



TECHNICAL BULLETIN : GENERAL INFORMATION

General Camera Information and use for NuAire Biological Safety Cabinets (BSC) and Isolators

General

In today's world, residential, commercial and institutions (homes, business's, stores, and schools) commonly install camera surveillance systems for the protection of occupants and visitors. Recently with the news of incidents within pharmacies where the Compounded Sterile Products (CSP's) were not prepared properly (compromised sterility, incorrect ingredients or concentration) there has been an increased awareness for the use of monitoring or surveillance systems to be located on or near the Primary Engineering Controls (PEC's) for the purpose of monitoring the very critical work and/or maintaining video evidence on past procedures and training. To accomplish this, NuAire is now offering general guidance to aid in the selection of camera systems that can be mounted on or near the PEC for both new PEC purchases and for field retrofit. In addition to the general guidance, Nuaire offers one camera choice along with accessories (i.e. cabling, monitors, DVR's) for a turnkey solution. Nuaire, as in the past, offers special installation options for camera systems that are provided by the customer. For further information, please contact your NuAire representative, distributor or factory sales team member for assistance.

Camera Mount Location

Location of the camera on the PEC is the most important aspect to assure maximum camera visual performance in terms of quality and field of vision. The camera location must also be kept out of the contaminated plenums to avoid constant disinfection and be readily accessible for ease of service.

Currently, Nuaire has selected three camera mounting locations to install video monitoring on a BSC or Isolator.

The first location (Photo 1), which must be factory installed, is located on the rear wall of the work zone.

To accomplish, an NSF approved 6" x 6" sealed window is installed through the rear wall of the cabinet or isolator.

Another option would be to mount the sealed window on the cabinet side (Photo 2).



Photo 1 – View of camera and access from back.
1' x 1' opening reduced to 6" x 6" using tape.



Photo 2 – View of rear mounted camera from the
front side of Biological Safety Cabinet.

The second location may be either factory or field installed.

In this case, the camera may be mounted to the bottom of the control panel either in the center or offset to either side. The control panel holds the fluorescent lamps in this area, so the mounting process should be performed by a qualified service technician who is familiar with the cabinet operation. Bottom control center mounting may also be a choice for different camera models as long as they perform to expectations and don't interfere with cabinet user procedures. Photo's 3 and 4 show a camera mounted on the bottom of the control center.



Photo 3 - View of camera mounted on the control panel bottom center.



Photo 4 – View of Camera mounted on the control panel bottom right side to minimize operator interference.

The third location could be a remote camera installation on the lab ceiling. In this case, the method would be to contact your security system provider and discuss a total solution that would be integrated to the building system and existing security software package.

In regards to the referenced camera mounts stated above, the camera viewing angle varies depending on where the camera is mounted.

Camera's that offer viewing angles above 70 degrees optimally represent the work zone.

To illustrate the viewing angle, photo's 5, 6 and 7 represent video monitor screen shots of the camera mounts located as previously discussed.



Photo 5 – Viewing angle with camera in back.



Photo 6 – Viewing angle with center mounting.

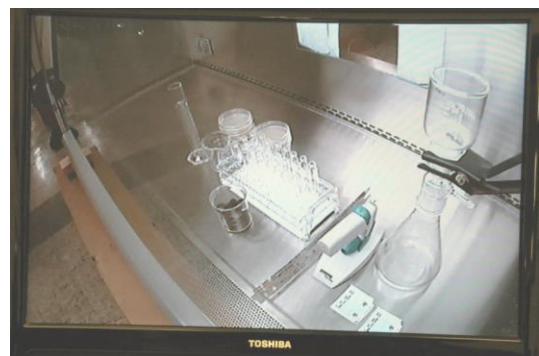


Photo 7 – Viewing angle moved 12" to right.

Discussion of Camera Solutions

The world of cameras has changed since cameras became digital.

Many aspects of cameras from cell phones to very small surveillance cameras to cables, interconnections, wireless viewing and recording. To make some sense of this overwhelming picture, let's consider the four possible categories: Ethernet, USB, Video and Wireless.

Ethernet

The Ethernet approach allows the use a special video camera mounted on the PEC that outputs the video signal into a digital data stream that could be transmitted over the facilities Local Area Network (LAN). The data stream could then be used anywhere on the LAN with a Personal Computer (PC) that launches a web browser (i.e. Internet Explorer, Google Chrome) or a separate software package to allow the ability to view, monitor, and record work being done at done at the PEC.

USB

Universal Serial Bus (USB) connections are available for camera systems that are directly connected to a PC. As with the other cameras discussed, the USB camera can be mounted directly on the PEC and the USB cable connection is run directly over to a PC (Photo 10). The USB cable is the camera's input (power) /output (digital video) using a standard 4-wire USB cable. The camera typically is purchased with a software package that installs on a PC. The software allows you to snap a singular photo or to record an on-going streaming video on your PC (Photo 11). The advantage of this approach is simplicity for the installation process. However, the disadvantage is that the PC must reside next to the PEC.



Photo 10 – USB front mounted Video camera



Photo 11 – BCS with camera and PC.

Video

Video cables connections can run as far as 400 feet. Once you get to 400 feet, it would be recommended to use of a video amplifier to boost the video signal. The video camera would be mounted on the PEC in the preferred position. The video camera is then connected to a power supply and to the video cable. The video cable then runs from the PEC directly to the monitor where it's connected.

Video cable connections are the preferred solution for monitoring and security systems (over 80% of security systems) because they are less susceptible to accidental or purposeful damaging. Video cable connections also eliminate interference issues (i.e. wireless reflected RF and compromised antenna locations).

Wireless

Wireless connections make it possible to not have to worry about running cable from the camera to the monitoring station. Installation would be to mount the camera on the PEC and locate the camera antenna in a good position to get the RF signal to the receiver's antenna.

In Photo 8, we show a BSC rear wall mounted camera with its antenna located on top of the BSC.

The antenna is mounted in a direct visible line from the camera antenna at the BSC to the at the monitor RF receiver antenna, then to a video cable which then is connected to the monitor.

Adjusting the RF antenna position impacts the video quality.

RF signal strength can travel 700 feet outdoors or in a clear un-obstructed environment to 150 feet indoors with moderate obstructions.

Wireless camera systems typically operate at 2.4 GHz frequency.

Photo 9 shows what the camera is capturing. In this example, about 100 feet away on a 24" television.

The one area of concern with wireless systems is multiple wireless systems operating on the same frequency band. Wireless routers in buildings for computer systems sometimes also operate on the same 2.4 GHz frequency (Wi-Fi and 802.11). If this is the case, both systems may have interference issues which will likely lead to a poor video picture or computer system interruptions. However, some wireless router computer systems today operate at 4.8 GHz frequency, which poses no interference issues at the camera's lower 2.4 GHz level. Antenna size and position become very critical in maintaining acceptable video performance.



Photo 8 – Rear view showing RF transmitter and RF antenna



Photo 9 – TV located in monitoring office
(RF receiver and antenna to left of TV)

Video Recording

Video recording of the camera data can be accomplished with the use of a Digital Video Recorder (DVR). The connection of the DVR would be just before the connection to the monitor, so the video data runs through the DVR and supplies the monitor.

Multiple Camera (Quad) Monitoring

Multiple video cameras can be cable connected into a quad (4 channel) processor. The output of the processor would then be connected to the monitor or DVR that is also set up to display or record the 4 individual cameras.

Nuaire Camera Options

In reviewing the above information, there are many choices for video surveillance of PEC's used in laboratories and pharmacies. The steps involved in getting your BSC connected for monitoring can be summarized as follows:

1. Contact Nuaire or your Nuaire sales representative
2. Identify the quantity and type of PEC's that require a camera
3. Determine the distance from the camera to the monitoring or viewing station
4. Determine any other security requirements
5. Determine camera type (Video/RF/USB/Ethernet) and viewing angle.
6. Determine cable requirements based on camera type
7. Monitor type (size), DVR required, and quantity of each.
8. Desired camera location on BSC or Isolator (new PEC or field retrofit)

Please Note: Camera picture quality is as good as the network it's on!