The Outside View as a Part of the Show

Studios with Windows

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The outside view as a part of the show

As a step to integrate television as part of the real daily life of the viewers, there is general trend of including real backgrounds in the modern design of television sets. Having a glass wall in the studio opens the facility to the world and allows to the camera to catch whenever something happens outside. City skylines, cars moving on the streets, and even traffic street lights are becoming part of the scenes in news programs, interview sets and in morning and late shows, including small sets for live correspondents.

Nevertheless, this new architectural element in television studio design dramatically changes the lighting design process. The traditional full dark studio where the lighting designer is able to decide every light source does not exist anymore. The window becomes an important light source with different intensities and chromatic characteristics that is dependent on so many factors that are almost impossible to control: hour, season, weather, and even architectural illumination.

As an independent system integrator, the ARRI System Group has been observing this market trend and testing different solutions for various particular cases where the need to control external light is becoming an issue for television production. As a result of our experience, this paper keeps a record of the advantages and disadvantages for every implemented solution.

Of course, the reader should take this document as a first and general approach to the issue, understanding that there is no perfect solution that works for all the cases. Every studio, every client, and every outside view is different and requires a personalized solution that minimizes the possible disadvantages of the installation and provides an optimal integration of the outside and inside scene.
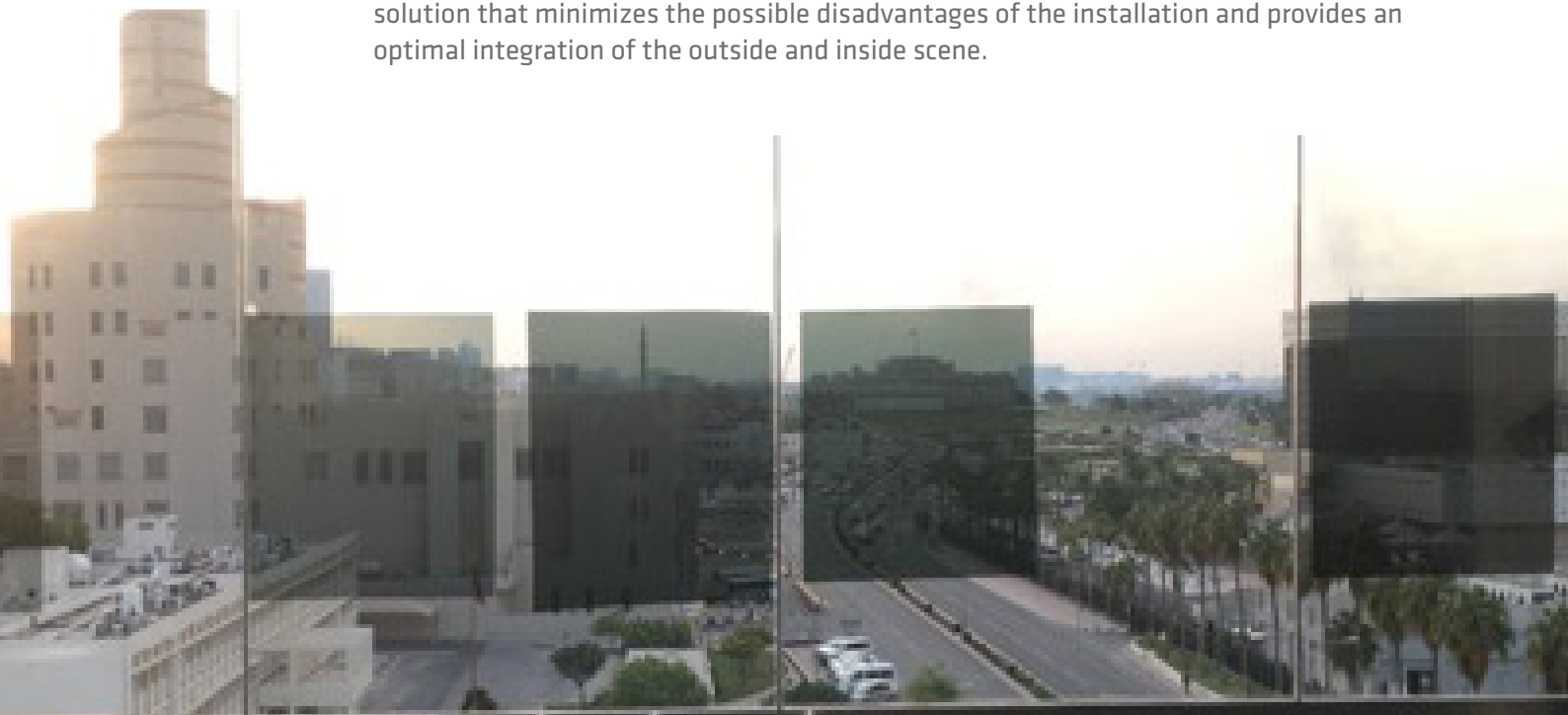
Image 1.
Source ARRI: Testing of different solutions for a glass wall studio.

Two different lighting environments

When shooting outside on a very bright day, we can stand a brightness of 120000 lux. This extremely high illuminated scene is not a big issue for the camera once one plays with the iris and the white balance.

Inside the studios we have a different world, with illuminances between 500 lux and 800 lux. Again, when our environment is limited to this brightness, our camera can be set to optimize the full bright scale.

The problems appear when both environments are mixed, and we have an average inside illuminance of 800 lux whereas there is a light source with more than 120000 lux in the background coming from outside. What should we consider as a reference white level?

If we decide that our white reference will be 800 lux, all the illuminances over that value will be overexposure, with a burnt result on our footage. On the other hand, if we decide to take the 120000 lux as a white level reference, all the elements in the scene that are under the bright range of the camera will appear as black.

Obviously, the solution can be achieved by finding a compromise between both values; increasing softly the inside illuminance and reducing the outside light input. We can easily increase the inside light to 1000 or 1200 lux with SkyPanels (LED soft panels). The big issue is how to decrease the amount of light that comes from the outside without reducing the skyline view and how to configurate this solution depending on the different variables (weather, season, hour, etc.).

The following solutions try to solve the second issue. These solution descriptions also include their technical characteristics and options, main advantages, and disadvantages.

1. Black-out solution

A curtain is placed in front of the window, blocking the outside light. The recommended technical specifications of the curtain are:

• Density, 300 g./m2.
• Pieces of 15 meters length max.
• 100% cotton, molton quality reference.
• Television white color/black/virtual green or blue.
• EU fire protection.
• Metal top eyelets every 20 cm distance, to hang the curtain from the single carriages.

The curtain is suspended from rails, that allow its movement using manual pole operated carriages. The technical specifications of the rails are:• Density, 300 g./m2.

• Aluminum rail, I shape, 49 mm width and 53 mm height maximum.
• The track will be built by 4/3/2/1 meters rail units, with steel alignment connectors on both sides of the junctions.
• There will be no more than 2 meters between two hanging points.
• A pole operated steel carriage, 4 wheels, with brake on both ends of each curtain.
• A carriage, 2 wheels, to hang the curtain from the track. The distance between two carriages will be 20 cm maximum.

Image 2.
Source ARRI: Full glass window covered by a black curtain to avoid the outside light input.

• **Advantages:** this solution is an easy installation, with reduced maintenance and production cost.
• **Disadvantages:** there is not any kind of light control. The solution still allows the view when required (night shooting mainly).

2. Neutral density filter

A 2.0 mm deep-dyed polyester film with different transmission factors (usually 12%, 25%, and 50%) can be installed in front of the window with two different systems:

- **Fixed installation:** the film is placed as a sticker on the surface of the window and becomes a fixed installation.
- **Rolled curtain installation**: the film is rolled and placed on the top of the window. It can be rolled on and off with a chain or through a motorized solution. This solution allows the installation of different layers with different transmission factors.

Image 3a. Source ARRI: Rolled neutral density filter. Light wave effect can be seen as a reflection from inside light.
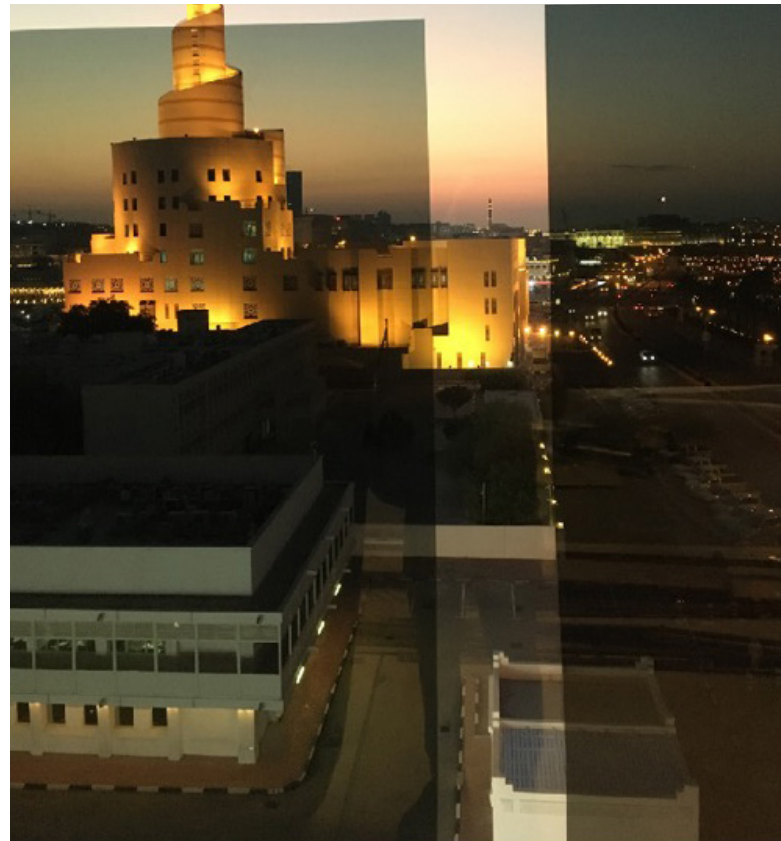

Image 3b. Source ARRI: Testing of fixed neutral density filters with different transmission factors.

- **Advantages:** easy installation and cost effective. Optimal solution when the skyline has big monuments or buildings with night illumination.
- **Disadvantages:** as a fixed installation, the cleaning needs special precaution. As a rolled installation, the solution can show light waves as a reflection from the lights placed inside of the studio. On both (fixed and rolled solution), reflections can happen when the outside is dark and the height of the fixtures is low. As a rolled solution, the material must be replaced periodically.

3. 4fs-5fs matrix curtain solution

A doubled-sided black matrix black curtain, with the following specifications:

• Density, 350-375g/m2.
• Rolled curtains of 3 meters height max. Widths: 2 m, 2,5 m or 3,2 m.
• 36% fiberglass and 64% PVC.
• 90-94 UV screen.
• EU fire protection.

The solution can be installed on fixed frames or on a rolled curtain with manual or motorized movement.

Image 4. Source RTVE.es:
Broadcast use in RTVE 24 hours
news channel. ⬈ **www.rtve.es**

Image 5. Source ARRI:
Fog effect when the focus
is on the curtain.

• **Advantages:** easy installation and cost effective. The material does not create reflection from the inside.
• **Disadvantages:** depending on the camera focus, some virtual fog could appear.

4. Double polarization system

Based on the polarization of two materials, one is placed on the window and the other is placed in front of the camera. The camera filter can be turned locally or remotely (dedicated control or with a software on a Windows computer). Depending on the relative position of both materials, the resulted polarization is stronger or weaker, allowing the light to go through.

• **Advantages:** step light regulation.
• **Disadvantages**: rainbow effect, twist colors and birefringence (when used with non-transparent windows), polarization changes on curved windows and when using different cameras, polarization can vary depending on the windows-camera distance, banding effects could appear when the angle windows-camera is lower than 45° from the perpendicular line that joins the window to the camera, orange peel effect could appear, not focus can be done outside of the windows, some LCD/LED TV can be affected by the camera filter, acrylic panels are easily scratched. Big panels can have deflection, especially when mounted with an angle. Junctions between two panels must be black-out covered.

5. Smart glass solution

Transparency of the glass changes depending on a tension control signal.

Image 6.
Source econtrol-glas: Intelligent glass solution demo.

• **Advantages:** full light control.
• **Disadvantages:** high price range. The solution needs to be considered when the building is designed, as a part of the architectural concept.

6. HDR camera

Reference: ARRI/AMIRA camera series. Considering a standard application of 69000 lux outside light luminance intensity and 1000 lux studio luminance intensity, AMIRA camera provides a high dynamic range with greater flexibility and efficiency on set.

⤴ **More detailed information on www.arri.com/amira**

Image 7a.
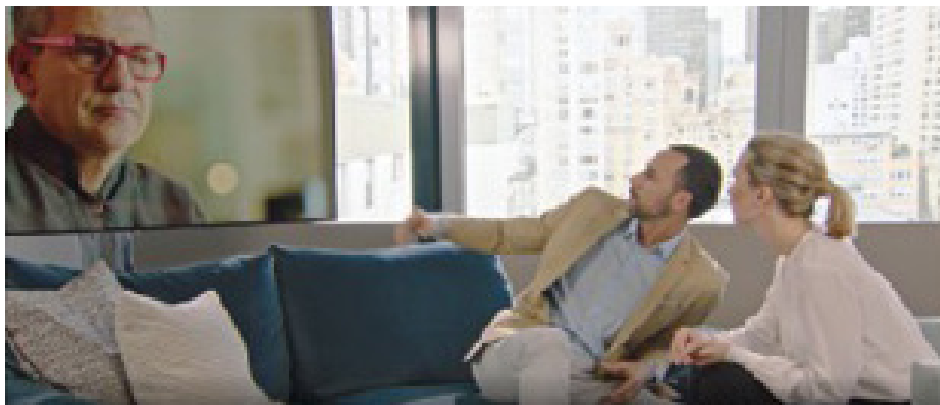Source ARRI: Shooting with standard 2/3, HD camera system.

Image 7b.
Source ARRI: Shooting with HDR camera like ARRI AMIRA B4 mount, same lenses.
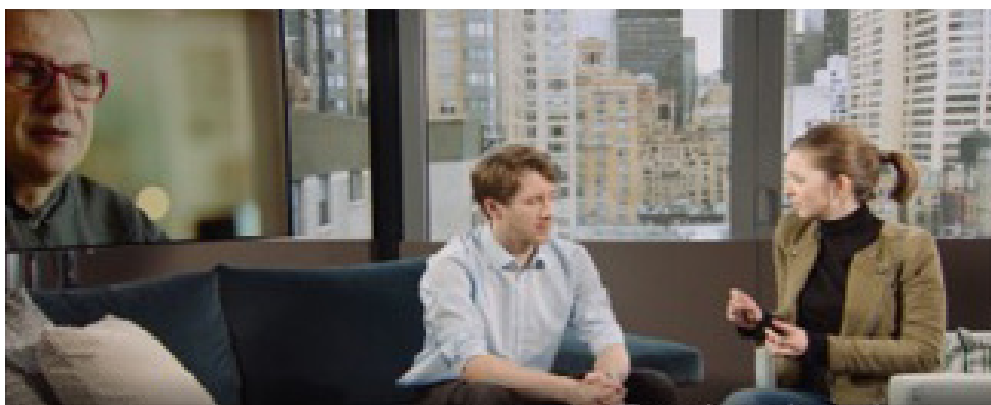

Image 7c.
Source ARRI: Shooting with HDR camera like ARRI AMIRA B4 mount – evening situation

Summary

An open area, a glass wall, or a glass window in a television or multimedia studio creates a challenging lighting environment due to the need to find a compromise between the outside and inside light intensity. Camera improvements make managing a wide range of light intensities easier, but, depending on the application, additional solutions need to be installed to compensate the extremely high intensity difference. Finding a perfect solution that reduces the light without reducing the view is almost impossible and the optimal solution depends on the specific use of the studio, on the physical location, and on the hours in which the shooting will be done.

Even when there is no perfect solution available, the market offers a range of suitable installations that come remarkably close to the requested needs of the client.

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