Washington State Department of
Labor & Industries

Small Business Economic Impact Analysis (SBEIS)

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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You can also view this report on the Department of Labor and Industries' website at http://www.lni.wa.gov/safety/topics/atoz/cranes/default.asp

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1. EXECUTIVE SUMMARY

The ratio of costs to employment for large and small firms indicates that the impact of both benefits and costs of the proposed rule is disproportionate. Therefore cost minimizing features are required.

Costs were estimated using a worst-case scenario:

Accreditation:

The largest 10% of construction firms are very large, averaging over 3,000 employees. They have costs of $3 per employee for employment of their accredited crane certifiers. The small firms seem to specialize and have costs of over $800 per employee for employment of their accredited crane certifiers.

Power Line Strike:

In the unlikely event that a large company hits a power line once every 10 years the cost is only $0.08 per employee where for a small firm it would be $17 to $26 per employee.

The law does not require that cost minimizing features of the proposed rule be evaluated. However L&I has done so. The proposed rule also creates disproportionate benefits for small businesses.

Because the proposed rule has a disproportionate impact on small business the law requires L&I to reduce the cost for small business if it is legal and feasible to do so. L&I has taken several actions to reduce the impact of the proposed rule on small businesses.

The largest cost-minimizing feature is the reduction in training hours required for operators. This taken together with the costs means that the net effect of the proposed rule is a savings. The net effect of the proposed rule is to increase employment by 8 jobs annually. Most of this change comes from cost savings due to reductions in the amount of training required for operators.[1]

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[1] Estimated using OFM's 2002 input output model.

2. BACKGROUND

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. When the crane arm broke near the top, the basket carrying the two workers fell 250 feet, sending the 32-year old and 39-year old men to their deaths. 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 Department of Labor and Industries (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, a 217' tall tower crane collapsed at a downtown Bellevue, WA construction site, 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 November 2006 catastrophic Bellevue, WA tower crane accident, the legislature passed engrossed substitute house bill (ESHB) 2171 which was signed in April 2007. This bill requires L&I to establish by rule a crane certification program for cranes used in the construction industry, to establish qualification requirements for crane certifiers, 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 the July 2007 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 crane 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. Hakkinen (1993) discusses the evolution in crane safety throughout the 1970s and 1980s. Recent studies at the international2 national3, and state level4, indicate a strong correlation between: 1) increased operator training and experience and crane safety; and 2) consistent maintenance and inspection requirements and crane safety. Though there are occasional "accidents", the vast majority of crane accidents can be directly attributed to either operator error or insufficient crane maintenance activities

[2] Häkkinen, 1993; Ross 1996
[3] Saruda, et al 1999; Yow, et al, 2000; McCann, 2003; Paques, 1993.
[4] ENR September 2, 2002 and ENR December 8, 2003.

3. ANALYSIS OF COMPLIANCE COSTS FOR WASHINGTON BUSINESSES

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.

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 and 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 include a general knowledge of operation, testing, inspection and maintenance requirements, and the duties and record keeping responsibilities required by this rule. The other written examinations will include 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 occurring 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 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 exam 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 are current with 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 comes in contact with an energized 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.

Costs Associated with Compliance:
Cost for 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.

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 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 proposed 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. In addition, related experience can be obtained by working for an employer in one of the identified trades.

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.

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:
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.

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 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:
L&I anticipates that there will be no cost associated with the requirement to conduct at least 21 crane inspections given that certifiers will be paid for this work. However, should a certifier opt to take the exams in lieu of the 21 crane inspections requirement, 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.

Step 2: Obtain Required Education
Compliance Process:
In addition, in order to qualify 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.

Step 3: Application for Renewal
Compliance Process:
Accredited construction crane certifiers must renew their certification through L&I every 3 years.

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

Step 4: Successfully Complete Written Examinations
Compliance Process:
At a minimum, every six years, 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:
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.

Recertification of crane following hitting power line:
(Required by proposed WAC 296-155-53214)
There are no current or existing rules that require construction cranes 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 (which shall be 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.

Potential Compliance Costs
L&I anticipates that the cost associated with this provision will be the cost to pay a crane certifier to re-inspect the crane and, if proof load testing is required, staff time associated with the proof load test activities.

Of the firms surveyed, a total of four firms indicated that they had hit a power line in the previous year. Two were small firms and one was a large firm. Currently, of the 93 firms that indicate that they own a crane, 39 are small businesses. Thirty-one of these firms indicate that they have individuals on staff that meet the qualifications for crane inspection (sixteen of these are small). A total of 10 firms indicate that they proof load their own cranes (8 of which are small), with the rest relying on outside inspectors. The cost of utilizing outside inspection ranges from $1,500 to $3,000 per inspection.

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.

Compliance Process:
Operators are to have a specific amount of actual operating experience/training and related experience, by crane type and capacity, in order to become a qualified operator.

Potential Compliance Costs:
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.

4. QUANTIFICATION OF COSTS AND RATIOS

The ratio of costs to employment for large and small firms indicates that the impact of both benefits and costs of the proposed rule is disproportionate. Therefore cost minimizing features are required.

Costs
These were estimated using a worst-case scenario:

L&I used the average number of existing crane certifiers for those companies currently employing certifiers, new hires for those companies expecting to hire employees in this category, and inexperienced hires for those companies that expect to hire and train. Survey results show that some companies who currently employ crane certifiers will not be hiring additional employees in this category. However, because L&I was unable to obtain data showing impacts for all firms, L&I is using anticipated worst-case scenario for this analysis.

L&I assumed one incident of cranes contacting energized power lines that would require crane recertification. Only 2 companies reported having a crane make contact with an energized power line, once per firm. In order to estimate the cost per employee to hypothetical small and large firm, we have estimated the cost of a single strike in a 10-year period.

<u>Accreditation:</u>
The largest 10% of construction firms are very large. They have costs of $3 per employee for employment of their accredited crane certifiers. The small firms seem to specialize and have costs of over $800 per employee for employment of their accredited crane certifiers.

<u>Contact with an energized power line:</u>
In the unlikely event that a large company hits a power line once every 10 years the cost is only $0.08 per employee where for a small firm it would be $17 to $26 per employee.

Table 4A and 4B display the costs for large and small companies. These costs were used to estimate the cost per employee. When you compare the cost per employee for small and large companies in these tables it is clear that the cost per employee is 2 orders of magnitude higher for the small companies.

Table 4A **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 4B 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 Accreditation						
-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

Gains
The gains from the proposed rule are also disproportionate.

Training
In determining the net impacts of the current rules on the industry, a comparison was made between the current law, RCW 49.17.430 (2)(b) , requiring 2,000 hours of experience regardless of the type of crane one certifies on, and allowable practices under the proposed rule, which reduces this requirement depending on the type of crane and the crane capacity. The hourly differential between current law and rule requirements was then multiplied by the average wage paid to inexperienced operators (used as a proxy for uncertified operators). Many firms refuse to hire inexperienced operators for insurance purposes[5]. **Table 4C** shows the share of the industry that employs inexperienced operators.

Table 4C
Share of Total Firms That Employ Inexperienced Workers

	All	Small	Large
Number of Firms	19	4	6
Share of Total	15.1%	7.3%	46.2%

[5] Source: July 11, 2008 conversation with International Union of Operating Engineers (IUOE) Washington State Locals 701 and 370.

Total impact was adjusted to account for firms that choose not to utilize inexperienced workers.

Table 4D Savings for Industry by Firm Type			
	All	**Small**	**Large**
Number of Firms	126	55	13
Average Employees per Firm	446.5	16.1	3,334.4
Average Wage, inexperienced Operators	$20.94	$17.6	$23.3
Average Wage, experienced Operators	$30.77	$27.3	$27.8
Average Wage, inexperienced crane inspectors	$24.40	$15.44	$27.00
Average Wage, experienced crane inspectors	$63.53	$73.16	$45.60
Crane Type			
(1) Mobile Cranes	$18,503,317	$540,760	$5,732,499
(2) Tower Cranes	$125,640	$0	$0
(3) Overhead Cranes	$369,382	$0	$182,672
(4) Derricks	$0	$0	$0
Total	$18,998,339	$540,760	$5,915,171

One primary reason that smaller firms have both higher costs and higher savings under this rule is that they pay more per hour for an experienced employee who are also able to inspect their cranes. The survey indicates crane inspectors that meet the proposed rule qualifications earn $73.16 at small firms and $45.60 at large firms. The average overall wage is $63.53. The survey indicates inexperienced crane certifiers earn $15.44 at small firms, $27 at large firms, and $24.40 overall.

Another reason that the small companies gain more from the reduction in operator training hours is that they dominate in ownership of the mobile cranes.

Table 4E Total Cranes by Size and Type			
	Business Size		
Crane Type	**Small**	**Large**	**All**
Mobile	363	150	1,059
Tower	3	6	611
Overhead	27	115	207
Derricks	16	10	83
Total cranes	409	281	1,960

Accidents

An additional cost to small businesses resulting from the reduced hourly experience requirements as compared to the legislation is an increase in the potential for accidents to occur. As discussed above, the current literature indicates a link between additional operator experience and safety. Therefore, as the proposed rules decrease the hours required for certification, there could be an increase in accidents.

A crane accident is a significant event, often resulting in property damage, significant injury, fatalities, injuries, equipment damage, emergency response, road closures, investigation, and power outages. Quantifying many of these costs for Washington State is not possible with current Washington State data. However, national statistics exist on fatalities related to crane accidents[6]. When the national fatality rate was applied to Washington State data on total employment in the construction industry, it was found that the fatality rate for big businesses

[6] Suruda, et al. 1999

was larger than that for small businesses. In addition, individuals that die as a result of crane accidents are often not employees of the crane company. As a result, the crane company may incur a substantial death benefit liability to the family of the person killed. Large firms are more likely to survive the financial impacts of this type of accidents. Small firms, however, are unlikely to be able to financially pay for this type of accident and are, therefore, more likely to go out of business. Assuming a cost of $7 million, this indicates that the costs from increasing the risk of crane operation are less for small businesses than it is for large businesses. Table 4.F. below shows the expected annual fatality rate from crane accidents and the associated costs of these fatalities in Washington.

Table 4F
Expected Costs of Fatality

	Annual Fatality Rate	**Expected Costs**
All firms	0.19	$1,330,000
Small firms	0.09	$630,000
Large firms	0.10	$700,000

5. ACTIONS TAKEN TO REDUCE THE IMPACT OF THE PROPOSED RULE ON SMALL BUSINESS

The proposed rule has a disproportionate impact on small business. The law requires L&I to reduce the cost for small business if it is legal and feasible to do so. L&I has taken several actions to reduce the impact of the proposed rule on small businesses.
The largest cost minimizing feature is the reduction in training hours required for operators. This is discussed in Section 4.

The methods for reducing costs prescribed in the law are treated below as subsections:

(a) Reducing, modifying, or eliminating substantive regulatory requirements

WAC 296-155-53102(2)(c)
Choice of lower experience requirements: 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.

This requirement was mirrored after the California State Plan (CAL-OSHA) requirements for crane certifiers. Title 8 CA Code of Regulations, §344.61(2).
L&I considered the following alternative requirements:

- Adopting the OSHA maritime requirement of 10-years of experience. After consideration, L&I determined that 5 years of crane-related experience was sufficient.
- 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.

WAC 296-155-53102(4)
Choice of fewer exams based on what inspectors plan to do. 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 record keeping responsibilities required by this rule. The other written examinations will include safe operating and engineering principles and practices with respect to specific crane types 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.

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).

L&I considered the following alternative requirements:

- 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.
- Requiring the inspectors to take exams for all of the crane types regardless of what types 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.

WAC 296-155-53108(3)

Choosing reduced accreditation requirements. 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.

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.

L&I considered the following alternative requirements:

- Requiring annual renewal for accreditation of the crane certifiers. After consideration, L&I determined that completing the written examination every six years was sufficient.
- Bi-annual renewal for accreditation of the crane certifiers. After consideration, L&I determined that completing the written examination every six years was sufficient.

Choice of reduced reapplication requirements. A requirement is being added that an accreditation will be valid for three years. This requirement is necessary to ensure that all applicants are current with the changes happening within the industry.

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.

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.

(b) Simplifying, reducing, or eliminating record keeping and reporting requirements

WAC 296-155-53108(1)

Choice of reduced training through reduced reapplication requirements. A requirement is being added 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.

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. L&I considered requiring additional continued education. After consideration, L&I determined 40 hours of continued education was sufficient.

(c) Reducing the frequency of inspections

WAC 296-155-53108(2)
Choosing reduced inspections for retaining certification. 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 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 exam to become recertified. This requirement is necessary to ensure skills and knowledge are maintained to accurately conduct inspections.

This requirement was added in consultation with the small stakeholder group to ensure that cranes certifiers maintain skills and knowledge to accurately conduct inspections.

L&I considered the following alternative requirements:

- Requiring additional inspections to be completed to be considered "active." After consideration, L&I determined 21 inspections was sufficient.
- Based on stakeholder requests, L&I considered requiring exams every 3 years instead of every 6 years. After consideration, L&I determined an accreditation period of 6 years was sufficient.

(d) Delaying compliance timetables

WAC 296-155-53300(5)
Allowing additional time for compliance. L&I intends to adopt this rule before the legislatively required date of January 1, 2010. This will allow employers and others time to come into compliance with the requirements of the proposed rule. In addition, L&I considered the impact to business when determining the proposed rule requirements as described below.

WAC 296-155-53102(1)
A grace period within a new requirement. 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.

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, Sickelsteel Cranes, Coast Cranes, Morrow cranes, business and labor representatives from the electrical industry, and currently certified maritime crane inspectors.

L&I considered the following alternative requirements:

- 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.
- Stakeholders suggested that L&I 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.

(e) Reducing or modifying fine schedules for noncompliance; or

Reduced fines for small businesses. RCW 49.17.180 addresses the civil penalties for WISHA citations. RCW 49.17.180(7) requires the Department give consideration in the penalty assessment to factors including the size of the employer's business. WAC 296-900-14015 (see Table 5) sets forth the specific process for penalty adjustments including employer size.

(f) Any other mitigation techniques
WAC 296-155-53214(1)(a)

Certification validity. A requirement is being added that if a crane comes 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.

The requirement to re-inspect a crane after contact with an energized line derives from standard manufacturer's recommendations. In addition, stakeholders requested this provision.

Based on stakeholder request, L&I originally considered several other reasons to invalidate a crane certification other than connection with an energized line. Some of these included:

- Lightning strikes
- 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**
- Other deficiencies identified by a qualified person.

6. THE INVOLVEMENT OF SMALL BUSINESS IN THE DEVELOPMENT OF THE P PROPOSED RULE AMENDMENTS

During the 2006-2007 legislative session representatives of small business and business associations were involved in the development of Engrossed Substitute House Bill 2171. This bill was passed and the Department of Labor and Industries (L&I) began rulemaking to comply with the requirements of RCW 49.17.400 through RCW 49.17.440.

L&I decided to hold statewide stakeholder meetings before presenting draft language to stakeholders for review. In July 2007, L&I held 7 meetings around the state to discuss the history of the statute and solicit input on the development of the draft rule. Notification of these meetings was sent to individuals who had expressed interest in L&I's Crane rewrite project and legislation. In addition, notice of these meetings was posted on L&I's website. Small businesses and business representatives and associations attended these statewide meetings.

As a result of the July 2007 statewide stakeholder meetings, a small stakeholder group[7] was developed consisting of business representatives and associations and members of the Electrical Utility Safety Advisory Committee (EUSAC).[8] This small stakeholder group reviewed L&I's draft language over 3 meetings in October 2007. The small stakeholder group provided input on the draft language.

Based on the input provided by the small stakeholder group, L&I updated the draft rule and provided it for stakeholder review. In October 2007 through November 2007, L&I held 5 additional stakeholder meetings across the state. The purpose of these meetings was to solicit input on the draft rule.

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[7] 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, Sickelsteel Cranes, Coast Cranes, Morrow cranes, business and labor representatives from the electrical industry, and currently certified maritime crane inspectors.

[8] The EUSAC is a standing ad-hoc committee of employers and IBEW unions covering electrical utility work in Washington State.

L&I updated the draft rule based on the October/November 2007 statewide stakeholder meetings. This draft was reviewed with the small stakeholder group during 2 meetings in December 2007 and an updated version was reviewed in a final meeting on January 31, 2008. Since that time, the draft rule has been posted on the Department's website.

The proposed rule language is a result of consensus from the small stakeholder group and input from stakeholders across the state.

Small businesses were also included in the development of the economic analyses.

7. THE NAICS CODES OF IMPACTED INDUSTRIES

Construction can take place in any industry. Chapter 296-155 WAC, Safety Standards for Construction Work applies to all industries in Washington State where construction, alteration, demolition, related inspection, and/or maintenance and repair work, including painting and decorating, is performed. L&I does not enforce safety and health for the mining industry. The mining industry is covered by Mining Safety and Health Administration (MSHA).

The NAICS codes for these industries are as follows:

11	Agriculture, Forestry, Fishing and Hunting
22	Utilities
23	Construction
31-33	Manufacturing
42	Wholesale Trade
44-45	Retail Trade
48-49	Transportation and Warehousing
51	Information
52	Finance and Insurance
53	Real Estate and Rental and Leasing
54	Professional, Scientific, and Technical Services
55	Management of Companies and Enterprises
56	Administrative and Support and Waste Management and Remediation Services
61	Educational Services
62	Health Care and Social Assistance
71	Arts, Entertainment, and Recreation
72	Accommodation and Food Services
81	Other Services (except Public Administration)
92	Public Administration

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.[9] 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

[9] 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.

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
- 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.

8. IMPACTS ON JOBS

L&I used the OFM 2002 Input Output model to estimate job impacts. In this case it is difficult to estimate because there is a mix of effects and because it is unclear whether the proposed rule will be at least 20% effective in saving lives and preventing injury. There are direct costs of compliance to business and gains to labor in the form of lives saved and injury prevented. There are significant savings from reducing the training required for operator certification below the 2,000 hours in the law.

This estimate assumes a 10 year savings of about 20% of the $.4 million in business costs due to lives saved, a 9 year cost of 10 million for accreditation and recertifying cranes, and a 10 year savings of $18 million for reduced training costs.

The input output model yields an annual increase of 8 jobs per year from this net savings.

Note: Savings of lives from increased training required in the law were not included because they do not accrue to the proposed rule.

Appendix 1
Survey Instrument

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
Safey 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
❑	Construction of buildings
❑	Heavy and civil engineering construction
❑	Specialty trade contractors
	Manufacturing
❑	Electrical equipment, appliance, and component manufacturing
	Mining
❑	Support activities for mining
	Real estate and rental and leasing
❑	Rental and leasing services
	Utilities
❑	Utilities
	Wholesale trade
❑	Merchant wholesalers, durable goods
❑	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
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")

MOBILE CRANES—PLEASE WRITE “0” IF NONE
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
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 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

MOBILE CRANES—PLEASE WRITE “0” IF NONE
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")
We need to know how many operators of lattice boom truck 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
When you hire untrained operators for lattice boom truck 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
6f. Large telescopic boom cranes (swing cab), capacity 130 tons or 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 **750 hours** of actual crane operating experience on large telescopic boom cranes (swing cab) of any capacity and an *additional* **750 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 large telescopic boom cranes (swing cab) of capacity 130 tons or 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 large telescopic boom cranes (swing cab) of capacity 130 tons or above, how many hours do you train the operator before allowing them to operate the crane without supervision? _____ hours of training
6g. Large telescopic boom cranes (swing cab), capacity between 40 and 130 tons
How many operators do you currently employ that operate these cranes? _____ (if none, enter "0")

MOBILE CRANES—PLEASE WRITE “0” IF NONE
How many of the operators you employ have both **250 hours** of actual crane operating experience on large telescopic boom cranes (swing cab) of any capacity and an *additional* **250 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 large telescopic boom cranes (swing cab) of capacity between 40 and 130 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
When you hire untrained operators for large telescopic boom cranes (swing cab) of capacity between 40 and 130 tons, how many hours do you train the operator before allowing them to operate the crane without supervision? _____ hours of training
6h. Large telescopic boom cranes (swing cab), capacity under 40 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 **40 hours** of actual crane operating experience on large telescopic boom cranes (swing cab) of any capacity and an *additional* **40 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 large telescopic boom cranes (swing cab) of capacity under 40 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
When you hire untrained operators for large telescopic boom cranes (swing cab) of capacity under 40 tons, how many hours do you train the operator before allowing them to operate the crane without supervision? _____ hours of training
6i. Small telescopic boom cranes (fixed cab), including boom trucks, capacity 15 tons or 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 **40 hours** of actual crane operating experience on small telescopic boom cranes (fixed cab), including boom trucks, of any capacity and an *additional* **40 hours** of crane-related experience? _____ operators (if none, or if you do not employ crane operators, enter "0")

MOBILE CRANES—PLEASE WRITE “0” IF NONE
We need to know how many operators of small telescopic boom cranes (fixed cab), including boom trucks, of capacity 15 tons or 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 small telescopic boom cranes (fixed cab), including boom trucks, of capacity 15 tons or above, how many hours do you train the operator before allowing them to operate the crane without supervision? _____ hours of training
6j. Small telescopic boom cranes (fixed cab), including boom trucks, capacity under 15 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 **20 hours** of actual crane operating experience on small telescopic boom cranes (fixed cab), including boom trucks, of any capacity and an *additional* **20 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 small telescopic boom cranes (fixed cab), including boom trucks, of capacity under 15 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
When you hire untrained operators for small telescopic boom cranes (fixed cab), including boom trucks, of capacity under 15 tons, how many hours do you train the operator before allowing them to operate the crane without supervision? _____ hours of training
6k. Articulating Boom Cranes
How many operators do you currently employ that operate these cranes? _____ (if none, enter "0")
How many of the operators you employ have both **20 hours** of actual crane operating experience on articulating boom cranes and an *additional* **20 hours** of crane-related experience? _____ operators (if none, or if you do not employ crane operators, enter "0")

MOBILE CRANES—PLEASE WRITE "0" IF NONE
We need to know how many operators of articulating boom cranes 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 articulating boom cranes, how many hours do you train the operator before allowing them to operate the crane without supervision? _____ hours of training
The proposed rule will require articulating boom cranes to be equipped with a fire extinguisher with a basic minimum extinguishing rating of 10 BC in the cab or at the machinery housing. How many articulating cranes do you own that currently meet this qualification? _ cranes

CRANE OPERATORS, TOWER CRANES

7a. Do you employ tower crane operators?

- ❑ Yes → How many? __
- ❑ No → Please go to 'Crane Operators, Overhead or Bridge Cranes'

TOWER CRANES—PLEASE WRITE "0" IF NONE
7b. Hammerhead Cranes
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 hammerhead cranes 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 hammerhead cranes 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 hammerhead cranes, how many hours do you train the operator before allowing them to operate the crane without supervision? _____ hours of training
7c. Luffer Cranes
How many operators do you currently employ that operate these cranes? _____ (if none, enter "0")

TOWER CRANES—PLEASE WRITE "0" IF NONE
How many of the operators you employ have both **500 hours** of actual crane operating experience on luffer cranes 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 luffer cranes 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 luffer cranes, how many hours do you train the operator before allowing them to operate the crane without supervision? _____ hours of training
7d. Self-Erecting Tower Cranes
How many operators do you currently employ that operate these cranes? _____ (if none, enter "0")
How many of the operators you employ have both **50 hours** of actual crane operating experience on self-erecting tower cranes and an *additional* **50 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 self-erecting tower cranes 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 self-erecting tower cranes, how many hours do you train the operator before allowing them to operate the crane without supervision? _____ hours of training

CRANE OPERATORS, OVERHEAD OR BRIDGE

8a. Do you employ overhead or bridge crane operators?

❑ Yes → How many? __

❑ No → Please go to 'Derrick Operators'

Overhead or Bridge—PLEASE WRITE "0" IF NONE
8b. Cab-Operated Cranes
How many operators do you currently employ that operate these cranes? _____ (if none, enter "0")
How many of the operators you employ have both **40 hours** of actual crane operating experience on cab-operated cranes and an *additional* **40 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 cab-operated cranes 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 cab-operated cranes, how many hours do you train the operator before allowing them to operate the crane without supervision? _____ hours of training
8c. Pendant/Remote Cranes
How many operators do you currently employ that operate these cranes? _____ (if none, enter "0")
How many of the operators you employ have both **40 hours** of actual crane operating experience on pendant/remote cranes and an *additional* **40 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 pendant/remote cranes 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 pendant/remote cranes, how many hours do you train the operator before allowing them to operate the crane without supervision? _____ hours of training

DERRICK OPERATORS

9a. Do you employ derrick operators?

❑ Yes → How many? __

❑ No → Please go to 'Section 3: Crane Owners'

DERRICKS—PLEASE WRITE "0" IF NONE
9b. Derricks
How many of the operators you employ have both **20 hours** of actual crane operating experience on derrick cranes 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 derrick cranes 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 derricks, how many hours do you train the operator before allowing them to operate the derrick without supervision? _____ hours of training

Section 3: CRANE OWNERS

MOBILE CRANES

10. Does your business own mobile cranes?

❑ Yes → How many? __

❑ No → Please go to the next section, 'Tower Cranes'

If your business owns mobile cranes please answer the following questions about how many mobile cranes of each type your company owns:

MOBILE CRANES	# of Cranes Owned (if none, enter '0')
Lattice Boom Crawler Cranes—300 ton capacity and above	
Lattice Boom Crawler Cranes, under 300 ton capacity	
Lattice Boom Truck Cranes, capacity 300 tons and above	
Lattice Boom Truck Cranes, capacity under 300 tons	
Large telescopic boom cranes (swing cab), capacity 130 tons or above	
Large telescopic boom cranes (swing cab), capacity between 40 and 130 tons	
Large telescopic boom cranes (swing cab), capacity under 40 tons	
Small telescopic boom cranes (fixed cab), including boom	

MOBILE CRANES	# of Cranes Owned (if none, enter '0')
trucks, capacity 15 tons or above	
Small telescopic boom cranes (fixed cab), including boom trucks, capacity under 15 tons	
Articulating Boom Cranes	
The proposed rule will require articulating boom cranes to be equipped with a fire extinguisher with a basic minimum extinguishing rating of 10 BC in the cab or at the machinery housing. How many articulating cranes do you own that currently meet this qualification?	

TOWER CRANES

11. Does your business own tower cranes?

- ❑ Yes → How many? __
- ❑ No → Please go to the next section, 'Overhead or Bridge Cranes'

If your business owns tower cranes please answer the following questions about how many tower cranes of each type your company owns:

TOWER CRANES	# of Cranes Owned (if none, enter '0')
Hammerhead Cranes	
Luffer Cranes	
Self-Erecting Tower Cranes	

OVERHEAD OR BRIDGE CRANES

12. Does your business own overhead or bridge cranes?

- ❑ Yes → How many? __
- ❑ No → Please go to the next section, 'Derricks'

If your business owns overhead or bridge cranes please answer the following questions about how many overhead or bridge cranes of each type your company owns:

OVERHEAD OR BRIDGE CRANES	# of Cranes Owned (if none, enter "0")
Cab-Operated Cranes	
Pendant/Remote Cranes	

DERRICKS

13a. Does your business own derricks?

- ❑ Yes → How many? __
- ❑ No → Please go to the next section, 'Other Types of Cranes'

13b. How many derricks does your business own? _derricks

OTHER TYPES OF CRANES

14. How many cranes not listed above does your company own? __ cranes (*if none, enter "0"*)

SECTION 5: CRANE INSPECTORS

15a. Do you any of your employees inspect cranes? ❑ Yes: *please continue with question 15b.*

❑ No: please go to the next section, "Crane Usage".

15b. How many of your employees conduct crane inspections? __ employees

15c. If you own cranes, do you plan to use your own inspectors to perform crane inspections? If you do not own cranes, please continue with question 15d.

❑ Yes: please continue with question 15d.

❑ No: please go to the next section, "Crane Usage".

CRANE INSPECTORS—PLEASE WRITE "0" IF NONE
15d. Crane Inspector Qualifications and Training
Under the proposed rule, in order to be eligible for the inspector certification process, an inspector must have 5 years of crane-related experience, including: 2 or more years inspecting cranes up to 3 years of related experience, including experience as a crane operator, crane mechanic, shop foreman, operations supervision, and rigging specialist 2 years of related education can be substituted for 1 year of related experience How many of your current employees meet the above requirements? ___ employees On average, how much does your company pay inspectors that meet the above requirements? $ _____ per hour
We need to know how many crane inspectors you think your business will need to hire in 2008, 2009 and 2010 and how many of these new inspectors you predict will need training to meet the requirements in the paragraph above. Please enter the number of new inspectors you think you will need to hire in the next three years, including any inspectors already hired this year: 2008: _ new, *untrained* inspectors 2008: _ new, *trained* inspectors 2009: _ new, *untrained* inspectors 2009: _ new, *trained* inspectors 2010: _ new, *untrained* inspectors 2010: _ new, *trained* inspectors
When you hire untrained crane inspectors, how many hours do you currently train the inspector before allowing them to inspect a crane without supervision? _____ hours of training On average, how much does your company pay untrained inspectors per hour? $_____ per hour
How many of your company's inspectors do you expect will go through the inspector certification process? _____ employees Of these employees, how many meet the requirements listed under 15c above? _____ employees

15e. In the table below, for each inspector your company employs, place an "x" in the box under each type of cranes that each inspector is qualified to inspect. (*if you have more than 10 inspectors please copy page and continue*)

Inspector #	Mobile Cranes	Tower Cranes	Overhead Cranes	Derrick Cranes
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

15f. Do any of your inspectors currently participate in continuing education?

❑ Yes: please continue with question 15g. ❑ No: please go to question 15i.

15g. On average, how many hours of continuing education units (CEUs) do each of your inspectors participate in annually?

_____ hours

15h. Through what vendors do your inspectors participate in continuing education?

_____

15i. How many of your inspectors do you anticipate will be conducting at least 21 crane inspections during each three-year period following initial certification?

_____ inspectors

SECTION 4: CRANE USAGE

16a. Do you use cranes in your business operations?

❑ Yes: Please continue the survey with question 16b.

❑ No: Your survey is complete—please return it in the postage-paid envelope as soon as possible

16b. Will the employee conducting the inspection of a given crane also be the only employee qualified to repair or modify that same crane?

❑ Yes ❑ No

16c. Do you currently have a crane inspector inspect the tower crane and tower crane assembly parts after reconfiguring the boom, jib, or counter-jib? ❑ Yes ❑ No

16d. How many times per year do you reconfigure your crane after initial erection?

_____ times per year

16e. How many times per year do any of your cranes contact a power line? _____ times per year

16f. How many times per year do any of your cranes become overloaded? _____ times per year

16g. Under which of the following circumstances do you currently, or would you if the circumstance arose, have your cranes inspected? Please check all that apply.

❑ after initial erection of the crane

❑ after overloading the crane. when *not* directed to overload the crane by the manufacturer or a registered professional engineer and when *not* when proof-load testing the crane

❑ after contacting a power line

❑ after any modification or repair of a load bearing part, including the boom, jib, or counter-jib

❑ other, please specify: ____

16h. Who proof load tests your cranes?

❑ company employees

❑ outside crane inspector

❑ both

16i. Are any of your employees currently certified to perform crane inspections in the maritime industry?

❑ Yes ❑ No

16j. Do you own any cranes used in the maritime industry?

❑ Yes:please go to question 16k ❑ No: please go to question 16m

16k. Are the cranes you own used *only* in the maritime industry? ❑ Yes ❑ No

16l. How many of your cranes are used in the maritime industry? _ cranes (if none, put "0")

16m. How often do you inspect and proof load test your cranes?

❑ More often than one time per year: _____ times per year

❑ Less often than one time per year: one test every _ years.

Thank you for completing this survey. Please return it in the postage-paid envelope as soon as possible.

Appendix 2
Data Collection Disposition

July 2008	PHASE 1	PHASE 2	PHASE 3	TOTAL
Total sample received from DOSH	2220	425	126	
Mail completes	139	2**	2**	139
Bad address/no listing unable to call	219			
Refused	1			
Duplicate listings for companies/contacts		79	17	
No phone number/Unable to locate phone #		14		
L&I employee		1		
No company name/contact info in file		6		
Imported into telephone survey	1861	325	109	2295
telephone completes	133	158	43	334
Refusal/company policy no surveys allowed/terminated survey	10	23	1	34
Wrong #, disconnect , fax, residential	86	13	4	103
Said sent/will send	12			
Resent/faxed qxr to respondent	8			
Language barrier	2	0	1	3
Still callable/not called *	1392	59	9	1460
Not qualified misc./gone for remainder	2	71	51	124
Cell phone	2	1	0	3
Returned mail survey after calling began (18 with large companies)	214			214
TOTAL completes	486	160	45	691
No to q1d	441	58	14	513
Long survey	20	85	26	131
Subcontracts cranes	25	17	5	47
Completes	486	160	45	691
Disqualified/unable to determine if qualified	311	85	56	452
Still callable/unreachable; no answer, blocked #/said will mail/mailed	1412	59	9	1480
Refused survey	11	23	1	35
Total Sample	2220	327	111	2658
* 926 were never called in Phase 1				
** These were mail surveys sent and received by L&I and sent to Gilmore for entry and surveys received after Phase 1 closed.				

Appendix 3
Risk Classes Used in Survey Sample Frame – Phase 1

Risk main sub	Description
010100	STREET OR ROAD CONSTRUCTION, N.O.C.
010101	AIRPORT TAXIWAY OR RUNWAY: CONSTRUCTION OR REPAIR
010102	EXCAVATION, N.O.C.
010103	GRADING, N.O.C.
010104	LAND CLEARING OR FIREFIGHTING, N.O.C.
010105	ROAD SURFACING AND STRIPING
010106	COAXIAL CABLE OR CONDUIT CONSTRUCTION: UNDERGROUND
010107	CONCRETE CONSTRUCTION, N.O.C.
010110	DIKING, N.O.C.
010111	DITCHES AND CANALS, N.O.C.
010112	DREDGING, N.O.C.
010114	PIPELAYING, N.O.C.
010115	STREET OR ROAD CONSTRUCTION: GRAVEL PRODUCTION
010116	RAILROAD CONSTRUCTION OR REPAIR
010117	STREET OR ROAD CONSTRUCTION: RETAIN WALLS
010118	SEWAGE DISPOSAL PLANT, CONSTRUCTION
010121	TRENCHES AND SEWERS: CONSTRUCTION, N.O.C.
010122	TUNNELS AND APPROACHES - NON-PNEUMATIC
010123	TUNNELS AND APPROACHED - NON-PNEUMATIC
010126	STREET OR ROAD CONSTRUCTION: LIGHTING OR SIGN INSTALLATION
010135	SLOPE GROOMING
010150	REINFORCING STEEL INSTALLATION
010207	CONCRETE CONSTRUCTION, N.O.C.
010208	CONCRETE CULVERTS: SPAN LESS THAN 12 FEET
010412	DREDGING, N.O.C.
010700	UTILITY LINE CONSTRUCTION: UNDERGROUND
010701	PIPE LAYING, N.O.C.
010800	DITCHES AND CANALS, N.O.C.
010801	SEWER CONSTRUCTION
010802	TANKS, N.O.C. - UNDERGROUND TYPE: INSTALLATION, REPAIR OR REMOVAL
020101	BRIDGE OR OVERHEAD CROSSING CONSTRUCTION
020103	WHARF OR PIER CONSTRUCTION AND SUBAQUEOUS WORK, N.O.C.
020104	BREAKWATER, JETTY OR LEVEE CONSTRUCTION
020106	CONCRETE CULVERTS: SPAN OVER 12 FT
020107	UNDERCROSSINGS & APPROACHES
020108	TUNNELS AND APPROACHES
021701	CONCRETE - WOOD BUILDINGS

030108	LANDSCAPE OPERATIONS
030201	BRICK AND SLATE WORK, N.O.C.
030202	MASONRY, N.O.C.
040300	SIGN ERECTION OR REMOVAL
040314	SIGN ERECTION OR REMOVAL - NEON TYPE
050301	FURNACES OR HEATING SYSTEMS AND BOILERS: INSTALLATION, N.O.C.
050414	SIGN ERECTION OR REMOVAL - NEON TYPE
050500	BUILDING CONSTRUCTION: PRIVATE RESIDENCES
050501	BLDG. CONSTRUCTION: WOOD NOT EXCEEDING 3 STORIES IN HEIGHT
050502	BUILDING CONSTRUCTION, N.O.C
050503	WRECKING OR DEMOLISHING BUILDINGS
050524	BUILDING CONSTRUCTION: IRON/STEEL/CONCRETE
050525	WOOD BUILDINGS: MORE THAN 3 STORIES
050604	WRECKING OR DEMOLISHING BUILDINGS
050802	WINDMILL OR SILO ERECTION OR REPAIR
050811	CRANE OR DERRICK INSTALLATION
050900	OVERHEAD LINE CONSTRUCTION: TELEPHONE OR TELEGRAPH
050902	OVERHEAD LINE CONSTRUCTION: ELECTRIC
050903	OVERHEAD LINE CONSTRUCTION, N.O.C.
051601	PLAYGROUND EQUIPMENT: INSTALLATION - WOOD
051700	MOBIL HOME SET UP BY CONTRACTOR
060105	HIGHWAY LIGHTING INSTALLATION
060306	PUMP INSTALLATION OR REPAIR
200515	PLUMING SUPPLY DEALERS
200622	OIL OR GAS WELL SUPPLIES OR EQUIPMENT DEALERS SECOND HAND
200901	ELECTRICAL SUPPLY DEALERS: EXCLUDING REPAIRS
200904	PUMP, PLUMBING, IRRIGATION PIPE, AND PIPE SUPPLY DEALERS: INCLUDES PUMP REPAIR IN SHOP
200906	HVAC SUPPLY DEALERS
210215	PLUMBING SUPPLY DEALERS
210222	OIL OR GAS WELL SUPPLIES EQUIPMENT DEALERS - SECOND HAND
520679	CONSTRUCTION OR ERECTION CONTRACTORS - PERM. SHOP OR YARD
640903	OIL OR GAS WELL SUPPLY OR EQUIPMENT DEALERS

Appendix 4
Establishes Origin of Proposed Rule Provisions

WAC	Source
	RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation. (1) The department shall establish, by rule, a crane certification program for cranes used in construction. In establishing rules, the department shall consult nationally recognized crane standards
WAC 296-155-52900 Scope. (1) Except as provided in subsection (2) below, this part applies to power-operated cranes and derricks used in construction that can hoist, lower and horizontally move a suspended load (with or without attachments). Such equipment includes, but is not limited to: articulating boom cranes (such as knuckle-boom cranes); crawler cranes; floating cranes; cranes on barges; locomotive cranes; mobile cranes (such as wheel-mounted, rough-terrain, all-terrain, commercial truck-mounted, and boom truck cranes); multi-purpose machines when configured to hoist and lower (by means of a winch or hook) and horizontally move a suspended load; industrial cranes (such as carry-deck cranes); dedicated pile drivers; service/mechanic trucks with a hoisting device; a crane on a monorail; tower cranes (such as fixed jib ("hammerhead boom"), luffing boom and self-erecting); pedestal cranes; portal cranes; overhead and gantry cranes; straddle cranes; side-boom tractors; derricks; and variations of such equipment.	RCW 49.17.410 Construction crane safety — Application (1) RCW 49.17.400 through 49.17.430 apply to cranes used with or without attachments.
WAC 296-155-52900 Scope. (2) Exemptions. WAC 296-155-529 through WAC 296-155-53214 do not apply to the following:	RCW 49.17.400 Construction Crane Safety – Definitions (2) RCW 49.17.400 through 49.17.430 do not apply to:

WAC	Source
WAC 296-155-52900 Scope. Equipment included in paragraph (1) while it has been converted or adapted for non-hoisting/lifting use. Such conversions/adaptations include, but are not limited to, power shovels, excavators and concrete pumps.	RCW 49.17.400 Construction Crane Safety – Definitions (2)(a) A crane while it has been converted or adapted for a nonhoisting or nonlifting use including, but not limited to, power shovels, excavators, and concrete pumps;
WAC 296-155-52900 Scope. Power shovels, excavators, wheel loaders, backhoes, loader backhoes, track loaders. This machinery is also excluded when used with chains, slings or other rigging to lift suspended loads.	RCW 49.17.400 Construction Crane Safety – Definitions (2)(b) Power shovels, excavators, wheel loaders, backhoes, loader backhoes, and track loaders when used with or without chains, slings, or other rigging to lift suspended loads;
WAC 296-155-52900 Scope. Automotive wreckers and tow trucks when used to clear wrecks and haul vehicles.	RCW 49.17.400 Construction Crane Safety – Definitions (2)(c) Automotive wreckers and tow trucks when used to clear wrecks and haul vehicles;
WAC 296-155-52900 Scope. Service trucks with mobile lifting devices designed specifically for use in the power line and electric service industries or handling associated materials to be installed or removed from utility poles.	RCW 49.17.400 Construction Crane Safety – Definitions (2)(d) Service trucks with mobile lifting devices designed specifically for use in the power line and electric service industries, such as digger derricks (radial boom derricks), when used in the power line and electric service industries for auguring holes to set power and utility poles, or handling associated materials to be installed or removed from utility poles;
WAC 296-155-52900 Scope. Equipment originally designed as vehicle-mounted aerial devices (for lifting personnel) and self-propelled elevating work platforms.	RCW 49.17.400 Construction Crane Safety – Definitions (2)(e) Equipment originally designed as vehicle-mounted aerial devices (for lifting personnel) and self-propelled elevating work platforms;

WAC	Source
WAC 296-155-52900 Scope. Hydraulic jacking systems, including telescopic/hydraulic gantries.	RCW 49.17.400 Construction Crane Safety – Definitions (2)(f) Hydraulic jacking systems, including telescopic/hydraulic gantries;
WAC 296-155-52900 Scope. Stacker cranes.	RCW 49.17.400 Construction Crane Safety – Definitions (2)(g) Stacker cranes;
WAC 296-155-52900 Scope. Powered industrial trucks (forklifts).	RCW 49.17.400 Construction Crane Safety – Definitions (2)(h) Powered industrial trucks (forklifts);
WAC 296-155-52900 Scope. Mechanic’s truck with a hoisting device when used in activities related to equipment maintenance and repair.	RCW 49.17.400 Construction Crane Safety – Definitions (2)(i) Mechanic's truck with a hoisting device when used in activities related to equipment maintenance and repair;
WAC 296-155-52900 Scope. Equipment that hoists by using a come-a-long or chainfall.	RCW 49.17.400 Construction Crane Safety – Definitions (2)(j) Equipment that hoists by using a come-along or chainfall;
WAC 296-155-52900 Scope. Dedicated drilling rigs.	RCW 49.17.400 Construction Crane Safety – Definitions (2)(k) Dedicated drilling rigs;
WAC 296-155-52900 Scope. Gin poles used for the erection of communication towers.	RCW 49.17.400 Construction Crane Safety – Definitions (2)(l) Gin poles used for the erection of communication towers;
WAC 296-155-52900 Scope. Tree trimming and tree removal work.	RCW 49.17.400 Construction Crane Safety – Definitions (2)(m) Tree trimming and tree removal work;

WAC	Source
WAC 296-155-52900 Scope. Anchor handling with a vessel or barge using an affixed A-frame.	RCW 49.17.400 Construction Crane Safety – Definitions (2)(n) Anchor handling with a vessel or barge using an affixed A-frame;
WAC 296-155-52900 Scope. Roustabouts.	RCW 49.17.400 Construction Crane Safety – Definitions (2)(o) Roustabouts;
WAC 296-155-52900 Scope. Service cranes with booms that rotate manually.	DOSH initiated language.
WAC 296-155-52900 Scope. Machines equipped with a boom that is limited to up and down movement only and does not rotate.	DOSH initiated language.
WAC 296-155-52900 Scope. Cranes used on-site in manufacturing facilities or powerhouses for occasional or routine maintenance and repair work; and	RCW 49.17.400 Construction Crane Safety – Definitions (2)(p) Cranes used on-site in manufacturing facilities or powerhouses for occasional or routine maintenance and repair work; and
WAC 296-155-52900 Scope. Crane operators operating cranes on-site in manufacturing facilities or powerhouses for occasional or routine maintenance and repair work.	RCW 49.17.400 Construction Crane Safety – Definitions (2)(q) Crane operators operating cranes on-site in manufacturing facilities or powerhouses for occasional or routine maintenance and repair work.
WAC 296-155-52900 Scope. (3) Where provisions of this standard direct an operator, crewmember, or other employee to take certain actions, the employer must establish, effectively communicate to the relevant persons, and enforce work rules, to ensure compliance with such provisions.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Accredited crane certifier*** means a crane inspector who has been	DOSH initiated language.

WAC	Source
accredited by the department.	
WAC 296-155-52902 Definitions. ***Apprentice operator or trainee*** means a crane operator who has not met requirements established by the department under RCW 49.17.430.	RCW 49.17.400 Construction Crane Safety - Definitions "Apprentice operator or trainee" means a crane operator who has not met requirements established by the department under RCW 49.17.430.
WAC 296-155-52902 Definitions. ***Articulating boom crane*** means a crane whose boom consists of a series of folding, pin connected structural members, typically manipulated to extend or retract by power from hydraulic cylinders.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Audible signal*** means a signal made by a distinct sound or series of sounds. Examples include, but are not limited to, sounds made by a bell, horn, or whistle.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Bogie.*** See “travel bogie”.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Boom (equipment other than tower crane)*** means an inclined spar, strut, or other long structural member which supports the upper hoisting tackle on a crane or derrick. Typically, the length and vertical angle of the boom can be varied to achieve increased height or height and reach when lifting loads. Booms can usually be grouped into general categories of hydraulically extendible, cantilevered type, latticed section, cable supported type or articulating type.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Boom (tower cranes).*** On tower cranes: if the “boom” (i.e., principle horizontal structure) is fixed, it is referred to as a jib; if it is moveable up and down, it is referred to as a boom.	DOSH initiated language.
WAC 296-155-52902 Definitions.	DOSH initiated language.

WAC	Source
Boom angle indicator. A device which measures the angle of the boom relative to horizontal.	
WAC 296-155-52902 Definitions. ***Boom hoist limiting device*** includes boom hoist disengaging device, boom hoist shut-off, boom hoist disconnect, boom hoist hydraulic relief, boom hoist kick-outs, automatic boom stop device, or derricking limiter. This type of device disengages boom hoist power when the boom reaches a predetermined operating angle. It also sets brakes or closes valves to prevent the boom from lowering after power is disengaged.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Boom length indicator*** indicates the length of the permanent part of the boom (such as ruled markings on the boom) or, as in some computerized systems, the length of the boom with extensions/attachments.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Boom stop*** includes boom stops, (belly straps with struts/standoff) telescoping boom stops, attachment boom stops, and backstops. These devices restrict the boom from moving above a certain maximum angle and toppling over backward.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Boom suspension systems.*** A system of pendants, running ropes, sheaves, and other hardware which supports the boom tip and controls the boom angle.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Certified crane inspector*** means a crane certifier accredited by the department.	RCW 49.17.400 Construction Crane Safety - Definitions (3) "Certified crane inspector" means a crane inspector who has been certified by the department.
WAC 296-155-52902 Definitions. ***Climbing.*** The process in which a tower crane is raised to a new working height, either by adding additional tower sections to the top of the crane	DOSH initiated language.

WAC	Source
(top climbing), or by a system in which the entire crane is raised inside the structure (inside climbing).	
WAC 296-155-52902 Definitions. ***Counterjib (counterweight jib)*** means a horizontal member of the tower crane on which the counterweights and usually the hoisting machinery are mounted.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Counterweight.*** Weight used to supplement the weight of equipment in providing stability for lifting loads by counterbalancing those loads.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Crane*** means power-operated equipment used in construction that can hoist, lower, and horizontally move a suspended load. "Crane" includes, but is not limited to: Articulating boom cranes, such as knuckle-boom cranes; crawler cranes; floating cranes; cranes on barges; locomotive cranes; mobile cranes, such as wheel-mounted, rough-terrain, all-terrain, commercial truck mounted, and boom truck cranes; multipurpose machines when configured to hoist and lower by means of a winch or hook and horizontally move a suspended load; industrial cranes, such as carry-deck cranes; dedicated pile drivers; service/mechanic trucks with a hoisting device; a crane on a monorail; tower cranes, such as fixed jib, hammerhead boom, luffing boom, and self-erecting; pedestal cranes; portal cranes; overhead and gantry cranes; straddle cranes; side-boom tractors; derricks; and variations of such equipment.	RCW 49.17.400 Construction Crane Safety - Definitions (5) "Crane" means power-operated equipment used in construction that can hoist, lower, and horizontally move a suspended load. "Crane" includes, but is not limited to: Articulating cranes, such as knuckle-boom cranes; crawler cranes; floating cranes; cranes on barges; locomotive cranes; mobile cranes, such as wheel-mounted, rough-terrain, all-terrain, commercial truck mounted, and boom truck cranes; multipurpose machines when configured to hoist and lower by means of a winch or hook and horizontally move a suspended load; industrial cranes, such as carry-deck cranes; dedicated pile drivers; service/mechanic trucks with a hoisting device; a crane on a monorail; tower cranes, such as fixed jib, hammerhead boom, luffing boom, and self-erecting; pedestal cranes; portal cranes; overhead and gantry cranes; straddle cranes; side-boom tractors; derricks; and variations of such equipment.
WAC 296-155-52902 Definitions. ***Crane/derrick type***. Means crane or derricks as established by American Society of Mechanical Engineers (ASME).	DOSH initiated language.

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WAC 296-155-52902 Definitions. ***Crawler crane.*** Equipment that has a type of base mounting which incorporates a continuous belt of sprocket driven track.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Critical lift*** means a lift that: ▪ Exceeds seventy-five percent of the crane or derrick rated load chart capacity; or ▪ Requires the use of more than one crane or derrick.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Crossover points.*** Locations on a wire rope which is spooled on a drum where one layer of rope climbs up on and crosses over the previous layer. This takes place at each flange of the drum as the rope is spooled onto the drum, reaches the flange, and begins to wrap back in the opposite direction.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Dedicated pile-driver*** is a machine that is designed to function exclusively as a pile-driver. These machines typically have the ability to both hoist the material that will be pile-driven and to pile-drive that material.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Derrick*** is an apparatus consisting of a mast or equivalent member held at the end by guys or braces, with or without a boom, for use with a hoisting mechanism and operating ropes	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Directly under the load*** means a part or all of an employee is directly beneath the load.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Dismantling*** includes partial dismantling (such as dismantling to shorten a boom or substitute a different component).	DOSH initiated language.

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WAC 296-155-52902 Definitions. ***Drum rotation indicator.*** A device on a crane or hoist which indicates in which direction and at what relative speed a particular hoist drum is turning.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Electrical contact.*** When a person, object, or equipment makes contact or comes close in proximity with an energized conductor or equipment that allows the passage of current.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Equipment*** means equipment covered by this part.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Equipment criteria*** means instructions, recommendations, limitations and specifications.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Fall protection equipment*** means guardrail systems, safety net systems, personal fall arrest systems, positioning device systems or fall restraint systems.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Flange points.*** A point of contact between rope and drum flange where the rope changes layers.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Floating cranes/derricks*** means equipment designed by the manufacturer (or employer) for marine use by permanent attachment to a barge, pontoons, vessel or other means of flotation.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Free rated load test.*** Testing stability and operation of crane, carrier, wheels, tires, tracks, brakes, etc., under load, when lifting without outriggers and/or traveling with the load are permitted at the activity for the type of crane being tested.	DOSH initiated language.

WAC	Source
WAC 296-155-52902 Definitions. ***Hoist*** means a mechanical device for lifting and lowering loads by winding rope onto or off a drum.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Hoisting.*** The act of raising, lowering or otherwise moving a load in the air with equipment covered by this standard. As used in this standard, "hoisting" can be done by means other than wire rope/hoist drum equipment.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Jib*** means an extension attached to the boom point to provide added boom length for lifting specified loads. The jib may be in line with the boom or offset to various angles in the vertical plane of the boom. For tower cranes, see boom (tower cranes).	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Land crane/derrick.*** Equipment not originally designed by the manufacturer for marine use by permanent attachment to barges, pontoons, vessels, or other means of flotation.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Load*** is the weight of the object being lifted or lowered, including the weight of the load-attaching equipment such as the load block, ropes, slings, shackles, and any other auxiliary attachment.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Load moment (or rated capacity) indicator.*** A system which aids the equipment operator by sensing the overturning moment on the equipment, i.e. load X radius. It compares this lifting condition to the equipment's rated capacity, and indicates to the operator the percentage of capacity at which the equipment is working. Lights, bells, or buzzers may be incorporated as a warning of an approaching overload condition.	DOSH initiated language.
WAC 296-155-52902 Definitions.	DOSH initiated language.

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Load moment (or rated capacity) limiter. A system which aids the equipment operator by sensing the overturning moment on the equipment, i.e. load X radius. It compares this lifting condition to the equipment's rated capacity, and when the rated capacity is reached, it shuts off power to those equipment functions which can increase the severity of loading on the equipment, e.g., hoisting, telescoping out, or luffing out. Typically, those functions which decrease the severity of loading on the equipment remain operational, e.g., lowering, telescoping in, or luffing in.	
WAC 296-155-52902 Definitions. ***Locomotive crane*** means a crane mounted on a base or car equipped for travel on a railroad track.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Load sustaining/bearing parts.*** Those parts of a crane that support the crane or load and upon failure could cause dropping, uncontrolled shifting, or uncontrolled movement of the crane or load.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Luffing boom*** is a member hinged to the rotating superstructure and used for supporting the hoisting tackle.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Luffing jib limiting device*** is similar to a boom hoist limiting device, except that it limits the movement of the luffing jib.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Mobile cranes.*** A lifting device incorporating a cable suspended latticed boom or hydraulic telescopic boom designed to be moved between operating locations by transport over the road. These are referred to in Europe as a crane mounted on a truck carrier.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Multiple lift rigging*** means a rigging assembly manufactured by wire	DOSH initiated language.

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rope rigging suppliers that facilitates the attachment of up to five independent loads to the hoist rigging of a crane.	
WAC 296-155-52902 Definitions. ***Nationally recognized accrediting agency*** is an organization that, due to its independence and expertise, is widely recognized as competent to accredit testing organizations.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Nonstandard tower crane base*** means any deviation from the structural support or base configuration recommended by the crane manufacturer.	DOSH initiated language.
WAC 296-155-52902 Definitions ***Occasional or routine maintenance and repair work*** means regular, customary and foreseeable work necessary to keep equipment in good repair and/or condition. This also includes regular, customary and foreseeable work necessary to return equipment to sound condition after damage.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Operational aid*** means an accessory that provides information to facilitate operation of a crane or that takes control of particular functions without action of the operator when a limiting condition is sensed. Examples of such devices include, but are not limited to, the following: anti-two-block device, rated capacity indicator, rated capacity (load) limiter, boom angle or radius indicator, lattice boom hoist disconnect device, boom length indicator, crane level indicator, drum rotation indicator, load indicator, and wind speed indicator.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Operational controls*** means levers, switches, pedals and other devices for controlling equipment operation.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Operator*** is a person who is operating the equipment.	DOSH initiated language.

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WAC 296-155-52902 Definitions. ***Overhead and gantry cranes*** includes overhead/bridge cranes, semigantry, cantilever gantry, wall cranes, storage bridge cranes, launching gantry cranes, and similar equipment, irrespective of whether it travels on tracks, wheels, or other means.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Pendants*** includes both wire and bar types. Wire type: a fixed length of wire rope with mechanical fittings at both ends for pinning segments of wire rope together. Bar type: instead of wire rope, a bar is used. Pendants are typically used in a latticed boom crane system to easily change the length of the boom suspension system without completely changing the rope on the drum when the boom length is increased or decreased.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Powerhouse*** means a plant wherein electric energy is produced by conversion from some other form of energy (e.g., chemical, nuclear, solar, mechanical, or hydraulic) by means of suitable apparatus. This includes all generating station auxiliaries and other associated equipment required for the operation of the plant. Not included are stations producing power exclusively for use with communication systems.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Power lines*** means electrical distribution and electrical transmission lines.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Qualified crane operator*** means a crane operator who meets the requirements established by the department under RCW 49.17.430.	RCW 49.17.400 Construction Crane Safety - Definitions (8) "Qualified crane operator" means a crane operator who meets the requirements established by the department under RCW 49.17.430.
WAC 296-155-52902 Definitions. ***Qualified person*** means a person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, successfully demonstrated the ability to solve/resolve problems relating to the subject matter, the work, or the project.	DOSH initiated language.

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WAC 296-155-52902 Definitions. ***Rated capacity.*** The maximum working load permitted by the manufacturer under specified working conditions. Such working conditions typically include a specific combination of factors such as equipment configuration, radii, boom length, and other parameters of use.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Rated capacity indicator.*** See load moment indicator.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Rated capacity limiter.*** See load moment limiter.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***RPE*** means a registered professional engineer licensed under chapter 18.43.040(1) RCW.	RCW 49.17.400 Construction Crane Safety - Definitions (7) "Professional engineer" means a professional engineer as defined in RCW 18.43.020.
WAC 296-155-52902 Definitions. ***RPSE*** means a registered professional structural engineer licensed under chapter 18.43.040(1) RCW.	RCW 49.17.400 Construction Crane Safety - Definitions (7) "Professional engineer" means a professional engineer as defined in RCW 18.43.020.
WAC 296-155-52902 Definitions. ***Running wire rope*** is a wire rope that moves over sheaves or drums.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Safety devices.*** Examples of safety devices are but not limited to the following: crane level indicator, horn, boom/jib or trolley stops, hydraulic holding device/check valve, rail clamps, rail stops, brakes, deadman control or forced neutral return control, emergency stop switch, guards, handrails, audible and visual alarms, etc.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Safety or health standard*** means a standard adopted under this chapter.	RCW 49.17.400 Construction Crane Safety - Definitions (9) "Safety or health standard" means a standard adopted under this chapter.

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WAC 296-155-52902 Definitions. ***Taglines.*** A rope (usually fiber) attached to a lifted load for purposes of controlling load spinning and pendular motions or used to stabilize a bucket or magnet during material handling operations.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Tower crane.*** A type of lifting structure which utilizes a vertical mast or tower to support a working boom (jib) suspended from the working boom. While the working boom may be fixed horizontally or have luffing capability, it can always rotate about the tower center to swing loads. The tower base may be fixed in one location or ballasted and moveable between locations.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Travel bogie (tower cranes).*** An assembly of two or more axles arranged to permit vertical wheel displacement and equalize the loading on the wheels.	DOSH initiated language.
WAC 296-155-52902 Definitions. ***Two blocking*** means a condition in which a component that is uppermost on the hoist line such as the load block, hook block, overhaul ball, or similar component, comes in contact with the boom tip, fixed upper block or similar component. This binds the system and continued application of power can cause failure of the hoist rope or other component.	DOSH initiated language.
WAC 296-155-531 Crane Certifier Accreditation Process. WAC 296-155-53100 Accreditation of Crane Certifiers of Cranes and Derricks – Requirements. (1) Any person engaging in the testing, examination or inspection for the certification of a crane, used in lifting at a construction site must apply for and obtain a certificate of accreditation from the department pursuant to this rule. For the purposes of this rule an "accredited crane certifier"	DOSH initiated language.

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refers to any individual holding a certificate of accreditation pursuant to this regulation. (2) Any person authorized by the department to certify maritime cranes prior to the effective date of this rule may continue to perform services under this regulation until January 1, 2012. Any accredited crane certifier desiring to continue providing services pursuant to this rule must have applied for and obtained a certificate of accreditation under these rules from the department prior to January 1, 2012. Maritime certifiers wishing to perform construction crane certifications must notify the department that they will perform construction crane certifications. In addition, the maritime certifier must specify which cranes they are qualified to inspect under their maritime certificate. The department may issue these individuals a provisional accreditation specifying the crane types they are authorized to inspect which will be valid through December 31, 2011 or upon expiration of their maritime certification, whichever is earlier. Any provisionally accredited crane certifier desiring to continue providing services pursuant to this rule must have applied for and obtained a certificate of accreditation under these rules from the department prior to January 1, 2012. (3) Crane certifiers accredited by any other state or governmental entity may be authorized to inspect cranes in Washington State provided the certifier submits an application and resume along with the certificate of accreditation from that state or governmental entity, and the types of cranes they are authorized to inspect. The department may issue these individuals a provisional accreditation specifying the crane types they are authorized to inspect which will be valid through December 31, 2011 or upon expiration of their out of state certification, whichever is earlier. Any provisionally accredited crane certifier desiring to continue providing services pursuant to this rule must have applied for and obtained a certificate of accreditation under these rules from the	

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department prior to January 1, 2012. (4) No person that has modified, altered, or repaired a crane which affected a load sustaining member of the crane may conduct the certifying inspection and proof load testing of that particular crane within the same certification period.	
WAC 296-155-53102 Accreditation - Application Form and Applicant Qualifications. (1) An accreditation to certify cranes pursuant to this rule may be obtained by submitting a completed application to the Division of Occupational Safety and Health (DOSH) and successfully completing written examinations developed and administered by the department or its authorized representative. Application forms may be obtained by calling the: Crane Certification Section of DOSH (360) 902-4943 or by written request to: Post Office Box 44650 • Olympia, WA 98504-4650	RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation. (2) The crane certification program must include, at a minimum, the following: (a) The department shall establish certification requirements for crane inspectors, including an experience requirement, an education requirement, a training requirement, and other necessary requirements determined by the director;
WAC 296-155-53102 Accreditation - Application Form and Applicant Qualifications. (2) An applicant seeking an accreditation must satisfy all of the following criteria: (a) An application with an attached resume must be submitted to the department based on experience with the various crane types per the ASME B30 series. The application and resume must include knowledge, training and experience with verifiable references. (b) All applicants must possess knowledge of chapter 296-155 WAC,	DOSH initiated language.

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Safety Standards for Construction Work, as well as American Society of Mechanical Engineers (ASME) standards, relating to the design, testing, inspection and operation of cranes, including those specifically applicable to the types of cranes for which an accreditation will be issued. (c) All applicants must demonstrate at least five years 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 supervision, 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. Related education could include such courses in Engineering, Physics, Applied Mathematics, Applied Science Courses in Nondestructive Testing, Construction Technology, Technical Courses in Heavy Equipment Mechanic, Welding Technology, etc. (3) Application Form. Any application for accreditation will be accepted by the department upon the filing of a completed application. All information and attachments must be given under penalty of perjury. The application must include, but not be limited to, the following: (a) A statement of the crane types per the ASME B30 series the applicant desires to certify pursuant to the accreditation. (b) A statement of qualifications and experience, including their capacities, satisfying at a minimum the criteria set forth in this section as well as any and all other qualifications the applicant wishes the department to consider. (c) Any other relevant information the applicant desires to be considered by the department. (4) Written examinations. Applicants to be approved for accreditation	

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must successfully complete the written examinations administered by the department or its authorized representative. (a) Once the department receives the application and resume, the department will make the determination and notify the applicant if they meet the minimum qualifications to take the written examinations. (b) 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. (c) The other written examinations will include safe operating and engineering principles and practices with respect to specific crane types subject to the accreditation, including inspection and proof loading requirements	
WAC 296-155-53104 Issuance of Accreditation. (1) The department may impose restrictions on the scope and use of the accreditation, such as limiting it to specific types of cranes based upon the qualifications of the applicant. The accreditation issued by the department will identify any limitations imposed by the department and the types of cranes the certifier is authorized to certify. (2) The department must deny issuance of an accreditation if the applicant does not satisfy the requirements of this rule.	DOSH initiated language.
WAC 296-155-53106 Accreditation Application--Processing Time. (1) Within 45 calendar days of receipt of a completed application for an accreditation the department must inform the applicant in writing that it is either complete and accepted for filing or that it is deficient and what specific information or documentation is required to complete the application and will inform the applicant if the applicant is eligible to take the written examination. An application is considered complete if it is in compliance with the requirements of this rule.	DOSH initiated language.

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(2) Within 75 calendar days from the date of completion of the written examinations the department must inform the applicant in writing of its decision regarding the issuance of the certificate of accreditation.	
WAC 296-155-53108 Duration and Renewal of an Accreditation. (1) The accreditation will be valid for three years. Crane certifiers must complete forty (40) hours of crane related training every three years, in courses recognized by the department. (2) Application for renewal must be filed with the department not less than 60 days prior to expiration of the accredited crane certifier's certification. A renewal may be obtained by filing a completed application for renewal meeting the requirements of WAC 296-155-53102 hereof 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 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. (3) At a minimum, all applicants for renewal must successfully complete the written examinations every six years.	DOSH initiated language.
WAC 296-155-53110 Revocation or Suspension of an Accreditation. (1) The department may suspend or revoke a certificate issued under the provisions of these rules upon the following grounds: (a) Permitting the duplication or use of one's own accreditation certificate by another;	DOSH initiated language.

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(b) Performing work for which accreditation has not been received; (c) Any person who obtains accreditation through fraudulent representation of accreditation requirements such as education, training, professional registration, or experience; (d) Any person who falsifies training documentation; (e) The holder of the certificate is found to be incompetent to carry out the work for which the certificate was issued; (f) Gross negligence, gross incompetence, a pattern of incompetence, or fraud in the certification of a crane; (g) Willful or deliberate disregard of any occupational safety standard while certifying a crane; (h) Misrepresentation of a material fact in applying for, or obtaining, a license to certify under this chapter; (i) Failure by an accredited crane certifier to maintain records; (j) Failure by an accredited crane certifier to report crane safety deficiencies affecting the safe operation of a crane while in the process of conducting an annual certification inspection; (k) Failure to meet or comply with the requirements of this rule or the limitations imposed on the accreditation; or	

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(l) Performance of work not in compliance with applicable laws and regulations. (2) Before any certificate may be suspended or revoked, the certificate holder must be given written notice of the department's intention, mailed by certified mail, return receipt requested to the address as shown on the application form. The notice must specify the reasons for the department action and must give the certificate holder the opportunity to attend a hearing before the department. The department must also include within the notice of revocation or suspension specific conditions which must be met before the applicant will be entitled to apply for a new certification. At the suspension/revocation hearing the department must give the certificate holder the opportunity to produce witnesses and give testimony. (3) The hearing will be held at the department's headquarters office or at such other location as may be designated by the assistant director and must be presided over an authorized representative of the assistant director. Following the informal hearing the department will issue a final decision on suspension or revocation. (4) A final suspension or revocation decision may be appealed to the superior court for the state of Washington in either the county in which the certificate holder resides or in Thurston County within thirty days after the suspension or revocation order is entered. (5) The filing of an appeal must not stay the suspension or revocation, and such action must remain in effect until such time as the applicant presents proof that the specified written conditions required by the department are met or until otherwise ordered after resolution of the	

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appeal.	
WAC 296-155-53112 Monitoring of Accredited Crane Certifiers. The Division of Occupational Safety and Health must monitor accredited crane certifiers to ensure that these certifiers certify cranes in accordance with all applicable Washington State laws and regulations. Monitoring activities will include, but not be limited to, audits of crane certifier's activities, complaint inspections, referrals, or accident investigations.	DOSH initiated language.
WAC 296-155-53114 Issuance of Temporary and Annual Certificates of Operation. (1) Accredited crane certifiers will issue a temporary certificate of operation if upon inspection and load proof testing no deficiencies were found that would affect the safe operation of the crane.	RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation. (3)(b) The department shall establish a process for certified crane inspectors to issue temporary certificates of operation for a crane and the department to issue a final certificate of operation for a crane after a certified crane inspector determines that the crane meets safety or health standards, including meeting or exceeding national periodic inspection requirements recognized by the department;
WAC 296-155-53114 Issuance of Temporary and Annual Certificates of Operation. (2) The accredited crane certifier will submit inspection worksheets and proof of load testing to the department within ten working days from the completion of the inspection and load proof test for consideration of the department for the issuance of a permanent certificate of operation.	RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation. (3)(b) The department shall establish a process for certified crane inspectors to issue temporary certificates of operation for a crane and the department to issue a final certificate of operation for a crane after a certified crane inspector determines that the crane meets safety or health standards, including meeting or exceeding national periodic inspection requirements recognized by the department; (3)(g) Inspection reports including all information and documentation obtained from a crane inspection shall be made

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	available or provided to the department by a certified crane inspector upon request.
WAC 296-155-53114 Issuance of Temporary and Annual Certificates of Operation. (3) If the accredited crane certifier upon inspection of a crane identifies deficiencies that would affect the safe operation or load handling capabilities of the crane, the accredited crane certifier must notify the department within five working days from completion of the onsite inspection by submitting the worksheet that identifies the deficiencies. If deficiencies are found that affect the safe operation or load handling capabilities of the crane no temporary certificate of operation will be issued until all identified deficiencies have been corrected and verified by an onsite visit by an accredited crane certifier.	RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation. (3)(b) The department shall establish a process for certified crane inspectors to issue temporary certificates of operation for a crane and the department to issue a final certificate of operation for a crane after a certified crane inspector determines that the crane meets safety or health standards, including meeting or exceeding national periodic inspection requirements recognized by the department; (3)(f) A certified crane inspector must notify the department and the crane owner if, after inspection, the certified crane inspector finds that the crane does not meet safety or health standards. A certified crane inspector shall not attest that a crane meets safety or health standards until any deficiencies are corrected and the correction is verified by the certified crane inspector; and
WAC 296-155-53114 Issuance of Temporary and Annual Certificates of Operation. (4) After the accredited crane certifier has verified that all deficiencies have been corrected and the crane has successfully passed a load proof test the accredited crane certifier will issue a temporary certificate of operation. The accredited crane certifier will submit inspection worksheets and proof of load testing to the owner or lessee and within ten days of completion of the inspection to the department for consideration of the department for the issuance of an annual certificate of operation.	RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation. (3)(b) The department shall establish a process for certified crane inspectors to issue temporary certificates of operation for a crane and the department to issue a final certificate of operation for a crane after a certified crane inspector determines that the crane meets safety or health standards, including meeting or exceeding national periodic inspection requirements recognized by the department;

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WAC 296-155-53114 Issuance of Temporary and Annual Certificates of Operation. (5) The accredited crane certifier must attach an identification sticker if not already attached and legible to each crane and crane component (component meaning; luffing boom, swing-away jibs, fly sections, jibs at variable offsets and boom sections). The identification sticker number must be entered on the inspection work sheet submitted to the department. Identification stickers may only be removed by a department representative or an accredited crane certifier. ***Note:*** Certified components may be installed without voiding the annual proof load test, providing the component was proof load tested within the prior four year period.	RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation. (3)(b) The department shall establish a process for certified crane inspectors to issue temporary certificates of operation for a crane and the department to issue a final certificate of operation for a crane after a certified crane inspector determines that the crane meets safety or health standards, including meeting or exceeding national periodic inspection requirements recognized by the department;
WAC 296-155-53114 Issuance of Temporary and Annual Certificates of Operation. (6) Certificates of operation issued by the department under the crane certification program established in this section are valid for one year from the effective date of the temporary operating certificate issued by the certified crane inspector.	RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation. (3)(b) The department shall establish a process for certified crane inspectors to issue temporary certificates of operation for a crane and the department to issue a final certificate of operation for a crane after a certified crane inspector determines that the crane meets safety or health standards, including meeting or exceeding national periodic inspection requirements recognized by the department; (4) Certificates of operation issued by the department under the crane certification program established in this section are valid for one year from the effective date of the temporary operating certificate issued by the certified crane inspector.
WAC 296-155-53114 Issuance of Temporary and Annual Certificates of	RCW 49.17.420 Construction Crane Certification Program –

WAC	Source
Operation. (7) The temporary or annual certificate of operation must be posted in the operator's cab or with the operator's manual.	Rules – Certificate of Operation. (3) Except as provided in RCW 49.17.410(2), any crane operated in the state must have a valid temporary or final certificate of operation issued by the certified crane inspector or department posted in the operator's cab or station. (3)(b) The department shall establish a process for certified crane inspectors to issue temporary certificates of operation for a crane and the department to issue a final certificate of operation for a crane after a certified crane inspector determines that the crane meets safety or health standards, including meeting or exceeding national periodic inspection requirements recognized by the department;
WAC 296-155-53114 Issuance of Temporary and Annual Certificates of Operation. (8) Maintaining Required Records. Accredited crane certifiers are required to maintain complete and accurate records pertaining to each crane of all inspections, tests and other work performed as well as copies of all notices of crane safety deficiencies, verifications of correction of crane safety deficiencies, and crane certifications issued for the previous five years and provide these records to the department upon request. Failure by an accredited crane certifier to maintain required records may result in accreditation suspension or revocation.	RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation. (3)(b) The department shall establish a process for certified crane inspectors to issue temporary certificates of operation for a crane and the department to issue a final certificate of operation for a crane after a certified crane inspector determines that the crane meets safety or health standards, including meeting or exceeding national periodic inspection requirements recognized by the department;
	RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation. (5) This section does not apply to maritime cranes regulated by

WAC	Source
	the department.
WAC 296-155-532 Crane Certification Requirements for Cranes WAC 296-155-53200 General Inspection Criteria, Wire Rope Inspection and Removal Criteria, and Pre-Proof Load Test Requirements for all cranes. (1) The accredited crane certifier must review the following documents as part of the crane certification process: (a) Crane maintenance records of critical components to ensure maintenance of these components has been performed in accordance with the manufacturer's recommendations. (b) Crane periodic and frequent inspection documentation. (2) Safety devices. Make sure all safety devices are installed on equipment in accordance with the requirements located in chapter 296-155 WAC, Part L. (3) Operational aids. Operations must not begin unless operational aids are in proper working order, except where the owner or lessee meets the specified temporary alternative measures. See chapter 296-155 WAC, Part L for the list of operational aids. Note: All accredited crane certifiers must meet and follow the requirements relating to fall protection, located in chapter 296-155 WAC, Part C-1, Fall Restraint and Fall Arrest.	DOSH initiated language.

WAC	Source
(4) General. (a) The accredited crane certifier must determine that the configurations of the crane are in accordance with the manufacturer's equipment criteria. (b) Where the manufacturer equipment criteria are unavailable a registered professional engineer (RPE), familiar with the type of equipment involved, must ensure criteria are developed for the equipment configuration. (5) Wire Rope. Wire ropes must meet the crane or wire rope manufacturer's specifications for size, type and inspection requirements. In the absence of the manufacturer's specifications, follow the requirements for removal criteria located in this section, including Table 1. ***Table 1 included at end of document*** (b) The accredited crane certifier must perform a complete and thorough inspection covering the surface of the working range plus three additional wraps on the drum of the wire ropes. (c) If a deficiency is identified, an immediate determination must be made by the accredited crane certifier as to whether the deficiency constitutes a safety hazard. If the deficiency is determined to constitute a safety hazard, the crane must not be certified until: (i) The wire rope is replaced and verified by the accredited crane certifier; or	

WAC	Source
(ii) If the deficiency is localized, the problem is corrected by severing the wire rope; the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited. (d) Remove wire rope from service if reductions from nominal diameter are greater than those shown below in Table 2. ***Table 2 included at end of document*** Replacement rope must be of a compatible size and have a strength rating at least as great as the original rope furnished or recommended by the crane manufacturer. (6) Prior to performing a proof load test: (a) A safe test area must be selected and all traffic and unauthorized personnel and equipment must be cleared from test area. This test area must be roped off or otherwise secured to prevent entry of unauthorized personnel and equipment; (b) Rigging gear must be inspected by a qualified person prior to using for load test of crane; (c) The employer must ensure all load test personnel understand the safety procedures of the test; (d) Proof load tests, with the exception of tower cranes, are overload tests and extreme caution must be observed at all times. Personnel must remain clear of suspended loads and areas where they could be struck in the event of boom failure. The test load must be raised only to a height sufficient to perform the test;	

WAC	Source
(e) During tests, safe operating speeds must be employed. Rated speeds in accordance with manufacturer's specifications need not be attained. Emphasis must be placed on the ability to safely control loads through all motions at normal speeds; (f) Proof load tests require the use of certified weights, or scaled weights using a certified scale with a current certificate of calibration; (g) Proof load tests must not exceed the manufacturer's specifications. Where these specifications are unavailable, a registered professional engineer familiar with the type of equipment involved must develop written specifications.	
WAC 296-155-53202 Additional Inspection Criteria and Proof Load Testing – Mobile Cranes. (1) After it is determined that the crane configurations meet the criteria in WAC 296-155-53200, the accredited crane certifier must conduct a visual inspection of the following components, if applicable, which can be visually inspected without disassembly (not including removal of inspection covers): (a) All control and drive mechanisms for adjustments interfering with proper operation and for excessive wear or contamination by lubricants or other foreign matter; (b) Air, hydraulic, and other pressurized lines for deterioration or leakage, particularly those which flex in normal operation; (c) Hydraulic system for proper fluid level;	DOSH initiated language.

WAC	Source
(d) Safety latches on hooks for damage; (e) Hooks for deformation, cracks, excessive wear, or damage such as from chemicals or heat; (f) A legible and applicable operator's manual and load chart is in the operator's cab or station; (g) A portable fire extinguisher, with a basic minimum extinguishing rating of 10 BC must be installed in the cab or at the machinery housing; (h) Crane cleanliness and housekeeping. Inspect for trash, oil, grease, debris or excessive dirt on crane components and catwalks, if applicable; (i) Wire rope reeving for compliance with the manufacturer's specifications; (j) Wire rope, in accordance with WAC 296-155-53200(5); (k) Electrical apparatus for malfunctioning, signs of apparent excessive deterioration, dirt or moisture accumulation; (l) Tires (when in use) for proper inflation and condition; (m) Ground conditions around the equipment for proper support, including ground settling under and around outriggers and supporting foundations, ground water accumulation, or similar conditions; (n) The equipment for level position;	

WAC	Source
(o) Operator cab windows for significant cracks, breaks, or other deficiencies that would hamper the operator's view; (p) Rails, rail stops, rail clamps and supporting surfaces when the equipment has rail traveling; (q) Equipment structure (including the boom and, if equipped, the jib): (i) Structural members: deformed, cracked, or significantly corroded. (ii) Bolts, rivets and other fasteners: loose, failed or significantly corroded. (iii) Welds for cracks. (r) Sheaves and drums for cracks or significant wear; (s) Parts such as pins, bearings, shafts, gears, rollers and locking devices for distortion, cracks or significant wear; (t) Brake and clutch system parts, linings, pawls and ratchets for excessive wear; (u) Safety devices and operational aids for proper operation (including significant inaccuracies); (v) Gasoline, diesel, electric, or other power plants for safety-related problems (such as leaking exhaust and emergency shut-down feature), condition and operation; (w) Chains and chain drive sprockets for excessive wear of sprockets and excessive chain stretch;	

WAC	Source
(x) Travel steering, brakes, and locking devices, for proper operation; (y) Tires for damage or excessive wear; (z) Hydraulic, pneumatic and other pressurized hoses, fittings and tubing, as follows: (i) Flexible hose or its junction with the fittings for indications of leaks. (ii) Threaded or clamped joints for leaks. (iii) Outer covering of the hose for blistering, abnormal deformation or other signs of failure/impending failure. (iv) Outer surface of a hose, rigid tube, or fitting for indications of excessive abrasion or scrubbing. (aa) Hydraulic and pneumatic pumps and motors, as follows: (i) Performance indicators: unusual noises or vibration, low operating speed. (ii) Loose bolts or fasteners. (iii) Shaft seals and joints between pump sections for leaks. (bb) Hydraulic and pneumatic cylinders, as follows: (i) Drifting. (ii) Rod seals and welded joints for leaks. (iii) Cylinder rods for scores, nick and dents. (iv) Case (barrel) for significant dents. (v) Rod eyes and connecting joints: loose or deformed. (cc) Outrigger pads/floats and slider pads for excessive wear or cracks; cribbing/dunnage for proper installation;	

WAC	Source
(dd) Electrical components and wiring for cracked or split insulation and loose or corroded terminations; (ee) Legible warning labels and decals as required by the manufacturer; (ff) Operator seat: missing or unusable; (gg) Equipped with original, or the equivalent, steps, ladders, handrails, guards; (hh) Steps, ladders, handrails, guards: in unusable/unsafe condition; (2) Crane deficiencies. If the accredited crane certifier determines other findings need to be monitored, the accredited crane certifier must provide written notification to the owner or lessee. (3) Operational testing. An operational test must be made without a load applied to the hook of the following items if they are applicable to the crane to ensure they function correctly: (a) Load lifting/hoisting and lowering mechanisms; (b) Boom lifting/hoisting and lowering mechanisms; (c) Boom extension and retraction mechanism; (d) Swing mechanism; (e) Travel mechanism;	

WAC	Source
(f) Brakes and clutches; (g) Limit, locking, and safety devices; (h) Suspension systems for cranes that work on rubber (tires); and (i) During the operational testing special attention must be paid to hydraulic and pneumatic valves: spools (sticking, improper return to neutral, and leaks); leaks; valve housing cracks; relief valves.	
WAC 296-155-53202 Additional Inspection Criteria and Proof Load Testing – Mobile Cranes. (4) Annual and quadrennial proof load testing. (a) Proof loads test must be completed on all hoist lines. The test load must be at least 100 percent but not to exceed 110 percent of rated capacity (i.e., for the crane's configuration of reeving, boom length, etc). The rated capacity must be the capacity shown on the posted load chart or as limited by other factors such as hook block capacity or wire rope line pull if the crane is not fully reeved. The test load includes the weight of (or deduction values for) the hook, block, slings, and auxiliary lifting devices (and for some cranes hoist wire rope not accounted for in load charts), and the combined weight deduction values must be subtracted from the nominal test load in order to determine the amount of test weights to be used. Follow original equipment manufacturer (OEM) load chart instructions for weight deduction values. Check accuracy of load indicators where installed. Test procedures for these cranes must follow OEM procedures and recommendations. (b) Annual proof load testing. After the crane has passed the visual and operational tests, a proof load test must be conducted in the as-configured	RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation. (c) Crane owners must ensure that cranes are inspected and load proof tested by a certified crane inspector at least annually and after any significant modification or significant repairs of structural parts. If the use of weights for a unit proof load test is not possible or reasonable, other recording test equipment may be used. In adopting rules implementing this requirement, the department may consider similar standards and practices used by the federal government;

WAC	Source
condition and must be performed within the structural and stability section of the manufacturer's load chart, as applicable. This test must be documented on the form or in the format approved by the department. A copy of this completed form and inspection worksheets must be sent to the department within ten working days upon completion of the examination. (c) Quadrennial proof load testing. No major component (luffing boom, swing-away jibs, fly sections, jibs at variable offsets and boom sections) may be used unless it has been proof load tested within the prior four year period. For jibs with variable offset angles, tests at the maximum offset used and maximum extension of all boom sections. (i) This test must be performed in accordance with this section and documented on the form or in the format approved by the department. (ii) A copy of this completed form and inspection worksheets must be sent to the department within ten working days upon completion of the inspection. (d) Free rated load test ("on rubber"). Check the stability and operation of crane, carrier, wheels, tires, tracks, brakes, etc., under load by performing the following tests, when lifting without outriggers and/or traveling with the load are permitted at the activity for the type of crane being tested. ***Note*:** Ensure all free rated load tests "on rubber" lifting requirements established by the OEM are complied with. Attach taglines to the load to control oscillation. For cranes with outriggers, extend outriggers and maintain minimal clearance (3 to 4 inches) above ground. Test personnel must stand clear of tires during load tests. This test is only required if the	

WAC	Source
owner/lessee wants an “on rubber” certification. If the crane has “on rubber” capabilities and the owner does not desire this certification, the crane certifier must document it on the certification document. (i) Maximum free rated load. Hoist maximum free rated test load at minimum possible radius over the rear (or over the front as required by the OEM). Slowly boom down to the maximum radius for the load. With boom and load hozist pawls (dogs) engaged where applicable, complete (A) and (B). (A) Rotate through the appropriate working arc; (B) Travel a minimum of 50 feet with test load over the rear (or front as required by the OEM) with the boom parallel to the longitudinal axis of the crane carrier. (ii) Stability test. Repeat step (i) above with a test load corresponding to the radii determined as follows: For telescoping boom cranes, test with the boom approximately halfway between fully retracted and fully extended but do not exceed OEM's boom length limitation for lifting on rubber. If no ratings are governed by stability, no stability test is required. ***Note*:** When lifting test loads, always lift the load well within the maximum radius and slowly boom down to a pre-measured radius. Lift the test load only high enough to perform the required tests.	
WAC 296-155-53204 Additional Inspection Criteria and Proof Load Testing – Articulating Boom Cranes. (1) After it is determined that the crane configurations meet the criteria in WAC 296-155-53200, the accredited crane certifier must visually inspect the following items, if applicable, on cranes for sound physical condition and that they are functional within the manufacturer's recommendations (not including removal of inspection covers):	DOSH initiated language.

WAC	Source
(a) All control and drive mechanisms for adjustments interfering with proper operation and for excessive wear or contamination by lubricants or other foreign matter; (b) Safety devices for malfunction; (c) All hydraulic hoses, particularly those which flex in normal operation of crane functions; (d) Hooks and latches for deformation, chemical damage, cracks, and wear; (e) Rope reeving for compliance with crane manufacturer's specifications; (f) Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, and moisture accumulation; (g) Hydraulic system for proper oil level and leaks; (h) Excessively worn or damaged tires. Recommended inflation pressure, cuts, and loose wheel nuts; (i) Connecting pins and locking device for wear and damage; (j) Deformed, cracked, or corroded members in the crane structure and carrier; (k) Loose bolts, particularly mounting bolts;	

WAC	Source
(l) Cracked or worn sheaves and drums; (m) Worn, cracked, or distorted parts such as pins, bearings, shafts, gears, rollers, and locking devices; (n) Excessive wear on brake and clutch system parts and lining; (o) Travel steering, braking, and locking devices, for malfunction; (p) Hydraulic, pneumatic and other pressurized hoses, fittings and tubing, as follows: (i) Flexible hose or its junction with the fittings for indications of leaks. (ii) Threaded or clamped joints for leaks. (iii) Outer covering of the hose for blistering, abnormal deformation or other signs of failure/impending failure. (iv) Outer surface of a hose, rigid tube, or fitting for indications of excessive abrasion or scrubbing. (q) Hydraulic and pneumatic pumps and motors, as follows: (i) Performance indicators: unusual noises or vibration, low operating speed. (ii) Loose bolts or fasteners. (iii) Shaft seals and joints between pump sections for leaks. (r) Hydraulic and pneumatic cylinders, as follows: (i) Drifting. (ii) Rod seals and welded joints for leaks. (iii) Cylinder rods for scores, nick and dents. (iv) Case (barrel) for significant dents.	

WAC	Source
(s) Crane cleanliness and housekeeping. Inspect for trash, oil, grease, debris or excessive dirt on crane components and catwalks, if applicable; (t) Legible warning labels and decals as required by the manufacturer; (u) A portable fire extinguisher, with a basic minimum extinguishing rating of 10 BC must be installed in the cab or at the machinery housing. (v) A legible and applicable operator's manual and load chart is in the operator's cab or station;	
WAC 296-155-53204 Additional Inspection Criteria and Proof Load Testing – Articulating Boom Cranes. (2) Annual proof load testing of articulating boom cranes. (a) Annual proof load testing. After the crane has passed the visual and operational tests, the accredited crane certifier must ensure a proof load test is conducted and must be performed within the structural and stability section of the manufacturer's load chart, as applicable. This test must be documented on the form or in the format approved by the department. A copy of this completed form and inspection worksheets must be sent to the department within ten working days upon completion of the examination. (b) Test loads must not be less than 100% or more than 110% of the rated load, unless otherwise recommended by the manufacturer. (c) Hoist the tests load to assure that the load is supported by the crane and held by the hoist brake(s).	RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation. (c) Crane owners must ensure that cranes are inspected and load proof tested by a certified crane inspector at least annually and after any significant modification or significant repairs of structural parts. If the use of weights for a unit proof load test is not possible or reasonable, other recording test equipment may be used. In adopting rules implementing this requirement, the department may consider similar standards and practices used by the federal government; WAC 296-155-53206(7), 296-155-53208(3), 296-155-53210(2), 296-155-53212(2) and 296-155-53214

WAC	Source
(d) Swing the crane, if applicable, the full range of its swing. (e) Boom the crane up and down within allowable working radius for the test load. (f) Lower the test load, stop and hold the load with the brake(s)	
WAC 296-155-53204 Additional Inspection Criteria and Proof Load Testing – Articulating Boom Cranes. (3) Quadrennial proof load testing. If the articulating boom crane has a jib or boom extension, these components may not be used unless it has been proof load tested within the prior four year period.	DOSH initiated language.
WAC 296-155-53206 Additional Inspection Criteria and Proof Load Testing – Tower Cranes. (1) Tower cranes and tower crane assembly parts must be inspected by a crane certifier both prior to assembly, following erection of the tower crane, after each climbing operation, or reconfiguring the boom, jib, or counterjib before placing the crane in service.	RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation. (d) Tower cranes and tower crane assembly parts must be inspected by a certified crane inspector both prior to assembly and following erection of a tower crane;
WAC 296-155-53206 Additional Inspection Criteria and Proof Load Testing – Tower Cranes. (2) The accredited crane certifier must verify a registered professional structural engineer, licensed under chapter 18.43 RCW, has certified that the crane foundations and underlying soil are adequate support for the tower crane with its maximum overturning movement.	DOSH initiated language.
WAC 296-155-53206 Additional Inspection Criteria and Proof Load Testing – Tower Cranes. (3) Prior to erecting a tower crane on a nonstandard tower crane base, the accredited crane certifier must verify that the engineering configuration of this base has been reviewed and acknowledged as acceptable by an independent registered professional structural engineer, licensed under chapter 18.43 RCW	RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation. (e) Before installation of a nonstandard tower crane base, the engineering design of the nonstandard base shall be reviewed and acknowledged as acceptable by an independent professional engineer;

WAC	Source
WAC 296-155-53206 Additional Inspection Criteria and Proof Load Testing – Tower Cranes. (4) The accredited crane certifier must review the following documents as part of the crane certification process for the current location and inspection period: (a) Crane maintenance records of critical components to ensure maintenance of these components has been performed in accordance with the manufacturer's recommendations; (b) Crane periodic and frequent inspection documentation. (5) After it is determined that the crane configurations meet the criteria in WAC 296-155-53200, the accredited crane certifier must visually inspect the following items, if applicable, on tower cranes for sound physical condition and that they are functional within the manufacturer's recommendations (not including removal of inspection covers): (a) All control and drive mechanisms for interfering with proper operation and for excessive wear or contamination by lubricants or other foreign matter; (b) Motion limiting devices for proper operation with the crane unloaded; each motion should be inched into its limiting device by carefully running at slow speed; (c) Load limiting devices for proper operation and accuracy of settings; (d) Air, hydraulic, and other pressurized lines for deterioration or leakage, particularly those which flex in normal operation; (e) Hydraulic system for proper fluid level;	DOSH initiated language.

WAC	Source
(f) Hydraulic, pneumatic and other pressurized hoses, fittings and tubing, as follows: (i) Flexible hose or its junction with the fittings for indications of leaks. (ii) Threaded or clamped joints for leaks. (iii) Outer covering of the hose for blistering, abnormal deformation or other signs of failure/impending failure. (iv) Outer surface of a hose, rigid tube, or fitting for indications of excessive abrasion or scrubbing. (g) Hydraulic and pneumatic pumps and motors, as follows: (i) Performance indicators: unusual noises or vibration, low operating speed. (ii) Loose bolts or fasteners. (iii) Shaft seals and joints between pump sections for leaks. (h) Hydraulic and pneumatic cylinders, as follows: (i) Drifting. (ii) Rod seals and welded joints for leaks. (iii) Cylinder rods for scores, nick and dents. (iv) Case (barrel) for significant dents. (i) Electrical components for malfunctioning, signs of apparent excessive deterioration, dirt or moisture accumulation, wiring for cracked or split insulation, and loose or corroded terminations; (j) Stationary cranes for manufacturer's recommended grounding of structure and power supply. Rail traveling cranes for grounding of each rail and the power supply per the manufacturer's recommendations;	

WAC	Source
(k) Runway rail and clamps. Inspect for loose, broken or missing clamps; (l) Hooks and safety latches for deformation, cracks, excessive wear, or damage such as from chemicals or heat; (m) Wedges and supports of climbing cranes for looseness or dislocation; (n) Braces or guys supporting cranes masts (towers) and anchor bolt base connections for looseness; (o) Crane structure (including the boom, jib and counter jib): (i) Structural members: deformed, cracked, or significantly corroded. (ii) Bolts, rivets and other fasteners: loose, failed or significantly corroded. (iii) Welds for cracks. (p) Cracked or worn sheaves and drums; (q) Worn, cracked, or distorted parts such as pins, bearings, shafts, gears, rollers, locking and clamping devices, sprockets, and drive chains or belts; (r) Excessive wear on brake and clutch system parts, linings, pawls, and ratchets; (s) Load, wind, and other indicators for inaccuracies outside the tolerances recommended by the manufacturer; (t) Travel mechanisms for malfunction, excessive wear or damage;	

WAC	Source
(u) A legible and applicable operator’s manual and load chart is in the operator’s cab; (v) Crane cleanliness and housekeeping. Inspect for trash, oil, grease, debris or excessive dirt on crane components and catwalks, if applicable; (w) A portable fire extinguisher, with a basic minimum extinguishing rating of 10 BC must be installed in the cab or at the machinery housing; (x) When applicable, tower tie-in collars, struts, and connections to building structure are structurally sound, free of cracks, distortion, excessive wear or corrosion. Pins and structural bolts are tight and installed per the manufacturer's specification; (y) Ballast blocks in place and secured per manufacturer's recommendations; (z) For cranes that telescope, the internal tower by a bottom climbing frame the climbing mechanism operates within the manufacturer's specifications; (aa) For cranes that top climb, the climbing frame operates within the manufacturer's specifications; (bb) A means to prevent traveling tower cranes running into stops while under power; (cc) A functional audible warning alarm that automatically sounds whenever the traveling tower crane travels; (dd) Wire rope reeving for compliance with the manufacturer’s specifications;	

WAC	Source
(ee) Wire rope, in accordance with WAC 296-155-53200(5); (ff) Safety devices and operational aids for proper operation (including significant inaccuracies); (gg) Legible warning labels and decals as required by the manufacturer; (hh) Steps, ladders, handrails and guards are in safe and usable condition. (6) Additional requirements for tower cranes prior to performing a proof load test. ***Note:*** General requirements relating to pre-proof load tests for all cranes are located in WAC 296-155-53200. (a) When tower cranes are erected, and before placing in service, all functional motions, motion limiting, load limiting devices, locking and safety devices, brakes and clutches must be tested for operation and be within the manufacturer's specification prior to placing the crane in operation. (b) Proof load tests require the use of certified weights, or scaled weights using a certified scale with a current certificate of calibration. (c) Functional motion test must be at crane manufacturer's rated load. Each test must include: (i) Load hoisting and lowering; (ii) Jib (boom) hoisting and lowering, or trolley travel; (iii) Slewing motion;	

WAC	Source
(iv) Travel motion when rail mounted; (v) Brakes and clutches; and (vi) Limit, locking, and safety devices. ***Note***: Functional motion tests made after climbing or telescoping may be performed without a load. (d) The functional motion test listed in subsection (6)(c) must continue until all controls, drives, and braking systems have been engaged and have functioned per the crane manufacturer's specifications. (e) Order in which test of tower cranes are to be performed is as follows: (i) Functional motion test without rated load; (ii) Functional motion test at crane manufacturer's rated load. For other than traveling cranes, these test may be combined with test of base structural support or foundation system given in subsection (6)(c); (iii) Test of base structural support or foundation per subsection (6)(f). (f) During functional motion tests, the crane's base structural support or foundation system must be visually checked by the accredited crane certifier. If any part of the crane's base structural support or foundation system shows excessive visual displacement, visual distress, or audible distress, then the lifted load must be lowered at hoist creep speed and all crane operations are to cease. An evaluation must then be made by the accredited crane certifier.	
(7) Proof load testing of tower cranes. Setting hoist load limits for tower cranes. (a) Annual proof load testing. After the crane has passed the visual and operational tests, the accredited crane certifier must ensure a proof load	RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation. (c) Crane owners must ensure that cranes are inspected and load proof tested by a certified crane inspector at least annually

WAC	Source
test is conducted and must be performed according to the manufacturer's recommendations. This test must be documented on the form or in the format approved by the department. A copy of this completed form and inspection worksheets must be sent to the department within ten working days upon completion of the examination. (b) Tower crane hoist load limit switches must be set in accordance with the manufacture's specifications using specified certified weights. Procedure is to be verified by the accredited crane certifier. In the absence of the manufacturer's specifications, hoist load limit switches must be verified by means of a static test using test loads of 102.5 percent to 110 percent of the applicable ratings. Test loads are to be lifted at creep speed until just clear of the ground. (c) Setting of hoist load limits must be documented on the form provided by the department. A copy of the completed form and inspection worksheets must be sent to the department within ten days upon completion of the examination. (d) After erection of fixed freestanding tower cranes, the base structural support or foundation system on which the crane is supported must be tested before placing the crane in service. The test must be conducted with the crane manufacturer's rated load placed at maximum radius permitted by site conditions. When the base structural support or foundation is symmetrical, the crane's jib (boom) must be rotated through 90 degrees with 10 minute stops at the starting position and at each 45 degree position. When the support is asymmetrical, the crane's jib (boom) must be rotated through 360 degrees with 10 minute stops at the starting position and at each 45 degree position.	and after any significant modification or significant repairs of structural parts. If the use of weights for a unit proof load test is not possible or reasonable, other recording test equipment may be used. In adopting rules implementing this requirement, the department may consider similar standards and practices used by the federal government;

WAC	Source
(e) After erection of rail traveling tower cranes, the base structural support or foundation system to which the rail is attached must be tested before placing the crane in service. The test must be conducted with the crane manufacturer's rated load placed at maximum radius permitted by site conditions. The jib (boom) must be located over the bogie. The crane must travel the entire length of runway, returning with the same load over the bogie on the opposite rail.	
WAC 296-155-53208 Additional Inspection Criteria and Proof Load Testing - Self-erecting tower cranes. (1) After it is determined that the crane configurations meet the criteria in WAC 296-155-53200, the accredited crane certifier must visually inspect the following items, if applicable, on cranes for sound physical condition and that they are functional within the manufacturer's recommendations (not including removal of inspection covers): (a) For cranes that telescope the internal tower by a climbing frame the climbing mechanism is structurally sound; is free of cracks, distortion, excessive wear or corrosion; operates within the manufacturer's specifications; (b) Structural bolts are tightened; (c) All control and drive mechanisms for interfering with proper operation and for excessive wear or contamination by lubricants or other foreign matter; (d) Motion limiting devices for proper operation with the crane unloaded; each motion should be inched into its limiting device by carefully running at slow speed; (e) Load limiting devices for proper operation and accuracy of settings; (f) Air, hydraulic, and other pressurized lines for deterioration or leakage,	DOSH initiated language.

WAC	Source
particularly those which flex in normal operation; (g) Hydraulic system for proper fluid level; (h) Hydraulic, pneumatic and other pressurized hoses, fittings and tubing, as follows: (i) Flexible hose or its junction with the fittings for indications of leaks. (ii) Threaded or clamped joints for leaks. (iii) Outer covering of the hose for blistering, abnormal deformation or other signs of failure/impending failure. (iv) Outer surface of a hose, rigid tube, or fitting for indications of excessive abrasion or scrubbing. (i) Hydraulic and pneumatic pumps and motors, as follows: (i) Performance indicators: unusual noises or vibration, low operating speed. (ii) Loose bolts or fasteners. (iii) Shaft seals and joints between pump sections for leaks. (j) Hydraulic and pneumatic cylinders, as follows: (i) Drifting. (ii) Rod seals and welded joints for leaks. (iii) Cylinder rods for scores, nick and dents. (iv) Case (barrel) for significant dents. (k) Electrical components for malfunctioning, signs of apparent excessive deterioration, dirt or moisture accumulation, wiring for cracked or split insulation, and loose or corroded terminations; (l) Ensure crane is grounded per manufacturer’s specifications;	

WAC	Source
(m) Hooks and safety latches for deformation, cracks, excessive wear, or damage such as from chemicals or heat; (n) Crane structure (including the boom, jib and counter jib): (i) Structural members: deformed, cracked, or significantly corroded. (ii) Bolts, rivets and other fasteners: loose, failed or significantly corroded. (iii) Welds for cracks. (o) Cracked or worn sheaves and drums; (p) Worn, cracked, or distorted parts such as pins, bearings, shafts, gears, rollers, locking and clamping devices, sprockets, and drive chains or belts; (q) Excessive wear on brake and clutch system parts, linings, pawls, and ratchets; (r) Load, wind, and other indicators for inaccuracies outside the tolerances recommended by the manufacturer; (s) A legible and applicable operator's manual and load chart is in the operator's station; (t) Crane cleanliness and housekeeping. Inspect for trash, oil, grease, debris or excessive dirt on crane components and catwalks, if applicable; (u) A portable fire extinguisher, with a basic minimum extinguishing rating of 10 BC must be installed in the cab or at the machinery housing;	

WAC	Source
(v) Ballast blocks in place and secured per manufacturer's recommendations; (w) Wire rope reeving for compliance with the manufacturer's specifications; (x) Wire rope, in accordance with WAC 296-155-53200(5); (y) Safety devices and operational aids for proper operation (including significant inaccuracies); (z) Legible warning labels and decals as required by the manufacturer; (aa) Steps, ladders, handrails and guards are in safe and usable condition. (2) Additional requirements for self-erecting tower cranes prior to performing a proof load test. ***Note:*** General requirements relating to pre-proof load tests for all cranes are located in WAC 296-155-53200. (a) Functional motion test must be at crane manufacturer's rated load. Each test must include: (i) Load hoisting and lowering. (ii) Jib (boom) hoisting and lowering, or trolley travel. (iii) Slewing motion. (iv) Brakes and clutches. (v) Limit, locking, and safety devices (b) The functional motion test listed in subsection (2)(a) must continue	

WAC	Source
until all controls, drives, and braking systems have been engaged and have functioned per the crane manufacturer's specifications. (c) Order in which test of self-erecting tower cranes are to be performed is as follows: (i) Functional motion test without rated load (ii) Functional motion test at crane manufacturer's rated load. These test may be combined with test of base structural support or foundation system given in subsection (2)(a). (d) During functional motion tests, the crane's base structural support or foundation system must be visually checked by the accredited crane certifier. If any part of the crane's base structural support or foundation system shows excessive visual displacement, visual distress, or audible distress, then the lifted load must be lowered at hoist creep speed and all crane operations are to cease. An evaluation must then be made by the accredited crane certifier.	
WAC 296-155-53208 Additional Inspection Criteria and Proof Load Testing - Self-erecting tower cranes. (3) Annual proof load testing of self-erecting tower cranes. (a) Annual proof load testing. After the crane has passed the visual and operational tests, the accredited crane certifier must ensure a proof load test is conducted and must be performed according to the manufacturer's recommendations. This test must be documented on the form or in the format approved by the department. A copy of this completed form and inspection worksheets must be sent to the department within ten working days upon completion of the examination. (b) The structural support or foundation examination during proof load test:	RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation. (c) Crane owners must ensure that cranes are inspected and load proof tested by a certified crane inspector at least annually and after any significant modification or significant repairs of structural parts. If the use of weights for a unit proof load test is not possible or reasonable, other recording test equipment may be used. In adopting rules implementing this requirement, the department may consider similar standards and practices used by the federal government;

WAC	Source
(i) This test must be conducted with the rated load placed at maximum radius permitted by site conditions. The superstructure must be rotated through 360 degrees with 5 minute stops at each outrigger position. If any part of the support structure becomes displaced or distressed, all crane operations must stop until an evaluation is made by a qualified person. (ii) For rail-mounted cranes, a load test must be conducted with the jib in the position causing maximum loading on one wheel or bogie. The test must comprise traveling the entire length of the runway, then returning with the same load on the other rail. If a sleeper or support becomes displaced or damaged, crane operations must stop until an evaluation is made by a qualified person or until track ballast has been reset, or repairs made and a satisfactory test performed. (c) Self-erecting tower crane hoist load limit switches must be set in accordance with the manufacturer's specifications using specified certified weights. Procedure is to be verified by the accredited crane certifier. (d) Setting of hoist load limits must be documented on the form provided by the department. A copy of the completed form and inspection worksheets must be sent to the department within ten days upon completion of the examination.	
WAC 296-155-53210 Additional Inspection Criteria and Proof Load Testing – Overhead and Bridge Cranes. (1) After it is determined that the crane configurations meet the criteria in WAC 296-155-53200, the accredited crane certifier must visually inspect, without disassembly, and if applicable, the following items on overhead and bridge cranes for sound physical condition and that they are	DOSH initiated language.

WAC	Source
functional within the manufacturer's recommendations (not including removal of inspection covers): (a) Controllers. Control mechanisms for interfering with proper operation. Control and drive mechanisms for apparent excessive wear of components and contamination by lubricants, water or other foreign matter; (b) Load hooks. Inspect for damage wear to hook nuts, mousing device and hook swivel. Check for deformation, cracks, excessive wear, or damage such as from chemicals or heat. Inspect blocks for wear to sheaves, check plates, and pins. Check for loose pins, bolts and guards; (c) Sheaves and bearings. Check all sheaves and bearings for lubrication and excessive wear. Ensure sheaves turn freely. Check sheave pin locking device; (d) Structural supports. Inspect for damage or bent girders, girder seat top plate, diaphragms and structural column connections. Check for loose bolts or rivets, and cracks; (e) Bridge inspection. (i) Check complete structure for broken, cracked, damaged, missing, or corroded parts and members. (ii) Handrails, Walkways, and Ladders. Inspect for loose, missing, bent, deteriorated or misaligned members, loose bolts, rivets, broken welds and hangers. (f) Brackets. Check for cracked or corroded welds, missing or loose bolts, bent or cracked brackets;	

WAC	Source
(g) End stops. Inspect for damaged wheels, broken welds, loose or missing bolts, damaged bumpers, missing pins or damaged plates; (h) Runway rail and clamps. Inspect for loose, broken or missing clamps. Check the condition of railhead and side wear, rail splice plates and or welds, rail gaps and associated bolts, wedges, connectors and rail switches; (i) Crane alignment. Inspect for proper bridge end float while crane travels in both directions on runway. Check all corner connections for rust, shear marks, loose or missing bolts, nuts and washers. Inspect square marks and legibility of dimension; (j) Wheels and bearings. Inspect wheels for wear, flat spots, chips, flange wear, cracks, loose axle pins, or securing devices. Check bearing clearance, chatter, loose bearing caps and lubrication; (k) Trolley. Check for loose, missing, broken or bent members. Inspect for loose, faulty or missing coupling guards. Check for broken, loose or missing axle pins. Inspect for axle pins displaying excessive wear; (l) Trolley rail. Inspect for bent or damaged members, loose bolts, rivets, guards, trolley rail clamps, end stops and broken welds. Check condition of rail head and side wear, rail splice plates and/or welds and rail gaps; (m) Trolley conductors. Inspect insulators and clamps, loose connectors, bent, pitted or damaged wires or collectors; (n) Shafts, couplings, and bearings. Inspect shafts for vibration, cuts and	

WAC	Source
nicks, loose or worn keyways and misalignment. Check coupling for wear, loose bolts or keys and misalignment. Inspect bearing for clearance, chatter, loose bearings caps and proper lubrication; (o) Gearing. Inspect gears for worn teeth, cracked teeth, superficial root cracks, pitting, unusual indentation or wear marks, full contact or end loading, loose set screws and keys. Check guards and covers. Inspect gear cases for excessive noise and vibration, proper lubrication and leaking; (p) Wire rope and drum. Inspect wire rope for damage. Check rope clip fittings and associated mounting hardware for wear and damage. Inspect drum grooves for excessive wear. Inspect drum pedestal and bearing condition. Check for cracks in drum; (q) Electrical items. Check all contacts for proper alignment and evidence of excess heating or unusual arcing. Inspect all coils, contact leads, shunts and wires, fuses or overload devices for loose connections and evidence of overheating. Inspect panel board and arc shields for cracks, loose bolts, dirt and moisture. Check panel marking for legibility. Inspect speed control resistors for damaged insulation, cracked or broken grids, loose connections, bolts and brackets; (r) Motor. Inspect for damage, bearing noise, vibration and lubrication, spark and cleanliness of commutator and brush wear, loose hold down bolts and motor brackets. Inspect commutator or slip rings for evidence of overheating and brush sparking. Inspect motor leads and insulators, damaged or deteriorated insulation and loose connections. Inspect brush holder for proper clearance to commutator or slip rings, and freedom of brushes;	

WAC	Source
(s) Brakes. Inspect for wear in linkage, pins and cams, weakness of springs, wear and condition of lining, smoothness of the drum, heat check crack and clearance between drum or disk. Inspect for improper solenoid air gap; evidence of overheating; damaged brass, and loose core laminations; delay or restriction in opening of brakes; (t) Hoist brakes. Inspect for wear in linkage, pins and cams weakness of springs, wear and condition of lining, smoothness of drum, heat check cracks and clearance between drum of disks. Inspect for improper solenoid air gap; evidence of overheating; damaged brass, and loose core laminations; delay or restriction in opening of brakes; (u) Limit switches. Remove covers and inspect all electrical and mechanical components for malfunction including contacts, springs, ratchets, pins, arm and insulators, rollers, cams and dogs. Inspect cover gaskets, counterweight guides. Check all securing bolts and guards. Check for weather or moisture damage. Check for proper operation; (v) Crane cleanliness and housekeeping. Inspect for trash, oil, grease, debris or excessive dirt on crane components and catwalks, if applicable; (w) Operation of crane controls. Operate all crane controls and check for proper operation. Check for smooth and regular motions without abnormal sensations, hesitations, binding, vibrations, shimmy, or irregularity; (x) Warning device/fire protection. Inspect for proper operation of sirens, horns, bells and lights. Check switches and inspect wiring and connections;	

WAC	Source
(y) A legible and applicable operator's manual and load chart is in the operator's cab or station; (z) A portable fire extinguisher, with a basic minimum extinguishing rating of 10 BC must be installed in the cab or at the machinery housing;	
WAC 296-155-53210 Additional Inspection Criteria and Proof Load Testing – Overhead and Bridge Cranes. (2) Annual proof load testing of bridge/overhead cranes. (a) Annual proof load testing. After the crane has passed the visual and operational tests, the accredited crane certifier must ensure a proof load test is conducted and must be performed according to the manufacturer's recommendations or a registered professional structural engineer (RPSE). This test must be documented on the form or in the format approved by the department. A copy of this completed form and inspection worksheets must be sent to the department within ten working days upon completion of the examination. (b) The proof load test must be at least 100 percent but not to exceed 125 percent of the rated capacity. (c) This test must be documented on the form or in the format approved by the department. A copy of this completed form and inspection worksheets must be sent to the department within ten working days upon completion of the examination. (d) Hoist the test load a distance to assure that the load is supported by the crane and held by the hoist brake(s).	RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation. c) Crane owners must ensure that cranes are inspected and load proof tested by a certified crane inspector at least annually and after any significant modification or significant repairs of structural parts. If the use of weights for a unit proof load test is not possible or reasonable, other recording test equipment may be used. In adopting rules implementing this requirement, the department may consider similar standards and practices used by the federal government;

WAC	Source
(e) Transport the test load by means of the trolley for the full length of the bridge, as practical. (f) Transport the test load by means of the bridge for the full length of the runway in one direction with the trolley as close to the extreme right-hand end of the crane as practical, and in the other direction with the trolley as close to the left-hand end of the crane as practical. (g) Lower the test load, and stop and hold the test load with the brake(s). (h) Mechanical load brake tests. Hoist test load and hold for 5 minutes. Release the holding brake, either mechanically or electrically to verify mechanical load brake function or hoist the rated load then lower, monitoring the hoist for any speed control issues.	
WAC 296-155-53212 Additional Inspection Criteria and Proof Load Testing – Derricks. (1) After it is determined that the derrick configurations meet the criteria in WAC 296-155-53200, the accredited derrick certifier must visually inspect the following items, if applicable, on derricks for sound physical condition and that they are functional within the manufacturer's recommendations (not including removal of inspections covers): (a) All control and drive mechanisms for adjustments interfering with proper operation and for excessive wear or contamination by lubricants or other foreign matter; (b) All chords and lacing, tension in guys, plumb of the mast, external indication of deterioration or leakage in air or hydraulic systems; (c) Derrick hooks for deformation or cracks, distortion causing an	DOSH initiated language.

WAC	Source
increase in throat opening of 5 percent not to exceed ¼ inch or as recommended by the manufacturer. Any wear exceeding 10 percent (or as recommended by the manufacturer) of the original section dimension of the hook; (d) Rope reeving for noncompliance with derrick manufacturer's specifications; (e) Hoist brakes, clutches, and operating levers; (f) Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt and moisture accumulation; (g) Structural members for deformation, cracks, and corrosion; (h) Crane cleanliness and housekeeping. Inspect for trash, oil, grease, debris or excessive dirt on crane components and catwalks, if applicable; (i) Bolts and rivets for tightness; (j) Parts such as pins, bearings, shafts, gears, sheaves, drums, rollers, locking and clamping devices, for wear, cracks, and distortion; (k) Gudgeon pin for cracks, wear and distortion; (l) Foundation or supports for continued ability to sustain the imposed loads; (m) A legible and applicable operator's manual and load chart is in the operator's cab or station;	

<table>
<tr><th>WAC</th><th>Source</th></tr>
<tr><td>(n) A portable fire extinguisher, with a basic minimum extinguishing rating of 10 BC must be installed in the cab or at the machinery housing.</td><td></td></tr>
<tr><td>WAC 296-155-53212 Additional Inspection Criteria and Proof Load Testing – Derricks.
(2) Annual proof load testing of derricks.

(a) Annual proof load testing. After the derrick has passed the visual and operational tests, the accredited derrick certifier must ensure a proof load test is conducted and must be performed at the maximum and minimum boom angles or radii or as close to these as practical and at such intermediate radii as the derrick manufacturer or RPSE may deem necessary. This test must be documented on the form or in the format approved by the department. A copy of this completed form and inspection worksheets must be sent to the department within ten working days upon completion of the examination.

(b) Proof load tests and safe working load ratings must be based on the designed load ratings at the ranges of boom angle or operating radii. Proof loads must be as per the manufacturer’s recommendations. When the manufacturer recommendations are not available follow the requirements in the Table below:

Table – Derrick Load Test

<table>
<tr><td>Safe Working Load
SWL</td><td>Proof Load</td></tr>
<tr><td>Up to 20 tons</td><td>25 percent in excess</td></tr>
<tr><td>20-50 tons</td><td>5 tons in excess</td></tr>
</table>
</td><td>RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation.

(c) Crane owners must ensure that cranes are inspected and load proof tested by a certified crane inspector at least annually and after any significant modification or significant repairs of structural parts. If the use of weights for a unit proof load test is not possible or reasonable, other recording test equipment may be used. In adopting rules implementing this requirement, the department may consider similar standards and practices used by the federal government;</td></tr>
</table>

WAC	Source
<table><tr><td>Over 50 tons</td><td>10 percent in excess</td></tr></table> (c) Hoist the test load a few inches and hold to verify that the load is supported by the derrick and held by the hoist brake(s). (d) Swing the derrick, if applicable, the full range of its swing, at the maximum allowable working radius for the test load. (e) Boom the derrick up and down within the allowable working radius for the test load. (f) Lower the test load, stop and hold the load with the brake(s). (g) After satisfactory completion of a proof load test, the derrick and all component parts thereof shall be carefully examined in all applicable requirements in this section. (h) This test must be documented on the form or in the format approved by the department. A copy of this completed form and inspection worksheets must be sent to the department within ten working days upon completion of the examination.	
	RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation. (f) A certified crane inspector must notify the department and the crane owner if, after inspection, the certified crane inspector finds that the crane does not meet safety or health standards. A certified crane inspector shall not attest that a crane meets safety or health standards until any deficiencies are corrected and the correction is verified by the certified

WAC	Source
	crane inspector; and
WAC 296-155-53214 Crane De-Certification and Reinstatement. (1) If any of the following occur, the certification becomes invalid: (b) Any overload, other than proof load testing, or one that has been approved in writing in advance by the crane manufacturer or a RPE; (c) Any significant modifications or significant repairs of a load sustaining/bearing part. ***Note:*** Replacement of hoisting rope does not constitute de-certification. (2) The owner or lessee must notify the crane certification section by phone within 24 hours if any of the above occurs. (3) The certification may be re-instated only after affected components have been re-inspected by an accredited crane certifier. If the accredited crane certifier identifies any deficiencies during the re-inspection, the deficiencies must be corrected before the certification can be reinstated. If the accredited crane certifier believes proof load testing should be conducted prior to reinstatement of the certification, proof load testing shall be conducted. In the case of major modifications or repairs to important load sustaining/bearing parts, proof load testing shall be performed prior to reinstatement. The accredited crane certifier must notify the department that the certification has been reinstated.	RCW 49.17.420 Construction Crane Certification Program – Rules – Certificate of Operation. (c) Crane owners must ensure that cranes are inspected and load proof tested by a certified crane inspector at least annually and after any significant modification or significant repairs of structural parts. If the use of weights for a unit proof load test is not possible or reasonable, other recording test equipment may be used. In adopting rules implementing this requirement, the department may consider similar standards and practices used by the federal government;**.**
WAC 296-155-53214 Crane De-Certification and Reinstatement. (1) If any of the following occur, the certification becomes invalid: (a) Contact with an energized power line;	DOSH initiated language.

WAC	Source
WAC 296-155-533 Crane Operator Qualifications and Certification. WAC 296-155-53300 Operator qualifications and certification. (1) Prior to operating any crane covered under chapter 296-155 WAC, Part L, with the exception of the trainee/apprentice requirements outlined in subsection (2) of this section, the employer must ensure that the crane operator:	RCW 49.17.430 Qualified Construction Crane Operators – Rules – Apprentice Operators or Trainees – Reciprocity. (1) Except for training purposes as provided in subsection (3) of this section, an employer or contractor shall not permit a crane operator to operate a crane unless the crane operator is a qualified crane operator.
	RCW 49.17.430 Qualified Construction Crane Operators – Rules – Apprentice Operators or Trainees – Reciprocity. (2) The department shall establish, by rule, requirements that must be met to be considered a qualified crane operator. In establishing rules, the department shall consult nationally recognized crane standards for crane operator certification. The rules must include, at a minimum, the following:
WAC 296-155-533 Crane Operator Qualifications and Certification. WAC 296-155-53300 Operator qualifications and certification. Has a valid crane operator certificate, for the type of crane to be operated, issued by a crane operator testing organization accredited by a nationally recognized accrediting agency. The operator certification must include a successful passing of a written and practical examination. Notes: An operator's certificate issued by the accredited testing agency is valid for a five year period, and must be renewed to ensure operators maintain qualified operator status. For self-erecting tower cranes, the department will accept a tower crane certification issued by a nationally accrediteding testing agency. For derricks, the department will accept, at a minimum, a lattice boom	RCW 49.17.430 Qualified Construction Crane Operators – Rules – Apprentice Operators or Trainees – Reciprocity. (a) The crane operator must have a valid crane operator certificate, for the type of crane to be operated, issued by a crane operator testing organization accredited by a nationally recognized accrediting agency which administers written and practical examinations, has procedures for recertification that enable the crane operator to recertify at least every five years, and is recognized by the department;

WAC	Source
truck or crawler mobile crane operator's certificate.	
WAC 296-155-533 Crane Operator Qualifications and Certification. (1)(b) Has crane hours of experience as shown in Table 1; and See Crane Operator Experience, Table 1 at end of document	RCW 49.17.430 Qualified Construction Crane Operators – Rules – Apprentice Operators or Trainees – Reciprocity. (b) The crane operator must have up to two thousand hours of documented crane operator experience, which meets experience levels established by the department for crane types and capacities by rule; and
WAC 296-155-53300 Operator qualifications and certification. Pass a substance abuse test conducted by a recognized laboratory. ***Exemption:*** When it is necessary in the performance of their duties, manufacture representatives, factory representatives and maintenance personnel are not required to be certified crane operators. ***Note:*** Cranes and other lifting machines that are exempt can be found in WAC 296-155-52900(2).	RCW 49.17.430 Qualified Construction Crane Operators – Rules – Apprentice Operators or Trainees – Reciprocity. (c) The crane operator must pass a substance abuse test conducted by a recognized laboratory service.
WAC 296-155-53300 Operator qualifications and certification. (2) Pre-qualification/certification training period. An employee who is not a qualified crane operator as outlined in subsection (1) is permitted to operate the crane as part of his/her training providing the following requirements are met:	RCW 49.17.430 Qualified Construction Crane Operators – Rules – Apprentice Operators or Trainees – Reciprocity. (3) An apprentice operator or trainee may operate a crane when:
WAC 296-155-53300 Operator qualifications and certification. (2)(a) The employee ("trainee/apprentice") must be provided with sufficient training prior to operating the crane to enable the trainee to operate the crane safely under limitations established by this section (including continuous supervision) and any additional limitations established by the employer.	**RCW 49.17.430 Qualified Construction Crane Operators – Rules – Apprentice Operators or Trainees – Reciprocity.** (a) The apprentice operator or trainee has been provided with training prior to operating the crane that enables the apprentice operator or trainee to operate the crane safely;
WAC 296-155-53300 Operator qualifications and certification. (2)(b) The tasks performed by the trainee/apprentice while operating the crane must be within the trainee's ability, as determined by the	**RCW 49.17.430 Qualified Construction Crane Operators – Rules – Apprentice Operators or Trainees – Reciprocity.** (b) The apprentice operator or trainee performs operating tasks

WAC	Source
supervising qualified crane operator.	that are within his or her ability, as determined by the supervising qualified crane operator; and
WAC 296-155-53300 Operator qualifications and certification. (2)(c) Qualified crane operator. While operating the equipment, the trainee/apprentice must be continuously supervised by a qualified crane operator who meets the following requirements:	**RCW 49.17.430 Qualified Construction Crane Operators – Rules – Apprentice Operators or Trainees – Reciprocity.** (c) The apprentice operator or trainee is under the direct and continuous supervision of a qualified crane operator who meets the following requirements:
WAC 296-155-53300 Operator qualifications and certification. (2)(c)(i) The qualified crane operator is an employee or agent of the trainee's/apprentice's employer.	**RCW 49.17.430 Qualified Construction Crane Operators – Rules – Apprentice Operators or Trainees – Reciprocity.** (i) The qualified crane operator is an employee or agent of the employer of the apprentice operator or trainee;
WAC 296-155-53300 Operator qualifications and certification. (2)(c)(ii) The qualified crane operator under this section and is familiar with the proper use of the equipment's controls.	RCW 49.17.430 Qualified Construction Crane Operators – Rules – Apprentice Operators or Trainees – Reciprocity. (ii) The qualified crane operator is familiar with the proper use of the crane's controls;
WAC 296-155-53300 Operator qualifications and certification. (2)(c)(iii) While supervising the trainee/apprentice, the qualified crane operator performs no tasks that detract from the qualified crane operator's ability to supervise the trainee/apprentice.	**RCW 49.17.430 Qualified Construction Crane Operators – Rules – Apprentice Operators or Trainees – Reciprocity.** (iii) While supervising the apprentice operator or trainee, the qualified crane operator performs no tasks that detract from the qualified crane operator's ability to supervise the apprentice operator or trainee;
WAC 296-155-53300 Operator qualifications and certification. (2)(c)(iv) For cranes other than tower cranes: the qualified crane operator and the trainee/apprentice must be in direct line of sight of each other. In addition, they must communicate verbally or by hand signal.	**RCW 49.17.430 Qualified Construction Crane Operators – Rules – Apprentice Operators or Trainees – Reciprocity.** (iv) For equipment other than tower cranes, the qualified crane operator and the apprentice operator or trainee must be in direct line of sight of each other and shall communicate verbally or by hand signals; and
WAC 296-155-53300 Operator qualifications and certification. (2)(c)(v) For tower cranes: the qualified crane operator and the	**RCW 49.17.430 Qualified Construction Crane Operators – Rules – Apprentice Operators or Trainees – Reciprocity.**

WAC	Source
trainee/apprentice must be in direct communication with each other.	(v) For tower cranes, the qualified crane operator and the apprentice operator or trainee must be in direct communication with each other.
WAC 296-155-53300 Operator qualifications and certification. (d) The trainee/apprentice must not operate the crane in any of the following circumstances: (i) If any part of the crane, load line or load (including rigging and lifting accessories), if operated up to the crane's maximum working radius in the work zone, could get within 20 feet of a power line that is up to 350 kV, or within 50 feet of a power line that is over 350 kV; (ii) If the crane is used to hoist personnel; (iii) In a multiple-crane lift situation; or (iv) Multiple-lift rigging, as defined in WAC 296-155-52902 of this chapter, can only be accomplished by the trainee/apprentice when the qualified crane operator determines that the trainee's/apprentice's skills are sufficient for this high-skill work. (v) Critical lifts, excluding tower cranes, and as defined in WAC 296-52902 of this chapter, can only be accomplished by the trainee/apprentice when the qualified crane operator determines that the trainee's/apprentice's skills are sufficient for this high-skill work. (3) The employer must obtain documentation showing hours of crane operator experience and crane related experience separated out by crane type and capacity.	DOSH initiated language.

WAC	Source
(4) For experience obtained prior to January 1, 2010, the employer may accept a declaration from the crane operator attesting to actual hours of crane operator experience and crane related experience separated out by crane type and capacity. Hours documented prior to 2010 will count towards the hour requirements of actual crane operating experience and crane related experience. (5) Beginning January 1, 2010, crane operator experience and crane related experience must be documented and separated out by crane type and capacity. If the employer is documenting crane operating and/or related crane experience hours, the employer must provide a copy of the hours to the operator as soon as practical, if requested.	
	RCW 49.17.430 Qualified Construction Crane Operators – Rules – Apprentice Operators or Trainees – Reciprocity. (4) The department may recognize crane operator certification from another state or territory of the United States as equivalent to qualified crane operator requirements if the department determines that the other jurisdiction's credentialing standards are substantially similar to the qualified crane operator requirements.
	RCW 49.17.440 Construction Crane Safety – Rules – Implementation. (Effective January 1, 2010) The department of labor and industries shall adopt rules necessary to implement RCW 49.17.400 through 49.17.430.

Appendix 5 - Summary of Crane Accidents

Crane Types: M = Mobile T = Tower U = Unknown

Crane Accident	Crane type	Month & Year	Fatalities	Injuries	Equipment Damage ($)	Property Damage ($)	Cause Identified
Cal-OSHA Crane Accidents Report[i] (158 accidents)		1997-99	1 operator 12 non-operators 13 TOTAL	23 operators 79 non-operators 102 TOTAL	---	---	
Crane Type / No. / %							
Mobile Cranes / 115 / 73							
Bridge Cranes / 26 / 16							
Gantry Cranes / 5 / 3							
Tower Cranes / 4 / 3							
Ship Cranes / 1 / 1							
Not Determined / 7 / 4							
							All Crane Types / Mobile Cranes
							1. Instability / 67 / 49
							a. Unsecured Load / 34 / 6
							b. Load Capacity Exceeded / 0 / 29
							c. Ground not level/too soft / 0 / 4
							2. Lack of Communication / 32 / 24
							3. Electrical Contact / 13 / 10
							4. Misc. in 14 Categories / 46 / 32
CANADIAN ACCIDENTS Province of Ontario[ii] Mobile & Tower Cranes (138 fatal accidents)		1969-2002	121 mobile cranes 15 tower cranes 138 TOTAL	---	---	---	**TOWER CRANE FATALITIES** 34 YEARS (1969 - 2002) CAUSE / NUMBER / % Fall From Crane / 4 / 26.6% Load Handling / 3 / 20% Dismantling / 2 / 13.3% Erecting / 1 / 6.6% Structural Collapse (Overload) / 1 / 6.6% Wire Rope / 1 / 6.6%

Crane Accident	Crane type	Month & Year	Fatalities	Injuries	Equipment Damage ($)	Property Damage ($)	Cause Identified
							Miscellaneous 3 20% . Boom Hit Swing Stage (1) . Pulled Into Drum (1) . Motor Exploded (1) TOTAL 15 100% **<u>MOBILE CRANE FATALITIES</u>** 34 YEARS (1969 - 2002) CAUSE NUMBER % Powerline Contact 53 43.8% Load Handling 18 14.9% Rigging 16 13.2% Overload 10 8.3% Operator Error 9 7.4% Rapid Breaking (1) . Two-Blocking (3) . Dropped Boom (1) . Crane Misapplication (1) . Crane Out-Of-Level (1) . Ground Failure (1) . Hoist Line Not Vertical (1) Dismantling Boom 5 4.1% Wire Rope Failure 5 4.1% Miscellaneous 5 4.1% . Signal Man (1) . Contact Power Source (1) . Struck By Crane/Cwt (3) TOTAL 121 100%

Crane Accident	Crane type	Month & Year	Fatalities	Injuries	Equipment Damage ($)	Property Damage ($)	Cause Identified
Altamonte Springs, FL[iii]	M	07/14/2008	---	---	---	"The house has been condemned…"	"…they were watching about 10 workers from Gator Tree Service remove a large branch when the crane collapsed, crashing onto the house."
Buyck, MN[iv]	M	06/26/2008	1 worker	---	---	---	Worker electrocuted when truck's boom contacted live overhead power lines.
Campbellsport, WI[v]	M	04/21/2008	1 driver	1 car passenger	"…the two vehicles collided, tipping the truck over onto the car."	---	"Investigators said that a … man …pulled into the path of a crane truck…. [T]he driver of the truck attempted to swerve, but the two vehicles collided, tipping the truck over onto the car. "
Chatsworth, IL[vi]	M	07/04/2008	---	2 drivers	---	---	A construction crane with broken wheel fasteners crashed into a semi truck during transport.
Chincoteague, VA[vii]	M	04/03/2008	---	---	---	"…the incident caused a electrical short that burned through one of the main circuit cables that feeds power to the island."	"A crane involved in construction of the new Chincoteague bridge struck high-voltage power lines…" "…a crane was being moved away from the construction area closer to March Island. The operator did not have the crane lowered enough to safely clear the lines." "…construction crews may have violated some work requirements when the crane hit the cable."
Colorado Springs., CO[viii]	M	06/02/2006	1 operator	---	---	---	Crane tipped over.

Crane Accident	Crane type	Month & Year	Fatalities	Injuries	Equipment Damage ($)	Property Damage ($)	Cause Identified
Denver, CO[ix]	M	04/30/2008	---	---	---	---	
Eureka, CA[x]	M	04/28/2008	---	---	---	---	"The crane was large and overturned on a hairpin turn…"
Ft. Lauderdale, FL[xi]	M	06/24/2008	---	1 operator		"The overturned boom truck began leaking fuel, which authorities later cleaned up… The lift bent a lamp post and damaged a palm tree when it toppled over a fence onto Northeast 26th Avenue"	Boom truck flipped over during a roofing job.
Gainesville, GA[xii]	M	07/10/2008	---	---	"…the crane slid into the water."	"…an oil slick appeared on the lake surface… Oil booms were installed and absorbent material was used to contain the oil slick within an area of about 60 feet by 60 feet. …[T]he county has stopped using water intake pipes near the spill area 'until the situation	"…contractor crews were trying to move the crane onto a barge when an anchor cable came loose and the crane slid into the water."

Crane Accident	Crane type	Month & Year	Fatalities	Injuries	Equipment Damage ($)	Property Damage ($)	Cause Identified
						is stabilized and operations are back to normal at the construction site.'"	
Houston, TX[xiii]	M	07/04/2008	1 operator	---	---	---	"Investigators said the unidentified crane operator had just exited the cab of the crane to inspect the boom when it fell and killed him."
Hurst, TX[xiv]	M	04/12/2008	1 worker	1 worker	---	---	"Witnesses said crews were using a small crane to hoist a 4,000-pound utility pole up when the cable snapped and it fell on [the victim]."
Laconia, NH[xv]	M	07/02/2008	---	---	---	---	Crane snagged on power lines as it was leaving a construction site.
Las Vegas, NV[xvi]	M	06/13/2008	---	---	"The metal supports for the crane span malfunction ed,"	---	Crawler crane buckled.
Memphis, TN[xvii]	M	04/17/2008	---	---	"A large crane caught fire and exploded…"	---	"A large crane caught fire and exploded during an accident on I-55…"

Crane Accident	Crane type	Month & Year	Fatalities	Injuries	Equipment Damage ($)	Property Damage ($)	Cause Identified
Miami, FL[xviii]	M	06/09/2008	---	2 workers			The construction workers were building the 318-foot crane to bring up roofing supplies for the condo when the incident happened about 3 p.m., Miami Fire Rescue spokesman Iggy Carroll said. The father is 52; his son is in his 20s. "They were about 100 feet up, putting together the crane, when the elbow part came slamming down, knocking the workers," Carroll said. ``At this time we don't know how it happened or why."
Miami, Fl[xix]	M	07/25/2005	---	Up to 6 workers	---	---	Operator error.
Naples, FL[xx]	M	04/22/2008	---	---	"As the construction workers ran away, Rives' Honda Civic plowed through the fallen crane, ripping a hole through its lattice of metal." "…after it fell, pieces of the crane	Front-end damage to Honda Civic.	"Officials struggled through the afternoon Wednesday to account for the sudden collapse of a crane used to carry concrete pilings for an overpass…" "Brad Closson, a California-based expert in crane safety, said one possibility in the Estero case is that the crane's brakes gave out, sending the boom to the ground."

Crane Accident	Crane type	Month & Year	Fatalities	Injuries	Equipment Damage ($)	Property Damage ($)	Cause Identified
					lay on the pavement, mangled by the Honda."		
Overland Park, KS[xxi]	M	06/07/2008	---	---	---	---	Road construction crane collapsed during bridge/overpass construction.
Port Angeles, WA[xxii]	M	04/24/2008	---	1 operator	---	---	
San Antonio, TX[xxiii]	M	04/23/2008	---	---	"The large construction crane flipped and was left standing at a near 90-degree angle."	"As the crane flipped, witnesses watched a large sign fall right in the middle of Southwest Military Drive." "A few businesses in the area had to evacuate for a short time because of a chemical leak the crane caused as it fell."	"Investigators believe he was moving a sign that was way too heavy for his machine." "Emergency workers believe wind may have also been a factor in the accident."
San Antonio, TX[xxiv]	M	06/14/2008	---	---	---	---	Crane tangled in power lines.
San Luis Obispo, CA[xxv]	M	06/25/2008	---	1 operator		"… sending it sliding down a neighborhood street, uprooting trees, uplifting a	"Chaos is a good way to describe what happens when there is a brake failure on a big rig, sending it sliding down a neighborhood street, uprooting trees, uplifting a fire hydrant, and smashing cars

Crane Accident	Crane type	Month & Year	Fatalities	Injuries	Equipment Damage ($)	Property Damage ($)	Cause Identified
						fire hydrant, and smashing cars parked in its way."	parked in its way. One of the uprooted trees ended up on the driver's legs."
St. Augustine, FL[xxvi]	M	04/17/2008	---	1 worker	---	"As it fell, the boom of the crane landed directly in the center of the crane operator's 1996 Chevy truck — causing significant damage."	"…the operator extended the boom of a crane and his co-worker… stepped onto the end of the lift. As the operator was lowering the boom, the crane tipped over and [the man] was thrown off; landing on top of some wooden pallets on the ground nearby. The crane may have lost its footing because it was in soft sand at the time of the accident."
Telford, PA[xxvii]	M	08/21/2003	1 operator 2 workers 3 TOTAL	---	---	---	All three were electrocuted through crane boom contacting live overhead lines
Wallkill, NY[xxviii]	M	06/02/2008	---	---	---	---	Crane became unbalanced, almost tipped over.
Washington, IN[xxix]	M	07/16/2008	---	---	"That top section just buckled…"	"The crane fell on a security fence surrounding the tower and a portable baseball batting cage."	
Queens, NY[xxx]	M man-lift	07/16/2008	1 worker	---	---	---	"The truck, which was hauling wooden crates … crashed into the crane. The crane, a Genie Z-80/60 known as a man lift, was being used at a work site..."
Baltimore, MD[xxxi]	T	04/30/2008	1 worker	---	"No one else was hurt and	---	"Apparently, they were in the process of dismantling the crane when something went wrong and one worker was caught between

Crane Accident	Crane type	Month & Year	Fatalities	Injuries	Equipment Damage ($)	Property Damage ($)	Cause Identified
					nothing is believed to have been wrong with the crane…"		pieces and crushed…"
Bellevue, WA[xxxii]	T	11/16/2006	1 bystander	1 worker	---	Three downtown high-rise/ multi-story buildings were damaged.	
Hoover Dam, NV[xxxiii]	T	09/15/2006	---	---	"The September crane collapse forced contractors Obayashi Corp. and PSM Construction USA Inc. to find the resources to remove 300,000 pounds of steel cable and debris at the bottom of the Colorado	"…the construction accident … caused $50 million in damages and set back the project's completion date two years."	Two tower cranes working on Hoover Dam highway bypass collapsed. High winds

Crane Accident	Crane type	Month & Year	Fatalities	Injuries	Equipment Damage ($)	Property Damage ($)	Cause Identified
					River."		
Miami, FL[xxxiv]	T	03/25/2008	2	5	---	---	
New York City, NY[xxxv]	T	05/30/2008	2 construction workers	1 worker 1 bystander 2 TOTAL	"…the crane's turntable fell into the street, and the mast was affected."	"Pieces from the crane hit an apartment building across from the jobsite…"	"Construction crews erected he tower crane in late April and jumped it on May 22 and May 27 with city engineers onsite, LiMandri says. 'The first examination of the records say this crane was inspected, installed and stepped in compliance with regulations,' Bloomberg said. 'We do not know why the top snapped off.'"
New York City, NY[xxxvi]	T	09/29/2006	---	5	---	"Shattered glass showered down on Sixth Avenue and 43rd Street in one of the busiest areas of Manhattan, forcing authorities to close several streets."	"A crane slammed its load into the side of a signature skyscraper under construction…" "A worker at the site said the crane dropped a crate from the top of the 51-story Bank of America tower…"

Crane Accident	Crane type	Month & Year	Fatalities	Injuries	Equipment Damage ($)	Property Damage ($)	Cause Identified
New York City, NY[xxxvii]	T	10/17/2007	---	6	"Firefighters left the crane in its partially tipped over position until another crane arrived at about 1 p.m. to help lift it back to the ground."	Crane fell on a car, into a building, and into power lines.	Crane tipped over and into power lines and a building.
New York City, NY[xxxviii and xxxix]	T	03/15/2008	6 construction workers 1 bystander 7 TOTAL	13 construction workers 11 first responders 26 TOTAL	The crane split into pieces as it fell…"	"The big, white crane stood at least 19 stories high and demolished parts of several buildings as it fell. A four-story brownstone was completely pulverized by the falling wreckage, and three buildings were damaged."	"…the crane was scheduled to be moved Saturday so workers could start work on a fresh story when a piece of steel fell and sheared off one of the ties holding it to the building…" "City Building Department records showed that on March 4, a caller told officials that the upper portions of the crane appeared to lack the proper number of safety ties attaching it to the building. A city inspector visited the site and determined on March 6 that no violation was warranted. Another call questioning the crane's safety was dismissed as unwarranted by another inspector in February."

Crane Accident	Crane type	Month & Year	Fatalities	Injuries	Equipment Damage ($)	Property Damage ($)	Cause Identified
						"The crane split into pieces as it fell. Part of it came to rest against an apartment tower, buckling its facade and smashing it upper floors." Another piece of the crane hit traveled another half a block, ripping away walls and ceilings and crushing a small building." "Firefighters clambered through piles of rubble, several stories high, looking for victims. Witnesses reported a strong smell of gas in the area. Gas utility Consolidated Edison said it shut off service to area buildings. "	
Aventura, FL[xl]	U	04/03/2008	---	2 workers	"… the		"The two men were moving the air-

Crane Accident	Crane type	Month & Year	Fatalities	Injuries	Equipment Damage ($)	Property Damage ($)	Cause Identified
					smaller [crane] collapsed."		conditioning unit from a large crane to a smaller one, both on the roof, when the smaller one collapsed."
Casper, WY[xli]	U	06/02/2008	---	3 workers	"… the collapse caused extensive damage to the crane. 'It's completely toppled over; it's a mass of blue, twisted metal,' he said. 'My guess would be that they might be able to salvage the power unit and the tracks, and things like that. But the gantry, that's going to be scrap metal, would be	"A 70-foot section of the tubing blocked the [railroad] tracks, and material and debris were also blocking a connection off the main line that serves the Black Thunder and Jacob Ranch mines, Melonas said. "'We did shut down railroad traffic,' he said." Arch Coal Inc. spokesman Greg Schaefer said the company will assess the damage after crews clear the wreckage. Bill Denning, spokesman for the Mine Safety and Health	"…[the crane] was moving a 260-foot, 500,000-pound section of tubing over the triple-track main railroad line -- jointly owned by BNSF Railway and Union Pacific -- when the [crane collapsed]…

Crane Accident	Crane type	Month & Year	Fatalities	Injuries	Equipment Damage ($)	Property Damage ($)	Cause Identified
					my guess.'"	Administration in Denver, said the mine will be shut down while agency officials conduct an investigation.	
Dallas, TX[xlii]	U	06/13/2008	---	3 workers	---	---	
Honolulu, HI[xliii]	U	06/02/2008	1 worker	---	---	---	"…Greg Wong, 50 was getting a concrete pumper truck ready to pour cement. That's when police say a gust of wind blew a canvas strap, which was attached to a nearby crane moving overhead. The strap then snagged onto the boom arm of the pumper. "The worker was standing beneath the concrete pumper and the boom from the concrete pumper came down and struck the operator…"
Ingleside, TX[xliv]	U	04/29/2008	1 operator	2 workers	"the crane collapsed, pinning [the operator] inside the cab of his crane. Workers had to bring in another		"The victim… was one of four crane operators who were trying to move a 1000-ton oil platform when the crane collapsed…"

Crane Accident	Crane type	Month & Year	Fatalities	Injuries	Equipment Damage ($)	Property Damage ($)	Cause Identified
					crane to remove the tons of metal…"		
Las Vegas, NV[xlv]	U	05/31/2008	1 oiler	---	---	---	"[The victim], who worked as a crane oiler for Dielco Crane Service, was crushed Saturday morning when he got stuck between the counterweight of the crane and the track of the crane."
Las Vegas, NV[xlvi]	U	06/13/2008	---	1 operator	---	---	"Small crane" tipped over.
Lauderhill, FL[xlvii]	U	04/11/2008	---	---		"[The roof piece] landed on an unoccupied black passenger car. Flying debris however damaged the window of an apartment with a hole the size of a baseball."	"The crane, which was moving a mansard from the roof of a 10 story building, dropped a 12 foot by 4 foot section from 10 stories up"
Lubbock, TX[xlviii]	U	06/10/2008	---	2 workers		"…parts of a parking garage collapsed after a crane dropped an 18,000-pound precast cement beam onto the top floor of the three-story structure under construction.	"…The accident happened when a brake drum failed on the part of a crane hoisting the beam…"

Crane Accident	Crane type	Month & Year	Fatalities	Injuries	Equipment Damage ($)	Property Damage ($)	Cause Identified
						…The failure caused the load to be dropped 10 feet to the floor of the top level of the garage… That caused a serial "pancake" collapse of parts of the floors below…"	
Mobile, AL[xlix]	U	06/19/2008	1 worker	---	---	---	"…Hicks was operating an overhead crane and was pinned between a sheet of steel and a wall."
Portland, OR[l]	U	06/26/2008	---	---	---	---	Crane hook contacted power lines, shut down power to 8,000 people.
Seattle, WA[li]	U	06/10/2008	---	---		"About 172 City Light customers remained without power at noon today after a construction crane knocked out a power line… The outage also knocked out power to traffic signals…"	Construction crane knocked out a power line.
Seattle, WA[lii]	U	08/22/1994	2 workers	1 operator	Broken crane arm; damaged cab and		Crane basket fell at the Kingdome during roof repairs: " … the basket carrying the two workers fell 250 feet, sending the men to their deaths, when the crane arm broke near

Crane Accident	Crane type	Month & Year	Fatalities	Injuries	Equipment Damage ($)	Property Damage ($)	Cause Identified
					basket		its top. As it dropped, the basket struck the cab carrying the crane operator.
Seattle, WA[liii]	U	09/22/1994	---	---			Crane hit the top of the inside of the Kingdome during roof repairs
Woodstock, VA[liv]	U	07/01/2008	1 worker	---	---	---	Construction crane part being removed from the crane fell on the worker below.
Yucca Valley, CA[lv]	U	04/19/2008	1 operator	---	---	---	"…a crane he was operating came into contact with a live electric line…"

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