sector as a whole, although some employees may be far more exposed to the particular hazards in question than others. These sectors account for a further 250,000 employing organisations, six million employees, and 860,000 self-employed persons.

New firms and workplaces

38. According to the Small Business Survey, new Value Added Tax registrations are currently 7.5% of the existing stock for business start-ups in manufacturing and 9.5% in wholesale, retail, and repair. Allowing for existing businesses starting up new workshops, we allow for a business start-up rate of 10% of the existing stock in the industries identified above. This would imply a total of 6,000 new employing organisations significantly affected by the proposals each year and some 17,000 new workplaces, including those operated by the self-employed.

Compliance costs to business

39. In the remainder of this section, costs to businesses are discussed by examining those that could be incurred as a result of each individual Regulation. Many of the requirements of DSEAR are already contained either explicitly or implicitly in existing Regulations. Areas where requirements go further than those in existing Regulations and where firms will incur costs are identified below. The introduction of DSEAR may cause firms to review procedures, and in some cases make improvements. Compliance may also increase as a result of increased knowledge and familiarisation with the safety risks from dangerous substances and explosive atmospheres. We also attempt to identify these costs although much of the cost will not be strictly attributable to the introduction of DSEAR as firms should already be complying with existing legislation.

Familiarisation

40. No comments were received on our estimates of familiarisation costs during consultation, and these remain unchanged. Industry will incur costs in becoming familiar with the contents of the Regulations and deciding what action to take. The costs are likely to be greater where firms discover that they have to take some additional action to comply with the requirements of DSEAR, and need to become familiar with specific sections of the Regulations. For the self-employed, we discuss the total time taken to both become familiar with and also to re-assess risks in the section below.
41. For firms with employees who are significantly affected by the Regulations we assume that the process of familiarisation alone takes 2 hours for a micro sized firm, one

half day for a small firm, with medium and large firms requiring one and two days of time respectively. In small/micro firms we assume this process will be undertaken by the manager at a full economic cost of £21 per hour, whilst in medium/large firms it will be undertaken by a health and safety officer at a cost of £13 per hour. This leads to a total cost of familiarisation amongst firms significantly affected of £11.6 million.

42. Costs of familiarisation will be lower amongst those sectors slightly affected by the introduction of DSEAR. Although there may be a small number of firms in these sectors who may need to become familiar in detail with the Regulations, for the remainder the exercise is likely to be a relatively simple affair. We therefore assume that the average time needed for familiarisation is half that of businesses significantly affected. Total costs to firms in these slightly affected sectors are accordingly estimated at £6.4 million. Costs of familiarisation with DSEAR for *all* employing organisations affected are therefore estimated at a total of £18 million, incurred in the first year of the appraisal period.

Regulation 5: Risk assessment

43. DSEAR requires employers (or self employed persons) to:

- a Carry out a risk assessment before commencing any new work activity involving dangerous substances;
- b In the case of an employer with 5 or more employees, to record the significant findings of the assessment at the time it is made including:
 - The measures (technical and organisational) taken to eliminate and/or reduce the risks;
 - sufficient information to show that the workplace and the work equipment will be safe during operation and maintenance;
 - details of any hazardous zones and any measures to ensure co-ordination of safety procedures where employers share a workplace;
 - arrangements to deal with accidents and emergencies;
 - measures taken to inform, instruct and train employees.

44. HSE believes the above will make explicit a duty that is already implicit in the Management Regulations. However, some companies may need to make a more detailed assessment, or revisit an existing one. The majority of respondents to the questionnaire stated that their companies did already assess the risks from all dangerous substances and work activities involving those substances. However, around half of the responses from individual firms indicated that some additional action would be necessary, such as extending the risk assessment to include other substances or checking current risk assessments to ensure they complied with the requirements. The responses from the trade associations roughly followed this pattern, but with respondents saying that the amount of work needed to be done would vary across companies. Trade associations also reported that larger firms were more likely to have adequate risk assessments.

45. In the initial questionnaire, the time estimated by respondents where action would be necessary to ensure compliance with the risk assessment requirements of DSEAR varied widely, from 4 hours per site given by a petrol retailer and an animal feed manufacturer, to around 100 hours for a large firm involved in the supply of liquid petroleum gas (LPG). One very large utility company indicated that the process would take several hundred days.

46. From these responses, we calculated the average time that would be needed to complete the additional work on the risk assessment *on a per employee basis*. Figures ranged from a high of around 1 hour per employee, to a low of approximately one tenth of this amount. We initially took the mid-point of this range - one half hour per employee - as being approximately representative of those firms who are significantly affected by the requirements of DSEAR. This gave an average cost of around £10 per employee.
47. Many respondents to the consultation document felt that we had generally underestimated costs. Some comments related more to control costs, which are discussed below. However, several respondents thought that risk-assessment related costs would be higher. One respondent pointed out that DSEAR increases the scope of dangerous substances (to a wide range of substances with higher flashpoints). An industry association maintained that in-depth written risk assessments would now be required where historically a generic assessment was made. The association also pointed to the ongoing costs of updating and auditing the assessments.
48. The original figure of £10 per employee converts into £1,000 of staff time for a firm with 100 employees. Using the marginal wage costs at paragraph 15, this converts into six days of time for a health and safety specialist. As already stated, the use of marginal wage costs relates to the fact that this work will be undertaken by an existing employee. However, to take account of comments received during consultation, we now double this average cost to £20 for each employee of the company – equivalent to twelve full-time days for a firm of 100 people.
49. These costs cannot be estimated more precisely in advance of formal evaluation of the regulations, after they have been in place some time. We consider that this time allowance will be more than sufficient for revising and enhancing (if necessary) existing risk-assessments, including the written documentation (this is not required for firms with fewer than five employees). HSE has previously estimated that the costs of compiling a risk assessment ‘from scratch’ in high hazard industries (such as those which are significantly affected by DSEAR) are around £100 per employee. An allowance of 20% of the predicted initial cost in compiling the assessment seems reasonable.
50. We do not expect that all risk assessments will have to be completely re-written, in fact we only expect additional action to be taken in half of cases. Some respondents pointed out that costs in their industries will be higher. For example, any utility supplier is likely to have many ‘workplaces’ – some of which will be largely unmanned, but all of which already have generic risk assessments. Costs will undoubtedly be higher for companies in these industries, and the average will not be representative. However, we believe our estimate of the total number of workplaces is broadly correct, and includes the utility companies in the total. As stated in the original assessment, the cost per employee will be higher than the average in particularly hazardous areas, and may also be higher in some small firms.
51. At major hazard sites, any action taken in this regard can also be considered as attributable to COMAH, although it is likely to be prompted by DSEAR. At offshore installations, this can be thought of as also attributable to the Offshore (Safety Case) regulations. We have not explicitly costed action at high hazard and offshore installations, although we believe our cost allowances are broadly applicable. A recent regulatory impact assessment of the COMAH regulations found that the cost of compiling a risk-assessment and major accident prevention plan was in the order of £70,000 for a ‘top-tier’ COMAH site. If there are normally 500 people on site, this is equivalent to around £140

per employee. We have allowed £20 per employee for any revisions as a result of DSEAR, which seems reasonable given that we are not expecting a wholesale re-writing of existing documentation. Costs will be higher at some COMAH sites, and also higher than average in the offshore industry as a whole (according to a detailed evaluation, the costs of compliance per employee with the risk-assessment elements of the Offshore (Safety Case) regulations are typically around twice as high as on-shore COMAH sites). At the same time, even at high hazard sites, we would expect the time required would be lower than the average where only a very small proportion of the firms employees work in explosives atmospheres.

52. A cost of £20 per employee for the 50% of the businesses needing to look again at their risk assessments (employing a total of 1.7 million employees) gives a total cost of £34 million, incurred in the first year of the appraisal period. For slightly affected sectors, we continue to assume that costs per employee would be 10% of those for businesses significantly affected. This is due to the fact that many of these businesses may have fewer (if any) employees who are exposed to risks from dangerous substances and also the risk to the majority of these employees will be generally much lower. This leads to a total cost to slightly affected firms of revisiting their risk assessment of around £12 million ($£20 \times 10\% \times 6$ million employees).
53. We have far less information for the costs incurred by the self-employed, and we received no significant comments during consultation. We initially allowed a total time of two hours for a significantly affected self-employed person to both familiarise themselves with the Regulations and consider the risks arising from their activities (a written assessment is not required). For self-employed persons in industries who are only slightly affected, we initially allowed allow one-tenth of this time in total, recognising that this may be concentrated amongst particular occupations in these slightly affecting industries (for example self-employed welders in the construction industry). However, we now double both these time allowances, in line with our increase for employers. This gives a total cost of £20 million, calculated as follows:

$$[245,000 \times 4 \text{ hours} \times £15] \text{ plus } [860,000 \times 10\% \times 4 \text{ hours} \times £15] = £20 \text{ million}$$

54. New firms and sites that become newly operational will not incur additional cost in preparing an appropriate risk assessment, over and above those incurred under existing legislation – in fact we believe that the process will be easier. The total initial costs to firms affected by DSEAR in revisiting their existing risk-assessments are therefore estimated at £60 million in first year of appraisal period. There will be recurring costs for both new and existing firms in revising their existing (or newly compiled) risk assessments over the appraisal period. We take these to be around 10% of the initial cost, giving a total net present value of just over £100 million over the ten years after the regulations come into force (which we round to £100 million given the uncertainty in the estimates).
55. The risk assessment should be recorded as soon as practical after the assessment has been made, and before work commences. When asked about the timing of the risk assessment, respondents to the questionnaire did not report any cost implications, and none were reported during the formal consultation.

Regulation 6 : General safety and protective measures

56. This Regulation reflects the well understood safety hierarchy of elimination or control/mitigation, the contents of which are present either explicitly or implicitly in existing legislation. The DSEAR questionnaire asked what additional action companies may take to reduce risks, either through elimination/substitution of the dangerous substance or measures to control/reduce the risk.
57. The vast majority of the respondents to our initial questionnaire indicated that they would not consider the elimination or replacement of any of the dangerous substances present in their workplace. For many, either the dangerous substance is integral to their business, or they are involved in supplying the dangerous substance (e.g. petrol retailers) rather than using it as part of a production process. Two responses from firms who use dangerous substances during production said that they would consider substitution or replacement of dangerous substances but were unable to supply detail regarding likely action. In addition, two respondents to the small firms litmus test said that they had considered switching to the use of water based (rather than solvent based) paints, but had not done so on grounds of cost.
58. Several firms and trade associations indicated that the use of technical measures would be considered for controlling risks from explosive atmospheres. Examples included dust suppression/extraction systems, leak detection equipment and redesign of intake systems for raw materials. Other control measures that may need to be adopted would include close circuit television (CCTV) facilities to monitor workers in potentially explosive atmospheres.
59. Gas monitors cost around £500 including installation. CCTV devices can be installed outside the potentially explosive atmosphere, at a cost of about £2,000, or inside the potential atmosphere, which will require more sophisticated equipment, costing about £10,000 (these estimates are based on information from manufacturers).
60. Dust monitoring requires sampling to be undertaken. A small business would typically require one day of a consultant's time with an average of 10 samples at a total cost of around £800. A medium sized business would require a consultant and a technician for one day plus the analysis of about 20 samples, at a cost of around £1,200. A large business would typically require the services of a consultant and a technician for 2 days and the analysis of about 40 samples at a cost of around £2,500. In terms of control, a dust extraction unit costs between £5,000 and £10,000 including installation, with maintenance costs of about £500 annually, and an opening booth with local exhaust ventilation (LEV) is estimated to cost between £20,000 and £40,000 with an annual maintenance bill of around £3,000.
61. Several respondents to the consultation pointed to the costs of control measures, but without supplying any details of further costs. At the time of consultation, we expressed the view that measures would only be justified on a risk basis for a very small proportion of the potential premises affected. In particular they are unlikely to be required of the vast majority of small organisations. Larger organisations are already likely to have sufficient control measures already in place.
62. We estimated likely expenditure as being roughly £1,000, (covering, say, two gas monitors or dust sampling together with simple control procedures - not LEV) for 10% of small firms, and perhaps £20,000 for 10% of large workplaces (allowing for substantial

monitoring or extraction techniques). Finally, some self-employed persons, say 10%, who work at fixed premises may incur some expenditure, we suppose around £500 for one monitoring device.

63. This gave a total expenditure of £32.4 million across affected industries as a whole, calculated as follows:

$$100,000 \times 10\% \times £500 + 58,000 \times 10\% \times £1,000 + 10,800 \times 10\% \times £20,000 = £32.4\text{m}$$

Allowing for annual maintenance of 10% of initial costs, these costs would total some £54 million in present values over ten years.

64. We cannot give more precise estimates in advance of the regulations being assessed and amendments to risk-assessments actually being made. Some respondents have said this is an under-estimate of control expenditure. However, we have now re-assessed evidence from the detailed evaluation of the Control of Substances Hazardous to Health regulations (COSHH). Although this concerns substances hazardous to health, and was conducted ten years ago, we believe that it still provides a useful indication of expenditure (in time and money) on risk assessment itself versus expenditure on control measures.

65. The COSHH evaluation found that, if anything, significantly more expenditure (mostly management and specialist time) was spent on the risk assessment process than actual control measures. This was true for both small and large firms. We have calculated the initial costs of revising and amending risk assessments to be £60 million in total. This indicates that we would not expect spending on control measures to exceed this amount, and indeed we might expect it to be significantly less. Our initial estimate of spending on control measures of £32.4 million across industry seems reasonable in this context, although it is an approximate estimate only.

66. Much, if not all, of this illustrative cost is attributable to existing regulation, even if it is prompted by DSEAR. Businesses starting up may incur further expenditure along these lines, totalling £33 million over ten years in present terms (given a workplace turnover rate of 10%, and allowing for recurring costs to these firms), again prompted by, rather than attributable to, DSEAR.

Signage of places where explosive atmospheres may occur

67. Employers are required, where necessary, to mark entrances to zoned areas with a specified 'EX' sign, unless the 'residual' risk after control measures are put in place is thought to be insignificant. Signing is designed to further reduce risks, and is not required if a sign will not help to reduce the risk. Where an explosive atmosphere may be present at many different parts of a site it may be more appropriate to mark the entrance to the whole site provided that the precautions to ensure safety apply throughout the site.

68. The new sign would be required at those sites currently zoned as well as those we have identified as having to undertake further work. Several respondents to our questionnaire provided information in this area. Both the number of signs required at each site and the cost of putting up signs (including materials and labour) varied significantly. The average number of signs needed at each site was thought by respondents to be around five. Based on the responses, we allow a cost of £50 per sign including labour (which is a reduction from our previous figure of £100), although it should be noted that unit costs quoted by respondents

varied from £10 to £200 (£10 is thought to be far too low for a durable and firmly secured sign, including labour).

69. If signing on this basis is required for three-quarters of all workplaces operated by employing organisations significantly affected by explosive atmospheres, this would indicate costs of $69,000 \times 75\% \times £250 = £13$ million. For the remaining workplaces, we assume that control measures are able to almost fully mitigate risk, or signing is not effective at reducing risks. We believe that costs would be less for those workplaces operated by the self-employed, who would typically require two signs, at a cost of £100. If three-quarters of these workplaces require signing, this would indicate costs of $100,000 \times 75\% \times £100 = £7.5$ million.

70. Some 20% of this cost would be re-incurred each year, either as new workplaces become established, or existing workplace characteristics change. Total present costs over ten years are £48 million.

Verification of explosive safety

71. This requirement relates only to new sites, although half of all respondents to our questionnaire said they would be affected by the requirement. One respondent indicated that external expertise would be required, whilst another indicated that adequate knowledge existed in-house. These responses were made on the understanding that zoning requirements would change, and may have been influenced by that. Nevertheless, several small firms we spoke to during the small firms litmus test received outside health and safety advice, and expected a visit lasting between $\frac{1}{2}$ and one day would be required on introduction of the regulations.

72. One respondent to the questionnaire suggested a cost of £250 to £300 per site using in-house expertise coupled with guidance. However, following comments during consultation, we allow £800 if an external adviser is employed for this task, and we assume this is for one half day's time on site and one half day for a written report. If in-house expertise is used in half of cases, and external advice in the other half, this would lead to an average cost of around £500 for the verification and assessment of zoning of all new sites (taking a central figure between £300 and £800).

73. It could be argued that costs would be expected to be higher for larger sites. However, we would expect all risk assessment work to already be in place at large sites under a range of current regulation (including COMAH, and explosives legislation). An allowance of £500 can be taken as the additional cost of a final verification of arrangements which are already in place and well documented, which we believe should take no longer than one day. If further work is required as a result of verification, this is already included in our cost estimates above.

74. For the 6,900 new workplaces with employees established each year, this would indicate annual costs of £1.7 million. Workplaces operated by the self-employed may be more straightforward to assess, but adequate in-house expertise is far less likely to be present. In this case, we allow the same cost as for workplaces operated by employing organisations. Given a workplace turnover rate of 10% (which is the same as saying that the average workplace is in use for ten years), we would expect 10,000 new workplaces operated by the self-employed in which explosive atmospheres are a significant hazard each year. The annual cost of verification would be £2.5 million. Total annual costs are

estimated at £4.2 million. Over ten years, these costs are equivalent to £30 million in present terms.

Regulation 9 : Provision of information, instruction and training

75. Much of the information that DSEAR specifies should be passed to employees should already be provided under existing legislation. The majority of both trade associations and individual firms who responded to our questionnaire did not expect any additional costs in providing information to staff, although one respondent did report “considerable” costs. No comments were received on the issue of training and competency during consultation, and our estimates remain unchanged.
76. Almost all firms expected to undertake some additional training, if only to familiarise key staff with the new legislation. All respondents reported that formal training would be required of certain key staff at each site, typically lasting between one-half and one day. It was thought by respondents that other employees could be made familiar with essential aspects of the new legislation and provided with any additional information during routine staff briefing sessions at very little additional cost. Overall, respondents reported that around 5% of their staff would need formal training, principally technical specialists, and managers of those employees actually working with dangerous substances in particularly high hazard areas.
77. We estimate that some 3.5 million employees work in firms significantly affected by DSEAR, and therefore some 175,000 may need formal training. Based on the responses to our questionnaire, we believe that this should take on average one-half day at a full economic cost of around £100 including the cost of training provision. In some instances a full day may be required, but for some staff two hours formal on site training should be adequate. This would indicate a one-off cost of £17.5 million. We do not have any information on the extent to which additional training would be undertaken by the self-employed.
78. Some six million employees work in industries which will be affected by DSEAR, but not to the extent of the specific industries identified above. In many cases, it is possible that formal training would not be required of any personnel, if the organisation does not use dangerous substances to any great extent. Some sectors, such as construction, will involve certain specific activities that use significant amounts of dangerous substances, whilst most activities will not involve the use of dangerous substances to the extent that DSEAR would have a significant effect. By the same token, some individual firms in construction may be affected significantly by DSEAR, whilst some may only be slightly affected.
79. For simplicity, we assume that five personnel in each medium size organisation and ten personnel in each large organisation in these industries require formal training, these being either safety specialists or managers of those personnel involved in work involving dangerous substances. For small firms with between six and forty nine employees, we assume that on average one person requires formal training. Actual numbers will vary considerably across companies, and could be several dozen in large organisations. Given the number of firms in each size band, this would indicate some 90,000 further personnel requiring formal training.

80. There are also some 200,000 ‘micro’ firms and almost 900,000 self-employed persons in these industries. Many will not need any formal training, but to allow for those that do, we increase the total number needing training by a further 60,000 to 150,000. The one-off costs in those industries slightly affected (overall) by DSEAR would therefore be around £15 million.
81. Since this training will focus on changes to existing requirements, we do not expect any *additional* recurring training costs associated with DSEAR, since training should be normally provided to new entrants (and refresher training to existing personnel) under current legislation - in other words we do not expect DSEAR to lead to a general increase in the volume of training undertaken on a long term basis, instead we expect that future training would be adapted to accommodate the Regulations. If certain aspects of DSEAR do lead to a slight increase in the amount of material covered in a typical training course, we believe this time will be more than outweighed by reductions in time spent addressing the many different pieces of regulation that exist at present.

Regulation 10 : Labelling of pipes and containers

82. The majority of firms that responded to our questionnaire said that they would incur costs in adequately identifying containers and pipes containing dangerous substances, however one respondent said that this was already done. This could suggest that marking under existing legislation is not being carried out rather than that new action will be needed under the requirements of DSEAR. No further advice on this was received during consultation. There is an express derogation in DSEAR to say that identification is not required where other legislation applies, and we believe that further action would almost exclusively concern fixed pipes in the workplace rather than containers of any sort. The costs of briefing staff are already identified under regulation 9 above. However where further action concerning pipes is undertaken, at a typical larger workplace we expect this would take no more than one day’s time, at a full economic cost of £200 including an allowance for materials, where (for example) colour coding or explicit labelling is used.
83. This Regulation will primarily affect manufacturing organisations and those distributing dangerous substances in bulk, including the liquefied petroleum gas and the petroleum industry - all of whom have been identified as significantly affected by DSEAR. If the majority of the of the 245,000 employing organisations (some 300,000 workplaces) do need to take some further action on identifying pipes, say 200,000 individual sites, this would indicate one-off costs of around £40 million. We believe that the self-employed will be less significantly affected by this proposal, but are unable to estimate costs.

Regulation 11: Duty of co-ordination

84. This duty applies to workplaces which are shared by two or more employers. Four out of seven company respondents stated that they do share at least some workplaces, and three of the six trade associations said many of their members did. However, several respondents stated that this was already done, presumably under the existing duty in MHSWR to co-operate and co-ordinate health and safety arrangements. Two respondents

gave costs of £1,000 and £1,500 per site, although it was not clear whether this expenditure has already been incurred and would therefore be largely attributable to MHSWR.

85. Where additional action is prompted by DSEAR, there would be some cost ensuring that any additional measures are co-ordinated across workplaces. Again, both the additional action and duty of co-ordination is not attributable to DSEAR. The example costs quoted by respondents do seem high in this case, since we have estimated that the risk assessment and associated administrative expenditure in a particular workplace will be not more than several thousand pounds at most. We expect co-ordinating this action, if required, to cost only a small proportion of the total administrative cost.

Compliance costs for a 'typical' business

86. For a business already fully compliant with existing legislation, we expect little or no additional costs. Most businesses with potentially explosive atmospheres will be affected by the new signing requirements, and perhaps need to undertake some labelling of pipes and training of personnel. We estimate this would cost around £500 to £1,000 for a typical site, including familiarisation with the proposals.
87. Where businesses are not fully compliant with existing legislation, these businesses may review and enhance their current arrangements, seek external advice, put in further control measures and undertake some further training. For a medium size business (200 employees, one site) with potentially explosive atmospheres, total costs are estimated at around £10,000. The majority of this cost relates to risk assessment and control, and is attributable to existing regulation (for example MHSWR or COMAH) and not to DSEAR. This expenditure would only be incurred by a minority of sites, and we would expect significant safety benefits, as discussed below.

Total compliance costs

88. Total compliance costs to industry are estimated at just over £350 million in present terms over the ten years from 2002-3, of which initial costs are just over £200 million. All this expenditure, with the exception of the marking of zoned areas with the new 'EX' sign, is attributable to greater compliance with existing regulation which we believe will be prompted by DSEAR.

Impact on small and medium sized businesses (SMEs) and Small Firms Litmus Test

89. In general, we believe any action prompted by DSEAR will be proportional to the size of the workplace. However, small firms are more likely to seek outside assistance with respect to risk assessment, zoning and verification. This disproportionate impact on small firms will be mitigated to the extent that HSE is able to produce advice and guidance specifically aimed at SMEs.
90. We contacted eight small and medium size enterprises as part of our small firms litmus test. These represented a range of small firms who we expect to be most affected by the legislation, comprising two independent car repair workshops, two industrial cleaning companies; two plumbers; and two small metal fabricating companies. All were

sent copies of the questionnaire (without being asked to fill it in) and seven were able to respond.

91. The responses (which were initially completely unprompted) largely confirmed the expected impact outlined above. No companies expected any major costs. In particular, all felt that their operations involving hazardous chemicals were well controlled (many giving examples), and no company expected any further expenditure on control. Most of the companies were below the threshold for written assessment, although several did take independent advice from outside safety assessors. Three companies expected to take some further advice, and following prompting as to the time required for this, this was expected to take no more than half a day of a routine visit. Again (following prompting), most companies expected to have to re-sign their premises.
92. Three of the seven SMEs reported no additional costs (even after prompting). Two companies reported that they had considered swapping to water based (rather than solvent based) paints. All companies thought that their ventilation requirements were adequate, including a metal fabricating company (who tended to do any welding outdoors in the yard).
93. Finally, two companies expected significant benefits from the proposals. A CORGI registered plumber greatly welcomed the decision not to require written records for companies with less than five employees, and pointed to the large amount of paperwork that has to be currently done (whilst at the same time appreciating it's necessity). An industrial cleaning company, which turned out to be medium size (200 employees), pointed to the difficulty they have with all health and safety regulation, in getting companies they are working for to supply information necessary for the discharging of their duties towards their own employees. This company greatly welcomed the new duties concerning co-operation, which they regarded as their number one health and safety problem.

Costs to enforcing authorities

94. There will be no significant additional costs to HSE or other enforcing authorities. There has been a small cost to HSE in developing the proposals which is estimated to be in the order of £100,000. Costs associated with enforcement arrangements as a result of changes to petrol legislation have not been included in this assessment as they have already been addressed in the regulatory impact assessment for the Consultation Document "New Petrol Legislation, Phase 1, Changes to Workplace Controls".

Other costs

95. There are no other costs associated with these proposals.

Total costs to society

96. These are as for industry above, with the exception of the relatively small costs to enforcing authorities.

ENVIRONMENTAL IMPACTS

97. Greater control over the risks posed by dangerous substances will bring positive environmental impacts.

BALANCE OF COSTS AND BENEFITS

98. Total compliance costs to industry are estimated at £350 million over the ten years from 2002-3, almost all of which is attributable to action that should be taken in any case under existing regulation. Against this cost, the total losses associated with incidents involving dangerous substances are valued at just over £800 million over ten years.

99. Although we would not expect the greater compliance with existing regulation we have outlined to fully eliminate these losses, we would expect the expenditure to have a significant effect. In order for costs to balance benefits over ten years, some 40% of the losses associated with safety failures would need to be eliminated. This figure would fall to around 20% over a ten year period, since the vast majority of cost is incurred on a one-off basis.

100. We believe the action we have outlined would be enough to bring every organisation into full compliance with both existing regulation concerning dangerous substances, and DSEAR. In other words our cost estimates are based on full future compliance. This could be expected to have a significant effect on future incidents. On this basis, we believe a reduction in incidents of around 40%, sufficient to fully balance costs, is possible and achievable.

Uncertainties

101. Estimates of both costs and benefits are very uncertain, and are based on a small number of responses. This regulatory impact assessment will be revised after formal consultation, and we welcome any advice on costs or benefits during consultation.

Arrangements for monitoring and evaluation

102. The Directives requirements will be monitored by inspectors employed by HSE and by Environmental Health Officers employed by Local Authorities during their planned and preventative visits to workplaces, and through any feedback received from industry. The Directives require that Member States report to the European Commission every five years on the practical implications of the Directives, indicating the views of employers and employees. HSE will review the effectiveness of the requirements in the years following the implementation of the Directives, and prepare the first five year report to the Commission by July 2007.

Contact:

Marion Dale,
HSE, SPD D1,
Bootle

Tel: 0151 951 3214

Email - marion.dale@hse.gsi.gov.uk

Annex A: Industries significantly affected by DSEAR

Industry (3 or 4 digit SIC) Asterix (“**”) indicates particularly affected by explosive atmospheres	Number of employing organisations	Self-employed (estimate, 000s)
Farming of animals	19,460	20
Mixed farming	20,670	42
Forestry & Logging	1,140	3
Mining of coal and ignite; extraction of peat*	110	0
Extraction of crude petroleum & natural gas	195	1
Mining of metal ores	20	0
Other mining and quarrying*	1,070	1
Manufacture of grain mill products*	110	0
Manufacture of prepared animal feeds	445	1
Manufacture of wearing apparel	5,004	12
Sawmilling and planing of wood	775	1
Manufacture of veneer sheets and other wood panels	200	0
Manufacture of other wood products (containers, carpentry/joinery)*	5,555	10
Manufacture of pulp, paper and paper products*	2,120	2
Printing and services activities related to printing*	12,935	1
Manufacture of refined petroleum products (includes LPG)*	175	0
Manufacture of chemical and chemical products*	3,245	5
Manufacture of rubber and plastic products (manufacture of synthetic rubber is contained in above category)	6,090	8
Manufacture of non-metallic mineral products (includes ceramics)	3,495	5
Manufacture of basic metals*	2,045	2
Manufacture of fabricated metal products	22,135	27
Manufacture of machinery and equipment NEC	11,535	12
Manufacture of weapons and ammunition*	145	0
Manufacture of motor vehicles	2,770	3
Manufacture of other transport equipment	1,945	10
Manufacture of furniture*	5,930	14
Recycling of waste and scrap*	880	1

Industry (3 or 4 digit SIC) Asterix (“**”) indicates particularly affected by explosive atmospheres	Number of employing organisations	Self-employed (estimate, 000s)
Electricity, gas, generation & supply*	135	0
Collection, purification and distribution of water*	50	0
Maintenance and repair of motor vehicles*	20,665	21
Maintenance and repair of motor cycles*	2,040	2
Retail sale of automotive fuel*	6,020	6
Wholesale of agricultural raw materials and live animals	2,070	0
Whole sale of non-ag intermediate products (includes LPG, chemicals and other <fuels)*	13,225	12
Research and experimental development on natural sciences/engineering*	1,320	8
Sewage and refuse disposal*	1,260	5
Dry cleaning (estimate)*	4,652	8