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4910-06-P

DEPARTMENT OF TRANSPORTATION

Federal Railroad Administration

49 CFR Parts 240 and 242

[Docket No. FRA-2015-0123]

Best Practices for Designing Vision Field Tests for Locomotive Engineers or Conductors

AGENCY: Federal Railroad Administration (FRA), Department of Transportation (DOT).

ACTION: Interim interpretation with request for comments.

SUMMARY: FRA is issuing this interim interpretation to clarify provisions in its locomotive engineer and conductor qualification and certification regulations with respect to vision standards and testing. In particular, this document addresses further evaluation of persons who do not meet the vision threshold criteria provided for in those regulations, and provides best practices guidance for designing valid, reliable, and comparable vision field tests for assessing whether persons who do not meet those thresholds can perform safely as locomotive engineers and conductors.

DATES: Written comments on the interpretation must be received on or before [INSERT DATE 60 DAYS FROM DATE OF PUBLICATION IN THE FEDERAL REGISTER]. Comments received after that date will be considered to the extent possible without incurring additional expense or delay.

ADDRESSES: Comments related to Docket No. FRA–2015–0123 may be submitted by any of the following methods:

- Web site: http://www.regulations.gov. Follow the online instructions for submitting comments.
- Fax: 202-493-2251.
- Mail: Docket Operations Facility, U.S. Department of Transportation, 1200 New Jersey Avenue, SE., W12-140, Washington, DC 20590.
- Hand Delivery: 1200 New Jersey Avenue, SE., Room W12-140, Washington, DC 20590, between 9 a.m. and 5 p.m., Monday through Friday, except Federal Holidays.

Instructions: All submissions must include the agency name and docket number. Note that all comments received will be posted without change to http://www.regulations.gov, including any personal information provided.

Privacy Act: Anyone is able to search the electronic form of any written communications and comments received into any of our dockets by the name of the individual submitting the comment (or signing the document, if submitted on behalf of an association, business, labor union, *etc.*). See http://www.regulations.gov/#!privacyNotice for the privacy notice of regulations.gov or interested parties may review DOT's complete Privacy Act Statement in the Federal Register published on April 11, 2000 (65 FR 19477).

Docket: For access to the docket to read background documents or comments received, go to http://www.regulations.gov at any time or to U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday

through Friday, except Federal Holidays. Anyone is able to search the electronic form of any written communications and comments received into any of our dockets by the name of the individual submitting the comment (or signing the document, if submitted on behalf of an association, business, labor union, etc.). In accordance with 5 U.S.C. 553(c), DOT solicits comments from the public to better inform its processes. DOT posts these comments, without edit, including any personal information the commenter provides, to www.regulations.gov, as described in the system of records notice (DOT/ALL–14 FDMS), which can be reviewed at www.dot.gov/privacy. See also http://www.regulations.gov/#!privacyNotice for the privacy notice of regulations.gov.

FOR FURTHER INFORMATION CONTACT: Dr. B. J. Arseneau, Medical Director, FRA, 1200 New Jersey Avenue SE., Washington, DC 20590, (202) 493-6232; Alan Nagler, Senior Trial Attorney, FRA, Office of Chief Counsel, Mail Stop 10, 1200 New Jersey Avenue SE., Washington, DC 20590, (202) 493-6049; or Joseph D. Riley, Railroad Safety Specialist, FRA, Mail Stop 25, 1200 New Jersey Avenue SE., Washington, DC 20590, (202) 493-6318.

SUPPLEMENTARY INFORMATION:

I. Background

FRA is issuing this interim interpretation to clarify provisions in its locomotive engineer and conductor qualification and certification regulations related to further evaluation of persons who do not meet the vision threshold criteria in Title 49 Code of Federal Regulations (CFR) 240.121(c) and 242.117(h), and to provide best-practices guidance for designing valid, reliable, and comparable vision field tests, in response to: 1) the fatal railroad accident that occurred near Goodwell, OK, on June 24, 2012; 2)

inquiries FRA has received requesting clarification of the applicable regulatory provisions; and 3) numerous requests for FRA review, under the locomotive engineer and conductor certification regulations, when individuals have been denied recertification by a railroad based on a color vision or monocular vision deficiency.

A. *Railroad Accident Near Goodwell, OK*

The fatal accident that occurred near Goodwell, in which two Union Pacific Railroad (UP) trains collided head-on, exemplifies how important it is to railroad safety that each railroad establish valid, reliable, and comparable procedures to evaluate persons who do not meet the vision thresholds in 49 CFR 240.121(c) or 242.117(h), and to strictly adhere to those procedures. The locomotive engineer and conductor of the eastbound train and the engineer of the westbound train were killed. Three locomotives and 24 cars of the eastbound train and 2 locomotives and 8 cars of the westbound train derailed. Several fuel tanks from the derailed locomotives were ruptured, releasing diesel fuel that ignited and burned. Damage was estimated at $14.8 million. The National Transportation Safety Board (NTSB) determined that one of several probable causes of the accident was the eastbound engineer's inability to visually detect and recognize the approach and stop signal aspects of wayside railroad signals due to color vision deficiency and distant visual acuity impairment the engineer had acquired as a result of a number of chronic, progressive eye conditions and visual disturbances.[1]

During its investigation of the Goodwell accident, the NTSB found that: 1) the eastbound engineer last underwent vision testing required for recertification in 2009; 2)

[1] National Transportation Safety Board Railroad Accident Report NTSB/RAR-13-02 (adopted June 18, 2013). Head-On Collision of Two Union Pacific Railroad Freight Trains Near Goodwell, Oklahoma, June 24, 2012. Retrieved from http://www.ntsb.gov/investigations/AccidentReports/Reports/RAR1302.pdf on Dec. 2, 2014.

during that testing, the eastbound engineer failed an initial color vision test (i.e., the Ishihara Color Vision Test[2]) that UP selected from the list of color vision test protocols in 49 CFR Part 240, Appendix F, and did not meet the distant visual acuity threshold (corrected) in 49 CFR 240.121(c); 3) UP relied on a vision field test of unknown validity, reliability, and comparability[3] in further evaluating the engineer and did not adhere to UP's field test protocol; 4) UP relied on a telephonic report of distant visual acuity testing from the engineer's optometrist in recertifying the engineer, and did not adhere to UP's own policy which required UP to obtain written documentation from the engineer's optometrist to confirm the telephonic report; and 5) UP failed to reevaluate the engineer's vision within one year of his 2009 recertification despite the UP medical examiner's written determination that it was necessary to reevaluate the engineer's vision within one year, rather than triennially, due to the engineer's chronic, progressive eye conditions. The NTSB concluded that had the engineer been reevaluated by UP the following year or when he self-reported his test results, the collision might have been avoided.

B. *Color Vision Deficiency, Monocular Vision and Other Eye Conditions and Visual Disturbance*

As indicated in the NTSB's report on the Goodwell accident, there are numerous eye conditions, including color vision deficiency and monocular vision, which can affect a person's ability to safely perform as a locomotive engineer or conductor. The American Optometric Association defines "color vision deficiency" as the inability to distinguish certain shades of color, or in more severe cases, see colors at all. The term "color blindness" is also used to describe this visual condition, but very few people are

[2] S. Ishihara, Tests for colour-blindness (Handaya, Tokyo, Hongo Harukicho, 1917).
[3] The NTSB did not define the terms "validity," "reliability," and "comparability" or indicate what might constitute a valid, reliable, and comparable field test.

completely color-blind. People who have complete color-blindness, a condition called achromatopsia, can only see things as black and white or in shades of gray. The severity of color vision deficiency can range from mild to severe. "Red-green" is the most common deficiency. Another form of color deficiency is "blue-yellow." The latter is a rare and more severe form of color vision deficiency since persons with blue-yellow deficiency frequently have red-green deficiency too. Color vision deficiency can be inherited. About 8 percent of Caucasian males are born with some degree of color deficiency. Women are typically asymptomatic if they are carriers of the color deficient gene (i.e., women are carriers of the gene without suffering with color vision deficiency), though approximately 0.5 percent of women have color vision deficiency. People can also acquire a color vision deficiency as a result of certain types of medical conditions, a side-effect of certain medications, and certain eye injuries. Examples of eye conditions that can cause an acquired color-vision deficiency include, but are not limited to, diabetes, glaucoma, macular degeneration, multiple sclerosis, chronic alcoholism, leukemia, sickle cell anemia, syphilis, or other conditions resulting in optic nerve damage or inflammation. Examples of medications that can sometimes cause adverse effects that result in color-vision deficiency include, but are not limited to, certain medications used to treat heart problems, high blood pressure, infections, and nervous disorders.

There are many other eye conditions and visual disturbances other than color-vision deficiency. Examples of these problems and disturbances include halos, blurred vision (i.e., the loss of sharpness of vision and the inability to see fine details), and blind spots or scotomas (i.e., dark "holes" in the vision in which nothing can be seen, and loss of use of one eye, commonly called "monocular vision"). The degree to which these

conditions and disturbances can affect a person's ability to perform safely varies by individual, depending on the specific job duties a person performs as a certified locomotive engineer or conductor, the nature and severity of the condition, the degree to which the visual disturbance is corrected with treatment, and in certain cases, the degree to which a person can compensate for the disturbance. Persons with monocular vision can sometimes, on a case-by-case basis, compensate for a limited degree of peripheral vision field loss by head turning.

II. FRA's Interpretation

A. Requirement for Further Evaluation by the Railroad's Medical Examiner

FRA's locomotive engineer and conductor qualification and certification rules do not require railroads to categorically disqualify or decertify individuals who do not meet the vision thresholds in 49 CFR 240.121(c) or 242.117(h) because they may have a color-vision, sub-threshold distance visual acuity, or field of vision (e.g., monocular vision) deficiency, if they are otherwise qualified. To the contrary, 49 CFR 240.121(e) and 242.117(e) require railroads to subject, upon request, persons who do not meet those thresholds to further medical evaluation by the railroad's medical examiner to determine whether the person can safely perform as a locomotive engineer or conductor. FRA's longstanding view is that there are some people who, despite not meeting the vision threshold in 49 CFR 240.121(c) and 242.117(h), have sufficient residual visual capacity to safely perform as a locomotive engineer or conductor.

The Railway Association of Canada (RAC) has published medical guidelines that are applicable to qualification and certification of locomotive engineers in Canada.[4] FRA

[4] Railway Association of Canada (2013), Canadian Medical Rules Handbook, pages 38, 43, 44, and 51. Retrieved from http://www.railcan.ca/publications/rule_handbook on March 24, 2015.

allows railroads to adopt the monocular vision criteria in the RAC's guidelines under the railroad's own authority.

B. *Vision Requirements to Safely Perform as a Locomotive Engineer or a Conductor*

Depending on their assigned responsibilities, a person generally must have sufficient distant visual acuity and field of vision to see railroad signals and stationary and moving objects such as other locomotives, workers, and railroad equipment on or near the track, to perform safely as a locomotive engineer or conductor. Should a person perform as a locomotive engineer or conductor on portions of the railroad system on which colors of railroad signals convey information about speed, routing, or obstructions or other hazards, a person with that responsibility must additionally have sufficient color vision to safely perform.

FRA recognizes that railroads may assign some employees the responsibility to recognize and distinguish color light railroad signals, but not other employees. For example, some passenger conductors may not have responsibility to recognize and distinguish between colors of railroad signals. FRA also recognizes that some locomotive engineers and conductors only perform service in unsignalled (i.e., dark) territory or in territories where they do not have responsibility to recognize and distinguish between one or more types of colored railroad signals (e.g., wayside color light signals, color-position light signals, and blue flag signals). Although FRA's certification regulations require that both locomotive engineers and conductors be vision-tested, including color-vision, regardless of the actual operating or working conditions, a railroad's medical examiner should be cognizant of whether a person with a color-vision deficiency already works or could work safely in dark territory. Medical examiners

should also keep in mind that even though a person may only work in dark territory, that person may still need to be able to identify colored items such as blue signals or roadway worker flags.

C. *Use of Valid, Reliable, and Comparable Vision Tests*

There are many types of eye conditions and visual disturbances ranging in severity from very mild to severe and many types and designs of railroad signals and railroad operating rules. Accordingly, FRA's locomotive engineer and conductor qualification and certification rules grant railroad medical examiners discretion in determining the methods and procedures the medical examiner will use to further evaluate persons who do not meet the vision thresholds in 49 CFR 240.121(c) and 242.117(h). In the 1991 final locomotive engineer certification rule, FRA stated that "[m]edical discretion will allow railroads to respond appropriately when they encounter individuals who fail to meet FRA-prescribed acuity levels, but demonstrate that they can compensate to a sufficient degree for their diminished acuity level." 56 FR 28228, 28235; June 19, 1991. FRA granted railroad medical examiners similar discretion in further evaluating persons for the purposes of conductor qualification and certification. FRA states in its locomotive engineer and conductor certification rules that, should a person not meet specific vision thresholds, appropriate further evaluation may include optometric or ophthalmologic referral, or (secondary) testing with a field or other practical or scientific screening test. Although FRA's rules grant discretion to railroads in selecting a test protocol, FRA's longstanding interpretation of this provision is that the test offered by a railroad must be a valid, reliable, and comparable test for assessing

whether a person who fails an initial vision test can safely perform as a locomotive engineer or conductor.

1. Field Tests

A "practical test," more commonly known as a "field test" within the railroad community, is a test performed outdoors under test conditions that reasonably match actual operating or working conditions. A railroad is permitted to conduct field testing on a moving train, positioned in a stationary locomotive, or standing on the ground at distances from a signal or other object that the person must see and recognize to perform safely as a locomotive engineer or conductor.

Before issuing this interpretation, FRA contacted several organizations to collect information that would help in the development of recommended best practices for field tests, and FRA has captured that feedback in memoranda and documents it has placed in the docket. First, FRA wants to thank the American Academy of Ophthalmology and the American Optometric Association for providing expert medical information regarding testing and evaluating color perception during six conference calls held with FRA personnel. Second, FRA wants to thank the Brotherhood of Locomotive Engineers and Trainmen (BLET) and United Transportation Union-SMART Transportation Division for providing information and concerns regarding the strengths and weaknesses of current field testing practices, and asking that FRA find a way to encourage each railroad to conduct such field testing, during a conference call with FRA personnel. Third, FRA wants to thank the Association of American Railroads (AAR) for providing a written overview of the different practices currently used by various Class I railroads. AAR stated, in a July 14, 2015, Discussion on Color Vision Field Testing that field "testing is,

at the moment, the preferred way of determining whether an individual's unique set of deficits actually impacts performance." FRA provides best practices for designing valid, reliable, and comparable vision field tests in Section III, "Best Industry Practices for Conducting Color Vision Field Testing" of this interpretation.

2. Scientific Tests

A scientific vision test is a test instrument that, based on the results of a rigorous scientific study published in a peer-reviewed scientific or medical journal or other publication, is a valid, reliable, and comparable test for assessing whether a person has sufficient distance visual acuity, field of vision, or color vision, which, for purposes or railroad operations, allows the person to safely perform as a locomotive engineer or conductor. Examples of such scientific screening tests include, but are not limited to, a simulator, the Ishihara test and other color plate tests, a perimetry test (i.e., a test of field of vision), and a Snellen or equivalent distance visual acuity test. Should a railroad offer a scientific test to further evaluate persons who fail an initial test, FRA expects the test to be a valid, reliable, and comparable test for assessing whether the person can safely perform as a locomotive engineer or conductor despite not meeting the specific vision threshold (i.e., distance visual acuity, field of vision, or color perception) in 240.121(c) or 242.117(h). That means the railroad must be able to cite a rigorous scientific study published in a peer-reviewed scientific or medical publication that demonstrates the scientific test is a valid, reliable, and comparable test for that visual capacity. For example, Hovis and Oliphant, in 2000, published a validation test of a lantern test that they designed, the CNLAN lantern test. The authors rigorously validated the CNLAN lantern test in a peer-reviewed journal against a simulated field test with a high degree of

content validity to show the CNLAN lantern test has a high degree of validity and reliability for assessing the ability to recognize and distinguish between aspects of color light railroad signals in Canada.[5] Two major railroads in Canada use the CNLAN lantern test. Interested parties should note, however, that simply showing a person a lantern with different colored lights displayed is certainly not the same as the CNLAN lantern test, which is a scientifically validated test.

3. Determining the Validity, Reliability, and Comparability of a Vision Test

Validity means the degree to which a test actually measures what the test is intended to measure. For example, a color vision field test is valid to the degree that it assesses whether a person can recognize and distinguish between colors of the types of railroad signals in the yard or on all portions of railroad systems on which the person must perform safely, depending on the person's responsibilities. One way to estimate the validity of a test is to assess its degree of job-relatedness (content validity). The degree to which a field test's conditions match actual operating conditions determines, to a large extent, its validity.

Reliability means the degree of reproducibility of the test results. In this case, reproducibility means an examinee that is repeatedly administered the same test would demonstrate the same number of correct responses and missed signal responses each time the test is administered.

Comparability means the testing procedures are fairly administered and the test results are uniformly recorded. When tests have comparability, it is fair to compare test results between individuals regardless of whether different testing officers, or different

[5] Hovis, J. K., and Oliphant, D., A Lantern Color Vision Test for the Rail Industry. American Journal of Internal Medicine, 38:681-696 (2000).

railroads, administered the test. Additionally, for a test to be comparable, the testing officer must administer the test without any bias or prejudice.

D. *Optometric and Ophthalmologic Referral*

In addition to field and scientific tests, FRA's locomotive engineer qualification and certification regulations also permit optometric or ophthalmologic referral which can provide important information about the nature and severity of a person's eye condition or visual disturbance. The referral can also provide information about whether the vision condition is stable or should be monitored more frequently than triennially by the railroad's medical examiner because it is likely to worsen to a level that would make it unsafe to perform service prior to a certified employee's next triennial recertification evaluation.

E. *Special Conditions of Certification (Restrictions)*

Sections 240.121(e) and 242.117(e) permit railroads to conditionally certify a person as a locomotive engineer or conductor if the railroad's medical examiner determines in writing that a special condition of certification is necessary on the basis of findings elicited on further evaluation of the person's vision. Examples of special conditions of certification include: 1) more frequent evaluation of an eye condition or visual disturbance by a railroad's medical examiner that will likely deteriorate prior to the person's next required triennial recertification examination to a level that the person may not be able to safely perform; 2) required use of corrective lenses (i.e., glasses or contact lenses) to correct distant visual acuity to a level that the person can safely perform as a locomotive engineer or conductor; 3) restriction to perform service only in unsignalled (dark) territory should a person be otherwise qualified but not have the ability

to recognize and distinguish between colors of wayside railroad color light or color-position light signals; 4) restriction of service to unsignalled (dark) territory, or marking up for service only at night when there is greater brightness contrast between signals and the remainder of the operating environment, should a person demonstrate the ability to perform safely only under those operating conditions; or 5) restriction of service to performance in a yard or on portions of railroad systems where locomotives move at slower speeds, should a person be able to recognize and distinguish between colors of railroad signals at those slower speeds. There is research evidence that some individuals with color vision deficiency may be able to detect and recognize signal aspects at shorter sighting distance that exist in the yard or on portions of the railroad where locomotives move at slower speed to perform safely.[6]

F. *Chromatic Lenses*

FRA's locomotive engineer and conductor certification rules do not permit examinees to use chromatic lenses when taking an initial test the railroad selects from the list of accepted color vision test protocols in the appendices to parts 240 and 242. Although examinees may not use chromatic lenses during an initial color vision test, FRA grants each railroad the discretion to determine whether it will permit examinees to use chromatic lenses during a secondary field or other practical or scientific test offered by a railroad to further evaluate his or her ability to perform safely. However, since the time FRA last amended part 240, the Food and Drug Administration (FDA), issued the following cautionary information about the use of ChromaGen chromatic lenses:[7]

[6] Hovis, J.K., and Ramaswamy, S., The Effect of Test Distance on the CN Lantern Results. Visual Neuroscience, 23, 675-679 (2006).

[7] Premarket Notification Device Clearance for ChromaGen lenses (510(k) No. 994320), Ophthalmic Devices Panel Meeting Summary for November 8, 2000, Food and Drug Administration, retrieved from

a. ChromaGen lenses do not help wearers to see "new" colors or to perceive or appreciate colors as people with normal color vision do, but merely add brightness/darkness or hue differences to colors that are otherwise difficult or impossible to distinguish;

b. The ability to pass diagnostic color vision tests with ChromaGen lenses does not imply the ability to perform other color vision-related tasks. Therefore, ChromaGen lenses should not be used with diagnostic color vision tests to meet occupational performance requirements; and

c. Persons using the darker shades of tint in their ChromaGen lenses may experience some or all of the following: reduced 10W contrast acuity, reduced illumination at night, distortions in distance perception of moving objects or while driving, distortions of apparent velocity. Wearing darker lenses, especially at night, or under foggy, misty, or other adverse conditions, may make driving an automobile difficult.

Based on FDA's findings, and the fact that railroads generally operate to a degree under similar environmental lighting and weather conditions as operating an automobile, FRA recommends that railroads take a conservative approach.

Railroads should not permit locomotive engineers and conductors that have responsibility to recognize and distinguish between colors of railroad signals to safely perform as locomotive engineers and conductors until data from a valid, reliable, and comparable research study clearly establishes operating conditions when it is safe to use

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http://www.fda.gov/advisorycommittees/committeesmeetingmaterials/medicaldevices/medicaldevicesadvisorycommittee/ophthalmicdevicespanel/ucm124831.htm on Dec. 2, 2014. See also Summary of Safety and Effectiveness: ChromaGen v2.0 Haploscope System, for Color Vision Enhancement (510(k) No. 994320), Department of Health & Human Services Food and Drug Administration, Oct. 20, 2000, retrieved from http://www.accessdata.fda.gov/cdrh_docs/pdf/k994320.pdf on Dec. 2, 2014.

chromatic lenses for that purpose, and then restrict use to those operating conditions. Please note that both the FDA and FRA make a distinction between chromatic lenses and contact lenses manufactured to correct distant, intermediate, and near visual acuity that have a very light blue tint to aid the user in locating, handling, and cleaning the contact lens. Railroads should not prohibit use of those blue-tinted contact lenses during testing and when performing as a locomotive engineer or conductor.

G. Documentation

The railroad medical examiners are required by FRA certification regulations to document the basis for his or her decision that a person can or cannot safely perform as a locomotive engineer or conductor. This includes reports of testing, and should the examiner use optometric or ophthalmologic referral, the report of testing and evaluation from the optometrist or ophthalmologist.

H. Part 240 and 242 Program Descriptions

FRA's locomotive engineer and conductor regulations require each railroad subject to those regulations to have a written visual testing program on file with FRA. Among other things, the certification program must include a railroad's procedure for evaluating the visual acuity of its locomotive engineers and conductors when those train crew members fail to meet the vision threshold criteria provided for in parts 240 and 242. See 49 CFR 240.101, 240.121, 242.101, and 242.117; 49 CFR Part 240 Appendix F, and 49 CFR Part 242 Appendix D. Such procedure is especially necessary to address situations where locomotive engineers and conductors have a history of safe performance that would normally suggest that they have the ability to safely perform their duties. A review of the programs on file with FRA, however, revealed that the railroads do not

sufficiently describe their field testing procedures to allow FRA to determine whether those procedures are likely to produce valid, reliable, and comparable field tests. Thus, each railroad that utilizes field testing procedures should review the best practices provided in this interpretation and update its programs accordingly under part 240 and part 242.

FRA considers this type of program modification to be a "material modification" requiring railroads to submit their revised programs to FRA for review and approval. See 49 CFR 240.103(e) and 242.103(i). Before implementing a change to its field testing procedures, a railroad must submit a description of how it intends to modify the procedures in its program. For part 240 programs, the description of the modification must be submitted to FRA at least 30 days prior to implementation. See 49 CFR 240.103(e). For part 242 programs, the description of the modification must be submitted to FRA at least 60 days prior to implementation. See 49 CFR 242.103(i). The modified program is considered approved and may be implemented 30 days after being filed with FRA unless FRA notifies the railroad in writing that the program does not conform to the criteria set forth in parts 240 and 242. To facilitate the submission of modified programs to FRA, railroads may submit both parts 240 and 242 programs electronically using the procedures described in Appendix B to Part 242 for "Submission by a Railroad."

Attachment A. Best Industry Practices for Conducting Color Vision Field Testing

The following best practices are intended to guide each railroad in designing, implementing, and scoring color vision field testing for locomotive engineer and conductor certification. They are broadly drafted to allow each railroad to develop field testing procedures that will work for its own operational environment and to consider the unique medical circumstances of each examinee tested. Furthermore, these best practices will guide railroads to establish best field testing practices. Of course, FRA recognizes and appreciates that some railroads already follow many of these best practices, and will readily adopt additional best practices that are viewed as making the field test more valid, reliable, and comparable. FRA encourages each railroad to consider adopting all best practices.

(1) Standardize Test Procedures. The railroad's procedures for administering and scoring the test are standardized, and the railroad strictly adheres to the procedures established.

(2) Qualified Supervisor Conducts the Test. The person administering and scoring the field test (testing officer) is qualified to supervise certified locomotive engineers or conductors, as appropriate, and has knowledge of the railroad's field testing procedures.

(3) The Testing Officer's Vision Meets the Regulatory Medical Thresholds. For purposes of administering and scoring the field test, the testing officer meets the medical thresholds in 49 CFR 240.121(c) and 49 CFR 242.117(h).

(4) Record the Test Results During Testing. The railroad uses a standard form or method to record all relevant information. For example, the railroad may design a field

testing form that will prompt the testing officer to record administrative and test data information such as:

a. The date and location of the test;

b. The participants' names and contact information;

c. The number of signals viewed;

d. Which signals were incorrectly identified; and

e. The aspects of each signal encountered.

(5) Capture All Essential Data and Void Tests With Incomplete Data. The railroad should design any standard form or method used so the testing officer must record all relevant information in a manner ensuring that all essential standard procedures for testing have been followed. If a form is required, and it is missing essential data, the railroad must void the test.

(6) Testing Officer Affirms Test Data Accurately Recorded. The railroad may gain an additional level of assurance by requiring the testing officer to sign an affirmation that the testing officer strictly adhered to the railroad's field testing procedures and that the data recorded was accurately documented.

(7) Prior to Test, Inform the Examinee of the Test's Purpose and Procedures. Each railroad should standardize the procedures for informing the examinee of the purpose of the test, what the examinee is required to do during the test, and how test data will be documented and scored. For example, before the start of the test, the testing officer reads a set of instructions out loud and answers any questions. An example of an alternative or additional approach would be to provide a written explanation and test instructions directly to the examinee before the test, either as a separate document

or at the top of a railroad's testing form. The railroad may consider it a timesaver to provide this information to the examinee before the test so less time is spent explaining the testing protocol on the day of the test.

(8) Considerations When Examinee Wears Corrective Lenses. The examinee should be offered the opportunity to wear contact lenses or glasses prescribed by his or her optometrist or ophthalmologist to correct his or her distant visual acuity.

a. Light Blue Tint May Be Acceptable. Please note that both the FDA and FRA make a distinction between chromatic/ChromaGen lenses and contact lenses manufactured to correct distant, intermediate, and near visual acuity that have a light blue tint added solely to aid the user in locating, handling, and cleaning the contact lens. Thus, use of contact lenses with this type of tinting should be permitted.

b. Corrective Lenses Worn During Test Must Be Worn On-Duty, If Certified. The examinee should be warned that the use of any lenses or glasses during a passed test will result in conditioning of the examinee's locomotive engineer or conductor certification on wearing those lenses or glasses.

c. Notify Examinee, Preferably in Writing at Time of Test, What To Do If Corrective Lenses Are No Longer Needed In the Future. If an examinee's certification is conditioned on wearing lenses or glasses, the railroad should notify the examinee in writing that if the examinee's eyes improve, whether on their own or through corrective surgery, the examinee should immediately contact the relevant railroad official who can verify the improved vision and remove the restriction from the certificate and certification records. The

railroad should consider including this information on the copy of the test form provided to the examinee.

(9) Either Prohibit Examinees from Wearing Chromatic/ChromaGen Lenses or Understand Their Limitations and Proceed Accordingly. The FDA has issued cautionary information on the use of chromatic or ChromaGen lenses. Therefore, each railroad medical examiner should understand the limitations of these lenses before deciding whether to allow an examinee to wear them during a field test.

(10) Consider Whether a Vision Condition is Stable or Deteriorating. Both examinees with stable vision deficiency conditions and those with deteriorating vision may pass field tests, but that does not mean a railroad, or its medical examiner, should treat these examinees in the same manner. FRA's regulations permit a railroad's medical examiner to consider an examinee's known medical condition, and find that the person either cannot be trusted to operate safely given the volatility of the condition or recommend that the examinee's certification be conditioned on more frequent medical or field testing vision testing than the minimum FRA mandate of every 3 years.

(11) Design Tests With Validity, Reliability, and Comparability.

a. Validity to the Examinee's Expected Duties. The railroad should design the test so that the examinee is tested on railroad signal indications the examinee will be expected to recognize and comply with as part of the examinee's typical locomotive engineer or conductor duties. The railroad should require the testing officer to allow the examinee an attempt to recognize signal aspects or indications within the same timeframe, at the appropriate sight distances, as

the examinee would be expected to recognize the signal under actual operating or working conditions. Because the field test conditions should reasonably match actual operating or working conditions, the test should be performed outdoors. The examinee may be either on a moving train, positioned in a stationary locomotive, or standing on the ground at distances from a signal or other object that the person must see and recognize to perform safely as a locomotive engineer or conductor.

b. Assess Content Validity.

i. Conduct Test On Actual Working Conditions. The railroad should generally administer the test over territories where the examinee has previously demonstrated knowledge of the physical characteristics and will continue to work, if certified. If this is not feasible or practical, the tests should generally be administered over territories where the examinee will be expected to work upon being certified or recertified, to the extent possible. Under all conditions, the tests should be administered to replicate actual operating conditions that the examinee will encounter as a certified locomotive engineer or conductor.

ii. FRA Does Not Require System-Wide Certification, Restrictions Permitted. A railroad should not test the examinee on every possible railroad signal indication on the system if the examinee has previously been limited to yards, divisions, or other territories where the examinee would only encounter a subset of the types of signal indications found system-wide and the examinee has demonstrated a

positive safety record. Moreover, the examinee's certification should be restricted to that limited work arrangement.

iii. Consider Whether a Person Works in Dark Territory or is Not Required to Recognize Signals. Not all railroad employees are assigned responsibility by a railroad to recognize and distinguish colored railroad signals. For those employees, providing a field test that requires recognition of colored railroad signals would not be a valid test. Rather, the field test in that instance should focus on whether the employee can safely perform his or her duties. For example, the field test may require the employee to identify blue signals or roadway worker flags.

iv. If Expanding Examinee's Actual Working Conditions, Provide Rationale. If a railroad intends to implement a system-wide type test for an examinee who has not previously worked system-wide, the railroad should provide its rationale for doing so. It is not acceptable for a railroad, or its medical examiner, to inform an examinee that the railroad must ignore a demonstrated positive safety record with a limited work arrangement because FRA's regulations apply a stricter standard, as that is not a true statement.

c. Reliability.

i. Signal Sequence Should Not Be Predictable. The railroad should consider the sequencing of railroad signal indications to remove the likelihood that an examinee could pass the test by predicting each

signal with an educated guess. For instance, signals that predictably follow a particular sequence familiar to the examinee should be avoided. A qualified supervisor should know where these sequenced signal indications may occur and either avoid them for testing purposes or arrange for them to display an uncharacteristically different sequence of signal indications.

ii. Remove Chance Guesses By Testing Each Signal Multiple Times. The railroad should consider the number of signal indications viewed to remove the likelihood that an examinee could pass the test by chance guess. Statistics suggest that a minimum of 3 to 6 repetitions of the same signal indication may be necessary to avoid the chance that an examinee can pass with guesses. A railroad may certainly consider additional repetitions of a signal indication if it is designed to probe an examinee's ability to correctly identify signal aspects that a person with the examinee's known color vision deficiency is likely to confuse with another aspect.

iii. Signal Aspects Must Be Actual Signals or Similar, And In Good Working Condition. The blue flag, sign, or signal light used in testing must be of similar size and chromaticity[8] to the actual signal the person must recognize to safely perform locomotive engineer or conductor duties. For example, an unacceptable field testing practice

[8] *Chromaticity* means the colors (single or multiple) of light emitted by a railroad color-light signal or color-position light signal, specified as x-y or x and y chromaticity coordinates on the chromaticity diagram according to the 1931 Commission International d'Éclairage (CIE) Standard Observer and Coordinate System Railroad Signal Colors. The CIE is a professional organization recognized by the International Standards Organization as an international standardization body regarding illumination.

is use of colored light bulbs that do not have similar size, chromaticity, and transmittance as colored lenses of railroad signals on the railroad systems on which the examinee is expected to perform as a locomotive engineer or conductor. Another unacceptable field testing practice is use of a railroad signal that has an incandescent light source to test an examinee on a safety-critical signal aspect that would typically be displayed by a signal with an LED light source. Similarly, it would be unacceptable to conduct a test with a well-worn, faded blue flag.

iv. Consider Daylight, Darkness, and Weather Conditions to the Extent Those Factors Might Skew the Test Results. The railroad's procedures should allow a medical examiner to inform the testing officer that a particular examinee must be tested at night (i.e., under darkness) or during the day with bright sunshine, or under some other condition, so that the test can appropriately focus on the examinee's known color vision deficiency found during the initial medical testing and will be an accurate indicator of whether the examinee can safely perform anticipated locomotive engineer or conductor duties. For most people, signal visibility will be the greatest at night and more challenging during the daytime in bright sun when the sky is clear. Field testing conducted at sunrise or sunset may pose a greater likelihood that severe glare could skew test results such that it would be difficult for individuals with normal color vision to identify a signal indication or aspect. FRA's regulations do not prohibit a railroad from

requiring multiple field tests under different operating or working conditions, and certainly some examinees will warrant such testing based on their known vision deficiency. Likewise, if a test is conducted during a snowstorm, rainstorm, fog, or other weather conditions that would inhibit a person's vision, acceptable sight distances should be adjusted accordingly, and in some instances, may suggest that a test cannot be verified as reliable and should be voided.

d. Comparability.

i. Implement Procedures To Address Bias Accusations. To effectively address accusations that a particular test was unfairly designed, implemented, or scored, a railroad should allow the examinee to bring along a volunteer witness of the examinee's choosing, and all participants, including witnesses, should be afforded an opportunity to record their observations regarding whether testing procedures were followed and the conditions under which the test was conducted. The testing officer should have a standard method that will capture the names and contact information of any witnesses who observe the test, and the railroad should permit the examinee and any witnesses an opportunity to submit their observations in writing for direct review by the railroad's medical examiner. The railroad should provide the medical examiner with the authority to void any test in which the examinee or another witness makes a substantial showing that bias or

prejudice may have led to a test failure and, in such a situation, request that a new test be conducted with a different testing officer.

ii. Create Adequate Records and Provide to Examinee. Because an examinee who fails a field test and is subsequently denied certification or recertification may request FRA to review that decision, each railroad should be prepared to provide the examinee with the results of any field tests. A railroad should consider developing a method or protocol by which the testing officer offers a copy of the completed test form to the examinee upon completion of the test. The railroad may want the testing officer to record on the form whether the examinee was offered a copy of the form, and whether the examinee accepted receipt. The form may also include a signature line for the examinee to acknowledge receipt of the completed test form.

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