



## » HEAVY RAIL

Also referred to as Rapid Transit, Elevated Subway, Metro, & Rapid Rail

Potential NASG Products:

- ♦ Framed/Unframed FRA I windshields heated with NASG wire-grid technology or coated glass and unheated versions & laminated with Spallshield® Composite or Anti-spall liner
- ♦ Aluminum framed side vent windows with Anti-Vandal protective film
- ♦ Cab side balance drop sash windows
- ♦ Cab side horizontal sliding sash windows with locks and latches
- ♦ Aluminum framed side and end door windows
- ♦ Cab door windows with light control film
- ♦ Fixed side and door windows, FRA Type II or ANSI laminated glass
- ♦ Designs for mounting with frame; gaskets or for bonded applications



## » LIGHT RAIL

Also referred to as Trolley's, Tramways, & Streetcars

Potential NASG Products:

- ♦ Non-framed Curved front windshields heated by NASG wire grid technology
- ♦ Large curved front windshields (FRA Type I)
- ♦ FRA II Cab horizontal sliding sash windows heated by NASG wire grid technology or coated glass
- ♦ Glass and Southwall X-I-R® solar reflective film
- ♦ Specially designed cab side sliding sash windows
- ♦ FRA II or ANSI Side passenger windows with Southwall
- ♦ X-I-R solar reflective film and Anti-Vandal protective film
- ♦ Interior windscreen glass with Anti-Vandal protective film
- ♦ Curved side window glass
- ♦ Curved door glass
- ♦ Designs for mounting with frame; gaskets or for bonded applications



## » COMMUTER RAIL

Also referred to as Regional Rail, Suburban Rail, & Metropolitan Rail

Potential NASG Products:

- ♦ Framed or unframed FRA I windshields heated by coated glass or wire grid windshield technology and Anti-spall liners
- ♦ Cab side FRA II drop sash windows with balancing mechanism
- ♦ Framed FRA II polycarbonate emergency escape/access side windows
- ♦ Side passenger FRA II laminated glass windows; Fix, Egress/Access Designs for mounting with frame; gaskets or for bonded applications



## » LOCOMOTIVES

Potential NASG Products:

- ♦ Framed/Unframed FRA I windshields heated with NASG wire-grid or coated glass technology and Anti-spall liners
- ♦ Framed non-heated glass
- ♦ Cab side FRA II drop sash windows with balancing mechanism
- ♦ Designs for mounting with frame; gaskets or for bonded applications

NASG is in the process of developing "Light Weight" thinner laminates that will meet the impact requirements of FRA Type I and II.

Part of the CGH Family of Companies for more information, visit [www.cghinc.com](http://www.cghinc.com)



### Complex Windshield Shapes

The shape of railway windshields has evolved as the next generation of trains becomes more aerodynamic. NASG meets these changing needs by developing customized glazings in traditional flat or curved shapes, small or large dimensions, state-of-the-art complex curvatures, and traditional multiple-ply assemblies (including curved heated shapes) for whatever is required by our customers.

### Windshield Heating Systems

A heating system that provides maximum visibility for the operator in all weather conditions is essential for any railway windshield, regardless of size or shape.

The heating system also needs to operate rapidly and efficiently to minimize time waiting for the windshield to clear.

North American Specialty Glass offers two optimized electrical heating systems B-plex, based on a conductive glass technology, and Wire Grid, a system using advanced conductive wire technology.

NASG guarantees the preservation of colors (colorimetry) and high optical quality whatever the requirements of the windshield specification and relevant safety standards.

A NASG designed heating system can also improve the ballistic performance of a windshield, especially its impact resistance at low temperatures.

### B-plex Coating Technology

- ♦ Very thin, transparent metallic coating fused onto glass surface during glass manufacturing
- ♦ Used in high-voltage applications (74 V and higher)
- ♦ Negligible loss of luminous transmission
- ♦ Distortion free when heated
- ♦ No visible heating wires
- ♦ Manufactured and assembled in the United States

### Wire-Grid Technology

- ♦ Very thin, nearly invisible wires woven into interlayer material
- ♦ Wires blanket the windshield in a sine pattern, with close spacing between wires
- ♦ Very flexible system for uniform heating, even on oddly shaped windshields
- ♦ Works with voltages 74V and below
- ♦ Luminous transmission unaffected by the heating element

- ♦ Strong adhesion to the laminate helps prevent delaminating

### Side Window Systems

North American Specialty Glass offers a full line of side window systems, including side passenger windows, cab-side horizontal sliding sash windows, cab-side vertical sliding windows, cab-side mechanically balanced drop windows, cab-partition windows, wind screens, and passenger door windows.

All NASG Side window systems are certified in accordance with U.S. and international railway standards.

### Reducing the Effects of Vandalism

Vandalism has caused many transit authorities to rethink windows and issues related to their replacement. In response, NASG offers a complete line of products that provide vandal-resistance and quick change-out for customers experiencing vandalism problems.

### Anti-vandal Removable Plastic Liners

- ♦ Installed during manufacture or after glass installation
- ♦ Optical characteristics comparable to those of glass
- ♦ Increased protection of glass
- ♦ Can be removed and replaced should vandalism occur
- ♦ Available in single or multiple layers

### ToroGlas® – for Improved Impact Resistance

To improve its mechanical performance – resistance to impacts, wind pressure, thermal stresses or other applied loads – annealed glass for railway applications must be reinforced before it is laminated. Typically the reinforcing is done by either thermal tempering, or by chemical strengthening. Both processes create compressive stresses in the outside surfaces of the glass to reinforce its strength.

While thermal-tempered glass provides strength superior to that of annealed glass, it is not as tough as annealed glass and vulnerable to scratches and abrasion.

Plus on impact thermal-tempered glass shatters into tiny thumb-nail size pieces because of edge stresses created during the heat-treating process. In a laminated window this shattering characteristic creates a break pattern that can severely limit visibility.

With ToroGlas chemically strengthened glass from NASG the break pattern is comparable to that of annealed glass. The break remains localized, with no dicing effect to interfere with visibility.

ToroGlas also delivers the high-strength of thermally-tempered glass while providing the optical qualities of annealed glass (flatness, with no undulation).

The impact-resistance of ToroGlas far exceeds that of annealed glass. And unlike its thermally treated counterpart, ToroGlas offers scratch and abrasion resistance, thermal-shock resistance, high optics, and is available on all float glass thicknesses (.6 mm to 12 mm) for improved weight reduction.

North American Specialty Glass also uses semi-tempering to strengthen certain products.

The choice between chemical strengthening and strengthening by semi-tempering depends on the application – but each process results in excellent residual visibility after impact damage.

### Ballistics and Large Object Impact Resistance

All North American Specialty Glass windshields and safety glazing systems are tested, validated on site, and optimized in terms of thickness, weight and cost effectiveness.

This information is then re-certified by independent outside laboratories to ensure our products meet all applicable U.S. and Canadian safety performance standards.

Among the parameters taken into account:

- ♦ Climatic environment
- ♦ Impact energy
- ♦ Method of installation
- ♦ Location of the impact point
- ♦ Geometry of the window
- ♦ Size and speed of the object

Minimizing the effects of impact is of paramount importance in railway windshields.

North American Specialty Glass has developed anti-spall windows, using laminating materials such as Spallshield film that increase window strength and greatly reduce the possibility of glass fragments showering operator or passenger areas should an impact occur.

### Industry Standards

NASG offers a complete line of windshields and side window systems certified in accordance with following U.S. and Canadian railway standards.

FRA Type I

FRA Type II

FRA Type I Tier II

FRA Type II Tier II

ANSI -Z26.1 for AS-1, AS-2 and AS-3 glass.

**NASG is ISO 9001-2008 Certified**