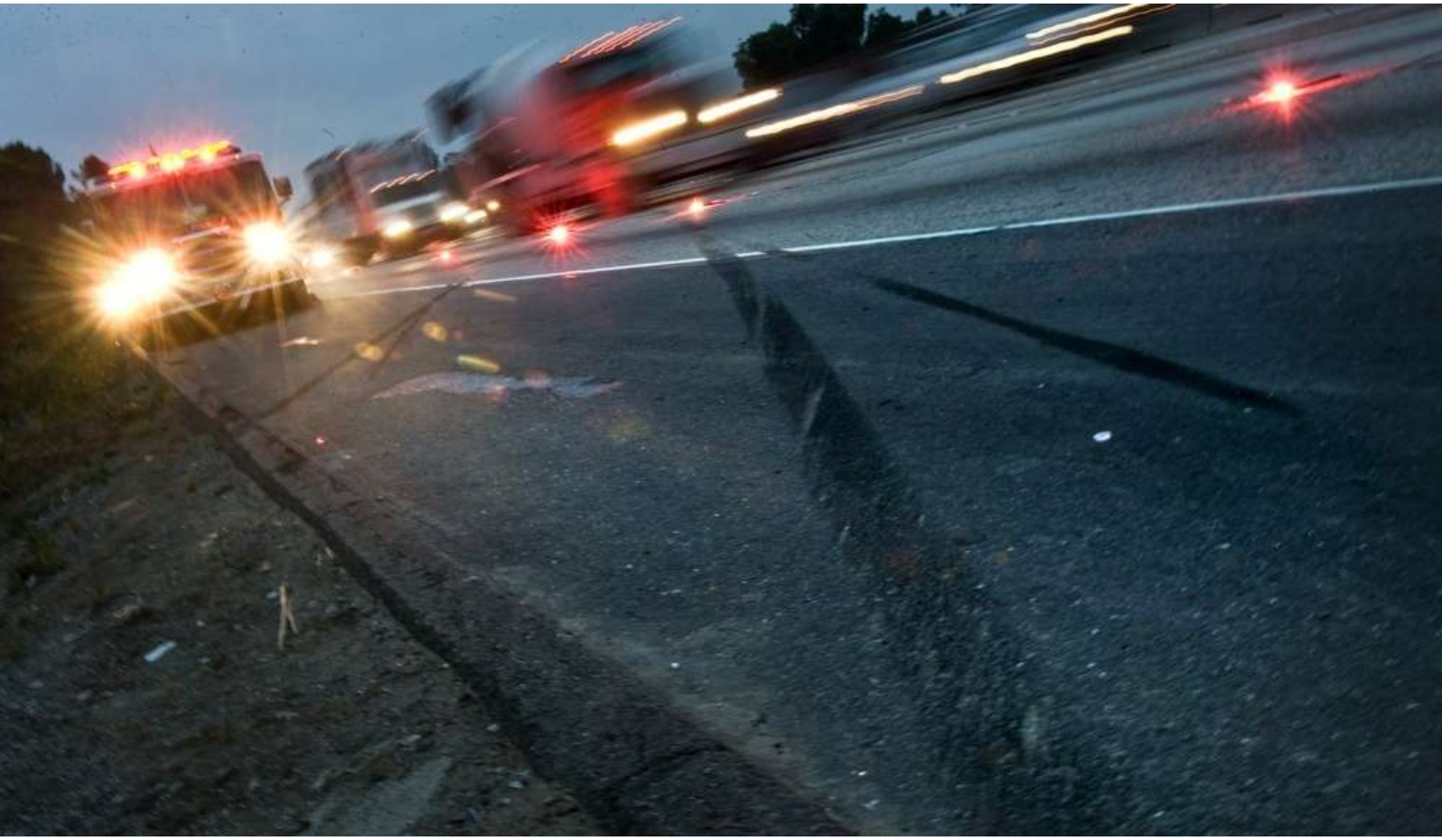
VELVAC®
In The Passing Lane Since 1934

VELVAC TRANSIT SOLUTIONS

VISION SYSTEMS DESIGNED WITH SAFETY IN MIND



SAFETY BEGINS WITH WHAT YOU DON'T SEE

VELVAC VISION SYSTEMS ELIMINATE BLIND SPOTS

Emerging technologies for collision avoidance and driver assistance hold great promise for the future. But even in cases where sensor systems provide the best reaction times, observation of traffic information, routing information and object avoidance all still rely primarily on a clear view by the human eye.

Velvac vision systems are designed to provide transit drivers with dedicated views of blind spots and passing lanes around the vehicle, improving safety and reducing the potential for costly and dangerous accidents.

From our 2020SS shuttle bus mirror systems to our advanced Aero Cam vision system, Velvac has the mirror or camera solution you need to keep your passengers safe, and your driver… **in the passing lane.**

SHUTTLE BUS SOLUTIONS

EXPANDING YOUR FIELD OF VIEW

Most shuttle bus mirrors are not designed for body widths that extend beyond 96 and 102 inches. Misuse of these narrow mirrors leads to obstructed views and dangerous blind spots and may not fully meet all DOT mirror requirements based on these applications. Be confident that your shuttle bus meets or exceeds FMVSS 111 requirements for Rear View Mirrors:

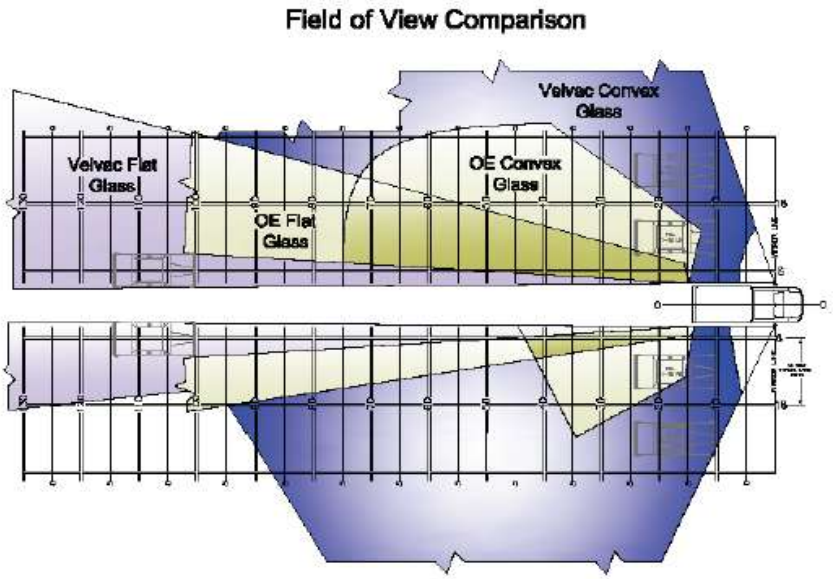
USE OR SPECIFY VELVAC 2020 SERIES MIRRORS

The field of view diagram to the right shows the superior vision and blind spot coverage provided by Velvac 2020 Series mirrors relative to typical OE mirrors used on shuttle bus applications.

Velvac's 2020 Series mirrors can help to reduce blind spots and provide visibility of multiple passing lanes around the vehicle leading to better driving decisions and the reduction of costly accidents.

Velvac Offers the Right Mirror for Your Vehicle
Available in the 2020, 2020 Mini-LEM, 2020 SS and 2020 XG configurations, the 2020 mirror series provides the options required for a wide variety of shuttle bus chassis and configurations. The fixed length arms are designed to position the mirror beyond the body, providing the driver with an unobstructed view of blind spots and passing lanes around the vehicle.

These versatile mirrors are available in several body widths and finishes, as well as manual or heated remote glass.



FOV Coverage Velvac 2020 Series (blue) versus OE Mirrors (amber)

Information shown above represents a typical vision pattern when using the Velvac 2020 or 2020 XG mirrors compared to a typical OE option mirror

Fender-Mount Applications

2020 SS

A combination of styling, quality and performance make the Velvac 2020 SS Series mirror the new benchmark for Shuttle Bus mirror systems. The fully integrated arm, base and mirror head not only look great, but work together as a system to reduce vibration, and provide large, clear views of blind spots and passing lanes around the vehicle.

Expanded Field of View

- Superior vision and blind spot coverage relative to typical OE mirrors
- Safer lane change maneuvers
- Observe late arriving passengers in loading zones
- Reduce side crashes

OE-Plus Styling & Features

- Seamlessly integrates into door sail area and fender for a clean, upscale look
- Die cast aluminum mounting base and upper arm are anodized and powder coated for corrosion protection
- Fold-away feature allows the mirror to fold forward and back for easy vehicle storage and protection against impact

Options Abound

2020 SS Mirrors are available for 86”, 96” and 102” applications. It also offers a multitude of service parts, including easily replaceable mirror heads, glass and arm components, which help to reduce downtime and service costs for your fleet.

33% of total transit crashes are sideswipes[2]

2020SS Shuttle Bus Mirror in black

Did you know that side blind spots cause….

- ✓ **413,000** accidents annually
- ✓ **160,000** injuries
- ✓ **Litigation Costs** from injury settlements that extend to Several Million Dollars
- ✓ **$6,000** on average property damage costs[1]

Sources:

[1]FTA 2002 NTD; [2]Dunn/CUTR

Door-Mount Applications

The rugged design of the 2020XG mirror system produces a solid image for improved visibility. The combination of 64 sq. in. of flat glass and 29 sq. in. of convex glass with an 18” radius of curvature provides unsurpassed coverage of passing lanes and blind spots around the vehicle.

Enhanced Image Stability

- Advanced vibration dampening system keeps image steady even on rough road surfaces

Superior Corrosion Protection

- Die cast aluminum mounting base and upper arm are anodized and powder coated for corrosion protection
- OE-approved plastic mirror shell and lower arm deliver durability and UV resistance

OE-Plus Styling & Features

- Integrated pivot system allows the mirror to be folded forward or back upon impact and returned easily to the normal driving position
- “Swept back” design, stylized base, arm and mirror head integrate seamlessly into the medium duty GM G Van and Ford F-Series and E Van door sail area
- Design pre-positions the mirror in the optimal location, eliminating the need for head adjustments, while minimizing installation time and costs

2020XG Mirror with Black Arm and Base and Chrome Mirror Head

2020 Mirror with Black Arm, Base and Mirror Head (offers same build quality and design as the 2020 SS mirror)

NCTR Camera Study

In a recent report, the National Center for Transit Research (NCTR) evaluated the effectiveness of camera-based vision systems in reducing transit bus side collisions.[1]

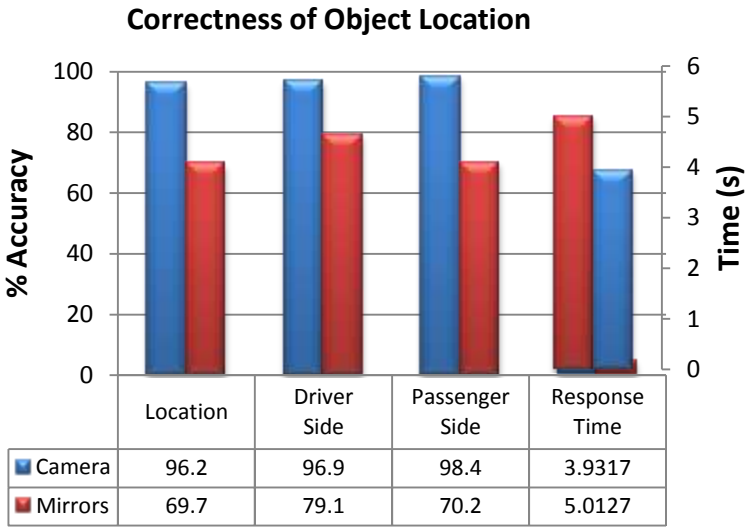
They devised a 2-part test utilizing 29 bus drivers to measure if the driver could identify an object and a person placed at different spots around the bus. They discovered that a camera-based vision system allowed drivers to more accurately and more quickly identify an object's location versus mirrors, providing a safer environment for passengers and pedestrians around the bus.

Results Based on Velvac Vision Systems

These positive results were based on the usage of Velvac vision systems >> The 2020 Mini-LEM for the shuttle bus and the Aero-Cam for the transit bus.

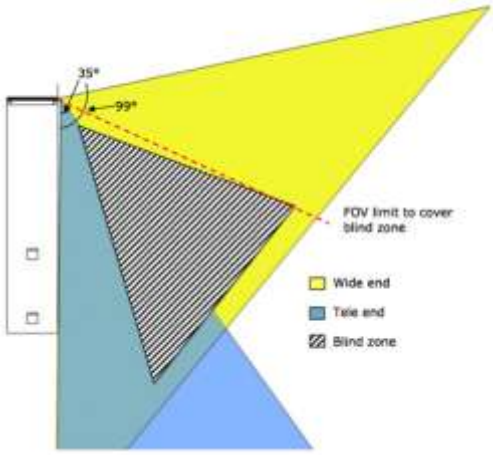
Conclusions

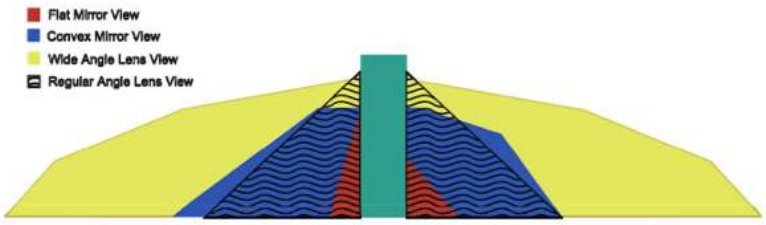
- Majority of drivers agreed that cameras can eliminate blind zones and reduce side crashes
- 100° FOV cameras provided too much info to drivers and distorts the image; 65° provided just the right amount of information
- Cameras provide a better view than mirrors in rain and nighttime
- Cameras allow drivers to better observe boarding and late arriving passengers
- Cameras eliminate the need for mirror adjustments and the danger of right side bus mirrors hitting waiting passengers
- Sensor-based systems are unreliable due to false alarms



	Location	Driver Side	Passenger Side	Response Time
Camera	96.2	96.9	98.4	3.9317
Mirrors	69.7	79.1	70.2	5.0127

NCTR at CUTR
National Center for Transit Research
Center for Urban Transportation Research
University of South Florida
www.nctr.usf.edu





Sources:

[1]Lin, Kourtellis, Wills, "Evaluation of Camera-Based Systems to Reduce Transit Bus Side Collisions-Phase II," NCTR, Dec 2012

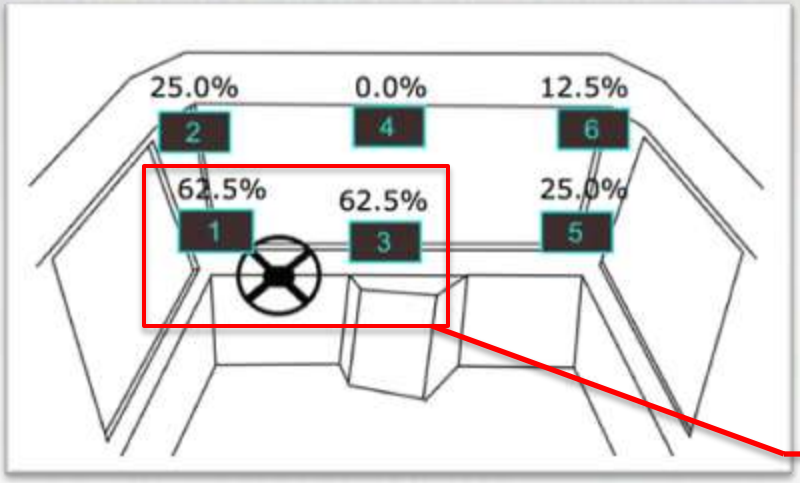
NCTR Product Recommendations

Based on the in depth study performed, NCTR made the following recommendations as it pertained to camera-based vision systems:

Recommended Product Specs

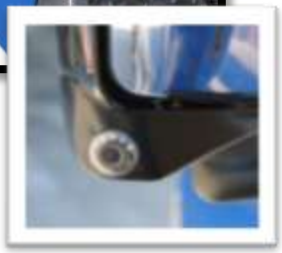
- Automatic IR filter
- Able to perform in all encountered lighting and environmental conditions
- Suppress blooming; rapid recovery from glare
- High resolution and natural color rendition
- 60°-65° FOV
- Mounted on mirror arm of shuttle bus as it was identified as the best location to achieve required FOV
- Housing should be small, lightweight, waterproof, have anti-fogging features and designed to avoid collection of debris

NCTR noted that Velvac camera-based vision systems were the only market ready solutions that met their chosen requirements.



Recommended monitor locations

Velvac AERO-CAM



Velvac 2020 SS with MLEM camera

Camera-Based Vision Systems

2020 Mini-LEM

Velvac's 2020 Mini-LEM vision system has a pre-positioned lower camera integrated into the mirror housing, providing greater coverage of blind spot areas around the vehicle. Its advanced CMOS camera technology provides superior visibility in all weather, sunlight, glare and nighttime conditions.

Velvac's 2020 Mini-LEM vision system is the only system that meets the NCTR requirements, and is designed to improve safety and reduce the potential for costly and dangerous accidents. It can also be integrated with back-up cameras and DVRs, also offered by Velvac, for complete vehicle blind spot coverage.

Integrated and Recordable Side Camera Vision System

OE-Plus Styling & Features

- Seamlessly integrates into door sail area and fender for a clean, upscale look
- Die cast aluminum mounting base and upper arm are anodized and powder coated for corrosion protection
- Fold-away feature allows the mirror to fold forward and back for easy vehicle storage and protection against impact

Consistent Visibility

- Infrared LEDs provide nighttime vision
- Camera eliminates adjustments between drivers
- Monitors with anti-glare polarized film and auto dimming provide clear images to driver

Monitors mounted per NCTR recommended practices

Advanced CMOS Imager

- Eliminates blooming, and provides superior color rendition and nighttime performance

Expanded Field of View

- 65° FOV camera eliminates "fish-eye" effect and offers better depth perception that convex mirrors and competitive cameras
- Safer lane change maneuvers
- Observe late arriving passengers in loading zones
- Reduce side crashes

100° Versus 65° Image Clarity

100°

65°

Mirror vs. Camera in Inclement Weather

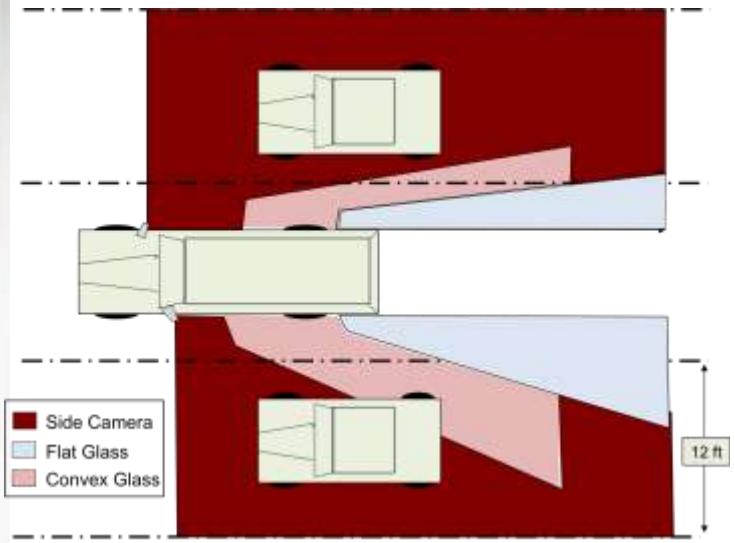
Mirror

Monitor

VELVAC IR FILTER

NO IR FILTER

Optimum FOV Ensures Pedestrian Safety

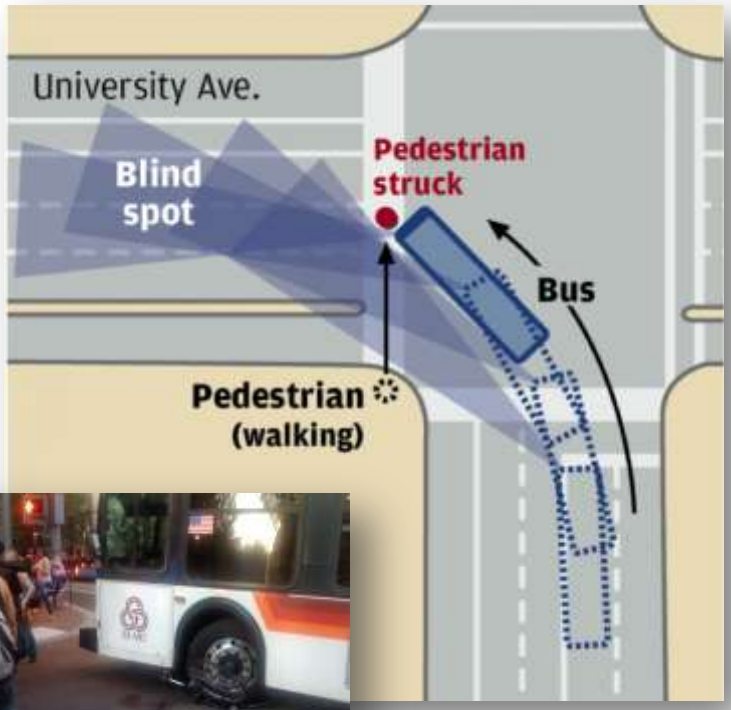


TRANSIT BUS SOLUTIONS

IMPROVING PEDESTRIAN SAFETY

Most transit bus mirrors are not designed for the rigors of constant duty. They corrode, vibrate and often break, making it difficult for drivers to safely operate their buses near pedestrians and other vehicles. This is one of the main reasons why 46%[1] of all transit crashes occur on the left or ride side of the bus, and 33%[2] of all crashes are sideswipes.

Velvac transit bus mirror systems eliminate the obstructed views and dangerous blind spots typical of competitive offerings, providing a much safer environment in and around the vehicle.

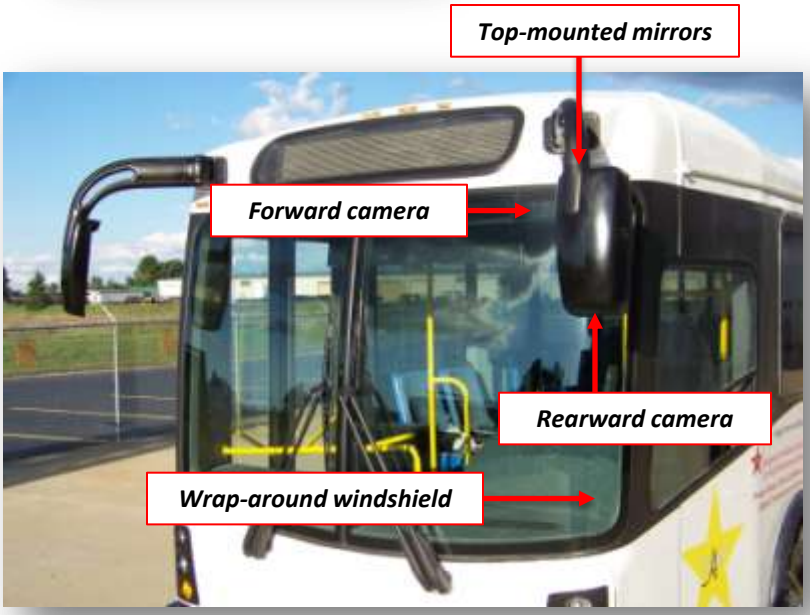


Most Frequent Problem

The driver's-side A-pillar and bus-style mirrors have combined to create one of the most dangerous blind spots around the bus. This has led to more than 100 fatalities annually, with thousands of injuries, when transit buses make left-hand turns. The stats are staggering. Left-hand turn accidents are responsible for:

- 46% of all pedestrian & bicycle fatalities
- 35% of all pedestrian crashes
- 49% of all fatal pedestrian crashes

By using a wrap-around windshield and Velvac Euro-inverted mirrors, this dangerous blind spot can be eliminated. Plus, when adding a Velvac forward-facing camera, the driver is provided a clear view of objects and pedestrians in that left-hand blind spot.



USE OR SPECIFY VELVAC TRANSIT BUS MIRRORS

Sources:

[1]FTA 2002 NTD; [2]Dunn/CUTR

Inverted Applications

Velvac's Euro Inverted mirror system provides a robust solution for eliminating the obstructed views and dangerous blind spots experienced by transit buses. It places the mirror above and out of the front, driver-side blind spot, helping to avoid left-turn accidents.

Plus, it has an optional pre-positioned lower camera integrated into the mirror housing, providing even greater coverage of blind spot areas around the bus.

OE-Style & Function

- Home position and fold-away feature for easy bus storage, wash and impact protection
- Die cast aluminum construction, anodized and powder-coated for corrosion protection and long service life
- Anti-vibration dampeners provide the driver with a consistent, stable image

Expanded Field of View

- Provides superior coverage of blind spots
- Safer lane changes and reduce side crashes
- Observe late arriving passengers in loading zones
- Optional advanced CMOS camera provides superior visibility and object detection

Plug & Play with DVRs

- Limit risk and liability by being able to substantiate or refute claims
- Reinforce safe driving behavior

Euro Inverted Mirror with Integrated Camera

CAMERA-BASED VISION SYSTEMS

Aero-Cam

The Velvac *AERO*-CAM was identified by NCTR to be the only market-ready camera-based vision system that met its recommended product specifications for usage on transit city buses.

It is also designed around the suggested optimal height, width and field of view recommendations by NHTSA to eliminate blind spots to the right and left of transit buses.

AERO-CAM *camera pod*

Fully Integrated Solution

- Provides the driver with dedicated views of blind spots and passing lanes around the vehicle (activated by turn signal)
- Full color monitors offer protective anti-glare polarized film, hood and auto-dimming
- Integrates with back-up cameras and DVRs, also offered by Velvac, for complete vehicle blind spot coverage

Velvac AERO-CAM *mounted to Transit Bus as part of NCTR study*

Unsurpassed Image Recognition

- Eliminates blooming, providing the driver with superior visibility, object distinction and depth perception in all weather, sunlight and glare conditions
- Expanded 65° field of view targets critical accident zones without depth perception issues typical of other cameras
- Safer lane change maneuvers and reduces side crashes
- Observe late arriving passengers in loading zones

THE RIGHT SPEC…

MAKES ALL THE DIFFERENCE

The Right Spec Makes All the Difference
When writing your specification for mirrors, make sure you incorporate the following features they provide to ensure long, lasting service, convenience and additional safety features.

Adjustable/Multiple home positioning/detent
- This provides consistent mirror head location
- Eliminates bus wash damage
- Allows foldaway in tight parking

Mirrors should be OE compliant
- Die cast aluminum construction
- Superior stability and corrosion resistance

Anodized/Powder Coating
- Provides corrosion and wear resistance
- Superior paint adhesion for paint primers
- More durable than conventional paint (automotive quality)

Optional: Integrated CMOS cameras in mirrors
- Two monitors located on dashboard
- CMOS back-up camera
- Integration into onboard Apollo DVR system

NOTES

NOTES

VELVAC®
In The Passing Lane Since 1934

Velvac is a leading manufacturer and supplier of vision systems and component parts to the recreational, truck and specialty vehicle industries. Velvac has the industry's broadest mirror product offerings, from high volume replacement mirror heads and service parts to unique, proprietary mirror systems. Founded in 1934, Velvac's corporate offices and aftermarket operations are located in New Berlin, Wisconsin. Its complete, state-of-the-art manufacturing facility is located in Reynosa, Mexico.

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