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MEMORANDUM

TO: Jennifer Lloyd, P.E.

Director of Roadway Design and Aerial Survey

FROM: Ali Hangul, MS, P.E.

Assistant Director of Roadway Design and Aerial Survey

DATE: October 15, 2021

Subject: Review of ADA Detectable Warning Surface Color

Our Office has received several design exception/waiver requests regarding our standard requiring newly constructed and retrofit ADA curb ramps have detectable warning surfaces that are Federal Yellow in color. This requirement applies to all projects developed or funded by the department including local program projects that involves TDOT funding. To manage and respond to design exception/waiver requests effectively, the ADA Office conducted a comprehensive review regarding the use of Federal Yellow with detectable warning surfaces installed for visually impaired pedestrians.

Background

The ADA Office review consisted of researching more than a dozen technical reports, expert articles, and studies on the topic of detectable warnings and human vision. Additionally, TDOT reached out to members of Tennessee RPO/MPO, other state ADA Coordinators, and disability organizations.

Executive Summary

The conclusion of this review is Federal Yellow provides several benefits over other colors for a detectable warning surface. Federal Yellow color provides very good *contrast* against **all** common sidewalk surfaces including brick, concrete, and asphalt. Federal Yellow provides superior *visibility* in different lighting and weather conditions. Federal Yellow color also effectively communicates a warning to

pedestrians. While there may be situations where other colors such as white, red brick, or black (the least desirable color) meet the technical requirements of PROWAG R305.13, our position remains there are reasons beyond simple contrast to justify our policy of exclusively using Federal Yellow.

Review Findings

This ADA review consisted of reviewing available studies, standards, and other applicable documents. The most comprehensive and useful was a synthesis concerning the use of Federal Yellow on Detectable Warning Surfaces. Compiled by Eugene Lozano Jr. in May of 2020, it includes numerous articles, studies and standards concerning the use of Federal Yellow. His summary and conclusion are as follows:

> "There are several reasons for using federal yellow (also referred to as safety yellow) for detectable warning (DW) surfaces and detectable directional texture (DDT). Physiologically, yellow is near the peak of the human photopic luminosity function, and thus is the color that appears brightest to the human eye. Yellow is quite distinctive in its color appearance, so that it is easily recognized. When using a DW surface and DDT, yellow is likely to be distinct and easily differentiated from its immediate background. This is because yellow or colors close to it are rarely used for walking surfaces. Alternative warning colors, such as black or white, are more likely to lose conspicuousness against certain commonplace backgrounds, as walking surfaces are most commonly of neutral colors. Federal yellow is an unusual color to encounter in one's environment, which invariably denotes risk, warning, and the need for caution."

Additionally, this synthesis refers to studies, articles, and standards which reinforce these points. A summary of the most noteworthy points listed below.

- Yellow is universally recognized as a color to indicate a warning and caution signs and alerts for physical hazards. *International Organization for Standardization. (2011). Graphical symbols -Safety colors and safety signs - Part 1: Design principles for safety signs and safety markings (ISO3864-).*
- Yellow detectable warnings were found to be an excellent color for partially sighted individuals and could be seen at the farthest distances *Chandler, M. (September/October 2004). Testing Truncated Domes.*

- In a 2007 study Federal Yellow was found to be the best color across against different materials (concrete, asphalt, and brick (red)) *Jenness, J. and Singer, J. (June 30 2007). Visual Detection of Detectable Warning Material, Technical Brief. Westat, Rockville, MD. Federal Highway Administration, Washington, DC.*
- In both daylight and in low light conditions yellow is at or near the most visible color to humans. In daylight Yellow is second only to Green, but in low light, Yellow is the most visible color as the photoreceptor rods within the human eye take over. *Sanders, A. (April 24, 2017). What Are the Most Visible Colors From a Distance?*
- In 2011 the American Council of the Blind issued a Resolution that stated in part that detectable warnings should be Federal Yellow in color. *Detectable Warning Specification: Resolution 2011-06*

Conclusion

The department's first and most important objective is to provide safe and reliable transportation facilities for all users, both able bodied and those that have disabilities. The department strives to develop and deliver projects with clear and consistent regulatory pavement markings and signs as well as needed warnings. The sole purpose and priority of installing detectable warning is to provide a surface that is easily identified when approaching a hazard within the pedestrian path of travel. For these reasons the department will continue to use the Federal Yellow exclusively for our detectable warning surfaces and will only consider exceptions that provide superior safety benefits.

cc:
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Local Programs Office, Program Development and Administration Division
RPO/MPO Coordinators, Long Range Planning Division
TN Blinds Association