

Crossrail: Occupational Safety and Health arrangements



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Abstract

Statistics from Crossrail suggest progressive Occupational Safety and Health (OSH) improvement over the course of the project. Accident levels are currently at or below those achieved on the Olympic Park, which was recognised as an exemplar of good practice. Interviews with employees of Crossrail and its contractors suggest this can be attributed to a range of factors including Crossrail's high expectations of the contracting companies, high levels of engagement and collaboration and the embedding of OSH throughout the project rather than it being seen as an 'add-on'.

OSH management at Crossrail has developed over time to take account of changing demands. Interventions in the last 4-5 years have included Gateway assessments to encourage contractors to develop and share good practice; Stepping Up Week to support worker learning on OSH; and the introduction of leading indicators.

Crossrail has worked hard to improve Occupational Health (OH) management by specifying standards for contractor OH services and by driving good practices in the management of health risks such as dust, vibration and shift working. Many interviewees commented specifically on how successful the project had been in this respect, although there was some variability between projects in the standards achieved. Implementation of Design for Health and the increased use of occupational hygiene practices have been features of Crossrail, but have been inconsistent across the project. The use of an Occupational Health Maturity Matrix (OHMM) has proved particularly effective as a mechanism to help contractors develop their processes and practices.

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There are many things which the industry can learn from Crossrail, particularly in relation to the operation of complex projects. These include the importance of sharing learning between contractors, the need to evolve management processes and OSH metrics, the need to balance the benefits of these against the demands they place on the contractors, and the importance of setting and enforcing clear standards in terms of clinical OH services and occupational hygiene services. Again the OHMM can be a particularly useful tool in this respect.

Many learning points from Crossrail have already been taken to other projects, such as Tideway, influencing for example Tideway's decision to specify a single provider of OH and occupational hygiene services; their focus on design for health from an early stage; and the introduction of leading indicators for OSH management.



¹ All images © Crossrail Ltd

1. Introduction

This overview report is part of a research project by Loughborough University, funded by IOSH to look at the implementation of OSH (Occupational Safety and Health) arrangements in complex projects. The main part of the IOSH project is an ongoing longitudinal study of the Tideway construction project. One of the aims of this Crossrail study is to inform that research by considering progression in OSH from previous projects such as the London 2012 Olympic Park, through Crossrail and on to the Tideway project and beyond.

OSH arrangements have evolved over time at Crossrail since the project commenced enabling works at the end of 2008. Several reports and legacy documents have been written by the Crossrail Health and Safety (H&S) team about the key OSH interventions on the project in recent years. This report provides an overview of some of these interventions, and draws out lessons for the construction industry to learn from Crossrail's experience.

The data used in this report have been gathered through:

- review of Crossrail OSH documentation including policies and procedures, statistics and reports written for the legacy website;
- observation of meetings and visits to four project sites, including conversations with frontline workers (n=12) on some of these sites;
- interviews with Crossrail employees (n=17) (mostly the H&S team including those based at Crossrail's main offices and those based on project sites, but also some site-based managers);



- interviews with contractors' employees (n=23), from the joint ventures (JVs) including some from project management (at various levels) and some employed in OSH roles;
- interviews with former Crossrail employees, interviewed as part of the Tideway research (n=10)

Report Structure

First, we present a summary of OSH within Crossrail, based on the published statistics and also on the perspectives of those working on the project. We then consider two specific OSH interventions and explore the impact of these, based on the experiences of those working with them. Occupational health (OH) arrangements are then considered: this is an arena where Crossrail has worked hard to achieve good practice and drive the industry forward. Finally, we consider the wider impact of Crossrail OSH practices and the lessons the industry can take from the project.

The data for this report were gathered during Spring and Summer 2016. Those interviewed were a relatively small sample of the total worker population: interviews with a different sample may have highlighted different issues. The report is 'point in time' and does not take account of changes in OSH management which have been implemented at Crossrail in the months since data collection.

2. Overview of OSH

Crossrail statistics

Crossrail's accident and injury rates suggest health and safety performance has been good compared to industry norms and has improved over the life of the project, with comparability with the Olympic Park since late 2015.² This is shown in Figure 1, which presents Crossrail (CRL) RIDDOR/3 day accident rates compared to those on the Olympic Park (ODA, Olympic Delivery Authority) at the same stage of the project.

The Olympics (ODA), in turn, was acknowledged to be a high performing project, reporting injury rates less than half those seen across the industry overall
<http://learninglegacy.independent.gov.uk/documents/pdfs/health-and-safety/259-leadership-worker-aw.pdf>

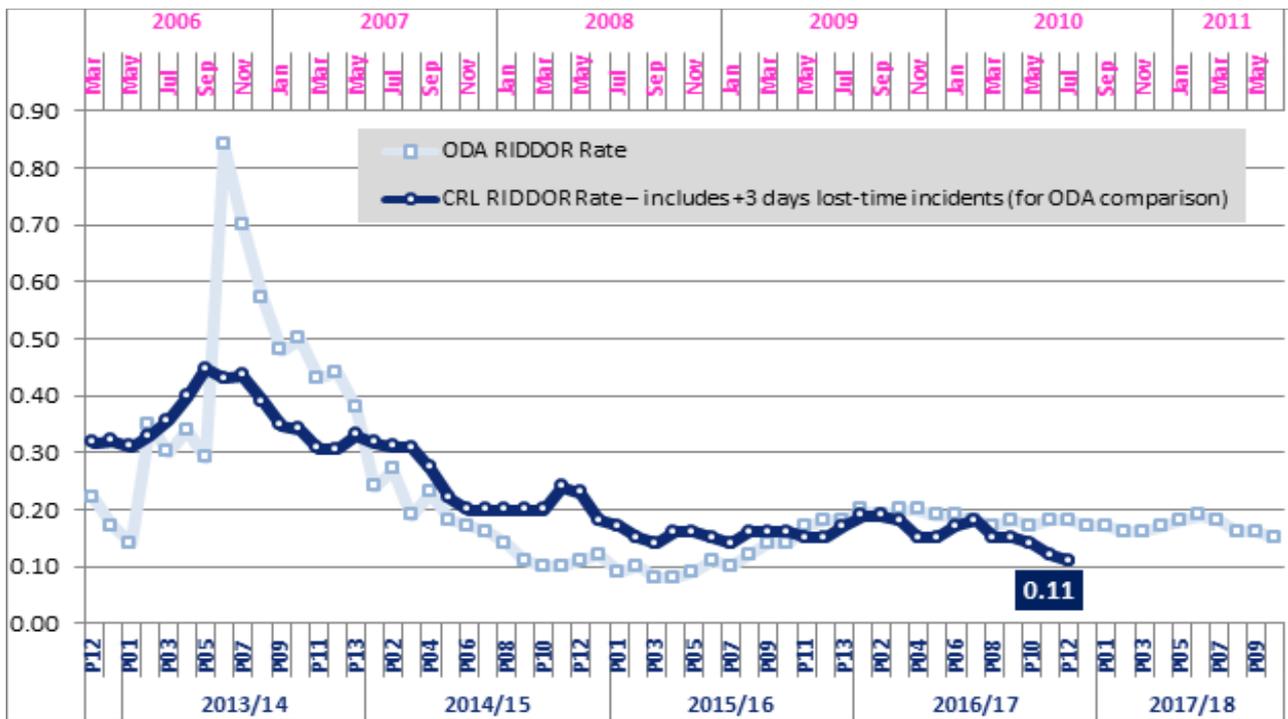


Figure 1 RIDDOR and 3 day accident rates on Crossrail, mapped against those from the Olympic Park at a similar stage of the project

Both projects showed a ‘spike’ in the earlier stages of the project: this is widely discussed in the industry as being typical of major construction projects, a consequence of increased activity as the main works get underway, and the time that new workers and contractors take to adjust to the culture and demands of the project. Progressive improvement can be seen after this for both projects.

For the Olympic Park, a second smaller (but sustained) increase in accidents can be seen at the later stage of the project: problems can arise when new workers and contractors join the project as it moves to a new phase (such as the move from civil engineering aspects to fit-out) and again take time to adapt to the project demands. Additionally, there is a risk in the later stages of time-limited projects that key people will move on to find new challenges, resulting in high churn, discontinuity and lost expertise. For example, Crossrail staff are already moving to Tideway and HS2. Crossrail has thus far avoided this 2nd peak – continuing the downward trend in accidents will be a key challenge as the project enters its final stages.

Views of OSH from employees and contractors

The good outcomes shown in Figure 1 suggest a positive OSH environment within

Crossrail, and this was recognised by many of those interviewed. Factors which were considered to have contributed to this included:

- the high expectations that Crossrail placed on all contractors and workers, *“I think the attention levels that they expect management to reach, so the management engagement. Also their engagement to making sure that operatives are valued and that safety ... and health is thought about”*

[Contractor/JV, OSH professional];

- the fact that OSH is embedded at all levels rather than being seen as an add-on,

“I mean the buy-in for health and safety here is probably as good as I’ve ever seen, and the sort of input into it and the amount of money spent on it is as good as I’ve ever seen” **[Crossrail, OSH professional]**

- the high level of engagement between different parties and with workers;
- the commitment to provide training, and the quality of the training provided;
- work demands on frontline workers which were not excessive;
- provision of high quality PPE (personal protective equipment) and other kit; and

- the collaboration between companies and the sharing of good practice (and challenges) between contractors,

“So I know that there's an observation or there's a near-miss, or there's an incident, a lot of the time you don't hear of if you work for one single company, but because it's Crossrail, that feeds out to every site, which is fantastic”

[Contractor/JV, Manager/Supervisor]

“Something that's quite unique with Crossrail... the amount of main contractors that are on Crossrail... just about every major contractor in the UK has been on Crossrail, and most of them are at the same time. And that has meant that there's been a massive opportunity for networking with each other. All the safety managers have Crossrail-instigated forums”

[Crossrail, OSH professional]

Interviewees also recognised that there had been improvements in OSH over time. One perceived reason for this was a change in the way Crossrail had operated,

“As a client Crossrail took a very much policing element around safety in the earlier days..... their approach towards certain things was not in the right place..... That's changed; I think the culture of a lot of people in Crossrail ... [they] now understand that you need to talk to people and engage with people”

[Contractor/JV, OSH professional]

Secondly, there was recognition of the difficulties of contractors adapting to the demands of the project. Even projects which have joined at quite a late stage have taken time to raise their standards to meet the Crossrail expectations,

“We had a company who didn't have method statements in place, didn't have risk assessments in place, didn't have anything in place.it was a massive culture change for them to come on board to what Crossrail wanted. So there was a lot of incidents in the beginning, not serious incidents, and that sort of got better as people got more experienced with the jobs and procedures, management systems were put in place, it got a little bit better”

[Former Contractor/JV, Manager/Supervisor]

“when I first came here, we had very little resource in terms of the safety team, and the structure for the operational team from the principal contractor side wasn't quite right. We didn't have the right people allocated and made accountable for certain work areas. And so I think now we've got a clear hierarchy and we've got a much bigger safety team that are working with the hierarchy”

[Contractor/JV, OSH Professional]

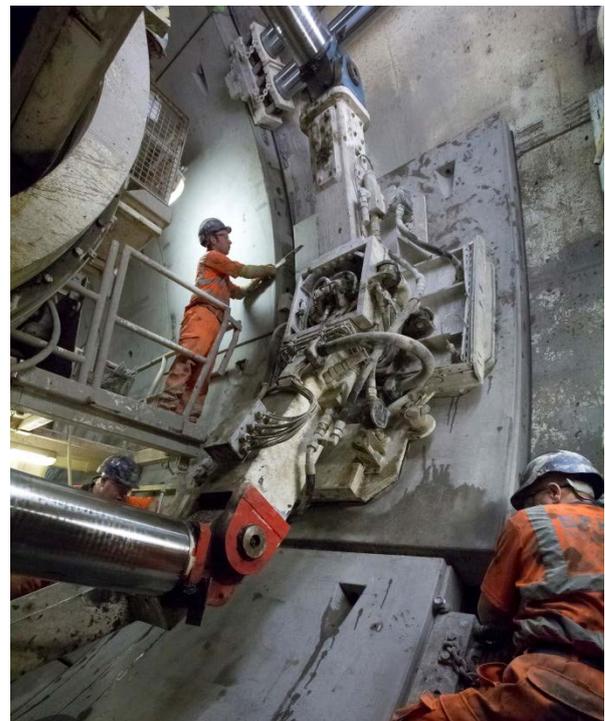
“...but the contractors,it took a long time to get them on that path....there's different cultures, you've still got people saying, ‘well that's a safety issue it's nothing to do with me’. No, you're in charge here, it's your issue”

[Crossrail, OSH professional]

“One of the ironies is that a lot of these jobs and certainly the Olympics and others and Heathrow Terminal 5, they have, they did great stuff but the same contractor steps across to us and they are not doing great stuff....”

[Crossrail, OSH professional]

This issue of some contractors starting at a lower level in addition to some difficulties relating to interfaces between different project sites were the main topic of negative comments regarding the project.



3. Crossrail interventions to improve OSH

Crossrail has implemented a range of interventions aimed at improving and assuring OSH on the project. These have included the following:

- Interventions with HGVs to protect cyclists: Crossrail introduced a range of vehicle modifications that are required for any HGV which visits its sites, with knock on benefits across the industry; they have also provided training for HGV drivers and cyclists to reduce the risk of collisions.³



- Serious incident event reviews (SIER): these are carried out for all major incidents or near misses, with discussions between all parties to identify root cause, and to identify learning for the project. The outputs will then be shared at the bi-weekly phone call.
- Bi-weekly phone call: all project managers participate in a conference call each fortnight where they share learning about incidents which have occurred (as set out in the SIERs) or examples of good practice or successful interventions.
- HSPI (Health and Safety Performance Index): this is discussed in more detail below
- Best practice guides: these relate to particular aspects of Crossrail's work and have been produced jointly with their contractors and others in industry, to share best practice within Crossrail and more widely.
- SHELТ: the Safety and Health Leadership Team is a forum for directors from the contracting companies. Introduced in 2013, it is modelled on a similar forum which was successful during the construction of the London 2012 Olympic Park. This group meet monthly to review the OSH performance of Crossrail and consider areas to improve. They share examples of good practice from the partner companies, and also make decisions jointly about implementation of new practices across all projects.
- Frontline leadership programme: Crossrail has provided training to those working in supervisory roles within its contractors and JVs, to help them develop effective leadership styles and influence behaviours effectively.
- Stepping Up Week: this is discussed in more detail below.
- Innovate 18: this is Crossrail's web-based innovation platform, which enables learning to be shared between different parts of the projects.⁴ Around 40% of the innovations shared through this have been related to health and safety.
- Diversity and inclusion: Crossrail has recruited a diversity and inclusion specialist into the H&S team to address the challenges and build on the benefits that come with a diverse workforce.
- Golden Rules: these are the behaviours which Crossrail has identified as important for all employees - **Respect the basics; Assess the risks; Check the site; Follow site requirements; Support each other.** The rules, published in April 2015, were specifically developed to apply to all types of work. They are supported by specific guidance on 'high risk activities' such as confined spaces, lifting operations and working at height. They underpin visits, inspections and other activities. For example, GREFS (Golden Rules Engagement Forms) are records of site visits conducted jointly by Crossrail and the contractor, to drive the engagement and the visibility of project and company leaders; HОFS (High Risk Observation Forms) are records of assessments carried out on specific high risk activities.
- Mental health interventions: these have included training of mental health first aiders, and various other training activities for different groups within the workforce.

³ www.crossrail.co.uk/news/articles/companies-across-britain-implement-crossrail-lorry-safety-requirements

⁴ DeBarro T et al. "Mantra to method: lessons from managing innovation on Crossrail, UK. Proceedings of the Institution of Civil Engineers-Civil Engineering. 168:4, 2015.

- Point of Work Risk Assessment (POWRA) briefings: these require supervisors to perform and discuss risk assessment at the work site at the beginning of each shift in conjunction with those doing the work, with further review during and after the shift. POWRAs were launched in 2016 on some sites and are now in place throughout the project.

All but the first three of the interventions listed above are relatively recent, having been introduced progressively through the last 4-5 years of the project in response to observed issues and developing trends. This highlights the evolving nature of OSH on major projects and the need for flexibility and openness to change as new challenges arise. It would seem likely that some or all of these interventions have contributed to the overall trend of OSH improvement on Crossrail, although it is difficult to demonstrate direct links. It is also difficult with cross sectional research such as this to get a clear picture of how the project developed in its earlier days and what lessons might be drawn from interventions at that stage.

Two specific measures taken to improve OSH will now be considered in more detail, to explore how they have developed and their perceived impact from the point of view of interviewees.

Health and Safety Performance Index (HSPI)

The Health and Safety Performance Index (HSPI) is used to rate Tier 1 contractors on their performance. The Index is made up of two elements, the 'Gateway' assessments and the Monthly scores.

Gateway Assessments

Gateway assessments (conducted 6-12 monthly) give the contractors opportunities to demonstrate how they are driving improved OSH standards, by sharing examples of what they are doing to meet specific criteria. Each project is measured against six pillars of good practice:

- Leadership and behaviour
- Designing for health and safety
- Communications
- Workplace health
- Workplace safety
- Performance improvement

For each pillar there is a maximum score of three:

- 1 is foundation, legal compliance
- 2 is commendation, good practice
- 3 is inspiration, best practice

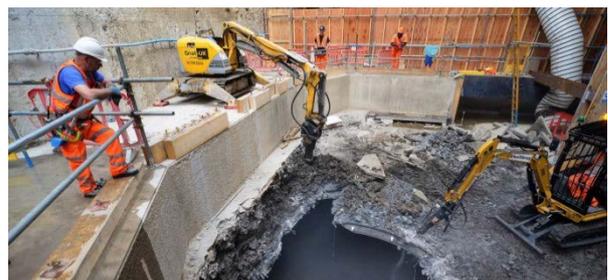
Gateway was introduced in 2012, being developed from similar processes in use at Tube Lines Ltd and London Underground (introduced to Crossrail due to employee job move, a common mechanism for innovation transfer). There is a focus on 'raising the bar': if a contractor introduces an initiative which is novel, it will be scored at 2 or 3. However, once it is taken up by most other projects, it then becomes expected as part of the basic foundation level, scoring 1. A new higher standard of activity will then be required in order to be scored as 'good' or 'inspirational'.

Leading indicators - monthly scores

In the second element, contractors are scored every four weeks against a series of leading indicators. These were first introduced in late 2012 to provide a more regular update on the performance of contractors than was possible with the Gateway scores alone. According to legacy documents, they also reflected the growing focus on leading indicators in OSH more widely in UK industry, to complement lagging indicators such as accident frequency rates.

The indicators have been subsequently revised at the beginning of each project year, in April 2014, 2015 and 2016 (and scheduled for April 2017). Changes to indicators were made to reflect different stages of the project, newly identified challenges and to drive further improvement amongst contractors by raising the standards to be achieved.⁵

As with Gateway, contractors receive a score of 1, 2 or 3 on each of 12-14 measures which include elements such as leadership tours and GREFs mentioned previously, and timeliness of reporting accidents and investigating root cause.



⁵ <http://learninglegacy.crossrail.co.uk/documents/hspl/>

These scores are combined with a contractor's most recent Gateway score to produce their HSPI. These are reported to SHELTON on a monthly basis. HSPI improvements, therefore, are largely focused on the short term changes but they can have significant uplifts at Gateway.

Certificates and awards are given to projects which achieve certain standards and an annual prize is awarded to the 'best' project on Crossrail.

HSPI - what we found

There was a lot of support in principle for the HSPI. Interviewees reported that the Gateway assessments had provided a mechanism for sharing good practice between different contractors and projects, and had driven improvement as a result of competition. In particular the competitive element had increased the engagement of their senior managers, with a direct impact on resources,

"It's helped over the time that I've been here that we've had a very competitive leadership team that want to do well and want to be world class"

[Contractor/JV, OSH professional];

"I get a lot more resource given to me than I might do on other client-led projects, because they understand if I don't have the resource given to me to run certain initiatives and run certain programmes, we will be scored down for it, and they will be reflected lower in a league table, and it will reflect on them, those guys as directors"

[Contractor/JV, OSH professional].

There was agreement that the use of leading indicators was a good way forward for OSH management generally. However, there was also a view that the metrics being used at Crossrail needed further development,

"I don't want to sound too negative about HSPI because I think the principle of it is really good, it's just... positives are incredibly difficult to measure"

[Contractor/JV, OSH professional];

"Overall, I'd say it's been a positive thing... (but) they've still not really nailed the measures"

[Crossrail, OSH professional].

The strongest criticism of the leading indicators was that they led to a 'numbers game' which was not always a true reflection

of reality, and that they led to a focus on quantity over quality,

"It's a contest to see who can put their hand up the highest"

[Contractor/JV, OSH professional];

"It's just a numbers game isn't it? I don't care about numbers, all I want is for (everyone) to come in here and go home in the same condition and health as (they) came in"

[Contractor/JV, Manager/Supervisor];

"Oh great, we've got two-hundred observations, but did we do anything about them, were they any benefit to us, did we learn anything from them?"

[Crossrail, OSH professional].

The other main concern arising from both the Gateway assessments and the monthly scores was the time and effort needed to fulfil the requirements, which many felt was disproportionate; particularly in the later stages of the project when there were fewer gains left to be made,

"So I think it's good, but I think it's quite onerous"

[Contractor/JV, OSH professional];

"The downside, which a lot of the contractors' safety managers will probably say, is that it's incredibly time-consuming for them to prepare for Gateway"

[Crossrail, OSH professional];

"I understand it, we all like to have a look at the pretty graphs, the pie charts but to be honest it's just too much on this project, it's just way too much"

[Crossrail, OSH professional];

"I've been on other projects that have had very positive health and safety assessment programs and similar the bronze, the silver, the gold. But this one certainly is massively detailed. I almost said painful, but I didn't want it to come across as wrong"

[Crossrail, Manager/Supervisor].

Stepping Up Week

The Stepping Up Week events are focussed periods of employee training, engagement and activities, arranged on a site by site basis. They were introduced in 2013, in response to an identified need to improve OSH performance and leadership engagement.



There have been two each year since then, covering a range of topics including sharing the outputs from Crossrail’s annual employee survey, launching the revised Golden Rules, and a recent focus on wellbeing and mental health issues. In each case, the Crossrail OSH team provides a range of resources including information, literature, posters and promotional goods: each site then plans its own timetable for the week with a range of activities and presentations, and including messages from a senior representative of the JV and/or Crossrail. A similar model of employee ‘stand-down’ is being used by CECA for their ‘Stop. Make a change’ programme which is the first national event of this nature, scheduled for April 2017.

Stepping Up Week - what we found

Interviewees identified the benefits of Stepping Up Week: reinforcing key messages such as the Golden Rules, but more importantly for some, demonstrating commitment to the workforce, and giving the workers an opportunity to feedback to Crossrail.

However there were also a number of negative comments about Stepping Up Week. The first set of concerns related to the content – the difficulty of finding topics that would engage the workforce. For some workers interviewed, the events were seen as unimportant and as getting in the way of doing the job. A recent shift to doing more site-based activities and work exchanges was mentioned by some interviewees as being a good way to make the content more relevant.

A second issue echoed the one raised in relation to HSPI, namely the effort involved to plan these weeks. This was substantial, both for the Crossrail OSH team and for the contractors arranging the events on site, particularly if it had to be done in addition to other events required by parent companies. Projects were keen to ensure that events involved night workers as well, but this further increased the demands of running the Stepping up Week events. There were suggestions that the frequency could be

reduced, particularly on parts of the projects which had been running for several years: there was some feeling that the process was ‘getting tired’ in addition to being onerous.

Other issues raised related to poor or late organisation of events, and the role of senior managers in such events (mainly that it was important to get one who was known to and respected by the workforce),

“At times Crossrail, I believe, lose some of their focus and vision around getting the right people to do the right things during things like Stepping Up Week. Directors within Crossrail get assigned to go and do a talk at a site and then they turn up and because their heart might not be in it, they quote the wrong location”

[Contractor/JV, OSH professional].

4. Occupational health

Initial arrangements

The initial arrangements for occupational health set out in the Works Information (WI) and in an OH standard dating from 2010 included:

- a requirement that all main contractors register with Constructing Better Health (CBH)⁶; would ensure that OH services were provided by a provider registered with CBH and accredited under SEQOHS (Safe, Effective, Quality Occupational Health Service⁷); and would work to CBH standards in arranging safety critical medicals and health surveillance;
- a focus on design for health;
- mandatory drug and alcohol (D&A) testing;
- recognition of the potential impact of fatigue and shift patterns, and a specific requirement on contractors to manage this in line with the HSE fatigue and risk indices.

⁶ Constructing Better Health (www.cbhscheme.com) is a ‘not-for-profit membership scheme dedicated to help the Construction Industry achieve a fit and healthy workforce.’ It provides written guidance on the management of occupational health in construction, including recommended industry standards for medicals, fitness for work etc. It also accredits OH providers, hosts a central database so that participating companies can manage worker OH data, and allows employers to check the fitness for work of their personnel

⁷ Safe, Effective, Quality Occupational Health Service is a voluntary accreditation service for occupational health providers. OH providers working within construction need to provide additional evidence to demonstrate their competence in this field.



A strategy document written in 2013 identified many areas where contractors were not meeting the required standards set out in the WI including poor adherence to D&A policy, failure to undertake health assessments as required, lack of accreditation of OH providers, and a 'lack of understanding of health and wellbeing programmes'.

Revised policy

A revised strategy document was issued in 2016, incorporating changes made to address these difficulties. This document states clear priorities for occupational health, with a four part model:

1. Health risk management
This was included previously but has a higher focus here than in previous documents; and a particular focus on dust and fatigue as key hazards
2. Fitness for work
3. Wellbeing
4. 'Healthy company'
This new element highlights the importance of high level leadership to drive occupational health, as well as emphasising the need for audit and identification of outcome measures.

Occupational Health Maturity Matrix (OHMM)

An occupational health maturity matrix (OHMM) was introduced in 2015 to drive improvements in occupational health (OH) within Crossrail. This initially required contractors to move from their starting point (level 0 – new to construction) to compliance with the works information (level 1); then to commit to improve further from this to levels 2 and 3. It is reviewed quarterly, and the score forms one of the HSPI indicators.

Initial audits using this tool identified poor compliance with the WI, particularly in relation to membership of CBH and data sharing

through CBH. Other common issues identified through the process included:

- management of fatigue and working hours;
- health surveillance, for example not being related to risk assessment in a structured way;
- failure to use the outputs from health surveillance and health assessments to look at trends and drive future OH provision; and
- excessive detail requested on OH questionnaires at pre-employment
- the need for leadership commitment to improve health and wellbeing commensurate with the level of risk.

Follow-up assessments have shown that contractors now all meet minimum standards and that many are making improvements to their OH practices. Thus the OHMM has evolved from being an audit tool to being a way of helping the contractors to learn how to manage OH more successfully as well as how to get the most out of their clinical OH providers.

Wellbeing

There has been a growing focus on health and wellbeing within Crossrail, with a particular focus on mental health. Projects are encouraged to nominate wellbeing champions and mental health first aiders for training provided by Crossrail. Training provided as part of Stepping Up Week has included mental health, mental resilience and fatigue as well as mindfulness and Coronary Heart Disease risks.



Occupational health - What we found

Health risk management

Overall the OH practices and health risk management on Crossrail were reported by interviewees to be good in many areas, and to be improving:

"I'd say Crossrail has taken it on to a completely new level with things like the health side of things"

[Crossrail, OSH professional]

"The OH expectations at Crossrail I think are one of the biggest positives that I've seen in Crossrail. So, as an H&S professional, I've acknowledged, the same as most other H&S professionals, it's a tiny little H and big S, and I intentionally took myself to work on Crossrailone of those reasons was I knew how strong the OH expectations were, and I knew it would do me good as a professional"

[Contractor/JV, OSH professional]

"Also, with noise for example, we do a lot of work, we have, I wouldn't say audits, but like we have periodic checks to come down and see what, take readings of dust, take readings of the heat, of the noise, whatever, depending on where the works are, or what they are. Certainly more than any other jobs that I've worked on in the past, this is miles ahead"

[Contractor/JV, Manager/Supervisor]

There was, however, some variation between projects. Interviewees reported that some new projects started at a lower standard than that achieved by existing contractors; it then took time for them to adapt to the culture and demands and to raise the standards of health risk management. For example, a project might move from measuring dust levels in response to a perceived problem to assessing dust levels to inform risk assessment before the problem occurs.

Crossrail had an early focus on Design for Health; this was something that had been of limited success during the Olympic Park construction where implementation did not begin early enough to have a major impact.⁸ A designers' guide was produced for Crossrail and workshops were carried out with employees from the project design companies. These were reportedly well received but it is difficult to assess their impact:

"I think that for me, one of the biggest losses at Crossrail was not following through. There were some fantastic ideas at the beginning....but it just wasn't followed through. I mean there were workshops with the designers and Health by Design Guide

⁸ www.hse.gov.uk/research/rrhtm/rr921.htm

and it stopped. There was then very little intervention with designers as it went through the projects"

[Contractor/JV OSH Professional]

Interview and observation on Crossrail identified several examples of design measures which have reduced health risk in projects, for example by eliminating manual handling,

"We also have the platform screen doors on this site, again a hydraulic train jig has been developed especially for this job so there'll be no manual handling and trying to fix these up by cranes, they'll come along on a train and be pushed into place and secured"

[Crossrail, OSH professional]

However, other examples were reported which suggest that there had been missed opportunities to design out health risks: this could be because worker health was not a priority at the design stage, or because of timing issues such as the need to make construction decisions before designs were complete (due to designs being last minute).

"There are doorways where packages could have been designed better, particularly around things like drilling. We're drilling a lot of holes in a concrete tunnel and silica exposure is a big risk"

[Contractor/JV, OSH professional]

"Well hang on, why are you using a vibrating tool in the first place; can you eliminate that risk in the first place?..... some of it, I think, comes back from the design phase, which is before we came in. So the designers are doing things a certain way and we've inherited that problem"

[Contractor/JV, OSH professional]



There is a particular focus within Crossrail on the importance of managing dust and fatigue. Research has been undertaken in these areas, some reports and guidance have been published and others are forthcoming.



However a limiting factor in the management of risks at source has been variation in the provision of occupational hygiene services. These are a requirement of the WI.

However, interviewees reported that the size and scope of services varies widely, perhaps 2-3 days per week on one project, but only one day every few months on another. Occupational hygiene activities were not explicitly assessed through the HSPI leading indicators until 2015.

There was evidence of good practice in many areas. For example, live dust monitoring has been trialled⁹ and several interviewees identified situations where Crossrail had worked hard to address risks. Particular comments (including those made by frontline workers) related to the high quality of PPE provided and the fact that this was readily available for subcontractors at all tiers,

"I've been to other jobs in the past where it didn't really make much difference, they wouldn't care too much. Here, we've got a policy where...we run off HAV meters, HAVs watches, we watch their times on vibration modes. For dust, we get companies in if we're doing works within areas. We try to reduce it by damping down, movement fans, whatever we can do within that, and then we go for the best masks, instead of just saying, we go FFP1 for example, we go to a FFP3, which is a higher standard mask..."

[Contractor/JV, Manager/Supervisor]

"Definitely, the dust masks are a lot better; we have like the air flow helmets and everything like that"

[Contractor/JV, Manager/Supervisor].

⁹ www.trolex.com/ctrl-data/uploads/files/TT_article.pdf

OH services

The intention on Crossrail, laid out in their published documentation, was that all clinical OH data would be collated on the CBH database, providing a body of knowledge for industry about the health of the construction workforce. This would also avoid duplication of effort, ensuring that existing certification e.g. of safety critical medicals and health surveillance would be recognised. However there have been challenges with this, for example relating to getting the right data in and out of CBH and managing issues around consent to share data,

"I just don't think CBH matched Crossrail's ambitions"

[Contractor/JV, OSH professional]

"And although the concept of it is really important and would be a really good thing if it succeeded, from what I'm aware of, just the management within CBH let themselves down as well and it wasn't very efficient"

[Crossrail, OSH professional].

These reflect wider problems with CBH which were beyond Crossrail's control and which are now being addressed within CBH itself.

As with occupational hygiene, there has been variation in the level of clinical OH provision on projects. The JVs each recruited an OH provider to meet the criteria set out in the WI (e.g. CBH membership, SEQOHS accreditation). However, the scope of service agreed in each case varies so that some contracts have only basic arrangements, covering assessment of fitness to work and health surveillance; while others have greater involvement in health management, toolbox talks etc. Several projects reported changing their OH provider during the course of the contract to try and improve the quality of the service; another had worked hard to raise the standard of provision,

"We've had to draw the OH provider into doing a lot of stuff that they weren't expecting to do. We are openly acknowledged as ... their most difficult client"

[Contractor/JV, OSH professional].

There was also variation in the qualification level of OH practitioners providing services. Some interviewees commented explicitly that they had a very high standard of professional support from an OHA as part of their contract; but this was not necessarily the case across all projects. There was also variation in the

level of access to an OH physician to provide support and definitive diagnosis e.g. in cases of suspected work-related ill-health.

Workforce perspectives

The high investment by Crossrail in the health and well-being agenda was valued by many: when asked about contact with the OH service, interviewees were much more likely to mention this than issues around work related ill-health.

"We get the occupational nurse comes down and does your BMI, your cholesterol, and things...and a lot of the (workers) go in there as well from site, and they take a lot of interest out of it as well, so it's really good for them. It's a good service and (they) go"

[Contractor/JV, Manager/Supervisor]

"We're sending them home hopefully sometimes healthier than when they arrived, with a little bit more understanding of the occupational health issues, you know, their wellbeing as well. It's about giving these (people) the right information to make the right decisions. I think there's some real benefits from that, the benefits of having health champions that are trained, competent and knowledgeable"

[Contractor/JV, OSH professional]

"I think it's a key time to really take that forward. People are literally just – just opening up to it now, getting – and some people you wouldn't expect actually like, 'Oh, what's this about wellbeing champions and is there any training?' "

[Crossrail, OSH professional]

"We might go down with health screening, now that's a fantastic thing, the (team) really appreciate that"

[Contractor/JV, Manager/Supervisor].



5. Conclusions and wider impacts

Crossrail have set high standards for OSH and have encouraged and supported their contractors to meet these. Intervention such as Gateway, HSPI and Stepping Up Week have all contributed to this. There were concerns raised by some interviewees in this research that the data collection demands made by Crossrail were disproportionately high, particularly as the project progresses and especially for those JVs who consider that they are already working at a high standard on safety. Subsequent to interviews conducted for this research, Crossrail have made changes to streamline the Gateway and HSPI processes and reduce the demands for those who are performing well whilst ensuring that good practice and continued improvement are maintained. They have also revised processes to more explicitly encourage contractors to share good practice with others.

In terms of occupational health, based on the interviews, observations and document review conducted for this research, it would appear that Crossrail are setting and generally achieving high standards on health risk management. However, design for health has not been consistently applied and occupational hygiene provision has been variable. Provision of OH services is widely valued on projects, particularly in relation to wellbeing. Again, service provision is varied and appears to have been below the WI standard for the early part of Crossrail on some sites. However it is improving, there were examples of good practice and it was regarded by most as being much higher than the standard across the industry. There was also widespread appreciation amongst interviewees of the role Crossrail had taken in supporting improvement in this area.

It is important to consider the management of OSH at Crossrail in context – a number of interviewees commented on how the construction industry has improved as a whole over the last few years, and some took a view that the good practices they operated were a function of their parent company, and were independent of any interventions by Crossrail. They also differentiated between the major projects such as the Olympics, Crossrail, and Tideway, which are well funded and set high standards, and those run on a more commercial footing where they

believe that the driver is still to do things as cheaply as possible. This makes it difficult to isolate the impact that Crossrail has had as a client on OSH performance from that which the contractors have driven; but the Crossrail role definitely appears to have had a positive impact.

Impacts beyond Crossrail

The impact of Crossrail's OSH management extends beyond the immediate project. First, there are examples of where it has 'raised the bar' by setting new standards for others in the industry to follow, including its requirements for HGVs to be modified to reduce the risk to cyclists¹⁰, and the publication of 'Best practice' guides regarding, for example, Sprayed Concrete Linings, Construction Railway operations and Fire Safety,

"Some of the things that we have instituted here on Crossrail I have never seen done before and I think they are going to become industry best practice.....one of them is we have five mandatory pieces of health and safety equipment that's on every one of our heavy goods lorries, extra mirrors, side panels"

[Crossrail, Manager/supervisor]

[the Point of Work RA] is talking about health and safety and thinking about health and safety...before they start work, so it's on the agenda right from the start each day. So that's been a very positive thing, and which I think should be made industry standard."

[Crossrail, Manager/supervisor]

There are also examples of contracting companies improving their practice companywide (i.e. on non-Crossrail projects) to embed good practice they have learnt on Crossrail.

"Yeah, I think my employer is already taking back a lot of things that we have done to fulfil the requirements of the occupational health maturity matrix. They're looking at that because we know we've got Thames Tideway, we've got High Speed 2 on the horizon..... and the baseline of what we've done in Crossrail is probably what other major clients are going to build from"

[Contractor/JV, OSH professional]



"I know my employer has implemented a similar scheme. I helped write their procedure for that.....so they run a bit of a Gateway assessment on their supply chain now"

[Contractor/JV, OSH professional].

An additional area of impact is the many individuals who have learned personally from being on Crossrail and can identify things that they will take on to other projects. There were examples of this all the way along the employee chain – from frontline workers who said they had learned how to keep themselves safe at work, supervisors who said they had learned about communicating effectively with a diverse workforce, and professionals and senior managers who had identified initiatives or practices that they would take to future jobs,

"Something else I've never seen before behind you is the five Crossrail values.....I am going to do this exact thing every place I go from now on"

[Crossrail, Manager/supervisor]

"So I think the thing I've taken away from this is that I'll, you know, when I finish at Crossrail, I'll be carrying out targeted health and safety visits, separate, above, beyond and separate to other stuff that I have to do"

[Crossrail, Manager/supervisor]

"I think they're improving the likes of me and others in their careers towards – certainly on the health and safety. It's like going to university compared to having two years on other projects I have worked on. They were quite good. But this is trying to get to the next level"

[Contractor/JV, OSH professional].

¹⁰ www.crossrail.co.uk/news/articles/crossrail-implements-lorry-requirements-to-improve-cycle-safety

Crossrail: Occupational Safety and Health Arrangements - Lessons Learnt

There are a number of lessons which the construction industry can take from Crossrail:

- **Benefit of shared learning:** competition between contractors can be a useful tool, particularly for driving engagement at a senior level. However, it is important to ensure that companies and individuals are rewarded for sharing good practice and for collaborating rather than just for 'winning'.
- **Need to evolve:** the processes and metrics need to change over the course of a long project to ensure they reflect the demands of the current stage of the project and to ensure they do not become tired.
- **Need to balance demands against benefits:** the extra work required to meet specific demands (e.g. in relation to metrics or special events) must be proportionate to the benefits; and should take account of the demands made on contractors by their parent companies.
- **Need to ensure the demands drive the desired behaviours and are correctly understood:** for example, metrics such as numbers of leadership tours or observations of good or bad practice are important not so much for the numbers generated (which are meaningless if they are an end in themselves) but because they encourage vigilance in identifying potential risks, and ownership of OSH at all levels.
- **Need for robust OH arrangements:** the involvement of a wide range of OH providers has created challenges for Crossrail, as has the lack of specification in the WI relating to provision of occupational hygiene. Nevertheless, Crossrail has driven forward good OH practice, through specification and enforcement of standards and through the use of the OHMM in the later stages of the project. Future projects should evaluate the impact of such interventions from earlier on.

Some of the learning from Crossrail has already been taken to Tideway, partly through early discussions between the main partners, and partly through the movement of individual staff. This is similar to the learning process from the Olympic Park which has been in evidence at Crossrail. Tideway is learning from Crossrail successes and also learning from the areas where it has had more difficulty. For example:

- Occupational health services at Tideway are provided by a single company, to try and ensure consistent standards across all projects.
- Occupational hygiene services from a single provider are also embedded on each project, supporting a high level of intervention on design for health activities and health risk management.
- Tideway have also introduced HSPI leading indicators, building on the success of these at Crossrail and developing them further.
- Tideway have introduced a 'Right Start' process to try and embed good practice on projects and phases at an early stage and eliminate the accident 'spike' seen on other major project

Ongoing longitudinal research by Loughborough University, funded by IOSH (Institution of Occupational Safety and Health) will evaluate the impact of these interventions.



Loughborough
University

