DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Parts 1910, 1915, 1917, 1926, and 1928

[Docket Nos. OSHA-2010-0058, OSHA-2010-0059]

RIN 1218-AC51

Reinforced Concrete in Construction, and Preventing Backover Injuries and Fatalities

AGENCY: Occupational Safety and Health Administration (OSHA), Labor.

ACTION: Request for information (RFI)

SUMMARY: OSHA is aware of employee safety risks in two areas, reinforcing operations in concrete work (construction only) and fatal backovers by vehicles and equipment (all industries), and is requesting information from the public on these risks. This RFI requests information that will assist the Agency in determining what steps, if any, it can take to prevent injuries and fatalities in these two areas.

DATES: Submit comments and other information by [INSERT DATE 90 DAYS AFTER PUBLICATION OF THIS NOTICE IN THE FEDERAL REGISTER]. All submissions must bear a postmark or provide other evidence of the submission date.

ADDRESSES: Submit comments and additional materials using any of the following methods (submissions relating to Reinforced Concrete in Construction to Docket No. OSHA-2010-0058, and submissions relating to Preventing Backover Injuries and Fatalities to Docket No. OSHA-2010-0059):

Electronically. Submit comments and attachments electronically at *http://www.regulations.gov*, which is the Federal eRulemaking Portal. Follow the instructions online for making electronic submissions.

Facsimile. Commenters may fax submissions, including attachments, that are no longer than 10 pages in length to the OSHA Docket Office at (202) 693-1648; OSHA does not require hard copies of these documents. Commenters must submit lengthy attachments that supplement these documents (*e.g.,* studies, journal articles) to the OSHA Docket Office, Technical Data Center, Room N-2625, U.S. Department of Labor, 200 Constitution Ave., NW., Washington, DC 20210. These attachments must clearly identify the commenter's name, date, subject, and docket number (i.e., for Reinforced Concrete in Construction, OSHA-2010-0058, and for Preventing Backover Injuries and Fatalities, OSHA-2010-0059) so the Agency can attach them to the appropriate comments.

Regular mail, express delivery, hand (courier) delivery, or messenger service. Submit a copy of comments and any additional material (*e.g.,* studies, journal articles) to the OSHA Docket Office, Docket No. OSHA-2010-0058 (for Reinforced Concrete in Construction), Technical Data Center, Room N-2625, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210; telephone (202) 693-2350 (TDY number: (877) 889-5627). For submissions relating to Preventing Backover Injuries and Fatalities, please identify the docket number as OSHA-2010-0059. Note that security procedures may result in significant delays in receiving comments and other written materials by regular mail. Contact the OSHA Docket Office for information about security procedures concerning delivery of materials by express delivery, hand delivery, or messenger service. The hours of operation for the OSHA Docket Office are 8:15 a.m. - 4:45 p.m., e.t.

Instructions. All submissions must include the Agency name and the OSHA docket number for this rulemaking; i.e., for Reinforced Concrete in Construction, Docket No. OSHA-2010-0058, and for Preventing Backover Injuries and Fatalities, Docket No. OSHA-2010-0059. The Agency places all submissions, including any personal information provided, in the public docket without change; this information will be available online at *http://www.regulations.gov*. Therefore, the Agency cautions commenters about submitting information they do not want made available to the public, or submitting comments that contain personal information (either about themselves or others) such as Social Security numbers, birth dates, and medical data.

Docket. To read or download submissions or other material in the docket, go to http://www.regulations.gov, or to the OSHA Docket Office at the address above. While the Agency lists all documents in the docket in the http://www.regulations.gov index, some information (*e.g.,* copyrighted material) is not publicly available to read or download through this Web site. All submissions, including copyrighted material, are available for inspection and copying at the OSHA Docket Office. Contact the OSHA Docket Office for assistance in locating docket submissions.

FOR FURTHER INFORMATION CONTACT: Information regarding this Request for Information is available from the following sources:

Press inquiries. Contact Frank Meilinger, Director, OSHA Office of Communications, Room N-3647, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210; telephone: (202) 693-1999.

General and technical information. Contact Blake Skogland, Office of Construction Standards and Guidance, OSHA Directorate of Construction, Room N-

3468, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210; telephone: (202) 693-2020; fax: (202) 693-1689.

Copies of this Federal Register notice. Electronic copies are available at *http://www.regulations.gov*. This *Federal Register* notice, as well as news releases and other relevant information, also are available at OSHA's Web page at *http://www.osha.gov.*

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SUPPLEMENTARY INFORMATION:

Exhibits Referenced in This RFI

Documents referenced by OSHA in this request for information, other than OSHA standards and *Federal Register* notices, are in Docket Nos. OSHA-2010-0058 (Reinforced Concrete in Construction) and OSHA–2010-0059 (Preventing Backover Injuries and Fatalities). The dockets are available at *http://www.regulations.gov,* the Federal eRulemaking Portal. Most exhibits are available at *http://www.regulations.gov*; some exhibits (*e.g.,* copyrighted material) are not available to read or download from that Web page. However, all materials in the dockets are available for inspection and copying at the OSHA Docket Office, Room N–2625, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC.

Reinforced Concrete in Construction

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I. Background

Concrete has strong compression strength (is not easily crushed), but weak tensile strength (breaks easily when stretched); thus, adding reinforcement increases concrete's tensile strength, which is particularly important in floor or deck construction. Without reinforcement, many concrete structures and buildings would not be possible. Reinforced concrete is concrete that uses reinforcing steel bars ("rebars"), reinforcement grids, plates, steel tendons, fibers, or other material to increase its tensile strength. The construction industry uses reinforced concrete in building most types of commercial, industrial, and residential structures; this use includes many types of structural components such as slabs, walls, beams, columns, and foundations. According to estimates provided by the National Ready Mixed Concrete Association, contractors used about 257 million cubic yards of ready mixed concrete in 2010 (National Ready Mixed Concrete Association (NRMCA) Fact Sheet), while the Steel Manufacturers Association estimates that the construction industry used 6.05 million tons of rebar in reinforced

concrete in 2010 (Apparent Domestic Consumption of Rebar 2010 Spreadsheet). This RFI will address reinforcing concrete construction activities.

A. Events Leading to this Action

The International Association of Bridge, Structural, Ornamental & Reinforcing Iron Workers ("Ironworkers"), along with an industry coalition of stakeholders,[1] petitioned OSHA on April 19, 2010, to conduct a negotiated rulemaking and publish new regulations for reinforcing steel and post-tensioning operations. (*Letter to David Michaels, OSHA, from Joseph Hunt, International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers*.) They explained the hazards of reinforcing operations, and noted that the use of steel-reinforced and post-tensioned poured-in-place concrete is likely to double its 1990 usage level by 2015. The request prompted OSHA to conduct a retrospective review of existing rules to determine what action, if any, the Agency should take to improve safety for workers engaged in this type of construction. In its review, OSHA found little information in the literature on the rates of incidents caused by reinforcing steel and post-tensioning activities. The Bureau of Labor Statistics (BLS) does not have statistics specific to this subject. Consequently, OSHA is issuing this RFI to gather more information to assess whether the Agency should take action to improve worker safety for reinforcing concrete activities.

B. Hazards and Accidents

OSHA conducted a review of its Integrated Management Information System (IMIS) incident database to determine the number of worker fatalities resulting from

[1]Ironworker Management Progressive Action Cooperative Trust (IMPACT), National Association of Reinforcing Steel Contractors, Concrete Reinforcing Steel Institute, Post Tensioning Institute, Western Steel Council, Department of Reinforcing Ironworkers Advisory Committee, and the Center for Construction Research and Training.

activities working with rebar for concrete reinforcement. This work includes constructing rebar mats and cages, and installing rebar. (Rebar and Post-tensioning Deaths from IMIS Database 2000-2009 Spreadsheet.) This review showed that, from 2000-2009, a total of 30 workers died while performing rebar-related activities, including five who died from impalement injuries, nine killed in falls, eight who died when rebar cages or columns collapsed, and six killed as a result of struck-by injuries. There also was one positional-asphyxiation death and one death involving a rebar mat collapse. In addition, during this period, IMIS data showed that one worker died while performing post-tensioning operations.

Many of the rebar-related deaths occurred despite the existence of a specific standard governing the activities involved.[2] For example, Federal OSHA and state-plan states other than California[3] cited 29 CFR 1926.703(d)(1), which requires employers to adequately support reinforcing steel for vertical structures to prevent overturning and collapse, nine times between 2000 and 2009. During the same time period, Federal OSHA and state-plan states also cited employers for various fall protection-related regulations in Subpart M – Fall Protection 15 times, and 29 CFR 1926.701(b), which requires the use of rebar caps, five times. While capping the rebar and using fall protection as required likely would prevent many of these accidents, it is unclear whether these existing standards are adequate to fully protect workers involved in reinforced concrete operations. For example, contractors involved in reinforced concrete operations

[2]The document "Rebar and Post-tensioning Deaths from IMIS Database 2000-2009 Spreadsheet," which is available in the OSHA-2010-0058 docket, lists the regulations that Federal OSHA and state-plan states cited after investigating rebar-related deaths.

[3]California adopted its own reinforcing concrete regulations, which differ from federal OSHA's standards. The other state-plan states have regulations that duplicate Federal OSHA standards, but may follow a codification system that differs from the Code of Federal Regulations.

may endanger the employees of contractors involved in subsequent steel erection or masonry work when they remove caps from rebar or supports from vertical form structures after they complete their work and leave the site; such an oversight indicates that the existing standards may need revision to ensure continuity of hazard control at these worksites. The Agency will study this issue further, and make use of any additional information collected from this RFI to determine what steps, if any, it can take to prevent fatalities and injuries related to working with reinforced concrete.

1. *Reinforcing Steel*

The construction industry uses reinforcing steel in a variety of different configurations, which create different hazards. Contractors use flexible steel wire to tie rebar together for such configurations as walls, mats, and cages. When tied improperly, these configurations can collapse. Formwork and decks also are susceptible to collapse when not properly installed. In addition, improperly anchored walls or cages can tip over, subjecting workers to fall and struck-by hazards. Vertical uncapped rebar can create impalement hazards. Workers also can face struck-by and crushing hazards related to material-handling when a crane operator uses a crane to place pre-assembled rebar components and does not rig the load properly. Suppliers deliver, and workers position, rebar during the early stages of construction when site conditions are typically poor—the ground is rutted and uneven, which presents tripping hazards, and mud and wet or icy conditions create slipping hazards.

The Center for Construction Research and Training (CPWR) discussed injuries sustained by ironworkers (which CPWR defined as "ironworkers, reinforced ironworkers, rodmen, or steelworkers") in the publication "Occupational Injuries among Construction

Workers Treated at the George Washington University Emergency Department, 1990-1997".[4] Although this study did not document what these workers were doing when injured, their job titles and the types of injuries indicate that they most likely received their injuries during operations involving reinforced concrete. Accordingly, this study showed that, from November 1, 1990, through October 31, 1997, 133 ironworkers received treatment for work-related injuries at the George Washington University Emergency Department. The most common injuries for these ironworkers were struck-by injuries (23%), which included injuries caused by falling objects. Other common injuries were caused by falls (21%), sharp objects (18%), and overexertion/strenuous movement (17%). Ironworkers were most likely to injure fingers, thumbs, hands, and wrists (combined 34%). To reduce these types of injuries, CPWR recommended limiting lifting and carrying objects over uneven surfaces, and the frequency of moving heavy materials. CPWR also recommended improving the efficiency of current staging practices, and having the workers wear heavy gloves.

A study from British Columbia found similar results for injuries reported by concrete-reinforcing workers. "Mechanisms of Injury: Concrete Reinforcing", WorkSafeBC, CU 721012. The WorkSafeBC study noted that falls, overexertion, and struck-by incidents constituted 71% of the injuries reported by 465 workers between 2007-2009.

2. *Post-tensioning*

Post-tensioning poses several unique hazards to workers. There are two types of post-tensioning systems: unbonded and bonded. In an unbonded post-tensioning

[4]At the time of the study's publication, CPWR was the acronym for the Center to Protect Workers Rights. It later changed its name to Center for Construction Research and Training.

operation, workers place high-strength steel tendons (coated in grease and sheathed in plastic) in a horizontal form (*e.g.*, to construct a floor or slab) before pouring concrete into the form; both ends of the tendons protrude through the form on opposite sides. In a bonded post-tensioning operation, contractors pour the concrete around plastic, steel, or aluminum ducts. Workers then maneuver a set of tendons through the ducts and seal the ductwork with grout. In both cases, once the concrete hardens, workers tension the tendons using hydraulic jacks. Workers typically tension the tendons between 30,000 and 50,000 p.s.i.

One of the most dangerous hazards in a post-tensioning operation is the struck-by hazard that results from tensioning or de-tensioning the tendons, especially a flying object propelled by the energy released when a tendon breaks or a component fails at these high pressures. According to OSHA IMIS database reports, in 2008, an employee died when he was de-tensioning the tendons. The jack slipped and struck the employee in the chest, killing him. Ten years earlier, a worker died after a flying object struck his right arm and the back of his head while he was post-tensioning a parking lot ramp.

C. Applicable Standards

The following provisions of OSHA's Concrete and Masonry Construction standard at 29 CFR 1926, subpart Q, regulate some aspects of reinforcing steel and post-tensioning operations: 29 CFR 1926.701(b) (Reinforcing steel); 29 CFR 1926.701(c) (Post-tensioning operations); and 29 CFR 1926.703(d) (Reinforcing steel).

Subpart M of 29 CFR 1926 (Fall Protection), specifically § 1926.501(b)(5) (Formwork and reinforcing steel), requires fall protection for workers exposed to heights over six feet when working on reinforcing steel.

D. Standards from Other Jurisdictions

In its research on reinforced steel and post-tensioning, OSHA found that, in the years since it published 29 CFR 1926, subpart Q, various federal agencies, state governments, and industry associations drafted additional regulations and guidelines for reinforcing steel and post-tensioning operations. A few of the 26 state-plan states, which can develop their own occupational safety and health standards, have regulations regarding reinforcing steel and post-tensioning operations. California, for instance, has several concrete-reinforcing regulations. These regulations specify the criteria for impalement covers and tests to determine whether caps are effective. California has detailed requirements for rebar caps and troughs, which are long wooden forms built to encapsulate the exposed ends of rebar, Title 8, CCR § 344.90. California also regulates job-built covers used to protect workers from protruding rebar and similar projections Title 8, CCR § 1712. In addition to impalement devices, California requires that contractors use a qualified person to install and remove guys, supports, and braces (*id*.).

Washington State regulates the performance of post-tensioning activities, which includes requirements that: "deadheads" used in post-tensioning be the type that will increase the grip on the cable as the tension increases; contractors use proper means and equipment to prevent over-tensioning; and only qualified workers perform post-tensioning operations, WAC-296-155-695. These regulations also require employers to: follow supplier recommendations and instructions regarding installation, maintenance, and replacement of anchor fittings; keep tools and strand vices clean and in good repair; and comply with minimum safety factors for expendable strand deflection devices and reusable strand deflection devices. Washington State also has regulations regarding

jacking operations which specify that "during jacking operations of any tensioning element or group of tensioning elements, the anchors shall be kept turned up close to the anchorplate" and that no one can stand "in line or directly over the jacking equipment during tensioning operations." (*Id.*) Jacking and pulling equipment must be inspected frequently. These regulations also include requirements for handling stressed concrete.

Federal agencies involved in construction activities also have requirements relating to concrete reinforcement. For example, section 25.3.6 of the 2009 edition of the Bureau of Reclamation Safety and Health Standards prohibits the use of reinforcing steel as guy attachments at deadmen or other anchorage points for scaffolding hooks, for stirrups, or as a load-bearing member of any lifting device.

Section 27.B.03 of the 2008 edition of the Army Corps of Engineers Safety and Health Requirements Manual requires that a registered professional engineer design support systems for reinforcing steel that are independent of other forms or shoring support systems. Additionally, this manual requires that contractors: secure connections of equipment used in plumbing-up; secure turnbuckles to prevent unwinding while under stress; place plumbing-up guys and related equipment so that employees can reach the connection points; and to remove these guys and equipment only under the supervision of a competent person. This manual also specifies that the designs and plans of shoring and formwork must meet the standards in the American Concrete Institute Publication 347 and that the manufacturer's specifications for fabricated shoring systems be available at the job site during job planning and execution.

The American National Standards Institute (ANSI) standard for reinforced concrete, ANSI/ASSE A10.9-2004, Safety Requirements for Masonry and Concrete

Work—American National Standard for Construction and Demolition Operations, also includes safety recommendations for operations involving reinforced concrete. Similar to the Bureau of Reclamation standards, section 1.13.2 of the ANSI standard prohibits the use of reinforcing steel as hooks or stirrups for scaffolding, or as a load-bearing member of any lifting device. The ANSI standard also requires that reinforcing mats used as walkways be capable of supporting the walkway's load, and it must have a surface covering that affords adequate footing (section 3.1.3). In addition, the ANSI standard requires that contractors clean and store post-tensioning tendons to prevent rusting, pitting, kinks, pits, or other damage (section 8.3), keep tools in good repair, and have a competent person inspect jacking equipment before and during jacking operations (section 8.4).

The purpose of this RFI is to gather information, data, and comment on hazards in operations involving reinforced concrete in construction, as well as effective measures to control these hazards to prevent injuries and fatalities.

II. Request for Data, Information, and Comments

As noted from the discussion in section IA, OSHA has limited information on reinforcing steel and post-tensioning operations. Therefore, OSHA developed the following questions to expand its information base. OSHA invites the public, especially the regulated community, both employers and employees, to read this document carefully and respond to these questions as completely as possible, including full explanations of their positions and arguments. Accordingly, OSHA is seeking data, information, and comment on hazards present in these operations, and the measures used to control these hazards and reduce accidents, injuries, and fatalities. OSHA welcomes any available

data, information, or comments related to regulatory requirements addressing operations that involve reinforcing concrete. Based on its analysis of the information received in response to this RFI, OSHA will determine what action, if any, it will take to address the hazards of operations involving reinforced concrete. Please refer to each question by its specific number when responding, and make submissions in the OSHA-2010-0058 docket on reinforced concrete.

A. Post-tensioning Operations

1. Are there specific post-tensioning hazards not currently addressed by OSHA standards? If so, what are they?

2. What are the most common post-tensioning-related injuries, and what procedures or techniques are available to prevent them?

3. Should a competent person inspect jacking equipment for visible signs of defects or other signs of failure before and during jacking operations? Are such inspections currently standard practice in the industry?

4. What safety checks are necessary before post-tensioning activity occurs?

5. Are there engineering issues relating to post-tensioning operations that affect the safety of employees?

6. Are there post-tensioning hazards associated with mixing components from various manufacturers?

7. How can employees be protected from risks or hazards associated with drilling or cutting concrete after post-tensioning operations are complete?

8. Are the hazards associated with de-tensioning generally different than the hazards associated with post-tensioning? Please explain. What measures are available to reduce these hazards?

B. Site Conditions and Roads

9. Some contractors perform rebar work, such as building rebar cages, on the ground. At a construction site with multiple contractors, concrete reinforcing workers may not have the authority to alter ground conditions that are muddy, uneven, or contain other hazards. Workers also need to transport rebar and other materials on the site. Do concrete reinforcing workers experience material-handling hazards, such as tripping, while carrying rebar when site conditions are poor? What site conditions make it difficult to transport rebar and other materials on the site? How do these conditions contribute to injuries, if at all? Please explain.

10. Do site conditions pose other significant hazards for reinforcing steel work? If so, how frequently does this occur and when should contractors address site conditions—after excavation, before formwork begins, or at another time?

11. Are road conditions a problem for reinforcing concrete contractors, and do they create hazards for employees? What would be an appropriate remedy to address risks to employees?

C. Documentation

12. Welding rebar used for reinforcement that is not safe for welding can make the rebar brittle and may lead to collapse of the structure and injury or death to workers. How can employees be protected from these risks?

13. Are inadequate guardrails a problem for workers performing rebar operations? If so, how frequently does this occur, and what would be an appropriate remedy to address this risk?

D. Reinforcing Steel Operations

14. What are the hazards associated with using gas-powered abrasive cut-off saws (demo-saws) on rebar? What are appropriate training and safety measures necessary to protect employees?

15. Are there safety issues in regard to the wire used for tying rebar (for example, the gauge of wire used for tying rebar)? If there are, what are the safety measures necessary to protect employees?

16. Rebar columns can collapse when not supported properly, potentially injuring or killing workers. What safety measures are necessary to protect rebar workers from this hazard?

17. Do some types of structures pose more risk to employees performing rebar work? Please explain.

18. Are there specific safety issues related to the use of reinforcing steel and post-tensioning in residential construction?

19. Workers may form rebar cages on the ground (horizontally) and then raise them to a vertical position. Are there specific rigging hazards related to moving rebar columns? If so, what are they?

20. What health hazards are associated with working with or cutting epoxy-coated rebar or galvanized rebar?

21. What are the hazards involved with using reinforcing steel as guy attachments at deadmen or other anchorage points for scaffolding hooks or stirrups, or as load-bearing members of any lifting device? Does the Bureau of Reclamation's regulation (indicated above) effectively address these hazards?

22. What are the hazards associated with using rebar mats as a walkway? What safety measures would address these risks?

23. What safety measures are needed to address the risk of concrete forms collapsing? Please explain.

E. General Reinforcing Safety

24. 29 CFR 1926.703(d)(2) requires employers to take measures to prevent wire mesh from recoiling. What types of injuries occur when working with wire mesh? Are there additional hazards related to wire mesh that require safety measures to protect workers? What would these additional safety measures be?

25. Are additional protective measures needed to address inhalation of the fibers used in fiber-reinforced concrete?

26. Is a competent or qualified person necessary to supervise guying, bracing, or shoring formwork? What measures would help avoid collapses of these structures? Is using a competent or qualified person for this purpose currently standard practice in the industry? When installation of formwork requires removal of structural-stability guying of an erected cage, is an alternative stability measure used in place of the guys? If so, what are these measures?

27. Are there safety issues associated with guardrails erected by reinforcing concrete contractors remaining onsite after the reinforcing contractors departed from the site?

Should a controlling contractor be responsible for the guardrails after the reinforcing contractors depart the site to ensure that guardrails remain effective? What is currently the standard practice in the industry?

28. Does improper sequencing among multiple crafts result in accidents or collapses in reinforcing concrete construction? Would a plan for project sequencing help eliminate the hazards created by multiple crafts working at the same time? Please explain.

F. Impalement

29 CFR 1926.701(b) requires that "all protruding reinforcing steel, onto which employees could fall, shall be guarded to eliminate the hazard of impalement." Despite this requirement, workers continue to die and experience serious injuries because of impalement incidents. OSHA is looking at ways that it can improve its existing impalement standard to prevent future injuries and deaths.

29. How could the current impalement provision be changed to be more effective or protective? Is it practical or effective to require additional specific forms of impalement protection for specific situations? For example, under what circumstances should a contractor use protective troughs?

30. Subpart R of 29 CFR 1926 contains regulations that explain when a controlling contractor may take possession of fall protection, 29 CFR 1926.760(e). These regulations allow a controlling contractor to take control and responsibility for fall protection installed by a subcontractor. Fall protection stays in place while the responsibility shifts from the subcontractor, who is leaving the area, to the controlling contractor, who remains at the worksite. Similar issues arise when many crafts use rebar caps placed by one contractor. Would procedures similar to the procedures specified for

fall protection be useful in ensuring that rebar caps remain installed until no longer needed?

31. The state of California has a test to determine whether rebar caps are effective. Does such testing increase worker protection of caps? Please explain.

32. OSHA issued a memorandum on January 15, 1997, that explains what types of rebar caps adequately protect workers from the hazard of impalement, *e.g.,* mushroom caps are insufficient for this purpose. What should OSHA do to update the clarifications described in this memorandum?

33. In addition to rebar, construction sites have other, similar hazards that protrude from concrete, such as pipes. Unlike rebar, no existing OSHA standard covers these hazards. Are these hazards a safety issue, and what would be the most effective measure to use in controlling them?

G. Training

34. Is specific training needed for work involving reinforcing steel and post-tensioning? If so, what specific types of training are needed for operations involving these activities?

35. How does your company/organization evaluate employees to confirm that they understand information provided in the training? Should employers rely on hands-on methods and practical demonstration of skills rather than written tests/evaluations?

36. Does your company/organization train employees for operations involving reinforced concrete? If so, what information does it cover? How is training adapted for non-English speaking employees? Please provide copies of training materials, if possible.

37. OSHA would like to receive information on employer experiences with training non-English speaking workers. What percentage of your workforce involved in reinforced

concrete operations speaks languages other than English? What training methods have you found to be effective with these workers? Are you aware of any data that estimates the number of non-English speaking workers engaged in operations involving reinforced concrete? If so, please identify the data.

H. Injuries

OSHA currently is looking for information and data on incidents in the reinforcing concrete industry. While the Bureau of Labor Statistics (BLS) keeps data on many types of injuries, the BLS data regarding concrete reinforcing is not specific to the incidents addressed by this RFI. While OSHA has some limited data, including the CPWR and BeSafeBC studies, the Agency needs additional data to determine the types and frequency of these incidents.

38. If you or your company/organization performs work involving reinforcing steel, what kinds of rebar-related injuries, if any, have your employees experienced? How many?

39. If you or your company/organization performs post-tensioning operations, what kinds of post-tensioning-related injuries, if any, have your employees experienced? How many?

40. Are you aware of any data used to evaluate the effect of implementing specific safety practices in reinforced concrete operations? Is so, please identify the data.

I. Economic Issues

41. The Agency examined data from the Bureau of Labor Statistics' (BLS) Occupational Employment Survey (May 2009) to identify which industries employ Reinforcing Iron and Rebar Workers (SOC 472171) (see the table below).[5] Based on the data in this table, it would appear that most concrete reinforcement activity occurs in NAICS code 238100,

[5]Standard Occupational Classification (SOC).

with small amounts of activity in other construction sectors.[6] However, the data may not be accurate because there may be construction workers, including laborers and carpenters, who perform reinforcing concrete operations and who are classified under other SOC codes because reinforcing concrete is not their primary activity. Also, there likely are reinforcing iron and rebar workers employed in non-construction sectors not accounted for in the data presented in this table.

Reinforcing Iron and Rebar Workers by Industry

Potentially Affected Industries		Potentially Affected Employees	
NAICS code	**Industry**	**SOC**	
		472171: Number of Reinforcing Iron and Rebar Workers	
		Subtotal	**Total**
236100	**Residential Building Construction**.....		**280**
236200	**Nonresidential Building Construction**.....		**ENR**
237000	**Heavy and Civil Engineering Construction**…….....		**2,520**
237100	Utility System Construction…….	360	
237300	Highway Street and Bridge Construction.	1,870	
237900	Other Heavy and Civil Engineering Construction…….....	100	
238000	**Specialty Trade Contractors**……...		**16,960**
238100	Foundation Structure and Building Exterior Contractors…….....	16,180	
238200	Building Equipment Contractors……...	150	
238900	Other Specialty Trade Contractors…….	620	
327300	**Cement and Concrete Product Manufacturing**……..		**40**
423000	**Merchant Wholesalers Durable Goods**…..		**130**
999301	**Local government including schools and hospitals**……		**40**
	TOTAL……...		**19,970**

ENR = "Estimate Not Released"—due to data suppression, the actual number of rebar workers will be larger than the total based on the available data.
Source: BLS Occupational Employment Survey, May 2009

[6]North American Industry Classification System (NAICS).

42. Do the data listed in the table provide reasonable estimates of where concrete reinforcement work is done and who is doing it? Are there construction sectors other than those listed in the table above that do concrete reinforcing work? Are there other occupational groups, such as cement masons and concrete finishers, that OSHA should consider in determining the industries in which concrete reinforcement work might take place?

43. Do reinforcing iron and rebar workers in sectors other than construction engage in construction work (as opposed to performing general industry maintenance)? Do they face hazards similar to reinforcing iron and rebar workers working in the construction sector?

44. OSHA is interested in the experience of employers in complying with existing standards regarding concrete reinforcement, in terms of costs and benefits; specifically, the experience of employers in states with supplemental mandatory requirements related to concrete reinforcement, such as California and Washington.

a. Have there been additional expenses in complying with these rules and what are these expenses?

b. Have these standards had any affect on the industry structure? Has there been a noticeable improvement in safety? Are there any data sources on injuries related to reinforced concrete operations at local or regional levels?

c. What is the industry's experience, in terms of costs and benefits, in complying with various consensus standards, such as the ANSI standards?

d. Have the Bureau of Reclamation or Army Corps of Engineers requirements imposed additional expenses, affected industry structure, or resulted in safety improvements?

e. Is there any reason to believe that, if OSHA adopted the requirements of these various standards, the resulting costs, benefits, and affects on industry structure would differ from current experience?

f. Are current state standards sufficiently flexible and/or performance-oriented to adapt to changing technology in the construction sector over time?

45. Subpart R requires the controlling contractor to properly grade and drain the work area (29 CFR 1926.752(c)(2)). Reinforcing concrete work may be done before structural steel work begins. Currently, there is no requirement to grade and drain the site prior to commencing reinforcing concrete work. If controlling contractors must drain and grade the site prior to reinforcing concrete work, would this increase the cost of draining and grading the site, or would it merely shift the timing of the cost? Please explain.

46. How many, and what kind of, small entities (small businesses, small organizations, and small governmental jurisdictions) perform reinforcing steel and post-tensioning operations? What percentage of the industry do they comprise? Are there important differences between entities of various sizes within the affected industries?

47. OSHA requests that members of the small business community and others familiar with small business concerns address any special circumstances small entities may encounter in controlling hazards and reducing injuries and fatalities associated with reinforcing steel and post-tensioning operations.

a. How, and to what extent, would publication of new regulatory provisions that address hazards in reinforcing steel and post-tensioning operations affect small entities in the industry?

b. Are there special circumstances that make the control of hazards in reinforcing steel and post-tensioning operations more difficult or more costly for small entities? Please describe these circumstances, and explain any alternatives that may serve to minimize these impacts, such as extended compliance dates, use of performance standards, simplified compliance options, different requirements, and partial exemptions for affected small firms.

48. Are there reasons why the benefits of new provisions to control the hazards of reinforcing steel and post-tensioning operations may be different for small entities than for larger establishments? Please explain.

J. References

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Preventing Backover Injuries and Fatalities

Table of Contents

I. Background

A. Introduction

1. *Backover Injuries and Fatalities*

Workers can experience caught-between injuries and fatalities when backing vehicles or mobile equipment, especially those with an obstructed view to the rear, pin them against an object and struck-by injuries when struck by backing vehicles or mobile equipment in other circumstances. The National Highway Traffic Safety Administration (NHTSA) refers to many backing incidents as "backovers," which are "crash[es] which occur when a driver reverses into and injures or kills a non-occupant" ("Fatalities and Injuries in Motor Vehicle Backing Crashes"). While backover incidents can be fatal, some backover incidents can result in serious non-fatal injuries, such as amputations, compound and simple fractures, and crushing injuries (OSHA Backing Injuries 2007-2009, Region 9 Spreadsheet). In this Request for Information (RFI), OSHA is seeking information about backover incidents that occur when drivers or mobile equipment operators have an obstructed view to the rear. In addition, some mobile equipment that has an unobstructed view, such as most forklifts, also may cause backing incidents. The Agency also is seeking information and comment on this equipment.

In a search of its Integrated Management Information System (IMIS) database for fatal accidents involving backover hazards, the Agency identified 358 fatal incidents over a six-year period, from 2005 through 2010[7] (OSHA Backing Fatalities 2005-2010

[7]This data did not include accidents caused by backing railroad vehicles because the Federal Railroad Administration regulates railroad vehicles, nor did it include accidents in which the driver of the vehicle was the only fatality. However, the data included accidents in which a backing vehicle hit an object which, in turn, resulted in a fatality (*e.g.,* a vehicle backed into a tower and toppled it onto an employee

Spreadsheet). Of these deaths, 142 occurred in the construction industry, and the remaining 216 occurred in general industry, shipyard employment, maritime, and agriculture industries. There were 279 fatalities involving struck-by hazards, and 73 fatalities involved caught-between hazards, 16 of which included workers caught between a loading dock and a tractor trailer, and 6 fatalities caused by falls from backing vehicles. Three types of vehicles caused a large number of deaths: 61 deaths involved dump trucks; 31 deaths involved tractor trailers; and 20 deaths involved garbage trucks.

The analysis of the IMIS data also provided a context for these fatal backover incidents. Eight of the deceased workers were using cell phones when the backover incident occurred. Twenty-one fatalities involved vehicles with no driver.[8] Twenty-five of the victims were acting as spotters for the vehicles that backed over them. In many of the cases, employers were using spotters to comply with the existing backover-related standards. In some these cases, OSHA cited employers under § 5(a)(1) of the Occupational Safety and Health Act of 1970, known as the General Duty Clause.

One area in which backover incidents are a significant concern are incidents that occur in highway work zones. Road construction workers routinely work in close proximity to mobile equipment and construction vehicles, which exposes them to struck-by hazards on the job site. For example, flaggers and other workers on foot are at risk because they may not be visible to equipment operators or motorists. Other highway workers are at risk because they routinely work in conditions of low visibility, low lighting, inclement weather, noise, or in congested areas with high traffic volumes. The

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standing nearby). Additionally, not all IMIS fatality reports are available to the public because the employer is contesting the citations, or the Agency is reviewing the report.

[8]In most of these incidents, the victims were drivers who left the cab of the vehicle while it was running to perform a task behind the vehicle.

2010 highway work zone study, "Fatal Occupational Injuries at Road Construction Sites, 2003-07," found that, of the 639 fatal workplace injuries on road construction sites between 2003 and 2007, 101 (15.8%) involved backing vehicles or mobile equipment. Additionally, the study found that dump trucks caused 60 of these fatal backover incidents. An earlier study found that 51% of workers killed by backing vehicles while on foot occurred within the confines of a highway work zone ("Building Safer Highway Work Zones: Measures to Prevent Worker Injuries from Vehicles and Equipment").

The National Institute for Occupational Safety and Health (NIOSH) compiles case studies of worker fatalities in its Fatality Assessment and Control Evaluation (FACE) reports. An OSHA review of 25 construction-related backover fatalities described in these reports indicates that, in 15 of these fatalities, the backup alarm on the vehicle was functioning properly, suggesting that backup alarms may not be sufficient to prevent backover incidents.

In the FACE reports, NIOSH recommended that employers:

- Ensure that procedures for backing vehicles safely are in place for mobile construction vehicles;
- Designate a spotter to direct vehicle backing;
- Train workers on the specific duties they are to perform during backing maneuvers;
- Train workers to recognize equipment blind areas;
- Ensure that drivers are in communication with workers who are on foot near the vehicle;

- Implement and enforce procedures that minimize exposure of workers on foot to moving construction vehicles and equipment;
- Provide personal protective equipment and high-visibility clothing, and require its use; and,
- Install after-market devices (*e.g.,* cameras, radars, and ultrasonic devices) on construction vehicles and equipment to monitor workers on foot in blind areas.

While vehicles cause the majority of backover incidents, mobile equipment cause backover injuries and fatalities as well. Powered industrial trucks, many of which are forklifts, are one type of mobile equipment that has the potential to create many backing hazards. Powered industrial trucks may need to change direction rapidly, which can make it difficult for a worker on foot to know where the forklifts are going. In addition, these machines cause injuries by backing slowly and trapping workers. ANSI standard B56.1-2009, Safety Standard for Low Lift and High Lift Trucks, provides safety instructions for personnel who operate powered industrial trucks. Section 5.2.7 of this standard instructs operators to "[s]afeguard pedestrians at all times." NIOSH recommended that powered industrial trucks have backup alarms to avoid worker on-foot fatalities ("Preventing Injuries and Deaths of Workers Who Operate or Work Near Forklifts"). Currently, there are no OSHA standards requiring powered industrial trucks to have backup alarms.

2. *Current OSHA Standards*

There are three OSHA construction standards that require employers to use an alarm or a spotter when backing a vehicle or other mechanical equipment with an obstructed view to the rear. These standards are:

- 29 CFR 1926.601(b)(4) – Motor vehicles;
- 29 CFR 1926.602(a)(9)(ii) – Material handling equipment; and
- 29 CFR 1926.952(a)(3) – Mechanical equipment.

General industry standard 29 CFR 1910.269(p)(1)(ii) provides similar requirements for vehicular equipment operated in general industry at off-highway jobsites.

While no OSHA standard defines the phrase "obstructed view to the rear," a 1987 OSHA memorandum addressing the use of the phrase in 29 CFR 1926.602(a)(9)(ii) provides the following explanation:

> A simple interpretation would be "anything" that would "blockout" (interfere) with the overall view of the operator of the vehicle to the rear of the vehicle, at ground level.
>
> "Obstructed view to the rear" could include such obstacles as any part of the vehicle such as structural members, its load (gravel, dirt, rip-rap), its height relative to ground level viewing, damage to windows or side mirrors, etc. used for rearview movement of the vehicle; in addition, it could include restricted visibility due to weather conditions such as heavy fog; or work being done after dark, without proper lighting.

(*Memorandum re: Interpretation of 29 CFR 1926.602(a)(9)(ii).*) In a letter of interpretation, OSHA also permitted the use of motion-sensing equipment (*e.g.,* radar) on vehicles, so long as it provides adequate warning to workers in the path of the vehicle or walking toward the vehicle (*Letter of Interpretation re: Permissible methods of operating trucks in reverse on construction sites).*

The above-mentioned construction and general industry standards only require the use of a backup alarm when the view to the rear is obstructed. If the obstruction is removed or non-existent, current regulations do not require an alarm. OSHA notes, however, that vehicles and mobile equipment with unobstructed views to the rear, such as

forklifts and some skid-steer loaders, kill and injure workers during backing maneuvers ("Fatal Occupational Injuries at Road Construction Sites" and "Building Safer Highway Work Zones").

While OSHA does not specifically require backup alarms on powered industrial trucks, there are regulations that prohibit removing a backup alarm if a powered industrial truck is equipped with one by the manufacturer. Accordingly, two OSHA standards for the maritime industry (29 CFR 1917.43(c)(5) and 29 CFR 1918.65(f)(1)) prohibit employers from removing safety devices, such as backup alarms, when the manufacturer equips a powered industrial truck with such an alarm. Additionally, 29 CFR 1910.178(q)(6) prohibits eliminating parts from powered industrial trucks, which would include backup alarms. Paragraph (n)(6) of 29 CFR 1910.178 requires employers to ensure that powered industrial truck operators look in the direction of travel, whether moving forward or in reverse. Similarly, 29 CFR 1910.266(f)(2)(v) requires operators of logging machines to determine that no employee is in the path of the machine before starting or moving the machine. Paragraph (g)(7) of 29 CFR 1910.266 applies this requirement to logging vehicles that "transport any employee off public roads or . . . perform any logging operation, including any vehicle provided by an employee."

OSHA also has a requirement for the longshoring industry that prevents backover incidents when operators drive vehicles on and off cargo vessels. Accordingly, 29 CFR 1918.86(n) requires that "[d]rivers shall not drive vehicles, either forward or backward, while any personnel are in positions where they could be struck."

3. *Consensus Standards and State Standards*

The ANSI A10.47-2009 standard, Work Zone Safety for Highway Construction, contains several sections regarding backing construction vehicles and equipment. Section 6.2 of this ANSI standard requires that, when pedestrians are potentially in the blind areas of vehicles and equipment, the vehicles and equipment must use a mechanical backing assistive device[9] or a spotter before backing. Section 6.2.1 requires the use of a mechanical backing assistive device and a backup alarm if the employer does not use spotters. Section 6.2.2 requires employers to train spotters on the following topics: how to safely direct backing maneuvers; on not standing in the path of construction vehicles or equipment; to remain in the direct line of sight of drivers; and to wear high-visibility apparel. Employers also must train drivers to stop their vehicles when they lose sight of spotters. Section 6.2.3 requires that visual warning devices supplement audible backup alarms, especially at night.

Some states have regulations to prevent backover injuries and fatalities. Washington State regulation WAC 296-155-610(2)(f) requires, "An operable mechanical device that provides the driver a full view behind the dump truck [to be] used, such as a video camera," or the use of spotters when using dump trucks where people will be walking behind them. In addition, Washington State law RCW 46.37.400 requires trucks registered or based in the state and equipped with a "cube-style, walk-in cargo box up to eighteen feet long used in the commercial delivery of goods and services" to have either crossview mirrors or backup devices that alert the driver when a person or object is behind the truck.

[9]The ANSI standard defines a mechanical backing assistive device as "a mechanical device that provides increased visibility or detection of objects behind a vehicle to prevent accidents during reverse operations."

Virginia promulgated a comprehensive regulation to prevent backover incidents in construction and general industry in 2009. The regulation applies to vehicles, machinery, or equipment used in off-road work zones, or for over-the-road hauling or transportation, and that are capable of operating in reverse and have an obstructed view to the rear (16VAC25-97-10). To operate a vehicle under these conditions, it generally must have a backup alarm audible above the surrounding noise level. The operator also must use a spotter or video camera, or "visually determine, that no employee is in the path of the covered vehicle" prior to backing (16VAC25-97-30). In addition, the regulation specifies requirements for spotters, including the use of fluorescent safety vests or jackets, maintaining visual contact with the driver when the vehicle is operating in reverse, and not using personal cell phones or headphones (16VAC25-97-40). Vehicle operators must stop immediately if they lose visual contact with the spotter. Employers must train spotters and vehicle operators on the regulation prior to commencing backing activities and provide refresher training for drivers and spotters when they violate the regulation, have an accident or near miss, or receive an evaluation showing that they are not operating under the regulation in a safe manner (16VAC25-97-50). Since Virginia promulgated the regulation, two backing fatalities occurred in the state, which is less than the four or five the state saw before promulgating the regulation (ACCSH Transcript, Dec. 16, 2011).

4. *Actions by Other Federal Agencies*

OSHA is not the only federal agency working to curb backover incidents. Recently, the NHTSA issued a Notice of Proposed Rulemaking that would expand the required field of view in passenger cars, trucks, multipurpose passenger vehicles, buses,

and low-speed vehicles rated at 10,000 pounds or less, gross vehicle weight, to prevent pedestrian backover deaths. In the near term, the only technology that complies with the proposal is cameras with an in-vehicle visual display. (*See* 75 FR 76186, December 3, 2010.) The Mine Safety and Health Administration recently published proposed rule which would require the use of certain proximity detection equipment on certain mining machines. (*See* 76 FR 54163, August 31, 2011.) This type of proximity detection system would stop the mining machines when they enter a pre-determined danger zone near a miner. A sensor on the machine detects a signal emitted by a device attached to the miner.

B. Backover Prevention Technology and Methods

1. *Backup Alarms*

Many construction employers equip large vehicles used on construction sites and in work zones with reverse signal alarms. Most of these alarms emit a single tone. Single tone alarms are used for backup alarms and other types of alarms on many types of vehicles and mobile equipment. Because they are used in so many applications, some workers may not pay attention to the alarms. It also may be difficult for workers to determine from what direction the tone is coming ("Construction Noise: Exposure, Effects, and the Potential for Remediation; A Review and Analysis"). Other types of backup alarms are available. These alarms include broadband alarms (also known as white-noise alarms) and self-adjusting alarms, which vary the tone based on the ambient noise level. However, the self-adjusting alarms can be problematic if several vehicles use them on a worksite and the alarms adjust to the tone that each alarm is emitting.

The noise generated by backup alarms can cause problems. For example, over the years, OSHA received several letters from members of the public about the annoying sounds emitted by backup alarms at construction sites, especially in residential neighborhoods. (*See, e.g., Letter of Interpretation re: Alternatives to common back-up alarms on construction motor vehicles; use of other effective technology or observers/signal persons.)* In addition, noise caused by backup alarms may cause problems for workers. The Eugene, Oregon, Fire Department commissioned a 1998 study on the hearing effects of backup alarms on firefighters. ("Personnel Noise Exposure to Fire Apparatus Backup Alarms: Eugene Fire and EMS.") The study failed to confirm that backup alarms caused hearing loss in firefighters, but the alarms were of sufficient concern that the fire department requested revision of a local ordinance that required the use of backup alarms, to allow the department to use spotters instead (*id.).*

2. *Cameras*

Most vehicles (and some types of mobile equipment) now can accommodate a camera that provides operators with a view to the rear. In a study involving medium straight trucks, NHTSA found that cameras provided an effective means of allowing the driver to see behind the vehicle ("Experimental Evaluation of the Performance of Available Backover Prevention Technologies for Medium Straight Trucks").

Several studies explored the use of cameras on construction equipment and identified conditions that limit their use. The NIOSH study, "Evaluation of Systems to Monitor Blind Areas Behind Trucks Used in Road Construction and Maintenance: Phase 1," found that, in winter, snow and grime may accumulate quickly on the lenses of cameras, thereby impeding their usefulness. Determining where to mount a camera for

maximum effectiveness may be difficult, especially on large vehicles. For example, dump trucks may require two or three cameras to monitor the blind spots on the front, rear, and side of the vehicle ("Monitoring Blind Spots: A Major Concern for Haul Trucks"). Mounting cameras on exposed areas subjects them to accumulations of mud and grime, which may damage the camera ("Evaluation of Systems to Monitor Blind Areas Behind Trucks Used in Road Construction and Maintenance: Phase 1"). Also, camera systems manufactured for the automobile market may not be durable enough to use on vehicles at construction sites (*id*.).

3. *Proximity Detection Systems*

Radar and ultrasonic technology both are used in backing safety systems. There generally are two types of radar used in these systems—Doppler effect radar and frequency modulated continuous wave radar. Doppler effect radar detects the presence of objects that are moving with respect to the vehicle. Consequently, either the vehicle or the object needs to be moving for the vehicle driver to detect it. Frequency modulated continuous wave radar can detect persons or objects that are not moving. However, these systems must be in a position where they will not detect harmless objects, such as the concrete slab of a driveway, which can interfere with the detection of an object or person behind the vehicle or mobile equipment. Also, the composition of the object can affect the detection of an object, with some materials being virtually invisible to radar ("Evaluation of the Performance of Available Backover Prevention Technologies for Light Vehicles").

Ultrasonic systems, such as sonar, emit bursts of ultrasonic waves. When the waves strike an object, they generate echoes used to determine the distance to the object.

A major drawback of radar and ultrasonic technology is that, in crowded work areas, many false alarms may result from detection of harmless objects ("Evaluation of Systems to Monitor Blind Areas Behind Trucks Used in Road Construction and Maintenance: Phase 1"). The accumulation of snow or mud on sensors also can cause false alarms (id.). Additionally, sensors may not detect every object behind a vehicle ("Experimental Evaluation of the Performance of Available Backover Prevention Technologies for Medium Straight Trucks").

Another type of proximity detection system is an electromagnetic field-based system. This system consists of a combination of electromagnetic field generators and field detecting devices. One electromagnetic field-based system uses electromagnetic field generators installed on a vehicle and electronic sensing devices worn by persons working near the vehicle. Another electromagnetic field-based system uses field generators worn by persons working near the vehicle, while the sensing devices installed on the vehicle. These electromagnetic field-based systems can be programmed to warn affected workers, stop the vehicle, or both, when workers get within the predefined danger zone of the vehicle.

4. *Combined Technologies*

NIOSH recommends combining a radar or ultrasonic system with a camera to protect workers from backover hazards ("Evaluation of Systems to Monitor Blind Areas Behind Trucks Used in Road Construction and Maintenance: Phase 1"). In a dual system, a radar or ultrasonic system would alert the driver to a possible object behind the vehicle, while a camera would enable the driver to easily determine if the signal is an object (including a person) or a false alarm ("Test Results of Collision Warning Systems

for Surface Mining Dump Trucks"). One study assessed the use passenger vehicle drivers made of cameras while backing and found that drivers were more likely to look at the video monitor if sensors alerted them to an obstacle than they were to look at the camera without a sensor[10] ("Backing Collisions: a Study of Drivers' Eye and Backing Behaviour Using Combined Rear-view Camera and Sensor Systems").

5. *Backover Prevention Methods*

One common method to address backover hazards is to use spotters to signal drivers while backing a vehicle. However, spotters are at increased risk of death or injury if drivers lose sight of them while backing.

Internal traffic control plans (ITCP) is another method used to address backover hazards. These are plans that project managers can use to coordinate the flow of construction equipment, workers, and vehicles at a worksite to prevent vehicle impacts with workers. These plans can significantly reduce, or possibly eliminate, the need for vehicles to back up on a site. ANSI standard A10.47-2009, Work Zone Safety for Highway Construction, section 6.3 recommends that employers develop ITCPs and communicate them to employees. In addition, section 6.3.3 states that an ITCP should include a diagram of travel routes; a listing of all onsite personnel and equipment; a checklist of site-specific safety hazards and how to minimize these hazards; a list of safety notes defining site-specific injury prevention measures; and a plan for communicating the ITCP to workers, truck drivers, and equipment operators. However, OSHA has no information on the effectiveness of this consensus standard.

C. Other Research on Backing Maneuvers

[10]In this study, the drivers were not performing work while driving.

Some studies examined the use drivers make of backover prevention technology, but OSHA found no studies that address the use of this technology by drivers and operators under working conditions. NHTSA reviewed studies of parking assist technology, such as cameras, and found that the warning devices often are not useful to drivers who are not expecting objects behind their vehicles ("Vehicle Backover Avoidance Technology Study"). Drivers in these studies stated, however, that they would brake immediately if they received a sudden alert while backing. However, this research also found that drivers brake less often when the backing aids have a high false alarm rate, even when an object is behind the vehicle.

II. Request for Data, Information, and Comment

OSHA is seeking additional information to evaluate the hazards that backing maneuvers pose to workers. The Agency is requesting information on how and when backing maneuvers occur in the workplace, and the injuries and fatalities caused by these maneuvers. OSHA is particularly interested in how employers use backover prevention technologies in the workplace. Workers who perform backing maneuvers are also encouraged to respond. Based on its analysis of the information received in response to this RFI, OSHA will determine what action, if any, it will take to address backover hazards.

OSHA appreciates detailed responses to the following questions on backover hazards and prevention. Please make comments regarding backovers in the OSHA-2010-0059 docket. When answering questions, please refer to the question number in your comments and also provide the following information:

- If you are a worker, employer, or manager, please explain what industry you are in, and what position you hold.
- If you are a public health professional, please explain which industry or industries you work with/study.

A. General: Backing with an Obstructed View

1. What types of vehicles or mobile equipment do you use that have an obstructed view to the rear?

2. How does your company address the risk of backing vehicles that have an obstructed view to the rear?

3. Are some types of backing safety systems, including non-technological solutions such as spotters, more effective than other systems in your work situations? Please explain.

4. To what extent do your vehicles with obstructed views have cameras or proximity detection systems?

5. Do you use multiple cameras or cameras in combination with another backing safety system? If so, describe the systems used, and why you use them.

6. How effective are the systems you use in preventing backing accidents involving vehicles with an obstructed view?

7. Are you also using backing safety measures to protect the driver and vehicle from accidents and damage, in addition to protecting pedestrians or other workers? If so, describe the measures you are using.

8. If your company uses spotters for backing maneuvers, how do drivers and spotters communicate—verbally, by using two-way radios, hand signaling, or some other technique?

9. Does your company require the use of reflective clothing for spotters or other exposed employees during backing maneuvers? If so, describe when you require its use (for example, during all maneuvers, only during periods when backing maneuvers are frequent).

B. Audible Backup Alarms

10. To what extent do your vehicles currently have audible backup alarms? Do you rely only on audible alarms when vehicles have an obstructed view to the rear?

11. Does your company rely on more than just an audible alarm to ensure safe backing maneuvers? If so, what additional backing safety system does it use, and why?

12. Backup alarm operations:

a. If your company primarily uses backup alarms during backing maneuvers, do you find that these alarms can be recognized at all times above the background noise?

b. Is it difficult to find a backup alarm that can be recognized above the background noise of the worksite?

c. Can workers recognize the direction of a backup alarm signal?

13. If your company requires hearing protection for workers who are on foot, does this protection interfere with their ability to hear the backup alarm on vehicles or mobile equipment during backing maneuvers?

C. Studies

14. Are you aware of any additional studies, including studies of over-the-road vehicles such as cars, that analyze the effectiveness of the backing safety systems discussed in this notice, including cameras or proximity detection systems? If so, please provide references to the studies.

15. Do you or your company use any backing safety technology not discussed in this notice? If so, please explain what the technology is, how it works, and whether it is commercially available.

16. Does your company follow the ANSI A10.47-2009 standard, Work Zone Safety for Highway Construction, section 6.2, for safe practices during backing maneuvers?

17. Are you aware of any studies addressing human factors or performance related to backing maneuvers in construction or other industries? If so, please provide the references to these studies.

18. Do you have any studies or other information on the effectiveness of backup alarms when used around workers on foot who have difficulty hearing? Please provide the references to these studies or information.

19. Do you have any studies or other information on injuries or fatalities resulting from backover hazards? Please provide the references to these studies or information.

D. Vehicle and Backing Safety System Manufacturers

20. For manufacturers of vehicles or mobile equipment:

a. Are camera or proximity detection systems available for your vehicles or mobile equipment that have obstructed views to the rear? Are they standard or optional equipment?

b. How frequently are these technologies chosen by customers if the technology is not standard-issue equipment? Why do customers choose a specific technology or combination of technologies (that is, what special benefits do they believe one technology has over others)?

c. Do you offer backing safety technology not mentioned in this RFI? If yes, please explain.

d. What factors do you consider when deciding whether to equip a vehicle or mobile equipment with a backing safety system?

21. For manufacturers of vehicles or mobile equipment with audible alarms:

a. What decibel ranges do you provide on audible alarms? How do you determine how loud an alarm should be?

b. Do you include audible backup alarms on all vehicles with obstructed views to the rear as part of the original equipment package? If not, are such alarms an option? Please explain your response.

c. What percentage of customers request single-tone alarms, or other alarms such as broadband (white noise) or self-adjusting alarms?

22. Are there types of vehicles or mobile equipment for which adding technology such as cameras or proximity detection systems are infeasible? Please explain.

23. Some vehicle operators have hearing loss. Do your radar and proximity detection systems that provide audible warnings also provide visual warnings?

24. For manufacturers of backing safety systems: do you provide any form of training in the use of this equipment?

a. If yes, whom do you train—company representatives, end users, and/or others?

b. If yes, what kind of training and training materials do you provide?

c. Are there vehicles that are difficult to retrofit with a backing safety system? Please explain.

25. For manufacturers of after-market backing safety systems: what kinds of support do you provide to companies that purchase your equipment? Do you suggest ways to mount the equipment?

26. Are there other types of proximity detection systems in use for backing safety not described in this RFI? Is there any new, commercially available, technology to enhance backing safety that OSHA did not mention in this RFI? Please explain your response, including a description of the technology and its availability in the United States.

E. State Regulations

27. If your company must follow Virginia's (16VAC-25-97-10 *et seq*.) or Washington's (WAC 296-155-610(2)(f)) backing regulations:

a. Do you use a spotter or a camera when backing?

b. How costly and difficult is it to comply with the regulations?

c. How do you train your employees?

d. Would phase-in periods make implementation of a regulation more effective? Please explain your response.

e. Have you retrofitted vehicles? If so, please describe that experience.

f. Did your backover incident rates change after implementation of the regulation?

g. Have you faced any challenges with implementation? If so, what are they?

F. Internal Traffic Control Plans

28. Internal traffic control plans regulate the flow of traffic in work zones and may reduce the frequency of backing that occurs in work zones. Does your company have an internal traffic control plan to aid or reduce backing maneuvers?

29. Should companies use internal traffic control plans on construction sites other than road construction? Please explain.

G. Training

30. Does your company have training requirements regarding backing maneuvers? If yes:

a. Who receives training?

b. Is there specific training for operators of vehicles or equipment that are involved in backing maneuvers?

c. Is there specific training for the designated spotters? Please describe this training.

d. What is the length of the training programs offered?

31. If you train your employees on backing maneuvers, how often do you conduct the training? Have you found a decrease in injuries since implementing the training?

32. Should spotters receive specific training for backing maneuvers?

33. Is backing maneuver training presented formally in a class or provided informally on a jobsite?

34. If you have one or more employees who do not speak fluent English, do you provide backing maneuver training for them in another language? Would it be helpful to have training materials and guidelines available in a language they can understand?

H. Economic issues

35. In addition to backup alarms, what initial costs are needed for safety measures associated with backing maneuvers? Please provide specific information on these costs.

36. Do these safety measures for backing maneuvers affect daily productivity? Please provide specific information on these productivity costs.

37. Do the various technological systems (cameras and proximity detection) save money or time if they replace spotters? Please explain.

38. Are your costs for general liability insurance or workers' compensation insurance affected by the types of backup safety systems you use? Please explain.

39. What property damage has resulted from backing accidents? Please describe the types of accidents, the property damage involved, and the value of the damaged property.

40. How, and to what extent, would promulgation of additional standards that address hazards in backing maneuvers affect small businesses in your industry?

41. Do special circumstances exist that would make additional standards difficult or costly for small entities? Please describe these circumstances.

42. Are there steps OSHA could take that would reduce the burden and cost of improved backing safety measures for small businesses? Please explain.

I. Scope

43. Should OSHA consider framing the problem in terms of the dangers associated with workers being too close to dangerous moving vehicles or mobile equipment, rather than focusing only on backover incidents?

44. Are there non-regulatory alternatives the Agency should consider?

45. What industry sectors, such as maritime or construction, have higher risks or greater frequency of injuries? On what information do you base your response?

J. References

All references in this list are available in OSHA Docket No. OSHA–2010-0059, Preventing Backover Injuries and Fatalities.

ANSI A10.47-2009, Work Zone Safety for Highway Construction.

ANSI B56.1-2009, Safety Standard for Low Lift and High Lift Trucks.

RCW 46.37.400. Mirrors, backup devices.

16VAC25-97-10. Applicability.

16VAC25-97-30. Covered vehicle requirements.

16VAC25-97-40. Responsibilities while engaged in reverse signal operation activities.

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David Michaels, Ph.D., MPH, Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, authorized the preparation of this notice pursuant to Sections 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657), 29 CFR 1911, and Secretary's Order 1-2012 (77 FR 3192).

Signed at Washington, DC, on March 23, 2012.

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