

## Integrating Risk Assessments, People and Processes

### 1. Case metadata

▪ **Country of origin:**

Ireland

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2009

▪ **Sector:**

F 41 – Construction & Civil Engineering

▪ **Keywords:**

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| 24361C | Good Practice          |
| 24401C | Case studies           |
| 19641D | Risk assessment        |
| 47441D | Construction accidents |
| 57721C | Construction sites     |
| 18241E | Construction safety    |
| 42881E | Cranes                 |
| 10801D | Refresher training     |
| 10841C | Training assessment    |
| 20641D | Worker participation   |

### 2. Organisations involved

John Sisk & Son Ltd.

### 3. Description of the case

#### 3.1. Introduction

Construction is a high risk sector and crane use requires particular attention. Nowadays it is not uncommon to have multiple cranes at construction sites, which poses high risks (see figure 1). The cranes can interface with the work of other machines, with each other and with the workers within the fields of operation. Coordination of cranes and activities is essential for safe operation. Cranes are operated by trained workers and their work is helped in many instances by the so called banksmen that guide the movement of the crane(s) at the ground. There is normally a radio connection for the communication between the crane operator and its banksman, and also between those cranes that have intersecting area of operation. Banksmen also use special hand signals to direct the crane operator and signal circumstances. The complexity of these activities and the coordination need special attention and safety awareness because any failure can result in serious accidents.

**Figure 1. Multiple tower cranes at a construction site**



Source: John Sisk & Son Ltd., 2009

### **3.2. *Aims***

The company wanted to make safer the simultaneous operation of multiple cranes at a single construction site. They wanted to reduce accidents and near misses related to crane activities.

### **3.3. *What was done, and how?***

The company carried out a risk assessment on the simultaneous operation of multiple cranes at a construction site. The hazard analysis of crane activity is summarized in table 1.

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**Table 1. Risk assessment of main crane activities**

| No. | Activity / element                                | Hazard                                            | Potential Injury                          | People at risk of harm    | Chance 1-5 | Effect 1-5 | Risk Level |
|-----|---------------------------------------------------|---------------------------------------------------|-------------------------------------------|---------------------------|------------|------------|------------|
| 1a  | Collision when slewing into radius of other crane | Jib collapse, rope entanglement, falling loads.   | Serious crushing injury                   | Driver, banksman          | 4          | 3          | 12         |
| 1b  | Slewing / slinging operations                     | Falling Materials                                 | Serious injury                            | Site workers              | 5          | 4          | 20         |
| 2   | Colliding with structure or temporary works       | Overturning and falling objects                   | Entrapment and serious crush injury       | Banksman                  | 4          | 5          | 20         |
| 3   | Maintenance on crane (s)                          | Moving parts                                      | Crush & amputation injuries               | Fitter                    | 3          | 4          | 12         |
| 4   | Use of crane in adverse weather (Gusts, winds)    | Sudden movement of jib / counter balance & strike | Serious crush injury from falling objects | Banksman and site workers | 5          | 5          | 25         |

Source: John Sisk & Son Ltd., 2009

The company did set up a working group comprising representatives from site management, the workforce and a safety professional. They analysed incidents and near misses of the first half of 2008. The objective of the group was to:

- analyse each incident and identify the causation factors;
- consult with workers and management and get their views and participation to risk assessment and potential solutions;
- collate findings and feedback and recommend an improvement plan;
- implement the improvement plan and monitor its progress.

There were 24 incidents involving crane activities. The risk levels of these events varied from minor to serious. The thorough inspection of each case revealed an underlying theme to many of these incidents: the human factor (table 2). It became obvious that human error and/or risk taking by individuals was a significant causative factor to the incidents. Due to this fact the company focused on a re-education programme for all trained crane drivers and banksmen, without exception. This included a 40 minute awareness module that addressed:

- the agreed risk assessments and agreed control measures for crane activities;
- the crane operator guidelines and site specific lifting plans;
- the crane codes of practice and the contents therein and;
- the site specific crane protocol for the site.

The session was based on the contents of the tower crane operator guidelines, the site specific crane protocol, the site lifting plan and the site arrangements for rope greasing. These documents already existed: they were not developed for this training. These texts are not abundant but focus on practical duties, task, clearly describing what the worker has to and must not do. There were also a specific Management Briefing for all site staff to outline the specifics of the above mentioned documents as well as outlining the specific duties that site management are to perform.

# CASE STUDIES

**Table 2. Causative factors contributing to accidents (analysis of 24 accidents)**

| Type               | Percentage | Example                                                                                                                     |
|--------------------|------------|-----------------------------------------------------------------------------------------------------------------------------|
| Management failure | 20%        | Lack of or inadequate crane protocol and/or lifting plan in place.                                                          |
| Banksman error     | 38%        | Banksman is not following & directing the load to its safe landing zone, allowing others to sling/bank load.                |
| Driver error       | 30%        | Driver fails to use radios when slewing in proximity to other crane(s). Inattention during lifting and lowering operations. |
| Other              | 12%        | Winds, third party interference.                                                                                            |

Source: John Sisk & Son Ltd., 2009

After the programme each driver and banksman was required to pass a test exam that inquired on the programme content. There were ten questions and only 100% graders were allowed resume crane duties. Those unable to pass had to re-attend the training and write the test again. The questionnaires were differentiated for drivers and for operators focusing on specific issues and duties. For workers not fluent in English an interpreter helped to understand the questions of the assessment.

The questions focus on the practical understanding of duties, responsibilities and tasks of the different personnel at the construction site involved in crane activities (like who is the appointed crane coordinator at the site, who decides on the permission of manoeuvres and specific activities, what channel the radio is set for communication, etc.)

In two months 14 sites where cranes were in use implemented the programme. A total of 119 crane drivers, banksmen and some site management undertook the programme, all participants attaining 100% grades. The company plans to continue the programme: revision of content, quarterly repetition of the training.

### **3.4. What was achieved?**

- Crane incident was reduced from 4 per month to 1 per month in the two month period after the programmes introduction.
- Annual training sessions costs are: 119 persons, one hour out of job 4 times a year: EUR 11.900.00
- Estimated savings on less accidents is around EUR 25,000.00
- Estimated net benefit is around EUR 13,100.00 a year.
- Cohesive safety in a work environment where subcontracting is high (in this case over half of the participants).

### **3.5. Success factors**

The programme was oriented to solve a well identified problem. They used risk assessment methods to reveal underlying causative factors. The training and the test are developed from real life situations and focus on the duties of the workers.

The working group found that the practical and experienced involvement from, in this case, a steel fixing foreman added value to the outcome in many ways including the willingness of drivers and



banksmen to accept the value of the programme and to attend assessments. Knowing that one of the workforce was involved in the improvement plan did contribute to an improvement of a safety culture on the 14 sites. Besides the risk assessment process, workers also participated in the development of the actual preventive measures.

The re-training of an entire crew at a site updates awareness and conscience of every worker. The results are cohesion and added safety in contrary to fragmented knowledge of random trainings.

### **3.6. *Further information***

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### **3.7. *Transferability***

The practical approach to the problem makes the idea transferable to any high risk activity where strict rules must be followed. The company informed that sixty-nine of the programme participants were sub-contractor employees. Many of these sub-contractors did not have resources to develop such programme. The company envisages that this type of programme could be shared and communicated amongst other contractors and sub-contractors in the construction sector. It could enhance cooperation and co-ordination initiatives and could be even used as part of an overall national or pan-European sector strategy to improve safety standards for high risk activities like crane operation.

## **4. References, resources:**

Information provided by the company in the framework of the Good Practice Award Competition 2008/2009.