Vision Testing: A Blind Spot in Occupational Safety

By William Margaretta, Barry R. Weissman, REM, CSP, CHMM, CHS-IV, CIPS

Feb 01, 2009

How many departments in your organization have requirements for visual inspections? How many of the codes, regulations, and legislative mandates demand that visual inspections be performed on a regular, weekly, monthly, quarterly, or annual basis? Think of the requirements for slings and wire ropes, aircraft parts, hazardous waste containers, and every commercial vehicle and load—the list goes on and on. Yet how many of those same codes have a single line that requires the inspectors (your employees) to be able to see and see correctly?

A few years ago, the New Jersey State Safety Council collaborated with the now defunct New Jersey Society to Prevent Blindness to offer vision screening to the firms that we trained in forklift operation and safety. The results were shocking. No matter where we screened, we found a 25 percent referral rate (i.e., referred for follow-up with their eye care professional). We found powered industrial truck operators being driven to work because an eye disease process had made driving a motor vehicle too risky. Yet, once they arrived at work, they climbed on a forklift. We found stationary crane operators with no depth perception.

I found these results alarming, and I began to question the fleet operators that the council surveyed. Did they have vision requirements at all? Did they check a driver’s vision? Most said they looked at the driver’s license. So we queried further: If a company did check the vision of a driver, we were interested in learning whom they checked, when, by whom, and how often. The results of this inquiry were even more disconcerting. Most claimed they photocopied the employee’s driver’s license, and if the state said they could drive, that was good enough for the employer. If the employee needed corrective lenses, most had no provisions for ensuring the corrective lenses were worn. Even more disconcerting, if a license did require corrective lens, no employer asked for documentation of a recent eye exam or prescription. Everyone just checked to see whether the employee had glasses or contacts, with no discussion of their visual problems. To make matters worse, most of those drivers got their licenses and only eye tests 20 to 25 years earlier! And it was New Jersey, to boot.

Why is this a problem? In New Jersey, there is no angle of view requirement. Consequently, there are more than 400 drivers with binoculars attached to one set of glasses in order to meet one of the most lenient vision standards of any state.

Many of our state’s fleets are mixed fleets with small, medium, and large vehicles. Some of the larger vehicles require a commercial driver’s license, which does have a federal vision standard. This sets up a new risk: A corporation with dual standards is at risk if a non-commercial driver
crashes while on duty with his own car on company business or with a company car while on company business. If half the fleet is tested to a known standard, why not test the whole fleet?

Even the federal government is not consistent in its requirements. In 40 CFR Part 391, Qualifications of Drivers and Longer Combination Vehicle Driver Instructors, it requires in §391.41(b)(10) that the drivers have 20/40 vision, color sense to recognize traffic lights, and a field of vision of at least 70 degrees in the horizontal meridian in each eye. While in Part 398, Transportation of Migrant Workers, §398.3(b)(4) requires the same except the field of vision in the horizontal meridian shall not be less than a total of 140 degrees.

Diabetic retinopathy, glaucoma, cataracts, age-related macular degeneration, lack of depth perception, and other disease processes may have robbed vision from your drivers. Because only a portion of the fleet is tested, however, these problems go undetected. It is only a matter of time before some company’s sales or service employee is involved in a serious motor vehicle crash. If that driver had visual problems that would have been detected by the federal vision standard used by the commercial drivers of that firm, it follows that the employer will be hard pressed to defend not testing the non-commercial drivers to a known, nationally recognized standard.

**Are You Missing a Root Cause of Errors?**

Wellness and health fairs are common in most organization and even communities; blood pressure, cholesterol, blood sugar, and hearing are commonly tested. Why don’t we test vision at these free fairs? We take vision for granted. We test vision once in the state of New Jersey—when you apply for a driver’s license—and while the law says it is supposed to be tested every 10 years, it is rarely if ever done, and, as of this writing, is not being done by the state.

Employees hired to drive or operate machinery will not have the same visual abilities 20 or 25 years hence. Common life processes will diminish some acuity, while diseases can and do affect millions of employees. Cataracts, diabetic retinopathy, macular degeneration, stroke, and trauma can and do alter the visual abilities of employees. So relying upon the State of New Jersey to set the visual standards of an employer is probably not a great idea.

There are other problems, such as night blindness, that may be picked up by a state and coded on the driver’s license. And problems in one state may not be recognized by another when an employee changes residences.

New Jersey is not unique. So I submit that, as an employer, if you are relying on your state motor vehicle codes to determine your vision requirements, you may be relying upon a woefully inadequate standard.

Visual acuity (how large an “E” you can see) is only one measure of “safe sight.” Proper vision is generally recognized as being 20/20, as measured on the Snellen chart. There is also Vernier Acuity, the ability to determine the difference between two things oriented in the same direction. (Think of a split-screen focus on a camera.) Many people have difficulty with this visual task, which explains the popularity of autofocus cameras. Yet companies have individuals who must read complex gauges, micrometers, and inspect surfaces for defects, cracks, and damage. Most companies have no idea whether their inspectors can see the things they are required to inspect because they have not tested the employees’ vision.

OSHA, FAA, and DOT all have requirements for visual inspections of parts and components, yet not one paragraph requiring that those doing the inspection be able to see! Doctors, scientists, and medical professionals of all types must review a variety of tests. If they have poor color vision or
deficient contrast sensitivity, they may misread blood or other bodily fluids in samples or be unable to detect what an X-ray clearly shows. Yet there are no vision requirements or mandated vision test in the vast majority of organizations.

Corrections officers have established a “useful field of view” in some states. This is to ensure the officer can in fact see the whole room of prisoners. Sufficient problems have arisen where something going on outside the peripheral field of an officer resulted in his or her being “blindsided.”

Yet we have fleets that have drivers who consistently report backing collisions or who are sideswiping objects, and they are drug and alcohol-tested—but they are not tested for depth perception or useful fields of view.

Slowly, American industry adopted procedures that provides for the quick drug and alcohol testing of employees involved in industrial mishaps or collisions, yet few if any employers test the vision of employees after a mishap. Often, the amount of damage done by a crane operator or forklift operator is written off as “operator error” when the root cause is visual.

Ask yourself some questions:

What are the vision requirements to receive a driver’s license in your state?

If you do not know the vision requirements of your state, why do you rely upon them to be your company’s standard? And if you do know what they are, are they adequate for the work your employees are required to perform?

Does your state have a field of view requirement? Does it allow binocular attachments to reach the required visual acuity?

How do you know if your employees need corrective lens to operate company equipment?

Why is vision the only area during a corporate health fair that is not routinely tested?

How many drug or alcohol tests have you administered after incidents in the past five years? How many of those incidents might have been a result of a visual miscue?

How many inspections for safety or quality are required by your company during a week, a month or a year?

How do you know if your employees can see the things they are supposed to be inspecting?

In your most critical and or dangerous jobs, what is the useful field of view that your employees must be able to see horizontally or vertically?

Have you experienced incidents involving property damage caused by employees driving a machine, either on or off company property? In how many of those incidents did you question the visual abilities of the employee operating the machine?

When was the last time you had a discussion with your occupational physician about doing more than a routine 20/20 Snellen test for new hires?

Why is the safety and health literature on this subject so woefully inadequate? In short, why is our profession blind to vision testing?

Components of a Safe Sight Program
Here are the key components of a Safe Sight Program:

- Visual acuity
- Useful field of view
- Color correct sight
- Depth perception
- Contrast sensitivity, and
- Light levels

Your job descriptions should have not only the specifications for the physical aspects of the job (stand for six hours, be able to lift up to 25 pounds, 10 times in a shift), but also you should determine the visual requirements. Let’s examine each one individually in terms of how it might be involved in incidents we investigate.

**Visual acuity**

Acuity is how clearly a person can see an object. This is generally specified for a person’s having good vision as having 20/20 vision, usually as measured by a Snellen chart.

Your employee is required to maintain the pressure of the reaction system at 200 psi using an analog gage. If the pressure gets below 195, the material will not react properly, and you have a ruined batch. If the pressure gets above 220 psi, the reactor will explode. Sure, you can install an electronic system that can control the pressure, but how much will that cost in time and equipment? Ensuring your employees can see correctly can provide the necessary management of the process.

An employee with poor visual acuity will need to stand back or move close to the gage to see it clearly. If he is back too far, he may not be able to see the gage reading correctly. If he has to move in too close, he could be burned by coming into contact with the reactor.

**Field of view**

The field of view is the angular direction that you can see. Human beings have almost 180 degrees of vision. Try this: Stand up and look straight ahead. Extend your arms straight out to your sides and wiggle your fingers. Do not turn your head or your eyes; keep them straight ahead. Slowly move your arms in together, and stop as soon as you see your fingers. Most people with a normal field of view will be able to see the fingers at an equal angle. Others may not because of either an eye disease or a visual problem.

While you are still standing, raise one arm above your head and lower the other arm straight down. Again, wiggle your fingers as you slowly move your arms together, and stop when you can see your fingers. If you do not see your fingers wiggling at almost 180 degrees, it may mean you need to be examined by an eye doctor.

**Color vision**

We have all had these tests, trying to determine the number that is hiding in a circle of dots. Is it a 3 or 27? A percentage of the population is color blind. Two of the more common types of color blindness are red-green and blue-red blindness. Imagine if you had never been tested, never needed to know trees were green and Christmas ornaments were red. What would happen when you started to drive a motor car and that signal ahead lit up at the top? Do you stop or do you go? If the pump is running, the light is green. If the pump stops, what color is the light? Can you employees tell the
difference?

**Depth perception**
Why do people step off the sidewalk when they didn’t mean to? Why do some people have problems walking up and down stairs? They have impaired depth perception. What do baseball players, waitresses, and dentists all have in common? They all need good depth perception to be able to do their work correctly. To find out if you have good depth perception, take the test at [www.vision3d.com/frame.html](http://www.vision3d.com/frame.html).

**Contrast sensitivity and light levels**
Contrast is the difference in the highlights and background of an image. When you look at trees just before sunrise, they all seem to be grey and very indistinct. Not many of the details are visible. Then, as the sun comes up, you see the colors start to develop into what they should be; you see the details in the branches and the leaves, and you see the sky go from back to gray to blue. What you are seeing is an increase in contrast as the light level increases. Another way to try this is with a light that is on a dimmer. At night or with all other lights out, notice the room. Look at the details in a fabric drapery and the colors in the rug. While you are observing these details, slowly lower the light level. What happens? Where did the colors go? Where did the details disappear?

Will your forklift driver be able to determine what information is on the label of the carton on the third level when he’s working the third shift and you have less than optimal illumination? Under the OSHA construction regulations, 29 CFR 1926.56, [illumination](http://www.osha.gov/) requires the following:

Implement your vision program by putting into place the six components of a safe sight program. Develop the vision criteria for all of the tasks at your facility. Include them in the “Job Specs” for the positions, and test your employees to ensure they meet the requirements. Have them get corrective lens if they are required, and ensure they are being used.

Finally, OSHA proposed new crane standard is open for comments at this writing. Don’t you think it’s time OSHA required crane operators to be able to see to a standard at least the same as that for a CDL driver? Currently, if a crane operator with one eye used binoculars to see the signalman, that would be okay. What’s wrong with this picture?

**About the Authors**
William Margaretta is President of the New Jersey State Safety Council.

Barry R. Weissman, REM, CSP, CHMM, CHS-V, CIPS, is Vice President of Hillmann Group, LLC of Union, N.J. He has more than 30 years' experience in safety and regulatory compliance and is responsible for helping clients with their regulatory compliance requirements and training needs.