DIAGNOSTICS SOCIAL & MARKET RESEARCH

WELDERS ATTITUDES TO HEALTH AND SAFETY
QUALITITIVE RESEARCH REPORT

Prepared by:

Oliver Murphy
Jane Alty
Helen Brown
Amy Brewer

Project No: A4446
COI Ref: 284530
31st March 2008

Prepared for the COI and the HSE

DISCLAIMER

This report and the work it describes were funded by the Health and Safety Executive. Its contents, including any opinions and/or conclusions expressed, are those of the author(s) alone and do not necessarily reflect HSE policy.
## CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive Summary</td>
<td>iii</td>
</tr>
<tr>
<td>Background</td>
<td>vi</td>
</tr>
<tr>
<td>Research Objectives</td>
<td>vii</td>
</tr>
<tr>
<td>Methodology and Sample</td>
<td>viii-x</td>
</tr>
</tbody>
</table>

### Research Findings:

1. Respondent Overview                                                 | 1-3      |
2. Career Paths and Training                                           | 3-6      |
3. Attitudes to the Job                                                | 6-9      |
4. Welder Involvement in Health and Safety                             | 10-13    |
5. Company Involvement in Health and Safety                             | 13-21    |
6. Specific Hazard Awareness                                            | 21-26    |
7. Corresponding Behaviour relating to dangers identified               | 26-30    |
8. Information Sources and Communications                               | 31-34    |
9. Suggestions for Communications Routes                                | 34-35    |
Conclusions and Recommendations                                         | 36-38    |
EXECUTIVE SUMMARY

Background and Objectives
The Disease Reduction Programme (DRP) of work contributes to HSE’s public service agreement (PSA) target of reducing occupational ill health by 6 per cent between 2004/05 and 2007/08. Two of the main areas of occupational ill-health which the DRP are focusing on for this PSA period are occupational asthma and chronic obstructive pulmonary disease (COPD). Welding has been included in the DRP because there are a large number of professional welders who are at risk of potentially severe ill health effects.

The overall aim of the research was to help the HSE to gain a clear understanding of how welders approach their tasks, both physically and attitudinally, with regard to health and safety issues and any precautions that they may, or may not, take. This understanding was aimed at helping the DRP to communicate more effectively with welders about occupational safety.

Sample Framework
A total of eighteen professional welders were interviewed via Individual and Paired depths each lasting 1 hour and 15 minutes. A mix of levels of experience was included as was experience across a range of types of metals and welding systems. Welders were interviewed in the Midlands (Coventry), the North West (Oldham) and the South East of England (London).

Fieldwork took place during February and March 2008.

Key Findings and Conclusions
1. Welders’ attitudes to their job tended to be influenced by their role in the company and the type of work they carried out. The spectrum in the sample ranged from inexperienced welders in low tech industries to those working in high tech, sophisticated organisations and being the top welder in the company.
2. Most of the welders in the sample were characterised by a feeling that they had not been academic at school but better at practical tasks. Many had come into welding via an engineering route, though occasionally there was a family history of welding, and most did not have ambitions beyond the shop floor.
3. Two thirds of the sample had engaged in formal training, but their main focus was on keeping their job and existing lifestyle within the area they wished to live in. Apart from a few welders, little or no interest was shown in furthering their knowledge of welding outside work.
4. Development within the job was largely reactive, learning ‘by osmosis’ from other welders or when demanded by a new task, with occasional developmental leaps when, for instance, being asked to acquire a new coding.
5. In spite of a feeling of satisfaction emerging in respect of a completed task well done, and the knowledge that welding was a skill, a degree of apathy was evident amongst most in our sample, in relation to welding. Those feeling they were working in a dynamic, progressive trade were relatively few.
6. Health and safety was not top of mind at a day to day level. Of most concern to this sample of welders was the fact that the job was dirty and hot and could be stressful owing to the degree of concentration required. The work was sometimes felt to be monotonous, but additional factors could reduce the routine nature of the job. These included working with new materials or using different processes.
7. In general, the subject of health and safety was now seen as more prevalent than in the past and to be working on their side, despite there being the usual gripes, from small businesses especially, regarding PC overkill on health and safety.
8. Health and safety, in connection with welding, was thought to be mainly common sense and to focus on ‘looking after yourself’. Welding could be a dangerous job, if care was not taken. Core areas of concern focused on burns and arc eye, followed by dangers from dropping materials or suffering foreign objects in the eyes.

9. Few however were actively worried about health and safety as it related to their work, since they assumed that the dangers they could see were ones they could control, whilst any dangers which were not visible would be controlled by management. Any long term issues relating to lungs and eyesight were (only) latent and easily pushed to back of mind, as unlikely to happen and thus not worth fussing about.

10. Fume and gas inhalation is a complex issue, generating much lower levels of concern than arc eye, as only visible fumes and clouds were considered likely danger points. These were assumed to be taken care of by the use of extractors or dismissed as unlikely to be harmful (N.B. parallels with the passive smoking campaigns).

11. Precautions that were taken by these welders included some continuous use of some forms of PPE. Most likely items to be worn on a regular basis were: boots, overalls, gloves and eye protection (visors). Some however were remarkably cavalier when it came to using RPE or ear plugs/defenders.

12. RPE’s were often not used because they were seen as unnecessary and because they could get in the way of the helmet. Moreover, LEV’s were assumed to negate the dangers from fumes. Most considered their LEV equipment to be fine, despite the fact that they tended to be upwards extractors or incorrectly used. Only a few were aware that their LEV’s were not adequate and even they were still only slightly concerned.

13. In only a few cases was welding equipment and PPE methodically checked and results recorded. In most cases it was on a ‘needs’ basis, with merely cursory examinations, i.e. informal and instinctive checks, carried out.

14. Health and safety information was derived from training (both formal and informal) which provided the bedrock of their current knowledge, added to by personal experience over the years from new jobs, new metals used and new equipment.

15. The greatest area of ignorance surrounded the noxious fumes generated by their work and the long-term consequences of inhalation. Only the immediately discernible physical effects of ‘chills and black outs’ seemed to be of any significance to these welders.

16. Support from their companies was generally (but not exclusively) patchy and ad hoc. Their focus tends to be on general health and safety issues, with welding specific advice only offered when a new process or metal is used. Moreover, incidence of welders feeling any need to keep up to date with developments in the trade, or to expand their knowledge of the subject, is low. Only two in our sample were occasionally browsing magazines or journals and only two had used a website on welding topics. Slightly more however did make use of welding catalogues.

17. Lack of welding specific education from companies is explained by welders not expecting there to be anything more to learn unless it relates directly to a new activity – in which case the companies would indeed inform them. New information is however spasmodically delivered via sales reps, equipment manufacturers, brochures, insurance company inspectors and other organisations involved in different types of welding.

18. There seems little opportunity to target these welders on an individual basis in their own right, as few felt any desire to learn more about welding, let alone about health and safety in welding. (There may be a role for mass media communication but it would probably have to shock welders into attention).

19. The best option seems to be to activate their organisations via easily delivered materials such as DVD’s and presentations, preferably relatively short, to be delivered in company time and with other welders and the health and safety manager present. Other possible resources might be unions
and training institutes, and equipment and supplies manufacturers, via their sales reps and catalogues.

20. Given the overall COPD-reduction aim of this initiative, it would seem sensible to specifically enlist the help of equipment and supplies manufacturers in the ventilation and RPE areas. A campaign centred on the “hidden dangers” of fumes and gases (cf. secondary smoking campaigns) should be attractive to these manufacturers as it might help them to sell more effective equipment.

21. Overall, the task of imparting health and safety information to welders in SME’s – particularly those in smaller companies and those dealing with less high tech products – does not appear to be an easy one. However, there are opportunities both via the company’s management system and via outside bodies which should help in the aim of reducing the incidence of COPD amongst SME welders.
BACKGROUND

The Disease Reduction Programme (DRP) of work contributes to HSE’s public service agreement (PSA) target of reducing occupational ill health by 6 per cent between 2004/05 and 2007/08. DRP will achieve this reduction by increasing and improving the use of appropriate control measures that prevent or limit exposure to chemicals and other substances in the workplace that are known to cause ill health. Appropriate control measures vary, depending on the causative substance and work practices; but these may include using a less harmful form of substance, segregating the process, using engineering controls and barrier methods, such as personal protective equipment where other control measures are not adequate.

Two of the main areas of occupational ill-health which the DRP are focusing on for this PSA period are occupational asthma and chronic obstructive pulmonary disease (COPD). Welding has been included in the DRP because there are a large number of professional welders e.g. 79,000, who are at risk of potentially severe ill health effects, including occupational asthma and welding fume fever caused by inhalation of welding fume. The DRP is conducting a mixture of awareness raising interventions that are primarily focussed on improving the control of exposure to welding fume. HSE needs to propagate the message to employers that welders should follow the good practice as published in Welding Essentials [1]. Although a sizable workforce, welding work tends to be undertaken by a small number of skilled people within an organisation or contracted out to companies who specialise in this type of engineering process. One of the challenges for the DRP is reaching workers whose work involves welding activities, in order to encourage appropriate behavioural change around safety procedures. For some workers welding is part of their overall job which also entails other kinds of skilled metal-work. For these workers, there is a sizable chance that they may miss out on receiving the necessary information required to undertake their welding work safely because they are not affiliated to any trade associations, or because they do not perceive themselves to be welders per se. Consequently, they do not readily recognise that HSE’s advice on welding is relevant for them.

In order for the DRP to communicate more effectively with this hard to reach group, the HSE wanted get a better understanding of workers’ (including those whose work involved infrequent welding activity) attitudes to their welding tasks, how they perform those tasks and the precautions they took (if at all) to stay safe.
RESEARCH OBJECTIVES

The overall aim of the research was to help the HSE to gain a clear understanding of how welders approach their tasks, both physically and attitudinally, with regard to health and safety issues and any precautions that they may, or may not, take. This understanding was aimed at helping the DRP to communicate more effectively with welders about occupational safety.

In order to achieve this, and deliver meaningful research findings, the research needed to answer the following objectives and aims:

- Provide independent evidence about welder’s attitudes to their work generally and specifically to any welding activities they have to undertake.
- Provide evidence on welder’s attitudes to taking health and safety precautions at work generally and, specifically when undertaking welding tasks.
- Provide detailed insights into how welders’ acquired knowledge of how to undertake welding work and the main sources of influence on how they undertake welding work specifically.
- Provide insights into welder’s awareness of the type of health and safety precautions and measures they should take when preparing to undertake and complete welding work.
- Provide insights into how HSE’s DRP could reach welders more effectively, to communicate health and safety messages.
METHODOLOGY & SAMPLE

RESEARCH APPROACH

Given the nature of both the sample and the subject we believed that it was advisable to conduct most of the research via Individual Depth Interviews. The latter was recommended because:

- Respondents were not likely to be concentrated in tight enough areas (for group recruitment)
- Much of the interviewing would focus on individual attitudes and behaviour
- Honesty may have been impaired by talking in groups, especially where ‘less than perfect’ behaviours are being followed

There was, however, a distinct advantage to having a point of comparison when discussing the realities of the job and work behaviours. For this reason we conducted some of the interviews as Paired Depths. This enabled respondents to swap and contrast experiences and attitudes. Individual and Paired depths lasted 1 hour and 15 minutes.

RESEARCH SAMPLE

Interviewing Plan

We recommended that the interviews were distributed in the following manner so as to allow for both the familiarisation exercise and the Pilot phase.

- **Familiarisation**
  - Familiarisation Site Visit (with HSL Hygienist and all researchers – arranged by HSL)

- **PILOT**
  - 6 Depth Interviews (off site)
  - Pilot Feedback (discussion)

- **Main Fieldwork**
  - 12 Depth and paired depth Interviews (off site)
METHOD

The types of Welder whom the HSE were interested in for this research were as follows:

- Welders working within SMEs that create end products (for themselves or for other organisations) – products such as chairs, kitchen sinks, metal cupboards, roadway metal barriers etc
- Welders working from a fixed site (not travelling contractors)
- ‘Routine’ welders meaning those for whom welding was their main daily activity i.e. they are actively welding for at least 4 hours per day

Another key criteria was the length of experience (in welding) held by the respondents. This factor was the main focus of the recruitment in order to test the hypothesis that the length of time in the trade affects the attitude of Welders to Health and Safety and whether those still in the training stage had a different attitude towards Health and Safety.

<table>
<thead>
<tr>
<th>Length of Experience</th>
<th>No. of Interviews</th>
<th>No. of Pairs</th>
<th>Total of Interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long experience</td>
<td>13</td>
<td>1 Pair</td>
<td>15</td>
</tr>
<tr>
<td>Welders</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5+ years of routine welding experience)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short experience</td>
<td>1</td>
<td>1 Pair</td>
<td>3</td>
</tr>
<tr>
<td>Welders</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(between 6 months to 3 years routine welding experience)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTALS</td>
<td>14</td>
<td>2</td>
<td>18</td>
</tr>
</tbody>
</table>

Welders were also recruited across a range of types of welding as defined by the types of activity and metals welded as these gave rise to particular health hazards

Welders were interviewed in the following regions: Midlands (Coventry), North West (Oldham) & South East (London)

Fieldwork took place during February and March 2008.

N.b It is important to note that the aim of this research was to provide a qualitative insight into the attitude of welders to Health and Safety. The research does not aim to suggest that the behaviours and attitudes outlined in this report of represent those of all welders.
The HSE provided the following ‘matrix’ of welding processes and associated ‘Welding Essentials Sheets’ in order to identify which welding processes produced the most harmful fumes. For the purpose of the research our interest lay with those working with high, or very high toxicity materials.

n.b. All references to ‘the Matrix’ in the report relate to this table.

<table>
<thead>
<tr>
<th>Fume</th>
<th>High Toxicity Fume e.g fume from welding stainless steels or alloys containing chromium, nickel, barium, manganese, cobalt or lead coated metal</th>
<th>Very High toxicity fume e.g. welding alloys containing cadmium or beryllium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Indoors</td>
<td>Indoors</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of welding process and appropriate Welding Essentials (WL) sheets</th>
<th>Tungsten Inert Gas (TIG) Welding</th>
<th>Oxy gas welding</th>
<th>Metal inert gas (MIG)</th>
<th>Metal active gas (MAG)</th>
<th>Manual Metal Arc (Stick)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WL3,WL4</td>
<td>N/A</td>
<td>WL10</td>
<td>WL10</td>
<td>WL9</td>
<td></td>
</tr>
<tr>
<td>WL7</td>
<td>WL7</td>
<td>WL7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Welding essential sheets that apply to all welding processes and need to be taken into account to ensure good practice.

WLO – Advice to Managers

G401 – Health monitoring for chronic obstructive pulmonary disease.

G406 – New and existing engineering control systems
RESEARCH FINDINGS

1. RESPONDENT OVERVIEW

1.1 Roles

Respondents included experienced welders whose experience ranged from 7 to 30+ years of experience as well as less experienced welders currently in training. (It is worth noting that inexperienced welders were hard to find according to the recruitment agencies used.) The sample also included a small number of people in middle management, for example, team supervisors and shop floor managers. It also covered some ‘senior’ welders who were either the top, or the only, welder in that business.

1.2 Activities undertaken

The activities undertaken by our sample ranged from those focusing on specific welding activities to those covering a broader base of activities. The latter included tasks both before and after the welding, for example, fabricating, polishing and cleaning (and even design). All of the respondents thought of ‘welding’ as including all the preparatory and refining work for example measuring, cutting, cleaning, grinding and cleaning up mistakes. It seemed that the type and size of the company were often the determining factors regarding how varied the welder’s role was with a welder in a small, more industrial and ‘low spec’ company would be most likely to be engaged in different activities as and when necessary.

“I do all the welding for the company. My boss can (weld) and one other, but the majority comes down to eyesight...I prepare everything- get a drawing, cut and prepare all the material, tack it all first, cleaning up, grinding.’ (Experienced, small company, London)

“I used to clean up. But then we got labourers to clean up. And if the stainless steel needs to be polished, it goes to the polishers to get a coating and be put in bubble wrap”. (Experienced, small company, Oldham).

“A few people wear many hats in a smallish firm” (Experienced, small company, Oldham)

“My role has always been the same. I do everything. With it being a small company, we have to be versatile and take on a number of roles”. (Experienced, small company, Coventry)

A few respondents were carrying out very varied tasks, but their roles were still centred on welding, for example, one respondent said they could be given a car shell and they would then put various ‘bits’ onto it.

1.3 Welding locations

Most of the respondents were carrying out their work indoors in standard factory settings in their own controlled area. However if respondents were producing a product from start to finish they sometimes had to follow it in order to install it, maintain it or do checks on it after installation which would involve travelling to and doing work on different sites. There were slightly different concerns in these instances
mainly due to the unpredictability involved. When respondents were in their normal factory they felt there were set controls and procedures they could rely on whereas working in an unfamiliar environment was a risk in itself. An example of this would be the concern welders sometimes had over getting burnt from sparks whilst in an unfamiliar setting due to the welder not knowing who might be moving around them or how good the screening was in different locations.

A few were doing occasional outdoor work such as gates, railings and repairs. Work that was not in the everyday factory setting provoked some different concerns such as balance issues from over-reaching, having to use smaller welding sets (less familiar and less powerful / fast) and having to factor in the weather.

A few were doing work in enclosed, difficult spaces for example, welding inside car shells, tanks or on ships. For some this felt like a more dangerous place in terms of proximity to fumes but for others the problems were perceived as less to do with fume build up and more to do with the potentially awkward positions that work of this kind could involve. An example of this would be welding above your head which could cause dripping or working in very awkward, small spaces which could cause body aches.

[Welding inside tanks] “We had five or six extractor pipes down there and special helmets that fit to your face”. (Experienced, small company, Oldham).

“It can be very dangerous working in vessels – the oxygen can suddenly go. It’s not something you can see!” (Experienced, small company, South London)

1.4 Companies

Two thirds of respondents were from small organisations and one third were from medium sized companies. Companies were most usefully distinguished by the type of work undertaken. There were some high tech, high specification organisations including companies producing pressure vessels, surgical instruments, parts for Formula One and the MOD, hydraulic fuel lines for the Aerospace industry and hip joints. There were also companies producing lighter weight products, which could be classed as consumer, where the products were likely to be on show such as kitchens, lighting fixtures and bar tops. Then there were more ‘industrial’ organisations both light and heavy producing, including companies producing paper production machinery, oil rigging, catering equipment and parts for trains and buses. There were also a few companies that did odd jobs such as fixing tools and minor repairs on gates, locks, bikes or pipes.

The type of work undertaken was important in our sample since a keen adherence to health and safety regulations tended to reflect pressure from customers (and insurance companies), particularly those demanding high tech and high specification work. These customers tended to exert a strong influence on business in terms of health and safety behaviour.

“We are an ex- Formula One supplier, they’re not going to let you supply to them unless they’re 100% happy with your safety” (Inexperienced, small, London)

1.5 Metals and welding processes

In our sample, the metals being welded most regularly were: stainless steel (“316 & 174”) which in reality is highly toxic due to nickel and chromium; mild steel, which does not appear on the HSE matrix
(see p. 8), but can lead to respiratory problems from manganese and neurological problems; and aluminium which was welded in smaller amounts but regularly and is not in fact as harmful in the wedling process as other metals discussed.

There were also some rarer metals being welded less frequently including galvanised steel (zinc coated), brass, cobalt chrome, cadmium and cast steel with magnesium plate.

The processes being used most regularly were MIG, TIG, MMA (stick) and oxyacetylene. The rarer processes being used were MAG, laser welding (for thinner metals) and electron beam welding, which was mentioned once although not used by that respondent.

2. CAREER PATH AND TRAINING

2.1 Career paths- Why started welding?

For some, following a career in welding came from the desire not to continue in academic education. For some this was fuelled by the desire to start making money straight from school and for others it was more that they recognised in themselves an greater aptitude for practical work with some having a genuine interest in the processes of making things.

Most did not start off with a welding career in mind but were more orientated towards general engineering, fabrication or sheet metal work with the welding task often gradually emerging. Amongst a number of the respondents there was a history of engineering in the family. Some saw plumbing as an allied trade and had come from that occupational route.

Only a few had positive experiences of welding from youth either in school or through a family member and a couple had army backgrounds (being trained in welding there).

2.2 Career history

Older respondents were more likely to have had early, long term associations with companies, with most welders having 20+ years in their first or second firm, although this trend seemed to be dying out and some of the older respondents had moved more than once in the last 5 years.

More recent histories, and younger and less experienced welders reflected current instability in the industry. This instability, circa 1990s, resulted in many respondents being subject to redundancies, company closures, takeovers or mergers. Many voiced their opinion that the whole engineering business in the UK is under considerable financial pressure.

“Engineering in Oldham is now dead”. (Experienced welder, small company)

“There’s not a lot of welding or engineering left in South London. This must be one of the last companies.” (Experienced welder, small company, South London)

“I want to get out really because it’s a dying industry”. (Experienced, small company, London)

2.3 Initial training: Formal (College based)
The majority of respondents had engaged in formal training and most had undertaken some sort of apprenticeship where they had usually been sponsored by a company and there was a sense that this was the norm. There were various training combination options such as: 4 years with the 1st year all in college and the remaining 3 years combining college and day release to work at the sponsoring company; 5 years with one day per week in college; and 4 years with one day per week in college.

“I did City and Guilds- one day every week for six months- I was working at the same time”
(Experienced, small company, Coventry)

This training had usually led to a City and Guilds qualification although there was one example of a BTEC – other course descriptions included Fabrication and Engineering, Fabrication and Welding, Sheet Metal Work. There was also one mention of a NFEC Qualification in MIG, TIG and Fabrication which was a two year night course.

Some respondents had undertaken a course in welding, or in more general engineering, and then specialised. An example of this was a respondent who had done a NVQ level 2 in Production Engineering which involved welding, fitting and machining and then an NVQ level 3 which was more specialised. This course, according to the respondent, covered a large amount of health and safety issues because it was more about actually working on the shop floor and how to prepare your workspace than the ‘theory’ of welding.

_I did a GNVQ advanced in engineering, then did aerospace and engineering at university._
(Experienced, small company, London)

However it is important to note that this welder was highly atypical.

### 2.4 Initial training: Informal

One third of our respondents (all from small companies) had not engaged in formal training at the start of their career, including two inexperienced welders. These welders were instead learning from existing welders. They were also often learning from their own experience e.g. being given a new task to do and having to work out how to do it.

“I pick it up off the other lads at work, or from the supervisor”. (Less experienced, small company, Oldham)

“I’m mostly supervised but I might be left alone if it’s going OK”. (Less experienced, small company, Oldham)

“I started off doing a bit of spot welding and just progressed through.” (Experienced welder, small company, South London)

“I’ve mostly learnt on the job, avoided City and Guilds. Not the best move really, when I think about it”. (Experienced, small company, South London)

“I like the hands on approach. I think training would only give you a paper qualification and make it easier to get another or better job.” (Less experienced, small company, Oldham)
In terms of on the job training Welders tended to start off with simple welding tasks such as simple, rough welding and welding related tasks and progress to welding processes requiring a higher level of precision.

A key learning that emerged was the use of language appropriate to welders. Use of the word ‘education’ tended to be inappropriate, given their general feeling that they were not academic. The word ‘training’ appeared to be more appealing and reflected the language they themselves would use.

2.5 Ongoing training - Formal

Learning skills beyond the initial years of education was fairly common, particularly in respect of gaining additional “Codings”, which were also referred to as ‘tickets’ or certificates. These Codings comprised certification that the welder has reached a proven standard and is able to carry out a particular task. However, there was a perception that Codings were now no longer a qualification that applied to their lifetime, but needed to be re-taken every 3 years. Those welders to whom this applied felt they were thus likely to let the Coding go out of date unless there was pressure from their employer to maintain it. This provides evidence of the absence of desire of welders to develop their skills.

A third of our sample had obtained codings in a range of skills at some point. These were usually attained in response to a client demand and were triggered by either client or insurance company standards.

“You wouldn’t go and get a coding yourself to further your career unless you planned to move to a company that like did a specific type of welding you don’t know”. (Experienced, medium company, Coventry)

“The management asked me (to get a code). They had a job coming in and no one to do it”. (Experienced, medium company, South London).

In these instances either a specific skill needed to be learnt or a specific level of quality guaranteed. It was found that companies usually had a small number of coded welders with the perception being that companies did not think it was worth the money to code everyone but better just to send the more skilled and / or willing ones. There was sometimes the impression that coded welders often had the same skills as other on the shop floor but the difference was just that they were certified if a client demands it. However there was definitely a kudos associated with attaining codings.

“Codes, I’ve done ‘em all. I got to Lloyds Class 1, but in my current job I don’t need codes.” (Experienced, small, South London)

“It’s knowing that you’re competent to do the job. Some clients require it. It’s always a bonus to get them. I’ve not been put forward to do them yet.” (Experienced, Medium, Coventry)

Codings are certified by an outside body, for example, ‘Training Connections,’ TWI, an Insurance company or a College. Welders were either trained on-site, with someone brought in to do the test, or they went to a test centre.

2.6 Ongoing training - Informal
All our respondents expected to continue to develop their skills beyond the early years. This was mainly through continuing to learn from other welders in the company or when encountering new welders, for example, welders joining from another company, or moving company. Many learned completely new types of welding on-site with experienced, long serving welders inevitably meeting new technologies. Welders were also learning from their own experience, i.e., being given a new task to do and having to work out how to do it. A few also picked up information elsewhere such as from sales reps, insurance company inspectors or from TWI personnel, when individuals from these bodies appeared on the shop floor.

3. ATTITUDES TO THE JOB

3.1 Attitudes to the job: Aspirations

The levels of aspiration respondents possessed depended to a large degree on the way welding as a job was perceived.

For most of the sample, especially older welders, welding was seen as a skilled manual labour job in which incremental improvements were most welcome. However these improvements were not seen as important to the welder as keeping their job and existing lifestyle, and living and working in their preferred geographical area.

“In five years time I see myself in a similar job. I can’t think where I could move up to”. (Less experienced, Small company, Oldham)

A few, exclusively those working in more sophisticated and high tech product areas were much more able to see personal progression and not just up the welding ladder, but off the shop floor as well.

“I don’t want to be stuck doing what I’m doing, even though I’m getting good money. I thought maybe going on to train as a welding inspector. I’ll probably go back to college doing nights.” (Experienced, medium company, Coventry)

“This business is really expanding and I want to help the company. I’m trying to get an electron beam welder into the company now. It’s the future of welding”. (Experienced, Medium, South London).

“I don’t want to do this for the rest of my life. I need more strings to my bow.” (Experienced, medium company, Coventry)

“I fancy owning my own company...maybe a little business.” (Inexperienced, Small, Oldham).

Attitudes and experiences of the job pushed some towards wanting to reduce their welding, retire early, or leave the industry all together. For some welders, whether experienced or inexperienced, young or old, this was fuelled by the feeling that the job was too mucky or that the metalwork industry was becoming de-skilled and automated.

“I would like to get the chance to move on to a managerial role. In welding, it’s just the state you get into- covered in black all the time. That’s the main reason.” (Experienced, medium company, Coventry)

Others felt that precision welding was too stressful on the eyes and other parts of the body. Some were jaded with their company and others felt that the repetitive nature of the task too often led to boredom.
Another reason for wanting to leave the industry, as touched on before, was the belief that it is an industry that is dying.

*If I don’t pull my finger out, I’ll be stuck here* (Experienced, small company, London)

There was regret amongst a few respondents of having gone into welding in the first place, they felt that they could have got better money elsewhere but all reluctantly accepted their current lot.

### 3.2 Attitudes to the job: Positives

However most had something good to say about their job with one of the main positives across the board being the satisfaction gained from producing a defined and finished product.

*“When I actually produce a job from start to finish, pick up the job as it comes through the door, I’m hand producing the part, not just welding, and I see a final article that I’ve made- the most satisfying part where I’ve done it all myself.”* (Experienced, small company, Coventry)

*“The best bit of the job is when it’s finished. It’s a piece of skill. I look at it with pride.”* (Experienced, medium company, South London).

Although this was the case for all, including inexperienced welders, those producing particularly higher end products tended to have an enhanced sense of achievement. This mainly stemming from the fact that these finished products had to be subjected to extreme testing to ensure they were up to standard, for example, x-ray tests, “things being dropped out of helicopters” and extreme testing of pressure vessels. From this we gauged that satisfaction with the job was gained where respondents felt they were a distinctive and successful part of a process.

Another key positive aspect of the job was that it was felt to involve real skill. Welders felt that they were constantly working and learning with the end result meaning that they could do something that others could not and that was actually much harder than it looked.

*“The others (non welders) are interested, but they’ve got a respect for our skills because they know they can’t do it.”* (Experienced, small, South London)

For some it was seen as a job that is intellectually stimulating, especially if they were involved in more than one part of the process, for example, if they were also a fabricator or a ‘designer’.

*“You get to use your brain- thinking about how things should be done. It’s problem solving. It’s like a bit lego model to fit together.”* (Experienced, small company, London)

For those working in bigger companies and more highly skilled welders there was sometimes a sense of satisfaction gained from being part of a bigger, important picture. This was mentioned by a few respondents who had worked for the MOD, in the car industry or whose company was breaking into the USA.

For a few a big positive was the opportunity to travel both nationally and internationally, for example doing checks and repairs in Beirut on tanks and the chance of being able to move to Australia in the future to do underwater welding.
Some, working in less production-line type roles, liked day to day variety and independence their job afforded them. This was due to the fact that they could be involved in different types of jobs or different types of processes and this required them to be frequently challenged and have to learn new skills. It meant that they were more in charge of setting their own priorities and agendas. It also increased the sense of satisfaction in the end product because they had effectively been involved from start to finish, from designing to polishing.

Some also mentioned camaraderie as a positive. It was felt by these respondents that welding was an industry where you were required to work closely with others as part of a team to get the job done and finished and this generated a degree of closeness.

In addition a few felt that the pay was good. For one respondent this was partly due to the decline in the Industry and partly due to the fact that Health and Safety regulations had given power to companies to cost jobs higher under the excuse that it would be a ‘risky job’ that the companies’ normal insurance would not cover.

“I do it for the money. It’s good wages and it’s getting better as young people don’t want to do it- they all want to go into media or law. Everyone in the industry is charging high prices now coz they can.”

(Experienced, medium company, London)

Another positive factor mentioned was welders having their own ‘territory’ within work areas. Indeed the physical space in which welders carried out their work was normally larger and more open than, for example, an office.

The fact that the work was relatively unchallenging for most, (and which was mentioned as a negative by some respondents), was actually mentioned as a positive factor by others (the less ambitious). These latter respondents liked the fact that the work was very easy and required little mental engagement as they felt they could do it on automatic pilot whilst thinking of other things or whilst half asleep and it was thus a very stress-free job which allowed them to remain in their comfort zone.

### 3.3 Attitudes to job: Negatives

Significantly, Health and Safety issues did not spontaneously rank as the most important issues here.

However a few negatives which can be linked to Health and Safety concerns were mentioned. It was frequently described as a ‘dirty’ job in terms of being physically dirty and smelly by the end of the day. This was more for MIG, stick and grinding and less so for high specification work and TIG.

“It’s just the state you get into- covered in black all the time”

(Experienced, small company, Coventry)

Another frequent complaint was heat levels which was an everyday concern but especially exacerbated in the summer.

“Sometimes you get home, you’ve been sweating all day and you wish you could have just been in an air-conditioned office.”

(Experienced, medium company, Coventry)

A few did spontaneously see the physical side effects as one of the key negatives such as damage from fumes and eye strain but this was very much a minor concern.
A further negative factor which was mentioned by a few respondents was the hassle of getting the weld wrong and having to start again.

“It’s a waste of material, a waste of time and the boss isn’t happy”. (Inexperienced, Small, Oldham).

Others felt the biggest down side to the job was the monotony they experienced. For some this was a day to day concern and for others this was specifically when they were involved in certain jobs such as long, ‘boring’ welds which would inevitably lead to a long period of grinding down afterwards.

“It’s repetitive in a way. It’s the same old grind, day in, day out”. (Experienced, medium, Coventry).

Some felt the solitude of the job was the biggest draw back; not being involved in the teamwork of other elements of the production line.

“Before, I used to be part of a team. But with welding, you’re just on your own. In an 8 hour shift you’re 6 hours on your own.” (Experienced, small company, Coventry)

Some did not like the fact that welding involves being physically cut off and without sunlight. Others felt that welding paid very poorly compared to other trades such as plumbing.

### 3.4 Attitudes to job: Challenges

Although most respondents regarded the work as relatively routine there were a number of job challenges mentioned.

Depending on the skills and experience of the welder some were less confident welding certain materials whereas others felt less confident with some of the processes.

“I’m not the greatest aluminium welder, it’s a different skill”. (Experienced, small, Oldham)

Another challenge was having to work in uncomfortable or strange positions for certain jobs or parts of the job.

“Some bits are more difficult. For some I’m pretty much blindfolded- doing it with mirrors. It’s really tricky.” (Experienced, small company, Coventry).

Others challenges mentioned were working at heights, working in enclosed spaces and having to work on technically difficult welds.

“You might receive a part, like a car panel. Maybe you’d have to fabricate this in two parts as it’s too difficult to do in one part”. (Experienced, small company, Coventry)

Inexperienced welders, as would be expected, found the job more challenging in terms of both specific problems such as getting the temperature setting right and more general challenges such as the need for concentration all the time.
4. WELDER INVOLVEMENT WITH HEALTH AND SAFETY

4.1 Attitudes to the health and safety ‘Industry’

All respondents were aware that health and safety is now much more part of public discourse than it used to be. There was also a widespread awareness that regulations are much tougher now and can no longer be ignored.

As a principle, health and safety was universally endorsed because it relates to ensuring safer work environments. The underlying attitude amongst all was that tighter health and safety regulations work to the benefit of all.

“Health and safety, it’s a good thing. It can be life saving”. (Inexperienced, small company, Oldham)

“People are a lot more conscious of health and safety. There’s been a change of attitudes towards it. Maybe it’s come from the media. Everyone’s a lot more positive about their own health. It’s like now you’ve got a lot of older guys who used to be ‘kebab and chips’ and now they’re eating salads. It’s like they’ve bought their house in Spain and they don’t want to die before they get to it.” (Experienced, medium, London)

In regards to health and safety there was a sense that many respondents felt they had ‘grown up’ and were much less cavalier towards their own safety.

Nonetheless, the implementation of health and safety regulations could still be criticised for being ‘ridiculous’, ‘PC’ and as impeding sensible working practices, not to mention being excessively onerous for smaller companies.

“Lots of it’s gone very silly. Health and safety people have never worked in a factory. Some of it (health and safety) just doesn’t work.” (Experienced, small company, South London).

“The health and safety thing, to me, is like this PC thing. It’s going too far the wrong way. Sometimes you have to get stuck in or the thing you’re trying to do won’t happen. You could slip over and twist your ankle at any time- where does it stop”? (Inexperienced, small company, London).

“If you followed it to the letter, everyone would work in a (boiler) suit and every time you did grinding you’d have to have a sweeper up too.” (Small, experienced, South London).

4.2 Health and safety and welding- Overview

When it comes to welding, health and safety was seen as ‘looking after yourself’. This was considered high priority and especially important in welding due to obvious and immediate impact risks. Most respondents had experience, either themselves or through a colleague, of arc eye, burns and even fingers being cut off.

Interestingly, longer term issues like lung damage did not spring to mind, as they are less immediate concerns.
‘Safety’ issues are more immediate and thus were more top of mind, whilst ‘health’ issues were seen as longer term and thus less salient. Health issues were seen as more theoretical because their impact is more gradual and future-tense.

“If you’re actively welding, fumes are involved. Most people breathe in a few bits and bobs, but you get used to it.” (Inexperienced, Small company, Oldham)

Welders tend to see their safety as their own responsibility. They display confidence in their own safety, partly because they control their own work areas and partly because they believe that their company will take care of any additional health and safety issues arising. There is a firm belief that it would not be in the company’s interests to do otherwise.

‘Health and Safety’ language was more generally associated with issues like slips, trips and manual handling than with welding. Health and safety for a company was often reckoned to be manifested in terms of cleanliness and orderliness such as keeping walkways clear, and workspaces tidy.

4.3 Welders’ interaction with health and safety

As a subject area, health and safety is something that most workers felt quite distant from. It was often thought of as a higher, official level of activity concerning machinery and equipment checking routines, risk assessments and official advice (such as COSHH sheets) even amongst the welders we spoke to, who were all working in SMEs.

Indeed, reading about health and safety regulations and absorbing ‘academic’ information was not their strength, so they were content to leave this to management.

Only a small number of respondents were actively involved in health and safety routines, such as risk assessments and checking routines. These (exceptional) respondents saw themselves as responsible for proactive concern about both environmental and welding specific health and safety issues.

Although the differences in health and safety provision between companies were quite large, most respondents were - at least on the surface - happy with the health and safety advice and equipment they received and struggled to come up with ideas on how it could be improved. A few worked in organisations where the health and safety regime was highly sophisticated and they personally felt no need to be concerned or involved. Most however worked in businesses that were not, on the surface, highly organised in health and safety terms, but even these welders assumed that what needed to be done, was being done. There was also some acknowledgement, especially in small companies, of financial barriers to full-scale implementation of ideal improvements. The fall back, for most people, was their awareness that personal safety is ultimately down to the individual and experienced welders know what to do.

4.4 Primary health and safety concerns amongst welders

As previously mentioned, almost all the welders were aware that, in principle, welding is a dangerous job but for most this was felt to be mitigated by their own sensible behaviour. A few were working with highly sophisticated machinery that made the activity almost ‘fool proof’ safe.
Risk assessment to welders tended to mean looking around for any obvious dangers and applying common sense. It did not equate to Risk Assessment in HSE terms.

As also suggested, fumes were only occasionally mentioned as a pressing concern, with most of the spontaneous worries relating to obvious and immediate physical dangers. The main concerns mentioned here were arc eye, minor burns from either splattering or from heat getting around the edges of PPE, dropping heavy things and various dangers of grinding such as ‘white hand’ from using the grinder too long or getting a bit of metal in the eye.

“Arc eye’s the worst. It’s really horrible, it’s like having hot sand in your eyes”. (Experienced, Small, South London).

“You want to watch out for arc eye. It’s worst when you’re working with aluminium because you get a reflection from the arc”. (Experienced, Medium, South London).

“It can be dangerous. It only takes someone to slip while you’re pulling a beam in, and you’ve got crushed fingers and crushed feet.” (Experienced, small, Oldham)

“[Metal in the eye from grinding] I’ve had to go to the nurse or to casualty a couple of times to have bits taken out. I feel like I have a season ticket down the eye hospital” (Experienced, small, Coventry).

However there was some concern expressed for less immediate dangers. Fume and gas inhalation was an issue discussed by some although the reactions to the dangers here were complex. In principle, no one wishes to breathe in the fumes, partly because fumes are seen as physically unpleasant in terms of smell and taste and partly because they ‘probably aren’t good for you,’ in some unspecific way (in the long term). The relatively lower levels of concern about fumes seemed to be due to the fact that they are connected to long term health effects that are not immediately obvious or indeed attributable to a single cause. The immediate dangers were also often dismissed because welders could ‘see’ the fumes going somewhere else (usually upwards) and they therefore assumed that there was no or little danger.

“The extractor’s so strong it could suck up a ten pound note.” (Experienced, small, Oldham).

There were some analogies to the effects of passive smoking i.e. that it is only what you can see that harms you.

A very few who were aware of having poor extraction facilities were, understandably, more concerned.

“Extraction is not superb. We’ve got a second hand, portable extractor. It does its job but it’s not as good as you can buy on the market. You can move the head but it doesn’t suck all the fumes away”.

(Experienced, Small, Coventry)

It seems reasonable to assume that the lack of clear knowledge about the long term dangers associated with specific metals and gases has reduced levels of concern.

There were a few lower level concerns mentioned by respondents. One of these was a concern about the damage done by long term concentration on a single point and on a bright light which a few respondents felt would probably lead to a diminished quality of vision. Another concern was back problems

Overall, from the point of view of the welders interviewed, there would appear to be three types of organisation in our sample.
The first of these can be categorised as all medium sized companies plus those smaller organisations involved in high tech or precision work, often to ISO standards or higher. These companies seem to be highly aware of what is required and put it into effect. They are often driven by high expectations from customers, insurance companies and the approval of other bodies such as the FDA in the USA. These organisations were often seen as examples of what ‘good’ organisations should be i.e. to behave with a keen sense of corporate responsibility.

The second of these types of organisation were small companies who are very receptive to requests for improvements in health and safety equipment and standards, but whose management cite money difficulties for not meeting demands (in full).

The third type of organisation we identified were small organisations that do the basics only and may or may not have formal mechanisms for dialogue with their workers about health and safety issues.

Factors that were ‘known’ to incentivise companies to pay attention to health and safety regulations included both less positive and more positive issues. Less positive issues included the desire to avoid being sued or closed down by the HSE and the desire to avoid court cases and liability arising from workers’ claims. Other ‘negative’ issues were bad publicity and damage to the companies’ image and, ultimately, loss of business.

There were however a number of positive reasons why some organisations consciously adhered to health and safety regulations. One of these reasons was making sure workers were happy and healthy. This tied to the issue of ensuring high productivity. It also tied to the issue of doing, and being seen to do, the right thing. Another reason was that good health and safety was often necessary as a part of gaining higher certifications which would, in turn, attract more and better business.

Overall, whatever the provision of care from their organisation, almost all the sample felt that their company was looking after their best interests. This was well based in many instances, but for some smaller organisations, felt like a product of blind trust rather than knowledge of what was required and how these needs were being fulfilled.

5. COMPANY INVOLVEMENT IN HEALTH AND SAFETY

5.1 Responsiveness to health and safety concerns

The company’s responsiveness to health and safety concerns depended in part on the knowledge and responsibility path for health and safety. The longest possible chain of responsibility occurred in medium sized companies, where up to 3 levels were identified: ‘On the shop floor’ reps/foremen through to line managers (e.g. a health and safety manager or production manager) and finally to (or from) top tier management/owners concerned with broad policy decisions.

“In a larger company you’d have a health and safety representative but in this company I would just say ‘look I think that needs sorting out’ and so could the other lads because a lot of people are friends who work there. With a larger company there’d be one of two health and safety reps and I’d speak to them and they’d go and speak to the company as a unit.” (Experienced, small, Oldham)

There was a high variation in terms of the route taken by any health and safety query or request and the efficiency with which it was dealt. Those with more tiers of management often had formal policies.
which insisted on each stage being recorded and even laying down response times e.g. 7 days. Smaller, high spec companies also took a more rigorous approach to responding to health and safety queries. Smaller, non-high spec organisations, on the other hand, usually relied on simple, verbal requests that may or may not be logged or indeed acted upon.

“The supervisor, he looks after the lads”. (Inexperienced, small, Oldham)

In those companies where there was a positive attitude to health and safety as well as clear lines of responsibility, for example a named health and safety officer in addition to a wide knowledge of procedures, there was a greater willingness on the part of welders to raise health and safety issues.

Where health and safety responsibility was built into the structure of the organisation, it seemed that it was more secure and could survive turnover of staff in that role. In small organisations in particular, the efficacy of health and safety promotion tended to be fragile, as it rests entirely with specific individuals.

“It’s been worked into the system, and taken on a life of its own”. (Experienced, medium, London)

“We didn’t used to have a health and safety rep- we used to just keep an eye on it. Now they’ve melded it together so there’s someone to tell. We’ve had him for...4 and a half or five years now. He won’t let you get away with anything.” (Experienced, small, Oldham)

5.2 Company involvement- Personal Protective Equipment Provision and Training Overview

Mostly, Personal Protective Equipment (PPE) was provided free of charge to welders by their company. Boots were the only occasional exception and this tended to occur in smaller organisations in order to save money. Almost always each person had their own basic set of PPE, but in some cases certain items were shared. A few shared welding masks with the company practice being welders just picking up the nearest one. One respondent shared Respiratory Protective Equipment (RPE) as this was something not often used. One respondent from a very small organisation shared most of his equipment with colleagues.

Most companies supplied a standard issue set of PPE with only a few allowing welders to choose their own or choose from a selection.

“PPE wise, you get anything you want. You ask in the morning and it’s there by the afternoon.” (Experienced, small, Oldham)

In terms of replacing items, this was normally in line with (reasonable) demand but a few of the more high tech/high spec organisations had an established replacement policy, for example, new boots every two years, new overalls every three years.

There was generally little training provided in using PPE. At best, when a new piece of equipment came in, an instruction leaflet or demo from the rep was received. Few felt that ‘training’ on standard PPE was in any way necessary. Indeed, there was a lack of understanding as to what training would involve. The commonly held view was that it either works or it does not; either it is all in one piece or it is not.

“(PPE) We’re not trained to use it at all”. (Experienced, small, Oldham).
5.3 Company Involvement - PPE Provision

The standard PPE set for welding was regarded as including the following: visors (‘masks’), gloves, steel toe capped boots, overalls (fire retardant), ear protection and un-powered RPE.

With regards to visors, these often had different lenses with only a few of the respondents having access to ‘reactolight’ visors. It seemed as though most companies provided their welders with both a light (manual lifting) and a heavy (welding) pair of gloves. There was one instance of a company attempting to cut costs by only providing welders with a right-handed heavy glove. This proved to be not the best idea when it emerged that some of the welders were left handed. Fire retardant overalls were something that was seen as completely standard with some respondents having more than one set. A few respondents had theirs put through the laundry by their company.

Disposable ear plugs and non disposable ear defenders were always available and were usually kept in a store cupboard. Goggles were always available. Leather aprons and gauntlets, although seen as basic items, were less common and generally associated with ‘heavier’ work with a few associations to TIG and MIG.

Some form of Local Exhaust Ventilation systems (LEV) was available to all the welders although the quality of equipment varied. Moveable (head) extractors were more common than fixed LEVs.

5.4 Company involvement - Training on PPE and Machinery

Two thirds of the welders had received some formal training in welding and in the course of this had been given instruction about various welding plants and even occasionally about PPE. Ongoing training was, however, fairly patchy with only the more sophisticated and better organised companies providing formal instruction on new welding equipment and possibly on ancillary equipment, such as ventilation.

“My company’s really good on sending us on courses for new stuff. They’re almost too good. The C&C boys are always off to Germany to learn about new lathes”. (Experienced, medium, South London).

In the absence of any formal instruction, which was the day to day experience for most of these welders, common sense was expected to prevail along with help from any handbook or asking more experienced colleagues for assistance.

“(Training on using extraction?) Not really. You just turn it on and it starts sucking. Then you turn it off”. (Experienced, small, Coventry).

“Well, they taught me where the emergency off switches are”. (Experienced, small, London)

“Pretty common sense really. Perhaps if a newly designed mask, they’d have to show you how to use it. But apart from that it’s pretty straightforward”. (Experienced, medium, Coventry).

“You’d have to read up on it, you’d have to know (if it were something new).” (Experienced, small, Oldham)
“We got a new welder in about a year ago- a TIG machinist. I was told to read the (TIG) manual. If you’ve got to use something you’ve never used before, they’ll tell you how to use it”. (Experienced, small, London).

In terms of the choice of temperature at which welding machinery is operated, there was a broad awareness that optimum temperatures may be indicated somewhere and were probably discussed during initial formal training. At a practical level, however, almost all welders saw this as a question of personal choice and experience in knowing what works for their equipment and for the specific task in hand.

“I think it has to be a certain temperature to get the weld right, but I do struggle to get it right”.  
(Inexperienced, small Oldham)

“(Regarding temperature control) It’s my choice for each job. The MMA rod case says the temperature on it, but you know it’s trial and error”. (Experienced, small, South London).

There was no differentiation in welders minds between being trained in how to wear and use PPE versus being trained in when to use it, when not to use it and then ultimately on the checks needed to ensure it is in proper working order.

5.5 Company involvement- Awareness of Health and Safety Checks

PPE

With regard to the checking of PPE, most of the welders regarded this as their personal responsibility, but at a very informal level. ‘Checking’ was seen as principally a question of spotting anything that was obviously worn or broken. Almost all of these respondents kept no records and were not aware of any management checking of their activities.

Management’s responsibility was merely to replace worn or damaged equipment.

This informal checking by welders was thought to be a self evident routine for their own safety.

Two welders were involved in more formalised systems, one more rigid than the other. The strictest system out of these two involved daily self checks on an audit list carried out by each welder who was also spot checked on an at least a weekly basis by the company health and safety officer. The less demanding routine was filling in a daily audit sheet which was presented monthly and occasionally checked by the health and safety officer on an at least annual basis.

RPE

With regard to the checking of RPE there was generally a more diligent attitude towards changing filters amongst those welders involved in visibly dirty or noxious processes and amongst a few involved in very high tech work. In the one very high tech company there was a regular fortnightly change of filters even if they had not actually been used. For many involved with dirty processes there was self imposed regular checking. There was even some low level awareness of changing filters according to dated needs.

“Filters have a date to change them by, so I change them by that date or if I feel they’re not working”.  
(Experienced, small, South London).
However, most were more lax in terms of their approach to checking and changing filters. For some this was because they used filters rarely and for others it was more due to the fact that they felt that it would be obvious when a filter needed to be changed. A few clearly did not change their filters, especially where their RPEs were shared although this was often due to the fact that they were not supplied with new filters by the company.

“There’s no change- they’ve pretty much always been the same. I take them out sometimes and give them a dust over.” (Experienced, small, Coventry).

“I wouldn’t know how to check them, and (have) never seen anyone do it”. (Experienced, small, Coventry)

Very few respondents had had their RPE face fitted, but this was not surprising since few were using RPEs that required this (or indeed were using tools or processes that required RPE to be face fitted).

5.6 Company involvement- Awareness of Checks and Risk Assessments

General Checks

For the few who were working in high spec/high tech businesses, health and safety was firmly embedded into the organisational culture and structure. These respondents were usually aware of checks covering both the general worksite and welding equipment. For some of these respondents there was active engagement in this process, whilst for the others it was not something they personally had to worry about or get involved in. Health and safety checking was often instituted not simply by the company but also by clients, insurance companies and other interested bodies.

However, most of the respondents had a low level of knowledge on what checks (if any) were carried out, and by whom. They relied on recall of specific incidents, for example when they last saw an inspector, to build up their picture of how health and safety works and were not involved in ‘the bigger picture’.

“There are six month checks (not welding specific). These could be to do with the insurance”. (Inexperienced, small, Oldham).

“I don’t know if any outside people come in, but the fire brigade came in once and checked the fire extinguishers”. (Experienced, small, Oldham).

In terms of an awareness of what checks or actions should officially be carried out COSHH sheets were largely not something respondents were familiar with. A few had heard of COSHH sheets in the context of cleaning fluid, chemicals and special processes. In addition one had actively used a COSHH sheet whilst a few others knowingly relied on the management to use them and instruct welders accordingly.

“COSHH sheets- it’s the office that keeps them...the manager tells us. Like with spray paint we had to use filtered masks with special filters.” (Experienced, small, South London)

There was some expectation that, with new processes or when visiting other sites, COSHH sheets might be used to ensure safety. When COSHH sheets were explained, to most of the sample who had never heard of them, almost all expected COSHH sheets to be part of the management’s responsibility.
Risk assessments

There was some confusion over what constituted a risk assessment. At its most basic, it was seen as the normal, sensible planning of any job, i.e., how am I going to tackle this in the safest manner? Few were involved in any kind of highly formal processes except in certain instances. One of these instances would be when the company started a new job or procedure or working at a different place.

“More if it’s off site” (Experienced, small, Coventry)

Therefore there was some perception that risk assessments would not apply to everyday, routine work in the factory.

“I personally do a risk assessment if it’s a new job or a new machine. I also do risk assessments on my own area, like my welding bay.” (Experienced, medium, South London).

Only one welder claimed to carry out a risk assessment before tackling any jobs.

“Every time, every job” (Experienced, small, Oldham)

Machinery and Equipment checks- General

Around half respondents were aware of ‘regular’ general safety checks on equipment and machinery within the workplace. For some this was more naturally associated with bigger machinery, for example, cranes.

“Health and safety people come round and check the machinery to see if all the safety guards are in place…probably once a year. I don’t know if that’s welding equipment.” (Experienced, small, London)

Insurance companies were also known to do their own checks.

“The vents are checked twice a year. That’s done by Zurich Insurance. It’s now up to the company to show it’s doing it right, not up to the HSE (to check)”. (Experienced, medium, South London).

PAT (electrical) tests were also mentioned by a few respondents.

“PAT’ test done every 6 months to a year. We do lots of wiring up here- every plug and sockets. It’s done by an electrician. We need it for the insurance.” (Experienced, small, London)

“We have a PAT test every year and my welding plant’s checked every year too’. (Medium, experienced, South London)

Machinery and Equipment checks- Welding

For most, there was no awareness of outside checks on their machinery and it was generally thought to be their responsibility to keep an eye on whether it was working satisfactorily.
“That’s down to the individual” (Experienced, small, Oldham)

“We check out welding equipment ourselves. You’ve got a spool of metal- check there’s a mechanism inside, and a gas bottle. You’ve got to check there’s no leaks. It’s not formally checked, but I know if it doesn’t feel right and I’ll get someone in if I can’t fix it myself- we do a lot of our own maintenance.” (Experienced, small company, South London)

However there were a few respondents who were aware that their welding kit was formally checked for safe functioning.

“Welding equipment changed every 2 years- but don’t know if that’s because they’re worn out or because of new technology”. (Experienced, small, Oldham)

“Did have a guy come in checking the welders. He checked the fumes and wrote down the name of the welder. And he held the trigger down on the equipment and measured the excess metals on it. He was someone outside, probably from the welding institute.” (Experienced, medium, Coventry)

“Someone comes in every six months or the welder reports it to a supervisor. If it’s not working properly they shut the machine down”. (Inexperienced, small, Oldham)

There was some expectation, from those in more sophisticated organisations, that checks are probably going on without their knowledge.

**Personal health checks**

Amongst the whole sample there were only three particularly health conscious companies who instituted regular health checks for their employees.

“We have our ears checked every year, and get a full medical once every six months. ” (Experienced, small, Coventry)

“We get eye checked six monthly. It’s customers’ requirements for things like that. You want to make sure you don’t have a one eyed welder. It’s to give them peace of mind so they know the work is OK, like a lady wouldn’t want plastering done in her house by a plasterer with one arm.” (Experienced, medium, Coventry)

“Well, I had a health check when I started, and the company has a voluntary annual check but I don’t go every year. They do checks for your lungs, for your eyesight and for skin cancer.” (Experienced, medium, South London).

Most of the welders seem to never have thought that it might be an option to have a regular work-related health check and indeed were slightly puzzled (and even mildly concerned) when the subject was raised since they had assumed there was no special need relating to their occupation.

**Fume level checks**

For most, this was also an unfamiliar and surprising concept. There was a broad assumption that if the extractors are checked to see if they are operational then there would be no need to check for fumes. They felt that all fumes would be sucked up anyway – or at least most fumes.
By contrast, in more sophisticated companies, it is assumed these checks are actively occurring, but that they are unaware of it happening. Thus only four respondents were aware of regular fume level checks actually taking place.

“*The air is regularly controlled…it’s obvious.*” (Inexperienced, small company, London).

“We’ve got fume extractors at the workshop. They’re checked by health and safety every year for noise, electrics and fumes.” (Experienced, small company, South London)

**Checks relating to Fire Safety**

Fire safety was sometimes mentioned spontaneously as a safety check which was thought to be occurring regularly. These checks were thought to be carried out either by the fire department, the insurance company, the gas provider or the internal health and safety rep.

“We once had a visit from the fire brigade, to check the fire extinguishers”. (Experienced, small company, Oldham).

“The health and safety officer comes around once a day and checks. He makes sure we’ve got fire blankets on the petrol tanks, a screen around you, fire extinguishers. His big thing is that a lot of bubble wrap and cardboard gets sent around, and he makes sure it’s not been left around anywhere”. (Experienced, small company, Coventry).

Gas bottles in particular were recognised as a fire hazard.

“The fire department comes to check us- and we notify them where we keep the gas bottles.” (Experienced, small company, London).

“Our gas bottles are all checked by the company we get them from and they all have certificates to say they’ve been checked and if something went wrong you could sue the hell out of that company.” (Inexperienced, small company, London)

“I’ve got an issue with the storage of propane gas. They’re much too near to our benches”. (Experienced, medium, South London)

However, regarding personal checks on gas canisters, only a few respondents were checking these conscientiously

**Written records of checks**

Most respondents did not regard the existence or completion of written records as being part of their responsibility, it was instead seen in a vague way as the responsibility of ‘the Management’. Indeed, only a few were aware of written records for any health and safety checks. This was in line with a generally low awareness of whether checks were happening at all.

“*Dunno if we have any checks on machinery or equipment*”. (Experienced, small company, Oldham).
There was some awareness, however, of written records for some specific equipment.

“We don’t have written records for PPE or anything to do with welding, we just have checks for big machinery”. (Inexperienced, small, Oldham).

In a couple of cases, written records of one of more processes were kept and made available with one ‘extreme’ case discovered:

“There’s a folder for all health and safety checks and I’d know where to find them if I wanted to look at them”. (Experienced, small company, Coventry).

6. SPECIFIC HAZARD AWARENESS

6.1 Awareness of Hazards- Overview

Whilst the topic of hazard awareness has been touched on already within different sections we feel that it is valuable to gather responses to hazards in one place to give a clearer overview.

Most of our sample were experienced welders and, as such, felt they had built up a reasonable knowledge bank about which particular welding methods and metals were associated with extra or particular hazards. However, even for experienced welders, there were day to day exceptions. These included situations such as new jobs with new or unusual metals or with different equipment or PPE. New issues were also raised by high spec work with unusual metals and new or unusual welding equipment. For the most part however experienced welders relied on this ‘knowledge bank’ built up over the years from their own personal experience augmented by reading instructions from customers/suppliers and by advice given by managers in response to new jobs. The less experienced welders, on the other hand, were still largely at the stage of relying on their managers to help them to take sufficient precautions with each task and were happy with the level of support they were given.

What was significant was that these ‘knowledge banks’ built up by experienced welders were almost always incomplete and often contained erroneous assumptions. It was found that experience in welding can simply lead to repetition of error and passing on of incorrect assumptions, whatever improvement welders had made in their process skills.

The greatest areas of ignorance surrounded the precise contents of noxious fumes and their long term consequences if breathed in. For the most part they focused on obvious and visible dangers such as splattering, burning, arc eye and fumes when they billowed out or smelt or tasted particularly unpleasant. Any concerns about long term health effects tended to be pushed to the back of their minds on a day to day level.

“You don’t really know unless you get something and it’s diagnosed by a doctor, what damage is being caused... I suppose I should worry about the long term health effects because you haven’t got a clue what they’re doing”. (Experienced, small company, Coventry).

It was found that even where there was wide spread awareness of immediate physical responses, for example, ‘the chills’ or blackouts this did not equate to awareness of the long term consequences.
“Lung damage- never give that a thought”. (Experienced, small, Oldham)

“I don’t feel concern about the fumes. I don’t feel like I’m in ill health. I don’t feel like it’s knackered me up.” (Small, experienced, Oldham)

“I’m not worried about lung disease, because your nose filters it (fumes) a lot”. (Experienced, small company, South London).

There were very few mentions of long term, specific disorders potentially resulting from welding activities.

6.2 Awareness of Hazards: Metals

During the research there were some interesting insights gained into the assumptions welders held about certain metals and processes. Whilst not probed in-depth these could nonetheless be useful in illuminating the areas in which Health and Safety education could be targeted. Not everyone had worked with all the metals so comments largely came from those who had most recently worked with these metals. The differences between welders views in this area appeared to be idiosyncratic as opposed to correlating between welder type.

**Mild steel**

This was generally perceived to be non-toxic.

“I don’t think there’s anything wrong with mild steel”. (Inexperienced, small company, Oldham).

“For fumes, everything’s (mild and stainless steel) much the same”  (Experienced, small, Oldham)

“Yeah, it’s dirty but there’re no real dangers”. (Experienced, medium, South London)

**Stainless steel**

There was some awareness that stainless steel might be somewhat toxic, at least in comparison to mild steel. Few were however worried about it as they assumed the LEVs would cope adequately with any hazards.

“Stainless steel- I was told it gives off carbon in the fumes, but with our extraction system, I’m not too bothered”. (Inexperienced, small, Oldham)

“Stainless isn’t very bad, as long as you’ve got a bit of ventilation” (Experienced, small company, London)

“We don’t use any highly toxic stuff- just mild steel and aluminium. Stainless steels got nickel and chromium, but I don’t think they’re that high. Titanium’s bad, but that’s mainly in the aircraft industry”. ( Experienced, medium company, London)
“There’s no specific worries with stainless steel. You just need to wear a face mask, but look out for arcing because you get a flash off the polished sheets.” (Experienced, medium, South London).

**Galvanised steel**

In contrast, those welding galvanised steel recognised it as particularly hazardous. Zinc in particular was known to be a dangerous metal resulting in chills and cold-like symptoms if inhaled. Few were however welding galvanised steel on a regular basis.

“Galvanised- it’s got zinc in it. Gives off this whispy white smoke that’s poisonous. The boss knows the exact name for it, but it’s like mustard gas.” (Experienced, small company, London).

“Zintech material: Mild steel, coated in zinc. It gives off an ashy type vapour”. (Experienced, small company, Coventry).

“It’s very toxic”. (Experienced, small company, Oldham).

“I do have protection when I’m using galvanised metal, but that’s only because I can taste it”. (Experienced, small company, South London).

“The zinc- it’s very bad to breathe in- you get zinc chills. But it’s just a short term thing, so you use a filtered mask.” (Experienced, medium, South London).

**‘Mystic oil’**

Mystic oil is a soluble coolant used to coat the metal. As with other metal coatings, it did cause some concern but again the smell was the trigger.

“I’m worried about it. It’s not the fumes, it’s the smell.” (Inexperienced, small company, Oldham).

**Paint**

There was one example of a respondent welding through paint. This was known to be hazardous.

“If you’re welding stuff with paint, the fumes are ridiculous. I told him (the boss) to remove the paint, and he told me it was removed, but it wasn’t. It made me feel sick.” (Experienced, small, London).

**Aluminium**

There was a strong perception that aluminium is hazardous both to the lungs and the eyes and can easily cause burns. It was sometimes described in more dangerous terms than stainless steel.

“I don’t like working with aluminium. You get lots of flare and toxic fumes which isn’t good for your lungs. I wear a filtered face mask for that”. (Experienced, medium, South London).
“Working with aluminium welding and grinding has been connected with cancer in the past...it's general knowledge that I found out through the course of being a sheet metal worker and in the trade”. (Experienced, small company, Coventry)

“I think it's aluminium gives off a white cotton in the fumes, I don't know what it does”. (Inexperienced, small company, Oldham)

“Aluminium doesn’t change colour when it gets hot, so you don’t know when you come to pick it up”. (Experienced, small, London).

“Welding with aluminium- it's the most dangerous one. You get a lot of reflection from the arc”. (Experienced, medium, South London).

**Other metals**

There were a few welders that were working with less standard metals such as ‘Super alloys’, Titanium, Cobalt chrome and Manganese (one in our sample).

“Super alloys are the worst because, to make the super alloys, it’s like super fuels for your car. They stick god knows what in.” (Inexperienced, small, London).

“We don’t use cobalt chrome very much. About 5%. And I don’t know if it gives off different fumes. To be honest, I can’t see it because it goes up the extractor.” (Experienced, medium, South London).

**6.3 Awareness of Hazards: Processes**

**MIG and MAG**

These were seen as less sophisticated and more standard processes, bringing with them not much more than the standard hazards.

“MIG and MAG are a lot safer from a human perspective, because you’re using electricity so it’s not as dangerous as arc welding, I first started with MIG and MAG, but I think it’s more psychological because I don’t really think any welding is life threatening”. (Experienced, medium, London).

“The main hazard is MIG welding as there are a lot of sparks and you can get burnt quite a lot.” (Experienced, small company, Coventry).

“You can get burns from molten metal when you’re doing overhead work” (MIG). (Experienced, small, South London).

“MIG- there’s lots of splattering. Imagine a sparkler. There’s a shower of sparks”. (Experienced, small company, Oldham)

**TIG**
This process was very widely used amongst the sample, although not necessarily as their most frequent welding method. It was considered by some to be quite ‘clean’, because it is a more precise process, and indeed some had no knowledge with any particular hazards associated with it. Three welders who were using TIG as their main process did recognise certain specific hazards such as argon gas, arc eye, burns and the rod metals fumes and burns.

“...an asthma attack. It happened to me once, when I was TIG welding in a vessel.” (Experienced, medium, South London).

“With TIG you use a different gas. It’s heavier than air, so it can build up in confined spaces and you could suffocate, but with MIG its carbon dioxide which is lighter than air so will disperse in the atmosphere”. (Experienced, medium, Coventry).

“I do know that some of the tungstens you use- they have a substance in them that can be harmful, like cyanide or something, which means they last longer. That’s a worry you wouldn’t have with MIG”. (Experienced, medium, Coventry).

“You have to watch out for your colleagues getting arc eye. You have to keep other people informed if you’re going to arc up”. (Experienced, medium, South London).

“Argon can be a problem, but only if the gas flow’s too high. Usually there are fewer fumes, so I don’t wear a mask”. (Experienced, medium, South London).

“I’d say TIG is more dangerous for anyone around you. You could have a metre long welding rod and it could take someone’s eye out.” (Inexperienced, small, London).

**MMA**

This was thought to be a fairly basic process which resulted in a lot of mess and potential hazards.

“You could get an electric shock.” (Inexperienced, small, Oldham).

“You can get fume fever off stick welding. It’s like a cold on the chest”. (Experienced, medium, South London)

“Stick welding, you’re jabbing at the thing to strike the arc, which can be dangerous.” (Inexperienced, small company, London).

**Oxyacetylene**

This was only occasionally used by our sample in the present day, although almost everyone had experience of it. It was not a prime source of concern by and large.

“Oxyacetylene (cutting) is the main problem, as oxygen is coming out very fast. You could hurt yourself if you had a lapse in concentration”. (Experienced, medium, London).

“The flame on the acetylene is very flammable and a leak on it can cause explosions, so it’s a big safety concern”. (Experienced, small company, Coventry).
Enclosed spaces

There was a general worry here, from those with experience, around working in enclosed spaces where there could be a threat to the oxygen supply which could result in sudden death. This was in addition, of course, to the lesser issue of uncomfortable working conditions.

"My main worry, in an enclosed space, would be fumes- that there’s enough oxygen in the air to breathe. In the past, you would have just got on with it, but now you think ‘no, it’s like smoking forty to sixty cigarettes a day’”. (Experienced, medium, London).

7. CORRESPONDING BEHAVIOUR RELATING TO DANGERS IDENTIFIED

Given their awareness of some of the hazards it was of interest to see what precautions were therefore being taken by the welders interviewed.

7.1 Behaviour relating to Fumes

By and large, these welders were not overly concerned about the dangers of fumes, with a few specific exceptions as described earlier. The presence of general extractor fans and ventilation was seen as the primary defense against fumes for many. However, awareness of poor standard of ventilation/extraction in some premises meant that others either ignored the issue or were more reliant on their RPE.

LEVs were considered to be an essential part of the organisation’s kit in maintaining a good quality of air in the workplace. A couple of welders even used multiple extractors in particularly high fume environments.

“I’ve got a friend who’ll put 2 extractors on it if he’s doing MMA” (Experienced, medium, Coventry)

Only one welder had no form of LEV or general ventilation at all.

“There’s no ventilation- no windows, nothing. I get a fan for the summer, but even that can be bad because it affects the weld.” (Experienced, small company, London).

Whether general ventilation, or LEVs, were highly rated or not, something was used by almost all respondents, although for some, certainly not necessarily every time.

“I don’t know how good our ventilation equipment is. It’s seldom used”. (Experienced, small company, Oldham)

“The extractors are very noisy, so we don’t put them on much”. (Inexperienced, small company, Oldham).

“We’ve got 2 extractors and I use them if we’re welding for a lot of the time. Particularly if I’m using MIG for the day. We’ve also got one over the bench, and I’ll use it if I’m doing things like Manganese- because it smells”. (Experienced, small, South London)

Nonetheless, most were convinced they were using their LEV properly and that they are effective.
“The (LEV) ventilation is very good. The hood’s very close to what I’m doing and I’m welding at arm’s length anyway. I can see the column of fumes going up into the ventilator. And anyway, anything else goes around my face because of the mask.” (Experienced, small company, South London).

“It definitively works. You can see it”. (Experienced, small, Oldham)

For the few doing ‘long’ welds their LEVs were rarely moved with the weld.

“You’d have to stop and start- it would take at least four times as long.” (Experienced, medium, Coventry)

“I’m working on a five metre bar. It’s made from stainless steel tubing. Part of it’s on show. The extraction is on, but I don’t move it.” (Experienced, small company, Oldham).

Whilst some respondents placed LEVs directly over the work, others placed it above their heads. It was often perceived that LEVs were difficult to get into the right position.

“Sometimes you can’t get it where you want so you just put it overhead. It does go in your face a bit- you’re just reducing it as much as you can in these things. Nothing’s perfect” (Experienced, medium, Coventry)

RPE (Unpowered)

It is worth noting at this point that RPE was not a term used or generally understood. It was usually referred to as a subcategory of PPE.

Usage of unpowered RPEs was very variable, with some never or seldom using them, and mostly using them only for specific tasks. Only a few respondents used them all the time.

“We have the tissue type of face masks. They’re not fitted, and we don’t use them”. (Experienced, small Oldham)

“I don’t use a mask except when I’m polishing. That’s because the extractor’s so good, and I don’t use stick or MIG”. (Experienced, medium, South London).

“I wear my mask all the time, but some people don’t. It covers your nose and mouth and has a canister on the side. I wear it even for grinding, and even for TIG.” (Experienced, small, Oldham)

“I wear my mask underneath my helmet if I’m going to be welding for a long time or the fumes are going to be bad. I wouldn’t for a small job” (Experienced, small, London)

The tasks that seemed to prompt usage more readily were grinding, because of the dust, paint spraying and welding galvanised steel.

A range of different types of mask were mentioned made either from paper/tissue to fabric to plastic/rubber with a filter and to plastic with a filtered canister attached. Almost all were using the simpler forms of RPE.
There were some suggestions that only the ‘lighter’ and less intrusive masks could be worn underneath helmets/visors and hence their popularity.

“I haven’t got a rubber mask with a filter. I thought about getting one, but I can’t get it under the welding mask. The material ones are the only ones that fit underneath it.” (Experienced, small, London)

RPE (Powered)

Only a few in the sample had current experience of using powered RPE. Most of these were using it only occasionally, with only one ‘full time’ user. There were indications that powered RPE were associated with specific needs, such as with MMA, grinding, high toxicity metals or confined spaces.

“For the breathing equipment, you can get on with a pack on your back that produces it’s own extraction for MMA…it’s better to be safe than sorry, there’s nothing else that produces more fumes.”
(Experienced, medium, Coventry)

One welder did not have powered RPE available, but was nonetheless attracted to it for health reasons.

“Powered masks are brilliant. I’d certainly wear it if I was grinding and they’re a lot nicer to use. It’s safer because you breathe in smoke and fumes without noticing. (If you don’t have one).” (Experienced, small company, South London).

7.2 Behaviour relating to noise

Ear plugs and ear defenders were regarded as the standard equipment available to protect against noise damage. Ear plugs were seen as the more day to day form of protection. Ear defenders were seen as necessarily only for particularly noisy work such as grinding.

Ear protection was regarded as optional by many, or of lower importance on the scale of safety measures. This was because either welding was not thought of as that noisy or because the noise was seen as the lesser danger as opposed to not being able to hear problems with the machinery or shouts from other welders. Some respondents simply could not be bothered to wear them.

“Noise isn’t much of an issue for you if you’re just a welder”. (Experienced, small, Coventry).

“We do have ear protectors, but only for grinding. I don’t wear them generally, because there’s not much noise”. (Experienced, small company, Oldham).

“I sometimes wear my walkman instead of ear defenders. I can’t have a radio because the TIG interferes with it” (Experienced, small company, London).

“We don’t wear ear protection, although it is supplied”. (Experienced, small company, Oldham)

“I only wear ear plugs when I’m grinding. You must be able to hear your plant to know if it’s working properly”. (Experienced, small, South London).
There was little concrete awareness as to when each form of protection should be worn; it was largely perceived as the respondent’s choice in response to own circumstances.

“I don’t use plugs or defenders all the time. Only when they’re needed.” (Experienced, medium company, South London).

### 7.3 Behaviour relating to eye damage

In regards to eye protection against bright light and arc-ing, most were using the standard helmets with changeable lenses with a few using ‘autodark’ lenses. Some were not changing lens to suit the welding process or material, for example, some admitted to sometimes using lens that were too weak for the job.

“For MIG I use 10EW, but on TIG I use it up to half again. I do, but the option’s there for other people-it’s down to their own preference. There’s nothing stipulated.” (Experienced, small company, Oldham)

Some were not using full eye protection for short welding jobs such as ‘tacking’ welding. Instead they might just hold up the visor or put their hand in front of the light or close their eyes.

“I just use the handheld one with glass in”. (Inexperienced, small, Oldham)

Almost all had personal experience of arc eye with some on a repeated basis.

In terms of protection from foreign objects in the eye there were a number of recollections of having to go to casualty or the eye hospital due to a piece of metal in the eye. For some this was due to eye protection not being sufficient i.e. bits of metals getting in under or over the top of protective eye wear, for others it was through not wearing goggles when they knew they should have and for others still it was genuinely thinking it had been unnecessary, for example, for short drill jobs or grinding.

### 7.4 Behaviour relating to Burn Damage

‘Burns’ included both contact with hot materials and UV radiation burns. Protection against burns was a top of mind activity as the danger was obvious and the results immediate and visible. There was also a very direct connection between the action/omission and the result.

However, there was a perception that burns are occupational hazards, even if all the necessary health and safety precautions had been taken.

Spattering, where globs of metal fall off the weld or grinding job into the shoe/ear or onto the head, was a main concern in regard to burns.

“With MIG, there’s lots of splattering imagine it’s like a sparkler. It’s just a shower of sparks.” (Experienced, small company, Oldham).

“Yeah, I wear ear plugs all the time. They’re also good for keeping blobs of metal out of your ears-that’s the worst place to get it!” (Experienced, small company, Oldham).

“You can get burnt from the flux on stick- it flies about.” (Experienced, small company, Oldham)
Moreover, welders admitted to not taking the necessary health and safety precautions on occasion, for example, some were not always wearing gloves (heavy or light) when they feel they should.

“You don’t need the heavy gloves for TIG. It doesn’t spatter and it’s just like a pen. It’s really good.”
(Experienced, small company, Oldham).

“Sometimes I might not wear gloves...for any sort of welding. But I have burned myself before. I’ve never been told I should wear them for oxy acetylene.”
(Experienced, small company, London)

Other examples were not always putting on light gloves for manual lifting, not covering all the body while welding, not securing welding equipment properly when not in immediate use and wearing short sleeves/shorts in summer resulting in heavily sunburnt face/arms.

“You know, sometimes your sleeves will work their way up your arms while you’re welding”.
(Experienced, small company, London).

Leather aprons were not often talked about as a means of protection against burns and seemed to only be used for heavier activities. There were not many people wearing them even when they had them available.

“If you’re MIGGING and you’re sitting down, it can drip down onto your lap and burn through”
(Experienced, small, London)

Barrier cream was mentioned by a few but was not currently used by anyone.

7.5 Behaviour relating to Health and Safety Protection for non-welders

The need to protect other people, such as shop floor colleagues, inspectors, visitors, clients etc, was accepted by all.

The key dangers from which these people ‘needed’ to be protected were considered to be arc eye and fumes. The most obvious measure and frequent measure taken was to place screens around welders to guard against bright lights and indeed welders always had their own discrete area of operation. Although everyone now had screens, they were of varying levels of efficacy.

“We made them ourselves from tarpaulin from wagons. We just use one, to keep the bright light off non welders”. (Experienced, small Oldham).

“Before, they used to just stick bits of card up, but it was a very small welding bay. They have notified people- the guys upstairs used to come down and just walk in on me when I’m welding. They’ve said ‘if you see a light, call for him first’”
(Experienced, small, London).

Protection against fumes was presumed to be provided both by the welders’ LEVs and by the general ventilators. Ceiling ventilation was assumed to protect everyone.
8. INFORMATION SOURCES AND COMMUNICATIONS

8.1 Information Sources for Welding - Expertise and Knowledge

Keeping ‘up to date with welding’ was a foreign concept to most and indeed was mostly seen as an unnecessary activity. This seems to be due to most of the welders interviewed being happy in their comfort zones, with low levels of professional aspiration and seeing little benefit in proactively learning about other techniques. The general impression was also that welding, despite being a particular skill, is not a complex subject.

“How do you mean (keep up to date)? There’s only so much you can learn, it’s not rocket science”
(Experienced, medium, Coventry)

“I don’t think there’s any need to keep up to date” (Experienced, medium, S London)

“There’s not really been any changes over the years. Most of the information we get is about health and safety, that changes but welding processes don’t really change.” (Experienced, medium, London)

Generally, any ongoing proactive learning on the topic of welding was rare. Only two welders had ever used websites to further their knowledge about welding. One of these welders had, on occasion, used Wikipedia or Google to understand more about a new procedure he had come across. Across the board there were no magazines or journals that were regularly read although there was occasional browsing by two respondents.

“I have occasionally looked at TWI magazine.” (Experienced, small, S London)

“I used to see the odd magazine through the company; the works’ manager sometimes had Welding Craft” (Experienced, medium, S London)

However there was slightly more browsing of welding catalogues amongst respondents but these were come across in the course of their day and not sought out. Nonetheless, catalogues are a potential contact point when welders are looking for new PPE, browsing out of curiosity or just killing time.

“If a catalogue comes in, you might have a look about a price of a piece of equipment or things that might be handy for the future.” (Experienced, small, London)

There was some awareness of The Welding Institute (TWI) as a resource centre, but it was seldom consulted for information.

For the more senior welders, it seemed welding supplies company reps were a more regular source of learning about new products and possibly even new techniques.

“A sales rep came for new stud welding machines. I got a demonstration and just reported to the boss about it.” (Experienced, small, London)

“The rep comes round, and we talk about equipment and I say ‘get more of these.’” (Experienced, small, Oldham)

“Equipment manufacturers- their reps are useful. They tell you what’s new on the market, like a new rod or a new tool or even a ventilator”. (Experienced, small, South London).
“The reps come to the shop floor for a quick chat and they show you things like smaller welding torches. Recently, the 3M rep came round about tapes and masks.” (Experienced, small, South London)

The less experienced welders, however, seldom got to see the reps.

“They’re always coming round, but we don’t get involved in that.”

(Inexperienced, small, Oldham).

Another source of learning discovered is when welders visit suppliers or even other welding companies when outsourcing work.

“BOC- they’re the people who supply us with gas, been down to the centre to pick up rods sometimes. Before we got a new TIG welder, I’d talk to the guys there about it.” (Experienced, small, London)

“I found out about the electron beam welder when I visited another company we were outsourcing to”. (Experienced, medium, South London).

Although a small minority belonged to a Union (MSF/Amicus) these were not seen to be a source of information about welding. Unions were expected to put out general workplace information about Health & Safety but not about specialist welding issues. Nonetheless, the union is still undoubtedly a communication channel with current communication being via letters, magazines and meetings.

“We get letters from them all the time- little promotions and what they’ve been doing.” (Experienced, medium, Coventry)

8.2 Information Sources on general health and safety

There was a widespread awareness of various pieces of information relating to Health and Safety in the workplace. Most of this was fairly general and related to all workers with very little being specifically targeted towards welders.

Many companies used workplace walls as a means of fulfilling their obligation to communicate about health and safety. Typical items noticed were regarding insurance policies, food and hygiene regulations, keeping alleyways clear of obstructions, where to wear goggles and ear protection and the 1973 Act. Some organisations had specific health and safety boards, although these were not always taken seriously.

“They just pin it up there and no-one ever reads it.” (Experienced, small, Coventry)

There was also some experience of attending general health and safety courses, for example, manual handling courses, electrical safety courses, etc.

8.3 HSE as an information source

A few were well aware of the HSE as a body and what they could offer, including a website resource. One respondent even claimed to have seen an HSE magazine in the past.
“I used to get to see the health and safety magazine from the HSE, but not anymore. It used to be left in the staff room”. (Experienced, medium, South London).

Almost half were aware of the HSE to the degree that they could identify a communication received from them although this was more often posters rather than leaflets.

However, the rest of our sample had only a superficial understanding of the HSE, more frequently mistaking it as a term denoting generic health and safety bodies. This was probably exacerbated by what was seen as a plethora of organisations concerned with health and safety including insurance companies, local authorities and the NHS etc.

“HSE- I have heard of it. I’ve seen it on a leaflet at college, but there were lots of different authorities to do with health and safety” (Experienced, medium, Coventry).

“HSE- I’ve heard of them. I read over them briefly for a course I’m doing (plumbing). But I’ve not heard of them apart from in that book.” (Experienced, small, London)

Few had any experience of the HSE website and most felt the HSE website was not something they would bother to explore.

“I didn’t know it existed, and I wouldn’t use it”. (Experienced, small, Oldham).

“They’ve probably got a website, but I wouldn’t know how to find it” (Experienced, small, Coventry).

“It would probably be quite general stuff, nothing really about what I do”. (Experienced, small, Oldham).

There were only a few mentions of known site visits by HSE Inspectors and indeed a couple of older welders suggested that such visits were less frequent than in the past. One older respondent was also cynical about the practical knowledge base of ‘today’s’ HSE Inspectors as he perceived them!

“You don’t see factory inspectors these days. You used to get one or two visits a year in the past, and nowadays of course, it could be a girl and what would she know? Or someone from university with no shop floor experience.”

(Experienced, small, South London).

8.4 Information sources on welding health and safety

Most of what the welders knew about health and safety, as it specifically relates to welding, was learnt early on in their careers either formally, at college, and/or informally via apprenticeships or more experienced work colleagues. A few had added to their knowledge on health and safety as it related to new equipment or new processes, especially when gaining extra qualifications such as certificates or ‘codings’. Specific precautions that needed to be taken when completing particular tasks or jobs were passed down by managers in some instances, but this was not seen as formal learning.

There seemed to be an absence of (awareness of) specific welding health and safety courses when compared to other subjects that seem to be covered, such as general slips and trips, manual handling, dealing with asbestos, learning the electrical regulations, etc. This is in itself seems to be a problem since it reinforces the belief that welding specific health and safety is not needed. COSHH sheets have
the potential to be a health and safety learning source, but were not known to many and used by even fewer. There was little awareness or recollection of using the HSE website or COSHH sheets even whilst at college.

The other ongoing source of information about health and safety surrounding welding was, of course, the advice and concern of fellow workers with the more experienced of these stepping in if they see something risky going on.

9. SUGGESTIONS FOR COMMUNICATIONS ROUTES

Communications routes were explored for their potential to educate and inform welders on Health and Safety issues however only a few of these welders were sufficiently self motivated to want to learn anything about their job outside their normal working environment and hours. Anything that they needed to learn, they expected to learn courtesy of their managers and thus direct communications, in their leisure time (direct mail, internet, general media), are unlikely to be welcomed or taken up. There is little evidence that these welders were reading any professional/trade publications outside the workplace, although a number did look at catalogues. The younger, inexperienced welders did not show any greater enthusiasm for learning about welding, let alone health and safety in welding.

It is likely, therefore, that the more effective routes are going to be via the workplace, since this is where welders are when they are thinking about matters concerning welding. This would seem to be the best place for any communication to reach them although mass media might hold some promise since they were consumers of mainstream press, radio and TV.

Reasonable interest was shown in some of the ideas put forward during the interview, assuming that they are focussed on health and safety and welding. One of these was training/ information DVDs and organised viewing. This will probably work best for the medium sized companies and those more professionally structured who will have the motivation to fix training within the working day. Any such materials should / could be structured and ‘charted’ by specific metals and processes to allow for skipping forward and focussing on the key areas of relevance to each business.

“It might be good to have a DVD for in house training. We do get these for general health and safety things when we’re away from the factory, but we don’t get them in our own company”. (Inexperienced, small, Oldham).

Another idea that was well received was having a half day or 2 hour presentation by a health and safety expert. This is likely to appeal most strongly to the smaller and less organised companies where personal contact will create impact and make a space within their busy schedules.

“If they were to come and see us, that would be very good”. (Experienced, small, South London).

The idea of someone coming in to give a ‘talk’ on welding specific health and safety was the idea received most positively amongst welders across the sample. It was felt that this would be the best way to get the attention of welders whatever their attitude to the issue of health and safety. This method would mean direct, personal engagement with the welders and would allow them to ask questions, gain clarification over health and safety information and voice any concerns.
However a few suggested that this method might be too expensive or not logistically feasible for the HSE and thus a training DVD or organised viewing was seen as the second best option in terms of something that would be more directly engaging than a hand out, leaflet or online module.

**Other spontaneous suggestions** included continuing to use the company notice board and having ‘Reps’ (from equipment manufacturers) giving talks on health and safety. Relying on companies to put current health and safety information on the company board would be risky as it would depend on the company’s concern and involvement in health and safety and whether or not they have an appointed health and safety person who could be responsible for this task. It also depends on whether the company has a notice board and, of course, whether welders actually look at it.

Using **supplier ‘Reps’** was suggested by a few. This was perhaps because they often already had an established (if very informal) ‘training’ role in companies in terms of showing how new equipment worked, how to maintain it and, in some cases, the health and safety concerns associated with it. There was a sense that welders would listen to Reps perhaps due to them being ‘insiders’ to the industry and because welders would see them as experts on welding tools and methods and thus in the safety issues associated with them. However how the HSE could work in conjunction with equipment manufacturers and train the Reps in up to date health and safety knowledge is unclear.

An untapped resource could be **Unions and Trade Associations**. However there are pros and cons to delivering health and safety messages via a Union or Trade Association. In terms of Pros, the welders who were involved in Unions tended to see them as trustworthy and a good source of information and advice for Welders. However the obvious Con is that many welders were completely uninvolved in either a Union or Trade Association and were completely disengaged from the concept of either. An additional suggestion which we feel could well have potential is targeting welders via **daily newspapers**. Any attempt to target them, however, would need to attack their complacency, since otherwise news reports may well be ignored. Shock headlines on the dangers of welding could be the means to penetrate their complacency.

Some of the **ideas** were received with less interest. One of these was the concept of **E-learning modules**, especially at home. Few felt in any way incentivised to bring their work home and to dedicate precious leisure time to swotting up on welding issues. However it could possibly work if it was learning at work or college if it felt practical and interactive rather than academic.

The idea of having a **1 day events** was dismissed as it was instinctively felt to be too long for the subject matter. The idea of using the **HSE website** was also not met with little interest. There was very little enthusiasm for doing these sorts of activities which could feel like ‘extra’ work especially as they saw health and safety as a very practical and almost instinctive issue.
7. CONCLUSIONS & RECOMMENDATIONS

1. Welders’ attitudes to their job tended to be influenced by their role in the company and the type of work they carried out. The spectrum in our sample ranged from inexperienced welders in low tech industries to those working in high tech, sophisticated organisations and being the top welder in the company.

2. Most of the welders in our sample were characterised by a feeling that they had not been academic at school but better at practical tasks. Many had come into welding via an engineering route, though occasionally there was a family history of welding, and most did not have ambitions beyond the shop floor.

3. Two thirds of our sample had engaged in formal training, but their main focus was on keeping their job and existing lifestyle within the area they wished to live in. Apart from a few welders, little or no interest was shown in furtheing their knowledge of welding outside work.

4. Development within the job was largely reactive, learning ‘by osmosis’ from other welders or when demanded by a new task, with occasional developmental leaps when, for instance, being asked to acquire a new coding.

5. In spite of a feeling of satisfaction emerging in respect of a completed task well done, and the knowledge that welding was a skill, a degree of apathy was evident amongst most in our sample, in relation to welding. Those feeling they were working in a dynamic, progressive trade were relatively few.

6. Health and safety was not top of mind at a day to day level. Of most concern to our sample of welders was the fact that the job was dirty and hot and could be stressful owing to the degree of concentration required. The work was sometimes felt to be monotonous, but additional factors could reduce the routine nature of the job. These included working with new materials or using different processes.

7. In general, the subject of health and safety was now seen as more prevalent than in the past and to be working on their side, despite there being the usual gripes, from small businesses especially, regarding PC overkill on health and safety.

8. Health and safety, in connection with welding, was thought to be mainly common sense and to focus on ‘looking after yourself’. Welding could be a dangerous job, if care was not taken. Core areas of concern focused on burns and arc eye, followed by dangers from dropping materials or suffering foreign objects in the eyes.

9. Few however were actively worried about health and safety as it related to their work, since they assumed that the dangers they could see were ones they could control, whilst any dangers which were not visible would be controlled by management. Any long term issues relating to lungs and eyesight were latent and easily pushed to back of mind, as unlikely to happen and thus not worth fussing about.

10. Fume and gas inhalation is a complex issue, generating much lower levels of concern than arc eye, as only visible fumes and clouds were considered likely danger points. These were
assumed to be taken care of by the use of extractors or dismissed as unlikely to be harmful (nb parallels with the passive smoking campaigns).

11. Precautions that were taken by welders included some PPE used by all, all the time. Most likely items to be worn on a regular basis were: boots, overalls, gloves and eye protection (visors). Some however were remarkably cavalier when it came to using RPE or ear plugs/defenders.

12. RPE’s were often not used because they were seen as unnecessary and because they could get in the way of the helmet. Moreover, LEV’s were assumed to negate the dangers from fumes. Most considered their LEV equipment to be fine, despite the fact that they tended to be upwards extractors or incorrectly used. Only a few were aware that their LEV’s were not adequate and even they were still only slightly concerned.

13. In only a few cases was welding equipment and PPE methodically checked and results recorded. In most cases it was on a ‘needs’ basis, with merely cursory examinations, i.e. informal and instinctive checks, carried out.

14. Health and safety information was derived from training (both formal and informal) which provided the bedrock of their current knowledge, added to by personal experience over the years from new jobs, new metals used and new equipment.

15. The greatest area of ignorance surrounded the noxious fumes generated by their work and the long-term consequences of inhalation. Only the immediately discernible physical effects of ‘chills and black outs’ seemed to be of any significance to these welders.

16. Support from their companies was generally (but not exclusively) patchy and ad hoc. Their focus tends to be on general health and safety issues, with welding specific advice only offered when a new process or metal is used. Moreover, incidence of welders feeling any need to keep up to date with developments in the trade, or to expand their knowledge of the subject, is low. Only two in our sample were occasionally browsing magazines or journals and only two had used a website on welding topics. Slightly more however did make use of welding catalogues.

17. Lack of welding specific education from companies is explained by welders not expecting there to be anything more to learn unless it relates directly to a new activity – in which case the companies would indeed inform them. New information is however spasmodically delivered via sales reps, equipment manufacturers, brochures, insurance company inspectors and other organisations involved in different types of welding.

18. There seems little opportunity to target these welders on an individual basis in their own right, as few felt any desire to learn more about welding, let alone about health and safety in welding. (There may be a role for mass media communication but it would probably have to shock welders into attention).

19. The best option seems to be to activate their organisations via easily delivered materials such as DVD’s and presentations, preferably relatively short, to be delivered in company time and with other welders and the health and safety manager present. Other possible resources might be unions and training institutes, and equipment and supplies manufacturers, via their sales reps and catalogues.
20. Given the overall COPD-reduction aim of this initiative, it would seem sensible to specifically enlist the help of equipment and supplies manufacturers in the ventilation and RPE areas. A campaign centred on the “hidden dangers” of fumes and gases should be attractive to these manufacturers as it might help them to sell more effective equipment.

21. Overall, the task of imparting health and safety information to welders in SME’s – particularly those in smaller companies and those dealing with less high tech products – does not appear to be an easy one. However, there are opportunities both via the company’s management system and via outside bodies which should help in the aim of reducing the incidence of COPD amongst SME welders.