

OSHA Stakeholder comments
February 10, 2010

My name is Hester Lipscomb. I am an injury epidemiologist and a professor in the Division of Occupational and Environmental Medicine at Duke University.

My comments are based on over 10 years of study of acute injuries associated with use of pneumatic nail guns in residential construction. During this time we have documented the following.

- Injuries from pneumatic nail guns are the most common 'struck by' injury in residential carpentry; they account for approximately 14% of reported OSHA recordable injuries among residential carpenters.
- Nail guns are the most common cause of tool-related hospitalization among workers in the construction industry not just in residential construction even though use is largely limited to wood frame construction.
- 11-12% of injuries are to bystanders; these typically involve inadvertent shooting of a co-worker.
- Injuries are largely associated with framing nailers with contact triggers; contact triggers allow the gun to discharge a nail anytime the nose piece and the trigger are both depressed. The user can hold the trigger down and rapidly bump fire the gun. It also means the user can shoot a co-worker or themselves if they bump against the nose piece when the trigger is depressed, and it allows inadvertent firing if the gun hits the wood surface or previously placed nail following the recoil associated with firing the tool. Because the center of gravity of the tool is at the trigger it is natural for the worker to hold the gun with the trigger depressed.
- Tools with contact trip triggers are twice as dangerous as those with sequential triggers which require the nose be depressed before the trigger is pulled in order to prevent inadvertent discharge of nails.
- Inexperienced/untrained users are at greatest risk of injury, but part of their excess risk is related to greater exposure; the tool is easy to use and is, consequently, often given to inexperienced workers.
- The majority of nail gun injuries are not reported. The injuries are largely puncture wounds of the hand and fingers secondary to discharged nails. Injuries to other body areas and internal organs are also seen. Nail gun injuries can be among the most expensive work-related compensation claims in residential carpentry and they can cause death.
- We have documented a 55% drop in injury rates (based on actual hours of tool use) over a 4-year period among apprentice carpenters in the Midwest as training was initiated for early apprentices and contractors switched to tools with sequential actuation.

Laboratory studies are consistent with these epidemiologic findings.

- *Nailers with touch tip triggers are susceptible to double firing, especially when trying to accurately place the nailer against the work piece during toe-nailing. In awkward positions the user is less likely to hold the nailer firmly enough to counter the nailer's recoil. The recoil and firing of the second nail occurs well before the trigger can be released. Sensitive triggers in conjunction with nailer recoil can also lead to the inadvertent firing of another nail. The second nail can ricochet off the first nail and cause injury, or miss the work piece entirely to strike a body part of victim. --- From Consumer Product Safety Commission Engineering Report 2002*

We are aware of two concerns regarding use of sequential triggers namely, 1) slowing the speed of work in this very fast-paced sector of the construction industry, and 2) concerns of repetitive trauma from pulling the sequential trigger.

- Under experimental conditions with experienced users, the contact trigger is slightly faster (< 1% of total building time for 20 yard sheds) but the *majority of speed variability is related to the user not the trigger.* Productivity concerns should focus on training workers rather than the type of tool being used.
- There is no evidence from field study that the sequential trigger causes more repetitive trauma. In fact, we see higher rates of musculoskeletal complaints among users of contact trip tools. We have identified very few musculoskeletal events and we acknowledge the estimates are imprecise.

The epidemiology of acute injuries from pneumatic nail guns is now well-described. Consistent findings over different study designs and populations document a two-fold excess risk among users of tools with contact triggers. The safer sequential trigger has been available for over 30 years. The ANSI standard sponsored by the tool association in 2003 called for shipment of framing nailers with the sequential trigger. Since then many manufactures ship tools with both triggers; cost is obviously not an issue.

There are nearly 40,000 nail gun injuries treated in emergency departments each year in the U.S. The decreasing costs and easy availability of the tools has extended what was largely an occupational risk to the general public as well.

I draw your attention to the 2007 death of Damon Hutahla a 26-year old carpenter who fell with a nail gun in his hand. The OSHA investigator concluded he fell with his finger on the trigger and the nose piece of the gun contacted his head discharging a framing nail into his brainstem. The safety mechanism on the tool was described as intact and operating [US Department of Labor, Occupational Safety and Health Administration. Inspection Report 1032500, #309967933. Fatality/Catastrophe Report April 18, 2007]. This was a tool with a contact trigger and it operated exactly as designed. Sadly, at the time of this young man's death we already knew how to prevent this type of injury.

Many safety issues in construction are difficult to address – this one is not. I ask you to move forward with the December 2009 unanimous recommendation of the OSHA Advisory Council on Construction Safety and Health to consider both short and long term remedies to this problem including revision, and subsequent enforcement, of the standard on pneumatic tools to adequately address this acute injury hazard in a manner that will assure the safer tools are in the hands of workers. In the mean time OSHA compliance officers should educate contractors regarding tool risks and available control measures; they typically purchase power tools for their employees. These tools carry a significant injury risk that is well-described and for which there is feasible abatement at no additional cost. As such, with support from Federal OSHA the General Duty Clause could be invoked to control risk now. Doing so, could prevent a similar, senseless death to that of Mr. Hutahla's.

REFERENCES [Duke authors]

Nail gun injuries

- Lipscomb HJ, Dement JM, Nolan J, Patterson D, Li L. Nail gun injuries in residential carpentry: lessons from active injury surveillance. *Injury Prevention* 9: 20-24, 2003.
- Dement JM, Lipscomb HJ, Li L, Epling CA, Desai T. Nail gun injuries among construction workers. *Applied Occupational and Environmental Hygiene* 18(5):1-10, 2003.
- Lipscomb HJ, Dement JM, Nolan J, Patterson D. Nail gun injuries in apprentice carpenters: risk factors and control measures. *American Journal of Industrial Medicine* 49:505-513, 2006.
- Lipscomb HJ, Jackson L. Nailgun injuries treated in U.S. emergency departments, 1998-2005. *Morbidity and Mortality Weekly Report* 56(14); April 13, 2007.
- Lipscomb HJ, Nolan J, Patterson D, *Makrozasopoulos D, Kucera K, Dement JM*. How much time is safety worth? A comparison of trigger configurations on pneumatic nail guns in residential framing. *Public Health Reports* 123(4):481-486, 2008.
- Lipscomb HJ, Nolan J, Patterson D, Dement JM. Prevention of traumatic nail gun injuries in apprentice carpenters: Use of population-based measures to monitor intervention effectiveness *American Journal of Industrial Medicine* 51:719-727, 2008.
- Lipscomb HJ, Nolan J, Patterson D, Dement JM. Surveillance of nail gun injuries by journeymen carpenters provides important insight into experiences of apprentices. *New Solutions* (in press).
- Lipscomb HJ, Schoenfisch AL, Shishlov K, Myers D. Nonfatal tool and equipment-related injuries treated in U.S. emergency departments among workers in the construction industry, 1998-2005. *American Journal of Industrial Medicine* (in press).
- Lipscomb HJ, Nolan JM, Patterson D, Dement JM. Continued progress in the prevention of nail gun injuries among apprentice carpenters: What will it take to see wider spread injury reductions? *Journal of Safety Research* (in press).

Overall work-related injury – manuscripts contain information on nail gun injuries

- Dement JM, Lipscomb HJ. Workers' compensation experience of North Carolina residential construction workers, 1986-1994. *Applied Occupational and Environmental Hygiene* 14: 97-106, 1999.
- Lipscomb HJ, Li Leiming. Injuries among teens employed in the homebuilding industry in N.C. *Injury Prevention* 7:205-209, 2001.
- Lipscomb HJ, Dement JM, Li L, Nolan J, Patterson D. Work-related injuries in residential and drywall carpentry. *Applied Occupational and Environmental Hygiene* 18(6): 479-488, 2003.
- Lipscomb HJ, Dement JM, Behlman R. Direct costs and patterns of work-related injuries among union residential carpenters, 1995-2000. *Journal of Occupational and Environmental Medicine* 45(8):875-880, 2003.

Additional References

American National Standards Institute, Inc.(ANSI), and the International Staple, Nail and Tool Association (ISANTA), ANSI/ISANTA SNT-101-2002. Revision of ANSI SNT-101-1993. Safety Requirements for Portable, Compressed-Air-Actuated, Fastener Driving Tools (adopted December, 2002; effective May 2003).

Associated Press. Worker shot in head with nail gun. Friday, July 17, 1998.

Associated Press. Man surveys six nails driven into head. Thursday, May 6, 2004.

Associated Press. Nail embedded in man's skull for 6 days. Monday, January 17, 2005.

Baggs J, Cohen M, Kalat J, Silverstein B. 1999. Pneumatic nailer ("nail gun") injuries in Washington State, 1990-1998. Safety and Health Assessment and Research for Prevention (SHARP). Department of Labor and Industries, Technical report number 59-1-1999.

Baggs J, Cohen M, Kalat J, Silverstein B. 2001. Pneumatic Nailer Injuries: A Report on Washington State 1990-1998. Professional Safety Magazine.

Beaver, A.C.; Cheatham, M.L. 1999. Life-Threatening Nail Gun Injuries. *American Surgeon* 65: 1113-1116.

Broadwater T. Construction worker dies after nail-gun accident. SpokesmanReview.com. April 19, 2007.
<http://www.spokesmanreview.com/breaking/story.asp?ID=9950>
(accessed April 20, 2007).

Burke GE, Lemon WG, Shippee DM. Portable Pneumatic Fastener Driving Device with Improved Actuating Mechanism. Filed May 5, 1972. US Patent No. 3,784,077. Jan 8 1974.

Consumer Product Safety Commission. Memo to J Elder, Office of Hazard Identification and Reduction from Carolene Paul, Division of Mechanical Engineering. Subject: Evaluation of pneumatic nailers. May 23, 2002.

Eachempati SR, Bacchetta M, Barie PS. The image of trauma (case report). *Trauma* 1999; 47(5):985.

Jithoo R, Govender ST, Nathoo N. 2001. Penetrating nail gun injury of the head and chest with incidental pericallosal artery aneurysm. *South African Medical Journal* 91(4):316-317.

Kizer KW, Boone HA, Heneveld E, Orozoco JR. 1995. Nail gun injury to the heart. *J Trauma* 38(3):382-383.

le Nobel J, Wing P. 1987. Pneumatic nail gun injuries to the knee. *Clin Ortho Rel Res* 217:228-229.

Mitropoulos P, Guillama V. Analysis of residential framing accidents, activities, and task demands. *Journal of Construction Engineering and Management* feb 2010.

Nadesan K. 2000. A fatal nail gun injury - an unusual ricochet? *Medical Science Law* 40(1):83-87.

Takagi H, Mori Y, Murase K, Hirose H. 2003. Nail gun penetrating cardiac injury. *European Journal of Cardio-thoracic Surgery* 23:841.

US Department of Labor, Occupational Safety and Health Administration. Inspection Report 1032500, #309967933. Fatality/Catastrophe Report April 18, 2007.

Wang M, Chen I, Tsai S. 1999. Nail gun penetrating injury of the left ventricle and descending aorta. *Circulation* 100:e18-e19.

Webb DP, Ramsey JJ, Dignan RJ, Drinkwater DC. 2001. Penetrating injury to the heart requiring cardiopulmonary bypass: a case study. *J Extra-Corporeal Technology* 33(4), 249-251.

Wu WQ, Tham CF, Oon CL. 1975. Cranio-cerebral injuries from nail-gun used in the construction industry. *Surgical Neurology* 3(2):83-88.