

## PPE – Comfort, Fit, and Effectiveness

For our public works employees constructing and maintaining our roadways, curbs, sidewalks, signs, and pavement markings, safety vests and work boots are a given (hopefully), but personal protective equipment (PPE) policies should be a conscious policy consideration that is revisited from time to time. Agencies should develop policies for PPE, educate employees about proper use, and ensure that the correct PPE is procured and maintained.



In one of its first forays into online training, the Delaware T<sup>2</sup>/LTAP Center held a one-hour webinar on the topic and the [recording](#) is available for reviewing with your crews; maybe as a pizza-driven lunch and learn session. In the recorded workshop, we talked briefly about understanding risk of injury before jumping into a full array of PPE, from footwear to gloves, hard hats, safety glasses, ear protection, pants, shirts, coveralls, respirators, masks, face shields, safety vests, chaps, and fall protection.

Construction and maintenance personnel engage in a wide range of activities that expose them to personal injury. These obviously include pavement maintenance (paving, patching, crack sealing, pavement markings, etc.), curb maintenance (replacement, repair, painting, etc.), sidewalk and curb ramp maintenance and replacement, sign maintenance (inspection, repair, stabilization, and replacement), mowing (roadside, median, parks, etc.), and drainage maintenance. But what else? Holiday and special event decorations and banners are placed and removed. There's beach and boardwalk maintenance, cutting and welding, other fabrications, municipal waste removal, tree trimming and removal, and street sweeping, just to mention a few.

All of these activities and others involve some level of injury risk and risk management is a good way to think about how to reduce the likelihood of injury. Entering into each category of work with an assessment of risk forces you to consider how to minimize risks and leads to good PPE choices. Indeed, some activities that you are seldom involved with should begin with assessing whether your crew is best suited for the task. For example, perhaps the crew routinely deals with tree trimming but a large tree must be removed. Consider whether the crew has the equipment and experience to safely remove it – if in doubt, perhaps that is a job that is better handled by an experienced contractor with larger saws and bucket trucks.

Our friends at the Minnesota LTAP developed a helpful, interactive PPE [poster](#) that can be printed and posted in the breakroom as a reminder. Each element on the poster is linked to a helpful resource, usually an OSHA standard with details specific to conditions requiring use, fit, etc.

Let's walk through a number of PPE categories, realizing that you may have a blanket policy for all employees or



targeted ones for different crews or work assignments. We will include some examples of those choices as we go along.

Safety vests should just be a given and should be required at least whenever employees are within the right-of-way or the maintenance yard. Indeed, the Delaware MUTCD required in [Part 6D.03](#), that *all workers, including emergency responders, within the right-of-way who are exposed either to traffic (vehicles using the highway for purposes of travel) or to work vehicles and construction equipment within the [temporary traffic control] TTC zone shall wear high-visibility safety apparel that meets or exceeds the Performance Class 2 or 3 requirements of the ANSI/ISEA 107–2004 publication entitled “American National Standard for High-Visibility Safety Apparel and Headwear” (see Section 1A.11), or equivalent revisions, and labeled as meeting the ANSI 107-2004 standard performance for Class 2 or 3 risk exposure, except as provided in Paragraph 5. A person designated by the employer to be responsible for worker safety shall make the selection of the appropriate class of garment.*

Part 6D.03 goes on to say that at *all times, flaggers shall wear high-visibility safety apparel that meets or exceeds the Performance Class 3 requirements...* Since local crew workers will often perform flagging duties spontaneously (assuming they hold current Delaware certification for Flaggers), standardizing on Class 3 retroreflective vests is a recommended choice.



With a little care in selecting the style of Class 3 safety vests, they needn't be uncomfortable or cumbersome. Admittedly, “back in the day,” they were hot and sometimes difficult to wear. These days, there are choices that provide the necessary high-visibility, but close well with zippers and allow ample ventilation to keep the wearer much cooler. In the winter, some agencies choose to issue high-visibility work coats (meeting or exceeding ANSI Class 3) to minimize the bulk of a work coat and a vest.

Solid footwear should be a fundamental requirement for all construction and maintenance workers. At a minimum, water resistant, supportive boots are normally required, but many agencies require steel toed boots. Beyond that, other considerations include steel shanks, chemical resistant outer shells, and even metatarsal guards. These latter elements may compromise comfort, so it is important to balance risks with worker acceptance of what may be a slightly heavier and warmer/cooler boot.

The choice of long sleeves and long pants versus shorts and t-shirts is another balance equation for agencies. Some employees feel strongly about the option to wear shorts and/or t-shirts during the heat of the summer and depending upon their tasks, your agency may permit them, at least for some job tasks. But certain tasks (e.g., cutting/welding, weed-eating) call for better protection of the arms and legs.

Some tasks may require even other body protection. For example, municipal waste collection, beach cleanup, building or site cleanup, working with chemicals and paints, welding, or cutting may merit cloth coveralls, aprons, or even Tyvek type suits.



Policies regarding hard hats vary with the agency. Some agencies require hard hats at all times, while others target activities where employees will be exposed to equipment such as backhoes and falling debris such as tree limbs. Regardless, hard hats should comply with one of the standards listed by [OSHA](#) and it should be understood that hard hats do not improve with age. Their protectiveness decreases with exposure to ultra-violet light, and certainly when they are bumped, banged, and dropped. Many workers like to hold on to hard hats forever and decorate them with stickers from projects and such, but they should generally be replaced every five years or so; sooner if they are damaged or become suspect because of a strike.

Eye protection is another form of protection that, like safety vests, has come a long way in terms of comfort and effectiveness. “Back in the day,” there were safety goggles and that was about it, unless you were a welder or wearing torch cutting goggles. They fogged up, they were hot, and they didn’t stay on long. Safety glasses now are far more comfortable and functional, and have become so stylish, there may be a Vera Wang line soon. And that is good...to a point. If your safety glasses are more comfortable and make you feel like a rock star, you are more likely to wear them, but if style supplants the safety function, beware. Minnesota’s PPE poster will link you to OSHA’s [standard](#) for eye protection, where there are important consideration for side protection when there are flying object hazards (e.g., weed-eating, cutting, torch work, sandblasting, etc.) and employees who wear prescription eyewear. We see a lot of safety glasses these days, but probably still a little less than we should.

Hearing protection, on the other hand, is still overlooked in many agencies. In part, this may be a result of OSHA’s [standard](#) on the topic – it gets in the weeds very quickly with a lot of definitions and calibrations and logarithmic tables. Relax and keep it simple.

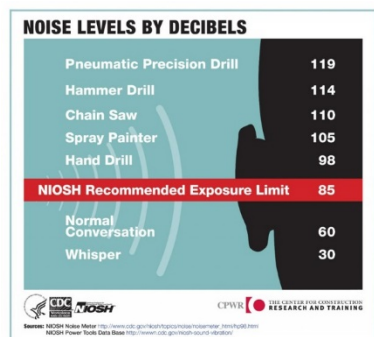
Noise exposure is a function of intensity, duration, and distance. OSHA’s Table D-2 shows the decibel (dBA) levels permissible for various durations and the NIOSH graphic provides some typical noise levels. Very briefly, sound is measured in decibels (dB), but often a filter is used as a weighted scale for judging loudness for the hearing threshold of the human ear – typically dBA (the mid-range frequencies). Other filters are used, for example, in the entertainment industry (dBC).

So, if your chainsaw measures 110 dBA (like NIOSH reports), OSHA tells you that exposure for more than 30 minutes per day requires hearing protection. Chances are, if the chainsaw is out, it’s going to be out for more than 30 minutes. What about your weed-eaters, lawn mowers, or circular saws? You can purchase a basic sound level meter for \$25-50 that probably works well enough for our purposes. Make sure your meter is set to measure dBA and measure your equipment at the distance the operator’s ear would be while the equipment is at its operational level. Also measure the sound level at locations where support personnel would be to determine if they require ear protection. Now you know which of your activities require ear protection and it is a matter of selecting disposable ear plugs, ear muffs, or other types of

TABLE D-2 - PERMISSIBLE NOISE EXPOSURES (1)

Duration per day, hours	Sound level dBA slow response
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or less	115

Footnote(1) When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions:  $C(1)/T(1) + C(2)/T(2) + C(n)/T(n)$  exceeds unity, then, the mixed exposure should be considered to exceed the limit value. C indicates the total time of exposure at a specified noise level, and T indicates the total time of exposure permitted at that level. Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.



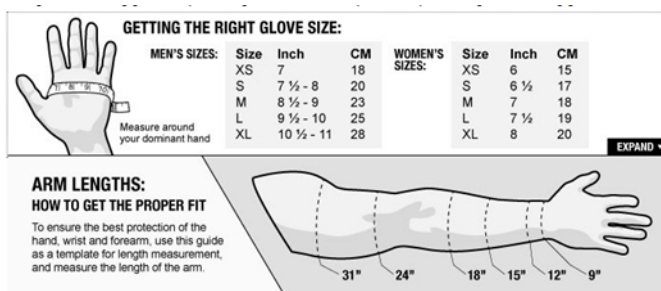
protection and setting your policy.

Until recently, respiratory protection was another form of protection that was probably underutilized, but most of us probably have a better understanding of the types these days. N95 masks aren't just for virus protection, so what exactly does N95 mean? NIOSH has ten certification levels for particulate filtering respirators and the coding is as follows. The N is for "not resistant" (to oil), R is for "resistant", and P is for "oil proof." The 95, 99, and 100 is for the percentage of airborne particles the material can filter (the 100 actually filters 99.97%; let it go). So, you have N95, N99, and N100, R95, R99, and R100, and P95, P99, and P100. The tenth is HE for high efficiency particulate air and these are used in powdered air purifying respirators (PAPRs) to filter 99.97% of airborne particles.

Some of our activities that generate a lot of airborne particulate for sustained periods should consider respiratory protection. Aside from the current supply chain challenges in purchasing them, there is another problem with masks that NIOSH explains in their Counterfeit and Altered Respirators [video](#). You can check your respirators before you buy by checking the TS number (notice the stamp on the mask at right, which should be available at the time of purchase) against NIOSH's certified equipment [list](#) (use the 2016 Reformatted tab). A quick look before you buy should assure you that you are getting the protection you are expecting.



Gloves are common PPE but did you know they come in sizes? They do and most manufacturers and distributors have sizing charts you should consult to ensure that your employees have the right sizes for their hands. Again, if they fit well and function well, they are more likely to be used and you will minimize injuries. Next, you have to decide what type of gloves are needed. For many tasks, general purpose gloves suffice (although there are dozens of choices just in that category), but coated gloves have also become popular to provide better grab. For some tasks, specialty gloves are needed. Cutting and welding require heat and fire resistant gloves. Cut resistant gloves are helpful if dealing with a lot of sharp objects or when sharpening tools. Electrical gloves are essential tools for qualified personnel working with energized lines, but these gloves must be tested every day to ensure they don't have so much as a pin hole in them, which can render them useless.



Chaps are another underutilized PPE and the US Product Safety Commission reports that leg area injuries are only a close second to arm and hand injuries when it comes to chainsaw use. If you doubt what chaps can do, there are many YouTube videos demonstrating how they work – have a look at one and you will likely be convinced that chainsaw work should include this protection. One thing that is overlooked with chaps is that most manufacturers recommend washing them prior to first use (and regularly thereafter) to fluff up the material for greatest effectiveness.



Fall protection is not an everyday tool for the road maintenance employee, which is all the more reason to think about it as part of your PPE policy. Are there times where some of your employees are working at 6' or greater heights? Fall protection can take many forms. A body belt and tie-off may be appropriate for certain tasks. A strong railing system along exposed edges of roofs or platforms is another. Bucket trucks are a form of protection, but some agencies require a lanyard in addition. If you are using safety harnesses, be mindful that these must be properly fitted to the individual, they must be inspected for damage or wear regularly, and, as with other PPE, they don't improve with age – replace them according to manufacturer's recommendations.

Believe it or not, this is not a comprehensive look at PPE, but it is a good start for assessing the needs of your operations and employees. Consider putting together a 3-5 member team of your employees and supervisors for a deep dive into the routine, and the unusual, activities you are called on to complete, determine which of those should be outsourced to a specialty contractor, and what PPE should be required and on hand, what PPE should be required for various tasks, and how you should go about ensuring they are in the right place at the right times.

Think about the example to the right and consider whether you are comfortable with the level of PPE. Safety vest, gloves, hard hat, and sturdy boots are evident, but what about eye and hearing protection? If you walk through your typical (and occasional) activities, you may raise an eyebrow about your PPE choices – that's good, because you can decide if your current level of protection is the right balance for your agency and your employees.



Each local agency must assess its own risks in determining PPE policies, but all agencies have a vested interest in the safety of the workforce and a periodic, thoughtful review of PPE use ensures that as your activities change over time, you are meeting those risks with a smart and balanced approach to safety.

The Delaware T<sup>2</sup>/LTAP Center's Municipal Engineering Circuit Rider is intended to provide technical assistance and training to local agencies and so if you have PPE questions or other transportation issues, contact Matt Carter at [matheu@udel.edu](mailto:matheu@udel.edu) or (302) 831-7236.