Specification #: WS017
Revision Level: 0
Revision Date: 8/18/2016

Sapphire Window Cleaning Notes

- Viewports are to be cleaned using the procedures listed below before packaging and shipment.
- These procedures are to be used on (COATED) Sapphire windows only.

Materials and Supplies Needed

- Spectroscopy grade Acetone, Methanol, Propanol, Hexane, De-Ionized Water (Only for Coatings below 1550nm) For coatings above 1550nm NO WATER is to be used.
- Ultra-filtered, low particulate
- Clean room vinyl, powder-free gloves
- Clean room, lint-free swabs
- 40 Watt illumination with ground glass lamp glass and black background
- Stoner™ Spray Anyway 360o GUST™ 360o Duster or regulated compressed nitrogen from a welding gas supply company.
- Lint free tissue
- Laminar flow hood

Precautions

- DO NOT USE ULTRASONIC CLEANING FOR SAPPHIRE VIEWPORTS.
- Always start by blowing off window first with clean, dry compressed air. This will remove any potentially hard, gritty dust that could cause scratching during cleaning.
- Always use a solvent-dampened swab to wipe clean a window, a dry swab can potentially scratch a window and in any event will leave more than it cleans if not damp.
- Excess solvent should be flung off by a flip of the wrist. If the swab is heavily soaked with solvent, the window will rapidly chill due to solvent evaporation; this will result in water condensation from the air. It may cause spotting or delays in cleaning. It is best to flip off the excess before touching the window with the swab. Alternatively, one can daub the swab on a piece of lint-free tissue to partially remove solvent.
- Compressed air in a can, if tipped upside down or violently shaken, will cause solvent to spray out with the air. No canned duster is perfect. Occasionally some solvent will contaminate the window. The best solution is to use a regulated supply of commercial dry compressed nitrogen gas from a welding gas supply company.
- Always handle the window with protected hands. Powder-free vinyl gloves work best; but, if touched with acetone they can dissolve and leave residue on the window. One should carefully avoid contacting the cleaning swab directly with the glove during the cleaning procedure.

Procedure

- Collect supplies and windows in a darkened room equipped with a laminar flow bench.
- Do all work under a HEPA filtered laminar flow hood if possible.
- Provide a blackened background placed approximately 18 inches behind and beneath the window and work in a darkened room.
- Illuminate the window at a nominally right angle from the viewing direction and hold at about 18 inches from the viewer.

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- Wearing a protective lint, powder-free glove on the window hand, hold the window with the thumb and forefinger in front of the 40 watt light source.
- Blow off window surface to be cleaned with clean, dry nitrogen or compressed air.
- Wet a clean swab with spectroscopic grade acetone and clean from the outer edge to the center with small circular motion, rotating the window occasionally to a new unclean section. DON'T BE SPARING WITH SWABS. Never go back over a cleaned area with a used swab. Throw it away and re-clean a "cleaned area" with a new swab. Make an effort to always clean a new area until gross cleaning is done. Then repeat, frequently changing swabs. Always use a damp, but not dripping swab.
- If after the acetone cleaning is repeated several times there is still dust, debris or "water marks" that cannot be removed by light rubbing with an acetone swab, repeat the same procedure (especially in the area of the difficult stain) with de-ionized water.
- The water should be used sparingly as it will have to be dried using an acetone dampened swab thereafter.
- Repeat the acetone cleaning procedure and note whether the difficult stains have lifted as a result of the water treatment. If not, one can try again with water then acetone.

Recommendations

- Be patient and work slowly and systematically. Select a pattern of movement that is comfortable and efficient. It is best to have a working pattern that avoids re-cleaning the same area with a dirty swab. Always try to move from cleaned to dirty area.
- Frequently change the swabs.
- Use solvents enough to make damp but not enough to soak the swab.
- Blow off lint that might settle rather than wipe off if possible.
- Less is more. Clean only obvious dirt. Don't arbitrarily clean a surface that appears clean just because you haven't cleaned it yet. Start with the worst dirt and move progressively around the window until all visible contamination is removed.
- If you create streaks or "water spots" in the coating be sure to go after them gently. (DO NOT CLEAN A COATED OPTIC USING WATER UNLESS YOU ARE SURE THE COATING IS NOT WATER SOLUABLE)