

CONCISE EXPLANATORY STATEMENT
Crane Certification and Crane Operator Qualifications and
Certification

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Table of Contents

I.	Purpose of Rulemaking.....	2
II.	Changes to the Rules.....	2
III.	Summary of Comments Received and Department Response.....	7
IV.	Cranes Literature Review.....	54
V.	Cranes Media Analysis Report.....	66
VI.	Crane Accident Fatalities – WA, OR, and ID.....	84

I. Purpose of Rulemaking

The legislature passed Chapter 27, Laws of 2007 (Engrossed Substitute House Bill 2171) in response to a catastrophic tower crane accident that happened in Bellevue in November 2006. The department conducted two sets of statewide stakeholder meetings to gather input from the industry for use in developing draft rules. The first set of statewide stakeholder meetings was held in July 2007. Following these meetings, the department decided to break the rulemaking into two phases. The first phase of this rulemaking adopts rules for the construction crane certification program, qualification requirements for construction crane certifiers, and operator qualifications, as outlined in RCW 49.17.400 through 440.

II. Changes to the Rules (Proposed rule versus rule adopted):

As a result of written and oral comments received, the following sections are being changed as indicated below:

WAC 296-155-52900 Scope.

- In subsection (2), the department added an exemption that cranes having a maximum rated capacity of one tone or less would not have to follow this rule.
- In subsection (2)(d), the department modified the language. The phrase “to be installed or removed from utility poles” was deleted. It now reads, “Service trucks with mobile lifting devices designed specifically for use in the power line and electric service industries or handling associated materials.”
- Renumbered the paragraphs in subsection (2).

WAC 296-155-52902 Definitions.

- The department added a definition for “dedicated drilling rig”. It reads, “Dedicated drilling rig means a machine which creates boreholes and/or shafts in the ground”.
- The department deleted “crane level indicator” from the definition of “Safety devices”. It now reads, “Safety devices, examples of safety devices are, but are not limited to, the following: 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.”

WAC 296-155-53108 Duration and renewal of an accreditation.

- In subsection (2), the department added the word “inspected”. It now reads, “Application for renewal must be filed with the department not less than sixty 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/inspected 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/inspected at least twenty-one cranes during the accreditation period may take the written exam to become recertified.”

WAC 296-155-53110 Revocation or suspension of an accreditation.

- The department amended the language relating to appealing a revocation or suspension to the superior court. We modified the language to say “board of industrial insurance appeals” instead of “superior court”. The new language reads:
 “A suspension or revocation order may be appealed to the board of industrial insurance appeals within fifteen working days after the suspension or revocation order is entered. The notice of appeal may be filed with the department or the board of industrial insurance appeals. The board of industrial insurance appeals shall hold the hearing in accordance with procedures established in RCW 49.17.140. Any party aggrieved by an order of the board of industrial insurance appeals may obtain superior court review in the manner provided in RCW 49.17.150.”

WAC 296-155-53200 General inspection criteria, wire rope inspection and removal criteria, and pre-proof load test requirements for all cranes.

- The department amended the wire rope inspection/removal criteria table in subsection (5). It now reads:

Table 1 - Wire Rope Inspection/Removal Criteria

(See also Figure 1 - Wire Rope)

Category of Cranes	Running Ropes*		Rotation Resistant* # of broken wires in specified diameters		Standing Ropes*	
	# of broken wires in 1 rope lay	1 strand in 1 lay			In 1 lay beyond end connection	At end connection
Mobile	6	3	2 (in 6xd)	4 (in 30xd)	3	2
Articulating	6	3	Consult rope mfg.	Consult rope mfg.	3	2
Tower	12	4	2 (in 6xd)	4 (in 30xd)	3	3
Self-Erector	6	3	2 (in 6xd)	4 (in 30xd)	3	2

Overhead & Bridge	12	4	2 (in 6xd)	4 (in 30xd)	--	--
Derricks	6	3	Consult rope mfg.	Consult rope mfg.	3	2

- The department added a note after the wire rope inspection/removal criteria table, it reads, “xd means times the “diameter”.”
- The department added a new subsection (6), it reads, “(6) Sheaves.
 - (a) Sheave grooves must be free from surface defects that could damage the rope. The cross-sectional radius at the bottom of the groove should be such as to form a close fitting saddle for the size of rope used. The sides of the groove must be tapered outward and rounded at the rim to facilitate entrance of the rope into the groove. Flange rims must run true about the axis of rotation.
 - (b) Sheave guards must be in place to:
 - (i) Guide the rope back into the sheave groove, when using ropes that can be momentarily unloaded.
 - (ii) Prevent ropes from becoming fouled when the block is lying on the ground with loose ropes.
 - (c) Sheave bearings, except for permanently lubricated ones, must have a means of lubrication.
- The department renumbered the proposed subsection “(6)” to “(7)”.

WAC 296-155-53202 Additional inspection criteria and proof load testing – Mobile cranes.

- The department reworded the language in subsection (1)(hh) and deleted the word “unusable”. It now reads “Steps, ladders, handrails, and guards are in safe and usable condition.”
- The department fixed a typographical error in subsection (4)(a). The letter “s” was deleted from the word “load” and added to the word “test”. The paragraph now reads:

“(4)(a) Proof load tests must be completed on all hoist lines. The test load must be at least one hundred percent but not to exceed one hundred and ten 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.”

WAC 296-155-53204 Additional inspection criteria and proof load testing – Articulating boom cranes.

- The department fixed a typographical error in subsection (2)(c). The letter “s” was deleted from the word “test”. It now reads:
“(c) Hoist the test load to assure that the load is supported by the crane and held by the hoist brake(s)”.

WAC 296-155-53210 Additional inspection criteria and proof load testing – Overhead and bridge cranes.

- In subsection (1)(b), the words “mousing device” were replaced with “safety latch”. It now reads:
“(b) Load hooks. Inspect for damage wear to hook nuts, safety latch 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;”

WAC 296-155-53300 Operator qualifications and certification.

- The title of Table 1 was changed to “Crane Operator Experience for Cranes Used in the Construction Industry”.
- One of the headings in Table 1, was reworded from saying “Crane Type” to “The Five Category of Crane and their Types”.
- In Table 1, the department fixed a typographical error in the lattice boom crawler crane (LBC) cell. It was changed from “300 tons and above – 1000 hours” to “Under 300 tons – 500 hours”.
- The department added another type of mobile crane with fewer hours required. The type that was added was a mobile crane under five tons, the hours of actual experience is eight hours, and related experience is sixteen hours.
- In Table 1, the category of cranes was renumbered.
- In Table 1, articulating boom cranes were moved to a separate category.
- In subsection (2)(d)(v), the words “excluding tower cranes and” were deleted. It now reads:
“(2)(d)(v) Critical lifts, as defined in WAC 296-155-52902, 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”.
- In subsection (5), the word “signed” was added. It now reads,
“For experience obtained prior to January 1, 2010, the employer may accept a signed 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”.

- After subsection (5) a note was added. It reads:
“**Note:** For experience obtained while working outside of the department’s jurisdiction, the employer may accept a signed declaration from the crane operator attesting to actual hours of crane operator experience and crane related experience separated out by crane type and capacity.”

III. Summary of Comments Received and Department Response

General Comments	Department Response
<p>I would like to address the fundamental flaw in Gross House Bill 2171, from our industry's point of view, and that's single-source operating competence, the certification. Our industry stands united in opposition to this concept. I know of no other, no other safety and health regulations adopted by the State of Washington Department of Labor & Industries or by the U.S. Department of Labor, OSHA, that embraces this concept when certification is required. Both in the legislative process and the rule-making process, extensive discussion and attention has been paid to the Federal C-DAC document. This document clearly rejects this concept, and, in fact, provides five different ways of doing certification. We believe our industry is the only industry with specific construction standards established in the 1913 Washington State Legislature entitled 1929 RCW. This law recognized the electrical industry as being unique and established safety standards and guards for both public and workers. The ability to have our workforce trained to perform all aspects of our industry, including the special operating procedures of working with equipment around, near or on energized conductors is for the protection of the public as well as for employees. Crane operation is one of the many skill sets, not the only skill set. We encourage, even welcome, training, certification, quality control, quality assurance measures, and requirements outlined in the statute for our operators. We support operator certification. Our training need, hazard proximity, and exposure are specifically excluded in the current testing requirements. We urge and request the Department to request legislation adopting requirements similar to the proposed</p>	<p>The department appreciates this comment. This change would require a legislative change. The department is considering a legislative proposal for introduction during the 2009 legislative session. This will include review of Option 2 – Qualification by an audited employer program – from the CDAC proposal, §1926.1427(c), be included as a certification option under RCW 49.17.430, which allows an employer to development an operator certification program.</p>

<p>Federal C-DAC provisions in this area, the three fundamentals and training and certification that must include and enhance the high voltage electrical utility industry for public safety, employee safety, and system response. You should promulgate the requirement and the standard in Chapter 45, the training program and the certification program and its requirements and outline that every employer must be met uniformly. We recognize that both from the workplace as well as the regulatory front, it's not static. It's dynamic, and it is ever-changing. We think this is an excellent first step. And as I said, we support certification. We do not want to rely singularly on an exemption clause.</p> <p>Dave Hutchins IBEW Local 77, EUSAC, Clark PUD, Yakima</p>	
<p>Training and certifying of your crane certifiers. It seems like the standard leaves out, as I had indicated earlier today, that the crane certifier need not have any crane experience to become a certifier. Now, it's easy to run a simulator. You don't have the real feel of it. It's easy to watch people operate cranes. You don't have any real feel of it. But once you become a crane operator and you actually have the responsibility, you need the technical ability to operate that crane in a manner that's safe for all people involved. I feel that it's highly important that the Department of Labor & Industries take into consideration when interviewing people for certification to be crane certifiers that they have a technical background as well as a practical application background so that when they do come to an employer, that they come with the knowledge and the technology that they can make accurate inspections that are to the benefit of all.</p> <p>Ron Knight, Retired Operator, Yakima</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The proposed accreditation requirements set forth in WAC 296-155-53100 and 296-155-53202 require certifier applicants to establish that they have knowledge, experience and background, which includes crane theory so that they can inspect and test these cranes safely with types of cranes they are applying for and to successfully pass written examinations. In addition, applicants must specifically demonstrate that they have 5 years crane inspection experience, two of which must be actual inspection activities and three of which may be a combination of experience in areas such as crane operator, crane mechanic, etc. or a combination of training. The department does not agree that crane certifiers need to have the skills necessary to operate these types of cranes.</p>
<p>It would seem to me that an inspector, part of the inspection should</p>	<p>No change was made to the proposed rules based on this</p>

<p>be to run the crane through its paces. So I would think that a crane inspector should at least know how to operate the crane. I'm not talking about a great deal of experience. But 40, 60, 80 hours of experience in that crane would make him able to spot if there was a problem with the crane.</p> <p>Gary Orsborn, Operator Engineer Regional Training Center</p>	<p>comment.</p> <p>The proposed accreditation requirements set forth in WAC 296-155-53100 and 296-155-53202 require certifier applicants to establish that they have knowledge, experience and background, which includes crane theory so that they can inspect and test these cranes safely with types of cranes they are applying for and to successfully pass written examinations. In addition, applicants must specifically demonstrate that they have 5 years crane inspection experience, two of which must be actual inspection activities and three of which may be a combination of experience in areas such as crane operator, crane mechanic, etc. or a combination of training. The department does not agree that crane certifiers need to have the skills necessary to operate these types of cranes.</p>
<p>The one I have that I'd really like to see the State get involved in, because we have talked about apprentices, we've talked about training all through our work shift, that in the past, the contractors, or let's say employers, have justified saying because of the cost, let's remove them. Well, what's happened here in the last eight to ten years, we now have throughout our state, with the economy that we have and the boom/bust in construction, we do not have enough qualified operators. I say to the State that what I'd like to see, and I'd recommend, is getting a two-man or a trainee or apprentices back on all of our cranes.</p> <p>Clyde Wilson, Yakima, Retired Operator</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The proposed rules, WAC 296-155-53300, allow for inexperienced operators to gain the experience to become a qualified operator.</p>
<p>We believe our industry is the only industry that has specific construction standards established in the state of Washington back in 1913 under Title 1929. This law recognized our industry as being</p>	<p>The department appreciates this comment. This change would require a legislative change. The department is considering a legislative proposal for introduction during the</p>

<p>unique and established the safeguards for both the public and the workers and allowed -- and allowed to have our ability of the workforce to perform that work, not only for the protection of the workers but for the public also. Since our industry does work inside that ten-foot rule, in that area where we have all those special requirements and training and work practices, the operation of crane is just one of the tasks. It's not the only task. It's one of the skills that those people have to learn and perform, and we'd like to have L&I recognize that. We have proposed, due to the regulatory requirements under FURF and NURF in maintaining our grid that in - in, for instance, one of the options in the C-DAC is to allow other ways to certify your people. We proposed some, I believe they'll be in writing, from our industry, both labor and management provided, as to how we could go about this. There's also a way, since the State is going to be the certifier, even in the C-DAC document, the State can be allowed to certify other programs.</p> <p>Kirk Hayfield, Avista, Yakima, EUSAC</p>	<p>2009 legislative session. This will include review of Option 2 – Qualification by an audited employer program – from the CDAC proposal, §1926.1427(c), be included as a certification option under RCW 49.17.430, which allows an employer to development an operator certification program.</p>
<p>It would be my opinion that first the single-source NCCO program, which I've had an NCCO card for ten years, and it's -- I don't really see it as single-source because we can obtain it from anyone. It's a single curriculum, but you can obtain it from almost anyone.</p> <p>Gary Orsborn, Operator Engineer Regional Training Center, Yakima</p>	<p>No change was made to the proposed rules based on this comment.</p>
<p>I've got 40 years of experience in marine and all phases of construction, and master mechanic. I do a lot of accident recovery. I think that the inspectors that I see in the field, and some of the cranes that I come across after somebody else has looked at them, it would be a good idea for the crane inspectors to understand the crane that he's inspecting more deeply. And one way of doing that is to understand the operation of that crane.</p> <p>Dan Jerald, Retired Operating Engineer & Current Certifier, Yakima</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The accredited crane certifier requirements in WAC 296-155-53102 will require an applicant to demonstrate that he/she possesses knowledge of these rules, ASME standards relating to the design, testing, inspection and operation of cranes, demonstrate five years crane related experience and</p>

	<p>successfully pass written examinations regarding specific types of cranes he/she wishes to certify. The department believes these requirements will be sufficient to ensure certifiers demonstrate an understanding of the cranes they will be inspecting.</p>
<p>I think another key factor for the overall safety in the construction crane industry is the need for rigger/signal person certification. Because of the nature of the work, the crane operators spend a high percentage of the time operating in the blind, picking and landing loads that they cannot see. You can have the most highly trained, experienced, and certified operator in the world running your crane, but if the person at the other end of the hook is not experienced and certified, then all the work to have certified operators has been for not. Riggers and signal persons should have hour requirements and related experience requirements just like operators. Of the 15 states that now require operator certification, Maryland leads the way with rigger/signal person certification requirement added to their crane safety legislation. Eric Bellamy, Spokane, James Hopkins, Spokane, John Stelfox</p>	<p>No change was made to the proposed rules based on this comment. This request would require a legislative change. The department will be addressing the training, experience, and knowledge requirements for signal/rigging personnel in Phase II of the construction crane rulemaking but will not be requiring certification of this personnel absent a legislative change.</p>
<p>I would like to see Labor & Industries address rigging next. We spend a great deal of time doing that, and it's resorted -- we've done that through experience of the crane operator himself has to become a corrector of what's happening in front of him because other people's mistakes cause accidents. So I'd like to see the State take some time after this is done and maybe address that. Gary Orsborn, Operator Engineer Regional Training Center, Yakima</p>	<p>The department intends to update the rigging requirements located in Chapter 296-155 WAC.</p>
<p>So often we have -- we write these rules and we anticipate what's going to occur. And the question I just have is, based upon the number of certifiers that are currently available to begin to train to this level, as well as those that may eventually be going in that</p>	<p>No change was made to the proposed rules based on this comment. To ensure availability of adequate number of crane certifiers</p>

<p>direction, I guess my basic question here is that do we have a good handle on the fact that once everything goes into effect that there are going to be enough people available to certify? In other words, are there going to be enough to meet the demand? Because I can foresee some problems where a contractor could have cranes in place needing inspection, and looking for people to do it, and saying, well, we might be able to get to you in a month or two. And in the meantime, we've got cranes sitting on site that's costing us a lot of money to keep there and that we can't operate</p> <p>Jay Meyers, Spokane</p>	<p>the rules allow currently certified maritime crane inspectors and crane certifiers accredited by other states or entities to become accredited to perform crane certification inspections until January 1, 2012 without meeting the certification requirements in this rule.</p>
<p>Have we looked at the concept of interstate movement of inspectors? I know you're going to have certain criteria for these people. If there are other states that have got qualified inspectors, are we going to have any kind of reciprocal agreements with them? A good example would be, we do a lot of work out in different states. If we have a crane, for example, over in Montana that comes up for an inspection requirement here in Washington, and knowing that we're going to be bringing that crane back, if that crane is inspected by an inspector from Montana, would that be acceptable when we bring that crane back? I don't think that's been addressed, at least not that I know of.</p> <p>Jay Meyers, Spokane</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The rules allow currently certified crane certifiers accredited by other states or entities to become accredited to perform crane certification inspections until January 1, 2012 without meeting the certification requirements in this rule. Beginning January 1, 2012, crane certifiers from other states will be required to apply for WA certification, meet the qualification requirements, and successfully pass written examinations as set forth in these rules. The department does not intend to enter into reciprocity with other states at this time.</p>
<p>We've got a construction site. We've got a fence on the construction site. And across the street from the construction site we have a lay-down yard. Are the same rules going to apply in that lay-down yard? We've discussed this a little bit before, because we have lay-down yards that either are or are not next to construction sites that should apply under the same rule. And there seems to be some question as to whether that is or isn't going to apply. I'm strongly impressing to see that the same rule applies to a lay-down yard as what is applying</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>When a lay-down yard is associated with a construction site the requirements will apply. Lay-down yards not associated with a construction site would not be covered by this rule.</p>

<p>to a construction site. Gary Neal, Coast Crane, Spokane</p>	
<p>We respectfully request that the Department clarify the effective date for the Department’s proposed rules. As drafted, it is our understanding that the proposed rules will have an effective date of January 1, 2009. However, pursuant to Section 7 of HB 2171, the act itself shall not take effect until January 1, 2010. Accordingly, we request clarification regarding the effective date of the proposed rules. Chris Meyers, PacifiCorp</p>	<p>The department appreciates this comment. WACs 296-155-531 through 296-155-53112 will be effective January 1, 2009 to allow the department to proceed with crane certifier accreditations. All other WACs will be effective January 1, 2010.</p>
<p>Since you're revising the code, that you would also look at making power line clearances consistent with other codes, the ASME, and they can be consistent with the clearances if you get a chance. Pete Campbell, BM Builders Construction, Seattle</p>	<p>No change was made to the proposed rules based on this comment. The power line clearances for operation will be addressed in Phase II of this rulemaking.</p>
<p>We also feel that the rule does not speak clearly to the delivery of materials. For instance, if a truck-mounted crane delivers materials to a job site and places the delivery on a roof or structure, rather than placing that on the ground, is that going to be considered delivery? The reason for our concern is that we've heard conflicting answers from the Department representatives in regards to this issue. Again we request that these issues are either made more clear in the rule or also addressed in a WRD. Mandi Kime, AGC, Tumwater</p>	<p>No change was made to the proposed rules based on this comment. The definition of “construction work” as outlined in WAC 296-155-012, clearly states that all operations in conjunction with excavation, construction, erection, alteration, repair, demolition, and dismantling, of buildings and other structures is considered construction work. Delivery of these construction materials, whether the material is delivered on the roof, ground or structure, would be an operation in conjunction with construction work. Truck mounted cranes delivering material to construction sites are covered by the proposed rules unless the crane meets one of the specific exemptions set forth in WAC 296-</p>

<p>We feel the proposed rules need more clarity in the areas of service and maintenance trucks. We need to have consistent answers from the Department on when a truck is considered to be performing maintenance and repair versus construction-related activities. We request and suggest that these issues are either made more clear in the rule or that they're addressed in some form of WRD. Mandi Kime, AGC, Tumwater</p>	<p>155-52900(2). No change was made to the proposed rules based on this comment. Mechanics trucks with a hoisting device when used in activities related to equipment maintenance and repair are not covered by these rules. See WAC 296-155-52900(2)(i). Service and maintenance trucks that meet the definition of a crane are covered by these rules when they are performing construction, maintenance, and/or repair work as defined by WAC 296-155-012.</p>
<p>In reference to the surveys for the purpose of economic analysis, we feel that they were not done in a manner that collected quality responses. We believe the Department's economic analysis severely under counts the number of cranes covered by the regulation. We appreciate the inherent difficulty in gathering the information. However, concerns expressed by those who were surveyed by the Department include the following: Confusion over the definition of cranes. Some survey responders did not automatically count truck-mounted equipment that is traditionally not referred to as a crane but which are indeed covered by the regulations. This factor alone contributed greatly to the under count. Second factor is confusion over owning versus renting. Some respondents may have given numbers of cranes they use as opposed to the number of cranes that they actually own. Lastly, it would be the timing of the calls. Some responders indicated that the survey calls came in during the height of the work day when the responder was in the field and away from their crane data. Time to gather the requested data was not granted. So through our own research, we estimate the number of cranes covered by the regulations is around 3,000. This is not necessarily a</p>	<p>The economic analyses were conducted based on the number of employees, not the aggregate number of cranes. The 1,960 crane count references in the Small Business Economic Impact Statement (SBEIS) were provided in the context of a discussion of discrepancies between large and small businesses, specifically the conclusion that small businesses had a higher proportion of mobile cranes. There is no reference to the estimate of 1,960 cranes in the Cost Benefit Analysis (CBA). Additionally, the 1,960 figure represents the number of cranes presented in the survey responses, not an extrapolated estimate for the total number of cranes in Washington state. When assessing the costs and benefits in the CBA for the recertification of cranes following contact with power lines, the number of cranes was considered. However, this analysis was based on cases indicated in the survey responses and not by aggregate crane counts.</p>

<p>definitive number, as I'm sure you guys understand and appreciate, but it gives us enough evidence to strongly suggest that the Department's numbers are a significant understatement, thus calling into question the validity of that economic analysis.</p> <p>Mandi Kime, AGC, Tumwater</p>	<p>As a result, an aggregate estimate of cranes in Washington state had no impact on the final determinations in the economic analyses for this project.</p>
<p>The proposed regulations are rather vague on what particular ANSI or ASME standards are being referenced. This could result in continuance of misapplication and misunderstanding of industry-accepted practices and consensus standards by end-users. We strongly suggest that the specific ANSI or ASME standard and issue date be referenced in each section or subsection of the proposed rules where applicable. In the alternative, a broad statement such as ANSI or ASME standards in effect at the time of use could be substituted. It is our understanding that if a rule is incorporating national consensus standards, that the entire consensus standard must be incorporated. By selective incorporations of the national consensus standards, the Department must then use a different rule-making process.</p> <p>Mandi Kime, AGC, Tumwater</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The only time ASME is mentioned in this rule is for the crane certifier applicants to possess knowledge of chapter 296-155 WAC, Safety Standards for Construction work along with the ASME B30 series relating to the design, testing, inspection and operation of cranes.</p>
<p>Through a meeting between the EUSAC crane committee and L&I they stated they understood our concerns but the only way to try and change the law would be to have public testimony concerning our industry concerns, which they could use to petition the legislature for a law change for clarity purposes.</p> <p>The Department of L&I further asked the electric industry to provide them with information which may be used to help the industry retain the ability to train and certify their own employees to be crane operators. This would maintain a crew structure that allows all employees to be able to operate a crane in the performance of</p>	<p>The department appreciates this comment. This change would require a legislative change. The department is considering a legislative proposal for introduction during the 2009 legislative session. This will include review of Option 2 – Qualification by an audited employer program – from the CDAC proposal, §1926.1427(c), be included as a certification option under RCW 49.17.430, which allows an employer to development an operator certification program.</p>

<p>building and maintaining system integrity. The information requested was to give the Department knowledge regarding how our industry is unique and different than what is typically found on a traditional construction site where there are different trades working within each of their own jurisdictions in the building of the project being worked on. They also requested information on the following:</p> <ul style="list-style-type: none"> ➤ Identify which types of equipment the industry would not be training on- i.e. the EUSAC committee has proposed that we would provide training on 40 tons and below, anything larger than this would require that the operator be certified by the organization the state recognizes as a nationally accredited testing company. ➤ Identify and propose how our industry would use one operator training curriculum throughout the state by all private, public (PUD's), and other electric companies such as REA's. ➤ Develop criteria on ensuring consistent training and certification for our industry. ➤ Provide information on how future regulatory changes would be addressed across the electrical industry in Washington. <p>Steve Neslund, Michaels Power, EUSAC, Clark PUD</p>	
<p>The EUSAC committee empowered the electric industry small crane committee to develop some talking points for the upcoming statewide public hearings concerning these rules, explaining how our industry different than traditional construction work by other trade groups:</p> <ul style="list-style-type: none"> ➤ We operate in close proximity to energized line and equipment. 	<p>The department appreciates this comment. This change would require a legislative change. The department is considering a legislative proposal for introduction during the 2009 legislative session. This will include review of Option 2 – Qualification by an audited employer program – from the CDAC proposal, §1926.1427(c), be included as a certification option under RCW 49.17.430, which allows an employer to develop an operator certification program.</p>

- Our industry trains on high voltage electrical hazard recognition
- Grounding of equipment is specific to each worksite.
- We have step and touch potential hazards around our cranes that other industries do not.
- Electrical bonding of crane to a source of ground potential.
- Equipotential Zone.
- Insulate and/or isolate equipment and personnel from electrical hazards.
 - i.e. Insulated booms and there safe work design and limitations.
- Potential for induced voltages from adjacent lines.
- Industry specific vocabulary and hand signals.
- We believe our industry is the only industry with specific construction standards established in the 1913 Washington state legislature in Title 19.29 RCW. This law recognized the electrical industry as being unique and established safe guards for both the public and the workers. The ability to have our workforce trained to perform all aspects of our industry including the special operating procedures of working with equipment around or near energized conductors is for the protection of the public as well as the employees.
- We work on exposed live line parts and any electrical hazard they may present (see WAC 296-45-325).
- We have statutory requirement to respond 24/7 to service outages.
- We are required to train all qualified electrical workers on the integrated skill sets of an electrical response crew. Crane operation is one of the many skill sets not the only one our

<p>people need to know. Steve Neslund, Michaels Power, EUSAC, Clark PUD</p>	
<p>The electric utility industry recognizes the Department of L & I's authority to make determination on "effective as." However, the electric utility industry and its contractors do not wish to rely solely on exemption status in the rule, and specifically notes that the industry is committed to training, testing, and certification of employees.</p> <ul style="list-style-type: none"> • We agree with the 40/40 affidavit experience on training • We will have employees pass a written exam • We will have employees pass skills test on crane and boom trucks <p>The scope of Electric Utility Industry program would be:</p> <ul style="list-style-type: none"> • 40 ton and below mobile cranes • Powerhouse cranes (overhead cab and remote/pendent controlled) • Articulating Cranes <p>We would provide consistently applied training by incorporating curriculum and training requirements for future regulatory changes into WAC 296-45 Electrical Workers Safety Rules.</p> <p>The electric utility industry recognizes the need for supporting portability of electrical contractors and portability of qualified electrical workers and would recognize nationally recognized crane certification programs recognized by L & I.</p> <p>We would recognize the equivalent training and certification as obtained through nationally recognized crane certification program such as NCCCO or any other state approved crane training programs.</p> <p>➤ The Electric Utility Industry employers and labor are opposed to the public policy of mandatory outsourcing and mandated single source training and certification of its employees.</p>	<p>The department appreciates this comment. This change would require a legislative change. The department is considering a legislative proposal for introduction during the 2009 legislative session. This will include review of Option 2 – Qualification by an audited employer program – from the CDAC proposal, §1926.1427(c), be included as a certification option under RCW 49.17.430, which allows an employer to development an operator certification program.</p>

- The proposed state certification process allows an individual to be qualified in all aspects of using a crane for all construction, but does not recognize the other specialized training our electrical workers are required to have in building and maintaining our facilities or infrastructure. As mentioned earlier our industry is mandated by NERC (National Electric Reliability Council) to maintain the electrical grid in a manner that eliminates and/or reduces the time frame in which the transmission and distribution of power is out of service.
- The national testing and certification as specified in the statute specifically excludes performance, proficiency, and competency training and certification on electrical hazards.
- No recognition of the crane and crane operator as being integrated into the crew structure that is unique to the electrical industry from the source to the meter.
- Limits utilities ability to ensure employee competency by outsourcing an incomplete certification process for the work performed in a specialized industry.
- The national certification program does not cover hazard recognition in our industry or how to mitigate exposure to the hazards when using a crane.
- The national certification program does not provide testing or certification on best practices as it relates to our industry.
- Electrical employers are required to train and ensure each employee is proficient in work practices, procedures and safety requirements in WAC 296-45 that pertains to their respective job assignments.
- The effect of requiring national certification has resulted in the employers' inability to use one certification program to certify our employees for our industry. One crane certification program

<p>that covers all aspects of crane use for our industry would better ensure competency and be more cost effective. Steve Neslund, Michaels Power, EUSAC, Clark PUD</p>	
<p>We request the department to submit legislation which will provide clear textual and visual explanations of these rules by identifying how they apply to construction, maintenance and operations of an (all inclusive) electric utility system. We are committed to this goal and are willing to do whatever is necessary to assist the department in this process. We believe an all inclusive “Electric Utility Industry Certification Program” will ultimately benefit labor and employers as well as the public. Andy Huck, Clark PUD</p>	<p>The department appreciates this comment. This change would require a legislative change. The department is considering a legislative proposal for introduction during the 2009 legislative session. This will include review of Option 2 – Qualification by an audited employer program – from the CDAC proposal, §1926.1427(c), be included as a certification option under RCW 49.17.430, which allows an employer to development an operator certification program.</p>
<p>The crane safety draft is a good start and I recognize a great deal of effort has gone into it. In my opinion it falls short of the Bellevue public’s goal to live and shop in safety around construction cranes and the legislator’s goal to serve their constituents and provide them with the safety they demand. Please do not allow the well funded lobbying voices of the construction companies, laborers, carpenters, and electrician unions to water down safety in the work place. John Stelfox, Operator</p>	<p>No change was made to the proposed rules based on this comment.</p>
<p>Forklift certification should be a law, look at the forklift accidents. John Stelfox, Operator</p>	<p>No change was made to the proposed rules based on this comment. ESHB 2171 and RCW 49.17.400-440 specifically exempt forklifts from the requirements of the proposed rules.</p>
<p>WAC 296-155-52900 Scope</p>	
<p>We are urging the department to add clear and concise language to the current proposed rule that would exempt our industry’s pump hoists from the overall scope of the new crane rules for the following reasons:</p>	<p>The department appreciates this comment. The department has amended WAC 296-155-52900(2) to include an additional exemption for pump hoists, as follows: “(t) Pump hoists with booms that do not rotate.”</p>

- Pump hoists, like drilling rigs, are strictly dedicated to pulling pumps out of wells, and like drilling rigs, should remain exempt from the crane rule.
- Pump hoists are not designed for, or used to swing a load, thus they do not fall into the definition of a crane as set forth in RCW 49.17.400(5), “Crane” means power-operated equipment used in construction that can hoist, lower, **and horizontally move a suspended load.**
- Failure to exempt pump hoists from the proposed crane rule will result in unnecessary confusion and related complications after the crane rule is adopted. Governor Gregoire’s Executive Order 05-03 on “plain talk” states, “Using plain talk principles, the announcements, publications and other documents agencies send to the public will contain clear and concise instructions and information.” Since pump hoists are a commonly used term within our nation’s well drilling industry, and a commonly used term to define our type of equipment, the Governor’s “plain talk” executive order thereby directs the department to clearly state that pump hoists are not included in the scope of the new crane rule as it already does for drilling rigs and eighteen other clearly stated exemptions that do not apply within the scope of the new crane rule.

We are confident that failure by the department to exempt pump hoists could result in unnecessary costs and challenges for both your inspectors and the many contractors and workers in Washington’s well drilling industry.

Pacific NW Sales Co., Rick’s Equipment, Mauldin’s Well Service, JKA Enterprises (4), Garrison Engineering, Wolfe Mechanical Services (2), B&C Well Drilling & Pump Service, R/Dub, Inc., Lad Irrigation,

Pump hoists that cannot horizontally move a suspended load are not considered to be a crane and therefore are exempt from this rule. Cranes that lift/lower pumps or other associated materials at construction sites are not exempt from this rule, unless they are listed in WAC 296-155-59200(2).

<p>Hansen Drilling (11), Hayes Drilling (7), Rock Well Water Systems, All Season's Well & Pump Service, Okanogan Drilling, Northern Waters, JKA (4), Ralph's Pump & Well (3), Dahlman Pump & Well Drilling, Bartholomew Pump Service, Davis Drilling, Turner Pump, Richardson Well Drilling (13), Purswell's Pump (5), Fogle Pump & Supply (36), Gregory Drilling (6), Joyco Drilling, Schroder's Well Drilling (2), Boart Longyear (9), B & J Drilling, Jack Horner Electric, MVM Quality Drilling</p>	
<p>Failure to exempt pump hoists will result in unnecessary confusions and complications such as we have encountered with the renewal of our electoral licenses where we are having to take a full electrical test and we only install a small segment of any electrical use. In other words we do not wire condos only pumps. Turner Pump</p>	<p>The department appreciates this comment. The department has amended WAC 296-155-52900(2) to include an additional exemption for pump hoists, as follows: "(t) Pump hoists with booms that do not rotate."</p> <p>Pump hoists that cannot horizontally move a suspended load are not considered to be a crane and therefore are exempt from this rule. Cranes that lift/lower pumps or other associated materials at construction sites are not exempt from this rule, unless they are listed in WAC 296-155-59200(2).</p>
<p>Add "roofing loading conveyors" to the list of exemptions. Commercial Industrial Roofing (4), Legacy Roofing (8), System Roofers Supply, Washington Alaska Roof Systems, Roofing Contractors Assoc., Crow Roofing & Sheet Metal, Wayne's Roofing, Meyer Brothers Roofing & Sheet Metal</p>	<p>The department appreciates this comment. The department has amended WAC 296-155-52900(2)(s) to exempt roof conveyors.</p> <p>Conveyors, including roof loading conveyers, do not meet the definition of a crane therefore they would be exempt from this rule.</p>
<p>House Bill 2171 titled "Crane safety" provides an exemption for our industry, specifically for service trucks and mobile lifting devices used in power line and electrical service industry. We have had many meetings, much that I have logged, much discussion with</p>	<p>No change was made to the proposed rules based on this comment.</p>

<p>Department representatives in the last few months and believe the Department's interpretation and future application of the proposed rule regarding the exemption are correct. In short, above ground in the overhead, at the ground level, i.e., pad-mount transformers, et cetera, and below ground NRURG and network secondaries. This application and interpretation were and are a primary concern for our industry.</p> <p>Dave Hutchins IBEW Local 77, Yakima, EUSAC</p>	
<p>Proposed WAC 296-155-52900(2)(d) exempts from certain crane operation and certification requirements “[s]ervice 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 are exempt from regulation.” While the proposed rule appears to ensure a comprehensive exemption for these types of cranes designed for electric utility functions, PacifiCorp is nonetheless concerned that the Department’s proposed rules may limit PacifiCorp’s ability to conduct certain types of utility work. Specifically, the Department’s proposed rules may be interpreted to mean that a line crew setting a pole would be exempt from the proposed rules, but when the same line crew after setting the pole uses a boom truck to pick and place a padmount transformer, the line crew would be subject to crane operation and certification requirements. The scenario described above was not the intent under the act and would effectuate an unnecessary result. We respectfully requests that the Department clarify that the intent of the proposed rules are to effectuate an exemption for all uses of service trucks with mobile lifting devices from certain crane qualification and certification requirements, thereby allowing utilities to continue providing safe and reliable service to customers with its existing and successful training regime.</p>	<p>The department has amended the rule language based on this comment. Specifically, the department has changed the language of this exemption, as follows: “Service trucks with mobile lifting devices designed specifically for use in the power line and electric service industries or handling associated materials.”</p>

Chris Myers, PacifiCorp, EUSAC, Andy Huck, Clark PUD	
<p>From our industry, I feel that we understand and recognize the service truck exemption. And as I understand, listening today and through other discussions, that we have an exemption for the type of electrical work that those trucks are designed for, no matter if it's overhead, underground, or on-grade pad-mount type work. I still think there might be some confusion as to with the addition to the language of "on or off poles."</p> <p>Kirk Hayfield, Avista, Yakima</p>	<p>The department has amended the rule language based on this comment. Specifically, the department has changed the language of this exemption, as follows: "Service trucks with mobile lifting devices designed specifically for use in the power line and electric service industries or handling associated materials."</p>
<p>I'd just like to comment on WAC 296-155-529, Crane Certifier Accreditation and Crane Certification, the new section WAC 296-155-52900 Scope, Item 2, letter D, "Service truck with mobile lifting device designed specifically for use in the power line and electrical service industries or handling associated materials to be installed or removed from utility poles." The comment I have is specifically on the word "poles," and I think that should be changed to either like "utility facilities" or "systems," because of the fact that we work on both overhead and underground systems. And an example would be we -- we would be allowed to pull a pole, with this present wording, and not allowed to replace that pole with a pad-mount transformer. And we would have to have a person accredited to -- certified to do that aspect of the job under this present wording. So if we're going to allow the utilities to do all their work under this exemption, we would need to remove that word "poles."</p> <p>Bill Stone, Northwest Line Apprenticeship, Vancouver</p>	<p>The department has amended the rule language based on this comment. Specifically, the department has changed the language of this exemption, as follows: "Service trucks with mobile lifting devices designed specifically for use in the power line and electric service industries or handling associated materials."</p>
<p>We urge the Department to work with the Legislature to exempt from these regulations all truck-mounted cranes that are five-ton or smaller capacity. These types of cranes are used almost exclusively for simple lifting tasks on and off of mobile vehicles and are becoming more and more common in our industry and many other</p>	<p>This request would require a legislative amendment of the statute, which does not currently allow the department to exempt cranes of 5 tons or less from the requirements of this rule.</p>

<p>industries because of the increasing recognition of the need to protect employees from ergonomic injuries. Many other states, including California, Hawaii, Montana, New Jersey, West Virginia, New York, and Connecticut, have crane safety rules and have similar lower limits on the application of those rules. Rich Adams, PSE, Seattle</p>	<p>However, the department has amended the operator hour requirements set forth in Table 1 of WAC 296-155-53300 to include an additional category for cranes with a capacity of 5 tons or less to require 8 hours of actual experience and 16 hours of related experience. In addition, in accordance with CDAC (proposed § 1926.1441) and ASME, the department has amended the rule language to exempt cranes with capacity of 2,000 pounds or less from the operator certification requirements.</p>
<p>In reference to the definition of -- under the exemptions, I would ask that you consider telecommunications industries to be exempt, as you did the electrical industry. Also, the five-ton exemption would be also something I think would make a lot of sense. Dan Scarvie, Qwest, Seattle</p>	<p>This request would require a legislative amendment of the statute, which does not currently allow the department to exempt cranes of 5 tons or less or the telecommunications industry from the requirements of this rule.</p> <p>However, the department has amended the operator hour requirements set forth in Table 1 of WAC 296-155-53300 to include an additional category for cranes with a capacity of 5 tons or less to require 8 hours of actual experience and 16 hours of related experience. In addition, in accordance with CDAC (proposed § 1926.1441) and ASME, the department has amended the rule language to exempt cranes with capacity of 2,000 pounds or less from the operator certification requirements.</p>
<p>I understand that cranes are exempt as long as they are in or on the powerhouse proper. And I would submit that work that is being done on the dam itself is all supportive of the electric generation</p>	<p>No change was made to the proposed rule based on this comment.</p>

<p>process that comes out of that powerhouse and extends to the adjacent switchyard, which is generally close to a dam anyway, within close proximity. So that would be our comment, that all of that work that is done in those areas is the same as it would be in the powerhouse.</p> <p>Tom Treat, Chelan PUD, Seattle</p>	<p>The exemptions for occasional or routine maintenance and repair work set forth in WAC 296-155-52900(2)(r) and (s) were adopted by the legislature in ESHB 2171 and RCW 49.17.410 and do not exempt cranes in power houses if these cranes are engaged in construction activities beyond occasional or routine maintenance and repair.</p>
<p>Automotive wreckers and tow trucks, when performing maintenance operations, and service trucks with booms for digging and augering when performing electrical or utility work are exempted. However, this rule applies to small truck-mounted cranes with a less than a five-ton capacity. Thus, the relatively small pieces of equipment that we use to achieve ergonomic advances that protect employees from lifting-related injuries now require the same level of certification as cranes with capacities well in excess of 300 tons. We believe this equipment should be exempt.</p> <p>Mandi Kime, AGC, Tumwater</p>	<p>This request would require a legislative amendment of the statute, which does not currently allow the department to exempt cranes of 5 tons or less from the requirements of this rule.</p> <p>However, the department has amended the operator hour requirements set forth in Table 1 of WAC 296-155-53300 to include an additional category for cranes with a capacity of 5 tons or less to require 8 hours of actual experience and 16 hours of related experience. In addition, in accordance with CDAC (proposed § 1926.1441) and ASME, the department has amended the rule language to exempt cranes with capacity of 2,000 pounds or less from the operator certification requirements.</p>
<p>It appears that the only new exemption is for manually rotated booms. But we've found that there are many automatically rotated booms on trucks in this state that are no larger or more dangerous than the manually rotated booms. We request that you revisit this issue with the Legislature and possibly define these booms with a small capacity as lifting devices or material handling equipment, or exempt equipment such as this with capacities less than 1,000 pounds.</p>	<p>This request would require a legislative amendment of the statute, which does not currently allow the department to exempt cranes of 5 tons or less from the requirements of this rule.</p> <p>However, the department has amended the operator hour requirements set forth in Table 1 of WAC 296-155-53300 to include an additional category for cranes with a capacity of 5</p>

<p>Mandi Kime, AGC, Tumwater</p>	<p>tons or less to require 8 hours of actual experience and 16 hours of related experience. In addition, in accordance with CDAC (proposed § 1926.1441) and ASME, the department has amended the rule language to exempt cranes with capacity of 2,000 pounds or less from the operator certification requirements.</p>
<p>Tacoma Power also supports excluding cranes of five tons or less from these rules. Jim Boyd, Tacoma Power, Tumwater</p>	<p>This request would require a legislative amendment of the statute, which does not currently allow the department to exempt cranes of 5 tons or less from the requirements of this rule.</p> <p>However, the department has amended the operator hour requirements set forth in Table 1 of WAC 296-155-53300 to include an additional category for cranes with a capacity of 5 tons or less to require 8 hours of actual experience and 16 hours of related experience. In addition, in accordance with CDAC (proposed § 1926.1441) and ASME, the department has amended the rule language to exempt cranes with capacity of 2,000 pounds or less from the operator certification requirements.</p>
<p>When we look at the proposed WACs as they're set up right now under the first section here on exemptions, we have some difficulty here with the wording because it is so short, and it's not descriptive enough to really entail the drilling world as far as rigs and what they actually do. Item K, "Dedicated drilling rigs," stops at that particular point. It doesn't describe -- what we'd like to have is words added to the effect of "including well pump pulling vehicle applications for</p>	<p>The department has amended the rule language based on this comment. We added a definition of "Dedicated drilling rig" to read "A dedicated drilling rig is a machine which creates boreholes and/or shafts in the ground and does not meet the definition of a crane."</p>

<p>lifting and lowering well pumps as well as related industry products and equipment." And what we want to do is have you keep in mind that if something is lost as far a load in that application, it's going to drop right down that hole. It's not going to create a problem as far as tower cranes in Bellevue and so on. But that verbiage needs to be added in there to clarify this. You're probably going to receive some letters as well from the drilling community throughout the state. It just needs more embellishment.</p> <p>Tumwater, Glen Smith, Washington State Ground Water Assoc., Lobbyist</p>	
<p>The Department of L&I came to the EUSAC committee and asked for representatives from both labor and management to serve on the crane stakeholder committee to help the department in writing the proposed regulations. The department understood what the electric industries concerns were in the Engrossed substitute House Bill 2171 regarding crane safety. This bill did not describe the full context of the work our industry incorporates in the generation, distribution, and transmission of electrical power. Specifically, the bill had an exemption for our industry as described here: Service trucks with mobile lifting devices designed specifically for use in the power line and electric service industries, such as digger derricks (radical 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.</p> <p>The industry's immediate concern with this wording was that L&I told us they had to interpret this law as written, which would mean that the line crew setting a pole would be exempt from this rule, but when that same crew after setting the pole later uses the same boom to pick and place a padmount transformer, they would then need to</p>	<p>The department has amended the rule language based on this comment. Specifically, the department has changed the language of this exemption, as follows: "Service trucks with mobile lifting devices designed specifically for use in the power line and electric service industries or handling associated materials."</p>

<p>be certified crane operators. There were other concerns brought up in the EUSAC meetings regarding the Department’s interpretation of the words “powerhouses” and “occasional or routine maintenance and repair work.” This verbiage is found in Sec. 3 (p) & (q) of the house bill. Again our industry asked for an interpretation of these so that everyone would understand where the exemption started and ended.</p> <p>Through additional meetings between our industry and the Department, we have been told verbally that the exemption for service trucks would be interpreted to mean all work performed with these types of trucks would be exempt whether it was for overhead, underground, or substation work. The Department has even modified the actual wording in the proposed safety regulations to try to incorporate this interpretation, however, the proposed language still has the statement, “or handling associated materials to be installed or removed from utility poles.” They have expressed to us that they are not able to offer a more clarifying statement due to the fact they are not able to change the language of the law by rulemaking. Until the language in the bill is modified by the legislature, the Department is unable to make further modifications for clarity.</p> <p>Steve Neslund, Michaels Power, EUSAC, Clark PUD</p>	
<p>In closing, Michels is opposed to the requirement of including small material handling booms under 5 ton ratings within the scope of the proposed regulations. The current proposal only exempts small material handling booms without powered swing and/or boom up/down features from the regulation.</p> <p>House Bill 2171 did exempt some small material handling booms but only on “Mechanic’s truck with a hoisting device when used in activities related to equipment maintenance and repair.” All other</p>	<p>This request would require a legislative amendment of the statute, which does not currently allow the department to exempt cranes of 5 tons or less from the requirements of this rule.</p> <p>However, the department has amended the operator hour requirements set forth in Table 1 of WAC 296-155-53300 to include an additional category for cranes with a capacity of 5</p>

<p>work with these small booms would require the person operating it to be a certified crane operator by the NCCCO.</p> <p>We feel that employees operating these small material handling booms of less than 5 tons are already required to have training in their safe operating procedures and limitations, and must be knowledgeable in rigging equipment and procedures. In addition, employers have purchased a number of these smaller booms for their employees' use to prevent musculoskeletal injuries in the work place</p> <p>Steve Neslund, Michaels Power</p>	<p>tons or less to require 8 hours of actual experience and 16 hours of related experience. In addition, in accordance with CDAC (proposed § 1926.1441) and ASME, the department has amended the rule language to exempt cranes with capacity of 2,000 pounds or less from the operator certification requirements.</p>
<p>WAC 296-155-52902 Definitions</p>	
<p>Clarify the definition of "crane" to reference the exemptions in the scope of the rule.</p> <p>Commercial Industrial Roofing (4), Legacy Roofing (8), System Roofers Supply, Washington Alaska Roof Systems, Roofing Contractors Assoc., Crow Roofing & Sheet Metal, Wayne's Roofing, Meyer Brothers Roofing & Sheet Metal</p>	<p>No change was made to the proposed rules based on this comment.</p>
<p>After hearing most of the concerns of people in the industry, I think I would like to make it clear, a better definition of " CRANE "needs to be part of your description. I do not feel housing all cranes under one category is correct. A truck crane is not a tower crane. Hoist trucks that have cranes for that use are not "cranes". The economic & job fall out from this will be a great impact to a very slow & tough market today. Months and years from now will be impacted also. Please understand I'm not against safety, but this impact to small operators will be devastating. An example of this is , DOT has already enacted a rule concerning the transporting of any boom to be tied down to the truck every 10', now I ask you in a definition how is anyone suppose to tie or restrain a boom in the middle of a plastic or fiberglass cab? Thanks to the already words of change from the State</p>	<p>The department appreciates this comment. The department has amended WAC 296-155-52900(2) to include an additional exemption for pump hoists, as follows: "(t) Pump hoists with booms that do not rotate."</p> <p>Pump hoists that cannot horizontally move a suspended load are not considered to be a crane and therefore are exempt from this rule. Cranes that lift/lower pumps or other associated materials at construction sites are not exempt from this rule, unless they are listed in WAC 296-155-59200(2).</p>

<p>of Washington, my insurance has gone up \$445 this next quarter & at that rate will be an extra \$ 1780 per year for something I own that was purchased as a "PUMP HOIST". With this new rule I hope the "BIG BUSINESS OF THE STATE ", will be able to get there equipment into the little peoples back yards to provide the "staff for life " WATER. Harbor Pump</p>	
<p>Remove the definition of “fall protection equipment” but add the requirement that crane certifiers must meet the fall protection requirements of WAC 296-155 when applicable. Commercial Industrial Roofing (4), Legacy Roofing (8), System Roofers Supply, Washington Alaska Roof Systems, Roofing Contractors Assoc., Crow Roofing & Sheet Metal, Wayne’s Roofing, Meyer Brothers Roofing & Sheet Metal</p>	<p>No change was made to the proposed rules based on this comment. The rule has a reference for fall protection, it directs the accredited certifier to follow the requirements in chapter 296-155 WAC, Part C-1, this reference is located in WAC 296-155-53200(3).</p>
<p>Exempt “hand-operated hoists” from the requirements of this rule by exempting “hand-operated hoists” from the definition of “hoist” in this rule. Commercial Industrial Roofing (4), Legacy Roofing (8), System Roofers Supply, Washington Alaska Roof Systems, Roofing Contractors Assoc., Crow Roofing & Sheet Metal, Wayne’s Roofing, Meyer Brothers Roofing & Sheet Metal</p>	<p>No change was made to the proposed rules based on this comment. Hand-operated hoists are not considered cranes therefore they are exempt from this rule.</p>
<p>Clarify the definition of “qualified person” to be a person designated by the employer. Commercial Industrial Roofing (4), Legacy Roofing (8), System Roofers Supply, Washington Alaska Roof Systems, Roofing Contractors Assoc., Crow Roofing & Sheet Metal, Wayne’s Roofing, Meyer Brothers Roofing & Sheet Metal</p>	<p>No change was made to the proposed rules based on this comment. The definition of qualified person is the same definition throughout all of rules and also the industry consensus standards.</p>
<p>We submitted definitions to the Department for powerhouse</p>	<p>No change was made to the proposed rules based on this</p>

<p>occasional and routine maintenance for the Department to consider in the adoption of the proposed rules. The proposed rules do not contain or include our industry proposed definition. I respectfully urge and request the Department reconsider these in the final adoption stage.</p> <p>Dave Hutchins IBEW Local 77</p>	<p>comment.</p> <p>The department believes the definitions proposed for these terms consider the recommendations made by industry and ensure consistency with use of these terms in the NESC and standard use of these terms.</p>
<p>As an industry, we did, at the request of DOSH, Labor & Industries, provide definitions to you as relates to powerhouse and occasional routine maintenance as referenced in the regulations and rules. We would like to again extend to DOSH that they would use those industry defined terms, per your request from us, and make that happen.</p> <p>Kirk Hayfield, Avista, Yakima</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The department believes the definitions proposed for these terms consider the recommendations made by industry and ensure consistency with use of these terms in the NESC and standard use of these terms.</p>
<p>There were additional concerns voiced in the EUSAC meetings concerning the department’s interpretation of the words “powerhouses” and “occasional or routine maintenance and repair work”. Our industry asked for an interpretation of these so that everyone would understand where the exemption started and ended. In turn L&I asked the EUSAC crane committee representatives to provide them with definitions for “powerhouses” and “occasional or routine maintenance and repair work.” The EUSAC crane committee provided L&I with commonly used terms and L&I responded with language as inserted in the proposed rule. We have no major objection to this language.</p> <p>Clark PUD</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The department believes the definitions proposed for these terms consider the recommendations made by industry and ensure consistency with use of these terms in the NESC and standard use of these terms.</p>
<p>The Legislation also contains an exemption for occasional or routine maintenance and repair work for cranes used on-site in manufacturing facilities. It should be noted that the scope of the DOSH construction standard, WAC 296-155 includes separately (1) construction, (2) maintenance, and (3) repair work. Given these</p>	<p>No change was made to the proposed rule based on this comment.</p> <p>The exemptions for occasional or routine maintenance and repair work set forth in WAC 296-155-52900(2)(r) and (s)</p>

<p>three terms, it is clear the legislature intended for all three activities to be subject to an exemption in manufacturing facilities which explains the need for separate mention of these activities in RCW 49.17.400(4) and RCW 49.17.410(p) and (q). If the Department takes the position that any construction work performed by a crane inside a manufacturing facility subjects the activity to the crane rule, this would in effect force the employer to import and utilize mobile cranes for jobs which can be performed more safely by the regular general industry utilized crane. An unintended consequence of this posture is a reduction in safety not safety improvement. <u>Definition of Occasional or Routine Maintenance and Repair Work.</u></p> <p>The proposed definition of “occasional or routine maintenance” should be struck; it is in conflict with the legislative intent to exempt <u>occasional</u> maintenance and repair work.</p> <p>The proposed rule reads as follows:</p> <p style="padding-left: 40px;">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.</p> <p>WAC 296-155-52902. This definition expands the scope of the universe of regulated cranes/operators by narrowing the statutory exception for “occasional” maintenance and repair. The plain meaning of “occasional” as expressed in the Merriam-Webster’s Online Dictionary defines “occasional” as “encountered, occurring, appearing, or taken at irregular or infrequent intervals”. The ordinary meaning of occasional does not mean regular, customary and foreseeable. The definition should be struck.</p> <p>Boeing, Claude Golden & Aileen Yankowski</p>	<p>were adopted by the legislature in ESHB 2171 and RCW 49.17.410 and do not exempt cranes in manufacturing facilities if these cranes are engaged in construction activities beyond occasional or routine maintenance and repair.</p>
<p>We request that the Department clarify that "associated equipment</p>	<p>No change was made to the proposed rules based on this</p>

<p>required for the operation of the plant" within the definition of powerhouses includes substations, related systems, auxiliaries, and facilities. The result of this clarification would provide certainty for the way in which utilities are allowed to maintain powerhouse facilities necessary for operation, such as fish hatcheries, ladders, passageways, and rearing facilities or dams and spillways. While it is the Company's current understanding that these systems are included within the definition of powerhouses, the Company requests that the Department confirm this interpretation.</p> <p>Chris Meyers, PacifiCorp</p>	<p>comment.</p> <p>The department believes the definitions proposed for these terms consider the recommendations made by industry and ensure consistency with use of these terms in the NESC and standard use of these terms.</p>
<p>It is significant to general industry employers who utilize cranes for general industry work that the rules give effect to the legislative intent that cranes used in manufacturing facilities are not subject to this rulemaking, even if a crane is also used for construction in the manufacturing facility. To carry out this clear legislative intent, it is important that the 2007 crane legislation statutory definition of construction be carried forth in the rule.</p> <p>The 2007 crane legislation defined construction as follows:</p> <p>RCW 49.17.400 -Construction crane safety — Definitions. (Effective January 1, 2010.) (4) "Construction" means all or any part of excavation, construction, erection, alteration, repair, demolition, and dismantling of buildings and other structures and all related operations; the excavation, construction, alteration, and repair of sewers, trenches, caissons, conduits, pipelines, roads, and all related operations; the moving of buildings and other structures, and the construction, alteration, repair, or removal of wharfs, docks, bridges, culverts, trestles, piers, abutments, or any other related construction, alteration, repair, or removal work.</p> <p>"Construction" does not include manufacturing facilities</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The exemptions for occasional or routine maintenance and repair work set forth in WAC 296-155-52900(2)(r) and (s) were adopted by the legislature in ESHB 2171 and RCW 49.17.410 and do not exempt cranes in power houses or manufacturing facilities if these cranes are engaged in construction activities beyond occasional or routine maintenance and repair.</p>

or powerhouses.

The proposed rule at WAC 296-155-52902 Definitions, is missing this important definition. It is significant that the Legislature did not simply adopt the existing definition of construction appearing at WAC 296-155-012, but instead borrowed the definition from WAC 296-155-012 and **added to it** for the crane legislation by specifically excluding construction in manufacturing facilities. The Legislature did not add this to the Washington Safety and Health Act definition section RCW 49.17.020 indicating a clear intent to create a requirement specific to crane use.

The differences in the two definitions are shown as follows with additions and strikethroughs showing the 2007 crane legislation changes:

WAC 296-155-012 "Construction ~~work~~" ~~shall mean and include~~ all or any part of excavation, construction, erection, alteration, repair, demolition, and dismantling, of buildings and other structures and all related operations ~~in connection therewith~~; the excavation, construction, alteration and repair of sewers, trenches, caissons, conduits, pipe lines, roads and all related operations ~~pertaining thereto~~; the moving of buildings and other structures, and ~~to~~ the construction, alteration, repair, or removal of wharfs, docks, bridges, culverts, trestles, piers, abutments or any other related construction, alteration, repair or removal work ~~related thereto~~. "Construction" does not include manufacturing facilities or powerhouses.

Boeing, Claude Golden & Aileen Yankowski

I wasn't able to find the definition of "construction activity" under the WAC section that we're dealing with, but the RCW Section

This request would require a legislative amendment of the statute, which does not currently allow the department to

<p>49.217.400 does have some construction definitions, although there's some vague nomenclature or language, you know, "and all related operations." I urge all the state agencies related to these rulings to try to be more specific in regards to material handling, material deliveries, maybe from suppliers who all they're doing is dropping off materials. They're not performing any construction activities. And I also support the gentleman from PSE in the five-ton exemption, because some of these things could be interpreted many ways, and I'd hate to have it go the wrong way because someone thought they were exempt and they were really not exempt. Sean Sullivan, Poppleton Electric & Machinery Co., Seattle,</p>	<p>exempt cranes of 5 tons or less from the requirements of this rule.</p> <p>However, the department has amended the operator hour requirements set forth in Table 1 of WAC 296-155-53300 to include an additional category for cranes with a capacity of 5 tons or less to require 8 hours of actual experience and 16 hours of related experience. In addition, in accordance with CDAC (proposed § 1926.1441) and ASME, the department has amended the rule language to exempt cranes with capacity of 2,000 pounds or less from the operator certification requirements.</p>
<p>The Department also asked the EUSAC crane committee representative to provide them with what the words "powerhouses" and "occasional or routine maintenance and repair" meant to members of the electric industry. The EUSAC crane committee provided in writing what these mean to us, but have only heard back verbally that the Department was not in agreement and would be sending us a counter proposal. Steve Neslund, Michaels Power</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The department believes the definitions proposed for these terms consider the recommendations made by industry and ensure consistency with use of these terms in the NESC and standard use of these terms.</p>
<p>WAC 296-155-53100 Accreditation of crane certifiers of cranes and derricks - requirements</p>	
<p>I am in opposition to the fact that this chapter allows in-house crane certification by the owner, owner's representative or employees, leaser and/or end user of a construction crane, provided that they can meet the accredited crane certifier's standards. To my knowledge nowhere in any state or federal regulation is the owner, owner's representative or employees, leaser or end user allowed to certify their own work or equipment, this would create a conflict of</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>During development of ESHB 2171, exclusive third party certification was considered as an option and rejected. As adopted and enacted, ESHB 2171 and RCW 49.17.400-440 allow an employer to conduct internal crane certifications.</p>

<p>interest. Examples would be: an electrician inspecting their own installation, elevator mechanic inspecting their own installation, building contractor inspecting the building they built, owners of all the above inspecting their own property for a permit of occupancy. As a US Department of Labor OSHA Maritime and Washington State Department of Labor and Industries Maritime accredited crane inspector, owner of a crane inspection company for the past twenty-plus years, in-house certification by a crane owner, owner's representative or employees, leaser or end user is not allowed under either state or federal codes. I can find no reason why the construction industry should be held to a lesser standard. WAC 296-155-53100(4) states "No person that 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 within the same certification period." This code is self-explanatory; it only prevents the person who has performed the actual work from certifying his own work. It does not prevent in-house certification as another certifier with the same company could perform the certification. I believe the legislator's intent was to promote a more safe condition and operation of cranes used in the construction industry. By allowing in-house crane inspections I believe we are taking away the check and balance. To coin an old phrase; "Leaving the fox to guard the hen house". Paul Parish, Certifier</p>	<p>To ensure credibility of this process, the department requires in these rules that the employer certifier successfully complete the certification process, including passing of written examinations and prohibits an individual from certifying a crane on which he/she has modified, altered or repaired a load sustaining member of the crane from performing the annual certification within the same certification period as the work was performed.</p>
<p>WAC 296-155-53102 Accreditation—Application form and applicant qualifications</p>	
<p>The Department alone may decide whether an inspector can be certified to inspect cranes in this state. The Department reserves the right to deny licensing to anyone; however, there are no provisions that we were able to locate within the draft for the applicant to</p>	<p>The department did not make a change to the rule based on this comment. Individuals who are denied accreditation may informally request reconsideration and/or rationale for the denial from the department.</p>

<p>appeal the Department's decision to a third party to deny credentials. So basically the Department is creating a system that we feel preferential treatment could exist. Unapproved parties would simply have no recourse, thus potentially hampering business or professional opportunities for inspector hopefuls. We do, however, support the inclusion of an appeals process. Mandi Kime, AGC, Tumwater</p>	
<p>WAC 296-155-53108 Duration and Renewal of an Accreditation</p>	
<p>When we're talking about the duration and renewal for accreditation, we're talking 21 cranes. The 21 cranes, does that mean 21 different cranes? Does that mean over a period of three years, I have seven, I do it three times, or if we're in a severe duty situation and four cranes we use twice a year, is also cranes --is that any cranes that's covered -- not covered under this such as powerhouse cranes? It just says 21 cranes. So clarification. Gary Lentsch, Chelan PUD, Spokane</p>	<p>The department made an amendment to this section for clarity. WAC 296-155-53108 does not require 21 certification inspections of 21 different cranes. Providing the certifier has conducted 21 certification inspections, the certifier will meet the requirements of this rule. The department has amended the language to clarify that the requirement is to perform 21 certification inspections.</p>
<p>WAC 296-155-53110 Revocation or suspension of an accreditation</p>	
<p>Add the following: "Issuing an annual certification before all safety deficiencies on the crane have been corrected and re-inspected" and "A hefty financial fine should also be imposed for each infraction". John Stelfox, Operator</p>	<p>No change was made to the proposed rules based on this comment. WAC 296-155-53110(1)(j) and (k) cover this issue.</p>
<p>WAC 296-155-53200 General Inspection Criteria, Wire Rope Inspection and Removal Criteria, and Pre-Proof Load Test Requirements for all Cranes.</p>	
<p>The point I want to speak to is in the crane certifier proposal, which is Section 296-155-53200. Under Subsection 4 "General," we have the standards to take sheaves and ropes out of service when they're</p>	<p>The department agrees with this comment and amended the language in WAC 296-155-53200(6) to read as follows; “(6) Sheaves.</p>

<p>failing, but we fail to have pulled into here the industry standard out of ASME on what sheaves and ropes need to meet to go into service. And it seems that it could be -- I mean, if we're taking them out, but we don't know what the standard is going in, that seems to be a mutually exclusive section. And I don't believe this is a major modification to the WAC as written, because it would come out of ASME, which is recognized industry standard, but what we would do is have it in one place. We wouldn't have to go over to the ASME standard to see what to bring it into service and look at the WAC on what to take it out of service.</p> <p>James Hopkins, Sickelsteel, Spokane</p>	<p>(a) Sheave grooves must be free from surface defects that could damage the rope. The cross-sectional radius at the bottom of the groove should be such as to form a close fitting saddle for the size of rope used. The sides of the groove must be tapered outward and rounded at the rim to facilitate entrance of the rope into the groove. Flange rims must run true about the axis of rotation.</p> <p>(b) Sheave guards must be in place to:</p> <ul style="list-style-type: none"> (i) Guide the rope back into the sheave groove, when using ropes that can be momentarily unloaded. (ii) Prevent ropes from becoming fouled when the block is lying on the ground with loose ropes. <p>(c) Sheave bearings, except for permanently lubricated ones, must have a means of lubrication.”</p>
<p>The wire rope inspection requirement unnecessarily exceeds industry standards. The final rule should not exceed industry standards.</p> <p>The proposed rule requires:</p> <p>296-155-53200 – General inspection criteria, wire rope inspection and removal criteria, and pre-proof load test requirements for all cranes.</p> <p>(5) Wire rope.</p> <p>(a) 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</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The industry standards for all cranes mention require no less than two full wraps on the drum during operation. The industry standard also states that during periodic inspections “This inspection shall cover the entire length of the rope”. This rule is addressing inspection of wire rope by the accredited certifier, he/she is to inspect the working range plus three additional wraps on the drum of the wire rope.</p>

<p>located in this section, including Table 1.</p> <p>(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.</p> <p>29 CFR 1910.179 (h)(2)(iii)(a), CMAA 70 and the ANSI/ASME B30.2, B30.5, B30.7, B30.11, B30.16, B30.17 only require 2 wraps remaining on the drum with the hook at its lowest point. Requiring 3 wraps could potentially result in the need to modify existing hoists to accommodate more rope. This requirement would add cost and disruption to operations without added benefit or safety.</p> <p>Boeing, Claude Golden & Aileen Yankowski</p>	
<p>On page 15 of the draft there are typos in the table that causes it not to match the ASME standards that are referenced. So we'd request that you make those alterations so that it matches ASME.</p> <p>Mandi Kime, AGC, Tumwater</p>	<p>The department agrees and made amendments to the wire rope table.</p>
<p>WAC 296-155-53202 Additional Inspection Criteria and Proof Load Testing – Mobile Cranes</p>	
<p>RCW 49.17.420(1)(c) requires DOSH to adopt rules for crane certification. In particular paragraph (c) states</p> <p>(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;</p> <p>The statutory language does not require that load proof test requirements exceed industry standards. As an approach, the load</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The rule only require on rubber load testing only if the crane will be used in that configuration. This testing is required to look at components that would not be tested and inspected while in the outrigger configuration.</p>

<p>proof tests requirements should not exceed recognized industry standards, set forth in ASME B30 series.</p> <p>An example is WAC 296-155-53202(4)(d) Free rated load test ("on rubber"). B30.5 does not specifically call for a free rated load test on rubber. This test would be performed in the cranes most unstable configuration (on-rubber) at 100% of its rated capacity (on-rubber) through a full range of motion. Considering this test is not recommended by the B30.5, and without very specific controls being required to ensure a safe test, performing this could create an unsafe condition and would introduce more risk than benefit.</p> <p>Boeing, Claude Golden & Aileen Yankowski</p>	
<p>WAC 296-155-53202(1)(v) – Add “propane heaters”.</p> <p>John Stelfox, Operator</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>This issue is more appropriately addressed in Phase II rulemaking in the frequent and periodic inspection requirements.</p>
<p>WAC 296-155-53202(1)(ff) – If a third of the operators seat cushion is worn down or missing due to wear of the operator sliding in and out of the seat causing the operators back to go out, is this considered unusable?</p> <p>John Stelfox, Operator</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>This issue is more appropriately addressed in Phase II rulemaking in the frequent and periodic inspection requirements.</p>
<p>WAC 296-155-53202(1)(hh) – Does this include attached by #9 wire?</p> <p>John Stelfox, Operator</p>	<p>No change was made to the proposed rules based on this comment. The rule currently would cover this situation.</p>
<p>WAC 296-155-53206 Additional Inspection Criteria and Proof Load Testing - Tower Cranes</p>	
<p>As I look at the section -- I'm looking at page 20 to the new Section 296-155-53206, Paragraph --Subparagraph 3. And it talks about</p>	<p>No change was made to the proposed rules based on this comment.</p>

professional engineer -- "an independent registered professional structural engineer should review and acknowledge as acceptable to base." That's great, but there's a gap that's missing. And that gap is that when you look -- I assume that means they're looking for a design, they're looking at something. There's no way for the engineer to know that that's actually going to be built exactly that way out in the field. So there would be two very helpful provisions that would close that gap. The first would be that, if you look in the building code, there's definitions for special inspectors. Anything that is a nonstandard base should have special inspectors look at it: the welds, the bolts, the member sizes, the materials that is used. So I would advocate you include a special inspection requirement of that base. Right now there's no inspection requirement for the base to make sure that what you looked is in fact what was built. The second thing is I think that -- and I don't know what term you used, whether it's the accredited certifier or a contractor. Someone should be required to hire that engineer to go out to the job site to look to make sure what was actually put up was in fact consistent with their design. There is no requirement for that now. Now, on the building side, when engineers are doing buildings, particularly in seismic zones, the building code says that the owner must retain the engineer to go out and look at what was actually built. You have a little bit of a gap here because there is no requirement for the designer to look at it. There's no requirement to hire the designer to do that. And if there's no requirement, they may not do it. They may or may not do it. So with those two things, I think that inspections, special inspections of what is actually built, and then a requirement that whoever is in charge hires that same engineer to go out and verify that it's consistent with what they thought was going to be there, that that would close that particular gap in the regulations.

These are issues more appropriately addressed between the RPE and the employer/contractor during the contract negotiations.

Jon Magnussen, PE, Seattle	
WAC 296-155-53300 Crane Operator Qualifications and Certification	
<p>I support the crane safety legislation presently being drafted by the state. We need strong crane rules not the watered down version that is now starting to show up in the draft stage. I am shocked that small telescopic boom cranes will only require 40 hours of actual crane experience for cranes 15 tons and above, and even worse, the cranes under 15 tons will require only 20 hours. Smaller cranes are subjected to more dangerous picks than the larger cranes and thus need better qualified operators. The large telescopic boom cranes for 40 tons and under will only require 40 hours, and this category of cranes is also equally abused. I would like to point out that near misses are under reported, and if the state only knew how much really goes wrong, you would want more qualifications.</p> <p>Janet McKinney, Operator</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The operator experience requirements were developed in conjunction with industry and labor representatives from the small stakeholder group, which felt the level of hours set forth in Table 1, WAC 296-155-53300, were appropriate. Further, in addition to showing proof of hours of experience, operators will be required to obtain a valid operator certificate for the type(s) of crane(s) he/she wishes to operate. The department believes that the two requirements will be sufficient to establish operator qualification.</p>
<p>The number one and foremost issue should be a training requirement for the smaller cranes. These pieces of equipment are the most abused and I know if you will look into your records that there are more accidents and fatalities connected with them than any other. I feel that the requirement should be a minimum of 1000 hrs before certification is given. These small cranes are so over used in ways that they were not designed for that I feel LNI would be grossly negligent in allowing people with limited experience to think that they could hop in one and start using it to maximum capacity.</p> <p>A simple test for you and your agency would be to take some one from your office, someone who has never been exposed to these small cranes, and have them operate the equipment with the minimum requirements which are proposed. I think you will agree that more training is required.</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The operator experience requirements were developed in conjunction with industry and labor representatives from the small stakeholder group, which felt the level of hours set forth in Table 1, WAC 296-155-53300, were appropriate. Further, in addition to showing proof of hours of experience, operators will be required to obtain a valid operator certificate for the type(s) of crane(s) he/she wishes to operate. The department believes that the two requirements will be sufficient to establish operator qualification.</p>

<p>Small crane operators must learn the equipment and demonstrate a proficient level of operation to achieve certification, this would keep them and the people around them out of harms way. Dan Madden, Operator</p>	
<p>We need qualified operators to operate cranes, and you will not get qualified operators by reducing the number of hours of actual and related crane experience required. You cannot learn to operate a crane safely with only 20 to 40 hours of actual crane time nor with only 20 to 40 hours of related experience. If you allow people to operate a crane legally with only 20 to 40 hours of seat time and related experience, we are setting ourselves up for more accidents not less. I urge you not to let anyone, especially some contractors who are more interested in profit then they are in safety, to influence the process by their arguments to reduce qualifications. Janet McKinney, Operator</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The operator experience requirements were developed in conjunction with industry and labor representatives from the small stakeholder group, which felt the level of hours set forth in Table 1, WAC 296-155-53300, were appropriate. Further, in addition to showing proof of hours of experience, operators will be required to obtain a valid operator certificate for the type(s) of crane(s) he/she wishes to operate. The department believes that the two requirements will be sufficient to establish operator qualification.</p>
<p>Our concern is with Table 1, the definition of fixed cab telescopic boom cranes. Our concern is with the service truck units without hydraulic stabilizers. Our belief is that it is not practical nor the intent of the rule to include these units with fixed-cab cranes. These units are used to handle equipment and supplies in the field, minimizing manual material handling by employees. Under the proposed rule, operators of these small cranes will require 40 hours of training, drug testing and a nationally administered written and practical test every five years. The proposed criteria define fixed cab telescopic boom cranes by capacity, with no lower limit. Using these criteria, the City of Everett Public Works Department has 5 distinct styles of crane that fall into this operator training requirement, totaling 23 units. These units have been used for at least 15 years in our utility, similar to tailgate lifts, with no incidents of injury or</p>	<p>This request would require a legislative amendment of the statute, which does not currently allow the department to exempt cranes of 5 tons or less from the requirements of this rule.</p> <p>However, the department has amended the operator hour requirements set forth in Table 1 of WAC 296-155-53300 to include an additional category for cranes with a capacity of 5 tons or less to require 8 hours of actual experience and 16 hours of related experience. In addition, in accordance with CDAC (proposed § 1926.1441) and ASME, the department has amended the rule language to exempt cranes with capacity of 2,000 pounds or less from the operator certification requirements.</p>

<p>property damage. They are inspected annually and installed in accordance with manufacturers' specifications for vehicle stability. (Photos and Table provided) Megan Munro, Everett Public Works</p>	
<p>Crane operators should be held to a high standard, which includes the NCCCO written and practical test for Mobile Crane Operators. We assume we will use NCCCO materials, examiners and certification to meet the proposed operator rules. The written exam includes core and specialty areas appropriate and valuable to our boom truck operators. The practical exam has four tasks, in addition to Pre-Test Briefing, a Pre-Test Familiarization Period, and a Pre-Task Familiarization Period. However, this material is excessive to only operate a simple service crane. We have 113 employees who may use these service truck units to assist in routine duties. Conservatively, the impact to comply would include:</p> <ul style="list-style-type: none"> • 40 hours documented training time = \$102,628 (Average hourly rate per job class) x (employees in each class) • 56 substance abuse tests for employees not currently tested = \$4480 • 3rd party written/practical test = \$1000 (from WRRC website) Not including any test-related expenses; 5 year renewal <p>A truck-mounted crane as an accessory is substantially different from a truck chassis that serves as a crane platform (boom truck). If Table 1 were modified to differentiate between fixed cab units with or without hydraulic stabilizers, this could provide a useful segregation. Other possibilities are boom length, crane capacity or creation of another certification category to include small accessory cranes. Megan Munro, Everett Public Works</p>	<p>The department appreciates this comment. This suggested change would require a legislative change. The department is considering a legislative proposal for introduction during the 2009 legislative session. This will include review of Option 2 – Qualification by an audited employer program – from the CDAC proposal, §1926.1427(c), be included as a certification option under RCW 49.17.430, which allows an employer to development an operator certification program.</p>
<p>I have a problem with respect to the hours that you have on the</p>	<p>No change was made to the proposed rules based on this</p>

<p>lower rated cranes. I'm just going to say 20 tons and under. If you look back through your history and you look at truck cranes and the number of accidents that have occurred with truck cranes, it seems to me that I would look at a lot more stringent requirement for folks who are operating truck cranes from 20 tons and below, because most of these cranes do not have the computer technology or anything else. They don't have the load limits like the other cranes do. And they get people on there that don't have the qualifications, the experience and background, and 20 or 40 hours or even 50 hours or even 100 hours is pretty slim. Because if you look at the number of truck cranes right now that are on the roads, the number of employers that utilize truck cranes, the number of problems that they have with unqualified operators, then I think maybe you should reconsider the number of hours that you have initially stipulated here as the minimums.</p> <p>Ron Knight, Retired Operator, Yakima</p>	<p>comment.</p> <p>The operator experience requirements were developed in conjunction with industry and labor representatives from the small stakeholder group, which felt the level of hours set forth in Table 1, WAC 296-155-53300, were appropriate. Further, in addition to showing proof of hours of experience, operators will be required to obtain a valid operator certificate for the type(s) of crane(s) he/she wishes to operate. The department believes that the two requirements will be sufficient to establish operator qualification.</p>
<p>We are in favor of training and certification. We have no problem with that. We do feel that during this legislative process a lot of discussion and reference was made to the C-DAC document. And in that C-DAC document, which was a consensus-type document, there is multiple options on how to go about certifying crane operators. I would like to see the State do that.</p> <p>Kirk Hayfield, Avista, Yakima, EUSAC</p>	<p>The department appreciates this comment. This suggested change would require a legislative change. The department is considering a legislative proposal for introduction during the 2009 legislative session. This will include review of Option 2 – Qualification by an audited employer program – from the CDAC proposal, §1926.1427(c), be included as a certification option under RCW 49.17.430, which allows an employer to develop an operator certification program.</p>
<p>As an electrical industry, we do work within that ten-foot distance where the other people, the other crafts in this room are not allowed to work. That's our area. That is an area that has extreme hazards. Our people are trained on those hazards. Inside that ten-foot barrier is no time for speed. The crane operator certification process at the</p>	<p>The department appreciates this comment. This suggested change would require a legislative change. The department is considering a legislative proposal for introduction during the 2009 legislative session. This will include review of Option 2 – Qualification by an audited employer program – from the</p>

<p>NCCCO, the single-source requires is based on a speed-type practical exam. I don't believe that ten-foot area is where we need to see speed in the operation of our cranes. We do train our people on the specific hazards, on specific grounding types of stuff and potentials and expedient zones that would need to be built to protect not only our people in the air but on the ground in lattice booms, and that includes maybe insulating or isolating equipment. We do have industry-specific vocabulary and hand signals due to the nature of our work. A lot of crews will use single-hand, one-hand signal instead of a two-hand national crane recognized signal. And these are understood not only at the crew level but throughout the industry.</p> <p>Kirk Hayfield, Avista, Yakima</p>	<p>CDAC proposal, §1926.1427(c), be included as a certification option under RCW 49.17.430, which allows an employer to development an operator certification program.</p>
<p>From Avista Corporation, we are opposed to having no small limit on the material handler booms. Most states that looked at -- I believe there's only out of all the states that currently have crane legislation, they all, except for one that I know of, have limitations, small size up to five tons seems to be the requirement that five ton and lower on the material handler booms on our small trucks are exempt from this rule. And I would like to see -- as Avista, I would like to see that the State entertain that and bring that into this program. We have implemented a lot of these smaller booms for ergonomic purposes. These are designed for moving material, small material. They're not designed for construction work. I would like to see that exemption added. And I think we can do that through request of legislative changes.</p> <p>Kirk Hayfield, Avista, Yakima</p>	<p>This request would require a legislative amendment of the statute, which does not currently allow the department to exempt cranes of 5 tons or less from the requirements of this rule.</p> <p>However, the department has amended the operator hour requirements set forth in Table 1 of WAC 296-155-53300 to include an additional category for cranes with a capacity of 5 tons or less to require 8 hours of actual experience and 16 hours of related experience. In addition, in accordance with CDAC (proposed § 1926.1441) and ASME, the department has amended the rule language to exempt cranes with capacity of 2,000 pounds or less from the operator certification requirements.</p>
<p>I do believe that in some of the -- as to echo a few others today, the</p>	<p>No change was made to the proposed rules based on this</p>

<p>small hour requirements on the small cranes is inadequate. 20 hours is basically enough to get someone just through the butterflies. I think that needs to be bumped up to, I'd like to see it 100. Gary Orsborn, Crane Instructor/Operating Engineer Regional Training Center, Yakima</p>	<p>comment. The operator experience requirements were developed in conjunction with industry and labor representatives from the small stakeholder group, which felt the level of hours set forth in Table 1, WAC 296-155-53300, were appropriate. Further, in addition to showing proof of hours of experience, operators will be required to obtain a valid operator certificate for the type(s) of crane(s) he/she wishes to operate. The department believes that the two requirements will be sufficient to establish operator qualification.</p>
<p>I think the hours for crane operators, like everybody else has stated, needs to come up a little bit. Like Gary, I worked at the training school. I did the practical training. We would get people for two weeks and we'd split it up 80 hours. I'd get 40 in the field, and he'd get 40 in the classroom. And at the end of 40 hours, a person with no basic skills of a crane is dangerous. They start to build a little bit of confidence. They begin to learn a little bit about the crane. But you have no time to teach a person how to set up a crane. And like Gary said, how to study the load charts and actually what you're doing. The person requires an apprenticeship program that goes for four years. But 20 hours in a boom truck is no time at all. Dan Jerald, Operator and Certifier, Yakima</p>	<p>No change was made to the proposed rules based on this comment. The operator experience requirements were developed in conjunction with industry and labor representatives from the small stakeholder group, which felt the level of hours set forth in Table 1, WAC 296-155-53300, were appropriate. Further, in addition to showing proof of hours of experience, operators will be required to obtain a valid operator certificate for the type(s) of crane(s) he/she wishes to operate. The department believes that the two requirements will be sufficient to establish operator qualification.</p>
<p>And the second -- or the third question comes into as far as operators are concerned. And what raises this particular issue is I just got a questionnaire from Alaska on Monday. And Alaska is thinking about doing some sort of certification program as well. And I think in that letter they said there were 12 or 15 other states that are looking at certification requirements. The question I've got, then, have we also looked at the interstate issue of other operators coming into</p>	<p>The department has made a change to the rule based on this comment. NCCCO is a nationally recognized accredited testing agency. Washington State will have an hours of experience requirement which other states may or may not have and operators will need to demonstrate that they possess the</p>

<p>Washington as well as operators from Washington going to other states? Once we get into this situation, and I can see a couple of years up the road, if we've got our requirements and Idaho has their requirements or somebody else does and they come here, well, sorry, you don't measure up to our expectation. You can't run a crane here, versus the same thing occurring someplace else. So I think that before -- or at least some time in the next year before this comes into play, we need to at least get some idea of what's going to happen when our operators go elsewhere, or we have other qualified operators coming in here. Just some things to think about and have -- at least have in place before we kick the football off and make sure and start the game, in a sense.</p> <p>Jay Meyers, Spokane</p>	<p>required number of hours of experience to operate cranes in Washington. However, the department has added a note to WAC 296-155-53300 to allow employers to accept declarations from out of state operators attesting the operator has the required hours of experience for the category of crane(s) he/she will be operating in Washington.</p>
<p>I'm in the rental business, and is it going to be a requirement of the rental companies throughout the state, whether it's us or whether it's someone else, is it going to be a requirement for us to witness the fact that this individual has a license to operate that crane before we -- before we rent it to him, or are we in any way going to be held, or is that -- is that the responsibility of the contractor? He sends somebody down there to pick up a boom truck from me. Do I care one way or the other, or is that something that's going to be a burden on the rental companies themselves?</p> <p>Gary Neal, Coast Crane, Spokane</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>It is the responsibility of the operator's employer to ensure that the operator meets the qualification requirements of this rule.</p>
<p>WAC 296-155-53300 extends the statutory reach of the crane operator qualification/certification requirements by applying the requirements to all cranes regulated under 296-155 Part L [Cranes, Derricks, Hoists, Elevators, and Conveyors Chapter 296-155 - Part L] instead of limiting the requirements to those cranes covered by the 2007 legislation.</p> <p>The proposed WAC provision provides:</p>	<p>No change was made to the proposed rules based on this comment.</p>

<p>WAC 296-155-53300 Operator qualifications and certification.</p> <p>(1) Prior to operating any crane covered under chapter 296-155, 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:...</p> <p>The cranes covered by the crane operator qualification and certification are not the whole of 296-155 Part L, but rather the cranes covered by RCW 49.17.400 – 440. To fix this overly broad scope, the regulation should either reference the statute, or reference WAC 296-155-52900 Scope, or repeat the scope stated in proposed WAC 296-155-52900 and add the definition of construction in WAC 296-155-52902.</p> <p>The simplest solution is</p> <p>WAC 296-155-53300 Operator qualifications and certification.</p> <p>(1) Prior to operating any crane covered under <u>WAC 296-155-52900</u> chapter 296-155, 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:...</p> <p>Boeing, Claude Golden & Aileen Yankowski</p>	
<p><u>Operator Qualification and Certification.</u></p> <p>The bolded underlined requirement appears to be a mistake and should be “<u>under</u> 300 tons – 500 hours”.</p> <p>(a) Lattice Boom Crawler Cranes (LBC) <u>300 tons and above</u></p> <p><u>1000 Hours</u></p> <p>Boeing, Claude Golden & Aileen Yankowski</p>	<p>The department agrees and made the amendment.</p>
<p>My concern is the shared liability with the bellmen. I believe the bellmen should know more than just the industry standard hand</p>	<p>No change was made to the proposed rules based on this comment. This request would require a legislative change.</p>

<p>signals and should have something that shows he has crane savvy. Keith Benson, Engineer, Seattle</p>	<p>The department will be addressing the training, experience, and knowledge requirements for bellmen in Phase II of the construction crane rulemaking but will not be requiring certification of this personnel absent a legislative change.</p>
<p>I think a couple of things are missing for operator qualifications. One is the physicals. Physicals should be required, like DOT, every three years, as well as drug testing. It's a standard in the industry. The majority of all contractors are drug testing now with random drug testing programs, and the operator should be included in that. Pete Campbell, BM Builders Construction, Seattle</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The statute does not require that operators pass a physical. However, it is likely that operators will be required to undergo a physical as part of the certification process.</p>
<p>My concern is that on the smaller rigs, the boom trucks and the smaller cranes, the fixed cab cranes, that the hours are not sufficient. Those cranes are usually the ones that will tip over faster. They're in a lot of different positions, different situations. And in my view, I just don't see that that time is enough time to cut somebody loose on that. I think by adding more hours to kind of force some of the organizations to create more training for these people rather than have the foreman or whatever, the supervisor, be in charge of that training. Dree Snider, Garner Construction, Seattle</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The operator experience requirements were developed in conjunction with industry and labor representatives from the small stakeholder group, which felt the level of hours set forth in Table 1, WAC 296-155-53300, were appropriate. Further, in addition to showing proof of hours of experience, operators will be required to obtain a valid operator certificate for the type(s) of crane(s) he/she wishes to operate. The department believes that the two requirements will be sufficient to establish operator qualification.</p>
<p>I think that on the rigger's end of it, I don't think there's enough strength in the operator that the operator has the ability to say that rigger is not who I want under my hook. When you have an operator in the seat that has the liability of that load, that operator should have the absolute final say on whether that rigger is qualified to rig under that crane. I think that's something that's very important, along with the certification. I mean, you can give people</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>This issue will be addressed in Phase II of this rulemaking.</p>

<p>certifications, but if they don't really have what it really takes to be a rigger, I think that the operator needs to be able to have that power there. You know, "competent personnel," I mean, that's kind of vague out there.</p> <p>Dree Snider, Garner Construction, Seattle</p>	
<p>We feel that the hours of crane operating experience and crane-related experience are substantially more than necessary to demonstrate operator proficiency. The required NCCCO certification, in and of itself, is an arduous and expensive process that does require proficiency. The point of this rule is to establish a standard level of competency for operators. We feel that NCCCO certification does achieve that and that additional hours of experience are not necessary.</p> <p>Mandi Kime, AGC, Tumwater</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The operator experience requirements were developed in conjunction with industry and labor representatives from the small stakeholder group, which felt the level of hours set forth in Table 1, WAC 296-155-53300, were appropriate.</p>
<p>Irregardless of how a small a crane is being operated a great deal of experience is required to safely operate cranes in various circumstances. Forty hours of experience is inadequate for 40 ton and lower cranes.</p> <p>John Stelfox, Operator</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The operator experience requirements were developed in conjunction with industry and labor representatives from the small stakeholder group, which felt the level of hours set forth in Table 1, WAC 296-155-53300, were appropriate. Further, in addition to showing proof of hours of experience, operators will be required to obtain a valid operator certificate for the type(s) of crane(s) he/she wishes to operate. The department believes that the two requirements will be sufficient to establish operator qualification.</p>
<p>In addition to the actual crane operating experience you have a note: "Additional actual crane operator experience may account for crane related experience". This is a loophole that will be abused. Therefore I would like to propose the following changes:</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The operator experience requirements were developed in</p>

<p>>170 ton – 500 hours actual seat time, 4000 hours crane related time <170 ton – 500 hours actual seat time, 4000 hours crane related time Also, recommend changing the note to read: “Any actual crane operator experience time (operating crane controls) above the minimum requirement for any actual crane operating experience category may count towards the crane related experience category”. John Stelfox, Operator</p>	<p>conjunction with industry and labor representatives from the small stakeholder group, which felt the level of hours set forth in Table 1, WAC 296-155-53300, were appropriate. Further, in addition to showing proof of hours of experience, operators will be required to obtain a valid operator certificate for the type(s) of crane(s) he/she wishes to operate. The department believes that the two requirements will be sufficient to establish operator qualification.</p>
<p>The rule should also have a requirement of 3 qualified operators would be required to sign off that an apprentice is now a qualified operator. John Stelfox, Operator</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>The trainee supervision requirements are dictated by statute. In addition, the operator experience requirements were developed in conjunction with industry and labor representatives from the small stakeholder group, which felt the level of hours set forth in Table 1, WAC 296-155-53300, were appropriate. Further, in addition to showing proof of hours of experience, operators will be required to obtain a valid operator certificate for the type(s) of crane(s) he/she wishes to operate. The department believes that the two requirements will be sufficient to establish operator qualification.</p>
<p>Current WAC 296-155-525(10)(z)(i) & (ii) – At no time is the oiler, bellman/signalman to be removed from their duties unless approved by the qualified crane operator and only while the crane is on standby. John Stelfox, Operator</p>	<p>No change was made to the proposed rules based on this comment.</p> <p>This is the employer’s responsibility.</p>
<p>In the proposed WAC 296-155-53300(2)(c)(iii) add at the end – “for the first 80 hours while the trainee is operating the equipment and for the remaining seat time the qualified operator must be within</p>	<p>No change was made to the proposed rules based on this comment.</p>

<p>visual direct line of sight and able to communicate by hand signal or electronic means.” John Stelfox, Operator</p>	<p>The trainee supervision requirements are dictated by statute.</p>
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IV. Cranes Literature Review

The following articles and publications were reviewed:

Cowper, Ronald J. (2004). "More training needed for crane operators," the Seattle *Daily Journal of Commerce* Web site: Construction & Equipment 2004, Special Section, March 25, 2004.

Davis, Gregory G., M.D., and Robert M. Brissie, M.D. (2000). "A Review of Crane Deaths in Jefferson County, Alabama," *Journal of Forensic Science*: 2000, volume 45, number 2, pp 392-396.

Häkkinen, Kari (1993). "Crane accidents and their prevention revisited." *Safety Science*: volume 16, pp 267-277, 1993.

Johnson, Wayne, and Risto Rautiainen (2003). "Analyzing a Fatal Crane Accident," *Professional Safety* magazine: January 2003, pp 16-20.

MacCollum, David (1993). *Crane Hazards and Their Prevention*, American Society of Safety Engineers: Des Plaines, IL, 1993, ISBN 0-9939874-95-4.

McCann, Michael, PhD, CIH; Janie Gittleman, PhD, MRP; Mary Watters (2008). *Crane-Related Deaths in Construction and Recommendations for Their Prevention*. The Center for Construction Research and Training (CPWR), 8484 Georgia Avenue, Suite 1000, Silver Spring, MD 20910, www.cpwr.com

McCann, Michael (2003). "Deaths in construction related to personnel lifts, 1992-1999," *Journal of Safety and Research*: volume 34 (2003), pp 507-514.

Mohan, Satish, and Wesley C. Zech ((2005). "Characteristics of worker accidents on NYSDOT construction projects." *Journal of Safety*: number 36 (2005), pp 353-360.

Ross, Bernard (1996). "A crane and rigging primer: Costs, case histories and remedies," *Implementation of Safety and Health on Construction Sites*, Alves Dias & Coble, editors, Balkema, Rotterdam, 1996, ISBN 90 5410 847 9

Ross, Bernard, Brian McDonald, S.E. Vijay Saraf (February 2007). *Big Blue Goes Down: The Miller Park Crane Accident*, engineering failure analysis report, Exponent Failure Analysis Associates, 149 Commonwealth Drive, P.O. Box 3015, Menlo Park, CA 94025, USA: 7 February 2007.

Suruda, Anthony, M.D., M.P.H.; Marlene Egger, Ph.D.; Diane Liu, M.Stat. (October 1997). *Crane-Related Deaths in the U.S Construction Industry, 1984-94*. Rocky Mountain Center for Occupational and Environmental Health, Department of Family and Preventive Medicine, University of Utah School of Medicine.

Suruda, Anthony, M.D., M.P.H; Diane Liu, M. Stat.; Marlene Egger, Ph.D.; Dean Lillquist, Ph.D. (December 1999). "Fatal Injuries in the United States Construction Industry Involving Cranes 1984-1994," *JOEM*, Volume 41(12): December 1999, pp 1052-1058.

Walker, Don (January 2006). "\$30 million deal ends Big Blue case," *Milwaukee Journal Sentinel*, Milwaukee, WI, www.jsonline.com/story/index.aspx?id=383742: January 9, 2006

Ware, Patricia (2008). "OSHA Defends Lag n Developing Derricks, Crane Rule, Citing Complexity." *Occupational Safety & Health Daily*, Bureau of National Affairs, Inc.: January 31, 2008.

Yow, Philip, Ray Rooth, and Ken Fry (2000). *Crane Accidents 1997-1999: A Report of the Crne Unit of the Division of Occupational Safety and Health*. Division of Occupational Safety and Health, California Department of Industrial Relations: May 23, 2000.

Cowper, Ronald J. (2004). "More training needed for crane operators," the *Seattle Daily Journal of Commerce* Web site: Construction & Equipment 2004, Special Section, March 25, 2004.

This article makes a good case for compulsory crane operator certification over voluntary certification, supports the hour requirements for training in the Washington crane safety rule, and shows how the cost of training programs can actually save employers money in the long run:

- "...Ontario, Canada, has had voluntary crane operator certification for almost 100 years that became compulsory in 1983. Also, Canada has had a National Crane Operator Certification and Apprenticeship program since 1999 that requires a minimum of 2,000, 4,000 or 6,000 hours of hands-on experience and classroom training, depending on provincial requirements and the crane classification being applied for. We know this system works because Canada's exceptionally low accident and fatality rate is envied around the world."
- "National Safety Council estimates put the cost of one lost-time accident at about \$27,000, with punitive damages sometimes ranging into the millions of dollars. Management that is seriously interested in promoting jobsite safety will quickly learn that the money spent on just one lost time accident could easily cover the cost of providing comprehensive and ongoing safety training programs for their operators, site managers and supervisors."

Davis, Gregory G., M.D., and Robert M. Brissie, M.D. (2000). "A Review of Crane Deaths in Jefferson County, Alabama," *Journal of Forensic Science*: 2000, volume 45, number 2, pp 392-396.

The authors of this study review the circumstances of ten crane-related fatalities that happened in Jefferson County, AL, during the 16 years from 1981 to 1996. These fatalities spanned industry, construction, and transportation (railroads), and included both mobile and tower cranes.

The authors make several interesting points:

- "Nationwide, electrocution is the most common cause of crane-related death, but no crane-related death in Jefferson County was caused by electrocution in our study. **The absence of electrocutions was due to the planned, routine suspension of power to electrical lines in the vicinity of a crane during the crane's operation**, a practice saving an estimated seven lives." [from the Abstract, emphasis added]
- "Häkkinen, working from insurance claims reports, found that the individuals most commonly injured in a crane accident are the workers fastening, guiding, or loosening loads. Häkkinen's review was of injuries, but our findings are in keeping with Häkkinen's, for nine of the ten decedents were working outside the cab of the crane when the accident occurred." (p.395) This supports their conclusion that "A member of the construction crew working outside the crane is far more likely to be injured than is the crane operator." (p.396)
- "In addition to proper planning and adherence to safety plans formed, we recommend that all crane operators be licensed and certified as such." And "We recommend mandatory licensure and certification for all professional crane operators in all

jurisdictions.” (both p. 396) To support this recommendation the authors cite a report showing dramatic decrease in crane accidents (by approximately 50 percent) in Ontario, Canada, in the years following mandatory certification as compared to years before.

Häkkinen, Kari (1993). “Crane accidents and their prevention revisited.” *Safety Science*: volume 16, pp 267-277, 1993.

This article is of limited usefulness to Washington State’s crane safety rulemaking effort:

- It is dated (15 years old, revisiting accident data that was then 15 years old and now is 30 years old).
- It considers crane accidents and approaches to industrial safety and health in Europe, particularly Finland, not the United States.
- It considers crane use in industry as well as construction, and does not separate the two out.
- Its author’s main revelation seems to be that “...we came more and more involved in human aspects of safety in our research which started mainly from a mechanical engineering approach.” Since OSHA and DOSH both already have as a fundamental premise the high impact of human factors on industrial safety and health, there is no news here.

Relevant points are as follows:

- This author echoes other authors in this literature review in noting that technological ‘fixes’ intended to make cranes safer, such as boom pins that can only be knocked out from outside the boom instead of under it, or anti-two-blocking devices, either are not adopted or are actively resisted by crane owners and operators. This puts more of the weight of preventing crane accidents on the operators and other workers, which emphasizes the importance of proper training and certification.
- The situations in which crane accidents happen are much the same today as they were 30 years ago, during the author’s initial study which stated them as:
 - Falling of loads
 - Fastening or unfastening of loads in danger area, e.g., at high places
 - Lifting of persons
 - Dismantling of cranes
 - Overturning of mobile cranes
 - Contact with overhead power lines

Johnson, Wayne, and Risto Rautiainen (2003). “Analyzing a Fatal Crane Accident,” *Professional Safety* magazine: January 2003, pp 16-20.

This article examines a fatal crane accident in 2000 wherein ground failure under outriggers compounded by faulty assembly of outrigger pads caused a moveable tower crane to fall while lifting a 28,000-lb. water tank into place, killing one worker.

Several points are relevant to Washington’s crane safety rulemaking:

- All the factors which created this accident were errors in human judgment and attention, and were therefore subject to being corrected by training:

- Contractors and crane operators can be trained to evaluate soil bearing capacities and to know when a qualified engineer needs to be consulted to determine whether ground footing is adequate for a particular crane and lift.
- Crane operators and adjunct workers can be trained in what types of outrigger pads should be used in different conditions, and how to properly construct pads when needed (for example, if an outrigger pad consists of multiple cribbing timbers, make sure the timbers are secured together, such as with appropriate bolts).
- Employers can be trained in the value of instituting policies and procedures to define the sizes and compositions of outrigger pads (for example, always use metal plates).
- Workers can be trained to watch not only the load and the load's destination but also a crane's footing and the whole crane setup during a lift.
- "Operator error in setup/use is the primary factor in most of these fatalities, with upset or overturn of the crane accounting for seven percent of deaths [for 502 deaths due to 480 crane accidents between 1984 and 1994]." (p 17) Operator error can be reduced through training and making sure operators are qualified.
- Unrelated to crane overturn, the article confirms what other sources show, that "Electrocution from overhead powerlines was the single largest cause of death (39 percent) [for 502 deaths due to 480 crane accidents between 1984 and 1994]." (p 16)

MacCollum, David (1993). *Crane Hazards and Their Prevention*, American Society of Safety Engineers: Des Plaines, IL, 1993, ISBN 0-9939874-95-4.

From the back cover: "...David V. MacCollum applies his more than forty years of experience to analyzing 47 crane hazards. He discusses what others are doing and what can be done to make crane operations safer and more productive. The result is a ready reference not only for the Safety Professional, but for everyone involved with or affected by the design, manufacture, and operation of cranes."

Although 15 years old, this information-rich book provides clear discussion of crane hazards and practical solutions to reduce or eliminate them. An excellent resource for L&I and for people responsible for training operators and others who work around cranes.

It would be important, however, to refer to current issues of cited references, such as the National Electrical Safety Code, in using this book for either reference or training.

McCann, Michael, PhD, CIH; Janie Gittleman, PhD, MRP; Mary Watters (2008). *Crane-Related Deaths in Construction and Recommendations for Their Prevention*. The Center for Construction Research and Training (CPWR), 8484 Georgia Avenue, Suite 1000, Silver Spring, MD 20910, www.cpwr.com

In this 8-page report from The Center for Construction Research and Training, the authors examine data from the Bureau of Labor Statistics to evaluate trends in crane-related deaths over time, and propose recommendations to prevent future injury and death.

The report confirms other research about crane accidents, included in this literature review:

- “Of the 307 fatal crane accidents, 216 (71%) involved mobile or truck cranes.” (p. 2)
- “Of the total 323 crane-related deaths, 102 were caused by overhead power line electrocutions (32%), 68 deaths were associated with crane collapses (21%), and 59 deaths involved a construction worker being struck by a crane boom/jib (18%).” (p. 2) These represent the first, second, and third leading causes of crane-related deaths.
- “Half of all electrocutions, the leading cause of death, were associated with the crane boom or a crane cable contacting an overhead power line. The rest involved contact of an overhead power line with unspecified parts of the crane.” (p. 2)
- “Mobile cranes were involved in 80 of the 95 overhead power line fatal incidents.” (p. 2)

The report’s “Conclusions and Recommendations” section contains many points relevant for Washington State’s crane safety rulemaking:

- “More than half of the deaths were among construction laborers and heavy equipment operators” (p. 3)
- “Employees working for small contractors represent a large portion (about one-third) of the total number of deaths.” (p. 3)
- “Most crane-related deaths involved mobile cranes.” (p. 3)
- “Possible explanations for these findings are a lack of worker and supervisor training, lack of jobsite safety plans, lack of adequate crane inspections, and lack of proper investigation and reporting of crane accidents and fatalities.” (p. 3)
- The authors make the following recommendations (summarized from p. 4):
 - “First, crane operators should be certified by a nationally accredited crane operator testing organization, such as the National Commission for the Certification of Crane Operators (NCCCO).”
 - “Second, riggers who attach the load to the crane and signalpersons who visibly or audibly direct the crane operator on where to place the load should be certified.”
 - “Third, crane inspectors should also be certified.”
 - “Fourth, in addition to other mandated inspections, cranes must be inspected thoroughly by a certified crane inspector after being assembled or modified, such as the “jumping” of a tower crane.”
 - “Fifth, ... only trained workers should assemble, modify or disassemble cranes, and they should always be under the supervision of a person meeting both the definition of qualified person and competent person specified in the standard.”
 - “Sixth, crane loads should not be allowed to pass over street traffic.”
 - “Seventh, more complete reporting of data, particularly after a crane collapse, is necessary.”
 - “Eighth, ...all efforts should be made to speed up the adoption of the C-DAC consensus standard and the additional recommendations provided in this report.”

McCann, Michael (2003). “Deaths in construction related to personnel lifts, 1992-1999,” *Journal of Safety and Research*: volume 34 (2003), pp 507-514.

From the abstract: “This study examined deaths of construction workers due to personnel lifts (boom-supported and scissor lifts, suspended scaffolds, and crane platforms)...for 1992-

1999...using data from the Census of Fatal Occupational Injuries, a Bureau of Labor Statistics database.Recommendations include: following OSHA regulations, wearing personal fall protection equipment, adequate maintenance, inspection before use, and training on the model of lift used. Precautions are also needed to prevent contact with overhead power lines.”

The relevance in this study for Washington State crane safety rulemaking lies mostly in the tenor of the findings rather than in specifics related to equipment or activities covered in the proposed rule.

In general, the findings of this study reinforce indicators from other sources saying that:

- Falls, tip-overs, and contact with live electrical power lines are significant hazards for workers involved with lifting devices.
- Lifting devices need to be adequately maintained, and inspected before use.
- Maintenance and inspection can be issues with rented lifting devices since the renting companies routinely re-rent them without necessarily inspecting them or performing maintenance on them first.
- Operators of lifting devices need to be adequately trained, ideally on the model of lifting device they will be operating.

Mohan, Satish, and Wesley C. Zech ((2005). “Characteristics of worker accidents on NYSDOT construction projects.” *Journal of Safety*: number 36 (2005), pp 353-360.

In this paper, the authors examine two types of accidents that happened in New York State Dept. of Transportation road construction work zones from 1990 to 2001: (a) construction area accidents, and (b) traffic accidents involving workers. The paper also revealed that two types of crane-related accidents, “Struck by Moving/Falling Load” and “Crane/Lift Device Failure,” ranked numbers four and five, respectively, among the five types of accidents that account for nearly 96% of the construction area fatalities and 91% of total costs (\$133.8 million total costs x 0.91 = \$121.758 million).

Cranes **may** also be involved in the number one and number three accident types, “Struck/Pinned by Large Equipment” and “Contact with Electrical or Gas Utility,” although the paper did not make a direct connection with cranes for these accident types.

In this way the authors support two of the premises behind Washington State crane safety rulemaking, which are that cranes are dangerous to work with and around, and that accidents involving cranes are extremely costly in both human and financial terms.

The authors’ cost analyses numbers do not transfer exactly to Washington State because of differences in terrain, climate, general cost of living, and population, among other differences, but they do give a real-world dollar value that can serve as a reference point. They calculate that the direct costs of a road construction area fatality are \$1.69 million, and that indirect costs can be calculated for fatalities and hospital-level injuries by multiplying direct costs by 2.06. This means a single NYSDOT road construction fatality costs \$5.17 million in direct and indirect costs [$\$1.69 \text{ million} + (2.06 \times \$1.69 \text{ million}, \text{ or } \$3.48 \text{ million}) = \5.17 million]

Ross, Bernard (1996). "A crane and rigging primer: Costs, case histories and remedies," *Implementation of Safety and Health on Construction Sites*, Alves Dias & Coble, editors, Balkema, Rotterdam, 1996, ISBN 90 5410 847 9

Excerpt from abstract (p. 259):

"This paper describes a study of various accident databases to understand the distribution of causes and circumstances that characterize crane and rigging accidents. A wide variety of case histories selected from the files of 300 such incidents investigated by the author over the past 30 years are discussed to illustrate the typical range of lifting equipment upsets that occur in construction activities.

Next, a breakdown of costs and penalties associated with crane and hoisting equipment accidents is presented. Here, the losses in productivity, capital write-offs, and most importantly, exposure to lawsuits are featured. Of particular interest is the style of litigation and allegations made against heavy equipment manufacturers in product liability court actions."

Items of note in relation to Washington State crane safety rulemaking issues:

- "...[in about 1977] the Province [of Ontario] embarked on a comprehensive program to train crane operating personnel in safe procedures and, moreover, to require professional licensing following appropriate course work and examination. The results of these efforts were superb. During the ensuing decade, 1978-1988, there was a 60 percent drop in crane-related fatalities. Moreover, this index continued to fall to the point where there were zero fatalities in 1991 and an early 1990's rate of approximately 1 fatality per 100,000 workers. Thus, the ratio between the best and worse [sic] years over an approximately 25 year span produced a six-fold improvement." (p. 266)
- "...the only approach toward insuring the reduction of fatality and personal injuries in the workplace due to crane and rigging operations must derive from strict personnel hiring practices, intensive training, government certification, licensing, and on-site surveillance." (p. 266)
- "By far, the largest number of incidents (50 percent) for fatal occurrences was boom or crane contact with energized powerlines." (p. 260)
- "Crane accidents particularly prone to adverse jury verdicts are those which involve power line contact and electrocution injuries or death." (p. 265) *NOTE: the author asserts in this paper that 50% of crane-related fatalities are the result of this type of accident.*
- "A cost of \$790,000 was allocated [by the U.S. National Safety Council] to each fatal accident [in 1994]." (p. 265)
- "...approximately 85 percent of all crane mishaps are caused by operator error." (p. 260)
- "A survey of major crane accidents based on over 1000 cases obtained from the Federal OSHA records data bank indicates that the highest percentage of causes (74%) relates to human interactions and procedures." (pp. 260-261)
- "...human error and operator intensive mistakes such as failure to use outriggers or ground support problems account for over 80 percent of all accidents." (p. 261)
- "...almost 25 percent of all tower crane accidents (14/59) concern erection and dismantling." (p. 261)

- “...human error induced accidents are particularly common with rough terrain cranes.” (p. 263)
 - “A paramount source of fatal injuries on construction jobs with crane equipment is related to the lifting of personnel in man baskets. All too often the man baskets employed are shoddy affairs fabricated onsite by common laborers or welders with little understanding of engineering principles and the governing workplace rules and regulations which apply to personnel lifts.” (p. 263)
 - “Crane related accidents are provoked in the construction workplace by improper load handling and load placement procedures. Often the operator is oblivious to the technical ramifications of a particular lift and is content to follow the rote instructions of riggers or steelworkers.” (pp. 264-265)
 - “Typically American crane operators show a disdain for anti two-block systems claiming they restrict freedom of operation. Consequently, these systems are often deliberately dismantled or bypassed.” (p. 265)
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Ross, Bernard, Brian McDonald, S.E. Vijay Saraf (February 2007). *Big Blue Goes Down: The Miller Park Crane Accident*, engineering failure analysis report, Exponent Failure Analysis Associates, 149 Commonwealth Drive, P.O. Box 3015, Menlo Park, CA 94025, USA: 7 February 2007.

This engineering failure analysis report “...describes the comprehensive engineering analyses undertaken by Exponent Failure Analysis Associates and allied consultants to disprove the adversary theories of failure as confirmed in a 100 million dollar jury wrongful death verdict against Mitsubishi.”

It examines the accident itself, the crane, the load, the ground, the lift conditions, the wind conditions, the on-site investigation and laboratory investigation, wind loads, and wind operation, and presents design analysis, structural and stability analyses, the results of metallurgical examination of relevant crane parts, the failure sequence of these parts, the basis of the litigation following the accident, and their conclusions about the cause of the accident. This report, although thorough and interesting, has little if any relevance for Washington State crane safety rulemaking, unless the rule intends to address responsibility and guidelines for crane lifts in windy conditions.

Since the authors’ conclusion, supported by their analyses, is that the accident was the result of the general contractor’s decision to go ahead with the lift in spite of obviously unfavorable wind conditions, there is no component of this accident that involves either crane fitness or the qualifications of the crane operator or a crane inspector.

Suruda, Anthony, M.D., M.P.H.; Marlene Egger, Ph.D.; Diane Liu, M.Stat. (October 1997). *Crane-Related Deaths in the U.S Construction Industry, 1984-94*. Rocky Mountain Center for Occupational and Environmental Health, Department of Family and Preventive Medicine, University of Utah School of Medicine.

This study considers data about crane-related deaths in the U.S. from OSHA investigation files, death certificates, the Bureau of Labor Statistics Census of Fatal Occupational Injuries, and a Bureau of Labor Statistics annual survey. The data considered are for the ten years between 1984 and 1994.

Although it might be argued that the age of the data affects the study's relevance, points of note in the report are:

- “Electrocution by power-line contact was the most common type of incident...” (p. 4) and “This study confirms the findings reported previously that electrocution via power-line contact accounts for a considerable number of fatal injuries to construction workers involving cranes...” (p. 5)
 - “More crane operators were killed in incidents involving upset/overturn or power-line contact than in other types of incidents...” (p. 4)
 - “For workers who were not crane operators, deaths from power-line contact represented the largest category...” (p. 4)
 - Because efforts to create and market engineering controls to prevent power-line contact have not succeeded, “...training of crane operators, spotters, and other construction workers would seem to remain the prevention method of choice for reducing electrocutions involving cranes.” (p. 5)
 - “...[A]ssembly or dismantling of cranes was the second leading cause of fatal injury...” because of the need for a worker to be underneath the boom of lattice-boom cranes to remove retaining pins, yet a design for conical pins that can only be installed in a way that eliminates this need “...has not found success in the crane market...” The researchers conclude from this that “Aside from engineering controls...increased training regarding crane assembly and disassembly should minimize this hazard.” (p. 5)
 - “Based on the findings reported here, useful preventive measures for fatal injuries related to cranes would be:
 - Training modules and certification for crane operators.
 - Training modules for construction site managers and for workers involved in crane assembly, disassembly, and maintenance.
 - Crane inspection programs.
 - ...
 - Enforcement of existing regulations, such as the requirement to maintain a separation between equipment and high-voltage power lines of 10 to 45 feet, depending on the voltage.
 - An increase in the frequency of OSHA inspections of construction sites that use cranes.”
-

Suruda, Anthony, M.D., M.P.H; Diane Liu, M. Stat.; Marlene Egger, Ph.D.; Dean Lillquist, Ph.D. (December 1999). "Fatal Injuries in the United States Construction Industry Involving Cranes 1984-1994," *JOEM*, Volume 41(12): December 1999, pp 1052-1058.

This journal article draws heavily on the 1997 study done by Seruda, *et alia*, titled *Crane-Related Deaths in the U.S. Construction Industry, 1984-1994* (published through the Rocky Mountain Center for Occupational and Environmental Health, Dept. of Family and Preventive Medicine, University of Utah School of Medicine), which is also included in this literature review.

The same observations apply here, with these additional items of note:

- "Firms covered by a collective bargaining agreement were twice as likely to have had a previous routine inspection (18% vs 9%) by OSHA and were less likely to have had an accident inspection (17% vs 22%)." See *Table 7, Previous OSHA Inspections*. This links a higher inspection rate with a lower rate of accidents and supports the assertion that increased inspections can reduce accidents.
- "The rate of fatal injury involving cranes was significantly higher...in large business establishments with 50 or more employees." See *Table 8, Fatality Rates and Establishment Size*. Since large businesses stand in need of making the greatest changes to reduce the overall number of crane-related deaths, and since Washington's employer base is mostly small businesses, this supports the assertion that small business will not be disproportionately affected by the proposed crane-safety-related rulemaking.

However, the authors note under "Limitations of this study" that "There may be bias in reporting of work-related deaths to OSHA such that deaths occurring in large construction firms may be more likely to be reported than those in smaller firms. We have no reason to believe that cranes are more likely to be used by smaller construction firms, leading to selective underreporting of deaths involving cranes."

Walker, Don (January 2006). "\$30 million deal ends Big Blue case," *Milwaukee Journal Sentinel*, Milwaukee, WI, www.jsonline.com/story/index.aspx?id=383742: January 9, 2006

This newspaper article highlights the dollar amounts involved in this wrongful death suit, and reveals that insurance companies, not the sued parties, ended up paying the out-of-court settlements, which ended up being about one third of the amount originally awarded by a jury as punitive damages:

- "The widows of the three ironworkers who died in the July 1999 collapse of the Big Blue crane at Miller Park will receive about \$30 million under the terms of an out-of-court settlement..."
- "The jury awarded \$5.25 million in compensatory damages and \$94 million in punitive damages." This verdict had been appealed and overthrown, then the overthrow reversed, when the out-of-court settlement was reached.
- "...Mitsubishi did not have to pay any money under the terms of the settlement. Instead, three insurance companies...are to make the payments" even though "...[the lift] was based on a decision by...Mitsubishi's on-site superintendent, and two other people."

- “The accident delayed the opening of the baseball stadium by a year and caused \$100 million in property damage *that insurance covered.*” (emphasis added)
- “The Milwaukee Brewers received \$20.5 million in compensation for loss of income.” The article does not say the source of the compensation.

So, the total amount paid out by three insurance companies is at least \$130 million, and may well be an additional \$20.5 million higher if they were also the source of the Brewers’ compensation for lost income.

This is relevant for Washington State crane safety rulemaking because it shows the effect that a single crane accident can have on insurance premiums paid by all insured parties. Avoiding crane accidents not only keeps workers safe, it contributes to keeping business costs down in the construction industry, which is good for the state’s overall economy.

Ware, Patricia (2008). “OSHA Defends Lag n Developing Derricks, Crane Rule, Citing Complexity.” *Occupational Safety & Health Daily*, Bureau of National Affairs, Inc.: January 31, 2008.

This one-page article briefly reviews the history of OSHA’s efforts to develop a federal rule governing derricks and cranes.

The main relevance for the Washington State rulemaking in this article is that Noah Connell, director of OSHA’s office of construction standards and guidance, is reported to have said “he could not predict when the rule would be issued, but he said it would not be finalized by the end of 2008 as previously estimated.”

This delay – from consensus on the rule content in 2004 to still no clear proposal date four years later – makes it clear that states are on their own to provide timely regulations for making operating cranes safer for workers and the public.

While the federal rule is waiting to be proposed, cranes are still in use every day, posing risks that can be reduced by Washington State’s crane safety rulemaking.

Yow, Philip, Ray Rooth, and Ken Fry (2000). *Crane Accidents 1997-1999: A Report of the Crne Unit of the Division of Occupational Safety and Health*. Division of Occupational Safety and Health, California Department of Industrial Relations: May 23, 2000.

This three-page OSHA report points up the high incidence of mobile crane involvement in the 158 crane accidents reported over a three-year period (although the split between construction and non-construction accidents was about even, with 79 accidents in construction work and 89 accidents in non-construction work).

- 73% of accidents involved mobile cranes (115 out of 158)
- The single crane operator fatality involved a mobile crane
- Of the 91 injuries of workers other than crane operators, 72 involved mobile cranes.
- Of the 12 fatal injuries of workers other than crane operators, 8 were those working in the vicinity of mobile cranes.

Looking at causes of accidents, we see:

- Instability was the primary cause of accidents for all crane types as well as for mobile cranes (49 out of 115)
- When “instability” is further broken down, the primary cause for mobile cranes is “load capacity exceeded” (29 out of the 49)
- If we disregard the secondary cause for mobile crane accidents because it is an aggregated number bridging 14 miscellaneous categories, the next **single** cause after “instability” is “lack of communication” (24 out of 115).
- The authors note that “Seventy-five percent of accidents caused by both ‘lack of communication’ and ‘electrical contact’ involved mobile cranes.”
- The authors further assert that “Although ‘Lack of Training’ did not rank very high as a primary cause, it would have been ranked within the top three if a secondary cause were listed.’

This report has high relevance for the crane safety rulemaking for the following reasons:

- Mobile cranes are primary workhorses in the construction industry
- The two greatest single causes of mobile crane accidents – ‘upset because load capacity was exceeded’ and ‘lack of communication’ – both directly reflect behaviors and decisions of operators and others, rather than arising from mechanical or engineering issues.
- The behaviors and decisions of operators and others can be readily affected by training.
- Because behaviors and decisions can be modified by training, this report shows that appropriate training should be able to eliminate or greatly reduce the two greatest single causes of mobile crane accidents.

V. Cranes Media Analysis Report

This report analyzes media reports – mostly newspaper or from news sites on the Internet – of accidents involving construction cranes in Washington, Oregon, and Idaho between the years 1994 and 2008, inclusive.

The source of most of the media reports was the archives and current posts of CraneAccidents.com, a Web site maintained by Mr. Doyle Peeks, a retired equipment operator (including cranes), master mechanic, equipment manager, superintendent, and business owner. He posts media-sourced articles about crane accidents around the world. Site archives go back to 1995.

From the CraneAccidents.com mission statement:

“Our primary mission is to maintain a perpetual database for recording accidents (crashes, mishaps, wrecks) in which cranes, (tower cranes, mobile, helicopter cranes, other) hoist, derrick, drill rigs, or personnel lifting equipment, (bucket trucks/lift platforms/scissor lifts) construction elevators, mobile TV units with masts may become involved. In general, any and all equipment or machine, mobile or stationary when used for lifting (hoisting) material or people. Any piece of equipment substituting as a crane, for instance a boom type forklift or an excavator/backhoe when used to lift/hoist a load) is also covered.”

We included only those accidents whose circumstances would be covered by the proposed language. For example, we did not include articles about maritime crane accidents, personnel lifts, etc.

Data limitations to be aware of:

- Obviously, this database contains only accidents that made it into newspapers or onto news sites, and then to CraneAccidents.com.
- In compiling articles, we disregarded traffic accidents where the crane’s presence, or the fact that it was a crane being transported, was incidental, such as when a crane boom hit an overpass during transport (not arriving at or departing from a construction site). We viewed such accidents as transport issues, not crane safety issues.
- Information about damage to the crane itself, and to surrounding property, is uneven because not all media articles provided this information, or did so to the same extent. When specific information was available, we captured it. Otherwise, readers must infer the likely damage to equipment and other property from the descriptions provided.
- Dollar figures for equipment damage and property damage, or for collateral losses such as income lost by surrounding businesses during street closures, must also be inferred, since dollar figures were seldom cited.

Some news articles were also found by direct searching of the Internet, which accounts for accident dates that are outside the date range of the CraneAccidents.com archives.

Summary of Crane Accidents – WA, OR, & ID

The following table summarizes crane accidents in the media in Washington, Oregon, and Idaho from 1999 through 2008.

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

Crane Accident Location	State	Crane Type	Date of accident or article	Fatalities	Injuries	Equipment Damage	Property Damage or Collateral Costs	Accident Cause or What Happened
Boiseⁱ	ID	M	11/12/2005	---	1 worker	<p>“...several tons of metal smashed to bits on the muddy bottom of the reservoir...”</p> <p>“The entire truck and crane assembly, which weighs about 5,600 pounds, fell over the east side of the bridge and smashed into the mud below with such force the debris flew on both sides of the reservoir bottom...”</p>	<p>“On the bridge, about 10 feet of steel railing is either gone or bent by the force of the fall.”</p>	<p>“A construction crane plummeted 160 feet off the High Bridge on Idaho 21 and smashed into the muddy bottom of Lucky Peak Reservoir...”</p> <p>“A construction crew was using a semi-tractor trailer/construction crane on the bridge to lower drilling equipment to workers at the bottom of the reservoir when the crane began to tip...”</p>
Jeromeⁱⁱ	ID	M	2/7/2008	1 worker	---	---	<p>“...the power line was undamaged but had burn marks where it came into contact with the cables.”</p>	<p>“A Kimberly man was killed Tuesday morning by electrocution while working near the Jerome City Waste Management plant. A co-worker on a project for Allstate Construction is lucky to be alive.”</p> <p>“[The victim] swung the</p>

Crane Accident Location	State	Crane Type	Date of accident or article	Fatalities	Injuries	Equipment Damage	Property Damage or Collateral Costs	Accident Cause or What Happened
								cables two feet sideways into a live power line. The electrical currents shot through the cables and the crane before it grounded through an outrigger..."
Sandpoint ⁱⁱⁱ	ID	M	11/10/2002	---	---	"It may be fixable, but we'll have to see when we get it out,' [the crane's owner] said Thursday."	"A dive team recovered a portable welder and some tools..." "A hazardous materials team set up a containment boom to confine fuel from the welder and crane..."	"A crew ...was working on... project to replace public docks on Thursday. When the crew returned on Friday, the crane was submerged in about 35 feet of water and the barge it had been sitting on was capsized." "[The crane's owner] suspects a section of the barge broke and took on water, dumping the crane into the water."
Bend ^{iv}	OR	M	3/18/2004	---	1 operator	"[the crane] slammed into an embankment."	"...an accident forced doctors to amputate both of his legs at the kneecap."	"Three vehicles, first a pickup, then a semitrailer pulling a trailer with crane equipment on it and, finally, [the victim], who was driving a crane, began creeping down a steep incline toward the river. '[He] joked about it,' said ...[the victim's] stepson, saying, "'If the brakes give out, I'll just jump out.' " But when [the victim's] crane began to speed down the hill... there was no time

Crane Accident Location	State	Crane Type	Date of accident or article	Fatalities	Injuries	Equipment Damage	Property Damage or Collateral Costs	Accident Cause or What Happened
								to jump out. [The victim] swerved to avoid hitting the pickup and semi-truck in front of him, and slammed into an embankment. “
Brookings^v	OR	M	5/22/2004	---	---	“The privately-owned crane...was going uphill... when it lost hydraulics....”	“Traffic on Highway 101 was shut down temporarily later that day while work crews righted the crane and towed it away.”	“A mobile crane headed toward a construction site on Parkview Drive crashed Tuesday morning into Eiler Creek adjacent to Highway 101.”
Mulino^{vi}	OR	M	4/1/2004	---	---	“...parts of the crane fell into Milk Creek below.”	“Booms were placed in the water to contain any leaks.”	“A small bridge gave way as a crane operator was trying to cross. “
Newburg	OR	U	2/26/2003	---	---	“Sparks flew and smoke billowed from the base of the crane as power flowed through the metal structure into a coil of wire laying adjacent to the apparatus...” “...although the fire damage was minimal, the heat the structure sustained could put the crane out of service for	“...The tires on a nearby generator were ablaze...”	“...a large crane caught fire after inadvertently touching a power line. Firefighters responded to a construction site ...to find the block and tackle of the large, remote-controlled crane resting against a power line...”

Crane Accident Location	State	Crane Type	Date of accident or article	Fatalities	Injuries	Equipment Damage	Property Damage or Collateral Costs	Accident Cause or What Happened
						some time..."		
North Bend ^{vii}	OR	M	5/13/2008	---	---	"...a crane came crashing down..."	---	<p>"...a crane came crashing down alongside Highway 101 in North Bend."</p> <p>"The crane had just successfully removed one section of an old fire wall, that dated back to the days when a plywood mill operated on that site, but when they attempted to remove the second section it capsized."</p>
Portland ^{viii}	OR	M	9/23/2002	1 worker	---	"...the crane tipped over..."	---	<p>"A crane collapsed on a construction worker at Portland's Providence hospital as it was being erected."</p> <p>"Investigators say the two-person crew was setting up the crane to work on an elevator on the back side of the main hospital."</p> <p>"[The victim] was standing near the loading dock behind the hospital... when the crane tipped over..."</p>
Portland ^{ix}	OR	T	6/26/2008	---	---	---	"...the incident knocked out power for 8,000 customers in east Portland..."	"A crane hit a power transmission wire in east Portland on Thursday, knocking out power to the area."

Crane Accident Location	State	Crane Type	Date of accident or article	Fatalities	Injuries	Equipment Damage	Property Damage or Collateral Costs	Accident Cause or What Happened
Portland^x	OR	U	6/10/2005	---	1 worker	"...a hook broke off a crane..."	---	"Officials say the worker was inside a trench when a hook broke off a crane and a cable hit the worker in the head."
Salem^{xi}	OR	M	6/5/2001	---	---	"The lattice boom failed in the center and folded to the left side."	"It narrowly missed two men who had no way of escape, with the boom coming down on one side of them, the cables and rigging in another direction. A 28,000 lb panel which was braced and sitting on its foundation was knocked loose by the original wall panel and began to fall in on the men."	"Crane tipped over while attempting to set a 48,700 lb concrete wall panel."
Talent^{xii}	OR	M	8/18/2006	---	1 operator	"...officials expect to spend several days recovering the fallen equipment."	"The crane contained 40 gallons of hydraulic fluid and some spilled from a pencil-sized hole in the system..." "Crews caught the spilling fluid in a bucket and cooler and placed absorbent pads on the ground and barriers in the creek to make sure it didn't spread into the environment."	"A construction crane operating on a bridge in Talent toppled into Bear Creek Thursday morning when a beam under it gave way."

Crane Accident Location	State	Crane Type	Date of accident or article	Fatalities	Injuries	Equipment Damage	Property Damage or Collateral Costs	Accident Cause or What Happened
The Dalles^{xiii}	OR	M	4/8/2004	---	---	[crane boom bent backwards completely over railing at The Dalles Dam, per photo]	---	“Someone started the crane to let it warm up and then walked away without realizing the boom hoist was engaged.”
Tigard^{xiv}	OR	M	6/23/2003	1 worker	---	---	---	<p>“A Tigard construction worker has been killed while working on a house and being struck on the head with a pallet of wood. This, after a crane apparently lost its load this morning.”</p> <p>“[The victim] was climbing the ladder of an unframed house when the accident happened. ...[He] then fell about one-story to his death.”</p>
Veneta^{xv}	OR	M	1/15/2005	---	---	---	<p>“It caused a transformer to explode... sending sparks flying.</p> <p>“The 12 thousand volt power line also ignited some tires and debris on the ground.”</p>	<p>“About 40 homes and businesses lost power in the Veneta area after a crane ran into a power line.”</p> <p>“According to Rod Smith with the Lane Rural Fire Department, “They were using a crane to move that roof. The boom of the crane hit the power lines, knocked the power lines to the ground and there was an explosion to the transformer.”</p>

Crane Accident Location	State	Crane Type	Date of accident or article	Fatalities	Injuries	Equipment Damage	Property Damage or Collateral Costs	Accident Cause or What Happened
Bellevue ^{xvi}	WA	T	11/16/2006	1 bystander	1 operator	Crane destroyed.	<p>“Part of the top floor of the Pinnacle Bell Centre was crushed and the building immediately next to the crane, Plaza 305, was damaged extensively, Kroon said. About 100 displaced residents in the apartments were taken to the Bellevue Hilton and other locations and sheltered overnight.”</p>	<p>“One person inside an apartment building was killed when a construction crane collapsed Thursday evening in downtown Bellevue, striking several buildings.”</p>
Centralia	WA	M	2/27/2001	--	---	---	<p>“The boom crushed the two conveyors that feed coal to the top of Trans Alta's Centralia, Washington coal fired steam power plant, shutting down both generators.”</p>	<p>From CraneAccidents.com – primary source unknown (not reported in media)</p> <p>“Sicklesteel Cranes was moving a 500 ton Demag with a luffing jib attached, in preparation of booming it down for disassembly. Somehow the crane became unbalanced and tipped over.”</p> <p>“The official cause of the accident was due to having too much boom extended at too high an angle and 5 inches of transverse slope in 10 feet on the ground. Also the operators didn't reset the air bags to re-level the crane when the ground slope</p>

Crane Accident Location	State	Crane Type	Date of accident or article	Fatalities	Injuries	Equipment Damage	Property Damage or Collateral Costs	Accident Cause or What Happened
								changed from the spot where the crane was set for the pick.”
Everett^{xvii}	WA	M	1/6/2006	---	---	“The cab of the crane remained at the top of the embankment, on the shoulder of the freeway. The crane did not break apart.”	“The crane’s boom fell down an embankment and landed in a residential back yard in Everett’s Lowell neighborhood...” “The boom crushed a small shed...”	“A crane that was operating on the shoulder of a northbound I-5 lane tipped over...” “It was being operated by a very experienced crane operator,’ [Department of Transportation spokeswoman Connie] Lewis said. ‘We don’t know yet why it happened.’”
Everett^{xviii}	WA	M	2/20/2004	1 worker	---	---	---	“A man was struck and killed by a wrecking ball at a construction site, officials said.”
Everett^{xix}	WA	M	9/1/1994	---	---	“It’s down; it’s all twisted metal,’ said Capt. Bob Downey of the Everett Fire Department.”	---	“The boom of a 70-foot crane collapsed at Scott Paper Co. this morning after the drill it was holding struck something underground and jammed.”
Gray’s Harbor^{xx}	WA	M	3/20/2003	1 operator	---	---	“The Coast Guard was summoned after oil from the overturned rig was discovered leaking into the Harbor. A Rognlin’s crane was called in to try to right the overturned crane. “	“A longshoreman operating a crane on the dock at Terminal 2 at the Port of Grays Harbor was killed at 10 o’clock this morning after the rig overturned and he was trapped inside. “ “Several companies, including Rognlin’s Inc. and

Crane Accident Location	State	Crane Type	Date of accident or article	Fatalities	Injuries	Equipment Damage	Property Damage or Collateral Costs	Accident Cause or What Happened
								Quigg Bros. Inc., were working on the dock on the construction of Ag Processing Inc., the new bulk grain - loading facility scheduled to open in September. “
Harbor Island^{xxi}	WA	T	11/14/2004	---	1 operator	---	---	<p>“A 50-year-old man is recovering this weekend after being rescued from the top of a crane on Harbor Island.</p> <p>The man was hit in the back of the head with a piece of re-bar. “</p>
Lynnwood^{xxii}	WA	M	2/22/2002	1 operator	---	---	---	“A boom crane operator died Thursday afternoon at a construction site when the crane's cable struck a power line.”
Lynnwood^{xxiii}	WA	U	8/13/2003	1 worker	---	“...Crane falls...”	---	<p>From CraneAccidents.com:</p> <p>“Crane Accident Kills Teen In Lynnwood”</p> <p>“Crane falls, killing boy, 16”</p> <p>“Employee, 16, wasn't using crane that fell”</p>
Mercer Island^{xxiv}	WA	U	10/20/1998	---	---	“...the crane tipped over, crushing the crane's cab.”	“As it fell, the crane boom hit a utility pole, which smashed into a house.”	“Firefighters said the crane was loading culverts weighing several tons each onto a truck at about 11 a.m. when the crane tipped over,

Crane Accident Location	State	Crane Type	Date of accident or article	Fatalities	Injuries	Equipment Damage	Property Damage or Collateral Costs	Accident Cause or What Happened
								crushing the crane's cab."
North Bend ^{xxv}	WA	M	1/14/2008	---	---	---	"The crane collapsed on top of a steel truck..."	"A construction crane collapsed at the construction site of a new casino..."
Orondo ^{xxvi}	WA	M	7/15/2001	---	1 worker	---	---	"[The worker] was shocked when a crew of men moved a water tank with a crane boom truck, which touched a Chelan County PUD 150-kilovolt line..."
Seattle	WA	U	2/10/2006	---	---	---	"...interrupting power to about 6,500 Seattle City Light customers." "The [2-hr] outage caused traffic jams in the area."	"A construction crane knocked down power lines in the lower Queen Anne neighborhood shortly before noon Wednesday, interrupting power to about 6,500 Seattle City Light customers."
Seattle ^{xxvii}	WA	M	1/5/1999	---	1 worker	---	"...crushed the portable toilet the worker was using."	"A construction worker near the future site of the new Seahawks football stadium was seriously injured yesterday after a 1,000-pound crane block swung like a giant pendulum and crushed the portable toilet the worker was using."
Seattle ^{xxviii}	WA	M	3/7/2006	---	---	"... the company had two other cranes on the site and one of those was brought in to begin removal of	"Passenger service on Sound Transit Sounder trains was blocked between Seattle and Everett, affecting an estimated	"A 100-ton crane toppled onto railroad tracks near Myrtle Edwards Park Tuesday afternoon,..." "...the operator was a 40-year veteran crane operator

Crane Accident Location	State	Crane Type	Date of accident or article	Fatalities	Injuries	Equipment Damage	Property Damage or Collateral Costs	Accident Cause or What Happened
						the metal boom.”	300 to 350 riders, who were given the option of taking the bus to Everett or waiting for the track to clear.”	who was moving the machine toward a large trench area on the west side of the tracks, when the soil slipped, causing the crane to tip on its right side.”
Seattle ^{xxix}	WA	M	6/10/2008	---	---	---	“The outage also knocked out power to traffic signals at Ninth Avenue North and Harrison Street, and also at Dexter Avenue North and Harrison Street, according to the Seattle transportation department.”	“About 172 City Light customers remained without power at noon today after a construction crane knocked out a power line at the intersection of Pontius Avenue North and John Street in the South Lake Union area. Seattle City Light officials said it estimates that power could be restored by 3 p.m.”
Seattle ^{xxx}	WA	M	6/28/2001	1 operator	1 worker, 1 bystander	“...crushed the cab of his crane.”	“Firefighters had to cut away branches to reach the injured men, said Helen Fitzpatrick, Seattle Fire Department spokeswoman. Firefighters tried to move the tree with a backhoe but stopped when they heard it cracking. Another crane was required to remove the elm.”	“A construction worker was killed yesterday when an 80-foot elm tree he was transplanting at Children's Hospital fell and crushed the cab of his crane.”
Seattle ^{xxxi}	WA	M	8/15/2008	---	---	“...a mobile crane	“...the fire was	“Traffic was blocked on

Crane Accident Location	State	Crane Type	Date of accident or article	Fatalities	Injuries	Equipment Damage	Property Damage or Collateral Costs	Accident Cause or What Happened
						caught fire.” “Damage is estimated at \$800,000.”	blocking traffic in the three right lanes, and only the far left lane was getting through. Brush above the freeway was also burning.”	northbound I-5 at Mercer Street Friday afternoon after a mobile crane caught fire.” “The fire was accidental, caused by a hydraulic hose break, according to the Seattle Fire Department.”
Seattle ^{xxxii}	WA	M	8/18/1994	2 workers	1 operator	“...the crane arm broke near its top.”	---	“Shortly before 8 p.m., the basket carrying the two workers fell 250 feet, sending the men to their deaths, when the crane arm broke near its top. As it dropped, the basket struck the cab carrying the crane operator.” [Kingdome accident]
Seattle ^{xxxiii}	WA	T	11/5/2007	1 operator	---	---	---	“The man, in his 40s, was climbing a ladder down from the crane when he fell and landed on concrete below, said Seattle Fire spokeswoman Helen Fitzpatrick.”
Seattle ^{xxxiv}	WA	T	11/7/2007	1 operator	---	---	---	“A crane operator at a downtown Seattle condominium construction site died Monday after he fell 60-feet from a construction crane.” “The operator apparently slipped and fell when he was

Crane Accident Location	State	Crane Type	Date of accident or article	Fatalities	Injuries	Equipment Damage	Property Damage or Collateral Costs	Accident Cause or What Happened
								climbing to the cab.”
Seattle ^{xxxv}	WA	T	12/14/2006	---	---	---	Exterior glass panels shattered on a downtown building	“Heavy chains dangling from a tower crane in downtown Seattle hit the Bank of California building Wednesday morning, shattering some exterior glass panels. “
Seattle ^{xxxvi}	WA	U	10/9/2001	---	---	---	“Homes and businesses in the Magnolia and Queen Anne neighborhoods were affected...”	“Power to 5,900 Seattle customers was knocked out for about two hours yesterday after a crane struck some overhead power lines.”
Seattle ^{xxxvii}	WA	U	3/4/2002	---	---	---	“...city utility workers restored power to about 90 percent of affected customers several hours later...”	“About 4,700 customers lost power shortly after noon today when a crane struck some power lines during a construction project near the University Village shopping center.”
Seattle ^{xxxviii}	WA	U	8/3/2005	---	---	---	“About 4,800 households in the U-District area went without power Monday afternoon after a construction accident.”	“A crane performing construction for a private contractor under the ship canal on North Lake Way by 7th Avenue accidentally snapped an overhead power line, said Dan Williams a spokesperson for City Light.”
Sequim ^{xxxix}	WA	M	5/21/2002	---	---	“...a stabilizer arm broke on the crane causing it to roll onto its	“The crane ...came to rest against a building at 503 S. Third Ave., causing damage to	“The operator of a crane and residents in several nearby duplexes escaped unhurt Sunday evening when the

Crane Accident Location	State	Crane Type	Date of accident or article	Fatalities	Injuries	Equipment Damage	Property Damage or Collateral Costs	Accident Cause or What Happened
						right side.”	Sanford Powder Coatings. The crane's boom pulled down power and television cable lines as it fell to the ground, barely missing duplex units on either side. “	machinery tipped onto its side while working in the 500 block of South Third Avenue.”
Tacoma ^{x1}	WA	M	3/14/2001	---	1 worker	Some equipment was damaged	---	<p>From CraneAccidents.com – primary source unknown (not reported in media)</p> <p>Sunnen Crane Services tipped over a 160 ton Demag in Tacoma. <i>Commentary:</i> Rumor is they had 130 foot of stick out, but did not have all the counterweight on. When they made their lift, the crane went over. Some equipment was damaged and one person injured when they jumped off a 15 foot ladder to get away.</p> <p>March 28, 2001 update: It is reported [where? by whom?] the accident was due to the operator punching in the computer code for having all the counterweight instead of no counterweight,</p>

Crane Accident Location	State	Crane Type	Date of accident or article	Fatalities	Injuries	Equipment Damage	Property Damage or Collateral Costs	Accident Cause or What Happened
								then they boomed down with a load on.
Tacoma ^{xli}	WA	M	3/27/2006	---	---	---	"The guard rail was damaged."	"Transportation Department spokeswoman Claudia Cornish said a work crew was finishing a job at about 3:30 a.m. and the crane was turning around when it lost its balance and crashed across the guard rail. No one was hurt."
Tacoma ^{xlii}	WA	M	5/9/2008	---	1 operator	---	"The crane barreled down a hill... and smashed into several trees, parked cars and light poles before coming to rest..." "Firefighters said the driver jumped from the out-of-control rig and was not seriously injured."	"A large mobile crane careened down a hill in central Tacoma Friday afternoon after its brakes failed..."
Tacoma ^{xliii}	WA	M	8/29/2006	---	---	---	"...piling work on the project will be delayed for a day or two while a new crane is brought in."	"A crane being used to pound pilings for The Esplanade condominium project along the Thea Foss Waterway collapsed Tuesday morning. Construction officials are investigating the cause, but initial findings suggest metal fatigue, said Lou Castino of Graham Residential

Crane Accident Location	State	Crane Type	Date of accident or article	Fatalities	Injuries	Equipment Damage	Property Damage or Collateral Costs	Accident Cause or What Happened
								construction company.”
Tacoma ^{xliv}	WA	U	6/7/2001	---	---	---	---	Headline: “Construction crane accident causes power outage in downtown area “
Vancouver	WA	M	4/19/2004	---	1 operator	---	“...the bridge he was hired to fix collapsed beneath him.”	“A crane operator was injured when the bridge he was hired to fix collapsed beneath him. “
Yakima ^{xlv}	WA	M	7/30/2005	---	2 workers	---	---	“Two workers survived a high-voltage shock Saturday when a construction crane accidentally contacted a power line above the bridge-widening project on State Route 24 east of Yakima, authorities said.”

VI. Crane Accident Fatalities – WA, OR, and ID

Crane Accident Location	State	Crane Type	Date of accident or article	Fatalities
Bellevue ^{xlvi}	WA	T	11/16/2006	1 bystander
Everett ^{xlvii}	WA	M	2/20/2004	1 worker
Gray's Harbor ^{xlviii}	WA	M	3/20/2003	1 operator
Lynnwood ^{xliv}	WA	M	2/22/2002	1 operator
Lynnwood ^l	WA	U	8/13/2003	1 worker
Seattle ^{li}	WA	M	8/18/1994	2 workers
Seattle ^{lii}	WA	M	6/28/2001	1 operator
Seattle ^{liii}	WA	T	11/5/2007	1 operator
Seattle ^{liv}	WA	T	11/7/2007	1 operator
Portland ^{lv}	OR	M	9/23/2002	1 worker
Tigard ^{lvi}	OR	M	6/23/2003	1 worker
Jerome ^{lvii}	ID	M	2/7/2008	1 worker

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

ⁱ **Crane falls off bridge into Lucky Peak Reservoir**, From the Idaho *Statesman* newspaper site, November 12, 2005 [paid archive], CraneAccidents.com cache copy: <http://cachecopy.com/2005/nov/11-12-05id.htm>

ⁱⁱ **Man electrocuted on work site in Jerome**, From the *Times-News* site, magicvalley.com, Feb 7, 2008, http://www.magicvalley.com/articles/2008/02/07/news/local_state/130309.txt

ⁱⁱⁱ **Crews to pluck crane from lake**, From *The Bonner County Daily Bee*, Sandpoint, ID, Nov 10, 2002 (or 2001?) [not available from primary source], CraneAccidents.com cache copy: <http://cachecopy.com/2002/nov/11-10-02id.htm>

^{iv} **Man loses legs in crane accident**, From KATU, Portland, OR, news site [not available from primary source], CraneAccidents.com cache copy: <http://cachecopy.com/2004/mar/3-18-04.htm>

^v **RUNAWAY CRANE LANDS IN DITCH, TIES UP TRAFFIC**, From the *Curry Coastal Pilot* newspaper site, Brookings, OR, May 22, 2004 [not available from primary source], CraneAccidents.com cache copy: <http://cachecopy.com/2004/may/5-22-04or.htm>

^{vi} **Bridge Collapses Under Weight Of Construction Crane**, From KOIN.com news site, April 1, 2004 [not available from primary source], CraneAccidents.com cache copy: <http://cachecopy.com/2004/apr/4-01-04or.htm>

^{vii} **Crane crashes down near highway, no one hurt**, From KCBY.com, Channel 11 news, Coos Bay/North Bend, OR, May 13, 2008, <http://www.kcby.com/news/18923069.html>

^{viii} **09/23/02: Portland, Oregon — 1 man was killed while erecting a crane**, From CraneAccidents.com – original source is *The Oregonian* newspaper site [paid archives], CraneAccidents.com cache copy: <http://www.craneaccidents.com/group/reports/2002/sep02.htm>

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- ^{ix} **Crane Hits Power Wires In East Portland**, From Oregon FOX 12 TV station Web site, June 26, 2008, <http://www.kptv.com/news/16720744/detail.html>
- ^x **Worker knocked into trench after hook breaks off crane**, From KATU news, Portland, OR, June 10, 2005 [not available from primary source], CraneAccidents.com cache copy: <http://cachecopy.com/2005/jun/6-14-05or.htm>
- ^{xi} **06/06/01: Salem, Oregon — Crane falls, clipping a South Salem church**, From CraneAccidents.com – primary source unknown, <http://www.craneaccidents.com/group/reports/2001/june01.htm>
- ^{xii} **Construction crane falls into Bear Creek**, From the Southern Oregon *Mail Tribune* newspaper site, Aug 18, 2006, http://archive.mailtribune.com/archive/2006/0818/local/stories/crane_tips_8-18.htm
- ^{xiii} **The Dalles, OR**, From CraneAccidents.com – primary source unknown. Info from their archive for April 2004, <http://craneaccidents.com/group/reports/2004/apr04.htm>
- ^{xiv} **Man killed after being struck by crane**, From KFXO.com news site, June 23, 2003 – page no longer available from primary source, CraneAccidents.com cache copy: <http://www.cachecopy.com/2003/jun/6-23-03or.htm>
- ^{xv} **Power Out in Veneta**, From the KVAL Channel 13 news site, Jan 15, 2005 [not available from primary source], CraneAccidents.com cache copy: <http://cachecopy.com/2005/jan/1-16-05or.htm>
- ^{xvi} **Crane collapse in Bellevue kills man**, From the Seattle *Post-Intelligencer* newspaper web site, Nov 17, 2006, http://seattlepi.nwsourc.com/local/292762_crane17.html
- ^{xvii} **Crane operating on I-5 Everett project falls over**, From HeraldNet.com, an Everett, WA, news site, Jan 6, 2006, <http://www.heraldnet.com/article/20060106/NEWS01/601060705>
- ^{xviii} **Wrecking ball kills worker**, From the Seattle Daily Journal of Commerce, Feb 20, 2004, <http://www.djc.com/news/co/11154011.html>
- ^{xix} **Operator Unhurt As Crane Boom Collapses**, From the Seattle *Times* newspaper site, Sept 1, 1994, <http://community.seattletimes.nwsourc.com/archive/?date=19940901&slug=1928349>
- ^{xx} **Crane topples at Port, killing longshoreman**, From *The Daily World* newspaper site (serves Olympic Peninsula) [not available from primary source], CraneAccidents.com cache copy: <http://www.cachecopy.com/2003/mar/3-20-03wa.htm>
- ^{xxi} **Man Injured In Crane Accident**, From KOMO 4 News channel web site, Nov 14, 2004, <http://www.komonews.com/news/archive/4138101.html>
- ^{xxii} **Crane operator dies when cable hits power line**, From the Everett, WA, *Herald* site, Herald.net, <http://www.heraldnet.com/article/20020222/NEWS01/202220702>
- ^{xxiii} **08/13/03: Lynnwood, Washington — Crane Accident Kills Teen In Lynnwood**, From CraneAccidents.com – articles not locatable at inferred primary sources, <http://www.craneaccidents.com/group/reports/2003/aug03.htm>
- ^{xxiv} **Crane Topples, Knocking Out Power To Homes**, From Seattle *Times* newspaper site, Oct 20, 1998, <http://community.seattleTimes.nwsourc.com/archive/?date=19981020&slug=2778679>

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- ^{xxv} **Crane collapses at casino construction site**, From KOMONews.com, Channel 4 news site, Jan 14, 2008, <http://www.komonews.com/news/local/13772572.html>
- ^{xxvi} From CraneAccidents.com, primary source unknown
[<http://www.craneaccidents.com/group/reports/2001/july01.htm>]
- ^{xxvii} **CRANE ACCIDENT INJURES WORKER NEAR DOME**, From the Seattle *Post-Intelligencer*, Jan 5, 1999, <http://seattlepi.nwsourc.com/archives/1999/9901050044.asp>
- ^{xxviii} **Crane falls on railroad tracks near Seattle waterfront**, From the Seattle *Post-Intelligencer* newspaper site, March 7, 2006, http://seattlepi.nwsourc.com/local/262030_crane07ww.html
- ^{xxix} **Crane knocks out power in South Lake Union area**, From the Seattle *Times* newspaper site, June 10, 2008, http://seattleTimes.nwsourc.com/html/localnews/2004468891_weboutage10m.html?syndication=rss
- ^{xxx} **Tree being moved falls, kills crane operator; 2 hurt**, From the Seattle *Post-Intelligencer* newspaper site, June 28, 2001, http://seattlepi.nwsourc.com/local/29175_crane28.shtml
- ^{xxxi} **Mobile crane fire blocks northbound I-5**, From KING5.com, Channel 5 news site, Aug 15, 2008, http://www.king5.com/localnews/stories/NW_081508WAB_truck_fire_KS.4d6ce897.html?npc
- ^{xxxii} **Two Workers Killed In Fall; Kingdome Closed Indefinitely -- Basket Drops 250 Feet Onto Cab, Injuring The Operator**, From the Seattle *Times* newspaper, <http://community.seattleTimes.nwsourc.com/archive/?date=19940818&slug=1925961>
- ^{xxxiii} **Man dies after falling from tower crane**, From Seattle *Times* newspaper site, Nov 5, 2007, http://seattleTimes.nwsourc.com/html/localnews/2003995746_webfall05m.html
- ^{xxxiv} **Crane Operator Falls to Death At Seattle Construction Site**, From ENR.com, 11/8/2007, http://enr.ecnext.com/coms2/article_nesaar071108
- ^{xxxv} **Swinging crane rattles nerves**, From Seattle *Post-Intelligencer* newspaper site, December 14, 2006, http://seattlepi.nwsourc.com/local/295894_crane14.html
- ^{xxxvi} **Wayward crane knocks out power to some**, From the Seattle *Post-Intelligencer* newspaper site, Oct 9, 2001, http://seattlepi.nwsourc.com/local/41990_tl309.shtml
- ^{xxxvii} **Crane cuts power to parts of U-District**, From the Seattle *Post-Intelligencer* newspaper site, March 4, 2002, http://seattlepi.nwsourc.com/local/60759_power04ww.shtml
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- ^{xl} **Sunnen Crane Services tipped over a 160 ton Demag in Tacoma**. From CraneAccidents.com – unidentified primary source, March 14, 2001, <http://www.craneaccidents.com/group/reports/2001/mar01.htm>

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- ^{xliv} **06/07/01: Tacoma, Washington — Construction crane accident causes power outage in downtown area**, From CraneAccidents.com – primary source, Tacoma *News Tribune* (paid archives), <http://www.craneaccidents.com/group/reports/2001/june01.htm>
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- ^l **08/13/03: Lynnwood, Washington — Crane Accident Kills Teen In Lynnwood**, From CraneAccidents.com – articles not locatable at inferred primary sources,
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^{lvii} **Man electrocuted on work site in Jerome**, From the *Times-News* site, magicvalley.com, Feb 7, 2008, http://www.magicvalley.com/articles/2008/02/07/news/local_state/130309.txt