

# **Mobile crane Compliance campaign 2005 report**

**Workplace Health and Safety Queensland  
December 2005**

Queensland the Smart State



**Queensland  
Government**  
Department of  
Industrial Relations

## **Executive summary**

Between May and June 2005 a compliance campaign focusing on safety in the mobile crane industry in Queensland was undertaken by Workplace Health and Safety Queensland specialist construction inspectors. In total, 307 audits of mobile crane set-ups on construction sites across the state were undertaken. In addition to the enforcement activity associated with unsafe cranes and their use, crane operators were interviewed and asked about a number of key safety issues. At the end of the campaign a total of 393 individual non-compliance items were identified in relation to safety. As a result, 143 improvement notices and 17 prohibition notices were issued to obligation holders.

The compliance campaign found the condition of mobile cranes in the hire industry was relatively good, which is reflected in the fact that of a total of 160 notices issued, only 17 were prohibition notices.

The major areas of non-compliance found during the campaign were issues associated with crane documentation e.g. a lack of evidence of twelve month and ten year inspection records.

Responses from the crane industry indicate the mobile crane compliance campaign has been a success. As a result of the actions of inspectors during the campaign, safety associated with mobile cranes has achieved a greater profile. Significant data has also been collected through the survey administered during the campaign, which will allow the industry and government in partnership to plan future safety improvements.

A number of recommendations are made in this report and are summarised as follows:

1. The implementation of the mandatory submission of yearly crane safety inspection reports to Workplace Health and Safety Queensland for all registrable mobile cranes.
2. The framework for mobile crane operator competency in Queensland is revisited to determine the best methods for crane operators to receive adequate training to safely operate cranes.
3. The level of understanding of mobile crane customers with respect to safe crane operation be investigated to determine if this is lacking.

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## Introduction

Between May and June 2005 a compliance campaign targeting mobile cranes was undertaken by Workplace Health and Safety Queensland (WHSQ). The campaign was in response to an increasing number of serious crane incidents in Queensland and is part of a WHSQ strategy to reduce the number of incidents. The campaign targeted mobile cranes on Queensland construction sites and was complemented by a tower crane campaign that was undertaken in July and August.

More than 300 mobile crane set-ups around the state were audited by Workplace Health and Safety Queensland inspectors and the results of this campaign are included in this report. In addition to the application of compliance instruments, the campaign also included interviewing crane operators to gain greater insight into the safety issues related to this industry. A number of conclusions and recommendations relating to the mobile crane industry are included in this report.

## Background

Cranes are an integral part of construction work in Queensland. This is particularly evident in the commercial construction sector, where the construction of multi-storey structures is achieved through the extensive use of cranes. The construction of larger, more complex structures has only been possible through the development of larger, more complex cranes.

Since the late 1990's there has been a boom in Queensland construction and a proliferation of cranes of all types and configurations. All types of cranes used in the construction industry are being exposed to more frequent and sustained use than ever before. There has also been a corresponding increase in serious crane incidents.

Table 1 shows the number of crane incidents from the beginning of 1999 through to August 2005.

Period	1999	2000	2001	2002	2003	2004	2005 up to 20 August
*Number of Qld crane incidents	10	12	8	15	12	20	23
Total	100						

*\*Reported to Workplace Health and Safety Queensland*

**Table 1: Total number of serious crane incidents in Queensland, 1999 – 20 August 2005**

At the time of writing this report, most crane incidents reported to WHSQ have not resulted in fatalities or serious injury to persons. This fact should not signal complacency within industry. Due to their physical size and mass, and their propensity to be used in built up areas, the likelihood of a failure resulting in a catastrophic event is very real.

From the events notified to WHSQ, the total number of serious crane incidents can be further broken down into incident types as indicated by Table 2 below.

<b>Incident type</b>	<b>Number of incidents</b>	<b>Percentage of total</b>
Crane overturn (mobile cranes only)	44	44%
Contact with overhead power lines	20	20%
Falling object	8	8%
Other types of operational incidents not included above	13	13%
Crane collapse or structural damage	15	15%
Total	100	100%

**Table 2: Queensland crane incident types, 1999 – 20 August 2005**

*(Compliance and Investigation System data base - CIS)*

The *Construction Industry Action Plan 2004 – 2007* highlights cranes as one of the areas in the construction industry requiring intervention by WHSQ. Cranes used in the construction industry predominantly fall into two categories - mobile cranes and tower cranes. Because the tower crane and mobile crane industries have a number of fundamental operational and hazard differences, it was decided there would be two separate compliance campaigns. This report solely references the mobile crane compliance campaign.

## Strategy

### *Audit criteria*

Incident data on cranes reported to WHSQ indicates that operational issues are the primary cause of most crane incidents in Queensland. In recognition of this information, the compliance campaign addressed operational issues in addition to the condition and safety features of the crane itself. Items to be audited were divided into two primary groups: the crane itself and the crane use. Cranes were inspected at the owners' crane yards and additionally, at construction sites whilst involved in actual crane operations.

For the actual crane, the key issues for consideration were:

- structural integrity – boom, carrier, outriggers, slew ring bolts, welding etc
- mechanical integrity – drive systems, wire ropes, hydraulic systems etc
- safety systems – load indicators, computer overload control systems, limit switches etc
- documentation – load chart, operator's manual, maintenance records and log book.

For crane operations, the key operational issues for consideration were:

- safe support of the crane – ground condition and gradient
- crane set up – proximity to overhead power lines
- crane proximity to persons (crushing and falling object risk)
- crane crew certification – operator and dogger
- crane loading (including load chart interpretation).

An audit checklist was developed for the compliance campaign to reflect both crane and crane use issues and a copy is included in Appendix 1.

The following Australian Standards were used in the audit criteria employed during the compliance campaign:

- AS 1418.5 – Cranes, hoists and winches - Mobile cranes
- AS 2550.1 – Crane, hoists and winches - Safe use: General requirements
- AS 2550.5 – Safe use: Mobile cranes.

In addition, the WHSQ document titled "Mobile Crane Audit Issues (Cranes used at construction sites)" dated 1 April 2005, was used by inspectors (see Appendix 2). This document provides guidance on a number of key safety issues associated with mobile cranes and also indicates benchmarks that are to be applied to older crane models manufactured before the current series of Australian Standards. It should be noted that Queensland workplace health and safety legislation is not retrospective and not all current requirements in Australian Standards can be applied to older cranes. However, in a number of high risk situations the principles are applied to older cranes. An example is the provision of motion cut hoist limits on cranes whenever they are used to lift personnel boxes, in comparison to indicating devices that only warn the operator when the hook block is about to strike the boom head. Because of the potential high

safety risk relating to workers it was considered that all cranes must be provided with motion cut hoist limits, irrespective of the age of the crane.

A goal of 300 statewide mobile crane set-ups were nominated and the audits were carried out predominately on building and construction sites. Based on plant registration statistics, there were approximately 2000 mobile cranes in use in Queensland at the time of the compliance campaign. A sample size of 300 was selected, as it would present a true indication of the safety performance of the mobile crane industry.

Compliance and Investigation System (CIS) data showed that a significant number of mobile crane incidents have involved cranes from crane hire companies employed in the building and construction industry. Consequently, focusing the compliance campaign on construction site crane set-ups achieved the goal of targeting mobile cranes in higher risk applications.

### *Crane operator questionnaire*

Most safety initiatives carried out by regulatory authorities tend to focus on the workplace health and safety inspector's observations, relating to both plant and work systems. While such information is important, feedback from workers in the industry can also be invaluable. Therefore the mobile crane compliance campaign also obtained feedback from the crane operators about their views on crane incidents they were aware of. This is considered a valuable tool because crane operators as a group have a wealth of knowledge regarding the culture and constraints that have an impact on safety in this industry. A questionnaire was developed which, in addition to obtaining data on the views of operators, also obtained valuable information with respect to the experience of, and training received, by crane operators (see Appendix 3).

### *Inspectors*

A total of 14 WHSQ inspectors were involved across the state. The inspectors were primarily from the construction inspectorate, but a number were also from the industrial inspectorate, particularly in regional areas. Inspectors were selected based on their knowledge of the mobile crane industry and their ability, and this was supported by an extensive information and learning session delivered by in-house technical and construction experts. The following subject matter was canvassed:

- crane design standards
- crane maintenance
- crane use
- campaign audit tools
- maintaining consistency of approach
- appropriate enforcement tools
- campaign reporting systems.

### *Reporting and technical support*

The compliance campaign was scheduled for six weeks and commenced on 11 April 2005. At the end of each two-week period, campaign report summary sheets were forwarded to the Construction Strategy Group (CSG). In addition, inspector directions such as improvement and prohibition notice information was entered into the WHSQ electronic reporting system and the results were collated by the CSG.

During the campaign, continuous technical and procedural support was provided to field inspectors, both by representatives of the Technology Services Unit and the Construction Strategy Group. This support was both verbal and written and also included a number of joint visits on crane audits.

### *Industry consultation and support*

Extensive consultation was undertaken before the compliance campaign commenced. WHSQ held a number of information sessions with both the mobile crane industry and the building and construction industry.

As a result of this consultation, the crane hire companies and builders involved in the consultation welcomed and actively supported the proposed compliance campaign. This comment is reinforced by the fact that very few complaints were received by these participants during the compliance campaign. Additionally, employer and union representatives were also consulted on the proposed campaign and they also actively supported, through their newsletters etc, the promotion of the campaign. WHSQ intends to build on this working relationship and will consult with these groups when future opportunities are presented.

## Results

### Compliance issues

A total of 307 crane set-ups were audited across the state which exceeded the goal of 300. Table 3 shows the total number of cranes audited and non-compliances for the various regions in Queensland.

Region	No. audits targeted	No. audits carried out	% of target	Noted non-compliances*	Notices issued		
					Improve	Prohibition	Total
North Queensland	40	40	100	94	26	11	37
Central Queensland	25	17	68	25	22	0	22
Wide Bay (incl. Sunshine Coast)	45	41	91	9	1	2	3
Brisbane North	80	92	115	138	37	1	38
Brisbane South (incl. Gold Coast)	80	87	109	53	35	2	37
South West	30	30	100	74	22	1	23
<b>Total</b>	<b>300</b>	<b>307</b>	<b>102</b>	<b>393</b>	<b>143</b>	<b>17</b>	<b>160</b>

**Table 3: Total number of cranes audited and non-compliances.**

In the above table, a total of 160 improvement and prohibition notices were issued during the campaign. A breakdown of the issue types identified in the notices is shown Figure 1.

\* "Noted non-compliance" describes the number of non-compliance issues with respect to the audit criteria used during the compliance visits. Each noted non-compliance did not necessarily result in an inspector issuing a written direction because the non-compliance may have been remedied during the visit.

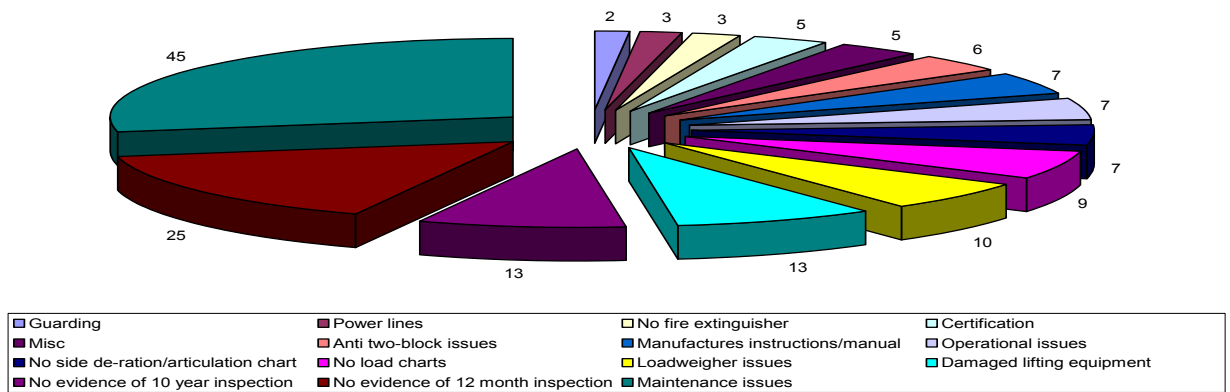
A breakdown of the crane types audited is included in Table 4.

Region	No. audits carried out	Breakdown of crane types *			
		Pin jib	Slewing hydraulic	Non-slewing	Vehicle loading
North Queensland	40	3	13	16	8
Central Queensland	17	3	9	5	0
Wide Bay (incl. Sunshine Coast)	41	5	24	11	1
Brisbane North	92	10	45	22	15
Brisbane South (incl. Gold Coast)	87	12	48	25	2
South West	30	5	10	10	5
<b>Total</b>	<b>307</b>	<b>38</b>	<b>149</b>	<b>89</b>	<b>31</b>

**Table 4: Breakdown of mobile crane types audited**

*\*A total of 307 crane set-ups were visited during the campaign. However, due to the mobile nature of this type of cranes the same crane may have been audited at different locations. In these situations the primary focus of the second visit with the crane was on operational issues.*

**Breakdown of Notices Issued.**



**Figure 1: Breakdown of issues on improvement and prohibition notices**

The non-compliance issues listed in the above figure are issues set out in the “Mobile Crane Audit Checklist” employed during the campaign (see Appendix 1).

The reporting summaries returned at the end of each two-week reporting period from the field included a breakdown of non-compliance issues. The highest level of non-compliance was in the area of crane documentation, which accounted for 27 percent of total non-compliance issues. Table 5 includes a breakdown for every issue reported.

ROPE	STRUCTURAL AND MECHANICAL	OPERATIONAL ISSUES	SAFETY FEATURES	CRANE DOCUMENTATION
<ul style="list-style-type: none"> <li>▪ <u>hooks</u> <b>3%</b> <ul style="list-style-type: none"> <li>- condition</li> <li>- safety latch</li> </ul> </li> <li>▪ <u>rope sheaves and wear</u> <b>2.5%</b> <ul style="list-style-type: none"> <li>- condition</li> <li>- sheaves rotate</li> <li>- wear</li> <li>- pads/rollers</li> <li>- rope keeper bar</li> <li>- plate on sheaves</li> <li>- bar clearance</li> </ul> </li> <li>▪ <u>ropes</u> <b>2.5%</b> <ul style="list-style-type: none"> <li>- Hoist rope condition</li> <li>- Hoist rope lubrication</li> <li>- Luff rope condition</li> <li>- Luff rope lubrication</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ <u>jib</u> <b>5.5%</b> <ul style="list-style-type: none"> <li>- straightness</li> <li>- deformation</li> <li>- cracks</li> <li>- corrosion</li> <li>- welds</li> <li>- play</li> <li>- wear pads</li> </ul> </li> <li>▪ <u>slew ring</u> <b>1%</b> <ul style="list-style-type: none"> <li>- teeth wear</li> <li>- bolt</li> <li>- hook rollers</li> </ul> </li> <li>▪ <u>articulated joint (Franna)</u> <b>1%</b> <ul style="list-style-type: none"> <li>- wear</li> <li>- integrity</li> <li>- emergency steer</li> </ul> </li> <li>▪ <u>pins (jib, etc)</u> <b>2%</b> <ul style="list-style-type: none"> <li>- correctly located</li> <li>- split pins</li> <li>- wear</li> </ul> </li> <li>▪ <u>other issues</u> <b>5.5%</b> <ul style="list-style-type: none"> <li>- guarding</li> <li>- hydraulic leaks</li> <li>- general lubrication</li> </ul> </li> <li>▪ <u>outriggers</u> <b>2%</b> <ul style="list-style-type: none"> <li>- extendible</li> <li>- feet condition</li> <li>- hydraulics</li> <li>- locking pins</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ <u>outriggers</u> <b>2%</b> <ul style="list-style-type: none"> <li>- packing</li> <li>- ground condition</li> <li>- crane isolated</li> <li>- extended</li> </ul> </li> <li>▪ <u>load handling</u> <b>5%</b> <ul style="list-style-type: none"> <li>- slings adequate capacity</li> <li>- slings correct type</li> <li>- sling condition</li> <li>- slings tagged</li> <li>- hook</li> </ul> </li> <li>▪ <u>crane motions</u> <b>2%</b> <ul style="list-style-type: none"> <li>- slew motion</li> </ul> </li> <li>▪ <u>pick and carry</u> <b>1%</b> <ul style="list-style-type: none"> <li>- ground slope</li> <li>- allowance for articulation</li> <li>- visibility</li> <li>- de-ration chart (side slope)</li> </ul> </li> <li>▪ <u>power lines</u> <b>1%</b> <ul style="list-style-type: none"> <li>- suitability of location of crane</li> <li>- adequate clearance</li> <li>- safety observer</li> </ul> </li> <li>▪ <u>operator and dogger issues</u> <b>1%</b> <ul style="list-style-type: none"> <li>- adequate personnel</li> <li>- communication</li> <li>- certificates</li> </ul> </li> <li>▪ <u>documented lift procedure</u> <b>3%</b> <ul style="list-style-type: none"> <li>- provided</li> <li>- suitable</li> </ul> </li> <li>• <u>personnel box issues</u> <b>2%</b></li> </ul>	<ul style="list-style-type: none"> <li>▪ <u>outriggers</u> <b>2%</b> <ul style="list-style-type: none"> <li>- visible (colours/stripes)</li> </ul> </li> <li>▪ <u>loadweigher</u> <b>2%</b> <ul style="list-style-type: none"> <li>- operable</li> <li>- calibrated</li> <li>- cut out operational</li> </ul> </li> <li>▪ <u>controls</u> <b>5%</b> <ul style="list-style-type: none"> <li>- correctly labelled</li> <li>- operable</li> <li>- deadman levers and pedals</li> <li>- radius gauge</li> <li>- level indicator</li> <li>- boom angle indicator</li> <li>- boom extension indicator</li> </ul> </li> <li>▪ <u>motion limits</u> <b>5%</b> <ul style="list-style-type: none"> <li>- anti two-block</li> <li>- luff (upper limit)</li> <li>- buffers/backstops</li> </ul> </li> <li>▪ <u>crane and carrier cabin</u> <b>7%</b> <ul style="list-style-type: none"> <li>- seating</li> <li>- visibility</li> <li>- noise</li> <li>- fire extinguisher</li> <li>- steps/ladder</li> <li>- grab-rail provided</li> <li>- clean9not slippery)</li> </ul> </li> <li>▪ <u>carrier</u> <b>5%</b> <ul style="list-style-type: none"> <li>- tyres</li> <li>- lights</li> <li>- mirrors</li> </ul> </li> <li>▪ <u>other issues</u> <b>1%</b> <ul style="list-style-type: none"> <li>- removable counterweights marked with ID</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ <u>documentation</u> <b>27%</b> <ul style="list-style-type: none"> <li>- operators manual(English)</li> <li>- logbook provided</li> <li>- 12 month maintenance report</li> <li>- major inspect-10yr</li> </ul> </li> <li>▪ <u>load charts</u> <b>4%</b> <ul style="list-style-type: none"> <li>- supplied</li> <li>- correct for crane</li> <li>- comply with AS 1418</li> <li>- legible and in English</li> <li>- visible</li> </ul> </li> </ul>
ROPE	STRUCTURAL AND MECHANICAL	OPERATIONAL ISSUES	SAFETY FEATURES	CRANE DOCUMENTATION
Total : 8%	Total: 17%	Total: 17%	Total: 27%	Total: 31%

**Table 5: Breakdown of non-compliance issues**

Table 6 shows a breakdown of the documentation into five further categories.

<b>Crane documentation issue</b>	<b>Percentage of total documentation non-compliances</b>
Operators manual not in English	16%
Log book not provided	13%
No evidence of 12-month inspection report	32%
No evidence of major (10 year) report	26%
Load chart issues	13%
<b>Total</b>	<b>100%</b>

**Table 6: Breakdown of “documentation” non-compliances**

#### *Questionnaire*

A total of 219 completed questionnaires were returned to the Construction Strategy Group. This number is less than the total number of total crane audits performed for two primary reasons:

1. a number of crane operators were contacted more than once during the campaign (i.e. audited at more than one location)
2. in some cases the operation of the crane could not be interrupted and the operator could not be interviewed.

As most of the data is presented in graphical format and has less information than the compliance data, it is included in the “Discussion” section of this report.

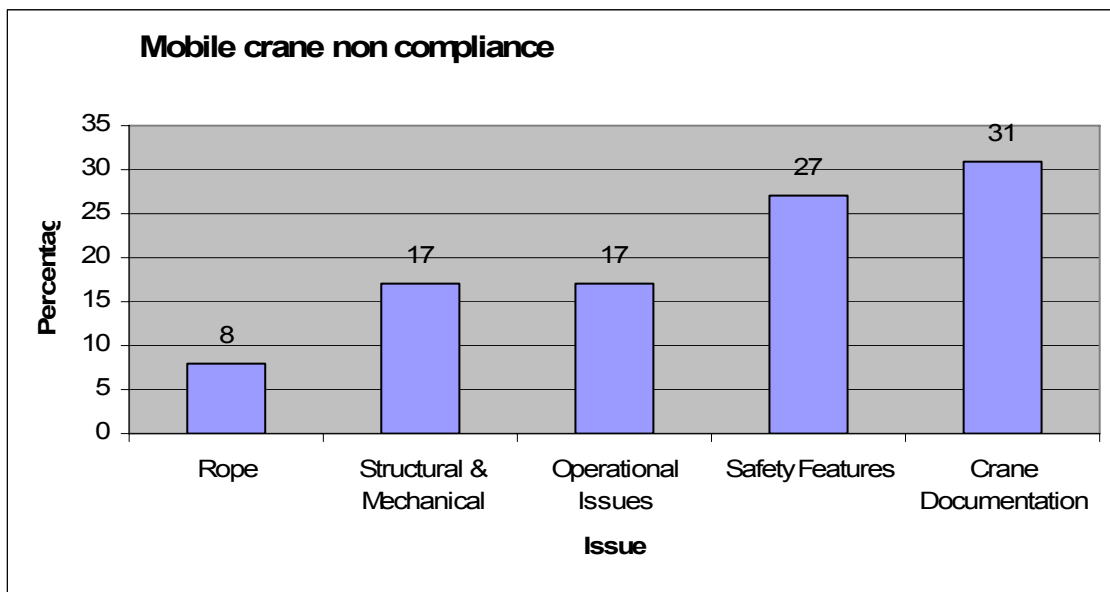
## Discussion

The information gathered during the mobile crane compliance campaign provides an excellent insight into the nature of the industry and key safety obstacles that exist. This section of the report discusses compliance issues and the results of the survey questionnaire.

### *Compliance issues*

The condition of mobile cranes in the hire industry is relatively good, which is reflected in the fact that of a total of 160 notices issued, only 17 were prohibition notices. While inspectors expressed concern at the poor condition of a small percentage of mobile cranes, the majority of cranes audited appeared to be in good working order and well maintained. This is also reflected in the fact that there are relatively large numbers of newer mobile cranes operating in the hire crane industry. Nearly one quarter (23.5%) of the mobile cranes audited were no more than five years old. The boom in the building and construction industry, particularly since 2000, is one reason for the large number of newer mobile cranes operating in this industry.

To assist in drawing conclusions from the data, it is necessary to group the non-compliance issues into major groups and this is illustrated in Figure 2.



**Figure 2: Breakdown of crane non-compliance issues**

Figure 2 shows that crane documentation issues were the main non-compliance issues on cranes. Crane documentation issues are further broken down in Table 6, which indicates that the lack of either 12-monthly or major inspection reports accounted for over half (58%) of the documentation issues. This is supported by the fact that 38% of notices issued during the campaign were in relation to the lack of adequate 12-monthly or major inspection reports (see Figure 1). From the data obtained, it is reasonable to state that nearly one in five cranes audited during the campaign did not have satisfactory inspection reports available. This indicates that there is room for

improvement in this area and not all crane owners are applying the safety inspection instructions of the crane manufacturer and Australian Standard AS 2550.

The second highest level of non-compliance is related to safety features, which accounted for 27% of non compliance issues (see Figure 2). This serves as a reminder to the mobile crane industry to ensure safety features are both provided on the cranes and their continued operation is monitored.

Operational issues had a relatively low percentage (17%), however this does not reflect the current trend that most crane incidents in Queensland are attributed to operational issues. One possible reason is that there was a heightened awareness among crane crews and customers of the compliance campaign, and consequently they were less inclined to “take shortcuts”. Therefore the low proportion of non-compliances in this area should not be seen as an argument to reduce the focus on operational issues. The fact that so many crane incidents are caused by documented operational issues is enough to justify major attention to this area. This outcome is further supported by the view of crane operators and is illustrated by the results of the questionnaire carried out.

Structural and mechanical issues accounted for 17% of the total number of non-compliances. A large proportion of the structural and mechanical issues applied to hydraulic oil leaks and corrosion on the booms of the cranes. While most examples were not enough to justify stopping the operation of the crane, there is a need for the industry to ensure booms and hydraulic rams are regularly checked and maintained.

### *Questionnaire survey*

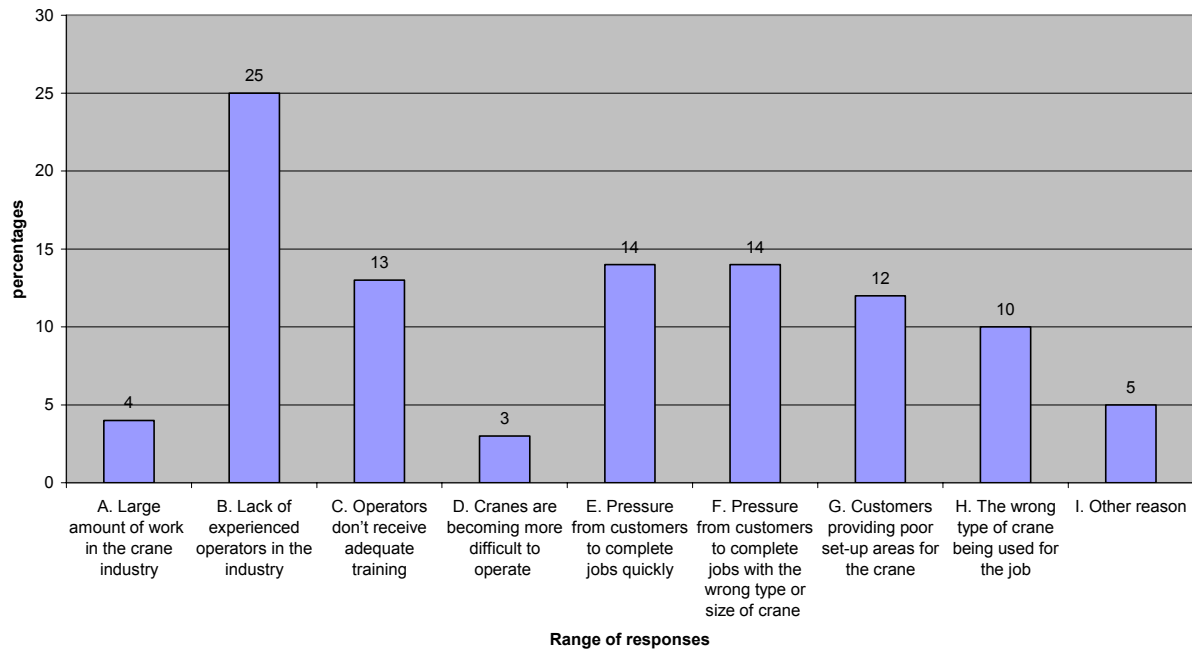
As previously mentioned in this report, the survey questionnaire has provided invaluable information that would not have been obtained if the campaign had only been compliance focused. An important issue that the questionnaire has highlighted is the concern over perceived adequate crane crew competency in the mobile crane industry. One of the questions operators were asked was:

*“What do you believe is the main reason for the increase of crane incidents over the last few years?”*

The answers to the question are graphically shown in Figure 3 of this report. The most common response to the above question was *“lack of experienced operators in the industry”* and accounted for one in four responses. This was followed by the statement *“operators don’t receive adequate training”* (13%). Both of these responses relate to operator competency and when combined (38%), it is evident these issues are at the forefront of crane operators’ concerns and deserve urgent consideration.

The large percentage of responses to the survey also helps to dispel the misconception that operators do not care about the safety performance of their industry. The response is an excellent indication of the candidness of the crane operators and, more importantly, their desire for the level of operator competency to be raised and consequently, safety within the industry increased. The response also provides supporting evidence as to why operational issues accounted for more than 75% of crane incidents in Queensland.

What do you believe is the main reason for the increase in crane incidents over the last few years?



**Figure 3: Responses to operator question – main reason for incident increase**

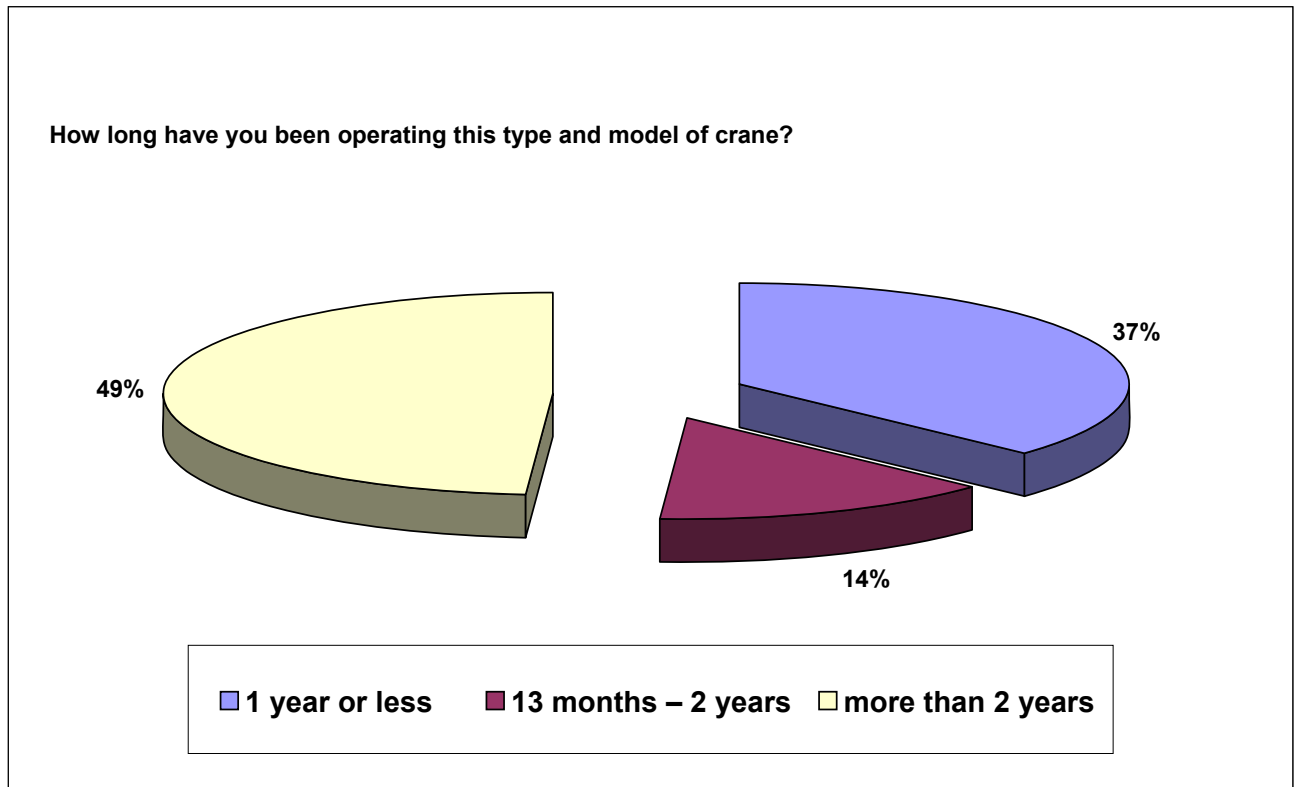
The other main issues highlighted by Figure 3 are the operators' responses relating to hire crane customers. The following three responses relating to customers accounted for 40% percent of all responses:

- Pressure from customers to complete jobs quickly - 14%
- Pressure from customers to complete jobs with the wrong size or type of crane - 14%
- Customers providing poor set up areas for the crane - 12%

**Total: 40%**

The combined total of customer related issues (40%) indicates that this is a very important issue that needs addressing. It demonstrates operators' concerns that they consider customers not only have a poor understanding of safe crane operation but that crane customers are also applying considerable pressure to the hire crane industry to "get the job done" without considering the correct type of crane for the task.

Another question related to the period of time that the crane operator had been operating the particular type and model of crane encountered at the time of the inspector's visit. This question was designed to obtain feedback on the amount of experience operators had with specific cranes and the results are illustrated in Figure 4. Almost half of the operators indicated that they had more than two years experience. Figure 4 shows that 37% of operators have less than one years experience as a certificated crane operator. This figure is not considered to be unusual considering the transient nature of the industry.

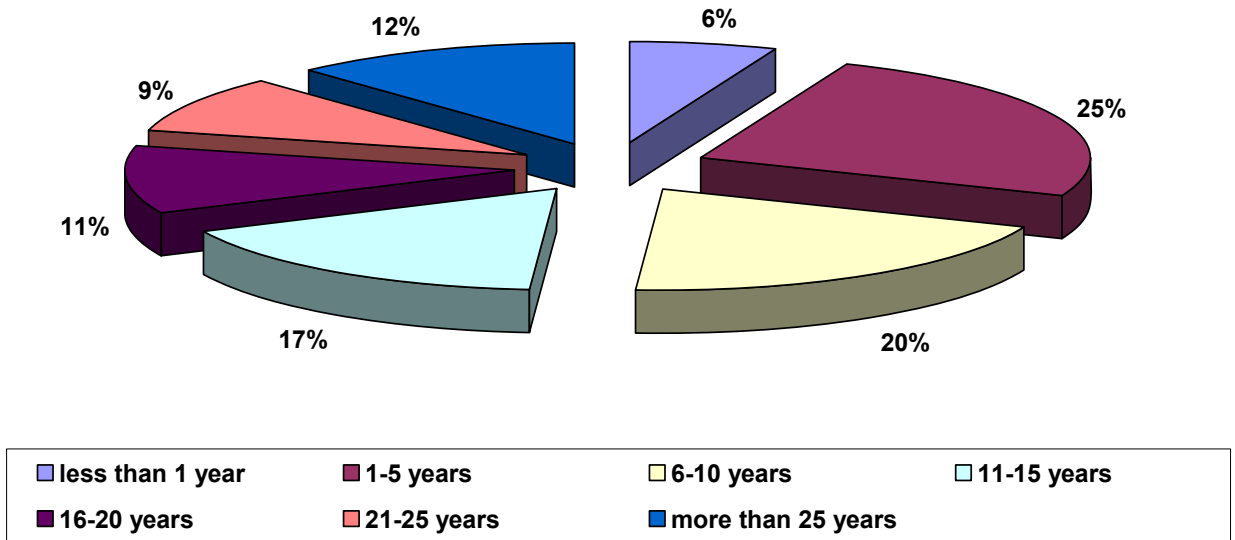


**Figure 4: Operator experience on type and model of crane**

Figure 5 shows a breakdown for the time periods that a crane operator has been operating the crane type encountered at the time of the inspector’s visit. This question differed from the previous question, in that it was not specific to the crane model but only applied to the basic type. For the purposes of the campaign, basic types were defined as follows:

- hydraulic slewing
- non-slewing (i.e. Franna, Linmac)
- pin jib
- vehicle loading cranes.

**How long have you been operating cranes of this basic type in total ?**



**Figure 5: Operator experience on basic crane type**

Almost one third (31%) of operators have operated the basic crane type for no more than five years. This supports the previous belief that there are a large proportion of relatively new crane operators in the industry. This is logical considering the large demand for crane operators over the last few years associated with the building boom. In previous years, it was more the case that older, more experienced workers became crane operators after serving their “time” as doggers. This still tends to be the situation in the tower crane industry, however in the mobile crane industry, the trend is now for workers to become crane operators at a younger age and this is supported by the data. This factor also supports the need for increased training and mentoring of crane operators, particularly the less experienced operators.

It should be noted that the breakdown of data shown in Figure 5 is similar to answers received for the question “*how long have you been a crane operator?*”

## Conclusions

It can be argued that the mobile crane compliance campaign was successful for the following reasons:

- the campaign has enhanced the safety of the industry by improving the safety of mobile cranes themselves and the safety systems associated with crane use
- the data received, particularly from the crane operator survey questionnaire, has given an excellent indication of where further attention is required in this industry to help reduce the potential for future crane incidents
- the increased profile of Workplace Health and Safety Queensland inspectors has served as an incentive for crane owners, crane crews and principal contractors to make safety improvements in this industry.

A number of specific safety issues have been raised by the campaign. While it is to be stated that the mobile crane industry in general is safety conscious, there are a number of areas where improvement can be made. The key areas below summarise the most important issues highlighted by the campaign.

**Crane safety documentation:** The campaign has shown that improvements need to be made in the area of safety inspections of mobile cranes particularly with respect to yearly and major inspections. Nearly one in five cranes audited during the campaign did not have satisfactory inspection reports available. This issue is currently being discussed in the draft *Mobile Crane Code of Practice*, due for release in early 2006. In addition, recent amendments to the *Workplace Health and Safety Regulation 1997* require the mandatory submission of a yearly statement from crane owners stating registrable cranes have undergone routine inspection and maintenance in the six months prior to registration.

**Crane condition and safety features:** There is an ongoing requirement for mobile crane owners to ensure their cranes are supplied with all relevant safety features required by Australian Standards and to ensure that cranes are regularly and adequately maintained. The development of the *Mobile Crane Code of Practice* will further help to ensure compliance with this issue.

**Operator training and competence:** Crane operators have highlighted the need for improving the competency of crane operators as a group and consider this to be a major factor in the increase of crane incidents. The large proportion of crane incidents caused by operational issues supports the responses received from operators. The information received on these two key issues strongly indicates that the whole framework for operator competency in Australia should be reviewed. It is considered that training systems, in addition to those addressed by the *National Certification System*, need to be introduced in the crane industry. It should be noted that this issue has already been identified by the *Mobile Crane Code of Practice Reference Group* and the current draft code identifies the need for both familiarisation and refresher training of crane operators. However, there is a need for this issue to be addressed on a national level with health and safety authorities, union groups and employer groups.

**Crane customer input:** 40% of crane operators consider that crane customers, including principal contractors and their operational stipulations, have had a direct influence on the increase in crane incidents in Queensland. This feedback indicates that the issue requires further investigation and that crane customers may be unknowingly contributing to crane incidents. It is considered that the construction industry requires further education regarding the safe operation of cranes and the need to comply with guidance provided by the crane owner and operator.

Workplace Health and Safety Queensland greatly appreciated the support of the industry and welcomes future industry cooperation to promote a safer crane industry.

## Recommendations

This report makes the following recommendations relating to the mobile crane industry:

1. The *Workplace Health and Safety Regulation 1997* be amended to prescribe the mandatory submission of yearly crane safety inspection reports to Workplace Health and Safety Queensland, for all registrable mobile cranes.
2. The framework and assessment criteria for mobile crane operator competency in Queensland be revisited to determine if improvements can be made to addressing safety issues both in regard to operator training and certification. It is recommended that additional training requirements to those included in the *National Certification System* be introduced in the crane industry in Queensland. These additions will complement the *National Certification System*. It should be noted that this issue has already been identified by the *Mobile Crane Code of Practice Reference Group* and the current draft code identifies the need for both familiarisation and refresher training of crane operators.
3. The level of understanding of mobile crane customers with respect to safe crane operation be investigated to determine if there is a lack in this area. If this is the case, it is recommended that an effective education initiative be undertaken in this area.

It is intended that WHSQ will enter into discussion with all parties within the industry with the intention of implementing all of the above recommendations.

## Appendices

1. Mobile crane audit checklist, 1 April 2005
2. Mobile crane audit issues (cranes used at construction sites), 1 April 2005
3. Crane blitz – operator questionnaire

# Appendix 1

Mobile crane audit checklist	
1/4/05 S.Davis	
One checklist per crane set-up	
<b>Crane details:</b>	<b>Date:</b>
<b>Inspector:</b>	<b>Time:</b>
(1) Type and model	
Serial no.	
Carrier reg no. (Qld transport)	
(2) Manufacture date	
Plant reg. no.	
Design reg. no.	
Audit location	
Crane owner and address	
(3) Is crane 2 <sup>nd</sup> hand import from overseas? (if so, where from)	
Crane driver	Cert. no.
Dogger	Cert. no.

Crane	
Item	Comments
<b>(4) Boom/jib integrity</b>	
a) Straightness <input type="checkbox"/>	
b) Deformations <input type="checkbox"/>	
c) No visible cracks <input type="checkbox"/>	
d) Corrosion (check drain holes on pin jibs) <input type="checkbox"/>	
e) Welds <input type="checkbox"/>	
f) Boom/jib play <input type="checkbox"/>	
g) Wear pads (hyd. boom) <input type="checkbox"/>	
<b>(5) Pins (jib, sheave, etc)</b>	
a) Correctly located <input type="checkbox"/>	
b) Split pins provided and opened <input type="checkbox"/>	
c) Obvious wear <input type="checkbox"/>	

Item	Comments
<p><b>(6) Hooks</b></p> <p>a) Condition <input type="checkbox"/></p> <p>b) Safety latch <input type="checkbox"/></p>	
<p><b>(7) Rope sheaves and wear pads</b></p> <p>a) Condition <input type="checkbox"/></p> <p>b) Sheaves rotate <input type="checkbox"/></p> <p>c) Wear pads/rollers (boom/jib protection) <input type="checkbox"/></p> <p>d) Rope keeper bar/plate on sheaves <input type="checkbox"/></p> <p>e) Bar clearance correct <input type="checkbox"/></p>	
<p><b>(8) Ropes (AS 2759- guide)</b></p> <p><b>Hoist</b> (main and aux)</p> <p>a) Condition <input type="checkbox"/></p> <p>b) Lubrication <input type="checkbox"/></p>	

<p><b>Luff</b> (pin jibs only)</p> <p>c) Condition <input type="checkbox"/></p> <p>d) Lubrication <input type="checkbox"/></p> <p><b>Others (pennant, boom, etc)</b></p> <p>e) Condition <input type="checkbox"/></p> <p>f) Lubrication <input type="checkbox"/></p>	
<p><b>(9) Slew ring and drive</b> (where accessible)</p> <p>a) Lubricated <input type="checkbox"/></p> <p>b) Teeth wear <input type="checkbox"/></p> <p>c) Slew ring bolts (evidence of checking) <input type="checkbox"/></p> <p>d) Slew lock pin <input type="checkbox"/></p> <p>e) Hook rollers (where fitted) <input type="checkbox"/></p>	

<p><b>(10) Carrier</b></p> <p>a) Tyres <input type="checkbox"/></p> <p>b) Lights <input type="checkbox"/></p> <p>c) Mirrors <input type="checkbox"/></p> <p>d) Chassis condition <input type="checkbox"/></p>	
<p><b>(11) Articulated joint (Franna)</b></p> <p>a) Wear <input type="checkbox"/></p> <p>b) Integrity <input type="checkbox"/></p> <p>c) Emergency steer <input type="checkbox"/></p>	
<p><b>(12) Crane and carrier cabin</b></p> <p>a) Seating <input type="checkbox"/></p> <p>b) Visibility <input type="checkbox"/></p> <p>c) Noise <input type="checkbox"/></p> <p>d) Fire extinguisher <input type="checkbox"/></p> <p>e) Steps/ladder <input type="checkbox"/></p> <p>f) Grab-rail provided <input type="checkbox"/></p> <p>g) Clean (not slippery) <input type="checkbox"/></p>	

<p><b>(13) Load charts</b></p> <p>a) Provided (all set-ups) <input type="checkbox"/></p> <p>b) Correct for crane <input type="checkbox"/></p> <p>c) Comply to AS 1418 <input type="checkbox"/></p> <p>d) Legible &amp; in English <input type="checkbox"/></p> <p>e) Visible <input type="checkbox"/></p>	
<p><b>(14) Outriggers</b></p> <p>a) Extendible <input type="checkbox"/></p> <p>b) Feet condition <input type="checkbox"/></p> <p>c) Visible (colour/stripes) <input type="checkbox"/></p> <p>d) Hydraulics <input type="checkbox"/></p> <p>e) Lock pins (if req.) <input type="checkbox"/></p>	
<p><b>(15) Loadweigher</b></p> <p>a) Operable <input type="checkbox"/></p> <p>b) Calibrated <input type="checkbox"/></p> <p>Load movement system:</p> <p>c) Readings correct <input type="checkbox"/></p> <p>d) Cut out <input type="checkbox"/></p>	

<p><b>(16) Controls/indicators</b></p> <p>a) Correctly labelled <input type="checkbox"/></p> <p>b) Operable <input type="checkbox"/></p> <p>c) Deadman levers and pedals <input type="checkbox"/></p> <p>d) Radius gauge <input type="checkbox"/></p> <p>e) Level indicator <input type="checkbox"/></p> <p>f) Boom angle indicator <input type="checkbox"/></p> <p>g) Boom extension indicator (hyd. booms) (can be electronic) <input type="checkbox"/></p>	
<p><b>(17) Motion limits</b> (see guidance)</p> <p>a) Anti two-block (note type) <input type="checkbox"/></p> <p>b) Luff (upper limit) <input type="checkbox"/></p> <p>c) Buffers/backstops <input type="checkbox"/></p> <p>d) Other <input type="checkbox"/></p>	

<p><b>(18) Documentation</b></p> <p>a) Operators manual (English) <input type="checkbox"/></p> <p>b) Logbook provided complete <input type="checkbox"/></p> <p>c) 12 mth maint report <input type="checkbox"/></p> <p>d) Major inspection (10 year) <input type="checkbox"/></p>	
<p><b>(19) Other crane issues</b></p> <p>a) Guarding <input type="checkbox"/></p> <p>b) Hydraulic leaks <input type="checkbox"/></p> <p>c) General lubrication <input type="checkbox"/></p> <p>d) Removable counterweights marked with ID <input type="checkbox"/></p>	

<b>Crane use</b>	
<p><b>(20) Outriggers</b></p> <p>a) Packing/timber <input type="checkbox"/></p> <p>b) Ground condition <input type="checkbox"/></p> <p>c) Crane isolated or barricaded (where hazard exists) <input type="checkbox"/></p> <p>d) Extended (as per load chart) <input type="checkbox"/></p>	
<p><b>(21) Load handling and slings</b></p> <p>a) Load balanced <input type="checkbox"/></p> <p>b) Slings adequate capacity <input type="checkbox"/></p> <p>c) Slings correct type <input type="checkbox"/></p> <p>d) Sling condition <input type="checkbox"/></p> <p>e) Slings tagged <input type="checkbox"/></p> <p>f) Hooks okay <input type="checkbox"/></p>	

<p><b>(22) Brakes</b> (general operation observed during audit – this is not an overload test as per AS 1418.5 )</p> <p>a) Hoist <input type="checkbox"/></p> <p>b) Slew <input type="checkbox"/></p> <p>c) Luff (pin jib) <input type="checkbox"/></p>	
<p><b>(23) Crane motions</b> (operable, smooth, etc)</p> <p>a) Hoist motions <input type="checkbox"/></p> <p>b) Luff motions <input type="checkbox"/></p> <p>c) Slew motion <input type="checkbox"/></p> <p>d) Telescopic motion (hydraulic only) <input type="checkbox"/></p>	

<p><b>(24) Pick and carry</b></p> <p>a) Ground slope <input type="checkbox"/></p> <p>b) Ground condition <input type="checkbox"/></p> <p>c) Speed <input type="checkbox"/></p> <p>d) Allowance for articulation <input type="checkbox"/></p> <p>e) Persons clear <input type="checkbox"/></p> <p>f) Visibility <input type="checkbox"/></p> <p>g) De-ration chart (side-slope) <input type="checkbox"/></p>	
<p><b>(25) Power lines</b></p> <p>a) Location of crane suitable <input type="checkbox"/></p> <p>b) Allowance sag/sway <input type="checkbox"/></p> <p>c) Clearances adequate (during audit) <input type="checkbox"/></p> <p>d) Safety observer (where required) <input type="checkbox"/></p> <p>e) Documentation (verifying power turned off) <input type="checkbox"/></p>	

<p><b>(26) Operator and dogger issues</b></p> <p>a) Adequate personnel <input type="checkbox"/></p> <p>b) Communication suitable <input type="checkbox"/></p> <p>c) Certificates <input type="checkbox"/></p> <p>d) Dogger provided (when load out of view) <input type="checkbox"/></p>	
<p><b>(27) Documented lift procedure</b> (unusual loads, multiple crane lifting, tilt-up etc)</p> <p>a) Provided <input type="checkbox"/></p> <p>b) Suitable <input type="checkbox"/></p>	
<p><b>(28) Other issues</b></p> <p>a) Personnel box (design and marking, anti two block, deadman controls, harnesses etc) <input type="checkbox"/></p>	

# Mobile crane audit issues (Cranes used at construction sites)

1 April 2005

## Purpose

To provide a minimum standard for use by Workplace Health and Safety inspectors when performing plant audits on mobile cranes used on construction sites. This document does not discuss all issues relating to mobile cranes and their safe operation, but highlights the principal issues that can be audited during mobile crane audits. This document is intended to be a guide and an inspector may issue other directions based on considerations at the time of the inspection.

## Design issues

Australian Standard AS 1418.5, 'Mobile and vehicle loading cranes' specifies that mobile cranes be fitted with a number of features that assist in the safe operation of the crane, depending on the type and rated capacity of the crane. Table 7.3 of AS 1418.5-2002 summarizes both optional and mandatory limiting and indicating devices applicable to mobile cranes.

The Plant Code of Practice 2005 encourages manufacturers to design mobile cranes in accordance with AS 1418. However, standards prior to the *current edition* of AS 1418.5 are not as comprehensive as the current standard. In addition to AS 1418.5, guidance on the safe use of cranes is provided in AS 2550.1 'Cranes safe use – General requirements'. This standard requires that cranes used to lift persons are fitted with a number of safety features.

## Load indicators

1. *Function:* A load indicator measures and displays the mass of the load being lifted. This indicator assists the crane driver to stay within the load chart and SWL of the crane. The load indicator should be capable of displaying the mass of the suspended load at all times.
2. *Conclusion:* Load indicators to be fitted to all mobile cranes with a rated capacity of 15 tonnes and greater. This requirement should also apply to mobile cranes manufactured since 1996 with SWL equal to or greater than 3 tonnes (refer AS 1418.5-2002 and 1418.5-1990). This only applies to crane design and is not retrospective.
3. *Action:* The inspector should seek information on how safe use of the crane is ensured. Generally an improvement notice is issued when an operational load indicator is not provided to the categories of mobile cranes highlighted above. In some situations a prohibition notice would be justifiable – e.g. where the crane is working close to its maximum rated capacity and the mass of the suspended load has not been verified. Note: The allowable tolerance of the load weigher should be within 100 to 110% of the actual load (see section 7.3.2.2 of AS 1418.5-2002).

## Rated capacity limiters

1. *Function:* A rated capacity limiter prevents overloading of the crane by stopping all relevant crane functions when an overload is detected.
2. *Conclusion:* Should be fitted to all mobile cranes with a rated capacity of 15 tonnes and greater, manufactured since 1996. Should also be fitted to all mobile cranes that were originally designed and manufactured with a rated capacity limiter.
3. *Action:* Improvement notice where an operational rated capacity limiter is not fitted to cranes with a rated capacity of 15 tonnes and greater, manufactured since 1996.

## Anti two-block (hoisting indicator or limiter)

1. *Function:* (1) Indicator: warns the operator of impending contact between the hook block and boom head or head sheave assembly. (2) Limiter (motion cut): when activated, stops all crane functions whose movement can cause the hook block contacting the boom or head sheave (note: on older cranes the motion cut is usually on the hoist motion only).
2. *Conclusion:* Anti two-block devices should be fitted to all mobile cranes *other than* non-slewing mobile cranes, unless the later were originally designed with the feature. However, every slewing crane used to lift persons should be fitted with anti two-block (AS 2550.1 section 7.16.3(e)). The purpose of the anti two-block fitted to mobile cranes (introduced 1996) is to *stop all relevant crane functions* (e.g. hoist, luff and telescoping functions). The purpose of the anti-two block fitted to older cranes used to lift persons is to stop the hoist motion. However, cranes originally designed and manufactured with a motion cut anti two-block device on all relevant functions should retain this device.
3. *Action:*
  - a) For slewing cranes used to lift persons: prohibition notice if not fitted with motion cut anti two-block.
  - b) Other cranes: improvement notice if not fitted with anti two-block. However, if there is immediate risk due to factors such as the load size, lift height or operator's visibility, a prohibition notice would be justifiable.
  - c) Non-slewing mobile cranes (e.g. Franna): these cranes do not require anti two-block unless originally designed with this feature (e.g. 25 tonne Franna).

Note: Cranes pre-1996 device may be indicator type unless original design included a motion cut (provided crane is not lifting persons - then crane to have at least motion cut on hoist motion).

## “Dead-man” levers and foot pedals

1. *Function:* Ensures the lever or pedal returns to the neutral position automatically upon release by the operator. Usually applies to crane functions such as hoist, luff and slew.
2. *Conclusion:*
  - a) Any mobile crane used to lift persons (i.e. in a workbox) shall be fitted with full dead-man levers and pedals (AS 2550.1 - 2002 section 6.18.2(b)).

- b) All mobile cranes shall at least be fitted with partial dead-man levers and pedals. E.g. For normal operation of the levers the dead-man function operates, but the lever can be pushed into a “detent” position at the end of its travel.
- c) Any mobile crane that was designed and manufactured with full or partial dead-man levers and pedals should not have the levers and pedals altered, so that the deadman function is removed.

3. *Action:*

- a) Any mobile crane used to lift persons: controls (luff, hoist, telescope, slew) to be full dead man – otherwise prohibition notice.

NOTE: Some cranes have a deadman button that must be depressed for crane functions to operate, although levers themselves may not be fully deadmanned. This type of control system would be satisfactory.

- b) Crane designed and manufactured with full dead man but has dead man function removed: improvement notice.
- c) Crane that is designed with partial dead man controls but has dead man function removed: improvement notice.

**Luffing limiter and buffers (back stops)**

1. *Function:* Ensures that the boom or jib is not luffed up beyond the design or operational limitations (usually applies to pin jibs only - hydraulic cranes usually have feature designed in luff cylinder(s)).
2. *Conclusion:* Luff limiters and buffers should be fitted to all pin jib mobile cranes (AS 1418.5-2002).
3. *Action:* Pin jib not fitted with upper luff limit or buffer(s): prohibition notice. In a very rare situation it may be acceptable to issue an improvement notice (i.e. where lifts are of a repetitive nature and the lift zone is located such that the boom is no where near its maximum luff angle).

**Positive lock out on free fall**

1. *Function:* Prevents the hoisting function of the crane being inadvertently placed or knocked into “free fall” mode. Usually in the form of a keyed lock out on the free fall lever.
2. *Conclusion:* Only cranes with a positive lock out on the free fall function (i.e. keyed) should be used to lift persons (AS 2550.1 section 6.18.2(d)). The lock out device should be designed so that it can only be disengaged with a key or by using a tool.
3. *Action:* Cranes not fitted with positive lock out on free fall and *used to lift persons:* prohibition notice.

## **Operational issues**

### **Log books and maintenance records**

AS 2550.1 requires a log book to be maintained for the life of every crane and be readily available. Each log book entry should be signed by the responsible person making the entry. A list of routine checks for cranes is provided in Appendix B of AS 2550.1. A log book shall be carried on every mobile crane.

An inspection of other items usually needs to take place in the crane yard by a competent person(s). A major inspection should take place at intervals not exceeding *12 months*. The major inspection should comprise a thorough inspection of all mechanical, electrical and structural components. The competent person may require that parts of the crane are dismantled and/or non-destructively examined, in order to verify that the crane is safe for continued use. Evidence of the major inspections, including certification by the competent person, should be available upon request.

Maintenance records complying with the requirements of AS 2550.1 should be maintained for each mobile crane – these can be kept at the crane yard. AS 2550.1 sets out a number of inspection requirements and intervals, including a yearly and 10 year major inspection. The 10 year major inspection is based on crane having a mechanical design life of 10 years when designed in accordance with AS 1418 (the structural life should be based on a 25 year life). Checklists and compliance statement pro-formas are included in AS 2550.1 and should be used. The competent person is required to make the decision as to whether the crane should be stripped down or not.

### **Power lines**

The operation of a mobile crane in close proximity to power lines can be extremely hazardous to persons in close proximity to the crane. It can be very difficult for the operator to see power lines and this becomes a greater problem as the tower height increases. In addition the operator is usually focused on the crane operation and load movement, and can easily forget about power lines. It should be noted that the slew brake on a crane will not stop motion instantaneously because of the large amount of inertia developed by the slewing boom.

The *Electrical Safety Regulation 2002* regulates work in close proximity to overhead power lines. Guidance on such work is also provided in the Working Near Exposed Live Parts Code of Practice. One of the guidelines is that workers and mobile plant should maintain an exclusion zone of three metres around live power lines on poles (in certain limited situations there may be exceptions to this – see the code for details). Greater exclusion zones apply to live lines on transmission towers (six and eight metres depending on the voltage).

The best alternative is for power lines to be re-located or de-energised prior to and during the time the crane is in operation. There are no set instructions that can be applied to every situation where a mobile crane is capable of contacting overhead power lines. Suitable control measures will depend on factors such as visibility of the lines, crane working zones, crane height and the actual distance the lines are from the crane. However, there are some factors to note:

- No part of the crane, rope or load should ever come within three metres of a power line on poles (larger exclusion zones for lines on towers).
- If the builder claims the lines have been de-energised, written verification from the relevant power authority should be available on site.
- Where practical, power lines should be fitted with ‘tiger tails’ – note: tiger tails *do not* provide effective insulation.

The following should be noted about maintaining clearances from power lines:

- The minimum clearance is the distance from the closest part of the crane or suspended load to the power line.
- Allowances for sag and sway of the overhead lines should be made and added to the minimum clearances. Sway is usually caused by wind and sag occurs with temperature change of the line.

The principal contractor and crane company should be able to demonstrate what systems are in place to effectively prevent the crane contacting power lines. Reference should be made to the Working Near Exposed Live Parts Code of Practice. The inspector may consider the systems to be reasonable or may think otherwise depending on observations and feedback received on site (i.e. from the crane crew).

In applying the Working Near Exposed Live Parts Code of Practice to mobile cranes, the following is to be noted:

- The three metre exclusion zone is to be applied to all cranes working in operating mode, such that no part of the crane or load should enter the exclusion zone, unless an “authorised or instructed person” (as defined in the code) is operating the plant with a safety observer.
- If the crane is a tower crane or a mobile crane that is set up on outriggers, the crane will be required to be provided with a full time safety observer if it is capable of contacting the power lines *and* the crane has not been provided with properly set up limiting devices complying with section 5.4.3(iv) of the code. The following should also be noted:
  - A crane is deemed to be capable of contacting power lines if it is possible for any part of the crane or load to enter the exclusion zone. For example, a crane could be working 40 metres from the power lines but a full time safety observer would still need to be present at all times the crane is operating.
  - Provision of a safety observer is in addition to the provision of a dogger currently required with the operation of the crane.
- In the case of mobile cranes operating in the “pick and carry” mode, a safety observer should be provided where the crane is working within 6.4 metres of live overhead wires on poles or 10 metres of live overhead wires on towers (see AS 2550.1-2002 for further guidance).

### **Safe support of the crane**

Safe support of the crane will be checked. Issues include:

- poor “pig stying” of timbers under the outrigger pads on slewing cranes

- set up of the crane next to excavations or over ground cavities that are covered
- set up of the crane on ground that is too soft for the bearing area of the outriggers
- operation of the crane on sloping ground – mainly relating to pick and carry cranes.

Prior to setting up a crane on site, information on excavations and underground services should be provided by site management. Timbers are to be of a minimum size and strength specified by the crane manufacturer. Timbers should not be cracked and their surfaces should be flat and not rounded. Particular caution should be taken on soft ground and the minimum bearing area required for outrigger support should be calculated, where there is doubt about the ground strength.

### **Structural damage, modifications and repairs**

A prohibition notice should be issued for any structural damage to the crane that is not of a minor nature, and is to a critical part of the crane. Where the damage is of a minor nature an improvement notice would be appropriate.

Where the crane has been modified or repaired, some type of certification or evidence of a repair procedure should be available to the inspector upon request. The crane owner should also be able to verify competence of persons who have carried out repairs to a crane. This particular information does not have to be carried on the crane but should be available at the crane yard. Wherever the crane design has been altered, certification from a competent person (such as a Mechanical Engineer with RPEQ registration) should be available, unless the crane has been altered in accordance with instructions from the crane manufacturer. A new design registration may be required.

Where the crane has been repaired, and the design not altered, certification from an engineer may not be required provided the owner can provide a repair procedure authorised by the crane manufacturer. The crane owner would need to demonstrate that the tradesperson carrying out the work is competent.

In cases of non-compliance with the above issues, an inspector may either issue a prohibition notice or an improvement notice, depending on:

- the severity of the non-compliance
- whether there is deemed to be an immediate risk to health and safety.

### **Instruments, controls and load charts**

All crane controls and instruments should be operational and their function clearly identified. Verification of correct calibration may be required for some instruments (e.g. load indicators). Load charts should be provided in a location in the driver's cab that is easily visible. Where there are only one or two load charts, they should be fixed to the wall or other visible position. Load charts are to be:

- legible and written in English
- identified as applying to the particular type and model of crane

- provided for all lifting configurations used on that crane
- based on a stability ratio of 75% on outriggers, 66% on rubber – or complying with ISO 4305 (AS 1418.5 requirement).

Absence of the correct load chart is justification for a prohibition notice. If not absent, but load chart is otherwise defective (e.g. faded, not in English, etc) generally an improvement notice is to be issued.

### **Operator's manual**

All mobile cranes should be provided with an operator's manual written in English. Cranes without manuals shall generally be issued with improvement notices. However, should the inspector consider there is an immediate risk to health and safety a prohibition notice shall be issued.

### **Wire rope damage**

Guidance on the inspection of steel wire rope is provided in AS 2759, "Steel wire rope – application guide". The rope discard criteria in AS 2759 shall be followed during the blitz. Prohibition notices will be issued where AS 2759 specifies replacement of the rope.

### **Hooks and lifting gear**

Lifting gear should be audited and compared with the relevant Australian Standards to determine safe condition, adequate capacity and appropriate markings. Lifting slings are to be provided with identification tags and are to be provided with latched hooks. The provision of "Latchlok" type hooks, with a latch that automatically closes when the load is lifted, are preferable.

All crane hooks are to be provided with safety latches that are self closing and have been adequately maintained.

### **Suspended workboxes**

Guidance on the design and safe use of workboxes and cranes is provided in AS 1418.17 and AS 2550.1. *In addition to previous items required by this document (i.e. anti two-block, lock out and dead man controls), the following will be required:*

- at the maximum radius of the task to be performed, crane to have a minimum SWL of 1000 kg
- crane to have a minimum SWL of at least twice the total load of the workbox and its contents, at the maximum radius for the task to be performed (section 7.16.4 (e) of AS 2550.1)
- lifting slings (correctly tagged) to be supplied with the workbox and attached to lifting points by means of hammerlocks or moused shackles
- the factor of safety of each suspension sling shall be at least eight for chains and 10 for wire rope

- workbox to be marked with (1) SWL, (2) tare mass of workbox, and (3) identification reference
- if the workbox is provided with a door this should be inward opening only, self closing and should be provided with a latch to prevent accidental opening
- the sides of the workbox shall have a height of at least one metre.
- full body safety harnesses to be worn at all times. Harnesses to fall arrest anchorage points in box or to the main sling ring above the workers heads. Energy absorbers to be provided on lanyards (refer AS 1891.1).

### **Roadworthy issues**

Basic roadworthy items that may affect the crane's safety while on site should be checked, including:

- condition of tyres
- mirrors
- steering
- chassis condition
- operation of lights and indicators
- operation of audible warning devices
- brakes
- severe hydraulic leaks.

### **Design and plant registration.**

Mobile cranes more than 10 tonne SWL are required to be design registered or be approved under previous regulations. The crane owner should be able to provide a Queensland design registration or approval. If the crane has been design registered in another state, the crane owner should produce written evidence to Workplace Health and Safety Queensland (refer to Section 15 (2) of the *Workplace Health and Safety Regulation 1997*).

All mobile cranes of SWL of more than 10 tonne SWL are required to be plant registered with Workplace Health and Safety Queensland and a sticker in the crane cab is usually evidence of this. However, where the registration sticker has not yet been received evidence that the registration has been paid for should be provided.

### **Certification issues**

Crane operators and persons performing dogging duties are to hold appropriate certificates otherwise a prohibition notice or an infringement notice could be issued on the person.

Stuart Davis (Principal Adviser - Construction)

## Appendix 3

### Crane blitz – operator questionnaire

Crane type and model: \_\_\_\_\_ Date: \_\_\_\_\_

Basic crane type: \_\_\_\_\_  
(pin jib, slewing hydraulic, non-slewing hydraulic, vehicle loading crane)

Note: this information is to be treated in confidence – no name or certificate number to be recorded on this questionnaire.

Issue	Answer
<p>1. How long have you been operating this type and model of crane?</p> <p>(Note: has to be the exact type and model e.g. 12 tonne Franna, not Frannas in general)</p>	<p>a) Less than 1 week <input type="checkbox"/></p> <p>b) 1 week – 4 weeks <input type="checkbox"/></p> <p>c) 5 weeks - 12 weeks <input type="checkbox"/></p> <p>d) 13 weeks - 1 year <input type="checkbox"/></p> <p>e) 13 months - 2 years <input type="checkbox"/></p> <p>f) More than 2 years <input type="checkbox"/></p>
<p>2. How long have you been operating cranes of this basic type in total?</p> <p>(Basic types: pin jib, slewing hydraulic, non-slewing hydraulic, VLC)</p>	<p>1. Less than 1 year <input type="checkbox"/></p> <p>2. 1 – 5 years <input type="checkbox"/></p> <p>3. 6 -10 years <input type="checkbox"/></p> <p>4. 11 – 15 years <input type="checkbox"/></p> <p>5. 16 – 20 years <input type="checkbox"/></p> <p>6. 21 – 25 years <input type="checkbox"/></p> <p>7. More than 25 years <input type="checkbox"/></p>

<p>3. How long have you been a crane operator?</p>	<p>a) Less than 1 year <input type="checkbox"/></p> <p>b) 1 – 5 years <input type="checkbox"/></p> <p>c) 6 -10 years <input type="checkbox"/></p> <p>d) 11 – 15 years <input type="checkbox"/></p> <p>e) 16 – 20 years <input type="checkbox"/></p> <p>f) 21 – 25 years <input type="checkbox"/></p> <p>g) More than 25 years <input type="checkbox"/></p>
<p><b>Issue</b></p>	<p><b>Answer</b></p>
<p>4. Have you been provided with <b>documented</b> familiarisation training on the type of crane you are currently operating?</p>	<p><input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>5. Have you been given a copy of the familiarisation training record?</p>	<p><input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>6. Have you been provided with any type of refresher training? (i.e. general crane operator training every few years – not crane specific)</p>	<p><input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>7. What are the power line exclusion distances? (Answer: 3m lines on poles, 6m and 8m on towers – depends on voltage – not this is not exactly consistent with the code but is near enough)</p>	<p>3. Poles 3m correct – <b>YES NO</b></p> <p>4. Towers 6m correct - <b>YES NO</b></p> <p>5. Towers 8m correct - <b>YES NO</b></p>
<p>8. What percentage of persons giving you dogging instructions do you feel are competent?</p>	<p>a) 0 to 25%</p> <p>b) 25 to 50%</p> <p>c) 50 to 75%</p> <p>d) 75 to 100%</p>

<p>9. What do you believe is the <b>main</b> reason for the increase of crane incidents over the last few years?</p>	<p>(Circle answer below that best fits comment)</p> <ul style="list-style-type: none"><li>a) Large amount of work in the crane industry</li><li>b) Lack of experienced operators in the industry</li><li>c) Operators don't receive adequate training</li><li>d) Cranes are becoming more difficult to operate</li><li>e) Pressure from customers to complete jobs quickly</li><li>f) Pressure from customers to complete jobs with the wrong type or size of crane</li><li>g) Customers providing poor set-up areas for the crane</li><li>h) The wrong type of crane being used for the job</li><li>i) Other reason</li></ul>
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S Davis 1/4/2005