Washington State Department of
Labor & Industries

Preliminary Cost-Benefit Analysis & Significant Legislative Rule Analysis

Chapter 296-155 WAC, Part L Cranes – Rigging and Personnel Lifting

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List of Acronyms

APA Washington State's Administrative Procedure Act

ANSI American National Standards Institute

ASME American Society of Mechanical Engineers

BLS Bureau of Labor Statistics

CIA Crane Institution of America

DOSH Division of Occupational Safety and Health, Labor & Industries

ESD Employment Security Department

FTE Full Time Employee

HHS Health and Human Services

L&I Washington State Department of Labor & Industries

NAICS North American Industry Classification System

NCCCO National Commission for the Certification of Crane Operators

NSC National Safety Council

OSHA U.S. Occupational Safety and Health Administration

RPE Registered Professional Engineer

VSL Value of Statistical Life

WAC Washington Administrative Code

Chapter 1: Background

1.1 Requirements of the Administrative Procedure Act (APA)

The Administrative Procedure Act (APA; Chapter 34.05 RCW) requires that, before adopting a significant legislative rule, the Department of Labor & Industries (L&I) must analyze the probable costs and benefits of the rule, and determine that the benefits are greater than its costs, taking into account both the qualitative and quantitative benefits and costs." [RCW 34.05.328(1)(d)]
Under certain circumstances, a rule or rule component is exempt from this requirement. These exemption criteria are listed include:

- Emergency rules adopted under RCW 34.05.350;
- Rules relating only to internal governmental operations that are not subject to violation by a nongovernment party;
- Rules adopting or incorporating by reference without material change federal statutes or regulations, Washington state statutes, rules of other Washington state agencies, shoreline master programs other than those programs governing shorelines of statewide significance, or, as referenced by Washington state law, national consensus codes that generally establish industry standards, if the material adopted or incorporated regulates the same subject matter and conduct as the adopting or incorporating rule;
- Rules that only correct typographical errors, make address or name changes, or clarify language of a rule without changing its effect;
- Rules the content of which is explicitly and specifically dictated by statute;
- Rules that set or adjust fees under the authority of RCW 19.02.075 or that set or adjust fees or rates pursuant to legislative standards, including fees set or adjusted under the authority of RCW 19.80.045.

This cost-benefit analysis has been prepared in compliance with the APA for the rule amendments to Chapter 296-155 WAC that do not fall under these exemptions.

1.2 Background of This Rulemaking

1.2.1 Description of Current Regulation

The Department of Labor & Industries (L&I) administers and enforces the Washington Industrial Safety and Health Act (WISHA), and adopts rules governing safety and health standards for workplaces covered by WISHA. To maintain its status as an Occupational Safety and Health Administration (OSHA) State Plan state, Washington's safety and health standards must be at least as effective as standards adopted or recognized under OSHA.

Today, cranes are widely used in the construction industry and there are numerous types of cranes found on construction sites. While the utilization of cranes greatly improves the efficiency and effectiveness of construction operations, it may also impose great risk and cause tremendous damage to the workers, employers, and the communities involved if safety procedures are not followed.

State law required L&I to establish, by rule, a crane certification program and qualified crane operator requirements.

- Crane owners must ensure cranes are inspected and load proof tested by a certified crane inspector at least annually, and after any significant modification or repair of structural parts.
- Tower cranes and tower crane assembly parts must be inspected both prior to assembly and following erection of the tower crane.
- A certified crane inspector must notify L&I if the inspector finds the crane does not meet safety or health standards.
- Operation of a crane by a nonqualified crane operator is prohibited.

L&I establishes, by rule, the requirements to be a qualified crane operator. Qualified crane operators must have a valid crane operator certificate, for the type of crane being operated, issued by a crane operator testing organization which has an accredited program. Qualified crane operators must also have a certain number of hours of experience, which depends on the type of crane being operated, and pass a substance abuse test. Qualified crane operators must also be evaluated by a qualified evaluator.

L&I has created the duties of assigned personnel. This includes duties for crane owners, crane users, site supervisors, lift directors, and operators to follow.

All rigging must be performed by a qualified rigger present, and all signals must be given by a qualified signal person.

1.2.2 History of This Rulemaking

This proposed rulemaking accomplishes several objectives. The first is to amend the safety standards for cranes and derricks in construction. OSHA recently updated their standards, which included clarifying each employer's duty to ensure the competency of crane operators through training, certification or licensing, and evaluation as discussed below. Secondly, the 2024 legislature passed Second Substitute House Bill (2SHB) 2022 (Chapter 311, Laws of 2024), codified under RCW 49.17.400 through 49.17.440. The bill created new requirements for tower cranes, and this proposed rulemaking is needed to implement some of the changes made to RCW 49.17.400 through 49.17.440. The new law is in response to an incident in 2019 in which bystanders and workers died following the collapse of a tower crane in Seattle, Washington. The incident was preventable, and 2SHB 2022 aims to address causes of that incident. For example, 2SHB 2022:

- Requires tower crane manufacturers and distributors provide operational and safety information about their tower cranes available upon request by any person, within a reasonable time and in a format as determined by L&I.
- Directs L&I to establish effective stop work procedures that ensure the authority of any employee to refuse or delay tasks related to a tower crane that the employee believes could reasonably result in serious physical harm or death.
- Requires the presence of an assembly/disassembly director at every assembly, disassembly, or reconfiguration and requires rules establish qualifications of an assembly/disassembly director.
- Establishes maximum allowable wind speed for tower crane assembly, disassembly, and reconfiguration.
- Sets requirements for a written job plan.

OSHA also altered a provision that required different levels of certification based on the rated lifting capacity of equipment. While testing organizations are not required to issue certifications distinguished by rated capacities, they are permitted to do so, and employers may accept them or continue to rely on certifications based on crane type alone.

OSHA's rule also establishes minimum requirements for determining operator competency, which is accomplished through the operator evaluation requirement. Another recent update by OSHA included exemptions and clarifications for unique equipment used in roadway railway work. Finally, OSHA determined that operator certifications would be provided at no cost to the employees.

This rulemaking also intends to provide clarity on L&I's interpretation of requirements related to crane decertification and reinstatement. The changes under consideration would clarify what activities are covered, and will clearly state that damage to critical parts of the crane would require notification, rather than just implying it. The proposed language adds crane tipovers as a reporting requirement, while the assumption is that a crane involved in a tipover would be given an inspection prior to returning to service.

Finally, state-initiated amendments will also be proposed to address other areas in chapter 296-155 WAC, Part L, relating to cranes that either need to be updated based on current industry practice, or to clarify some of the language to maintain safety and health protections for employees. Additional housekeeping changes will also be included.

Due to OSHA recently updating their standard, prior rulemaking preproposals regarding Safety Standards for Cranes initiated in 2018 and 2019 have been withdrawn under WSR 21-14-078 and WSR 21-14-079. A new CR-101 was filed on July 6, 2021, to address this entire rulemaking, under WSR 21-14-080.

Chronologic summary of this rulemaking:

- March 20, 2018 – CR-101 (Preproposal Statement of Inquiry) filed to initiate proposed rulemaking relating to crane decertification and reinstatement. This rulemaking was intended to provide clarity on L&I's interpretation of these requirements.
- July 18, 2018 (Tukwila) – A stakeholder meeting was held to review draft language. There was an opportunity for stakeholder questions and input during the meeting.
- November 19, 2019 – CR-101 filed to initiate proposed rulemaking relating to the OSHA's recent updates to their standard for cranes and derricks in construction.
- January 15, 2020 (Tukwila) – A stakeholder meeting was held to share and review preliminary draft rule language. There was an opportunity for stakeholder questions and input during the meeting.
- January 23, 2020 (Moses Lake) – A stakeholder meeting was held to share and review preliminary draft rule language. There was an opportunity for stakeholder questions and input during the meeting.
- February 28, 2020 (Tukwila) – Continuation of the January 15, 2020 stakeholder meeting to finish review of the preliminary draft rule language. There was an opportunity for stakeholder questions and input during the meeting.
- July 6, 2021 – CR-101 filed to initiate proposed rulemaking relating to: OSHA's recent updates; provide clarification relating to crane decertification and reinstatement; propose state-initiated amendments throughout chapter 296-155 WAC, Part L, to reflect current industry practices; and clarify language to maintain safety and health protections for workers.
- July 6, 2021 – Withdrew CR-101's filed on March 20, 2018 (WSR 18-07-091), and on November 19, 2019 (WSR 19-23-082), in order to consolidate this current rulemaking into one rulemaking.
- July 15, 2021 – Virtual stakeholder meeting held to share and discuss updated preliminary draft rule language. There was an opportunity for stakeholder questions and input during the meeting.
- November 17, 2021 – Virtual stakeholder meeting held to share and discuss updated preliminary draft rule language. There was an opportunity for stakeholder questions and input during the meeting.
- January 5, 2022 – Virtual stakeholder meeting held to discuss specifically powered industrial truck (PIT) requirements and crane operator experience. There was an opportunity for stakeholder questions and input during the meeting.
- August 1, 2023 (Moses Lake) – A stakeholder meeting was held to share and discuss updated preliminary draft rule language. There was an opportunity for stakeholder questions and input during the meeting.
- August 3, 2023 (Seattle) – A stakeholder meeting was held to share and discuss updated preliminary draft rule language. There was an opportunity for stakeholder questions and input during the meeting.

- August 7, 2023 – Virtual stakeholder meeting held to share and discuss an updated preliminary draft rule language. There was an opportunity for stakeholder questions and input during the meeting.
- October 12, 2023 (Tukwila) – A small workgroup met with L&I to focus on the proposed changes to the preliminary draft rule. There was active participation from this group.
- November 28, 2023 (Tukwila) – Continued working with the small workgroup on updates to the preliminary draft rule. There was active participation from this group.
- December 19, 2023 (Tukwila) – Continued working with the small workgroup on updates to the preliminary draft rule. There was active participation from this group.
- January 30 and 31, 2024 (Tukwila) – Continued working with the small workgroup on updates to the preliminary draft rule. There was active participation from this group.
- February 22, 2024 (Tukwila) – Continued working with the small workgroup on updates to the preliminary draft rule. There was active participation from this group.
- April 2, 2024 (Tukwila) – A stakeholder meeting was held to share and discuss key changes to the preliminary draft rule. There was an opportunity for stakeholder questions and input during the meeting.
- April 3, 2024 (Spokane) – A stakeholder meeting was held to share and discuss key changes to the preliminary draft rule. There was an opportunity for stakeholder questions and input during the meeting.
- September 3, 2024 – A preliminary draft of rule language addressing some of the changes resulting from 2SHB 2022 was circulated to stakeholders for feedback.

1.2.3 Description of Rule Amendments

This proposed rulemaking addresses the following major changes:

- General housekeeping changes to streamline, create consistency of terms, and updated references throughout Part L.
- Throughout Part L, updated timeframe of submission of all annual certificates and inspection worksheets from ten to five days. Also, updated timeframes for submitting worksheets relating to proof load testing.
- WAC 296-155-52902 – Definitions are being added, amended, or removed throughout this section to reflect changes to the current rule.
- WAC 296-155-53100 – Amends current criteria requirements when certifiers must have a current and valid crane certifier certificate for the type of crane to be inspected and certified.
- WAC 296-155-53114 – Amends language to allow information from the worksheet to be contained with the annual certificates. Crane owners will no longer be required to wait for L&I to process the worksheet and provide confirmation. Amends timeframe for submitting worksheets, allows for electronic submission, adds requirements on what must

be included in the worksheet, and allows for an accessible digital copy of the worksheet/certificate to be placed in an operator's cab or manual.

- WAC 296-155-53200 – Updates and adds requirements regarding when and what must be included in shift inspections by accredited crane certifiers, updates language relating to hoist lines, and requires orders of immediate restraint issued by L&I to be lifted prior to equipment certification.
- WAC 296-155-53200 – Requires the accredited crane certifier to perform a complete inspection covering the surface of the entire length of the wire ropes. Adds an exception to this subsection relating to the feasibility due to the existing set-up and configuration of the equipment.
- WAC 296-155-53200 – Amends language relating to hoist lines not proof load tested are not considered certified.
- WAC 296-155-53206 – Updates language related to inspecting tower crane parts during assembly, disassembly, or reconfiguration. Adds new requirements around shift inspections and the use of static mounted cranes and traveling cranes. Updates timeframes for submission of worksheets to L&I similar to other sections. Require a registered professional engineer (RPE) to determine the setting of tower crane hoist load limit switches in the absence of the manufacturer's specifications.
- WAC 296-155-53214 – Amends language for when a certification of a crane or equipment is suspended, and when L&I must be notified of damage that has occurred to the equipment.
- WAC 296-155-53300 – Amends language relating to operator training. Adds language relating to when a testing organization is to be considered accredited. Adds language and literacy requirements. Adds language for when there is no accredited testing agency for the particular type of equipment an operator will use. Adds language indicating whenever operator certification/licensure is required there will be no cost to the employee. Amends language relating to substance abuse testing. Adds requirements related to retraining and evaluation processes, and makes other adjustments for clarity.
- WAC 296-155-53301 – Adds new section and requirements to address lift director qualifications.
- WAC 296-155-53303 – Adds new section and requirements to address assembly/disassembly (A/D) director qualifications.
- WAC 296-155-53400 – Adds language that the crane owner must ensure the crane receives a current worksheet/annual certificate of operation prior to use, and for tower cranes, after each reconfiguration.
- WAC 296-155-53400 – Adds language relating to outriggers and stabilizers.
- WAC 296-155-53400 – Adds new requirements related to multiple cranes and equipment, keeping clear of a load, tag and restraint line use, non-tower crane use inside or on multi-level building sites, flag and beacon light use, operations when wind speed exceeds limitations, stopping operations in unpredicted wind speeds, critical lift plans,

and requiring an RPE to review and approve use of cranes or equipment inside or on multi-level buildings.

- WAC 296-155-53401 – Updates section to reflect duties of assigned personnel, and when a position can perform more than one duty. Adds requirements to ensure the assembly/disassembly work zone is adequate and controlled. Clarifies language regarding radius of cranes and other equipment. Lastly, amendments add language related to load charts, riggers assigned to load handling activities, and additional A/D director duties.
- WAC 296-155-53402 – Adds language that the procedures for assembly, disassembly, or reconfiguration of a tower crane must be written and be on-site, and clarifies what qualified and competent mean.
- WAC 296-155-53404 – Adds language relating to the crane owner and crane user's compliance with manufacturer's established criteria.
- WAC 296-155-53405 – Adds language relating to removing a crane from service when a deficiency is found and creates a hazard.
- WAC 296-155-53406 – Adds language relating to the use of video equipment as an operational aid only.
- WAC 296-155-53408 – Updates section to reflect documenting planning meetings and who is required to attend, these meetings would occur at different phases of the job when working around power lines. Adds language relating to the work zone having demarking boundaries.
- WAC 296-155-53409 – Adds language relating to providing training prior to assembly, disassembly, or reconfiguration work when using a crane or equipment in the vicinity of energized lines.
- WAC 296-155-53414 – Updates section to reflect what is required when using crane or equipment bring used on a multi-level building. Add language requiring operations must cease in the event of safety devices or operational aids fail. Requires the operator must be evaluated prior to operating a crane or equipment and require signal persons be provided in certain situations.
- WAC 296-155-53416 – Adds new section and requirements to address when forklifts are used when lifting a suspended load.
- WAC 296-155-53700 – Amends existing language by adding new requirements when using electrically-operated cranes.
- WAC 296-155-53900 – Updates section to reflect the rigger and lift director must be certified when doing assembly, disassembly, or reconfiguration work. Adds language requiring the lift director must follow manufacturer's recommendations or an RPE. Requires certain criteria be met to address the operations of tower cranes on different job sites. Adds language related to the use of a dedicated spotter and require an anti-collision plan. Clarifies if manufacturer's procedures are not available an RPSE must develop the procedures. Adds new requirements when using electrically-operated cranes. Adds language requiring the crane manufacturer and distributor must provide operation instructions and guidelines when requested. Adds language relating to stop work

authority for any employee who has concerns with tower crane assembly, disassembly, reconfiguration, and operation.

- WAC 296-155-53910 – Adds new section to address tower crane notifications and inspections.
- WAC 296-155-53915 – Adds language relating to visual inspections of tower cranes. Adds criteria when working during adverse weather conditions. Also, adds language relating to maximum ballast or counterweight.
- WAC 296-155-54100 – Adds language requiring when manufacturer's procedures for welding on a self-erecting tower crane are not available an RPSE must be consulted. Adds new requirements when using electrically-operated cranes.
- WAC 296-155-55600 – Adds requirements relating to multi-tier rigging. Some current requirements were relocated to this section. Also, throughout this section the following American Society of Mechanical Engineers (ASME) standards were updated to the most current standard:
  - ASME B30.9-2021. Slings manufactured prior to the effective date of this section, must comply with ASME B30.9-2010.
  - ASME B30.26-2020. Rigging hardware manufactured prior to the effective date of this section, must comply with ASME B30.26-2010.
  - ASME B30.20-2021. Below-the-hook lifting devices manufactured prior to the effective date of this section, must comply with ASME B30.20-2010.
  - ASME B30.10-2019. Hooks manufactured prior to the effective date of this section, must comply with ASME B30.10-2009.
- WAC 296-155-55805 – Adds language requiring visually inspecting the wire rope sling before each shift.
- WAC 296-155-55815 - Adds language requiring visually inspecting the synthetic webbing sling before each shift.
- WAC 296-155-55820 - Adds language requiring visually inspecting the synthetic round sling before each shift.
- WAC 296-155-56105 – Current industry practice, adds language relating to shackles to match industry consensus standard.
- WAC 296-155-56110 – Current industry practice, adds language relating to turnbuckles, eyebolts, eye nuts, and swivel hoist rings, to match industry consensus standard.
- WAC 296-155-56115 – Current industry practice, adds language relating to wire rope clips and wedge sockets, to match industry consensus standard.
- WAC 296-155-56120 – Current industry practice, adds language relating to links, rings, and swivels, to match industry consensus standard.
- WAC 296-155-56125 – Current industry practice, adds language relating to rigging blocks, to match industry consensus standard.
- WAC 296-155-56200 – Updates to the more current ASME standard, ASME B30.20-2021, Below-the-Hook Lifting Devices and B30.20-2010 for structural and mechanical lifting devices manufactured prior to the effective date of this section.

- WAC 296-155-56205 – Updates to the more current ASME standard, ASME B30.20-2021, Below-the-Hook Lifting Devices and B30.20-2010 for vacuum lifting devices manufactured prior to the effective date of this section.
- WAC 296-155-56210 – Updates to the more current ASME standard, ASME B30.20-2021, Below-the-Hook Lifting Devices and B30.20-2010 for close proximity lifting magnets manufactured prior to the effective date of this section.
- WAC 296-155-56215 – Updates to the more current ASME standard, ASME B30.20-2021, Below-the-Hook Lifting Devices and B30.20-2010 for remotely operated lifting magnets manufactured prior to the effective date of this section.
- WAC 296-155-56220 – Updates to the more current ASME standard, ASME B30.20-2021, Below-the-Hook Lifting Devices and B30.20-2010 for grapples manufactured prior to the effective date of this section.

1.3 Description of the affected Businesses and Workers

The proposed rule impacts businesses and workers who are involved in crane-related activities. These activities include, but are not limited to, leasing, certifying, operating, directing, or supervising. The rules outline various aspects which are applicable to each activity, making clear not every single entity impacted would be subject to the full spectrum of the proposed rules. The rules also outline exemptions and/or restrictions whereby certain occupations or responsibilities are not subject to certain proposed requirements.

1.3.1 Affected Industries and Businesses

The proposed rules apply to all employers who are involved in crane-related activities. Using a low and high range of the likelihood of crane related activity of businesses within each industry, L&I was able to approximate the number of businesses within each industry likely affected by the proposed rules. The likelihood of overall crane use that informed the range estimates focused on mobile crane, tower cranes, overhead cranes, crawler/tractor cranes, and floating cranes. The industries most heavily impacted by the rules are (1) Crane Rental with Operator, Construction, Mining, and (2) Forestry Machinery and equipment Rental and Leasing, with an average of 95% impacted. These are followed by (3) Oil and Gas Pipeline and Related Structures Construction, (4) Highway, Street, and Bridge Construction, (5) Other Heavy and Civil Engineering Construction, and (6) Structural Steel Erection Contractors, at 65% each. Altogether more than 5,966 businesses may be affected by these proposed rules. Table 1 shares information about the top 20 businesses by percent of impacted industries. For a complete list of impacted industries and businesses likely impacted, see Appendix A.1. We also estimated the number of impacted businesses for forklift operator certifications for requirements under WAC 296-155-53416. The results reflect only those businesses with forklifts when used in a crane lifting capacity, and thus

omitted businesses with forklifts which are only used for general/standard functions (i.e. in a non-crane-lifting capacity). These were estimated to be approximately 4,544 likely impacted businesses. In Table 2 we present the top 20 industries likely impacted by percentage. See Appendix A.2 for the full list.

Table 1. Top 20 businesses likely impacted by industry[1]

NAICS	Industry	Percent likely impacted	No. of businesses likely impacted
238992	All Other Nonresidential Trade Contractors	95%	90
532412	Construction, Mining, & Forestry Machinery & Equipment Rental & Leasing	95%	71
237120	Oil and Gas Pipeline and Related Structures Construction	65%	17
237310	Highway, Street, and Bridge Construction	65%	143
237990	Other Heavy and Civil Engineering Construction	65%	116
238122	Structural Steel Erection Contractors	65%	40
236210	Industrial Building Construction	55%	36
236220	Commercial and Institutional Building Construction	55%	476
237130	Power and Communication Line and Related Structures Construction	55%	106
238112	Structural Steel and Precast Concrete Contractors	55%	32
332312	Fabricated Structural Metal Manufacturing	55%	33
237110	Water and Sewer Line and Related Structures Construction	45%	152
333924	Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing	45%	4
221122	Electric Power Distribution	40%	17
238111	Poured Concrete Foundation and Structure Contractors	35%	348
238191	Other Foundation, Structure, and Building Exterior Contractors	35%	63
238911	Site Preparation Contractors	35%	405
238912	Excavation Contractors	35%	113
238991	All Other Specialty Trade Contractors	35%	267
482111	Line-Haul Railroads	35%	*

Table 2. Top 20 businesses likely impacted by forklift operator certifications

[1] Top 20 list reflects the top 20 by percent of impacted industries

NAICS	Industry	Percent likely impacted	No. of businesses likely impacted
532412	Construction, Mining, & Forestry Machinery & Equipment Rental & Leasing	53%	40
333924	Industrial Truck, Tractor, Trailer, & Stacker Machinery Manufacturing	43%	4
423810	Construction and Mining (except Oil Well) Merchant Wholesalers	43%	56
482111	Line-Haul Railroads	38%	*
423990	Other Miscellaneous Durable Goods Merchant Wholesalers	38%	121
321922	Wood Container and Pallet Manufacturing	33%	7
332312	Fabricated Structural Metal Manufacturing	33%	20
236210	Industrial Building Construction	28%	18
236220	Commercial and Institutional Building Construction	28%	242
237120	Oil and Gas Pipeline Construction	28%	7
237310	Highway, Street, and Bridge Construction	28%	62
237990	Other Heavy and Civil Engineering Construction	28%	50
238112	Structural Steel and Precast Concrete Contractors	28%	26
238122	Structural Steel Erection Contractors	28%	17
238911	Site Preparation Contractors	28%	324
333112	Lawn & Garden Tractor & Home Lawn & Garden Equipment Manufacturing	28%	1
221122	Electric Power Distribution	23%	10
236116	New Multifamily Housing Construction	23%	12
237110	Water and Sewer Line Construction	23%	78
237130	Power and Communication Line Construction	23%	46

1.3.2 Affected Workers

In order to identify the occupations that are impacted by the rule and to estimate the number of workers in those occupations that are likely impacted, L&I relies on the occupation data form U.S. Bureau of Labor Statistics' Occupational Requirement Survey (ORS), data from the O*Net database and Washington State Employment Security Department's (ESD) occupational data.

Based on the scope of the proposed rules and the share of likely affected businesses, L&I estimates the number of impacted jobs for each individual section, as well as the number of impacted workers. The number of impacted workers for each requirement could vary and may

only represent a divided proportion of the total affected workers. These are explained in each section.

Table 3. Occupations most likely impacted by the proposed rule[2]

SOC	Job Title
53-7021	Crane operators
49-9096	Riggers
53-7021	Signal persons
47-1011	First-line supervisors of Construction Trades and Extraction Workers
49-1011	Lift Directors
17-2199	Engineers, All Other
53-7021	Crane Inspector
47-1011	A/D Director
53-7051	Forklift Operator

[2] The Standard Occupational Classification (SOC) system does not explicitly have a code for signal persons, lift directors, crane inspectors, or A/D directors. Based on their role and responsibilities they closely match that of existing SOC codes. The role of an A/D director and Lift director closely matches that of a First-Line Supervisor of Construction Trades and Extraction Workers, so we have assigned that code to them (SOC code "53-7021"). The role of a signal person or crane inspector most closely matches that of a crane inspector and so have been assigned the same code (SOC code "47-1011").

Chapter 2: Costs of Proposed Rule

2.1 Methods and Data Sources for Cost Analysis

The estimated costs in this analysis represent only the new cost of complying with the proposed rules for the affected parties, excluding realized potential costs associated or originating from the current practices, or "baseline" standards under existing laws, rules, or national consensus standards. Therefore, costs that are either attributable to or are insignificantly different from, these baseline standards are not analyzed or factored into our estimates.

The baseline for this analysis includes all the regulatory requirements that are currently applicable and in effect to crane-related activities. Additionally it incorporates recommendations, best practices, guidance, and requirements from relevant consensus standards, including chapter 296-155 WAC, OSHA, American Society of Mechanical Engineers (ASME), and American National Standards Institute (ANSI). Per RCW 34.05.328 (5)(b), all baseline requirements falling within existing state, federal or other regulatory requirements are exempt from this analysis. Only proposed rules and amendments that go above and beyond this baseline requirements and standards, are analyzed.

This chapter assesses each of the proposed rule components identified as having a probable cost implication. We assess all costs and benefits over a 10-year period (examined period) to capture the impact of initial costs as well as renewal requirements. All costs and benefit figures have been annualized based on this 10-year term. The chapter concludes by summarizing the total quantified probable costs.

Survey methodology

In order to effectively evaluate the cost implication of the proposed rule, L&I developed a structured and comprehensive survey in November 2024 to gather pertinent data. The survey was designed by Research and Data Services within the agency with input and feedback from DOSH and L&I's internal survey review committee. The primary objective of the survey was to gather detailed and relevant data to support the cost assessment of the proposed rules that will inform the cost-benefit analysis. Additionally, the survey aimed to determine the range of impact across various business sizes, particularly small businesses.

Survey Design

To ensure the survey yielded meaningful and relevant data, the following key principles guided the methodology:

Sample Frame - the target audience: The proposed rule affects businesses engaged in crane-related activities across several industries, including construction, telecommunications, electrical, manufacturing, transportation and logistics, and specialized services. The survey aimed to gather

responses from a representative sample of businesses most likely impacted within these sectors. To select this sample, L&I first identified the sub-industrial sectors within these industries that would be most affected. Using the 6-digit NAICS code designation, L&I then obtained a list of businesses likely involved in construction and crane-related activities from its administrative data warehouse. Next, L&I compiled a list of crane owners from its crane certification data. The population most likely impacted was derived from these two sources. L&I further refined this list by including only businesses headquartered in Washington State and filtering for those with valid email addresses. The resulting list formed the effective population from which the survey sample was drawn.

Sample Size: The total population of most likely impacted businesses comprised from the crane owners and sub-industrial-sectors, described above, was approximately 32,491. To select the appropriate sample size, L&I employed the conventional sampling methods to ensure statistically valid estimates by using a 95% confidence level and a ±5% uncertainty level. L&I then assumed a probable response rate of about 10% based on past rulemaking-related surveys. These factors applied to the estimated population, resulted in a sample size of 3,797, considered sufficient to yield statistically significant data.

Sampling and Data Collection Method: To select the businesses to be surveyed, L&I applied a random sampling method to the total population. L&I utilized an online survey tool in order to distribute the survey via email to the selected sample, and the same tool was utilized for collecting the responses. Fifty of the sampled businesses had an invalid email address which resulted in 3,747 emails being successfully submitted for sampling. This method was the preferred option for several reasons: (1) most impacted businesses have an email address to receive such electronic communications; (2) it ensures the quickest delivery method of the survey and collection of responses; and (3) it facilitates easy storage and preparation of responses for statistical analysis, allowing for faster analysis of the response data.

Survey Development: The survey was drafted to include a mix of both open-ended and closed-ended questions. This approach allowed for the quick statistical analysis of quantified responses as well as capturing some nuanced impacts. The initial draft of the survey was completed in November 2024. It was reviewed and tested internally and then submitted to L&I's internal survey review committee for further review. The survey was then updated based on feedback and further tested internally before being finalized. The survey was submitted to the sample list of companies on December 3, 2024 via email campaign. The survey respondents were given until December 13, 2024 (two weeks), to complete the survey. This particular timeframe was chosen to fall in between the Thanksgiving and Christmas holidays in order to increase the likelihood of a response. Two reminders were sent to respondents: first reminder was sent seven days after the initial email, and the second was sent two days before the deadline. Due to the low response rate, a second campaign was created using the same number of respondents, but adjusted for those who already completed the survey, those who unsubscribed, and the bounced

backs. This second campaign was submitted on December 20, 2024 with a deadline of January 13, 2025. Two reminders were sent for this second campaign: the first reminder was sent seven days after the initial submission, and the second was sent two days before the deadline.

Survey Response. There were a total of 312 bounced backs, 45 unsubscribes, and 46 completed surveys. There were a total of 138 responses, 69.3% of respondents submitted a completed survey, and 30.7% submitted a partially completed survey. From the responses received, 90.4% were small businesses (fewer than 50 FTEs), 5.2% were medium-size businesses (50 to 250 FTEs), and 4.4% were large businesses (greater than 250 FTEs).

Survey Content: The survey consisted of 76 questions and took approximately 13-20 minutes on average to complete. Typically, respondents answer about 50-75% of the total questions. The survey can be broken down into two main sections. The first collects some basic information about the type of business, such as its size and scale of crane operations. The second section aims to gather estimated compliance costs of the newly proposed sections and proposed changes to existing regulations. (See Appendix A.3 for survey).

2.2 Cost Estimates by Provision

2.2.1 WAC 296-155-53100 – Accreditation of crane/equipment certifiers

The proposed changes to WAC 296-155-53100, Accreditation of crane certifiers, has significant modifications to the requirements for crane certifiers, which have important implications for compliance, operational costs, and safety within the industry.

Under baseline conditions, individuals engaging in the testing, examination, or inspection for crane certification at construction sites are required to apply for and obtain a certificate of accreditation from the relevant department. These certificates, once obtained, must be renewed every three years unless the certifier has inspected at least 21 cranes, in which case the certification is extended for an additional three years.[3] Obtaining this certificate requires successfully completing the written examination(s) issued by L&I, or its authorized representative, prior to certifying a crane to be used in the state.

The proposed rule language establishes more stringent requirements. It mandates that individuals must first hold a current and valid crane certifier certificate specific to the type of crane they intend to inspect. This certificate must be issued by an accredited testing organization which is recognized by a national accrediting agency. It introduces structured protocols for re-

[3] Currently, there is no requirement for the agency issued certificate to be renewed every three years. However, certificates are valid for this time frame so it follows that certificate holders would renew every three year to remain in status. We therefore treat it as a baseline condition.

certification by requiring testing organizations to implement procedures for re-applying and re-testing crane certifiers who fail or are decertified.

The proposed changes increase the compliance burden on impacted businesses who must now ensure personnel are adequately trained and certified. Companies will need to allocate resources for certification fees associated with obtaining and renewing nationally recognized certifications. Based on data from the National Commission for the Certification of Crane Operators (NCCCO), the National Safety Council (NSC), and the Crane Institute of America (CIA), initial certification-only costs typically range between $150 and $600[4], which includes training and exam fees, while a full training program can range from $1,000 to $4,000.

Generally, it takes approximately 30 to 70 hours for the training and preparation for the certification, which includes time for the specialty exam. Based on agency data on registered crane certifiers, there are currently 111 crane certifiers in the state, 50 of whom would need to complete the requirements to be in compliance with the proposed rule.[5] It is very likely that the number of certifiers will grow overtime and so we assume a reasonable growth rate based on ESD's employment projections.[6] Due to the fact that experience, knowledge and training amongst current certifiers vary, we further assume that all those initially required to obtain certification, as well as future certifier candidates, would invest in the full preparation time. Ultimately, we estimate initially 50 persons would seek certification as per the proposed requirements, and two persons thereafter per year in the examined period, culminating in a total of 69. As a result, total cost of certification is approximately $129,021 to $353,231, or $14,514 to $39,264 annualized.

Current practice is for the certificate holder to renew the agency issued certificate of accreditation every three years. In this proposed language, the agency is clarifying the renewal requirement, as well as updating the term from three to five years. We assume no cost here since this is already standard practice. However, the requirement for the crane certifier certificate from a crane certifier testing agency imposes a renewal aspect on those certificate holders. These must also be renewed every five years in order to remain in active status. We assess the impact of this renewal for cost.

[4] Range is based off results from online searches including from the NCCO, NSC, and CIA.
[5] 61 registered crane certifiers only perform maritime crane certifications and are subject to WAC 296-56 and 296-304.
[6] There is no specific SOC code for a crane certifier. These are typically fitted into SOC 53-7021 – Crane and Tower Operators. According to ESD QCEW employment projections there were 1,362 Crane and Tower Operators in 2022 with a growth rate of 22 persons per year up to 2027. This results in 1,428 Crane and Tower Operators in 2025. Our current number of crane certifiers (111) represents ~13% of this total. ESD growth projections estimate 13 persons from 2027-2032. ESD projections were not available from 2033 and beyond so we estimate this by taking the average of the previous two terms to estimate the average annual increase for 2032 – 2034. This results in an overall annual average of around 16. Based on crane certifier proportion of the totals, it is projected that around two persons, on an annual average, will be crane certifiers.

According to data from testing organizations, this renewal requirement at five-year intervals will typically demand about eight to 16 hours for refresher courses, plus the exam. According to the same sources identified earlier, typical recertification costs at three to five year renewal periods are approximately $100 to $300. While recertification costs may vary across testing organizations, certificate holders must complete recertification requirements during the 12 months prior to certificate expiration. In the examined period (10 years), this would mean that every five years, approximately 52 persons on average would need to renew their certification, for an estimated cost of $64,016 to $143,319, or $5,733 to $12,831 annualized. See Table 4.

Table 4. Cost of Crane Certifier Accreditation Requirements[7]

Description	Value
Cost of crane certification	
Number of certificate candidates over 10 years	69
Average hourly wage	$51.84
Average cost of certification	$1,000 to $4,000
Average certification training time	30 to 70 hours
Annualized cost of crane certification	**$14,514 to $39,264**
Cost of renewals	
Total renewals in years 5-10	111
Average renewal time	8 to 16 hours
Average renewal fees	$100 to $300
Annualized cost of renewals	**$5,733 to $12,831**
Total annualized cost	**$20,246 to $52,095**

2.2.2 WAC 296-155-53206(7)(b) – Proof load testing of tower cranes

Proof load testing of tower cranes is an existing requirement. At baseline standards, in the absence of manufacturer specifications, hoist load limit switches must currently be verified by means of a static test using test loads of 102½% to 110% of applicable ratings. Under this requirement, the test loads were predetermined and so were simply executed.

The proposed language introduces changes to this approach. Instead of using a predetermined and standard test load, these are now required to be determined by a registered professional

[7] Total may not add up due to rounding.

engineer (RPE). This introduces a change in the cost structure of this requirement for crane operators, which is new.

The varying complexities of test loads contribute directly to the amount of effort required by an RPE to finalize a determination. The structural components would need to be thoroughly assessed, industry standards would need to be referenced, and calculations done, among other actions, to ensure the recommended test load is appropriate. This takes time, and based on a typical case, L&I estimates this task to take approximately 4 to 8 hours. Given the hourly wage of a registered professional engineer of $66.86[8], L&I estimates the cost of this requirement to be $226.48 to $452.96 per crane.

There are four primary instances which would require an RPE in this situation: before initial use, after significant repairs or modifications, periodically (as required by regulation or manufacturer specification), or as determined by qualified personnel. For purposes of this assessment, we assume that on average this requirement is triggered only once by the first instance - the initial load test after a crane is newly installed as a one-time requirement.

Internal agency data on registered cranes reveal that there are approximately 71 tower cranes operating annually in Washington State. Based on survey data, owners reported that manufacturer specifications were missing about 25% of the time. This results in approximately 18 tower cranes without manufacturer load testing specifications. Tower cranes on average may remain on a job for several months to one year, or even longer. This implies that this requirement would be triggered at a frequency no greater than at least once annually. Based on these factors, we estimate the total cost of this proposed change to be approximately $4,691 to $9,381. See Table 5 below.

Table 5. Cost of requiring an RPE to determine tower crane load test[9]

Description	Value
Number of registered tower cranes	71
Percent of cranes missing manufacturer specifications	25%
Number of times an RPE is needed for this task per year	1
Average time for a typical task	4 to 8 hours
Total annualized cost over 10 years	$4,691 to $9,381

2.2.3 WAC 296-155-53214(1)(c) – Crane decertification and reinstatement

[8]Hourly age is based off the starting wage for an RPE of $56.62 as per ESD employment data, and adjusted for wage growth over the examined period.
[9] Total may not add up due to rounding

Baseline requirements under this WAC has a limited scope of the regulation. Presently, modifications or repairs of a load bearing/sustaining part of a crane that triggers the invalidation of a certification and necessitates the inspection by an accredited crane certifier must be significant. In addition, any deficiency identified by a qualified person, or as a result of an L&I inspection, also triggers the invalidation of the certificate and subsequent inspection.

Proposed updates to this WAC introduce several significant changes regarding the crane certification and safety protocols. First, the proposed changes in subsection (1) expand the section's scope of application to explicitly cover all crane/equipment work under chapter 296-155 WAC, Part L, regardless of the activity, governmental jurisdiction, or industry scope. It would now require the immediate cessation of work when specified events occur. The triggering actions have been expanded whereby in addition to damage and modification of the load sustaining part which affects crane operations, repairs to these parts are now also a condition. The extent of these do not need to be significant in order to trigger a work cessation and crane inspection.

Additionally, instead of invalidating a certificate upon the triggering event, the certification is suspended. The proposed changes also add a new criterion event trigger - crane/equipment tip overs. The changes propose more detailed guidance on the inspection process, specifically requiring an accredited crane certifier to determine if damage, modification, or repairs are extensive enough to decertify a crane, in the event of any damage, modification, or repairs of a load sustaining/bearing part of the crane. The crane certifier must also consult with the manufacturer of the crane/equipment and follow any criteria or recommendations provided.

To estimate the impact of these proposed change, we first need to determine the frequency with which general damage, modifications or repairs occur to load sustaining/bearing parts of a crane which could affect safe operations. We then need to find out how long, on average, it would take an accredited crane certifier to determine the extent of the damages and make a decision on whether or not to decertify the crane. The crane certifier must also consult with the crane/equipment manufacturer and follow any criteria or recommendations. L&I relies upon data from its industry participant survey, and reasonable assumptions, to inform the analysis of these costs.

Based on survey data damage, modification, or repairs to load sustaining parts which are beyond normal or routine wear occurs 1 to 15 times within the 25th to 75th percentile on a crane. Assuming each crane owner has on average two cranes, then this amounts to an average of 2 to 30 times per crane owner. Based on L&I's internal data warehouse, there are currently 2,664 crane owners operating in Washington State. For this analysis, we focus only on the amount of time it takes an accredited crane certifier to complete the task of determining the extent of the damage and making a decision on whether or not to decertify. According to industry participants, this takes approximately one to four hours, depending on the complexities of the

situation. Based on the starting median hourly wage of an accredited crane certifier of $27.86[10], this requirement is estimated to cost $173,203 to $10.4 million. See Table 6.

Table 6. Cost of proposed changes to crane decertification and reinstatement[11]

Description	Value
Average number of annual repairs/damage/modifications	1 to 15
Average number of cranes per crane owner	2
Number of crane owners	2,664
Starting hourly wage: accredited crane certifier	$27.86
Average time in the determination process	1 to 4 hours
Total annualized cost over 10-years	$173,203 to $10,392,203

2.2.4 WAC 296-155-53301 – Lift Director Qualification

WAC 296-155-53301 establishes comprehensive requirements for lift director qualifications in the state. The proposed section aims to ensure that persons directly responsible for overseeing crane operations and associated rigging crews possess the necessary skills and qualifications to maintain safety and efficiency on construction sites. Specifically, the language outlines two optional pathways for qualification: assessment by a third-party evaluator or by an employer's own qualified evaluator. Each of these options would require the employer to maintain qualification documentation, which must be readily available at each work site. The lift director must be qualified as both a rigger and a signal person and must demonstrate knowledge proficiency in specific areas of the WAC verified through a written or oral test. The proposed language institutes a five-year validity period for the qualifications which requires renewal and a written examination at such time of expiration. Finally, the proposed language restricts lift directors from performing multiple roles during the assembly, disassembly, or reconfiguration of tower cranes.

[10] L&I used the average hourly wage of a crane inspector who would most likely be the individual acting as an accredited crane certifier.
[11] Total may not add up due to rounding.

The entire section is new and would impose a cost upon impacted employers and employees. The qualifications portion detailed in subsection (4) outlines the general knowledge requirements which the candidate must possess and demonstrate as part of the evaluation component. It is generally acknowledged that riggers or signal persons, who are the primary candidates, are already expected to possess this knowledge. As a result, there will be no additional cost associated with this aspect. Therefore, the primary costs associated with this proposed requirement is the cost of getting evaluated, and recertification.

To estimate the cost impact of this proposed section, we broke down the components into three segments. First, we calculated the evaluation qualifying cost of using option 1 or option 2. Second, we estimate the cost of certification renewal. Finally, we assess the economic impact of the restrictions placed on operating multiple roles of the lift director. L&I relies upon data from its industry participant survey to inform its analysis.

A lift director is required on all jobs sites during crane and lifting operations. As a first measure, we need to estimate the total number of candidates who may qualify as lift directors. Analysis of the industry shows that riggers and signal persons are the persons currently executing the role of a lift director and so are most likely to seek qualification. Employment data from Washington State ESD shows that as of May 2023, there were 900 riggers in the state. Using signal persons numbers from 2011, and applying an average annual growth rate of 0.50%, results in an estimated 2,181 signal persons in 2024.[12] If we assume 75%[13] of all riggers and signal persons would seek qualification as a lift director, this amounts to approximately 2,320 (684 riggers and 1,636 signal persons) initial candidates. Based on ESD's projected growth rates, an average addition of 12 persons (four riggers and eight signal persons) would be seeking qualification each subsequent year.

Cost of evaluation

Employers have the option of using either a qualified third party qualified evaluator or conducting the evaluation in-house with an employer qualified evaluator. Survey data shows that approximately 60% would use a third-party evaluator and 40% would be able to do this in-house. This translates to 1,392 individuals using the third-party option who would face both service and labor time cost. Cost of third-party evaluation services are estimated to cost between $400 and $750[14], and evaluations times are on average 8 to 90 hours, which includes the training plus examination.[15] This results in an estimated $126,541 to $725,954 annualized.

[12] Cost assessment from L&I to a 2011 crane rule, estimated 2,034 signal persons in the state.
[13] This estimate represents a range most likely to capture the true figure.
[14] This reflects the starting cost of the service. These figures have been adjusted for inflation in our general calculations.
[15] Based on general industry data.

Employer qualified evaluations take less time at approximately eight to 24 hours and would only impose labor time cost on the 928 individuals using this option. Companies surveyed indicated that the most likely person representing their qualified evaluator is along the lines of a construction manager or rigging supervisor. Based on the mean hourly wage of these individuals, and the average time for the process, employer qualified evaluations cost approximately $80,754 to $242,263. See Table 7.

Table 7. Cost of qualification evaluations[16]

Description	Value
3rd Party Evaluations	
Number of candidates	1,392
Average hourly wage	$41.96
Average time needed for qualification	8 to 90 hours
Average services cost	$400 to $750
Annualized cost of 3rd party evaluations	**$126,541 to $725,954**
Employer-Qualified Evaluations	
Number of candidates	968
Average hourly wage of candidate	$28.93
Average hourly wage of evaluator	$68.36
Average time needed for qualification	8 to 24 hours
Annualized cost of evaluations	**$80,754 to $242,263**

Certification renewal

The proposed rule requires a renewal of the certification every five years to ensure the lift director maintains qualified status. Renewal information from nationally-recognized organizations reveal that recertification for a lift director entails passing the applicable examinations. These examinations are estimated to take between 1 to 1.25 hours, and typically has a starting costs of around $160.[17] We do not assume any cost for refresher trainings or courses since lift directors would be current practitioners. Some recertification organizations requires certifications to be completed 12 months prior to expiration. This means lift directors would have two renewals within the examined 10-year period. Based on these factors, L&I estimates certification renewals over the examined period to be $122,204 to $137,102 annualized. See Table 8.

[16] Total may not add up due to rounding.
[17] The average inflation-adjusted cost for the examined period is $219.97.

Table 8. Cost of certification renewals[18]

Description	Value
Lift Director Renewals	
Number of renewals in 10 years	4,689
Average hourly wage	$70.77
Average renewal time	1 to 1.5 hours
Average renewal examination cost	$160
Annualized cost of renewals	**$122,204 to $137,102**

Cost of role restrictions

The proposed requirements prohibit the lift director from operating in any other capacity during assembly, disassembly, or reconfiguration. Following the previous section, this means that the company would need to replace either a rigger or signal person since this individual would now be the assigned lift director. Assuming that each impacted business needs to replace either a signal person or rigger, then one of those would need to be replaced for each job, or a new employee would need to be hired as a replacement. We identify these as the "as needed" and "full time" options respectively. As stated in the previous section, approximately 684 workers would transition to a lift director from a rigger, and 1,636 from a signal person. Given that 10% of businesses are medium-sized to large, the ones who would most likely be involved in tower crane work, we extend this same percent to the number of workers. Thus 68 riggers and 164 signal persons would be impacted. General industry standards recommend four to six riggers for a typical tower crane assembly/disassembly and a single signal person.[19] For our analysis we assume an average of five riggers and one signal person per crane job.

The time needed to assemble or disassemble a crane varies depending on the size and complexity of the crane. A small crane can be assembled or disassembled within a few hours, whereas a large tower crane could take several days or even weeks. For purposes of this analysis, we assume an average of four hours to dismantle a small crane as our lower end range, and five days (40 hours) to dismantle a much larger crane as our high-end range.

Based on this these replacement hours, L&I estimates the cost of restricting the role and the lift director to be $67,006 to $670,055. See Table 9.

Table 9. Cost of role restrictions[20]

Description	Value

[18] Total may not add up due to rounding.
[19] Technical documentation on Crane Assembly and Dismantling from www.liebherr.com recommends 4 to 6 riggers per assembly/dismantle tower crane jobs.
[20] Total may not add up due to rounding.

Average number of jobs needing replacements: Rigger jobs Signal person jobs Average hourly wage: Rigger Signal person Average time per assembly/disassembly job Annual number of annual tower crane jobs **Total annualized cost**	 355 71 $41.96 $28.93 4 to 40 hours 71 **$67,006 to $670,055**

Total cost

Overall, the total cost of the proposed requirements from WAC 296-155-53301 is estimated to be $396,505 to $1,775,375. See Table 10.

Table 10. Total annualized cost of lift director qualifications

Description	Value
Cost of evaluation	$207,296 to $968,217
Cost of renewal	$122,204 to $137,102
Cost of role restrictions	$67,006 to $670,055
Total annualized cost	**$396,505 to $1,775,375**

2.2.5 WAC 296-155-53303 – Assembly/Disassembly Director Qualifications

Proposed WAC 296-155-53303 is new and establishes comprehensive requirements for Assembly/Disassembly (A/D) directors of cranes/equipment. The rule mandates that A/D directors must have the authority to implement prompt corrective measures to eliminate hazards during the assembly/disassembly, or reconfiguration processes. A/D directors must be qualified by either obtaining documentation from a third-party evaluator attesting to their knowledge and capability as outlined in subsection (3) of this WAC, or be assessed by an employer qualified evaluator. Qualification documentation must remain and be available on-site specifying the types of equipment the A/D director is qualified to oversee. The rule also introduces an ongoing assessment component requiring retraining and reassessment if the A/D director's actions suggest they may not meet the qualification standards. Specific qualifications include the ability

to identify hazards, knowledge of relevant regulations and manufacturer instructions, and fulfillment of duty requirements. These competencies must be demonstrated through a written or oral examination. The proposed rule institutes a five-year renewal period for qualifications, which cannot be exceeded in order to maintain qualified status. The renewal requirement implements, at a minimum, the inclusion of a documented written examination.

To estimate the cost impact of this proposed section, L&I analyzed two main segments: the cost of the evaluation options and the cost of renewal. L&I relies upon a combination of data from its industry participant survey, as well as well-reasoned assumptions, to inform its analysis.

Cost of evaluations

Similar to the evaluation options for qualifying a lift director, employers have the same two options of qualifying an A/D director. To estimate the cost of these qualifications, we first need to determine the number of A/D director candidates. This estimation is based on a combination of survey data and reasonable assumptions.

Survey data indicates that approximately 46% of medium to large businesses employ an A/D director in their operations. Typically, the complexities of crane assembly and disassembly – primarily involving mainly larger cranes, such as tower cranes, mobile, and large articulating boom cranes – necessitate the use of an A/D director.

We assume that 75-100% of the large businesses, which are more likely to frequently use larger cranes and employ full-time A/D directors, require an A/D director on staff. For medium-sized businesses, we assume a range of 25-50%. Small businesses were not included, as they are less likely to own or operate larger cranes. This results in an overall percentage 48-73%, equating to a range of 126 to 191 medium to large businesses likely to have an A/D director candidate.

Based on survey data, firms employing A/D directors, or persons in equivalent roles, indicated that, on average, they would need to qualify three individuals as A/D directors to meet the requirements of this proposed section. Assuming each firm qualifies someone, approximately 377 to 572 workers would need to be trained. Survey data indicate that riggers, signal persons, or crane operators are the most likely employees to transition to this position. Data for third-party training providers indicate that it takes two days to complete the A/D director training qualifications.[21] Using this information, we estimate the cost of qualifying candidates using the two options.

Third-party evaluations

Based on survey data, 67% of firms (84 to 128) indicated that they would use a third-party evaluator, with 33% (41 to 63) stating they would use an employer-qualified evaluator. We

[21] Data from various training providers overall indicated an average of two days for full training.

assume all firms would need to qualify approximately three A/D directors based on the earlier statement. The estimated cost to qualify an A/D director using a third-party service was stated to be $1,270 to $1,905 inflation-adjusted, per director.[22] Since there's no data on the growth rate of the A/D director, L&I used the growth rate of the construction industry to represent the new individual who would need to get A/D director qualifications every year throughout the examined period. According to ESD long-term aggregate industry data, the construction industry is expected to grow at an annual rate of 1.57% from year one to year three, then 1.14% from year four to year eight, then 1.36% from year nine to year 10. Based on these growth rates, each year an average of 82 businesses would be added from which we estimate three would need A/D directors.[23] This results in an average of eight new A/D directors each year, five of whom would be qualified using a third-party evaluator. This amounts to an average annual of $37,442 to $56,163 in total third-party evaluator services cost.

In addition to these services cost, there's also a labor cost, reflected as lost work hours, for the time needed in the qualification process. Based on the average salary of a rigger, signal person, and crane operator, and the total time required for qualification, impacted businesses would incur approximately $19,694 to $29,560 every year in total labor cost. Combined, the estimated total cost of third-party evaluations range from $57,136 to $85,723 annualized over the examined period with the highest cost occurring in year one after rule implementation. See Table 12.

Employer-qualified evaluations

To estimate the cost of this option, we assume the time needed to qualify an A/D director is the same as in the first evaluation option. 33% of firms using this option results in 41 to 63 firms needing to train and qualify 124 to 189 employees. The employees likely to qualify as an A/D director are the same as in the previous option with employers stating that they are likely using a rigging supervisor or safety manager as their qualified evaluator. The total cost associated with this option is simply the labor time needed to do the evaluation. Based on the average hourly wages of the workers involved, the estimated cost of the employer-qualified evaluations are $16,136 to $24,063. See Table 11.

Table 11. Cost of employer-qualified evaluations[24]

Description	Value
3rd Party Evaluations	
Number of candidates	252 to 383

[22] While the cost for qualifying an A/D director would vary across providers, on average the typical cost would fall within $1,000 to $1,500 (2024 dollars). For instance, the cost for the two-day training at Crane Assembly & Disassembly Director | ITI is $1,195.
[23] This figure is calculated based on same methodology used to calculate the original impacted businesses. 5% of businesses are medium-sized and46% of those would be the ones to qualify an A/D director.
[24] Total may not add up due to rounding.

Average hourly wage	$40.91
Average time needed for qualification	16 hours
Average services cost	$1,270 to $1,905
Annualized cost of 3rd party evaluations	**$57,136 to $85,723**
Employer-Qualified Evaluations	
Number of candidates	124 to 189
Average hourly wage of candidate	$40.91
Average hourly wage of evaluator	$82.66
Average time needed for qualification	16 hours
Annualized cost of evaluations	**16,136 to $24,063**

Cost of renewal

There is a five-year qualification period, at which point the A/D director qualification must get renewed in order to maintain status. The proposed requirements around this renewal ranges from taking a written or oral examination, similar to the one taken at original qualification, to repeating in entirety the original qualification process. L&I believes that most reasonable individuals would chose the former option, which is the most time and cost-effective method. This option would impose a labor time cost represented as the lost work time of the individual for taking the examination, plus the cost of the exam. If going through this step using a third-party evaluator, the cost could range from $100 to $300 for the exam and paperwork, while there would be minimal to no cost for the employer qualified evaluator.[25] The amount of time needed for the exam is assumed to be the same regardless of the evaluation option used – one to two hours.[26]

Using the same renewal approach, whereby all requirements are to be satisfied 12 months prior to expiration, we assess the cost of two renewals in a 10-year period. Based on the cost factors and the number of A/D directors who would be renewing in this time frame, the estimated cost of renewals ranges from $10,552 to $27,524. See Table 12.

Table 12. Cost of renewals[27]

Description	Value
Renewals using 3rd party providers	
Number of candidates	252 to 383
Average hourly wage	$49.64

[25] Third-party cost estimates are based off data from the National Commission for the Certification of Crane Operators, the National Safety Council, and the Crane institute of America.
[26] Time frame is based on the typical time needed for a crane inspector or rigger certification.
[27] Total may not add up due to rounding.

Average renewal time	1 to 2 hours
Average renewal examination cost	$137 to $412
Annualized cost of renewals	**$8,743 to $23,905**
Renewals from employer-qualified evaluators	
Number of candidates	124 to 189
Average hourly wage	$49.64
Average hourly wage of evaluator	1 to 2 hours
Average renewal time	$87.49
Annualized cost of renewals	**$1,809 to $3,619**

Total cost

Overall, the total cost of the proposed requirements from WAC 296-155-53303 is estimated to be $83,824 to $137,310 annualized.

2.2.6 WAC 296-155-53400(39) – Multiple crane/equipment coordination plan

Proposed language in WAC 296-155-53400(39) is a new subsection and has no baseline. It outlines requirements for a multiple crane/equipment coordination plan in situations where cranes or equipment operate within the working radius of each other, including across different job sites. Specifically, it requires supervisors of affected sites to establish a coordination system to be implemented in a formal plan. This plan must be developed, reviewed and signed by all the affected site supervisors, be implemented before operation of any of the affected cranes, and be kept on-site while the cranes/equipment is in use. Additionally, the plan requires the communication of the proposed maximum boom tip height and the proposed working area before the crane enters another's radius.

The proposed subsection is intended to enhance safety and coordination in complex crane operation environments. The requirements outlined would impose a new cost on impacted businesses which includes administrative expenses for developing, reviewing, and approving the coordination system by all affected supervisors. This process demands a time and resource component from those impacted and constitute the primary categories of cost.

In order to estimate the cost of this proposed requirement, L&I relies upon data from its industry participant survey, and upon a set of assumptions. First, in a typical scenario we assume there are only two sites impacted at a time where this requirement would be triggered. Second, each site has one supervisor who would be responsible for contributing towards the system. Third, survey data shows that within the 25th and 75th percentile, the average coordination plan takes

approximately 1.5 to 9 hours to develop, review and approve, through signage of the plan, based on the complexities of the site and equipment. This of course represents the time for one supervisor.

Based on survey data on the number of jobs where there's an intersection of the radius of different cranes, we estimate approximately two to nine plans on average (based on the 25th and 75th percentiles) would need to be created each year, per business. Based on the number of businesses impacted, this amounts to an average of 693 to 2,760 each year. Survey data also shows that the workers most likely to be involved in the survey plan are Site Supervisor, Crane Operator, Safety Manager, and Project manager. Using the 10-year average hourly wage of a First-line supervisor in construction trades of $60.51, the amount of time to complete the plan and the average number of plans, we estimate the cost of this proposed requirement to be approximately $109,932 to $2.9 million annualized over 10 years. See Table 13 below.

Table 13: Cost of multiple crane coordination plan[28]

Description	Value
Average number of businesses over 10 years	307
Average time to create a plan	1.5 – 9 hours
Average number of plans needed per business each year	2 – 9
Average annual plans created	613 – 2,760
Average hourly wage of a supervisor	$60.51
Total annualized cost	**$109,932 - $2,968,162**

2.2.7 WAC 296-155-53400(42)(b) – (c) – Keeping clear of the load

Baseline requirements under WAC 296-155-53400(42)(b) to (c) state that hoisting routes that minimize employee exposure to hoisted loads must be used in the situations where they are available. Proposed changes to this subsection introduce more stringent requirements in situations where the public is exposed to the lifting or hoisting of loads. First, in subsection (b) it specifically requires the closure of sidewalks, roads, and public areas which must be controlled, marked off, and cleared at all access points prior to moving the load in situations where the load may swing over public areas. This must be done to the extent allowable by applicable jurisdictions. Second, in subsection (c) it requires the development and utilization of a plan for minimizing public exposure when lifting loads over occupied buildings prior to the commencement of the lift.

[28] Total may not add up due to rounding.

The proposed subsection creates new costs for businesses engaged in crane operations that handle loads that have the potential to swing over an area accessible by the public, or involve lifting loads over buildings which area occupied. To assess the cost of this proposed requirement we estimate the cost from two components: cost of road and public access closure, and the cost of the minimum public exposure plan requirement.

Cost of road and public access closure:

When a load has the potential to swing over a publicly accessible area, the supervisor must close the sidewalks, road, and/or public areas and control, mark off, and clear all public access points. Road and public access closure and controls must be done where allowable by respective jurisdictions. This does present a true cost assessment challenge due to the wide variability of jurisdictional approaches and requirements, including fees. Additionally, this must be done in accordance with chapter 296-155 WAC, Part E, Signaling and flaggers, and the Manual on Uniform Traffic Control Devices.

To assess the impact of this proposed rule we rely on data from our participant survey, as well as reasonable assumptions to inform our analysis. We first need to estimate the number of businesses and crane jobs that meet this criteria. Given Seattle's high propensity of crane activity to the rest of the country in general, and in Washington particularly, we assume that 60% of crane businesses operate in or near an urban/suburban area, and 40% in the lesser populated areas. We further assume that 75% of crane operations in urban/suburban areas have the potential to swing over a public area due to the higher density of buildings; 20% was assumed for lesser populated areas. Based on these assumptions, we estimated approximately 3,162 (2,685 in urban/suburban and 477 in lesser populated areas) businesses would be impacted. Using our estimate of 3 to 20 jobs per business per year, this amounts to 6,136 to 44,661 jobs each year which has the potential for a load to swing over a public area.

Survey data indicates that the occupations most likely to be responsible for public access control are the crane operator or the flagger. Those responsible would spend on average 10 to 75 minutes to close a sidewalk, road, or public area, and to control, mark off, and clear a public area. Based on these factors, we estimate the probable cost of this requirement to be $153,082 to $8.36 million annualized. See Table 14.

Table 14. Cost of road and public access closure[29]

Category	**Details**
Total Businesses Impacted:	
Urban/Suburban areas	2,685
Lesser populated	477

[29] Total may not add up due to rounding.

Crane Businesses Distribution	
Urban/Suburban areas	60%
Lesser populated	40%
Crane Jobs Distribution	
Urban/Suburban areas	75%
Lesser populated	20%
Annual number of impacted crane jobs	6,136 to 44,661
Average time to close off public areas	10 to 75 minutes
Total Annualized cost	**$153,082 to $8,356,626**

Cost of minimum public exposure plan:

To assess the cost of this requirement we need to estimate the frequency with which lifting loads over occupied buildings occur. It is generally acknowledged that a significant portion of crane work occurs around buildings which are occupied. As a result, we assume that approximately 50-75% of all businesses conduct operations requiring lifts over occupied buildings. Among these businesses, according to survey data, about 9% of their jobs actually involve lifting loads over occupied buildings. This indicates that even though a larger portion of businesses perform such high-risk activities, the frequency of this particular task is relatively low.

The average number of annual crane jobs per business varies widely, and conservatively ranges from three to 20 per year in the 25th and 75th percentile range respectively.[30] This range accounts for the differences in business size, scope, specialization, and area of business. Over a 10-year period, this results in a cumulative estimate of 828 to 8,279 annually.[31] The average time to develop the typical plan is estimates at 30 to 60 minutes, and usually involves a crane operator ($43.90/hr.), supervisor ($51.25/hr.), and/or flagger ($29.75/hr.). Given the mean hourly wage of these workers, we estimate the cost of this requirement to be in the range of $60,280 to $1.2 million. See Table 15.

Table 15. Cost of minimum public exposure plan[32]

Category	**Details**
Number of businesses engaged in lifts over occupied buildings	477 to 2,685
Average number of annual crane jobs per businesses	3 - 20

[30] Figure is based of crane survey data for jobs completed in 2023.
[31] Figures based on 50-75% of business (5,767 to 8,651) with an impacted job rate of an average of 9%.
[32] Total may not add up due to rounding.

Percent of jobs involving lifts over occupied buildings	9%
Average number of jobs over 10 years involving lifts over occupied buildings	828 to 8,279
Average time to develop a plan (minutes)	30 to 60
Average hourly wage(total of all involved)	$147.48
Annualized cost of developing plans	**$60,280 to $1,205,605**

The total cost of this proposed requirement is therefore approximately $213,362 to $9.6 million annualized.

2.2.8 WAC 296-15-53400(76) – Tower cranes inside or on multi-level building sites

This proposed language requires that when cranes, with the exception of tower cranes, are being used inside of, or on, multi-level building sites, that methods to prevent the inadvertent movement of the equipment when handling loads are used.

The requirement here is simply for the employer to ensure that proper methods are used to shore up and prevent inadvertent movement without prescribing any method or manner. As a result, employers are able to use any and all means available to them and at their discretion to comply with this proposed requirement. As a result, L&I believes that an employer would choose the most reasonable and cost-effective approach. Therefore, there would be minimal to no cost of complying with this section.

2.2.9 WAC 296-155-53400(80) – Critical Lift Plan

Proposed WAC 296-155-53400(80) is new and has no baseline requirements. It outlines the comprehensive requirements for a critical lift plan, which is needed when a load handling activity exceeds standard lift plan criteria or is deemed a critical lift plan. The plan must be in written or digital form and made available on-site while the critical lift occurs. The requirements detail four main components of the plan: the load, the crane/equipment, rigging, and crane/equipment and load travel path.

The proposed requirement for the critical lift plan potentially involves significant administrative and personnel costs to those impacted. The critical lift plan is a comprehensive, detailed plan.

To assess the cost implication of the proposed requirement, L&I relied upon the assumption that the specifics outlined within the subsection, which are to be included in the plan, are already existing industry practice. Therefore the primary cost of this requirement focuses on the costs incurred in the development of the plan itself.

To estimate the cost, L&I determined the frequency with which critical lifts occur based on survey data. It revealed that 10% of businesses report doing critical lifts. 80% of these businesses reported critical lifts in up to 25% of their jobs, 10% reported critical lifts in up to 50% of their jobs, with the final 10% reporting critical lifts in up to 75% of their jobs. This results in approximately 1,125 to 7,497 annual critical lifts over the examined period. Developing a typical plan takes 1 to 2 hours on average and, according to survey data, usually involves a site supervisor, crane operator, safety manager, and/or a rigging supervisor, with respective starting hourly wages of $51.25, $43.90, $43.00, and $33.00.[33] As a result, the annualized cost of this proposed requirement is estimated to range between $119,314 and $1.6 million. See Table 16.

Table 16. Cost of critical lift plan[34]

Category	Details
Average number of annual critical lifts	598 to 3,986
Average time to develop a typical plan	1 to 2 hours
Total average hourly wage of employees involved	$202.09
Total annualized cost	$119,314 to $1,590,849

2.2.10 WAC 296-155-53400(81) – Multi-level Building RPE Reviews

Proposed WAC 296-155-53400(81) outlines requirements for using a crane/equipment inside of or on multi-level buildings. It mandates that a Registered Professional Engineer (RPE) must review and acknowledge three key elements before crane operations: the engineering of the structural support of the crane/equipment, the methods to prevent the crane/equipment from moving while hoisting a load, and the adequacy of equipment base, structural supports, and connection points to handle applied torsional moments and forces.

The proposed requirement is new and imposes a cost on impacted businesses engaged in multi-level building crane operations. The economic impact is as variable as the scope of the project being reviewed by the RPE. To assess the impact of this requirement, L&I relies upon a mix of survey data and assumptions to inform the analysis. To estimate this cost we focus on the

[33] L&I used the national average hourly wage for a safety manager and rigging supervisor as these were not available for Washington State.
[34] Total may not add up due to rounding,

administrative and personnel components primarily impacted by this requirement. Survey data indicates that on approximately two percent of businesses operate cranes inside of or on multi-level buildings.

Survey data was inconclusive in providing an estimation of the number of jobs conducted inside of or on multi-level buildings. However, considering factors such as type of project, crane type, and construction type (high-rise or multi-story, low-rise or horizontal construction), L&I based its analysis on the assumption that 50-75% of total jobs would be subject. On average, the frequency with which multi-level building crane operations occur are estimated to be 184 to 1,840 annually, based on our survey data.

While the complexities of each project make the reviews variable, we assume the typical multi-level building project review takes approximately 10 to 40 minutes. Using the average hourly rate of an RPE of $66.86, we estimate the total cost of this requirement to be $2,024 to $80,967. See Table 17.

Table 17. Multi-level building RPE review costs[35]

Description	**Value**
Percent of business who operate cranes inside of, or on, multi-level buildings	2%
Number of businesses	368 to 2,453
Percentage of jobs that include operations inside of, or on, multi-level buildings	50-75%
Number of jobs	184 to 1,840
Average hourly wage	$66.86
Average time for an RPE to review the plan	10 to 40 minutes
Total annualized cost	**$2,024 to $80,967**

2.2.11 WAC 296-155-53401(1) – Duties of assigned personnel

Proposed changes to this WAC would forbid a lift director and an A/D director from performing multiple roles during tower crane assembly, disassembly, or reconfiguration. Additionally, it introduces duties of the rigger and the A/D director.

Restricting the duties of the lift director and A/D director would require employers to rotate existing workers into those additional roles those directors took on, or hiring new employees for

[35] Total may not add up due to rounding

those roles, which require specialized training, like a rigger. While this implies a new cost burden upon those impacted, the cost associated with compliance here has already been assessed in section 2.2.4 WAC 296-155-53301, Lift director qualifications, and 296-155-53303 Assembly/Disassembly director qualifications. Refer to these for cost implication.

2.2.12 WAC 296-155-53402(1) – Assembly/disassembly and/or reconfiguration

Proposed changes to this section requires the procedures used for assembling, disassembling, or reconfiguring a crane to be in written or digital format and remain on-site for the entire time the crane remains on-site. The recommendations for these actions would be included in the manufacturer specifications which should be with each crane. These are typically provided to crane owners, but are also available upon request. The length that such specification documents could vary depending on the type of crane and the complexities involved in assembling and disassembling them. As a result, most would be available in both digital and written format while some would be in digital format only. It is expected that some crane owners would not have a current copy and need to retrieve one, but the cost is expected to be minimal since these documents are typically available for free. The typical owner would keep this document in digital format on a digital device that they already own. As a result, L&I estimates minimal to no cost of complying with this requirement.

2.2.13 WAC 296-155-53408(2)(b)(i) – Planning and Conducting Meetings

WAC 296-155-53408(2) deals with operating the crane with relation to power line safety. Baseline conditions under this WAC require a planning meeting be conducted with the operator and other workers who may be in the area of the crane or load on preventing encroachment and electrocution from power lines.

The proposed update introduces some significant changes. First, it specifies the timing aspect by requiring the meeting to be conducted prior to use of the crane/equipment. Second, the meeting must now be documented, have a list of specific requirements, and must remain on-site for the entire duration of the crane's presence. Finally, the utility owner must be invited to attend the meeting and, should power line conditions change, another meeting must be conducted before work can resume.

These proposed changes have cost implications to document the meeting and the time for the utility owner's attendance. To estimate these costs L&I relies on both survey data and reasonable assumptions. All of the meeting documents would have been prepared and available

prior to the meeting and is part of the current requirements. Documenting the meeting would simply entail compiling this information, along with the signatures of those in attendance and storing it. The time spent documenting a meeting varies depending on the complexities of the project, and is assumed to be between 5 to 15 minutes for a typical meeting. Survey data indicates that this task is most likely completed by a site supervisor. The estimated number of meetings was also deduced from survey data, which indicate that cranes operate within the zone of a high voltage power line in about 25% of jobs. This amounts to approximately 4,599 to 30,663 jobs on average each year, costing about $22,902 to $458,050 annualized over the 10-year period.

The utility owner or its representative must now be invited to attend such meeting. Given the topic of discussion, the utility's representative may most likely be an individual with expertise in safety, engineering, and operations, among other. For purposes of this analysis, we assume this individual to be a registered professional engineer. However, given that the requirement is only to invite the utility owner without placing a requirement to attend, this particular requirement will not be assessed for cost implication.

Table 18. Cost of document meeting with utility owner[36]

Description	**Value**
Cost of documenting meetings	
Average time needed (low to high)	5 to 15 minutes
Hourly wage of supervisor	$60.51
Average number of annual meetings	4,599 to 30,663
Annualized cost of documenting meetings	**$22,902 to $458,050**

Qualitative Costs

Construction projects, based on the scale and scope, often require extensive coordination among those involved, leading to significant time spent in meetings and on documentation. While these are essential for safety and compliance, when compounded they can nevertheless consume a non-insignificant amount of productive work time. This, in effect, can create operational delays and impact project schedules, which can lead to indirect costs such as extended equipment rental, idle labor, and potential penalties for missed deadlines.

Requiring another meeting should power line conditions change would involve additional costs of planning and documenting the meetings. Additionally, this could also lead to work stoppages with varying degrees of direct and indirect costs.

[36] Total may not add up due to rounding.

2.2.14 WAC 296-155-53409(1)(f)(ii) - Training

The proposed changes requires the employer to ensure that training for tower crane assembly, disassembly or reconfiguration is done and shall maintain documentation of this training on-site. The employees most likely to need and receive specialized training around the subject of tower crane activity include the rigger, signal person, crane operator, A/D director and lift director. Documentation for these workers could simply be the qualification card which riggers and signal persons already have. This would need to be extended to the crane operators, lift directors and A/D directors as well. As these can simply be produced upon request in digital form, which is an acceptable form by the agency, then this proposed requirement is not expected to impose any additional cost upon impacted employers.

2.2.15 WAC 296-155-53414 – Cranes with a rated hoisting /lifting capacity of 2000 lbs. or less

WAC 296-155-53414(7) is new and outlines three specific situations where a qualified signal person must be provided when operating cranes with a rated hoisting /lifting capacity of 2,000 pounds or less. This includes situations where the view of the operator is obstructed, such as in point of operations or when traveling. Additionally, a signal person must be provided when there are site specific concerns or the person handling the load determines it necessary.

Based on survey data, approximately 8% (491) of businesses on average operate a crane/equipment with a rated hoisting/lifting capacity of 2,000 pounds or less. To assess the cost implication of this proposed requirement we focus only on the first two situations. The third situation was omitted since it is one not guaranteed to occur and so would not trigger any regular or on-going cost from operations.

To estimate the cost of providing a signal person in the two determined situations, we assume that obstructed views occur in 25-50% of jobs, and the amount of time allocated to be compliant on a typical job is two to four hours. We assume this range to be reasonable to reflect the relatively low frequency with which these occur, and to capture a truer number of jobs actually impacted by this rule. Assuming cranes in this category conduct approximately three to 20 jobs each year, as previously noted, this results in about 368 to 4,906 jobs. Using the hourly wage of a signal person of $28.93, this is estimated to cost about $25,618 to $683,138 annualized on impacted businesses. See Table 19.

Table 19. Signal person costs for tasks[37]

Category	Value
Percent of jobs where visibility is obstructed	25-50%
Estimated number of jobs	368 to 4,906
Average hourly wage	$28.93
Total annualized cost	$25,618 to $683,138

WAC 296-155-53414(8): Rigger

The proposal of WAC 296-155-53414(8) is also new and requires a qualified rigger whenever employees are engaged in hooking, unhooking, or guiding the load, as well as in the initial connection of a load to a component structure.

Similar to the previous section on signal persons, on average approximately 491 businesses are impacted annually. The tasks of hooking or unhooking or guiding the load or initial connection, are reasonably expected in all jobs in which these cranes are involved. The amount of time needed for these tasks are not expected to be greater than those needed when assisting in situations where visibility is obstructed. As a result, we assume this task to take approximately 30 minutes to one hour per job. For cranes with this rated hoisting/lifting capacity of 2,000 lbs. or less, we assume one rigger would be needed for simple lifts involving small, uncomplicated loads, and two riggers for lifts requiring guidance, more precision, and or multiple lifting points. Using the same number of estimated annual jobs, and based on an hourly wage of $41.96 for a qualified rigger, this proposed section would impose approximately $30,494 to $813,160 annualized on impacted businesses. See Table 20.

Table 20. Rigger cost estimation for tasks[38]

Category	Value
Percent of jobs where visibility is obstructed	100%
Estimated number of jobs	368 to 4,906
Average hourly wage	$41.96
Total annualized cost	$30,494 to $813,160

2.2.16 WAC 296-155-53416 – Forklifts when lifting a suspended load

Proposed WAC 296-155-53416 is new and outlines requirements when using forklifts to lift a suspended load. The majority of this WAC is implemented as a result of updates to OSHA

[37] Total may not add up due to rounding.
[38] Total may not add up due to rounding.

standards and so are exempt from impact analysis. However, L&I has imposed a measure which exceeds OSHA's in the means used to lift a suspended load. OSHA's updates regulate forklifts when "…configured and used to lift or lower a suspended load, by means of a hook/shackle…" as an activity covered under WAC 296-155-53300 (Operator qualifications and qualification). L&I goes beyond those means whereby, as per subsection (4)(b), when forklifts are configured and used to lift or lower a suspended load by any other manner, the operator must be certified or be qualified. As a result, all means other than the use of a hook or shackle is new and need to be assessed for cost impact.

Additionally, L&I mandates that these subject operators be qualified prior to using the forklift for that type of operation using one of two methods. Operators can get qualified using a third-party evaluator in accordance with subsection (5)(a)(i) of this WAC, or by an employer-qualified evaluator, in accordance with subsection (5)(a)(ii) of this WAC.

In this analysis we focus on forklifts only with crane lifting capabilities as the actions of lifting a suspended load is as such. The other manners that a forklift can use to lift a suspended load includes jib crane attachments, telehandlers, forklift boom attachments, gantry crane systems, and forklift-mounted cranes. See Table 21.

Table 21. Forklift methods of lifting/lowering a suspended load

Type	Description
Jib crane attachments	Can be fitted to forklifts and in the process transform them into cranes. This allows the forklift to lift or move a suspended load with greater flexibility. These can handle loads of several thousand pounds, but capacity decreases as the arm extends.
Telehandlers (Telescopic forklifts)	Telehandlers combine the features of a forklift and a crane, equipped with an extendable boom that allows for listing loads to higher elevations. The forks are attached to an arm that can be raised up to place a payload on top of a building.
Forklift boom attachments	Similar to jib cranes, forklift boom attachments allow the forklift to lift loads more effectively by extending its reach
Gantry crane system	Some forklifts can be adapted to work with gantry crane system, which provide a more stable platform for lifting.
Forklift-mounted cranes	These are specialized cranes that can be mounted directly onto forklifts, allowing them to perform tasks similar to traditional cranes.

L&I determined the number of impacted businesses by estimating the number likely to using forklifts with crane-related capabilities. The results show that on average 23% of businesses in most industries would be subject to the rule, for a total of 4,544 businesses. Consistent with section (1) our analysis starts from 2027, year three in our examined period. All costs reflect this time frame.

Operator qualifications are not based on the frequency of lifts, but rather a single lift would require the operator to seek qualification. While this would imply at least one operator for each business, some businesses do not have operators or forklifts of their own, despite being in the list, but would rent out the equipment and contract out the operator duties. However, for purposes of our analysis we assume one operator for small businesses, one to two operators for medium sized businesses, and three to five operators for larger businesses. Survey data shows that approximately 90% of business are small with 5.10% and 4.40% as medium-sized and large respectively.

Survey data indicates that on average businesses would choose a third-party evaluator 67% of the time, and would do their own evaluation 33% of the time. L&I applied these rates to determine the number of operators who would qualify via each respective option. L&I assumes that certification would take, on average, one to two days despite the option used.[39] However, third-party evaluators would have an additional cost for examinations and courses which range from $50 to $300 per candidate.

Forklift operators and crane operators are often grouped together in statistics and data. Therefore, in order to estimate this cost since there's no wage data for a forklift operator, we use the starting hourly wage data for a crane operator, which is $43.90. For the employer-qualified evaluations, we use the starting hourly wage of a supervisor of $51.25 to assess the employer evaluator cost. See Table 22.

Table 22. Evaluation cost for forklift operator requirements[40]

Description	Value
3rd Party Evaluations	
Total candidates	734 to 828
Average hourly wage	$53.32
Average time needed for qualification	8 to 16 hours
Average services cost	$50 to $500
Annualized cost of 3rd party evaluations	**$37,346 to $134,267**

[39] This figure was based on general industry results, taking into consideration the mix of key components (classroom/online training, hands-on training, certification exams, etc.). Though there are some providers who offer one-day certification courses which combine classroom and hands-on, these were omitted from consideration in order to maintain a moderate level of training that would meet the intent of the proposed rule.
[40] Total may not add up due to rounding.

Employer-Qualified Evaluations	
Total candidates	361 to 408
Average hourly wage – candidate	$53.32
Average hourly wage - evaluator	$62.24
Average time needed for qualification	8 to 16 hours
Annualized cost of employer evaluations	**$34,727 to $70,527**

There is a three-year renewal requirement in order to maintain valid status. Given this rule goes into effect in 2027, two years after the assumed implementation date, then impacted businesses would have two renewals in the examined period. The renewal process typically requires an examination to attest the candidate has the relevant knowledge. Industry data shows that the renewal process typically takes two hours. Businesses who decide to go with a third party for renewals will face an additional service cost of $50 to $100 per exam in addition to the labor time required to take the exam. This results in an estimated renewal costs of $23,243 to $30,160.

Based on this above data, we estimate the cost imposed on businesses to get forklift operators who lift suspended loads via means other than a shackle or hook, qualified is $95,316 to $234,954.

2.2.17 WAC 296-155-53900(2) – Effective Stop Work Authority Procedures

This proposed language establishes requirements related to stop work authority. It gives all employees the right to refuse or delay the performance of a task they believe could reasonably result in physical harm or serious death, and to recommend that an operation be partially or completely shut down on the basis of such a hazard. The language directs work to be stopped, provides requirements for the recommencement of work, adds a documentation requirement, and relocates existing language about employee protections from intimidation, retaliation, or discrimination.

RCW 49.17.440(2)(j) directs L&I to establish effective stop work procedures. The updates to WAC 296-15-53900(2) are largely in alignment with the requirements set forth in the statute. The addition of the requirement to document employee stop work recommendations, and the response to ensure work is safe to resume, establishes a new requirement. L&I believes that this requirement closely aligns with other existing recordkeeping requirements in chapter 296-155 WAC, Part L, and that there would be minimal to no cost of complying with this section.

2.2.18 WAC 296-155-53900(42)(c)(iii) and (iv) – Tower cranes

Under baseline conditions, site supervisors can avoid positioning tower cranes in service without either the counterjib or jib/boom unless they use one of two options, with one being that they establish direct voice communications between the crane operator and a dedicated spotter.

Proposed changes in this WAC introduces several changes to the baseline requirements. First, it adds the option of using a dedicated spotter who must be stationed where the boom and/or counterweight movement, and the object with which it may contact, can be observed. Second, it expands on the direct voice communications option by adding the requirement that a written anti-collision plan be developed and implemented prior to the crane being used. In addition, this plan must remain on-site for the entire duration of the crane's presence at the site.

This proposed requirement aims to improve the safety and efficiency in multi-tower crane operations and does impose a new cost for construction companies who utilize this option. The first change is consistent with OSHA rules and so is not assessed for cost impact. Our analysis focuses on the updates to the direct communication option. While this is indeed an option which a company may or may not elect, we analyze this proposed change for cost since it increases the range of compliance costs for companies subject to this requirement.

The primary cost incurred by those impacted will likely be labor costs where input into the plan is required from various different professions. This plan would most likely be stored and kept on on-site in digital form and since most companies have the necessary digital devices, such as a laptop or tablet, on which to store the plan, the potential cost, if any, would be minimal. We assume that tower cranes would be the most likely cranes involved in operations where an anti-collision plan may be warranted because of their size, operations, and complexities of their jobs. The time and effort needed for these plans are based on the type of job, location, and type of crane involved, and so can be quite variable. While the development of an anti-collision plan would likely involve a mix of input from various employees, we use the hourly wage of a supervisor for our cost since the current requirement places the responsibility for compliance or execution upon this worker.

In a previous section (2.2.2), we identified the estimated number of tower cranes operating within the state and calculated the average annual jobs. Based on these figures, we determined that approximately 71 written anti-collision plans would probably be needed annually.

Assuming an estimated time of three to four days (24 to 32 hours) for completing a typical plan, including a thorough review and approval process[41], and an average hourly wage rate of $60.51

[41] We approximate the middle ground for a typical tower crane anti-collision plan based on the average time to create a plan for a large job (three to five days) and a smaller jobs (two to three days). The actual time for each plan

for a supervisor, the labor cost involved in creating this plan is estimated to range from $101,900 to $237,944. See Table 23.

Table 23. Cost of creating a written anti-collision plan[42]

Category	Value
Number of annual anti-collision plans	71
Average time to develop a typical plan (hours)	24 to 32
Average hourly wage	$60.51
Total annualized cost	**$101,900 to $237,944**

2.2.19 WAC 296-155-55600 – Multi-tier rigging

WAC 296-155-55600(23) proposes required procedures to enhance safety and efficiency in multi-tier rigging. Specifically, it proposes that only essential personnel are permitted in the fall zone and they must be fully aware of the additional hazards associated with multi-tier rigging. A maximum of three tiers per lift is allowed, and proper protection for slings is required to prevent damage from sharp edges, corners, protrusions, or abrasive surfaces. Each tier must be independently rigged with enough space for at least seven feet apart from each load. The proposed requirement mandates the use of hooks with self-closing latches and emphasizes that the total load must not exceed the rated capacity of the hoisting equipment. Controlled load lowering must be allowed and loads must be landed on stable surfaces to prevent hazardous movements. And finally, double wrapped basket hitches are the only allowable type to be used.

The proposed requirements were initiated from stakeholder feedback and provides guidelines on current industry practices. To assess the impact and implication of the proposed requirements, L&I first compared the proposed changes to the baseline. Since the proposed requirements in this section are new, there is no baseline requirement. We therefore treat current industry practices as the baseline which, in effect, are the same as the proposed requirements, with one exception. L&I identified one primary direct and one-time cost related to employees triggered as a result of the proposed rule. Informing employees involved in the work zone on the hazards and procedures of multi-tier rigging was determined to be a requirement above the baseline. This constitutes the primary cost associated with this proposed section. To estimate this new cost, L&I relies upon survey data from industry participants to supplement its own understanding and data of the impacted cost components.

would be based on the individual conditions for the job, but at a minimum would always factor in the complexity of the site, the number of cranes involved, and the level of detail required in the plan.

[42] Total may not add up due to rounding.

As required, employees would need to be informed on, and understand the hazards and procedures associated with, multi-tier rigging. L&I determined that the employees most likely to be in the work zone and need this communication on the hazards are riggers, crane operators, signal persons, lift directors and ground crew, which includes material handlers and construction crew helpers. For purposes of this calculation, L&I estimates one of each per rigging job. The hourly wage of these occupations are presented in Table 24 below. The average time needed to communicate the hazards to these workers depends on the size and complexity of the job and specific work zone. L&I estimates these briefings for a typical rigging job to be about 30 to 60 minutes. Based on the above, a typical multi-tier rigging job would cost an impacted business an average of $242.95 to $485.90 per job.

The final aspect of estimating the full cost of this requirement includes determining the average annual number of multi-tier riggings. Survey data indicates that roughly 2% of businesses engage in multi-tier rigging, who further indicated that about 1-25% of their jobs are multi-tier rigging jobs. For this analysis we assume the number to be 25%. Based on this data, the number of multi-tier rigging jobs is estimated to be approximately 368 to 2,453 each year. Assuming that communicating the hazards of multi-tier rigging occurs prior to each job, the total estimated cost of this proposed requirement to impacted businesses is about $48,548 to $647,308 annualized. See Table 25.

Table 24. Hourly wage of direct multi-tier rigging workers

Occupation	Hourly wage[43]
Rigger	$35.54
Crane operator	$43.90
Signal person	$35.54
Lift director	$56.63
Material Handler	$26.15
Helpers, construction trade	$28.57

Table 25. Estimated cost of multi-tier rigging over a 10-year period[44]

Category	Value
Average number of businesses impacted	123
Average hourly wage of workers needing training	$242.95 to $485.90
Average number of multi-tier rigging jobs	368 to 2,453
Total annualized cost	$48,548 to $647,308

[43] Represents the starting hourly wage of these employees based on ESD data.
[44] Total may not add up due to rounding.

2.3 Summary of Compliance Cost of Proposed Rule

Based on the estimates of each major significant legislative rule section which has a cost impact, outlined in sections 2.2.1 to 2.2.18, the proposed rule is expected to impose an estimated compliance cost of $1.4 million to $29.6 million upon impacted entities in Washington over the next 10 years.

Table 26. Summary of Compliance Cost.

Rule section	Annualized cost
296-155-53100	$20,246 to $52,095
296-155-53206(7)(b)	$4,691 to $9,381
296-155-53214(1)(c)	$173,203 to $10,392,203
296-155-53301	$396,505 to $1,775,375
296-155-53303	$83,824 to $137,310
296-155-53400(39)	$109,932 to $2,968,162
296-155-53400(42)	$213,362 to $9,562,231
296-155-53400(80)	$119,314 to $1,590,849
296-155-53400(81)	$2,024 to $80,967
296-155-53408	$22,902 to $458,050
296-155-53414(7) and (8)	$56,111 to $1,496,298
296-155-53416	$95,316 to $234,954
296-155-53900(42)	$101,900 to $237,944
296-155-55600(23)	$48,548 to $647,308
Total annualized cost	**$1,447,879 to $29,643,127**

Chapter 3: Benefits of Proposed Rule

3.1 Methods and Data Sources for Benefit Analysis

To estimate the potential benefits of the proposed crane rule, L&I draws on various sources, including relevant studies, workplace injury data from the Bureau of Labor Statistics (BLS), News, Online sources, and workers' compensation claim data from its database. However, it's important to note that this analysis does not assign a monetary value to the pain and suffering endured by injured workers and their families, nor does it quantify the benefits of the rule's improved clarity and comprehensibility. As a result, the estimated social benefits of the proposed crane rule are likely understated.

3.2 Quantitative Benefits

3.2.1 Benefit 1: Saving lives

According to the BLS, between 2011 and 2017, an average of 42 workers died each year from crane-related injuries, totaling 297 fatalities over that period. (Census of Fatal Occupational Injuries (CFOI)[50]).

Statistics indicate that over 50% of fatalities involved a worker being struck by an object or piece of equipment. About 3/5th of these cases (91 of 154) involved the worker being struck by a falling object or equipment, and in other cases, the worker was struck by an object falling from or put in motion by a crane (BLS[45]). 43% of fatal work injuries involving cranes took place in the private construction industry. 24% of fatal work injuries involving cranes took place in the manufacturing industry (BLS[46]).

On April 27, 2019, a crane collapsed onto Mercer Street in Seattle, Washington, killing four people and injuring four others. The incident led to efforts by Washington State legislators to pass a law to prevent similar tragedies[47].

Workers' compensation claims data from the L&I database indicates that six workers lost their lives in crane accidents in Washington State between 2012 and 2023, and we should note that additional people, who were not workers, have also died or been injured. Two of the four victims in 2019 were ironworkers, while the others—a college student and a former city administrator—were in vehicles on the street.

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[45] Bureau of Labor Statistics. *Injuries, illnesses, and fatalities home page*. U.S. Department of Labor. Retrieved January 29, 2025, from https://www.bls.gov/iif/home.htm

[46] Bureau of Labor Statistics. *Injuries, illnesses, and fatalities home page*. U.S. Department of Labor. Retrieved January 29, 2025, from https://www.bls.gov/iif/home.htm

[47] *Seattle crane collapse*. Wikipedia. Retrieved January 29, 2025, from https://en.wikipedia.org/wiki/Seattle_crane_collapse#:~:text=On%20April%2027%2C%202019%2C%20at,in%20vehicles%20on%20the%20street.

In the 2019 crane collapse, initial investigations suggested improper removal of pins and bolts during disassembly as a potential cause. Findings from L&I later confirmed the collapse resulted from the premature removal of over 50 pins. While this practice speeds up disassembly, it compromises stability. Language in the proposed rule under WAC 296-155-52901, 296-155-53206, and 296-155-53303 with inspection and proof load testing requirements, aim to prevent similar incidents.

Beyond regulatory measures, the financial and human costs of such tragedies underscore the importance of assessing the Value of Statistical Life (VSL) in policymaking. L&I relies on the findings of Viscusi (2004), adjusting the VSL value for inflation. As of January 2024, the U.S. Department of Health and Human Services (HHS) estimated the VSL at $13.1 million, a figure commonly used in regulatory impact analyses[48]. However, actual compensation amounts can vary significantly, incorporating indirect costs associated with crane incidents, as will be discussed in section 3.2.3. For instance, in 2022, $150 million was awarded to the families of the deceased and two injured individuals in the Seattle crane collapse accident, following two lawsuits.

Assuming these significant legislative rules can reduce fatalities, saving even one life per year, would represent a substantial value of approximately $13 million, underscoring their critical impact on safety and societal benefits. L&I workers' compensation data shows that in the past ten years, at least eight people have died in crane-related accidents. It is also important to note that this data comes from a single source, and according to online reports, the total number of fatalities—including both workers and non-workers—is higher. Data indicates that a total of $2,464,645 has been paid for claims related to crane-related fatalities, averaging $616,161 per fatal injury. When factoring in the VSL and assuming the new rules save a minimum of two lives and a maximum of four lives, the annualized cost savings are estimated to range from $3.4 million to $6.7 million.

3.2.2 Benefit 2: Preventing injuries

A key benefit of the proposed rules is their potential to significantly reduce crane-related injuries on construction worksites. Many of these injuries are severe or even catastrophic, making the prevention of such incidents highly impactful for construction workers, employers, regulatory agencies, and society as a whole.

These proposed rules are instrumental in reducing crane-related injuries by mandating detailed planning, hazard assessments, and strict safety protocols. They ensure collaboration among stakeholders, address risks like power line contact and equipment failure, and require

[48] U.S. Department of Health and Human Services (HHS). (2024). *Standard RIA values*. Retrieved January 29, 2025, from https://aspe.hhs.gov/sites/default/files/documents/cd2a1348ea0777b1aa918089e4965b8c/standard-ria-values.pdf

professional oversight and documentation. By promoting accountability, hazard awareness, and adherence to safety standards, these rules minimize the chances of accidents, thereby protecting workers and enhancing overall site safety.

The Konecranes Training Institute[49] recently released a new crane safety study analyzing 249 industrial overhead crane incidents over a 10-year period. The study identified the primary causes and outcomes of these incidents as follows:

- 37% - Crushed by the Load: Occurred due to load swing, load drops, or unstable loads tipping over. This category accounted for 33.8% of all fatalities and 36.8% of all injuries.
- 27% - Load Dropped: Primarily caused by poor rigging practices, making it the most common reason for load drops.
- 12% - Falls: Incidents where individuals fell from heights ranging between 8 feet and over 100 feet.
- 11% - Crushed/Run Over by an Overhead or Gantry Crane: 93% of these incidents resulted in fatalities.
- 6% - Improper or Missing Lockout/Tag out (LOTO): Failure to follow proper energy control procedures.
- 7% - Other: Various other contributing factors.

The most effective strategies for enhancing safety include:

- Crane Operator Training
- Rigging Training
- Lifecycle Care

According to workers' compensation claim data from the L&I database, between 2012 and 2023, 889 injuries (an average of 89 each year) occurred across various industries due to crane-related incidents. This resulted in a total dollar amount of claims of $44,795,875 and the average cost per injured worker of $50,389. A 2012 study published in Science[50] found that OSHA's random workplace safety inspections resulted in a 9.4% decrease in injury rates and a 26% reduction in injury costs for the companies inspected. These findings indicate that OSHA's interventions, along with new safety regulations, can have a substantial positive impact on workplace safety across multiple industries. In this analysis, L&I estimates the percent of total crane injuries that would be prevented if the proposed rule were in place at 30%, with 25% and 35% as the lower bound and upper bound respectively. The total benefit of preventing injuries based on L&I data will be between $1.1 million and $1.5 million.

[49] Konecranes Training Institute. (n.d.). *New crane safety study: OSHA violation statistics*. Retrieved January 29, 2025, from https://www.cranetrainingu.com/news/new-crane-safety-study-OSHA-violation-statistics

[50] Levine, D. I., Toffel, M. W., & Johnson, M. S. (2012). Randomized government safety inspections reduce worker injuries with no detectable job loss. *Science, 336*(6083), 907–911. https://doi.org/10.1126/science.1215191

3.2.3 Benefit 3: Avoiding indirect costs associated with crane-related incidents

The estimated direct costs of crane-related injuries, as calculated for the total benefits of preventing such incidents, do not account for various indirect costs. Numerous studies highlight that indirect costs, which are often substantial, include:

- Loss of productivity for the injured worker and their team.
- Time spent by supervisors and managers addressing the incident.
- Costs of transportation and medical treatment.
- Additional recruitment, training, and administrative efforts for replacement workers.
- Diminished employee morale and heightened fear of accidents, which directly impact overall productivity.

Studies have shown that the ratio of indirect to direct costs from workplace accidents varies significantly across industries and methodologies. Oxenburgh and Guldberg (1993)[51] estimate indirect costs as 75% of direct costs, excluding productivity losses. In Quebec, Brody et al. (1990)[52] found an average ratio of 0.83:1, Hinze (1991)[53] identified a range, with indirect costs 1.62 times higher than direct costs for medical cases and 1.79 times higher for lost workday cases. The actual multiplier varies widely, influenced by factors such as industry type, severity of the accident, and workplace conditions (Everett & Frank, 1996)[54]. Assuming the proposed crane safety rules prevent between $1,119,896 and $1,567,855 as described in the previous section (3.2.2) using a ratio of 0.5, results in an annual indirect cost saving between $559,948 and $783,928.

3.2.4 Benefit 4: Enhanced Regulations

3.2.4.1. WAC 296-155-53202: Additional inspection criteria and proof load testing—Mobile cranes.

According to the draft rule, WAC 296-53202(4)(a) specifies that proof load tests must be completed on all hoist lines to at least 90%, but not exceed 100% as configured. Any hoist line

[51] M.S. Oxenburgh, H.H. Guldberg, The economic and health effects on introducing a safe manual handling code of practice, International Journal of Industrial Ergonomics, Volume 12, Issue 4, 1993, Pages 241-253, ISSN 0169-8141, https://doi.org/10.1016/0169-8141(93)90094-T.

[52] Bernard Brody, Yves Létourneau, André Poirier, An indirect cost theory of work accident prevention, Journal of Occupational Accidents, Volume 13, Issue 4, 1990, Pages 255-270, ISSN 0376-6349, https://doi.org/10.1016/0376-6349(90)90033-R.

[53] Hinze, J. And Applegate, L.L. (1991). Costs of construction injuries. Journal of Construction Engineering and Management, 117(3), 537-550.

[54] Everett, John Garwood and Peter B. Frank. "Costs of accidents and injuries to the construction industry." Journal of Construction Engineering and Management-asce 122 (1996): 158-164.

not proof load tested is not considered certified. The test load must fall within 90% to 100% of the rated capacity (i.e., based on the crane's configuration, such as reeving and boom length). Previously, the requirement was for proof load tests to be completed on all hoist lines to at least 100%, but not exceed 110% as configured. Similarly, any hoist line not proof load tested was not considered certified, with the test load needing to fall between 100% and 110% of rated capacity.

This reduction in the test weight percentage (from 110% to 100% at the high end and from 100% to 90% at the low end) results in less weight being handled during proof load tests, leading to potential cost savings. Assuming the following parameters:

1. Crane capacity:

Minimum crane capacity: 20 tons, Average crane capacity: 100 tons and Maximum crane capacity: 1200 tons. Online sources[55] shows different mobile cranes have different capacities, among all mobile cranes, Boom Trucks typically lift between 1 to 20 tons, Rough-Terrain and All-Terrain Crane capacities range from 20 to over 100 tons and some cranes like Hydraulic Truck Cranes can lift from 100 to over 600 tons.

2. Weight savings per test:[56]

Reduction in the test weight percentage (from 110% to 100% at the high end and from 100% to 90% at the low end) results in less weight being handled. Average rated capacity of the crane is needed to calculate the weight savings per test.

At 90% load vs. 100%: 2 tons at minimum and 60 tons at maximum per test.

At 100% load vs. 110%: 2 tons at minimum and 60 tons at maximum per test.

3. Cost per ton:

Based on industry insights, we assume the following per-ton cost ranges: Minimum $200/ton, Average $350/ton and Maximum $500/ton.

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[55] Superior Rigging & Erecting Co. *What is a Boom Truck?* Retrieved from https://superiorrigging.com/what-is-a-boom-truck/#:~:text=Boom%20trucks%20come%20in%20a%20wide%20range,including%20a%20high%20aerial%20work%20platform%20capacity.
Manitowoc. *Grove Rough Terrain Cranes.* Retrieved from https://www.manitowoc.com/grove/rough-terrain-cranes#:~:text=Grove%20rough%20terrain%20cranes%20are%20designed%20to,effectively%20for%20longer%20days%20with%20less%20fatigue.
Maxim Crane Works. *Hydraulic Truck Crane vs. Boom Truck: What You Need to Know to Make the Right Choice.* Retrieved from https://www.maximcrane.com/blog/hydraulic-truck-crane-vs-boom-truck-what-you-need-to-know-to-make-the-right-choice/.

[56] For purposes of this calculation we focus on the average or typical mobile cranes. Very large mobile cranes, such as the Lieherr LTM 11200-9.1, are not admitted in this calculation as they fall outside of what's considered typical for this assessment.

These values reflect the average cost range of using either a water-filled weight bag or a solid weight for use in the proof load test.[57]

4. Minimum Annual number of tests that depends to the number of business that use at least one mobile crane.

Based on L&I data, we estimate that between 7,180 to 9,188 businesses use mobile cranes to varying degrees in their operations. Based on the size and cost of owning a typical mobile crane, we assume that approximately 10% of these businesses actually own a mobile crane, with the rest leasing one when needed. We further assume that on average, each of those businesses own one mobile crane. This results in an average of 818 tests being needed each year within the range of 718 minimum and a maximum of 919.

The benefit of this proposed section is realized from the dollar savings from the reduced weight handling which is needed for proof testing (identified in 2 above). Within the examined 10-year period, L&I estimates the savings due from this rule (the resulting reduced weight requirement) will be $352,266 to $33.8 million.

3.2.4.2. WAC 296-155-53301: Lift Director Qualifications

WAC 296-155-53301 establishes robust qualification requirements for lift directors, aiming to enhance safety and efficiency on construction sites by ensuring those overseeing crane operations and rigging crews are adequately trained and evaluated. Under the rule, each lift director must be qualified as both a rigger and a signal person. While this dual qualification imposes costs, some benefits arise from time and cost savings due to overlapping training content and extended certification validity.

The assumption is that most lift directors currently possess either rigger or signal person qualifications and must acquire the other. However, since there is a 30% overlap in training content (as outlined in section 2.2.4 above), we assume individuals do not need to invest in the full training time required for the second qualification, saving time and money. Rigger training typically takes eight to 40 hours, while signal person training requires four to six hours. Factoring in the overlap, these training durations are reduced by 30%, resulting in time savings valued at the respective hourly wages of $35.54 for riggers and $24.50 for signal persons.

Training costs also benefit from the overlap, with rigger training costing $635 to $1,905 and signal person training costing $381 to $635. By calculating the present value cost (PVC) savings

[57] Cost of 1 ton of either a water-filled weight bag or a solid weight for use in proof load testing of mobile cranes are variable, based on vendor, location, type etc. Our search revealed such a random range. Our analysis settled on a range deemed most reasonable from the search results. Actual costs would vary depending on individual search results.

over a 10-year period using a 5% social discount rate, 3% annual wage growth rate, and 3.96% inflation rate (annualization factor: 7.7217), the estimated annualized cost savings range from $664,448 (minimum scenario) to $2.2 million (maximum scenario), with an average saving of $1.2 million.

In addition, the rule's five-year certification validity period creates long-term savings for employers by reducing the frequency of renewal and associated costs. Lift directors may not need to spend additional time on refresher courses since they are active practitioners. Combined with the time savings from overlapping training and the reduced need for frequent certification renewal, the rule provides benefits that offset compliance costs while maintaining safety and operational efficiency.

3.2.4.3. WAC 296-155-53900: Tower cranes

According to AE Aerial Industries (2024)[58], the annual rental cost of a tower crane at a construction site can vary between $180,000 and over $720,000, depending on factors such as crane size, project duration, location, and additional expenses like delivery, assembly, and operator fees.

In their study, Huang et al. (2023)[59] explore the potential cost savings associated with implementing an anti-collision plan. They suggest using a 10.7% cost reduction as a benchmark for estimating savings. The calculation follows this formula:

Potential Cost Savings = Total Rental Cost × Savings Percentage

This approach helps quantify the financial benefits of optimizing crane layout and reducing overlap-related inefficiencies.

According to internal data, 71 tower cranes are currently operating in Washington State. Assuming that a minimum of 25% and a maximum of 50% of these tower cranes are rentals, the total rental cost savings are estimated to range between $419,315 and $3.4 million.

3.2.4.4. WAC 296-155-53100: Extending the renewal period

[58] AE Aerial Industries. (2024). *Tower crane cost estimates 2024*. Retrieved January 29, 2025, from https://aeaiwi.com/tower-crane-cost-estimates-2024/#:~:text=Factors%20Affecting%20the%20Tower%20Crane,spaces%20and%20extra%20labor%20needs.
[59] Huang, C., Wang, Z. K., Li, B., Wang, C., Xu, L. S., Jiang, K., Liu, M., Guo, C. X., Zhao, X. F., & Yang, H. (2023). Discretized cell modeling for optimal layout of multiple tower cranes. *Journal of Construction Engineering and Management, 149*(8). https://doi.org/10.1061/JCEMD4.COENG-13146

The proposed change from a three-year to a five-year renewal cycle for the agency-issued certificate of accreditation and the crane certifier certificate is expected to reduce administrative burden and lower costs for certificate holders. By extending the renewal period, the total number of required renewals decreases, resulting in fewer training sessions, reduced paperwork, and minimized disruptions to work schedules.

Over a 10-year period, each certificate holder would avoid approximately 1.33 renewal cycles, translating to an estimated time savings of 10.67 to 21.33 hours per person. When applied to the 50 individuals required to renew every five years, this equates to a total administrative burden reduction of 533 to 1,066 fewer hours spent on certification renewal over the examined period, or approximately 53 to 106 hours saved annually. Considering hourly wage equal to $43.90 for a crane operator which will increase by the annual average wage growth rate of 3%, the total cost saving of administrative burden reduction is around $2,400 to $4,800 in first year and will increase over the next 10 years.

In addition to time savings and their associated cost, the cost of recertification, which typically ranges from $100 to $300 per renewal, would also be reduced. The estimated total cost savings per person over 10 years ranges from $133 to $400. Adding these two cost saving categories and calculating the annualized present value lead to an overall cost reduction of $10,909to $29,995during the examined period.

These benefits suggest that extending the renewal cycle to five years aligns with efficiency goals, reduces unnecessary administrative overhead, and lowers costs for both businesses and individuals, while maintaining the integrity of certification requirements.

3.2.5 Total Estimated Benefits

The proposed crane safety rules offer significant benefits across several key areas, including saving lives, preventing injuries, reducing indirect costs, enhancing regulations, and lowering administrative burdens. The table below summarizes these estimated benefits over the examined period.

Table 27. Summary of Benefits

Benefit	Description	Min	Max
Saving Lives	Reducing crane-related fatalities through enhanced safety regulations and inspections.	$3,364,717	$6,729,434
Preventing Injuries	Reducing crane-related injuries through hazard planning, safety training, and improved oversight. (based on 13%-26% injury reduction)	$1,119,897	$1,567,855

Avoiding Indirect costs	Minimizing lost productivity, management time, recruitment, and medical costs due to crane incidents. (based on 0.5 multiplier of direct costs).	$559,948	$783,928
Proof Load Testing Regulations (WAC 296-155-53202)	Reducing total prof load test weights. (Over 10 years)	$352,266	$33,808,678
Lift Director Qualification Requirements (WAC 296-155-53301)	Cost savings from overlapping training and extended certification validity.	$664,448	$2,155,942
Tower Crane Anti-Collision Planning (WAC 296-155-53900)	Reducing rental and operational inefficiencies for tower cranes.	$419,315	$3,354,521
Reduced Administrative Burden (WAC 296-155-53100)	Extending certification renewal cycles from 3 to 5 years, reducing training, paperwork, and disruptions.	$10,909	$29,994
Total		$6,491,500	$48,430,353

3.3 Qualitative Benefits

In additional to the benefits quantified in the previous section, several additional benefits arise. While these are difficult to quantify, they are nevertheless relevant and accrue as a results of the proposed rule. Below are some of the main qualitative benefits identified.

3.3.1. Enhanced Public and Employee Safety

- Controlled Work Zones & Restricted Access: Closing sidewalks, roads, and public areas near crane operations and limiting personnel in fall zones reduce exposure to potential hazards, such as falling loads or equipment failure.
- Safe Work Practices & Compliance Clarity: Clear guidelines for load handling, securing unstable loads and standardized compliance expectations minimize workplace accidents and prevent misinterpretation of safety requirements.

3.3.2. Strengthened Crane Safety & Operational Standards

- The annual certification and proof load testing: ensures cranes operate safely by detecting potential mechanical failures. Fostering a safer environment for operators, riggers, and other personnel working in proximity to cranes.
- Critical Lift Planning & Structural Safeguards: Requiring detailed lift and registered professional engineer (RPE) approval for multi-level building operations enhances risk management and structural integrity
- Rigorous Inspections & Maintenance: Frequent inspections of cranes, rigging, crane components, and attachment points ensure equipment reliability and consistent safety performance.

3.3.3. Mitigation of Environmental and Structural Risks

- Wind Speed Dynamic Loading Considerations: Mandating operational pauses during high winds and incorporating environmental factors like temperature and site specific hazards reduce operational risks.
- Unintentional Movement Prevention: Methods to prevent unintended crane/equipment movement safeguard both workers and structural stability.

3.3.4. Improved Communication, Documentation, and Accountability

- Mandatory Notifications & Role Visibility: Reporting crane assembly/disassembly to regulatory bodies and clearly posting key personnel responsibilities improve oversight, transparency and coordination.
- Standardized Crane Assembly/Disassembly Processes: Requiring qualified A/D and lift directors and defining controlled work zones ensure safe execution of these critical activities.

3.3.5. Financial, Legal and Social Risk Reduction

- Reduction in Emotional and Social Costs: Preventing crane-related accidents helps avoid emotional distress and long-term societal impact on families and coworkers.
- Minimization of Financial and Legal Risks: Proactive risk mitigation, Comprehensive planning, inspection, and documentation reduce liability risks and operational delays.

3.3.6. Industry-Wide Advancements & Technological Integration

- Promotion of Best Practices and Professional Development: Emphasis on qualified personnel ongoing training and alignment with national standards ensures a skilled workforce and industry consistency.
- Long-Term Industry Benefits: Standardizing safety and operational criteria fosters a stronger safety culture, reducing accidents over time and promoting operational excellence.

- Adoption of Modern Safety Technologies: Provisions for digital certifications and automated safety monitoring integrate technological advancements, keeping regulations relevant in an evolving industry.

Chapter 4: Cost-Benefit Determination

As analyzed in the previous sections, the total probable costs of the proposed rule are estimated to be $1.4 million to $29.6 million each year, while the total probable quantified benefits range from $6.5 million to $48.4 million. In addition to the quantified benefits, there are additional qualitative benefits as described in section. Based on these results, L&I concludes that the probable benefits of the proposed rule outweighs the probable costs.

Chapter 5: Least Burdensome Analysis

L&I is required to determine, after considering alternative versions of the rule and the analysis required, that the amendments being proposed are the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives of the statute. See RCW 34.05.328(1)(e) for additional information.

As an OSHA State Plan state, L&I DOSH rules are required to be at least as effective as OSHA, and a large number of the amendments in the proposed rule are being made to align the rules with OSHA regulations. The following address areas of the proposed rule where language was adjusted based on stakeholder feedback and does not include all significant legislative rules as defined in RCW 34.05.328.

Forklifts when lifting a suspended load – Operator Certification

The rule requires workers to be certified or qualified to operate a forklift configured and used to lift or lower a suspended load, using a forklift similarly to a crane. Forklifts have long been used on job sites in Washington for several purposes to lift and suspend loads from a hook or shackle. Improper use and training for use of multipurpose equipment introduces hazards to workers both using, and in proximity to, that equipment. Other methods that have been used by employers, such as placing rigging over the forks and backstop in order to lift a suspended load, fall into a regulatory gap of coverage, even though the same dynamic loading is introduced onto the machine. L&I originally proposed requiring operators to be nationally certified when using a forklift to lift or lower a suspended load. L&I engaged stakeholders on the topic and received feedback that requiring national certification may be too costly, and encouraged L&I to consider other avenues to protect workers when using a forklift in this manner. The proposed rule provides two pathways to ensure workers are properly trained on how to use forklifts as cranes, either by obtaining national certification or through an employer qualification program. The proposed rule also provides that this provision does not go into effect until January 1, 2027, and requires L&I to reevaluate the proposed requirement within two years. This is this least burdensome approach because it provides more than one option for workers to become certified or qualified to operate a forklift configured and used to lift or lower a suspended load, and includes time for businesses to be informed about the new requirement and get into compliance with the rule.

Inspection of Wire Rope

The proposed rule amends the requirements for inspecting wire ropes, requiring the entire length be inspected and providing an exemption if existing set-up and configuration of the equipment or site conditions make it infeasible. The inspection is required when it becomes feasible. This is

the least burdensome approach because it provides clarity in the rule and aligns with OSHA regulations.

Digital Accessibility of Procedures, Worksheets, Work Plans, and Certificates

The proposed rule updates and adds the ability for critical lift plans, procedures, and certificates to be stored and made accessible to workers in digital formats or through digital QR codes. This update is the least burdensome approach because employers have been moving to electronic storage of policies, procedures, and other legally required plans and documentation. This improves the ability of workers to easily access critical information to perform their operations and employers ability to comply with the documentation requirements of the rule.

Adjusting Annual Proof Load Testing

The proposed rule updates current requirements for annual proof load testing of hoist lines to be at least 90% not to exceed 100%, a change from the current rule which is at least 100% not to exceed 110%. Equipment is required to be load tested to ensure it can safely perform the function and lift certain load weights. This is the least burdensome approach because it reduces the amount of counterweight that would need to be transported to perform the load test, and ensures manufacturer's recommendations to not overload machinery are followed.

Multi-tier Rigging

The proposed rule adds requirements to clarify how to perform multi-tier rigging. Current standards have requirements around steel rigging and the proposed rule addresses all instances of multi-tier rigging. This is the least burdensome approach because it provides safe guidelines to protect workers under these loads and will reduce time to perform tasks on job sites.

Substance Abuse Testing Requirements

The proposed rule makes amendments to clarify the current requirement for substance abuse testing under the operator qualifications and certification requirements. The proposed rule requires the level of testing required be the standard practice for the industry the operator is employed in. Initial proposals included a more specific list of requirements and definitions of different intoxicants. After discussions with stakeholders, including a recommendation to align with ASME standards, L&I made adjustments to tie the testing requirements to industry standard practices to make the rule the least burdensome approach and reduce gaps in understanding of what is required.

Updated ASME Standards

The proposed rule updates the use of ASME standards throughout the standard, removing dates to provide clear direction to the industry and ASME meeting regularly to ensure industry practices are up to date. This is the least burdensome approach to ensure employers using cranes know what regulations apply to them.

Chapter 6: Federal & Local Jurisdiction

Does this rule require those to whom it applies to take an action that violates requirements of another federal or state law?

☐ Yes. *(provide citation)*

☒ No.

Does this rule impose more stringent performance requirements on private entities than on public entities? RCW 34.05.328(1)(g)

☐ Yes.

☒ No.

If yes, explain whether the requirements justified by state or federal law. *(provide citation)*

Do other federal, state, or local agencies have the authority to regulate this subject?

☒ Yes *(describe below)* ☐ No

Is this rule different from any federal regulation or statute on the same activity or subject?

☒ Yes *(describe below)* ☐ No

If yes, check all that apply. The difference is justified based on the following:

☒ A state statute *(provide a citation)*

☐ There is substantial evidence that the difference is necessary to achieve the general goals and objectives of the statute as described above.

RCW 34.05.328(1)(h)
RCW 49.17.400, 49.17.410, 49.17.420, 49.17.430, 49.17.435, 49.17.440, and 49.17.445

The Unites States Occupational Safety and Health Administration (OSHA) also regulates this subject matter. Parts of the proposed rule are different from OSHA standards because they are more protective.
Explain how the rule has been coordinated, to the maximum extent practicable, with other federal, state, and local laws applicable to the same activity or subject matter. RCW 34.05.328(1)(i)
A comparison of the state and federal rules will be provided to OSHA following public hearings and final rule adoption. OSHA will then review to ensure that the final rule is at least as effective as the federal rule.

Chapter 7: Appendix

A.1. List of impacted industries and businesses - Cranes

NAICS Code	Description	Overall Usage Estimate	Common Crane Types
115310	Support Activities for Forestry	5-10%	Mobile cranes, Rough terrain cranes
221122	Electric Power Distribution	35-45%	Mobile cranes, Truck-mounted cranes, Aerial cranes
236115	New Single-Family Housing Construction	15-25%	Mobile cranes, Self-erecting tower cranes
236116	New Multifamily Housing Construction	20-30%	Mobile cranes, Tower cranes
236117	New Housing For-Sale Builders	15-25%	Mobile cranes, Self-erecting tower cranes
236118	Residential Remodelers	10-20%	Mobile cranes, Truck-mounted cranes
236210	Industrial Building Construction	50-60%	Tower cranes, Mobile cranes, Crawler cranes
216220	Commercial and Institutional Building Construction	50-60%	Tower cranes, Mobile cranes, Crawler cranes
237110	Water and Sewer Line and Related Structures Construction	40-50%	Mobile cranes, Crawler cranes
237120	Oil and Gas Pipeline and Related Structures Construction	60-70%	Mobile cranes, Crawler cranes, Sideboom cranes
237130	Power and Communication Line and Related Structures Construction	50-60%	Mobile cranes, Aerial cranes
237310	Highway, Street, and Bridge Construction	60-70%	Mobile cranes, Crawler cranes, Bridge cranes
237990	Other Heavy and Civil Engineering Construction	60-70%	Mobile cranes, Crawler cranes, Floating cranes
238111	Poured Concrete Foundation and Structure Contractors	30-40%	Mobile cranes, Tower cranes
238112	Structural Steel and Precast Concrete Contractors	50-60%	Mobile cranes, Tower cranes, Crawler cranes
238121	Glass and Glazing Contractors	20-30%	Mobile cranes, Truck-mounted cranes
238122	Structural Steel Erection Contractors	60-70%	Mobile cranes, Tower cranes, Crawler cranes
238131	Framing Contractors	15-25%	Mobile cranes, Truck-mounted cranes
238141	Masonry Contractors	10-20%	Mobile cranes, Truck-mounted cranes
238142	Drywall and Insulation Contractors	5-15%	Mobile cranes, Truck-mounted cranes
238151	Painting and Wall Covering Contractors	5-10%	Mobile cranes (rarely)
238152	Flooring Contractors	5-10%	Mobile cranes (rarely)
238161	Roofing Contractors	20-30%	Mobile cranes, Truck-mounted cranes
238162	Sheet Metal Work Contractors	15-25%	Mobile cranes, Truck-mounted cranes

238171	Siding Contractors	10-20%	Mobile cranes, Truck-mounted cranes
238172	Carpentry Contractors	10-20%	Mobile cranes, Truck-mounted cranes
238191	Other Foundation, Structure, and Building Exterior Contractors	30-40%	Mobile cranes, Tower cranes
238192	Other Building Equipment Contractors	20-30%	Mobile cranes, Truck-mounted cranes
238221	Plumbing, Heating, and Air-Conditioning Contractors	15-25%	Mobile cranes, Truck-mounted cranes
238222	Other Building Equipment Contractors	20-30%	Mobile cranes, Truck-mounted cranes
238291	Other Building Finishing Contractors	10-20%	Mobile cranes, Truck-mounted cranes
239292	Other Nonresidential Building Equipment Contractors	20-30%	Mobile cranes, Truck-mounted cranes
238321	Painting and Wall Covering Contractors	5-10%	Mobile cranes (rarely)
238332	Finish Carpentry Contractors	5-15%	Mobile cranes (rarely)
238341	Tile and Terrazzo Contractors	5-10%	Mobile cranes (rarely)
238342	Drywall and Insulation Contractors	5-15%	Mobile cranes, Truck-mounted cranes
238391	Other Building Finishing Contractors	10-20%	Mobile cranes, Truck-mounted cranes
238392	Other Building Equipment Contractors	20-30%	Mobile cranes, Truck-mounted cranes
238911	Site Preparation Contractors	30-40%	Mobile cranes, Crawler cranes
238912	Excavation Contractors	30-40%	Mobile cranes, Crawler cranes
238991	All Other Specialty Trade Contractors	30-40%	Mobile cranes, Tower cranes, Overhead cranes
238992	Crane Rental with Operator	90-100%	Mobile cranes, Tower cranes, Crawler cranes
333112	Lawn and Garden Tractor and Home Lawn and Garden Equipment Manufacturing	10-15%	Overhead cranes, Mobile cranes
333924	Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing	40-50%	Overhead cranes, Mobile cranes, Gantry cranes
423810	Construction and Mining (except Oil Well) Machinery and Equipment Merchant Wholesalers	25-35%	Overhead cranes, Mobile cranes
482111	Line-Haul Railroads	30-40%	Mobile cranes, Gantry cranes, Rail-mounted cranes
532412	Construction, Mining, and Forestry Machinery and Equipment Rental and Leasing	90-100%	Mobile cranes, Tower cranes, Crawler cranes
321922	Wood Container and Pallet Manufacturing	10-20%	Overhead cranes, Mobile cranes
332312	Fabricated Structural Metal Manufacturing	50-60%	Overhead cranes, Gantry cranes, Mobile cranes
339950	Sign Manufacturing	15-25%	Mobile cranes, Truck-mounted cranes
423990	Other Miscellaneous Durable Goods Merchant Wholesalers	10-20%	Overhead cranes, Mobile cranes
561730	Landscaping Services	5-10%	Mobile cranes, Truck-mounted cranes

A.2. List of impacted industries and businesses - Forklifts

NAICS Code	Industry Description	Estimated Usage (%)
115310	Support Activities for Forestry	10-15%
221122	Electric Power Distribution	20-25%
236115	New Single-Family Housing Construction	15-20%
236116	New Multifamily Housing Construction	20-25%
236117	New Housing For-Sale Builders	15-20%
236118	Residential Remodelers	10-15%
236210	Industrial Building Construction	25-30%
236220	Commercial and Institutional Building Construction	25-30%
237110	Water and Sewer Line Construction	20-25%
237120	Oil and Gas Pipeline Construction	25-30%
237130	Power and Communication Line Construction	20-25%
237310	Highway, Street, and Bridge Construction	25-30%
237990	Other Heavy and Civil Engineering Construction	25-30%
238111	Poured Concrete Foundation and Structure Contractors	20-25%
238112	Structural Steel and Precast Concrete Contractors	25-30%
238121	Glass and Glazing Contractors	15-20%
238122	Structural Steel Erection Contractors	25-30%
238131	Framing Contractors	15-20%
238141	Masonry Contractors	15-20%
238142	Drywall and Insulation Contractors	10-15%
238151	Glass and Glazing Contractors	15-20%
238152	Painting and Wall Covering Contractors	5-10%
238161	Roofing Contractors	15-20%
238162	Siding Contractors	10-15%
238171	Siding Contractors	10-15%
238172	Flooring Contractors	10-15%
238191	Other Foundation, Structure, and Building Exterior Contractors	20-25%
238192	Other Foundation, Structure, and Building Exterior Contractors	20-25%
238221	Plumbing, Heating, and Air-Conditioning Contractors	15-20%
238222	Other Building Equipment Contractors	15-20%
238291	Other Building Equipment Contractors	15-20%
238292	Other Building Equipment Contractors	15-20%
238321	Painting and Wall Covering Contractors	5-10%
238332	Finish Carpentry Contractors	10-15%
238341	Tile and Terrazzo Contractors	10-15%
238342	Drywall and Insulation Contractors	10-15%

238391	Other Building Finishing Contractors	15-20%
238392	Other Building Finishing Contractors	15-20%
238911	Site Preparation Contractors	25-30%
238912	All Other Specialty Trade Contractors	20-25%
238991	All Other Specialty Trade Contractors	20-25%
238992	All Other Specialty Trade Contractors	20-25%
333112	Lawn and Garden Tractor and Home Lawn and Garden Equipment Manufacturing	25-30%
333924	Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing	40-45%
423810	Construction and Mining (except Oil Well) Merchant Wholesalers	40-45%
482111	Line-Haul Railroads	35-40%
532412	Construction, Mining, and Forestry Machinery and Equipment Rental and Leasing	50-55%
321922	Wood Container and Pallet Manufacturing	30-35%
332312	Fabricated Structural Metal Manufacturing	30-35%
339950	Sign Manufacturing	20-25%
423990	Other Miscellaneous Durable Goods Merchant Wholesalers	35-40%
561730	Landscaping Services	5-10%

A.3. Survey – Crane Construction Rule 2024

2024 Crane Construction Rulemaking Survey

Responses to this survey is anonymous and confidential

The purpose of this survey is to determine any new costs your business may incur due to the increased requirements in the proposed construction crane rule. Your answers will also provide valuable input in helping us determine how the proposed rule could impact businesses of different types and sizes.

Please answer the questions the best you can. If you do not have the exact information, use your best estimate. In order for your cost data to be considered in the economic analysis of this rule, the survey must be completed by December 16, 2024. The survey is estimated to take between 10 to 20 minutes to complete.

If you have any questions about the proposed rule, please contact Cindy Ireland at Cynthia.Ireland@lni.wa.gov.
If you have any questions about the survey, please contact Kerwin Julien at Kerwin.Julien@lni.wa.gov.

1) Please check the one industry that most closely identifies your business.
*

( ) Residential Building Construction

( ) Nonresidential Building Construction

( ) Utility System Construction

( ) Highway, Street, and Bridge Construction

( ) Other Heavy & Civil Engineering Construction

( ) Foundation, Structure, and Building Exterior Contractors

( ) Building Finishing Contractors

( ) Building Equipment Contractors

( ) Other Specialty Trade Contractors

( ) Other (Please specify):: _____*

2) How would you categorize your business based on the number of fulltime employees (FTEs)?
*

( ) Small business (fewer than 50 employees)

( ) Medium sized business (50-250 employees)

( ) Large business (more than 250 employees)

3) Do you have a Registered Professional Engineer on staff?*

( ) Yes

( ) No

4) During 2023, on average, how many crane-related jobs did you work? Please provide a range.
*

_____

5) What type of cranes/equipment does your company typically use or operate? Select all that apply.
*

[ ] Tower cranes

[ ] Mobile cranes

[ ] Self-erecting tower cranes

[ ] Articulating boom cranes

[ ] Overhead/bridge and gantry bridge cranes

[ ] Derricks

[ ] Powered industrial trucks (forklifts)

[ ] Other (please specify): _____*

Under the proposed rule (WAC 296-155-53206(7)(b)) when a manufacturer's specifications are missing a registered professional engineer (RPE) must now determine the hoist load limit switches by means of a static test.

The following questions help us assess the impact of this proposed rule.

*6) On average, how many jobs do you complete a year using tower cranes? Please provide a range.**

_____

7) How often do you encounter situations where the manufacturer's specifications for setting tower crane hoist load limit switches are not available? Please provide a percentage of your total tower crane jobs.*

( ) 0-25%

( ) 26-50%

( ) 51-75%

( ) 76-100%

*8) Approximately how long does/would it typically take an RPE to determine the static test needed to verify hoist load limit switches? Please provide a range in minutes.**

_____

Under the proposed rule (WAC 296-155-53214(1)(c)) in cases where damage, modifications, or repairs to a crane go beyond general maintenance or routine replacements, an accredited crane certifier must evaluate if the changes warrant decertifying the crane. This assessment involves consulting with the crane/equipment manufacturer and adhering to any recommended criteria.

The following questions help us assess the impact of this proposed rule.

9) Are you a crane owner?*

( ) Yes

( ) No

10) Approximately how many cranes do you own? *

_____

11) On an average annual basis, how often do you repair or modify load-sustaining/bearing parts of a crane, beyond general maintenance or routine wear item replacement? *

( ) Never

( ) Number of times: min to max: _____*

*12) On average, how long would it take an accredited crane certifier to assess whether damage, modifications, or repairs are extensive enough to decertify a crane? Please provide a range in minutes.**

_____

WAC 296-155-53301 proposes necessary requirements for a lift director to meet in order to be qualified. These qualifications include:

Being a qualified Rigger (as per WAC 296-155-53306) and a qualified Signal Person (as per WAC 296-155-53302);

Knowing and understanding the relevant requirements of WAC 296-155-53401(6), Duties of assigned personnel;

Knowing and understanding the relevant requirements of WAC 296-155-3408, Power line safety;

Knowing and understanding the relevant requirements of WAC 296-155-56420, Operator certification – written examination – technical knowledge criteria; and

Being able to demonstrate they meet these requirements through passing a written or oral test.

The following questions help us assess the cost of the proposed qualification requirements.

13) The site supervisor must assign a qualified person to be the lift director to oversee the crane/equipment and associated rigging crew. Does your organization supply a lift director for this purpose?*

( ) Yes

( ) No

*14) Based on the proposed qualification requirements how many individuals in your organization would need to become qualified as a lift director to meet the requirements for overseeing crane and rigging operations? Please provide a number.**

_____

*15) Based on the proposed qualification requirements to become a qualified lift director, how much would it cost to qualify a lift director? Please provide a range.**

_____

16) The requirements to be a lift director must be met by using either a third-party qualified evaluator or an employer's qualified evaluator. Which type of evaluator are you most likely to use to qualify your lift directors?*

( ) Employer qualified evaluator (in-house)

( ) Third-party evaluator

17) Third-party Evaluators
Approximately how long would a third-party evaluation take? Please provide a range in minutes.

_____

18) Third-party Evaluators
How much would an average third-party evaluation cost per lift director? Please provide a range.

_____

19) In-House Evaluators
Which employee in your organization would most likely serve as the qualified evaluator to assess and document the qualifications of lift directors?

[ ] Crane Operator

[ ] Rigging Supervisor

[ ] Safety Manager

[ ] Other (please specify):: _____*

20) In-House Evaluators
Approximately how long would it take to evaluate a single lift director? Please provide a range in minutes.

_____

WAC 296-155-53303(1) proposes qualification requirements for an assembly/disassembly (A/D) director. These qualification requirements include:

Be capable of identifying existing and predictable hazards in the surroundings or working conditions of the assembly, disassembly, and/or reconfiguration work which are hazardous or dangerous to employees;

Have knowledge of requirements regarding relevant crane assembly, disassembly, and/or reconfiguration procedures;

Have knowledge of manufacturer's instruction, warning, precautions and prohibitions regarding assembly, disassembly, and/or reconfiguration of the specific crane being assembled, disassembled, and/or reconfigured;

Know and fulfill the relevant duty requirements of WAC 296-155-53401(9) and WAC 295-155-53303; and

Be able to demonstrate they meet these requirements through passing a written or oral test.

The following questions help us assess the impact of these proposed requirements.

21) Does your company operate mobile cranes?*

( ) Yes

( ) No

22) Do your operations require assembly/disassembly director duties?*

( ) Yes

( ) No

*23) How many individuals in your organization would need to become qualified as an A/D Director to meet the requirements for overseeing crane/equipment operations?**

_____

*24) Based on the proposed requirements to become a qualified A/D director, approximately how much would it cost to qualify a single A/D director? Please provide a range.**

_____

25) The qualifications of an individual to be an A/D director must be evaluated by either an employer's qualified evaluator or a third-party qualified evaluator. Which type of evaluator are you most likely to use to qualify your A/D Directors?

( ) Employer qualified evaluator (In-house)

( ) Third-party evaluator

26) Third-party Evaluators
Approximately how long would a third-party evaluation take for a single director? Please provide a range in minutes.

_____

27) Third-party Evaluators
Approximately how much would an average third-party evaluation cost? Please provide a range.

_____

28) In-House Evaluators
Which employee in your organization would most likely serve as the qualified evaluator to assess and document the qualifications of an A/D Director?

[ ] Crane Operator

[ ] Rigging Supervisor

[ ] Safety Manager

[ ] Other (please specify):: _____*

29) In-House Evaluators
Approximately how long would it take to evaluate one A/D Director? Please provide a range in minutes.

_____

Under the proposed rule (WAC 296-155-53400(39)) a multiple crane/equipment coordination plan must be developed where any part of a crane/equipment is within the working radius of another crane/equipment, including those on different job sites. This plan must (i) be developed, reviewed and approved by all affected supervisors, (ii) be implemented prior to the operation of any of the affected cranes, (iii) prior to a crane entering the radius of another the proposed maximum boom tip height and working area must be communicated to all cranes in the vicinity, and (iv) this plan must be kept on site while cranes are in use.

The following questions relate to multiple crane/equipment coordination plans.

30) At any time, has your company operated a crane/equipment that was within the working radius of another crane/equipment, including on a different job site?

( ) Yes

( ) No

*31) How many of your annual crane jobs involved operating a crane or equipment within the working radius of another crane or equipment, including those on different job sites? Please provide a range.**

_____

*32) Approximately how long would it typically take to develop, review, and approve a multiple crane/equipment coordination plan? Please provide a range.**

_____

33) Which employees are typically involved in developing, reviewing, and approving the multiple crane/equipment coordination plan? (Select all that apply).*

[ ] Site Supervisor

[ ] Crane Operator

[ ] Safety Manager

[ ] Project Manager

[ ] Other (please specify): _____*

Under the proposed rule (WAC 296-155-53400(42)(b)) if a load has the potential to swing over an area accessible to the public, the site supervisor must (i) close the sidewalk, road, and/or public area, and (ii) control, mark off and clear all public access points prior to moving the load.

The following questions relate to keeping clear of loads that have the potential to swing over public areas.

34) In what percentage of your jobs does a crane load have the potential to swing over an area the public can enter, including the assembly/disassembly zone?*

( ) None

( ) 1-25%

( ) 26-50%

( ) 51-75%

( ) 76-100%

35) Which employees are typically involved in controlling public access to the site during crane operations?*

[ ] Site Supervisor

[ ] Safety Officer

[ ] Flagger

[ ] Crane Operator

[ ] Other (please specify):: _____*

36) On average, how long does it take to close a sidewalk, road, or public area? Please provide a range.

_____

37) What is the typical average cost associated with closing a sidewalk, road, or public area (e.g. permits, signage, barriers)? Please provide a range.

_____

38) On average, how long does it typically take to control, mark off, and clear affected public areas at all public access points? Please provide a range.

_____

Under the proposed rule (WAC 296-155-53400(42)(c)) a plan for minimizing public exposure must be developed and utilized prior to lifting loads over occupied buildings.

The following questions relate to lifting loads over occupied buildings.

39) In what percentage of jobs do you lift loads over occupied buildings?*

( ) None

( ) 1-25%

( ) 26-50%

( ) 51-75%

( ) 76-100%

*40) Approximately how long would it typically take to create a plan to minimize public exposure to the site when lifting loads over occupied buildings?**

_____

41) Which employee(s) would most likely be involved in creating this plan? (Select all that apply)
*

[ ] Site Supervisor

[ ] Safety Officer

[ ] Flagger

[ ] Crane Operator

[ ] Other (please specify):: _____*

Under the proposed rule (WAC 296-155-53400(76)) where cranes/equipment, other than tower cranes, are used inside of or on multi-level building sites, employers must ensure methods are used to prevent inadvertent movement while handling a load.

The following questions relate to using cranes/equipment inside of, or on, multi-level building sites.

42) Do you use or operate cranes/equipment other than a tower crane inside of, or on, multi-level building sites?*

( ) Yes

( ) No

43) How often? Select the response which represents a percentage of your total annual jobs.

( ) 1-25%

( ) 26-50%

( ) 51-75%

( ) 76-100%

44) Approximately how long does it usually take to ensure that methods that prevent cranes or equipment from inadvertently moving while handling a load on multi-level building sites are implemented?

_____

45) Which employee(s) would most likely be involved in implementing these methods? (Select all that apply).

[ ] Site Supervisor

[ ] Safety Officer

[ ] Flagger

[ ] Crane Operator

[ ] Other (please specify):: _____*

Under the proposed rule (WAC 296-155-53400(80)) a critical lift plan is required when a lift is deemed critical or when the load handling activity exceeds critical lift standards, requiring additional planning and risk mitigation. The plan must be in written or digital format and must contain information on (i) the load, (ii) the crane/equipment, (iii) rigging, and (iv) crane/equipment and load travel path.

The following questions help us assess the impact of a critical lift plan when critical lifts occur.

46) In your operations do you encounter situations that require a critical lift?*

( ) Yes

( ) No

47) How often do you encounter situations that require a critical lift, or situations where your proposed load handling activities require more advanced planning or procedures because they exceed standard critical lift plan criteria? Please provide a range as a percentage of your total annual jobs.*

( ) 1-25%

( ) 26-50%

( ) 51-75%

( ) 76-100%

*48) Approximately how long would it typically take to complete a critical lift plan, including details about the load, crane/equipment, rigging, and crane/equipment traveling path?**

_____

49) Which employee(s) would most likely be involved in creating a critical lift plan? (Select all that apply).*

[ ] Site Supervisor

[ ] Crane Operator

[ ] Safety Manager

[ ] Rigging Supervisor

[ ] Other (please specify):: _____*

Under the proposed rule (WAC 296-155-53408(81)) prior to utilizing a crane/equipment inside of or on a multi-level building, a RPE must review and acknowledge (a) the engineering of the structural support of the crane/equipment; (b) the methods to prevent the crane/equipment from moving while hoisting a load; and (c) that the equipment base, structural supports, and connection points provide adequate support.

The following questions help us assess the impact of requiring a registered professional engineer (RPE) prior to utilizing a crane/equipment inside of or on a multi-level building.

50) Do you or your company operate a crane inside of or on a multi-level building?*

( ) Yes

( ) No

51) How often? Please select a range as a percentage of your total annual jobs.*

( ) 1-25%

( ) 26-50%

( ) 51-75%

( ) 76-100%

*52) On average, how long would it typically take an RPE to review and acknowledge the necessary requirements for utilizing a crane/equipment on a multi-level building?**

_____

Under the proposed rule (WAC 296-155-53401(1)) a single individual can no longer perform one or more assigned tasks concurrently when assembling, disassembling, and/or reconfiguring tower cranes.

The following questions help us assess the impact of proposed assigned duties in the assembly, disassembly, and/or reconfiguration of tower cranes.

*53) How many workers would typically be needed for tower crane assembly, disassembly, or reconfiguration at your worksite? Please provide the range.**

_____

54) Which of your employee(s) are usually involved in the tower crane assembly, disassembly, or reconfiguration process? (Select all that apply)*

[ ] Crane Operator

[ ] Rigger

[ ] Signal Person

[ ] Other (Please specify):: _____*

55) Does your worksite assign more than one role to a single individual during tower crane assembly, disassembly, or reconfiguration?*

( ) Yes

( ) No

*56) On average, how long would it take your crew to assemble, disassemble, and/or reconfigure a tower crane? Please provide the range.**

_____

*57) The proposed rule prohibits assigning more than one task to a single person when assembling, disassembling, and/or reconfiguring a tower crane. Based on this, how many additional workers do you estimate you would need to hire or have to reassign for these tasks?**

_____

Under proposed rules (WAC 296-155-53408(1)(b)(i)) a documented planning meeting is required before any crane assembly, disassembly, or reconfiguration near power lines. The meeting, which includes the A/D director, operator, relevant crew, and area workers, should address power line locations and safety steps to prevent encroachment/electrocution. The utility owner should be invited, and new meetings are needed if power line conditions change. Documentation must include meeting details, including date, attendees' names/signatures, work location, a diagram of the crane's work zone, voltage and location of power lines, and safety procedures. This record must remain on-site for the duration of the assembly/disassembly work.

The next 3 questions help us assess the impact of documenting power line safe planning meetings prior to assembly, disassembly, and/or reconfiguration of a crane/equipment.

58) Based on your total annual crane jobs how often do you assemble, disassemble, and/or reconfigure cranes that are either closer than 20 feet of a power line that's up to 350kV or closer than 50 feet of a power line that exceeds 350 kV? Please provide a range.*

( ) Never

( ) 1-25%

( ) 26-50%

( ) 51-75%

( ) 76-100%

*59) On average how long would it take to document a typical planning meeting related to power line safety before crane assembly, disassembly, and/or reconfiguration?**

_____

60) Who is typically responsible for documenting the planning meeting?*

[ ] A/D Director

[ ] Site supervisor

[ ] Safety Officer

[ ] Project Manager

[ ] Other (Please specify):: _____*

Under proposed rule (WAC 296-155-53408(2)(b)(i)) a documented planning meeting with the crane operator and nearby workers is now required before using the crane near power lines. The utility owner should be invited, and additional meetings are needed if power line conditions change. Documentation must capture meeting details, including date, attendee names/signatures, work location, a diagram of the crane's work zone, power line information, and safety steps to prevent encroachment/electrocution. This record must stay on-site while the crane is in use.

The next 3 questions help us assess the impact of conducting and documenting power line safety planning meetings prior to the operation of a crane/equipment.

*61) On average, how long would it take to conduct and document a typical planning meeting with the operator and other workers who will be in the area of the crane or load? Please provide a range.**

_____

62) Which employees will likely be required/present at a typical meeting? (Select all that apply).*

[ ] A/D Director

[ ] Site supervisor

[ ] Safety Officer

[ ] Project Manager

[ ] Rigger

[ ] Signal person

[ ] Other (please specify):: _____*

Under proposed rule (WAC 296-155-53408(4)(g)) a pre-operation meeting is required with the crane/equipment user, utility owner/operator (or qualified engineer), crane operator, and workers in the area to review safety procedures preventing encroachment of the minimum approach distance and electrocution. The meeting must be documented and kept on-site for the duration of the work. Documentation should include the names and signatures of attendees, the meeting date, the work location, a diagram of the work zone, voltage and location of energized lines, and the steps to prevent encroachment/electrocution.

The following questions help us assess the impact of this proposed requirement.

63) On average, how long would it take to document a typical planning meeting for crane assembly, disassembly, and/or reconfiguration related to power line safety? Please provide a range.*

( ) Never. This does not apply to my operations

( ) Minutes: min to max: _____*

64) How often do you operate a crane/equipment inside the Table 4 zone (the minimum clearance distance of an energized power line or power line of a particular voltage, in which any part of the crane/equipment can operate)? Please provide a percentage of your jobs.*

( ) 1-25%

( ) 26-50%

( ) 51-75%

( ) 76-100%

65) Who is typically responsible for documenting the planning meeting to review the procedures that will be implemented to prevent breaching the minimum approach distance of power lines?*

[ ] A/D Director

[ ] Site Supervisor

[ ] Safety Officer

[ ] Project Manager

[ ] Other (please specify):: _____*

Under proposed rule (WAC 296-155-53414(2)(a) through (c)) before using a crane or equipment inside or on a multi-level building, a Registered Professional Engineer (RPE) must review and confirm the adequacy of several key factors. These include the engineering of the crane/equipment's structural support, methods to prevent unintended movement during hoisting, and the ability of the equipment's base, structural supports, and connection points to withstand torsional and overturning moments, as well as horizontal and vertical forces. The RPE must acknowledge that these aspects are acceptable before the crane/equipment is used.

The next 4 questions relate to the use of crane/equipment with a rated hoisting/lifting capacity of 2,000 lbs or less.

66) Do you use or operate a crane/equipment with a rated hoisting/lifting capacity of 2,000 pounds or less?*

( ) Yes

( ) No

67) What percentage of your total crane/equipment has a rated capacity of 2,000 pounds or less?*

( ) 1-25%

( ) 26-50%

( ) 51-75%

( ) 76-100%

68) How often do you utilize these rated-capacity cranes/equipment inside of, or on, a multi-level building? Please provide a percentage of your total annual jobs.

( ) 1-25%

( ) 26-50%

( ) 51-75%

( ) 76-100%

69) On average, how long would it take an RPE to review and acknowledge the various aspects outlined in subsection (2)(a) through (c)?

_____

Under the proposed rule (WAC 296-155-55600(23)) multi-tier rigging is permitted only if several safety criteria are met: only essential personnel must be in the fall zone and avoid being directly under the load, employees must be aware of multi-tier rigging hazards, and the total load must not exceed the equipment's rated capacity. The rigging assembly should have a maximum of three tiers, use protected slings, be level, use hooks with self-closing latches, and rig each tier independently with at least 7 feet of spacing. Controlled load lowering is mandatory, loads must be landed on stable surfaces to avoid hazards, and only a double-wrapped basket hitch is allowed.

The following questions help us assess the impact of the proposed rule related to multi-tier rigging.

70) Do you engage in multi-tier rigging?*

( ) Yes

( ) No

71) Based on your annual total jobs, on average, how often are you engaged in multi-tier rigging? Please provide a range.*

( ) 1-25%

( ) 26-50%

( ) 51-75%

( ) 76-100%

72) On average, which essential employee(s) would be involved in a typical multi-tier rigging? (Select all that apply).*

[ ] Crane operator

[ ] Rigger

[ ] Signal Person

[ ] Lift Director

[ ] Supervisors

[ ] Other (please specify):: _____*

*73) On average, how long does it take to make employees aware of the hazards and safe practices related to multi-tier rigging? Please provide a range.**

_____

*74) Currently, how long does it take to rig the typical multi-tier rigging assembly?**

_____

*75) Based on the proposed language, how much time would it take to rig the same typical multi-tier rigging assembly?**

_____

*76) Based on the proposed language, what is the estimated cost associated with rigging the multi-tier rigging assembly for a typical job at your worksite? Please provide a range.**

_____

Thank You!

Thank you for taking our survey. Your response is very helpful in assessing the true impact of the proposed rule.
