



Washington State Department of
Labor & Industries

Preliminary Cost Benefit and Least Burden Analyses

Construction Cranes Rulemaking: Phase 1

**Construction Cranes Certification
WAC 296-155-529 through WAC 296-155-53214**

**Operator Qualifications and Certification
WAC 296-155-533 and WAC 296-155-53300**

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Conclusion

The Washington State Department of Labor and Industries (L&I) determines on a preliminary basis that the benefits of the proposed rule are greater than the costs and that we are proposing the least burdensome alternative of the rule.

The proposed rule is expected to provide net benefits of approximately \$0.7 million per year. L&I estimates the approximate annual benefit is \$1.9 million per year. L&I estimates the annual cost of the proposed rule is about \$1.2 million. The net for each year is approximately \$0.7 million.

The proposed rule reduces the cost of operator training, thus reducing the burden of the rule and the law. This part of the proposed rule is what makes this proposal the least burdensome version of the rule.

L&I has requested feedback on parts of this preliminary analysis. The final analysis may have different values than this preliminary analysis.

Purpose of this analysis

L&I is proposing to amend chapter 296-155 WAC, Safety Standards for Construction Work, Part L. The Administrative Procedures Act (RCW 34.05.328 (1)(d) & (e)) requires two types of analyses before adopting a significant legislative rule – a cost-benefit analysis and a least burdensome alternative analysis. This report provides the results of these analyses and shows the potential impacts associated with the proposed rule.

Background

History of existing rules

In August 1994, while working to repair the ceiling of the Kingdome in Seattle, WA, a crane was used to lift two construction workers to sandblast the ceiling. The basket carrying the two workers fell 250 feet, sending the 32-year old and 39-year old men to their deaths, when the crane arm broke near its top. As it dropped, the basket struck the cab carrying the crane operator. The operator suffered head injuries as a result of the accident. As a result of this incident, the Governor mandated that the L&I establish the Washington State Cranes Safety Association and adopt regulations for the use of attached platforms with cranes. Both of these mandates were completed by L&I.

On November 16, 2006, at a downtown Bellevue construction site, a 217 foot tall tower crane collapsed, injuring the crane operator and killing a 31-year man in the living room of his top floor apartment. At approximately 7:30 PM, the crane operator was preparing to shut the crane down for the night. The tower crane was being rotated clockwise from the North towards the North East when the failure began to occur. The tower crane operator stated that he saw the end of the jib (crane boom) start to rise up, as if he had just released a heavy load from the rigging. He then felt the crane sway and start to tilt. The top of the crane fell toward the South, striking three buildings before crashing into the roof of the apartment building.

After the catastrophic tower crane accident that happened in Bellevue in November 2006, the legislature passed engrossed substitute house bill (ESHB) 2171 which was signed in April 2007. This bill requires the department to establish by rule a crane certification program for cranes used in the construction industry and to establish requirements that must be met to be considered a qualified crane operator.

L&I conducted two sets of statewide stakeholder meetings to gather input from the industry for use in developing draft rules. The first set of statewide stakeholder meetings was held in July 2007. Following these meetings, L&I decided to break the rulemaking into two phases. The first phase would adopt rules for the construction crane certification program, qualification requirements for crane certifiers, and operator qualifications, as outlined in RCW 49.17.400 through 440.

The second phase is currently being drafted and will update the requirements that employers must follow with regard to inspection, maintenance and operation of cranes used in the construction industry. The second phase will also include updates to our current rigging and personnel lifting requirements.

The concerns in Washington pertaining to crane safety are consistent with views expressed globally in recent decades. Häkkinen (1993) discusses the evolution in crane safety throughout the 1970s and 1980s. Recent studies at the international¹ national², and state level³, indicate a strong correlation between: 1) increased operator training and experience and crane safety; and 2) consistent maintenance and inspection and crane safety. Though there are occasional “accidents”, the vast majority of crane accidents can be directly attributed to either operator error or the condition of the crane.

Reason for this rule proposal

This rulemaking is in response to Chapter 27, Laws of 2007 (Engrossed Substitute House Bill 2171) requiring L&I to have rules relating to certification of crane inspectors, construction cranes, and crane operators. The legislature intends to promote the safe condition and operation of cranes used in construction work by establishing certification requirements for construction cranes. The legislature intends that standards for safety of construction cranes and for certification of personnel operating cranes in construction work be established.

Construction cranes are not currently regulated in this state. In November, 2006, a tower crane collapsed and killed an individual in Bellevue, Washington and damaged several buildings in the area. Damages ranged in the hundreds of thousands of dollars. In the aftermath of this event, structural problems were found and corrected in other cranes. This proposal will prevent these types of accidents from happening. Cranes that are appropriately manufactured, assembled, inspected, maintained, and used are generally safe. Construction is growing in this state and it is important for public health, safety and welfare that this proposal is adopted.

¹ Häkkinen, 1993; Ross 1996

² Saruda, et al 1999; Yow, et al, 2000; McCann, 2003; Paques, 1993.

³ ENR September 2, 2002 and ENR December 8, 2003.

Scope of Analysis

This analysis evaluates the provisions of the proposed rule over which L&I had discretion. L&I has attempted to quantify the cost and benefits of the proposed rule changes based on anticipated compliance requirements of the proposed rule and without the proposed rule. The analysis uses existing rules and laws as the baseline for the analysis.

Data Collection Methodology for the Cranes Rulemaking

L&I uses surveys to obtain cost estimates from employers for economic analyses. For this proposed rule, L&I developed a survey with the help of the Cranes small stakeholder group to obtain cost estimates from employers. L&I contracted the Gilmore Research Group to do the survey due to its length and complexity. The survey instrument is in Appendix 1: Survey Instrument. The data collection process evolved through three phases. The results from this process are presented in Appendix 2: Data Collection Disposition. In addition, below are descriptions of the phases throughout the process.

Phase 1: The Construction Sample

L&I designed a sample frame of 10,010 firms based on the risk class of the employers.⁴ Risk class is directly associated with an account number and payroll systems and is likely to be an accurate assessment of the employer's business size and activity. Chapter 19.85 RCW, Regulatory Fairness Act, requires L&I to assess costs to small business based on the 2-digit NAICS code. Therefore L&I selected firms in NAICS Sector 23, Construction. The risk classes are included as Appendix 3: Risk Classes Used in Survey Sample Frame – Phase 1. These risk classes were selected as a result of a technical review by the L&I Cranes Safety unit. As a check on the selection process, industry description information was requested in the survey instrument.

Gilmore randomly selected 370 firms to contact as a starting group from the list provided by L&I. During a progress report, Gilmore and L&I discovered that survey responses predominantly indicated that the firms being surveyed did not use cranes as part of their business. Hoping a different set of firms might yield different results, Gilmore chose additional and different firms from the L&I-provided list, and collected data from 491 firms during this phase.

Unfortunately, the trend continued. L&I expected to have responses covering a random sample of 7,000 cranes. The response was too small. It is not possible to get meaningful results with the respondent pool generated. L&I reassessed the sample selection method.

Phase 2: Non-Random Targeted Crane Owner and User Selection

L&I decided to more specifically target firms that use cranes, rather than relying on industry codes to target them. To do this, L&I did the following:

Worked with the Associated General Contractors (AGC) to develop a list of survey candidates
Contacted Coast Cranes to develop a list of firms that use cranes in their business

⁴ The risk classes are included as Appendix 1: Risk Classes Used in Survey Sample Frame – Phase 1. These risk classes were selected as a result of a technical review by the L&I Cranes Safety unit.

Reviewed our L&I project stakeholder list and selected firms likely to use cranes in their business.

As a result of this process, L&I provided Gilmore 325 entries for contacts. After removing duplicative information between the lists, this approach yielded the names of 285 firms that do, or are highly likely to, use cranes in their business activities. Gilmore reviewed the list of names and removed 79 firms that had already provided data in Phase 1.

Phase 3: Follow-Up to Non-Random Targeted Crane Owner and User Selection

While Phase 2 produced 160 additional results from firms that use cranes, the most valuable new information was that the expectation of 7,000 Cranes in Washington was wrong.

L&I does not maintain a current count of construction cranes in Washington state. However, L&I did contact businesses to develop an estimate of the number of cranes in Washington state. In Department of Licensing indicated the number of mobile cranes, currently registered and exempt, in Washington state as of July 2008 is 1,383. This information is used to compare the survey results and determine the credibility of the survey responses.

Also, many of the responses indicated that the firms subcontracted work involving cranes. L&I contacted individual firms to discuss the common work methods of the industry. As a result of these conversations, L&I developed a third list of firms. After Gilmore reviewed this list and removed firms that had provided data in either Phase 1 or Phase 2, the list provided 109 additional firms.

Comparison of the Current and Proposed Rules

Current rule requirements

The key elements of the proposed rule are not required by existing construction cranes rules: operator certification, inspector certification, and annual crane certification.

Description of proposed changes:

WAC 296-155-53102(1)

A requirement is being added which would require an applicant to submit an application and successfully complete written examinations developed and administered by the department or its authorized representative. This requirement is necessary in order to have capable and knowledgeable individuals accredited to certify construction cranes in the state of Washington.

WAC 296-155-53102(2)(c)

A requirement is being added that all applicants must demonstrate at least five years of crane related experience, of which two years must be actual crane inspection activities. The other three years may include experience in duties such as a crane operator, crane mechanic, crane shop foreman, crane operations supervisor, or rigging specialist. Related education may be substituted for the three years of related experience at a ratio of two years of education for one year of experience. This requirement is necessary to ensure that applicants seeking certification possess the knowledge and experience necessary to conduct construction crane certification inspections in the state of Washington.

WAC 296-155-53102(4)

A requirement is being added that the applicant must successfully complete the written examinations in order to be an accredited crane certifier. The first written examination will test the applicant's general knowledge of operation, testing, inspection and maintenance requirements, and the duties and recordkeeping responsibilities required by the proposed rules. The other written examinations will test the applicant's knowledge of the safe operating and engineering principles and practices with respect to specific crane types subject to the accreditation, including inspection and proof loading requirements. This requirement is necessary to ensure that applicants seeking certification possess the knowledge and experience necessary to conduct construction crane certification inspections in the state of Washington.

WAC 296-155-53108(1)

A requirement is being added that an accreditation will be valid for three years and that crane certifiers must complete forty hours of crane related training every three years. This requirement is necessary to ensure that all applicants possess knowledge of the changes happening within the industry.

WAC 296-155-53108(2)

A requirement is being added that an application for renewal must demonstrate she/he has been actively inspecting cranes during their prior accreditation period. An applicant is considered active if he/she has certified at least twenty-one cranes during their three year accreditation period. If the applicant certified cranes in another state, then that applicant must provide documentation showing they were active during their accreditation period. An applicant who has not certified at least twenty-one cranes during the accreditation period may take the written exams to become recertified. This requirement is necessary to ensure skills and knowledge are maintained to accurately conduct inspections.

WAC 296-155-53108(3)

A requirement is being added that all applicants for renewal must successfully complete the written examinations every six years. This requirement is necessary in order that all applicants possess knowledge of the changes happening within the industry.

WAC 296-155-53204(1)(u)

A requirement is being added that a portable fire extinguisher must be installed in the cab or at the machinery housing of an articulating boom crane. This requirement is necessary in order to provide a safe means to extinguish any potential fire. Also, this is a current requirement for all of the other types of cranes covered by this rule.

WAC 296-155-53214(1)(a)

A requirement is being added that if a crane contacts an energized power line the certification becomes invalid. In order to reinstate the crane operating certification, the crane owner must have a certified crane inspector re-inspect the crane to ensure the crane was not damaged by the contact, and, if necessary, conduct additional proof load tests. Any deficiencies identified by the certified crane inspector must be corrected prior to reinstatement of the crane operating

certificate. This requirement is necessary in the event of contact an energized line. The crane could possibly be damaged and not operating in a safe condition.

Baseline for Analysis

The baseline for this analysis is the existing rules and laws. In Appendix 4 there is a crosswalk displaying where the new requirements came from including laws, other rules, and DOSH. New requirements coming directly from the law or from an existing rule will not be evaluated in this cost benefit analysis. New requirements where L&I had some discretion are evaluated.

Analysis of Costs & Benefits

Costs

L&I estimates the annual cost of the proposed rule ranges from \$615,000 to \$623,000. The total estimated cost for a 9 year cycle of training is \$5.5 to \$5.6 million.

Table 4.A Estimating the Cost per Employee for Large Companies.

| Costs by Category | Item | Unit Costs Low | Unit Costs High | Number of Workers Per Firm | Low Total | High Total |
|--|-----------------|-------------------|--------------------|----------------------------------|-----------|------------|
| Certifiers Accreditaion | | | | | | |
| Experience | Existing effort | \$ - | | | | |
| Application | Time Cost | \$ 3,648 | | 5.52 | \$ 20,137 | |
| Training (Non-Union) | Fee | \$ 325 | \$ 1,295 | | \$ 1,794 | \$ 7,148 |
| Exam | Fee | \$ 215 | \$ 275 | 5.52 | \$ 1,187 | \$ 1,518 |
| 3 Year Renewal | | | | | | |
| Experience | Time Cost | \$ 3,648 | | 5.52 | \$ 20,137 | |
| Application | Time Cost | \$ 1,824 | | 5.52 | \$ 10,068 | |
| Continuing education | Training Cost | \$ 826 | | 5.52 | \$ 4,560 | |
| 6 Year Renewal Exam | Fee, Time Cost | \$ 3,863 | \$ 3,923 | 5.52 | \$ 21,324 | \$ 21,655 |
| Recertifying Cranes | 2 cases only | \$ 1,500 | \$ 3,000 | | \$ 3,000 | \$ 6,000 |
| | Crane Time | \$ 150 | | | \$ 2,400 | |
| Sub Total W/O Recertification | | | | | \$ 79,206 | \$ 85,223 |
| Annual Effect | | | | | \$ 8,801 | \$ 9,469 |
| Ratio for Large Companies \$/employee | | | | | \$ 3 | \$ 3 |
| Ratio for Large Companies for recertification: \$/employee | | | | | \$ 0.08 | \$ 0.13 |

| Table 4.B. Estimating the Cost per Employee for Small Companies | | | | | | |
|---|-----------------|-------------------|--------------------|----------------------------------|-----------|------------|
| Costs by Category | Item | Unit Costs Low | Unit Costs High | Number of Workers Per Firm | Low Total | High Total |
| Certifiers Accreditaion | | | | | | |
| -Experience | Existing effort | \$ - | | | | |
| -Application | Time Cost | \$ 5,853 | | 5.37 | \$ 31,430 | |
| -Training (Non-Union) | Fee | \$ 325 | \$ 1,295 | | \$ 1,745 | \$ 6,954 |
| -Exam | Fee | \$ 215 | \$ 275 | 5.37 | \$ 1,155 | \$ 1,477 |
| 3 Year Renewal | | | | | | |
| -Experience | Time Cost | \$ 5,853 | | 5.37 | \$ 31,430 | |
| -Application | Time Cost | \$ 2,926 | | 5.37 | \$ 15,715 | |
| -Continuing education | Training Cost | \$ 826 | | 5.37 | \$ 4,436 | |
| 6 Year Renewal Exam | Fee, Time Cost | \$ 6,068 | \$ 6,128 | 5.37 | \$ 32,584 | \$ 32,906 |
| Recertifying Cranes | 2 cases only | \$ 1,500 | \$ 3,000 | | \$ 3,000 | \$ 6,000 |
| | Crane Time | \$ 150 | | | \$ 2,400 | |
| Sub Total W/O Recertification | | | | | \$118,493 | \$ 124,347 |
| Annual Effect | | | | | \$ 13,166 | \$ 13,816 |
| Ratio for Small Companies \$/employee | | | | | \$ 818 | \$ 858 |
| Ratio for Small Companies for recertification: \$/employee | | | | | \$ 17 | \$ 26 |

For the final analysis L&I requests information from owners of cranes on their experience with the cost of training. We may have overestimated costs. We specifically need data on employee turnover and the need to provide training to new staff.

These costs come from:

Training: The training and accreditation costs are evaluated as a 9 year cycle since the requirements for renewal at 3 and 6 years differ. There are approximately 45,720 crane and tower crane operators nation wide and approximately 900⁵ in Washington working in this job class. The average employment per firm of operators is 28.8. In addition small companies on average hire .6 new inexperienced operators per year and large companies hire about 25 new inexperienced operators each year. The average across all firms is 5 new inexperienced operators each year per firm. Employees will need to be trained for certifying cranes. Survey results indicate that most small companies expect to use their own operators to certify their cranes. Most of the larger owners expect to hire outside certifiers. Further, the small companies appear to specialize and dominate the mobile cranes. Finally, the small companies appear to pay their experienced employees more than the large companies.

⁵ The survey covered 273 of these workers but no independents.

Cranes will also need to be re-certified if they make contact with energized power lines.

Wages are a large factor in estimating the costs. Based on the reported wages in the survey, operator wages range from \$20 to \$31 per hour depending on how experienced the employees are. Inspector wages range from \$24.40 per hour for inexperienced inspectors to \$63 per hour for inspectors that already meet L&I's qualifications.

| Average Wages by Experience | Wages |
|-----------------------------------|---------|
| Number of Firms | 126 |
| Inspectors meeting qualifications | \$63.53 |
| Less Experienced Crane Certifiers | \$24.40 |
| Inexperienced Operators | \$20.94 |
| Experienced Operators | \$30.77 |

The number of employees affected by the additional accreditation training is probably overstated. L&I summed the average number of employees for companies that already have experienced inspectors with the average number of new hires for companies that expect to hire experienced inspectors and the number of new hires for companies that expect to hire and train inexperienced inspectors. **It is unlikely that most companies will do all 3 of these things. Therefore the stated accreditation costs may be twice the actual costs.**

Cost for Accredited Crane Certifiers to Obtain Initial Accreditation

(Required by proposed WAC 296-155-53100)

There are no current or existing rules that require construction crane certifiers or that require certifiers to obtain accreditation through L&I in order to inspect construction cranes. Since there is no accreditation at this moment, firms will follow a variety of strategies: an average of 2.3 employees per firm already qualify, an average of 2 will be put through training, and an average of .15 inexperienced employees will be hired and trained for this work.

Step 1: Obtain Required Experience

Compliance Process:

In order to be eligible for accreditation, the applicant must have 5 years of crane-related experience, 2 years experience performing crane inspections and 3 years related experience as a crane operator, crane mechanic, crane shop foreman, crane operations supervisor, or rigging specialist. The 2 years actual inspection experience can be obtained by conducting the periodic and frequent inspections which employers are currently required to perform under WAC 296-155-525(2)(d) or the annual inspection of hoisting equipment required under WAC 296-155-525(2)(e). The additional 3 years experience may be obtained by working in any of the identified positions. In addition, related education may be substituted for the 3 years related experience at a rate of 2 years education for every 1 year of actual experience.

Potential Compliance Costs for this Process:

L&I anticipates that costs associated with this provision will be the staff time needed to obtain the necessary amount of experience required or, if education is substituted for experience, the costs for crane related classes identified in the rule. However, the costs to obtain actual experience will be minimal given that an individual can obtain this experience by working for an employer and conducting the periodic and frequent inspections required by existing rules. The person must be competent but does not need to be accredited under WAC 296-155-525(2)(d). Therefore under this existing requirement, it benefits the employer as well as the employee to obtain this on-the-job-training. In addition, related experience can be obtained by working for an employer in one of the identified trades.

Estimated Cost: \$0

For example the union provides free training to members in the hoisting trade at the Operating Engineers Regional Training Center in Ellensburg. They require 6,000 hours of work done in this trade.

Step 2: Application for Accreditation**Compliance Process:**

This proposed rule requires applicants to submit a written application and a resume setting forth the knowledge, training and experience the applicant possesses working with cranes. The application/resume must contain verifiable references.

Potential Compliance Costs:

L&I anticipates that costs associated with this provision will be the staff time needed to complete the application document and resume. Further they will probably study for the exam and get ready to take it before applying.

Estimated Cost: \$5,082 per applicant

Experienced applicants earn on average \$63 per hour. Employers may or may not pay employees to apply. However, application is a cost of the rule. L&I assumes that the applicants will not apply until they are ready to take the exams. In addition to the on-the-job-training above, if the application process, studying for the exam, and taking the exam requires 80 hours of time per applicant, the cost would be \$5,082 per applicant per exam. There are approximately 45,720 crane and tower crane operators nation wide and approximately 900 in Washington working in this job class. Within maritime crane operations, over 60% can do inspections. In our survey it could be as low as 1/3. However, it is unlikely that all of these individuals will pursue accreditation to conduct certification inspections on construction cranes.

Step 3: Successfully Complete Written Examinations**Compliance Process:**

L&I will be developing between 2 and 6 types of written examinations for applicants. All applicants must successfully pass a written examination that will test the applicant's knowledge of the requirements of WACs 296-155-529 through 296-155-53214. In addition, the applicant

will be required to successfully pass a written exam testing the applicant's knowledge on safe operating and engineering principles and other practices for the specific types of cranes the applicant wishes to certify, separated out by Mobile Cranes, Tower Cranes, Articulating Cranes, Derricks, and Overhead Cranes.

Potential Compliance Costs: \$325 to \$1,295 per class and \$215 to \$275 per exam

L&I anticipates that costs associated with this provision will be the staff time necessary to prepare for and take the exam (which are included in Step 2 above) and payment of the fees required for each individual exam. The exam fees are anticipated to range from \$215 to \$275. Some companies offer training for these exams, which range in cost from \$325 to \$1,295 and may include trial exams.

Cost for Certifiers to Renew Accreditation

(Required by proposed WAC 296-155-53108)

There are no current or existing rules that require construction crane certifiers or that require certifiers to obtain accreditation or renew accreditation through L&I in order to inspect construction cranes.

Step 1: Obtain Required Experience

Compliance Process:

In order to qualify for renewed accreditation, construction crane certifiers must have conducted at least 21 crane certification inspections during their three year accreditation period OR retake the certification examinations required by WAC 296-155-53100.

Potential Compliance Costs: \$0 to \$5,082 per person

L&I anticipates that there will be no cost associated with the requirement to conduct at least 21 crane inspections during the three year accreditation period. Given that certifiers will be paid for this inspection work, if they are called for inspections, then there will be no cost associated with obtaining this experience.

However, certifiers who opt to retake the exams in lieu of the 21 crane inspections, will be required to pay the exam fees to retake the exams. The costs associated will be the staff time necessary to prepare for and take the exam and payment of the fees required for each individual exam. The fees are anticipated to range from \$215 to \$275.

Employers may or may not pay employees to apply. However, application is a cost of the rule. L&I assumes that applicants will not apply until they are ready to take the exams. In addition to the on-the-job-training above, if the application process, studying for the exam, and taking the exam requires 80 hours of time per applicant, the cost would be \$5,082 per applicant per exam.

Step 2: Obtain Required Education

Compliance Process:

In order to qualify to apply for renewed accreditation, construction crane certifiers will need to complete 40 hours of continuing education in crane related courses approved by the Department during the 3 year accreditation period.

Potential Compliance Costs:

L&I anticipates that the costs associated with this provision will be the staff time to take these courses and the course registration fees.

Estimated Cost: \$826 per applicant plus \$2,541 for the 40 hours

40 hours is a cost \$2,541 per applicant plus a possible cost of \$826 per renewal per applicant. L&I assumes some of the applicants will obtain this training free through the union. These costs are part of union dues but the training is a cost to the union. Others may obtain training from professional schools with fees ranging from \$325 to \$1,295.

Step 3: Application for Renewal

Compliance Process:

Accredited construction crane certifiers must renew their certification through L&I every 3 years.

Potential Compliance Costs: Cost Included above.

L&I anticipates that the cost associated with this provision will be the staff time required to prepare renewal application.

Step 4: 6 year Renewal, Successfully Complete Written Examinations

Compliance Process:

At a minimum, every six years, or for the second 3 year renewal, the crane certifiers must re-take and successfully pass the certification examinations required by WAC 296-155-53100 for every type of crane they wish to inspect and certify.

Potential Compliance Costs: \$5,279 to \$5,357.

L&I anticipates that costs associated with this provision will be the staff time necessary to prepare for and take the exam and payment of the fees required for each individual exam. The fees may range from \$215 to \$275. In addition to the on-the-job-training above, if the application process, studying for the exam, and taking the exam requires 80 hours, the cost will be \$5,082 per applicant per exam.

Recertification of crane following hitting power line

(Required by proposed WAC 296-155-53214)

There are no current or existing rules that require construction crane owners to certify their construction cranes. As a result, current rules also do not require a certification re-inspection if the crane makes contact with a power line.

Compliance Process:

Crane operating certificates (valid for 1 year) will automatically be invalidated if any part of the crane makes contact with an energize power line. In order to have the crane certification reinstated, crane owners must have all crane components re-inspected by an accredited crane certifier with no findings of deficiencies. If the accredited crane certifier identifies deficiencies during this re-inspection, the crane owner must correct all identified deficiencies and have this verified by the crane certifier before the crane certification can be reinstated. In addition, if the crane certifier determines during re-inspection that the crane must also be proof load tested, the crane must also have a proof load test successfully completed.

Worker Time Assumption:

Some employers may have their own employees do this as part of their accreditation experience requirements which are listed above. This cost should then not be counted in both places. However, some will hire a private party to recertify the crane. These costs are reported to range from \$1,500 to \$3,000. L&I has assumed that this cost will apply.

Crane Time Cost:

Until it is recertified and possibly repaired, the crane will be out of service. This time is unknown because only 2 respondents reported having made contact with power lines. L&I is using 8 hours as a place holder and a cost of \$150 per hour as an estimated replacement lease rates.

For the final analysis L&I requests information from owners of cranes on their experience with this issue. We specifically need data on the frequency of striking live wires as well as the cost of load testing and inspection.

Potential Total Compliance Costs: \$3,000 to \$6000 for 2 incidents and \$2,400 for replacement rentals. This does not include the cost of repairs.

Benefits

The law created the potential for benefits from reduced accidents. In writing the proposed rule, L&I has attempted to reduce some of the possible training costs implied by the 2,000 hour limit without significantly reducing the increased safety benefits.

L&I estimates the benefit of reduced training costs are approximately \$19 million and the benefit of reduced mortality is \$260,000.

L&I estimates the approximate annual benefit is \$1.9 million per year.

Crane Operator Qualifications for Certification

(Required by proposed WAC 296-155-53300)

There are no current or existing rules that contain operator experience requirements in order for the crane operator to be a qualified operator. However the law requires construction crane operators to have up to 2,000 hours of experience. Without the rule, crane operators could be required to obtain 2,000 hours of experience. The law therefore creates both the increases in cost from training and any benefits from training. The rule sets a variety of hours of experience which are less than 2,000 hours. The rule creates a cost reduction or benefit by setting the hours of experience required based on the size and type of crane. It may also create a foregone benefit in the form of voiding the reduced accidents which 2,000 hours of training might have created.

Compliance Process:

Operators are expected to obtain a specific amount of actual operating experience/training and related experience, by crane type and capacity, in order to become a qualified operator. These requirements are set forth in Table 1 below.

| Crane Operator Experience Table 1 | | |
|---|---|--|
| Crane Type | Number of Hours of Actual Crane Operating Experience | Number of Hours of Crane Related Experience |
| (1) Mobile Cranes | | |
| (a) Lattice Boom Crawler Cranes (LBC) | 300 tons and above 1000 Hours | 300 tons and above 1000 Hours |
| | Under 300 tons 500 Hours | Under 300 tons 500 Hours |
| (b) Lattice Boom Truck Cranes (LBT) | 300 tons and above 1000 Hours | 300 tons and above 1000 Hours |
| | Under 300 tons 500 Hours | Under 300 tons 500 Hours |
| (c) Large Telescopic Boom Cranes (Swing Cab) (TLL) | Over 130 tons 750 Hours | Over 130 tons 750 Hours |
| | Over 40 tons to 130 tons 250 Hours | Over 40 tons to 130 tons 250 Hours |
| | 40 tons and under 40 Hours | 40 tons and under 40 Hours |
| (d) Small Telescopic Boom Cranes (Fixed Cab)(TSS) | 15 tons and above 40 Hours | 15 tons and above 40 Hours |
| | Under 15 tons 20 Hours | Under 15 tons 20 Hours |
| (e) Articulating Boom Cranes | 20 Hours | 20 Hours |

| | | |
|--|-----------|-----------|
| (2) Tower Cranes | | |
| (a) Hammerhead | 500 Hours | 500 Hours |
| (b) Luffer | 500 Hours | 500 Hours |
| (c) Self-Erecting | 50 Hours | 50 Hours |
| (3) Overhead Cranes | | |
| (a) Cab Operated | 40 Hours | 40 Hours |
| (b) Pendant/Remote | 40 Hours | 40 Hours |
| (4) Derricks | 20 Hours | 500 Hours |
| <p>Hours of actual crane operating experience. For all cranes: time while the operator is at the controls of the crane; and/or has direct control of that crane; and/or a combination of operating hours within the same crane type. For mobile cranes: it also includes time while installing/removing boom sections, luffing boom, jib, extending and retracting outriggers/stabilizers, leveling crane, and replacing hoisting rope. For tower cranes: it includes time while jumping (increasing the height of the tower/mast).</p> | | |
| <p>Note: Additional actual crane operator experience may account for crane related experience.</p> | | |
| <p>Hours of crane related experience: Time as a signalman/bellman, oiler, crane mechanic, crane inspector, formal classroom training, crane simulator operation, and a combination of operating hours on other categories of cranes.</p> | | |

Potential Reduced Compliance Costs: \$19 million, or spread over a 10 year period, \$1.9 million per year. L&I anticipates that the cost associated with this provision will be the wage paid to the operator trainee throughout the time needed to obtain necessary hours of experience. While operators will need to reapply, they will not need to redo the experience. L&I assumes the employees will tend to stay in the work once they have their training and has assumed the cost would therefore be spread over at least 10 years of service.

| | |
|------------------|----------------|
| Mobile Cranes: | \$18.5 million |
| Tower Cranes: | \$125 thousand |
| Overhead Cranes: | \$369 thousand |
| Derricks: | \$0 |

This estimate is based on the year 1 cost savings given the difference between the law and the rule in terms of training time, and the savings in training time given the reported actual current levels of experience.

For the final analysis L&I requests information from owners of cranes on their experience with the cost of training. We may have overestimated or underestimated the annual savings. We specifically need data on employee turnover and the need to provide training to new staff.

Lives Saved

L&I anticipates there will be a reduction in the number and type of accidents as a result of compliance with the proposed rules and the law. This will result from reduced effects of crane accidents including reduced property damage, injury, equipment damage, emergency response, road closures, investigations, and power outages. Current data does not allow quantifying all of these benefits. However, L&I does have information on national mortality rates per 100,000 workers per 10 year period.

Benefit of lives saved: \$2.6 million every 10 years

The expected gain over an average 10-year period would be a 20% reduction in the typical 1.89 mortalities. About 20% of the fatal accidents are due to crane or tower crane failure. The crane inspections required by the proposed rules are assumed here to reduce mortality from this source. This would have a 10-year value of \$2.6 million, assuming a value of statistical-life of \$7 million, and an average annual value of \$260,000.

Operator error creates 80% of the loss. However, L&I has reduced training requirements from those in the law, therefore, any gain from additional operator training by comparison to current levels would be due to the law and not to the rule. It therefore cannot be counted as a benefit of the rule.

Net Benefits

The net benefit of the rule is estimated at over \$0.7 million per year.⁶ The estimated annual net benefits are equal to the benefit (\$1.9 million) minus the cost (\$1.2 million) minus.

- + L&I estimates the approximate annual benefit is \$1.9 million per year.
- L&I estimates the annual cost of the proposed rule is about \$1.2 million.
- = The net for each year is approximately \$0.7 million.

⁶ The benefits and costs are treated as annual for the net benefit comparison because some of the costs have a 9 year cycle, the mortality calculations are based on a 10 year average, and the cost of experience is spread over the career of an employee.

Least Burdensome Analysis

RCW 34.05.328(1)(e) requires L&I to “determine, after considering alternative versions of the rule and the analysis required under (b), (c), and (d) of this subsection, that the rule being adopted is the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives stated under (a) of this subsection.”

The table below presents requirements of the proposal and the alternative requirements considered.

| | | |
|---|--|---|
| <p>WAC 296-155-53102(1) A requirement is being added which would require an applicant to submit an application and successfully complete written examinations developed and administered by the department or its authorized representative. L&I has provided a grace period for maritime and other qualified crane certifiers to ensure an adequate number of certifiers are available to meet the needs of the industry. This requirement is necessary in order to have an adequate number of capable and knowledgeable individuals accredited to certify construction cranes in the state of Washington.</p> | <p>This requirement was specifically requested by stakeholders during the statewide stakeholder meetings. Additional details in this requirement were developed in collaboration with the small stakeholder group. This small stakeholder group was comprised of business and labor representatives including representatives from the Associated General Contractors (AGC), International Union of Operating Engineers, Independent Business Association (IBA), Truss Manufacturers Association, Sichelsteel Cranes, Coast Cranes, Morrow cranes, business and labor representatives from the electrical industry, and currently certified maritime crane inspectors.</p> | <p>L&I considered not creating a grace period for maritime and other qualified certifiers. After consideration, L&I determined that the grace period would provide additional time for individuals who planned to obtain the required certification and would ensure that the industry had enough qualified certifiers to meet their needs. Per proposed WAC 296-155-53100(2) and (3), the grace period would expire on January 1, 2012 or when the individual's maritime certification expires, whichever is the earliest. However, the proposed rule allows the individual to continue inspecting construction cranes until January 1, 2012 if the individual renews their maritime certification.</p> <p>Stakeholders suggested that L&I</p> |
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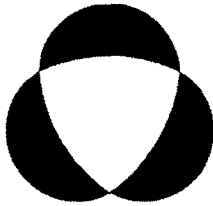
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| | | require certifiers to meet the same qualification criteria for crane operators. After consideration, L&I determined that it was not necessary for crane certifiers to meet the operator qualification requirements. |
| <p>WAC 296-155-53102(2)(c)</p> <p>A requirement is being added that all applicants must demonstrate at least five years of crane related experience, of which two years must be actual crane inspection activities. The other three years may include experience in duties such as a crane operator, crane mechanic, crane shop foreman, crane operations supervisor, or rigging specialist. Related education may be substituted for related experience at a ratio of two years of education for one year of experience up to three years. This requirement is necessary in order to have applicants with knowledge and experience being accredited in the state of Washington.</p> | <p>This requirement was mirrored after the California State Plan (CAL-OSHA) requirements for crane certifiers. Title 8 CA Code of Regulations, §344.61(2).</p> | <p>L&I considered adopting the OSHA maritime requirement of 10-years of experience. After consideration, L&I determined that 5 years of crane-related experience was sufficient.</p> <p>L&I considered requiring various levels of experience ranging from 10 years to 5 years. After consideration, L&I determined that 5 years of crane-related experience was sufficient.</p> |
| <p>WAC 296-155-53102(4)</p> <p>A requirement is being added that the applicant must successfully complete the written examinations in order to be an accredited crane certifier. The first written examination will include a general knowledge of operation, testing, inspection and maintenance requirements, and the duties and recordkeeping responsibilities required by this rule. The other written examinations will include safe operating and engineering principles and practices with respect to specific crane types</p> | <p>This requirement was mirrored after the California State Plan (CAL-OSHA) requirements for crane certifiers. Title 8 CA Code of Regulations, §344.61(4)(e).</p> | <p>L&I considered the development of additional exams by breaking the crane type out by capacity (tonnage). After consideration, L&I determined that exams provided by crane type were sufficient.</p> <p>L&I considered requiring the inspectors to take exams for all of the crane types regardless of what types</p> |

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| <p>subject to the accreditation, including inspection and proof loading requirements. This will result in the minimum of 2 examinations per inspector and a maximum of 6 exams. This requirement is necessary in order to have accredited crane certifiers that have the knowledge and experience to certify cranes in the state of Washington.</p> | | <p>of cranes the inspector planned to inspect. After consideration, L&I determined that requiring examination for the type of crane the inspector planned to inspect was sufficient.</p> |
| <p>WAC 296-155-53108(1) A requirement is being added that an accreditation will be valid for three years and that crane certifiers must complete forty hours of crane related training every three years. This requirement is necessary to ensure that all applicants are current with the changes happening within the industry.</p> | <p>The requirement for renewing every three years was mirrored after the California State Plan (CAL-OSHA) requirements for crane certifiers. Title 8 CA Code of Regulations, §344.64.</p> <p>Stakeholders requested L&I require crane certifiers complete crane related continuing education in order to re-certify. L&I and the small stakeholder group developed the requirement that crane certifiers take 40 hours of continuing education every 3 years.</p> | <p>L&I considered requiring additional continued education. After consideration, L&I determined 40 hours of continued education was sufficient.</p> <p>L&I considered requiring reapplication for accreditation at more frequent intervals than 3 years. After consideration, it was determined that reapplication at 3 years was sufficient.</p> |
| <p>WAC 296-155-53108(2) A requirement is being added that an application for renewal must be filed with the department not less than 60 days prior to expiration of the accredited crane certifier's certification, providing the applicant has been actively inspecting cranes during their prior accreditation period. An applicant is considered active if he/she has certified at least twenty-one cranes during their accreditation period. If the applicant certified cranes in another state, then that applicant must provide documentation</p> | <p>This requirement was added in consultation with the small stakeholder group to ensure that cranes certifiers maintain skills and knowledge to accurately conduct inspections.</p> | <p>L&I considered requiring additional inspections to be completed to be considered "active." After consideration, L&I determined 21 inspections was sufficient.</p> <p>Based on stakeholder requests, L&I considered requiring exams every 3 years instead of every 6 years. After consideration, L&I determined an</p> |

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| <p>showing they were active during their accreditation period. An applicant who has not certified at least twenty-one cranes during the accreditation period may take the written exam to become recertified. This requirement is necessary to ensure skills and knowledge are maintained to accurately conduct inspections.</p> | | <p>accreditation period of 6 years was sufficient.</p> |
| <p>WAC 296-155-53108(3) A requirement is being added that all applicants for renewal must successfully complete the written examinations every six years. This requirement is necessary in order that all applicants are current with the changes happening within the industry.</p> | <p>The requirement for successfully completing the written examinations every six years was mirrored after the California State Plan (CAL-OSHA) requirements for crane certifiers. Title 8 CA Code of Regulations, §344.64.</p> | <p>L&I considered requiring annual renewal for accreditation of the crane certifiers. After consideration, L&I determined that completing the written examination every six years was sufficient.</p> <p>L&I considered bi-annual renewal for accreditation of the crane certifiers. After consideration, L&I determined that completing the written examination every six years was sufficient.</p> |
| <p>WAC 296-155-53204(1)(u) A requirement is being added that a portable fire extinguisher must be installed in the cab or at the machinery housing of an articulating boom crane. This requirement is necessary in order to provide a safe means to extinguish any potential fire. Also, this is a current requirement for all of the other types of cranes covered by this rule.</p> | <p>L&I, in consultation with the small stakeholder group, added this requirement to ensure consistency across all crane types. All other crane types are required by ANSI to have a portable fire extinguisher on the crane.</p> | <p>L&I believes the failure of ANSI to include this as an articulating boom crane requirement was an oversight since all other cranes must have a fire extinguisher.</p> |
| <p>WAC 296-155-53214(1)(a) A requirement is being added that if a crane comes</p> | <p>The requirement to re-inspect a crane after contact with an energized line derives from</p> | <p>Based on stakeholder request, L&I originally considered several other</p> |

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| <p>in contact with an energized line the certification becomes invalid. This requirement is necessary in the event of contact an energized line. The crane could possibly be damaged and not operating in a safe condition.</p> | <p>standard manufacturer's recommendations. In addition, stakeholders requested this provision.</p> | <p>reasons to invalidate a crane certification other than connection with an energized line. Some of these included:</p> <p>Lightning strikes;</p> <p>Any repair or modification that effects the safe operation of the equipment such as modifications or additions involving a safety device or operator aid, critical part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism or capacity; or</p> <p>Other deficiencies identified by a qualified person.</p> |
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Appendix 1: Survey Instrument



Washington State Department of Labor & Industries

Division of Occupational Safety and Health

2008 Crane Rulemaking Survey

Responses to this survey are anonymous and confidential

Introduction:

The purpose of this survey is to determine any costs your business may incur due to the adoption of the proposed crane rule. Your answers will also help us determine how the proposed rule could impact businesses of different types and sizes.

There are five sections in this survey:

Section 1: General questions about your business as a whole

Section 2: Questions to answer if your business employs crane operators

Section 3: Questions to answer if your business owns cranes

Section 4: Questions to answer if your business employs crane inspectors

Section 5: Questions to answer if your business uses cranes

Each section will ask you questions that will help us determine how these rules might affect your business.

You may not need to fill out all sections. For example, if your company owns cranes and employs crane operators but does not actually operate the cranes, you would fill out Section 1, Section 2 and Section 3. On the other hand if your company uses cranes, but does not own any and does not employ and crane operators or crane inspectors, then you would fill out Section 1 and Section 5 only.

Please answer the questions the best you can. If you do not have the exact information, use your best estimate, or leave the response blank. In order for your cost data to be included in the economic analysis of this rule, the survey must be filled out and returned in the included postage-paid envelope by May 16, 2008.

If you have any questions about the proposed rule or the survey, please contact:

Cindy Ireland

Safety and Health Specialist
Division of Occupational Safety and Health
Department of Labor and Industries
(360) 902-5522

Section 1: GENERAL QUESTIONS ABOUT YOUR BUSINESS

1a. During 2007, what was the maximum number of full-time workers your business employed?

_____ full-time workers (if none, enter 0)

1b. During 2007, how many total hours did your part-time and/or seasonal employees work?

_____ hours (if none, or if you don't employ part-time or seasonal workers, enter 0)

1c. Please check the **one** industry name that most closely describes your business. If more than one of these industries fits your business, please select the one that represents the largest part of your business:

| | |
|---|--|
| Construction | |
| <input type="checkbox"/> | Construction of buildings |
| <input type="checkbox"/> | Heavy and civil engineering construction |
| <input type="checkbox"/> | Specialty trade contractors |
| Manufacturing | |
| <input type="checkbox"/> | Electrical equipment, appliance, and component manufacturing |
| Mining | |
| <input type="checkbox"/> | Support activities for mining |
| Real estate and rental and leasing | |
| <input type="checkbox"/> | Rental and leasing services |
| Utilities | |
| <input type="checkbox"/> | Utilities |
| Wholesale trade | |
| <input type="checkbox"/> | Merchant wholesalers, durable goods |
| <input type="checkbox"/> | Merchant wholesalers, nondurable goods |

1d. Does your firm own cranes, use cranes, employ crane operators or employ crane inspectors in any area of the construction industry? Please do not include service trucks with mobile lifting devices designed specifically for use in the power line and electrical service industry or handling associated materials to be installed or removed from utility poles in any of your responses. The rule language does not apply to this equipment.

Yes: Please continue with the rest of the survey.

No: Thank you for providing the information above. You have completed the survey. Please mail the survey in the postage-paid envelope included in your packet.

Section 2: CRANE OPERATORS

CRANE AND DERRICK OPERATORS, GENERAL QUESTIONS

If you do not employ any crane or derrick operators, please go to the next section, "Crane Owners".

2. How many operators of any type of crane or derrick do you expect to need to hire in the following years?

2008: _ operators (please include any operators already hired this year)

2009: _ operators

2010: _ operators

3. On average, how many hours a day do each of your operators operate cranes?

_____ hours per operator per day

4. When you hire new crane operators that have no experience operating cranes, how much do you pay them per hour?

\$_____ per hour

5. When you hire new crane operators that are experienced crane operators and that require no additional training by you, how much do you pay them per hour?

\$_____ per hour

Please answer the questions in the following sub-sections about the crane operators you employ, including how many operators you employ for each type of crane and how many crane operators you think you will need to hire in the next three years.

For the questions below, crane-related experience means time as a signal man/bellman, oiler, crane mechanic, crane inspector, formal classroom training, crane simulator operation, and a combination of operation hours on this or other categories of cranes.

CRANE OPERATORS, MOBILE CRANES

6a. Do you employ mobile crane operators?

Yes → How many? __

No → Please go to 'Crane Operators, Tower Cranes'

MOBILE CRANES—PLEASE WRITE "0" IF NONE

6b. Lattice Boom Crawler Cranes—300 ton capacity and above

MOBILE CRANES—PLEASE WRITE "0" IF NONE

How many operators do you currently employ that operate these cranes?

_____ (if none, enter "0")

How many of the operators you employ have both **1,000 hours** of actual crane operating experience on lattice boom crawler cranes of any capacity and an *additional 1,000 hours* of crane-related experience?

_____ operators (if none, or if you do not employ crane operators, enter "0")

We need to know how many operators of lattice boom crawler cranes of 300 ton capacity and above you think your business will need to hire in 2008, 2009 and 2010 and how many of these new operators you predict will need training to meet the requirements in the paragraph above. Please enter the number of new operators you think you will need to hire in the next three years, including any operators already hired this year:

2008: _ new, *untrained* operators 2008: _ new, *trained* operators
2009: _ new, *untrained* operators 2009: _ new, *trained* operators
2010: _ new, *untrained* operators 2010: _ new, *trained* operators

When you hire untrained operators for lattice boom crawler cranes of 300 ton capacity and above, how many hours do you train the operator before allowing them to operate the crane without supervision?

_____ hours of training

6c. Lattice Boom Crawler Cranes, under 300 ton capacity

How many operators do you currently employ that operate these cranes?

_____ (if none, enter "0")

How many of the operators you employ have both **500 hours** of actual crane operating experience on lattice boom crawler cranes of any capacity and an *additional 500 hours* of crane-related experience?

_____ operators (if none, or if you do not employ crane operators, enter "0")

We need to know how many operators of lattice boom crawler cranes of capacity under 300 tons you think your business will need to hire in 2008, 2009 and 2010 and how many of these new operators you predict will need training to meet the requirements in the paragraph above. Please enter the number of new operators you think you will need to hire in the next three years, including any operators already hired this year:

2008: _ new, *untrained* operators 2008: _ new, *trained* operators
2009: _ new, *untrained* operators 2009: _ new, *trained* operators
2010: _ new, *untrained* operators 2010: _ new, *trained* operators

MOBILE CRANES—PLEASE WRITE "0" IF NONE

When you hire untrained operators for lattice boom crawler cranes of capacity under 300 tons, how many hours do you train the operator before allowing them to operate the crane without supervision?

_____ hours of training

6d. Lattice Boom Truck Cranes, capacity 300 tons and above

How many operators do you currently employ that operate these cranes?

_____ (if none, enter "0")

How many of the operators you employ have both **1,000 hours** of actual crane operating experience on lattice boom truck cranes of any capacity and *additional 1,000 hours* of crane-related experience?

_____ operators (if none, or if you do not employ crane operators, enter "0")

We need to know how many operators of lattice boom truck cranes of capacity 300 tons and above you think your business will need to hire in 2008, 2009 and 2010 and how many of these new operators you predict will need training to meet the requirements in the paragraph above. Please enter the number of new operators you think you will need to hire in the next three years, including any operators already hired this year:

2008: _ new, *untrained* operators 2008: _ new, *trained* operators

2009: _ new, *untrained* operators 2009: _ new, *trained* operators

2010: _ new, *untrained* operators 2010: _ new, *trained* operators

When you hire untrained operators for lattice boom truck cranes of capacity 300 tons and above, how many hours do you train the operator before allowing them to operate the crane without supervision?

_____ hours of training

6e. Lattice Boom Truck Cranes, capacity under 300 tons

How many operators do you currently employ that operate these cranes?

_____ (if none, enter "0")

How many of the operators you employ have both **500 hours** of actual crane operating experience on lattice boom truck cranes of any capacity and an *additional 500 hours* of crane-related experience?

_____ operators (if none, or if you do not employ crane operators, enter "0")

THE FULL DOCUMENT IS AVAILABLE IN THE OIRA DOCKET LIBRARY
