



Technical Bulletin

ATS-183
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Handling, Inspecting and Fabricating Pilkington **OptiView™** Anti-Reflective Glass

Summary

Pilkington **OptiView™** Anti-Reflective (A/R) Glass has a hard coating of thin, clear, permanent, pyrolytically formed, Silica and Tin Oxide layers on one surface. This coating reduces the normal reflection of a glass-to-air interface from 4% to about 1%.

Pilkington **OptiView™** Anti-Reflective Glass is intended to be fabricated with two coated plies in a laminated light. The resulting laminate with the A/R coatings on laminate surfaces #1 and #4, will reduce the 8% reflection of single, clear, non-coated glass to a visible light reflectance of about 2%. Note: there is no visible reflection from laminate surfaces #2 and #3 because they are in contact with the interlayer material (pvb or other) which has a refractive index very similar to that of glass.

The A/R coating has a reduced emissivity value of 0.46. Using it on the four surfaces of an insulating glass (IG) unit gives the same U-Factor improvement as applying a single coating of Pilkington **Energy Advantage™** Low-E Glass. The Pilkington **OptiView™** coating is smoother, but it is not quite as tough as Pilkington **Energy Advantage™** Low-E Glass.

GLASS HANDLING

The coating is slightly rougher, on a microscopic scale, than the surface of non-coated glass, but is not as rough as the surface of Pilkington **Energy Advantage™** Low-E Glass, so the common practice of detecting the pyrolytic coated surface with finger tips or finger nails, will not be as reliable for detecting the Pilkington **OptiView™** coating.

Coated surface identification is best performed with a hand held, non-contact, meter such as the "ETEKT +" Model AE 1600 from EDTM at 419 861 1030 or www.edtm.com. The Pilkington **OptiView™** coating has a low emittance, electrically conductive property which that meter can detect. However there is a non-conductive Silica top layer on the coating which prevents its detection by simple circuit-continuity low-e testers in contact with the top surface.

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The "ETEKT +" meter detects the coated surface of non-laminated, 3 mm or 6 mm Pilkington **OptiView™** by a capacitance effect. When all 3 lights are lit, the detector is touching the coated surface. If only the yellow light is on, then the detector is touching the glass side. Care should be taken to avoid unnecessary or excessive contact with the coated surface of Pilkington **OptiView™**. Avoid contaminating the coated surface with cutting oils or finger prints after it has been properly cleaned. Such marks, while not permanent or damaging, are more visible than on non-coated glass and should not be present on the finished, installed product.

Pilkington **OptiView™** Anti-Reflective Glass should be cut, washed, heat treated, and generally processed, where possible, with the coated surface facing up to avoid unnecessary contact with other materials.

INSPECTION

It is the responsibility of the fabricator to carefully inspect Pilkington **OptiView™**, both before and after washing, and after any further fabrication. Glass not rejected by the fabricator during inspection prior to fabrication will be considered acceptable by Pilkington.

Pilkington **OptiView™** should be inspected in transmitted and reflected light, from the coated side of the lite.

When viewed in transmitted light, there should be a bright, uniform, diffused light (similar to an overcast sky) behind the glass. The objects in reflection (walls, ceilings, etc.) behind the viewer or inspector should be dark color or mat black and should have low level illumination on them to minimize masking reflections.

A critical close-up inspection can also be made using a hand held reflector flood light on an extension cord behind the glass, shining towards the inspector, whose eyes are just in shade from a direct line of sight with the bulb. This simulates direct sunlight conditions. This technique can often uncover marks from non-damaging contact with sucker cups, etc., which would only be visible in direct sunlight.

When viewed in reflection, the glass should be placed in front of a uniform, dark background (black velvet cloth is particularly effective) to minimize transmitted images, and the reflected image of a uniform diffuse light source or brightly illuminated white wall or screen (similar to an overcast sky) should be visible in reflection to the inspector.

UNPACKING

Pilkington **OptiView™** is shipped in either standard cases or stoces. Like other Pilkington glass products, the glass surfaces are protected with an interleaving material between the individual lights to resist moisture staining and abrasions.

Pilkington **OptiView™** should never be removed from cases which have been only end-opened, since sliding glass surfaces past each other may damage the coating or the glass surface.

Pilkington **OptiView™** can be handled with suction cups, though it is preferable to apply suction cups to the glass side rather than the coated side. The cups must be clean and dry to

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prevent damage to or marking of the coating. The cups should not be slid across the coated surface.

CUTTING

Stock Sheets

The fabricator is responsible for cutting stock sheets to eliminate imperfections from the finished cut size piece.

Standard procedures used in cutting 1/8" (3 mm) and 1/4" (6 mm) float glass should be practiced. All stock sheet edges must be trimmed a minimum of 1" (25 mm) to obtain a clean-cut edge. Special care should be exercised in cutting to avoid sliding tools over the coated surface.

Pilkington **OptiView™** Anti-Reflective Glass should be cut with the coated side up to eliminate coating damage that could result from glass particles on the cutting table, especially when using free-fall cutting table techniques.

Cutting oils should be light, evaporating lubricants such as "Low Odor Base Solvent" No. 529-66 available from Ashland Chemical, Charlotte, NC, phone: 800 522 1409. Keep the quantity of cutting oil to an absolute minimum to reduce contamination from gloves and to allow easier washing of the coated surface.

INTERNAL TRANSPORT

Mobile harp racks and other internal transport systems must have their surfaces cleaned regularly where contact will be made with the Pilkington **OptiView™** coating.

WASHING

Pilkington **OptiView™** Anti-Reflective Glass has a hard and durable pyrolytic coating. As with any coated glass product, care should be taken while washing the glass to prevent damage to the coating.

Mechanical Washing

Pilkington **OptiView™** Anti-Reflective Glass should be washed, with the coating side up, in a rotating drum brush flat glass washing and drying machine. Pilkington recommends using a detergent solution of hot, 120-140°F, (50°-60°C) clean water and a commercial detergent designed for glass washing. The final rinsing should be with clean deionized water heated to at least 110°F (43°C). As with all washing machines, either the water should be changed on a routine basis or a continuous overflow system should be used. Drying air should be filtered and directed in such a manner so as not to leave water droplets on the glass surfaces.

Polypropylene brush rolls are recommended for glass washing machines. If nylon brushes are used, care must be given to proper brush adjustment to avoid the possibility of surface

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damage. When selecting the proper brush for washing Pilkington **OptiView™** Anti-Reflective Glass, the fabricator should consider that polypropylene brushes usually have a lower coefficient of friction, and are softer, and more flexible than nylon.

Never allow the glass to remain stationary under the rotating brushes.

It is recommended that a test light be run through the washer before starting production. The glass should be inspected, in transmission and in reflection, and then with a bright spotlight close to the coated surface to determine if brush and/or air drying adjustments are needed. If abrasive materials are trapped in any washing implement, abrasion damage to the glass can occur.

Hand Washing

Pilkington **OptiView™** Anti-Reflective Glass can be cleaned and maintained by hand washing with non-abrasive cleaners. For hand washing Pilkington **OptiView™** Anti-Reflective Glass, a mild detergent and water solution is recommended. Uniformly apply the solution to the glass and wash with a clean, soft cloth, sponge, or pad. Rinse thoroughly with clean water and wipe or squeegee dry immediately. Make sure no metal parts of the cleaning equipment touch the coated glass surface, and that no abrasive particles are trapped between the glass and the cleaning materials. Do not use harsh chemical cleaners, abrasives, steel wool, or razor blades on the Pilkington **OptiView™** coated surface. See ATS Bulletin #182 "Hand Cleaning Pilkington **OptiView™** Anti-Reflective Glass" for further details.

Sealant contamination will be apparent due to the higher reflectance of contaminated areas compared to the anti-reflective properties of the coated Pilkington **OptiView™** surface. In the case of silicone contamination, the use of a silicone remover may be able to improve the appearance. Attempts to remove any silicone must be regarded as remedial action and no guarantees over the effectiveness of silicone removal can be provided, as this is dependent upon a wide number of factors including amount, time on surface and the nature of the silicone contamination. The use of silicone removers that contain Hydrofluoric Acid (HF) are not recommended as damage to the glass and coated surface can occur.

LAMINATING

Pilkington **OptiView™** Anti-Reflective Glass is intended to be laminated with A/R coatings on both outer surfaces (lamine surfaces #1 and #4 of a 2 glass ply laminate). The A/R coating is never placed against the pvb interlayer because there are no visible reflections from that interface.

Normal laminating, autoclave or cast-in-place resin, procedures can be used.

Note that the waffle or diamond pattern on rubber covered lamination pressure rolls, for de-airing the sandwich prior to autoclaving, can leave a faint imprint if they are not clean. Such marks may only be visible in direct sunlight or equivalent inspection light. See washing and spotlight inspection instructions above.

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Take care not to slide the coated surface across conveyor rollers to prevent creating temporary or permanent surface marks in the coating.

HEAT TREATMENT: Heat Strengthening, Tempering, Bending

Pilkington **OptiView™** Anti-Reflective Glass can be heat-strengthened, fully tempered or bent, after it is cut to size. Pilkington recommends that Pilkington **OptiView™** Anti-Reflective Glass be properly cleaned and dried prior to heat-treating. Clean cotton or cloth gloves should be used at this stage to prevent hand or finger prints, which could be burnt into the surface during heat-treating. The coated surface must be visibly clean before entering the heat treatment furnace. The Anti-Reflective coating should be facing up when heat-treating in a horizontal furnace to minimize the chance of coating marking or damage.

If the furnace rollers are clean, and there is no skidding or sliding of the glass, especially when the rollers reverse direction, then the glass can be processed with the coating down. This orientation will be necessary if frit is being applied to the glass surface. Spot light inspection (see above) is recommended after processing with the coating down against the rollers to ensure there are no deposits or marks from roller surfaces.

Overheating Pilkington **OptiView™** Anti-Reflective Glass can damage the coating and its Anti-Reflective property. If excessive distortion or coating damage is experienced, a cooler glass temperature during the heat-treating process will be required. Note: at no time should the glass temperature exceed 1184°F (640°C).

If the fabricator is experienced at heat-treating Pilkington ¼" (6 mm) Clear Float glass, those furnace and quench settings make an excellent starting point for the processing of Pilkington **OptiView™** Anti-Reflective Glass test lights. The effective radiant temperature of the furnace will determine the actual heat transfer to the glass. Individual furnaces will have different heating characteristics.

The first piece of tempered Pilkington **OptiView™** Anti-Reflective Glass processed should be examined for break pattern and distortion immediately after it has cooled down. Remember that the rate of feeding cold glass (singly or in continuous batches) into a hot furnace will have more effect on the glass temperature reached in the heating cycle than will the presence or absence of the Pilkington **OptiView™** Anti-Reflective Glass coating.

Pilkington **OptiView™** Anti-Reflective Glass has a reduced hemispherical emissivity value of 0.46 as compared to 0.84 for non-coated glass, or 0.15 for Pilkington **Energy Advantage™** Low-E Glass. This will have a slight effect in the furnace section where the glass top surface can run cooler because of some radiant heat reflection. If this causes temporary warping or 'dishing' during heat-up it can be countered by increasing top heat, reducing bottom heat, or by inverting the glass and running it with the coating down on the rollers. A slight (~5%) increase in furnace cycle time, compared to that used for equal thickness clear glass, may be needed if the coating is facing upwards.

If the fabricator has no previous experience heat treating glasses, Pilkington recommends a tempering furnace setting of approximately 1240°F (670°C) and a heating cycle time of 240

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seconds as the starting point for ¼" (6 mm) thick Pilkington **OptiView™** Anti-Reflective Glass test lights. Since each furnace is unique, furnace time and/or temperature adjustments will be required.

Sample lights of tempered Pilkington **OptiView™** Anti-Reflective Glass should be tested to ensure compliance to applicable safety standards and re-inspected for distortion prior to starting production. Confirmation that tempered Pilkington **OptiView™** Anti-Reflective Glass will meet or exceed all applicable safety glazing standards is the responsibility of the fabricator.

Note that under certain daylight conditions, heat-treated (tempered or heat strengthened) glass can often show a soft dappled shadow pattern from the furnace quench air, especially when viewed at an angle in polarized light (see ATS #157 for details). This is simply an indication of the stresses created by the heat treatment process and is not a defect in the product. This same pattern is often visible in all heat treated glasses, coated or not.

The furnace settings for bending processes can initially be the same as those for clear, non-coated glass of the same thickness.

INSULATING GLASS

When Pilkington **OptiView™** Anti-Reflective Glass is used in insulating glass units no edge deletion of the coating is required. The coated side of Pilkington **OptiView™** Anti-Reflective Glass has been found to be compatible with all the major insulating glass sealants tested. The fabricator of Pilkington **OptiView™** Anti-Reflective Glass has the ultimate responsibility of testing to ensure that the proper sealant is used for each application. Specific questions concerning compatibility should be directed to, and confirmed with, the individual sealant manufacturers. Once the insulating glass unit is made, care should be taken to ensure the coated surface is protected from sealant contamination or from being scratched.

PACKING FOR TRANSPORTATION

Pilkington **OptiView™** Anti-Reflective Glass should be separated from contact with adjacent glass by using paper interleaving or small cork tabs around the glass perimeter.

MOCK-UP CONSTRUCTION

The construction of a full-scale mock-up is recommended, where the glass can be examined from both sides in transmission and reflection in typical lighting conditions. A full-size mock-up, including both vision and spandrel glass when applicable, should be constructed and viewed on site, representing the proposed building location and viewing geometry. It should be approved prior to final glass production. This will show the final installed appearance of the glass far better than viewing small hand held samples under non-typical lighting conditions.

QUALITY SPECIFICATIONS

Standards

Pilkington **OptiView™** Anti-Reflective Glass meets the quality requirements of the current edition of ASTM C 1376 "Standard for Reflective Coated Glass".

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When viewed in reflection or transmission, as described above, from a distance of 10 feet (3 m), cut size lights will not have objectionable, bands, streaks or color differences as detailed in ASTM C 1376.

Uniformity

At a viewing distance of 10 feet (3m), it is acceptable for some mottling or streaking of the coating to appear. Slight differences between adjacent lights may be visible.

Pinholes

There shall be no single visible spots on the coating greater than 3/32" (2.4 mm) diameter in the outer area, or greater than 1/16" (1.6 mm) dia. in the central area.
There shall be no more than two readily apparent blemishes in a 3" (75 mm) dia. circle, or no more than five in a 12" (300 mm) dia. circle.

Scratches

When viewed from a distance of 10 feet (3m), visible scratches longer than 3" (75 mm) shall not be allowed in the normal viewing area.

Quality Standard of Base Glass

The base glass shall meet the requirements for Q3 quality in ASTM C 1036.

Optical Properties of Pilkington **OptiView™** Anti-Reflective Glass

Optical properties may be found in the current edition of the Pilkington Architectural Product Guide and on the Pilkington website at www.pilkington.com ; click on 'USA' on the World Map on the Home Page.

Summary	Editor	Date
Original	C. Barry	01/14/13
Update to "Hand Washing" section for silicone contamination	K. Natividad	08/30/22

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