OVERVIEW ON FLEET SAFETY TECHNOLOGY AND VEHICLE SPECIFICATION

AIGA 119/22

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Acknowledgement

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Some of the pictograms in Appendix-A of this document are taken from 'Transport For London – HGV Safety Permit Guidance' for operators entering London and thanks are hereby given to Transport For London for permission granted for the use of their document.

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1 Introduction

Commercial vehicle transportation is one of the highest risk activities in the industry. Various causes of incidents involved range from occupational safety such as drivers stepping into or out of the cabin resulting in slip and fall, during road transportation whereby contributing factors could be human behaviour (e.g. fatigue and distraction, lack of defensive driving knowledge), third party road users, defective transport equipment and lack of fleet safety technology to aid the drivers or transport management to reduce the risk of such incidents.

Over the years, Asia Industrial Gas Association (AIGA) has published various documents range addressing fleet transportation safety and maintenance including hosting webinars.

This document objective is to compile and present the overview on fleet vehicles safety specification and technology as well as to provide links to current documents that had been developed by AIGA and European Industrial Gases Association (EIGA).

This information will guide the fleet engineer to define the purchase specification for their future fleets, enhancing road safety, efficiency and driver comfort.

2 Scope

This document scope primarily focus on the dangerous / hazardous goods commercial vehicle transport which can be further sub-categorise as follows

a. Prime mover
b. Rigid tanker and cylinder trucks
c. Semi-trailers and trailer chassis for ISO containers and cylinders trailers.

The fleet engineers are responsible to ensure that the vehicles specification and gross vehicle weight (GVW) comply with the country transportation regulation where it is in service.

Photographs on above vehicle terminology are reference in Appendix B.

3 Definitions

For the purpose of this publication, the following definitions apply.

3.1 Publication terminology

3.1.1 Shall
Indicates that the procedure is mandatory. It is used wherever the criterion for conformance to specific recommendations allows no deviation.

3.1.2 Should
Indicates that a procedure is recommended.

3.1.3 May
Indicates that the procedure is optional.

3.1.4 Will
Is used only to indicate the future, not a degree of requirement.

3.1.5 Can
Indicates a possibility or ability.

3.2 Technical definitions

3.2.1 Prime mover
A heavy duty truck, which is the front part of a semi-trailer, commonly known as “tractor” in United States of America (USA). The prime mover connects to the semi-trailer or a trailer chassis for ISO container via the 5th wheel plate and king pin for haulage.

3.2.2 Rigid tanker and cylinder trucks
Design is similar to a prime mover, with exception that it has longer wheelbase, and the cryogenic vessel is mounted and secured onto the rigid tanker main frame chassis.
For cylinder trucks, a platform based on the vertical cylinder handling design is incorporated onto the rigid chassis. Refer to AIGA 038, “Vertical cylinder handling and transportation”.

3.2.3 Semi-trailers and trailer chassis
Does not have a front steering axle and the forward end (King Pin), is attached to the prime mover 5th wheel plate.

3.2.4 HGV
HGV stands for Heavy Goods Vehicles

3.2.5 VRU
VRU stands for Vulnerable Road Users

3.2.6 Wheelbase
Wheelbase is the horizontal distance between the centers of the front and rear wheels. For road vehicles with more than two axles (e.g. some trucks), the wheelbase is the distance between the steering (front) axle and the CenterPoint of the driving axle group.[1]

4 Recommended technical specifications for Heavy Goods Vehicles

4.1 Prime movers / rigid tankers

The following list a summary of safety equipment or system that are either legally required / comply to or should be considered when purchasing new vehicles or upgrading / refurbishing existing vehicles. This summary table (see Table 1) is primary focus for the prime movers / rigid tankers.

Due to the fact that transport safety systems or equipment are continually developing, this list is not exhaustive.

Table 1: HGV safety equipment and systems

S/No	Item	Description / Comments
1	ABS	Anti-lock Braking System (ABS) prevents the wheels from locking if the brakes are applied with too much force or the road conditions provide too little traction.
2	Acoustic warning device (horn)	This feature enable the driver to warn his surrounding of danger.
3	Active front collision avoidance	This system uses advance artificial vision intelligence to detect and identifies potentially dangerous situation and provides audio-visual warnings to driver of possible collision and may remote intervene to brake the vehicle.
4	Adaptive (Active) cruise control	Keeps the vehicle at a constant speed when activated and adjusts the speed depending on the proximity as the vehicle comes closer to slower moving vehicles ahead of it. *Note: Driver may be complacent using ACC and lost focus on his surrounding which may result in rear end collision.*
5	Adjustable driver seat	Vehicles seats must have adjustment for driver's height and reach. This improve ergonomic and promote non-constraining driving position.
6	Aerodynamic fairing of the prime movers	Side fairing between the axles and at the driver's cab including roof spoiler, increase fuel efficiency.
7	Air bags	Airbags keep driver or passengers' safe in the event of a front collision. New technology of airbags include side curtain airbags that inflate instantaneously in the event of a roll over that may help to reduce the risk of drivers or passengers injuries crushed by their own vehicle.
8	Audible reversing warning	Alerts pedestrians, cyclist / motorist to reversing vehicle.
9	Audible vehicle manoeuvring warning	Alerts pedestrians, cyclist / motorist to vehicle turning left or right.
10	Automated transmission	Provides flexibility between automatic or manual changing which can reduce distraction for driver in heavy traffic and dynamic road conditions.
11	Battery isolator switch	Vehicle safety and security for transporting dangerous and / or hazardous goods as classified by UN Model Regulations, fitted to ADR FL approved vehicle. The function of this device is to prevent current drain and is sufficiently charge to start the engine.
12	Blind spot sensor	Blind spot sensor systems alert the driver to obstacles in his blind spots.

S/No	Item	Description / Comments
13	Blind spot signal / decal	Warning signage to indicate blind spot of heavy trucks and to warn motorist, especially pedestrians and two wheeler the danger.
14	Bluetooth radio AM/FM	The Bluetooth radio AM/FM are able to sync with the driver handphone. In the event of fatigue detected, the supervisor could call the driver and instruct him to exit at the nearest R&R to take a rest. Note: can cause distraction and should use with care.
15	EBS	Electronic Braking Systems (EBS) is the later generation of braking to the older ABS systems.
16	Emergency brake assist (full brake detected)	Electronically increases braking pressure when the driver executes a full brake.
17	Engine or exhaust brake / retarder	Supplementary, wear free braking assistance device.
18	ESC	Electronic stability control (ESC) helps control the traction of the vehicles by automatically adjusting the individual wheels speed.
19	External pictorial stickers on heavy trucks vehicle warning.	To warn other road users of the hazard around the heavy vehicle
20	Fatigue and distraction	A stand-alone In Cabin Camera (ICC), this technology monitors the eye movement / eye lids closed position duration to determine the road alertness of the driver and provides an audible alarm and a sensory alarm via vibration seat cushion at the driver's seat.
21	Fifth wheel plate rating	To verify the 5^{th} wheel plate imposed load and D-value are rated for the maximum GVW (gross vehicle weight) of the trailer to be haul in that region of operation.
22	Fire extinguisher	This are usually dry power fire extinguisher, securely fitted. Their capacity and quantity shall comply with local regulation requirement where the vehicle operate. In cabin fire extinguishers should be located at easy to reach by driver in the event of a fire. Recommended location is next to driver seat / door panel or behind driver seat.
23	Heating / cooling air system	Helps keep the cabin in suitable condition concerning temperature. A faulty cooling system could result in fatigue and distraction driving condition.
24	High visibility (conspicuity) markings	All necessary high visibility or conspicuity markings or decal to improve the visibility of the vehicle.

S/No	Item	Description / Comments
25	In cab camera (ICC) or on-board video event recording cameras	Permanent or event triggered video recording. Using DVR – digital video recording technology to record road safety events and driver driving behaviour.
26	King pin safety devices	Warning devices that can assist the driver in the correct coupling procedures.
27	Lane departure warning	This technology can emit an acoustic signal or vibration within the steering wheel that warns the driver when he unintentionally drifted across a lane or leaves a lane without indicating.
28	Lifting axle	Actuates on the air bellows of the axles to redistribute load to other axles in order to improve manoeuvrability of the vehicle.
29	Lighting system	All necessary lighting (according to legislation) helps the driver see his surrounding and improves the visibility of the vehicles. Note: Additional non-mandatory lighting (e.g. xenon lights) can further improve safety.
30	Mirror cam	The two side mirrors disappear and are replaced by cameras with internal screens.
31	Mirrors	Mirrors help the driver improve his all-round view. *Note: Mirrors are mandated by legislation. Additional non-mandatory mirrors can further improve safety.* Direct vision blind spot mirrors are encourage to be install. • Class V – provide driver with nearside or kerbside blind spot view • Class VI – provide driver with front blind spot view Fresnel lens – a clear thin plastic lens that is pressed fitted to the passenger door window provide an extra downward view of the blind spot to the truck drivers.
32	Non-slip throttle, brake and clutch pedals	Assist vehicle control – especially in wet conditions.
33	Power steering	Assist manoeuvrability at slow road speeds.
34	Power steering wheels	Vehicles should be equipped with power steering to aid driver on ergonomic and promote non-constraining driving position.
35	Proximity sensors or cameras	Indicated distances to objects / obstructions. Aids manoeuvring in congested high risk environments where vehicles operate in close proximity to other vehicles and people.

S/No	Item	Description / Comments
36	Radio with AM/FM	To receive traffic / weather bulletins. Note: Can cause distraction and should use with care.
37	Rear under-run protection	Prevention of smaller vehicles travelling beneath the vehicle during rear end collision.
38	Seat Belt criteria	The driver and passengers seats shall be fitted with lap and diagonal seat belts (3-point seat belt). The seat belt shall have a high visibility colour. Seat belt ensure protection during deceleration or in case of accidents.
39	Seats with head restraints	The seats for the driver and passenger should be fitted with a head restraints safety feature. Head restraints minimize the whiplash in the event of an accident.
40	Side under-run protection	Prevention of cyclists and smaller vehicles travelling beneath the vehicle during side collision. It should be fitted on both side of the vehicle.
41	Sleeper bunks safety restraints	Sleeper bunks shall be equipped with safety restraints (e.g. safety net) to provide personnel protection for the co-driver who might be sleeping.
42	Speed limiter	Prevents excessive road speeds. *Note: This is the speed limiter installed by the vehicle manufacturer according to national legislation and not the limiter which can be activated by the driver.*
43	Statutory requirement	The prime mover / rigid tanker shall meet all legal requirement for the countries of operation including emission standards.
44	Tyre pressure monitoring system (TPMS)	System to inform when the tyres are on low pressure. Besides checking the tyres pressure, the TPMS is able to check the tyres temperature and can help pre-empt a tyres fire.
45	Vehicle doors – 2 x grab handles and 3 point entry	Vehicle doors to be equipped a minimum 2 grab handles to facilitate 3-point entry into the vehicle cabin safely as well when demounting.
46	Vehicle Telematics (On-board computer – OBC)	Records driving, road speed, harsh braking, resting hours to control driver fatigue and etc. Can help analyse and improve driving behaviour. Note: Supervisor can have interaction with drivers via the current OBC platform upon detecting the fatigue.

4.2 Semi-trailers and trailer chassis for ISO containers

It is important to note that for some semi-trailer and trailer chassis safety systems must be supported by the prime mover safety systems, for example, ABS and RSS.

Table 2: Semi-trailer and trailer chassis safety equipment and systems

S/No	Item	Description / Comments
1	ABS	Anti-lock Braking System (ABS) prevents the wheels from locking if the brakes are applied with too much force or the road conditions provide too little traction.
2	Anti-tow	System that avoids movement of the trailer when a loading or unloading procedure is taking place.
3	Blind spot decal	Located on kerb side and rear of the vehicle and to alert vulnerable road users of the danger.
4	High visibility (conspicuity) markings / tapes / decals	All necessary high visibility or conspicuity markings / tapes / decals improve the visibility of the vehicles and should also follow country code regulation.
5	Landing legs	Support the trailer from cantilever tip over when the prime mover is decoupled from the trailer. Heavy duty rated and both legs should be lower in tandem.
6	Lightings	All necessary lighting especially at rear (compliance to local legislation), helps the driver to see his surrounding and improves the visibility of the vehicle at night.
7	Rear axle steering	Improves the manoeuvrability of the trailer at customer sites or when driving through narrow or winding streets.
8	Rear collision avoidance	System that aids the driver during reversing manoeuvres with warning and active braking, that bring the vehicle to a complete stop if when system detect it is deem necessary.
9	Rear under-run protection	Prevention of smaller vehicles travelling beneath the vehicle during rear end collision.
10	RSS	Roll stability support systems for trailers that incorporate ABS function and help to mitigate potential roll over. It automatically applies trailer brake to reduce the risk of a roll over.
11	Securely fitted fire extinguisher	To extinguish minor fires. Their quantity and capacity should follow country code regulation.
12	Side marker turn indicator or signal indicator	To alert / warn motorist / two wheeler to vehicle turning left or right.
13	Side under-run protection	Prevention of cyclists and smaller vehicles travelling beneath the vehicle during side collision. It should be fitted on both side of the vehicle.
14	Step treader	Non-slipped platform with minimum 350mm width and 700mm length (compliance to local legislation) located at the rear chassis to aids the driver to be able to step up and operate the rear cabinet valves.

5 References:

[1] AIGA TP 18, *Roll over prevention* www.asiaiga.org

[2] AIGA TP 16, *Driver fatigue management* www.asiaiga.org

[3] AIGA TP 10, *Safe driving in bad weather conditions* www.asiaiga.org

[4] AIGA SP 03, *Driving distraction due to use of mobile phones* www.asiaiga.org

[5] AIGA SP 04, *Driver distraction due to use of mobile phones, series 2* www.asiaiga.org

[6] AIGA SP 02*, Driver fatigue series 2* www.asiaiga.org

[7] AIGA SP 01, *Driver fatigue series 1* www.asiaiga.org

[8] AIGA SB 20, *A guide on minimum safety requirement for customers pick up vehicles* www.asiaiga.org

[9] AIGA SB 10, *Prevention of accidents due to overheated or burning tyres* www.asiaiga.org

[10] AIGA SB 08, *In cab camera and how does it help to improve road safety* www.asiaiga.org

[11] AIGA 102, *Safety guidelines – Prevention of truck wheel detachment* www.asiaiga.org

[12] AIGA 092, *Prevention of tow-away incidents (harmonised publication)* www.asiaiga.org

[13] AIGA 043, *Transport safety guidelines* www.asiaiga.org

[14] AIGA 038, *Vertical cylinder handling and transportation* www.asiaiga.org

[15] EIGA Info TS 09/19, *Vehicle Specification and Maintenance*. www.eiga.eu

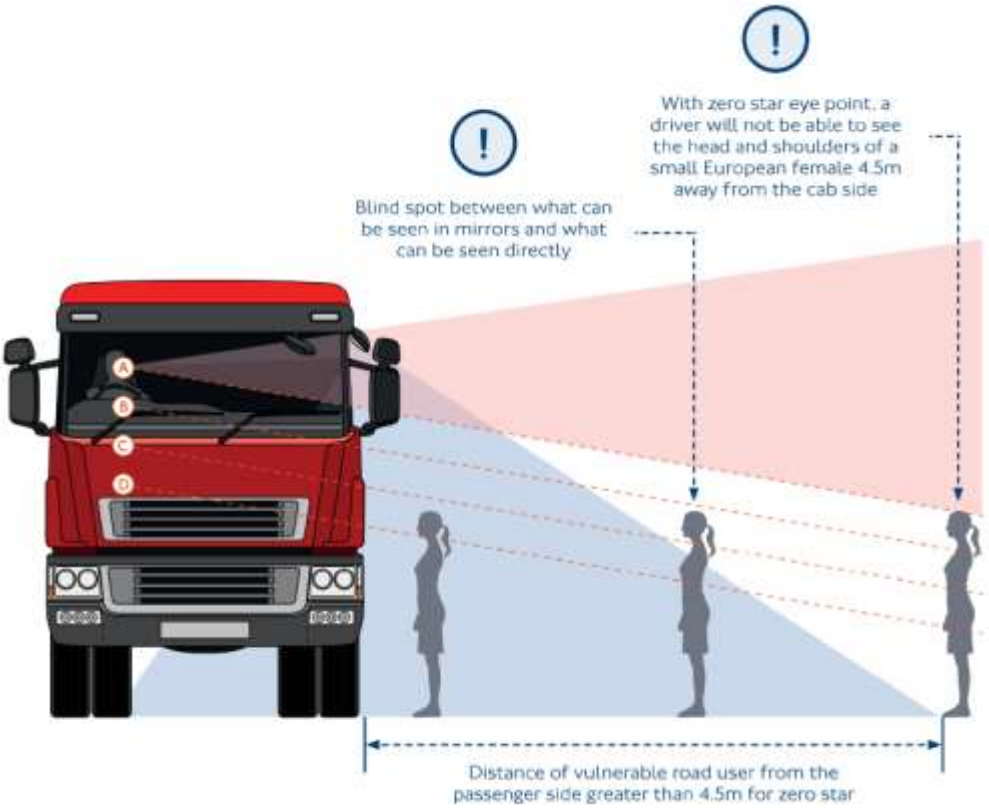
[16] '*Transport For London – HGV Safety Permit Guidance' Appendix A* – Pictograms https://tfl.gov.uk/

6 Appendix A - Pictograms

a. Good direct vision

b. Poor direct vision

c. Distances of vulnerable road users from passenger side greater than 4.5m for zero star



Star rating	Description
A	Zero star eye point
B	One star eye point
C	Three star eye point
D	Five star eye point

d. Class V and Class VI mirror

Class V mirror

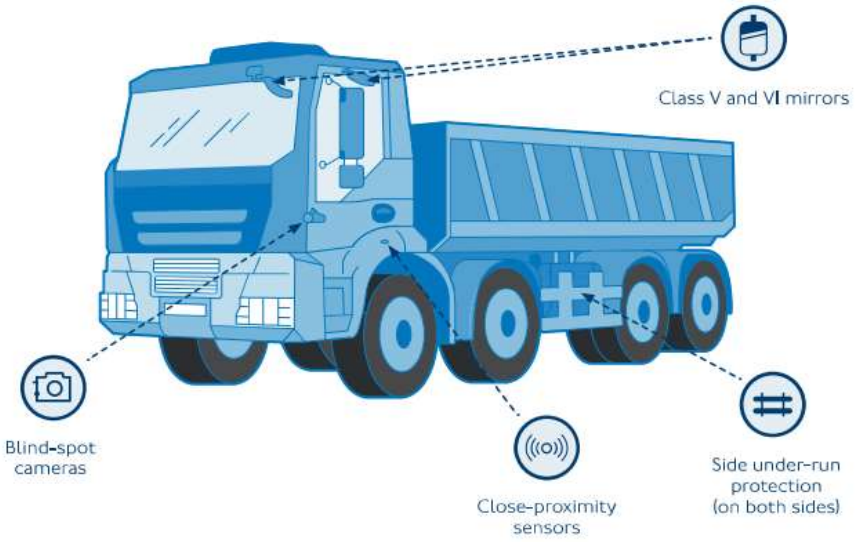
Class V mirror shall be fitted to the nearside of the vehicle

Class VI mirror

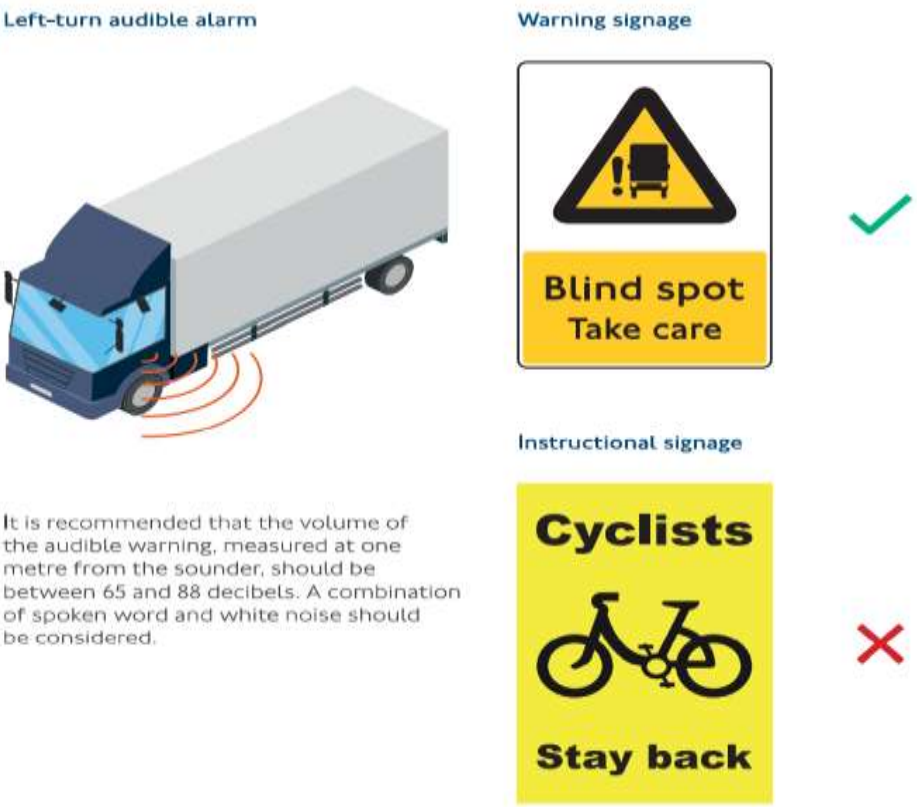
Class VI mirror shall be fitted to the front of the vehicle

e. Fresnel lens

f. Blind spot cameras, close proximity sensors, side under-run protection for both sides



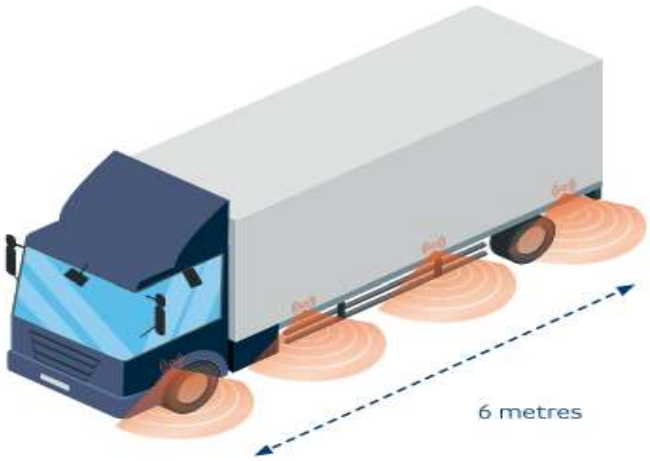
g. Audible alert for vehicle turning left, prominent pictorial warning signage



h. Side under-run protection / side guards

i. Sensors system with drivers alerts

It is recommended that sensors on rigid vehicles and articulated tractor units have coverage six meters down the nearside or one meter from the rear of the vehicles (prime mover unit) whichever is smaller.



7 Appendix B - Photographs on vehicle terminology

a. Prime Mover

b. Rigid Truck

c. Cylinder Trucks

d. Semi trailers

e. Trailer chassis