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Future Truck Program Position Paper: 2004-3

Future Driver Vision

Equipment User Expectations for Vision When Driving Heavy Trucks

Developed by the Technology & Maintenance Council's (TMC)
Future Cab Task Force

ABSTRACT

Many accidents and near misses are blamed on "driver error" when in reality the root cause often is a lack of adequate vision. This TMC Future Truck Position Paper defines the vision needs of drivers and encourages the commercial vehicle industry to develop standards that will ensure consistent, reliable, and functional solutions to the vision problems experienced with current trucks (even new models). The industry must develop performance-based standards to ensure that trucks of the future are safer to drive and provide the driver with the vision needed to make correct driving decisions.

INTRODUCTION

This TMC Future Truck Position Paper focuses on the vision needs of drivers of commercial vehicles (tractor-trailer combination units, straight trucks, delivery vans, etc.). The paper builds on the previously published TMC Position Papers or Information Reports:

- Future Driver Interface
- Innovation in Future Truck Cab Designs
- Future Cab Study

This paper is the result of work done by TMC's Future Cab Task Force in analyzing and prioritizing the issues identified in the discussion of a previous TMC Future Truck Focus Group. These issues were summarized in TMC's 2001-3 Information Report, "Future Cab Study Summary Report From Focus Group Activity."

TMC surveyed its fleet members to obtain clarification and amplification of the broad summary of cab concerns noted in the Focus Group. In reviewing the survey results, the Future Cab Task Force noted that over half of the prioritized "top 10" concerns related to issues involving the truck driver's ability to see adequately while driving.

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This position paper has therefore been prepared to communicate the severity of these vision issues, demand action to address these issues, and suggest some initial steps.

ISSUES

There are a number of issues prohibiting or limiting the adequate vision drivers need to maneuver commercial vehicles. Fleets are very concerned about the driver's restricted ability to see both looking forward (direct vision) and rearward (indirect vision). These restrictions are due to the physical design of vehicles (dimensional obscurations) and inclement weather conditions (environmental obscurations). Glare caused by bright sun reflections in the daytime and headlamp reflections at night is of significant concern to fleets. Overall, fleets have expressed to TMC a clear need for improved safety by a significant increase in what the driver can see (field of view).

Manufacturers have made improvements with some of the dimensional obscurations by designing sloped aerodynamic hoods, larger windshields, increased the overall window openings ("daylight openings" or DLO), added observation windows, and improved mirror systems. There has also been some development of supplemental devices to help the driver detect if something is in a "blind spot." While these actions are to be applauded, much more needs to be done.

Manufacturers and suppliers have also been active in developing ways to deal with the environmental obscurations such as adding treatments to mirror and glass surfaces (hydrophilic and hydrophobic), improving heaters, adding wipers, and managing air flow better to reduce eddy currents. Cameras and object detection systems are other examples of efforts to help solve the vision problem.

Manufacturers and suppliers have also attempted to address glare problems. New interior trim and instrument panel designs involving new materials are examples. The addition of tinting and/or electronic dimming of mirrors have also been advocated.

While work has been done to help address some of the vision problems, the industry still produces vehicles that do not permit drivers to see all they need to see. Nor have cost-effective and reliable supplemental devices reached the stage of mandatory equipment. Manufacturers can legally sell commercial vehicles with small DLOs and small mirrors (50 square inches) with the only mandatory requirement that the mirrors be positioned for "rearward view."

TMC believes that the time has come for the commercial vehicle industry to establish voluntary standards that will ensure drivers can see (or at least have a warning) completely around the vehicle they are driving.

VISION TARGETS

TMC's Future Cab Task Force divided vision needs into six areas, each with unique vision issues and requirements:

- **Zone A** – Area directly in **front** of cab.
- **Zone B** – Area in the **left** adjacent lane from the driver **forward.**
- **Zone C** – Area in the **right** adjacent lane from the driver **forward.**
- **Zone D** – Area in the **left** adjacent lane from the driver **rearward.**
- **Zone E** – Area in the **right** adjacent lane from the drive r**earward.**
- **Zone F** – Area directly **behind** the truck or trailer.

These zones are shown in **Figure 1**.

TMC has previously communicated the need for the driver to see 360° around the vehicle being driven. TMC's Future Cab Task Force proposes specific vision targets provide a method of measurement to ensure adequate vision.

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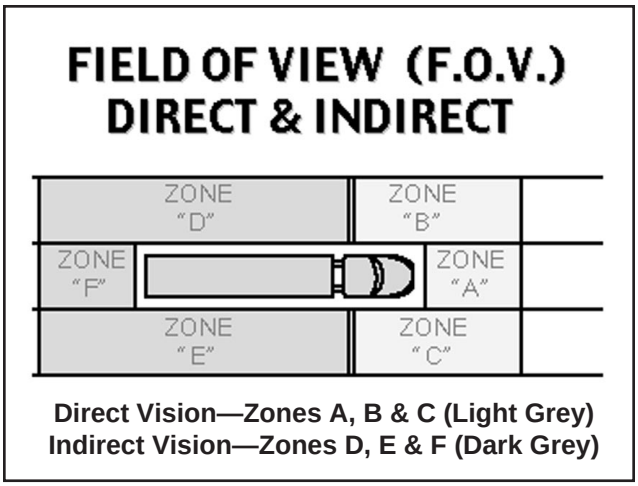

Figure 1

The vision target is defined as a cylinder one meter high and one half meter in diameter. These vision targets must be observable by the driver while sitting in the driving position. The vision targets will be placed in the key locations as described below and shown on **Figure 2**.

1. Six in front of the cab.
   - Located at outboard edges and centerline of vehicle.
   - Positioned one meter and two meters forward of front bumper.
2. Two adjacent to the front axle (both sides).
   - Located in line with axle.
   - Positioned at edge and on centerline of adjacent lanes.
3. Two adjacent to the second set of axles (when applicable).
   - Located in line with axles.
   - Positioned at edge and on centerline of adjacent lanes.
4. Three adjacent to the rearward most set of axles.
   - Located in line with axles.
   - Positioned at near edge, centerline, and far edge of adjacent lane.
5. Six target behind the truck or trailer.
   - Located on both edges and centerline of lane.
   - Positioned one meter and four meters from rear trailer or truck.

These vision targets apply to all commercial vehicles and are not limited to Class 8 combination vehicles or trucks.

In addition to defining an acceptable field of view with these vision targets, the following requirements are suggested to be considered as minimum requirements:

- Dimensional blockage shall not exceed a five degree arc when measured from the driver's eye point.
- Vehicles must have a method of controlling glare:
  - No bright sunlight reflections.
  - No night time interior lighting reflections of windshields or side glass.
  - No distracting indirect glare.

RECOMMENDED ACTION

TMC's Future Truck Committee recommends that manufacturers, suppliers, and equipment users collaborate on developing voluntary industry standards that will ensure adequate vision for the truck driver. TMC is proposing the vision targets described above as a starting point to stimulate this action. These voluntary industry standards may evolve into something different from these suggestions but they must equal or exceed these performance objectives. ❑

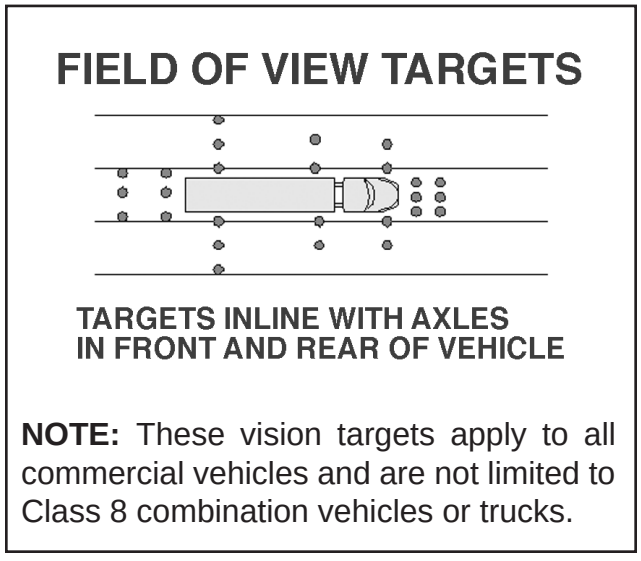

Figure 2

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