



10 APRIL 2019

Transport for London's Bus Safety Standard

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EVERY JOURNEY MATTERS

Today's reality

Bus collisions

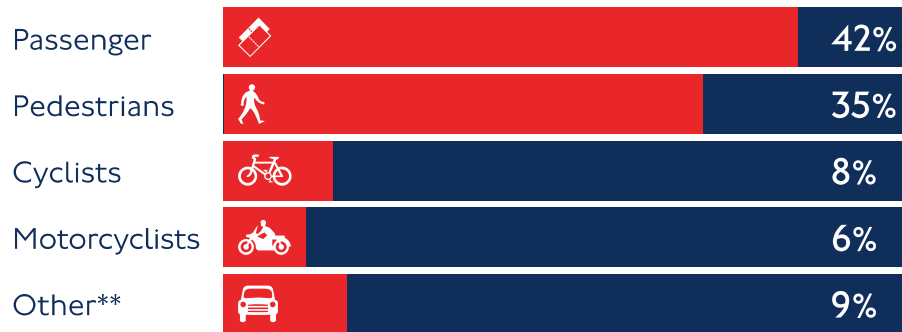
11

people killed
by a bus in 2017

269

people seriously injured
by a bus/coach in 2017

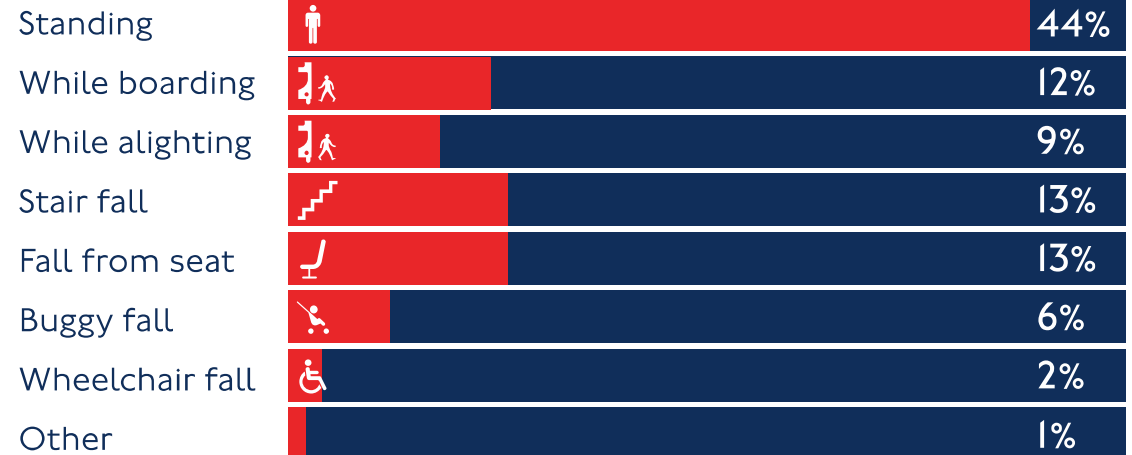
Of those killed or seriously injured in collisions:



On board

3,074

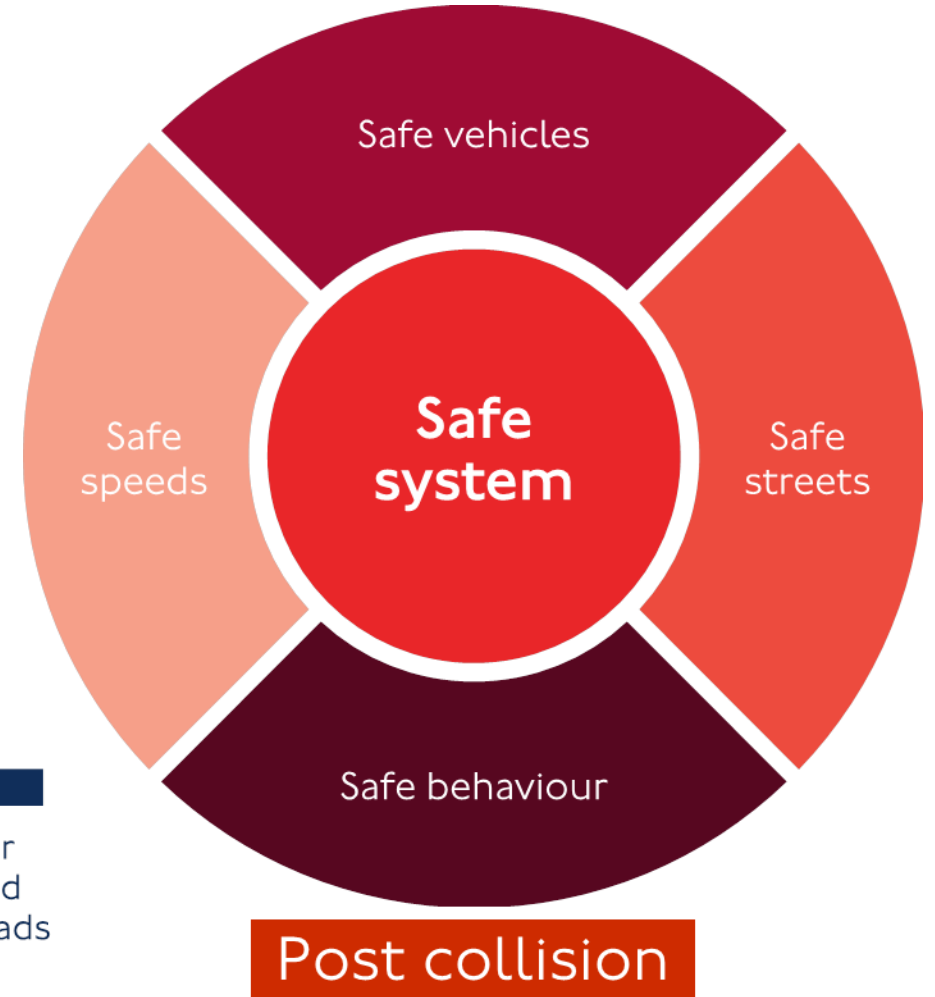
slips, trips and falls
on buses in 2017



Vision Zero for Buses

Loss of life and serious injuries are not acceptable nor inevitable.

0



Countdown to Vision Zero

2022

2030

2041

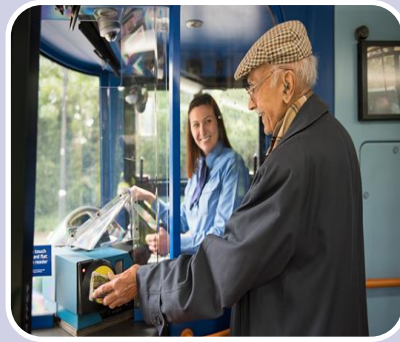
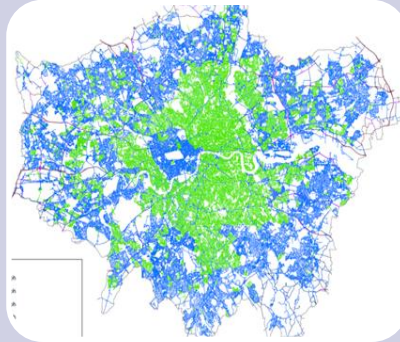
70 per cent reduction in people killed or seriously injured in or by a bus (based on 2005-09 baseline)

No one killed in or by a London bus

No one killed or seriously injured on London's roads



Bus Safety Programme



Safe Speeds

20mph
Speed
Compliance

Safe Streets

Research
pedestrian &
cyclist
behaviour
around buses

Safe Behaviours

Driver
training
Fatigue
research

Post Collision

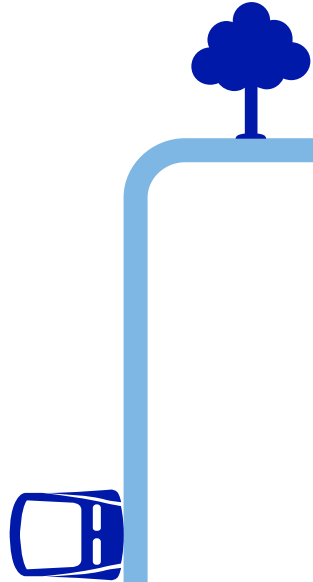
Enhanced
collision
investigation
London Fire
Brigade

Safe
Vehicles

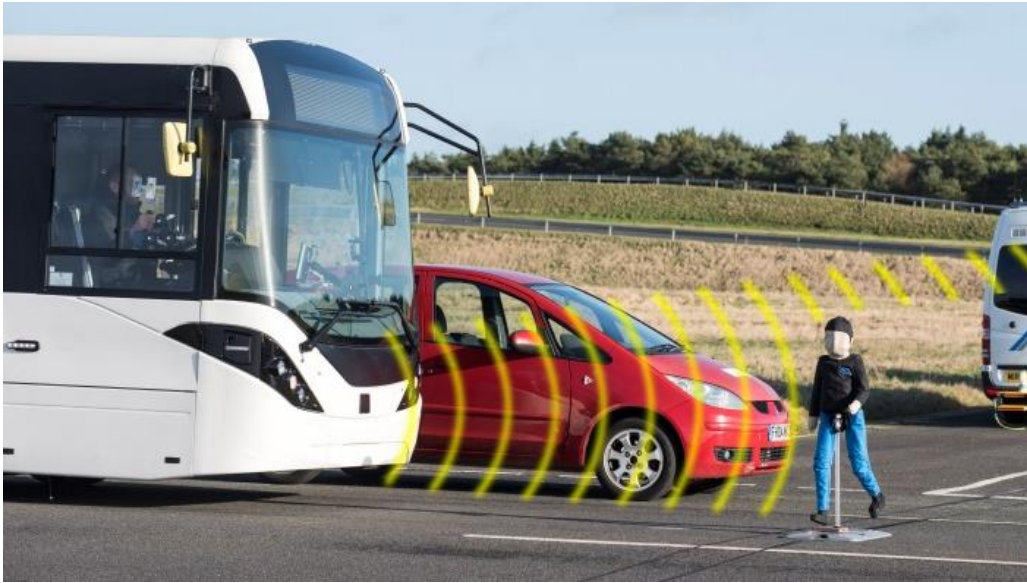


Bus Safety Standard - video

<https://youtu.be/c9Pr2fmgAd4>



BSS Measures: Advanced Emergency Braking (AEB)

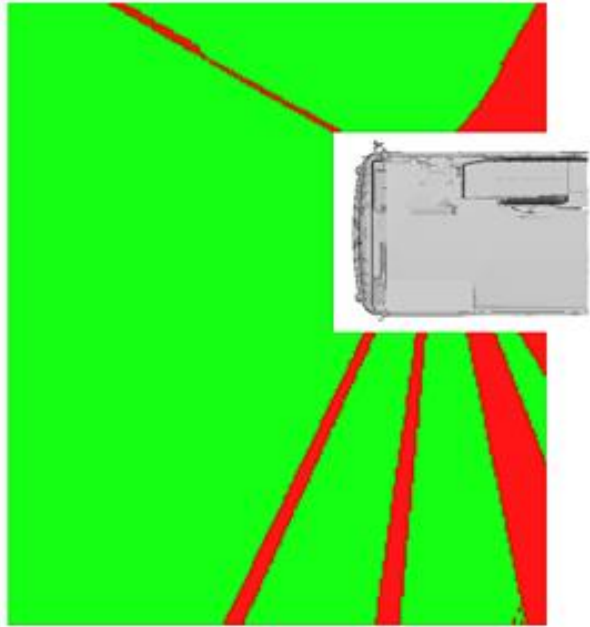


- AEB can be constantly vigilant, against a range of collision partners
- Emergencies only, if driver is unresponsive

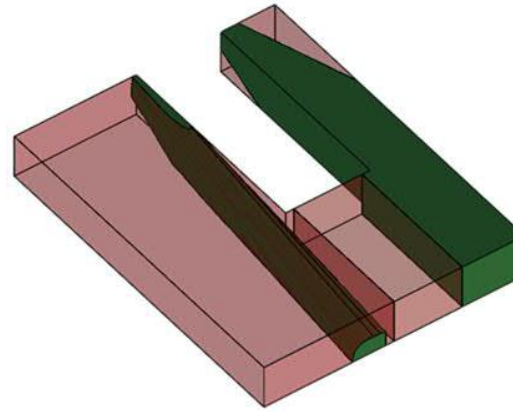
False Positives

- If falsely activated, AEB might pose additional risk to bus passengers
- Innovative test procedures, to discourage less robust systems

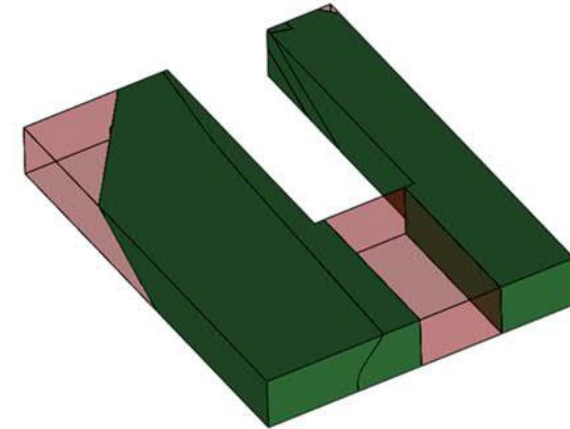
BSS Measures: Vision Standard for Buses



- Adaptation of the Direct Vision Standard to suit buses
- Innovative extension to include indirect vision too



Class II mirror only
spot mirror



Class II mirror + blind



BSS Measures: Runaway bus prevention



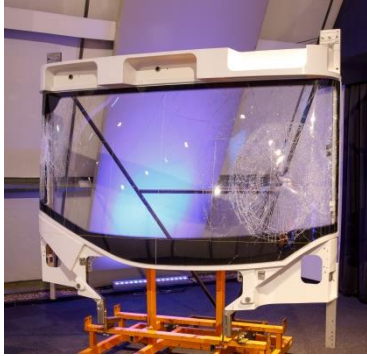
- Interlock system holds the brakes on to prevent rolling
- Bus driver workshops and task analysis
- Human factors experts development checklist

BSS Measures: Acoustic Conspicuity



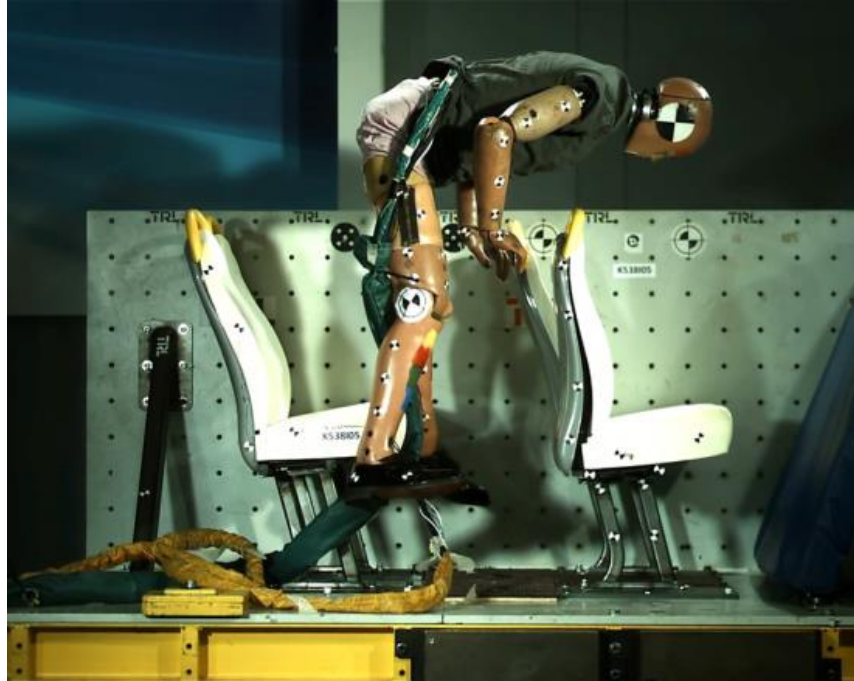
- Acoustic Vehicle Alerting System (AVAS) brings a quiet running bus to sound as conspicuous as a diesel engine bus
- Testing compared the speaker at the front and back against a quiet electric bus; sound at the front was most effective
- Innovation evaluation procedures developed to help select an ‘urban bus’ sound

BSS Measures: VRU Frontal Crashworthiness

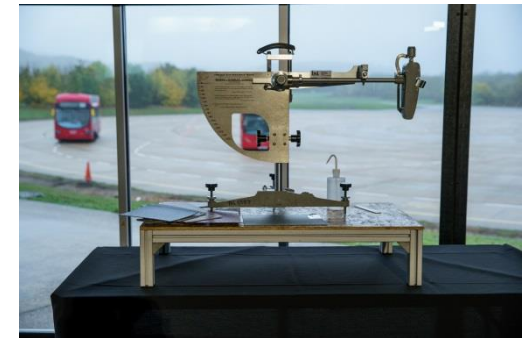


- Protecting Vulnerable Road Users (VRU) if an impact occurs
- Energy absorption and bus front end design
- Will drive some noticeable bus design changes
- Development of aggressivity testing for buses, adapted from HGVs
- Simulation work to investigate improvements in geometry to deflect and prevent run-over

BSS Measures: Occupant friendly interiors



- Evaluation testing (both simulation and sled testing) showed that higher back seats can better restrain occupants
- Visual inspections embedded in the design process
- Encourage better protection for bus passengers in braking and collisions



BSS Measures: Pedal application error



- Brake 'togglng' to update the memory of the brake pedal location
- Lights to help recovery from error
- Innovative evaluation procedure to check normal driving unaffected

BSS Measures: Intelligent Speed Assistance (ISA)



- Improves the effectiveness of most other measures
- Rolling out onto bus fleet now
- Around 700 buses on over 50 routes by March 2019

Roadmap

			2018	2019	2020	2021	2022	2023	2024	2025	2026	onwards	
Driver Assist	Intelligent Speed Assistance (ISA)	Standalone mandatory	Required										
	Advanced Emergency Braking (AEB)	Car, Pedestrian & Cyclist partners			Preferred				Required				
	Runaway Bus Prevention	Interlock system		Preferred		Required							
	Pedal Application Error – Foot placement	Brake toggling			Preferred		Required						
		Pedal standardisation			Preferred		Required						
	Pedal Application Error – Recovery	Pedal indicator lights		Required									
		Pedal acoustic feedback		Preferred		Required							
	Pedal Application Error – Intervention	AEB logic			Preferred				Required				
	Vision – Direct & indirect vision standard	Direct vision		Preferred			Required						
		Enhanced indirect vision			Preferred					Required			
		Class II CMS			Preferred		Required						
		Blind spot Mirrors		Required									
		Blind spot CMS			Preferred		Required						
		Reversing CMS		Required									
Front & Nearside				Preferred					Required				
Vision – Internal obscuration	Driver assault screens		Required										
Partner Assist	Acoustic Conspicuity	Acoustic Vehicle Alerting System	Required										
Partner Protection	VRU Frontal Crashworthiness – Bus front end design	Minimum geometry		Preferred		Required							
		Optimised geometry					Preferred		Required				
	VRU Frontal Crashworthiness – VRU impact protection	Energy absorption					Preferred		Required				
		Wiper protection		Preferred		Required							
VRU Frontal Crashworthiness – Mirror strike protection	Class II CMS			Preferred		Required							
Occupant Protection	Occupant Friendly Interiors – Visual inspection & design	Level 1 requirements	Preferred			Required							
		Level 2 requirements			Preferred				Required				
	Occupant Friendly Interiors – Slip protection	Surface friction requirements	Required										



Thank you

