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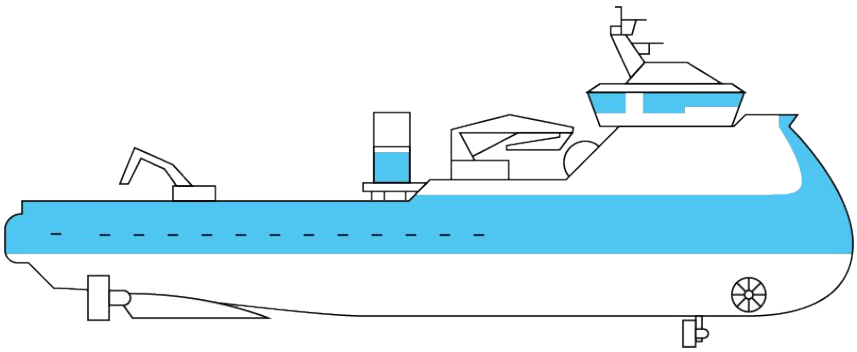

Choosing the optimal CCTV solution for ships and other marine vessels

A guide for optimizing your CCTV system for cost efficiency – without sacrificing quality

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Introduction

In a continuously evolving maritime industry, shipyards are constantly challenging electrical installers and sub-contractors to improve quality and optimize the cost-efficiency of their services.

To gain an edge on your competitors and secure a project you have to be able to present a superior solution, satisfying your client's demands for both quality and costs.

The purpose of this guide is to assist sub-contractors in the maritime industry with identifying opportunities to optimize both cost-efficiency and quality, allowing them to present their clients with a superior CCTV solution.

We believe the key to designing an optimized CCTV solution is to approach each specific location individually, and in this guide, we will highlight the most important aspects to consider in all relevant areas.

We hope this guide will be beneficial, not only to electrical installers and sub-contractors but to all parties involved in a ship construction project.

Our credentials:

Hatteland technology has over 30 years of experience with providing complete CCTV solutions for marine application.

Our specialty is identifying the best CCTV solution for any giving project and supporting electrical installers and sub-contractors with our extensive knowledge and expertise.

"Hatteland technology has been our preferred partner and supplier of CCTV systems for 20 years now. We are confident in their expertise and ability to deliver a product that satisfies our high demands regarding quality."

– Jan Arve Monsen, Technical Manager at Elpro Electro AS

The importance of a qualified CCTV solution

Whether constructing a cargo ship, tanker, ferry or cruise ship, safety and determining which parts of the ship are critical and are to be monitored should always be the first and foremost priorities of any shipyard.

In order to satisfy the industry's rigid safety standards, implementing an extensive, qualified and approved CCTV system is paramount – but identifying the optimal CCTV solution for your project can be challenging.

In this section, we take a closer look at the most important aspects to consider when designing a CCTV system for maritime applications and how to make smart choices that will reduce the total cost of the installation.

An important piece of the puzzle

Although an important one, CCTV is just one piece of the puzzle when designing and constructing a ship.

Shipyards rely on a multitude of suppliers and installers, providing all the equipment and technology that is essential for the construction of a ship. In addition, they utilize the expertise of a consulting company to piece together the puzzle and ensure that the delivery will be in accordance with the specification and the end user expectation.

Ultimately, it is the end user and the consulting company that determines the set of requirements for the new build. However, we often see that the CCTV system is not specified with up-to-date technology, or that the requirements are written in a way that closes the door for the best technology alternative.

It is close to impossible for consultants to have a deep expertise in all areas related to the construction of a ship and therefore they must be able to rely on their suppliers and installers to provide the best and most cost-effective solution for their individual area.

Choosing the right equipment for each specific purpose

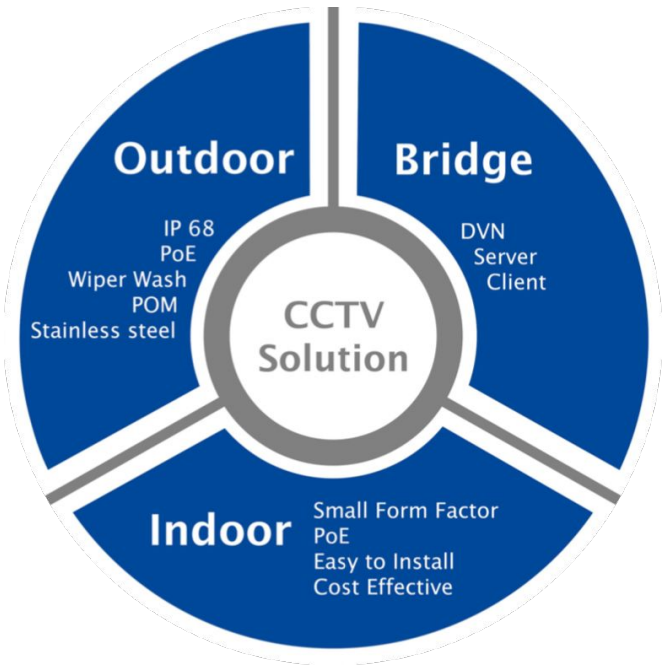
Naturally, all involved parts opt to find the most cost-effective solution but anyone that has been involved in the construction of a ship understand that this is a challenging goal to achieve.

The real challenge for suppliers and installers is balancing cost-efficiency and quality and being able to substantiate your suggestions.

This is especially true for your CCTV solution – where affordability can never be a priority at the expense of quality and safety. There is, however, several opportunities to keep your CCTV system affordable and cost-effective without sacrificing quality.

It all comes down to choosing the best option for each specific location onboard the vessel. From the bridge to the machine room, in an outdoor location or even as part of a critical system the cost and type of solution varies.

In section 2 we will take a closer look at the most important things to consider when choosing CCTV equipment located on or around the bridge.



Bridge CCTC solutions

All electrical equipment installed on the bridge should be tested to ensure an applicable standard and should conform to the regulation specified by the notified body.

In other terms: For systems that are not part of the vessel's critical infrastructure, a DNV certificate (or other third part classification certificate) is a document that ensures compatibility with the critical system.

To be a part of the critical infrastructure all electronics and electrical equipment is required to be tested in accordance with IEC 60945, but having a DNV certificate allows the unit to be installed on the bridge and/or be a part of the critical infrastructure.

This includes all PCs, monitors, panel PCs, keyboards, joysticks, jog wheels, servers, clients and cameras located on the bridge.

DNV GL's "Rules for Classification of Ships"

DNV GL (Det Norske Veritas) or another notified body will review the test report and/or the certificate in order to assess the classification of the vessel. Failing to provide test reports will disqualify the equipment from being part of the system installed on the bridge or part of the critical system.
Classification requirements are specified in DNV GL's "Rules for Classification of Ships". For CCTV, the document states that:

- CCTV system shall provide the operator with true color pictures of relevant areas for compensating lack of direct visual viewing.
- CCTV system used for compensating lack of direct visual viewing shall be connected to the main and emergency power system.
- The monitor size shall be adequate for easy viewing from the operator's position.

In addition, the DNV document includes rules for onboard equipment testing:

- The CCTV system shall be tested for verifying appropriate reproduction on the indoor monitor, including color correctness, brightness, dimming facilities (if the monitor can degrade the OOW's night vision) and display size. It shall further be verified that the picture is free of flickering.
- Means for cleaning the camera lens to be tested for cameras located in areas exposed to salt-mist.

Why are IEC 60945 standards important?

IEC 60495 is the international standard adopted by the International Maritime Organization (IMO) to ensure satisfaction of the Internation Convention for Safety of Life at Sea (SOLAS).

The standard specifies minimum performance requirements, testing methods and required test results in order to meet the general requirements for safety at sea.

"This is important because IEC 60945 includes testing to prove that the equipment does not cause noise or is affected by noise that could damage the equipment.

IEC 60945 also includes power supply tests, as well as a number of tests related to the environment on a ship, which help determine the longevity of equipment situated in a marine environment."

– Jan Tore Grimsrud, Head of Section (Control Systems) at DNV GL

Important equipment capabilities for electronic components tested by DNV GL

Shock and vibration:
Marine vessels experience varying vibrations, and components have to be tested in several unique patterns.

Electromagnetic interference (EMI):
The electromagnetic energy which affects the functioning of an electronic device.

Electromagnetic Compatability (EMC):
A component's ability to operate as intended in its shared operating environment while not affecting the ability of other equipment within the same environment to operate as intended.

Things to consider

Field-of-View (FoV):

Field of view from the bridge may determine the amount and type of needed cameras.

Ships with extended bridge wings from the pilothouse may have an extended field of vision compared to ships with a smaller pilothouse, and therefore the CCTV requirements will be more extensive for bridges with a smaller pilothouse.

All Field-of-Vision cameras must be DNV GL-approved, as they are a part of the ship's critical system infrastructure. Should one of these cameras fail it may lead to severe damage and injury, as the captain will lose a critical view for maneuvering the vessel.

Throughput:

- Depending on the size and complexity of your CCTV system, data throughput may become an issue.

- Connecting too many cameras to the same network may cause data bottlenecks and storage issues.

- Always be aware of your networks' bitrate capacity and recorder limitations.

Trackball:

- Although a minor detail, choosing the right type of trackball may have a significant impact on operations.

- Trackballs come in a variation of sizes, and our experience implies that larger is better.

In section 3 we will take a closer look at the most important things to consider when choosing CCTV equipment for outdoor areas

CCTV solutions for outdoor areas

Cameras mounted in outdoor areas account for a significant share of any ship's CCTV system, monitoring the hull and immediate area surrounding the ship, as well as important processes and operations on deck such as cranes, mooring stations and gangways.

CCTV cameras in outdoor areas are not required to be DNV GL-approved, because their location minimizes the risk of interfering with other critical systems.

There are to main qualities that must be ensured when choosing CCTV cameras for outdoor areas:

- Cameras must be non-corrosive (to ensure optimal functionality and longevity)
- Cameras must uphold an IP66 or IP67 rating (depending on application)

Ingress Protection ratings define the levels of sealing effectiveness of electrical enclosures against intrusion from foreign bodies such as dirt and water.

- The IP66 rating testifies that the camera is protected from dust, heavy sea and high-pressure water jets from any direction.

- The IP67 rating testifies that the camera is protected from dust and against the effects of immersion in water to a depth between 15 cm and 1 meter.

When building a complete CCTV solution for a specific ship or vessel you must consider the location, use, and purpose of each individual camera in order to ensure cost-efficiency without sacrificing quality.

Choosing the right material: Stainless steel vs. POM

There are two main materials used for CCTV cameras for outdoor areas, each with their advantages and disadvantages:

1. Stainless steel (316L)

Large, heavy and durable, stainless steel cameras are typically used in locations such as under the bridge, on and around the main mast, and in work-related areas.

In these critical areas of the ship, where safety is a concern, stainless steel cameras are required, due to their durability and wipe-and-wash function.

Advantages:

- Non-corrosive and incredibly durable
- Wipe-and-wash function to ensure vision and functionality in all conditions
- Heating element to prevent condensation on the lens

Disadvantages:

- May be difficult to mount and install due to their size and weight
- May not be compatible with a PoE solution

2. POM (Polyoxymethylene)

In many outdoor areas, it is beneficial to use POM cameras, as these are lighter and easier to mount.

Advantages:

- Lightweight materials make the cameras easier to mount
- More affordable than stainless steel

Disadvantages:

- No wipe-and-wash function

Fixed camera, PTZ or Dome?

There are three main types of CCTV cameras used in outdoor areas. What type of camera to install in each separate location is determined by its function and purpose.

1. Fixed cameras

Fixed cameras are used in all outdoor areas where there is no need for mobility. These cameras do not provide an option to pan, tilt or zoom, and is best used in areas where constant surveillance is a necessity.

Fixed cameras are available in both stainless steel and POM.

2. PTZ cameras (Pan/Tilt/Zoom)

PTZ cameras are usually mounted under the bridge, on or around masts and in work- and process-related areas onboard the ship.

These cameras offer the ability to pan, tilt and zoom, making them ideal for areas where you would want full control and a 360-degree view.

PTZ cameras are available in stainless steel and include the option for a wipe-and-wash function.

3. PTZ dome cameras

In certain critical outdoor areas, where safety is an issue, you are required to install large stainless steel-cameras with a wipe-and-wash function, in order to optimize vision and reduce the risk of serious injury.

In areas where wipe-and-wash functions are not a requirement, we recommend opting for dome cameras, as this is generally the better and more cost-effective alternative.

These cameras are easier to mount and maintain and present a much more cost-effective alternative – both in terms of price per camera and installation costs.

In section 4 we will take a closer look at the most important things to consider when choosing CCTV equipment for indoor areas.

CCTV solutions for indoor areas

CCTV cameras are spread out through all indoor areas of a ship – in the machine room, the instrument room, in cargo holds, hallways and so on.

These cameras are not subject to the same harsh conditions as outdoor locations, and therefore does not require an IP66 rating.

CCTV cameras in indoor areas do not need DNV GL-approval, with the exemption of cameras located on the bridge.

Size, safety, and affordability

Your main concern when choosing indoor CCTV cameras should be size, safety, and affordability.

We recommend using Mini Dome Cameras or smaller indoor PTZ domes in all locations where this option is applicable – as this option ticks of all three focus areas.

Size:
As the name implies, Mini Dome Cameras are small in size and take up much less space than most other type cameras.

Safety:
The small size and curved shape of Mini Dome Cameras promotes safety and reduces the risk of serious injury in narrow hallways and cramped machine rooms.

Affordability:
Mini Dome Cameras are an affordable and cost-efficient option compared to other types of cameras. This extends beyond price per camera, as the simple mounting process reduces installation costs.

In section 5 we will take a closer look at the potential benefits of varifocal cameras and Power-over-Ethernet solutions.

Varifocal and Power-over-Ethernet

In addition to the environment (bridge/outdoors/indoors), materials and camera type for each location, we wish to point out two more important aspects to consider when drawing up your CCTV solution:

Varifocal view

Most fixed cameras have a wide-angle view. While this is beneficial in many cases, there are certain situations in which you would want the ability to the focal length, the angle of view and zoom level.

If the purpose of a camera is to monitor a certain instrument or process you will most likely not want the majority of the screen to be occupied by large metal structures surrounding the point of interest.

Instead, you will want to utilize as much of the screen as possible, focusing only on the specific components you wish to monitor.

To achieve this, your best option is to install a varifocal camera that allows you to narrow down your viewing angle while at the same time getting a lot more detail within your focus area.

Power-over-Ethernet

It might be beneficial to install PoE (Power-over-Ethernet) cameras, satisfying IEEE 802.3af standards, in areas where this is an option.

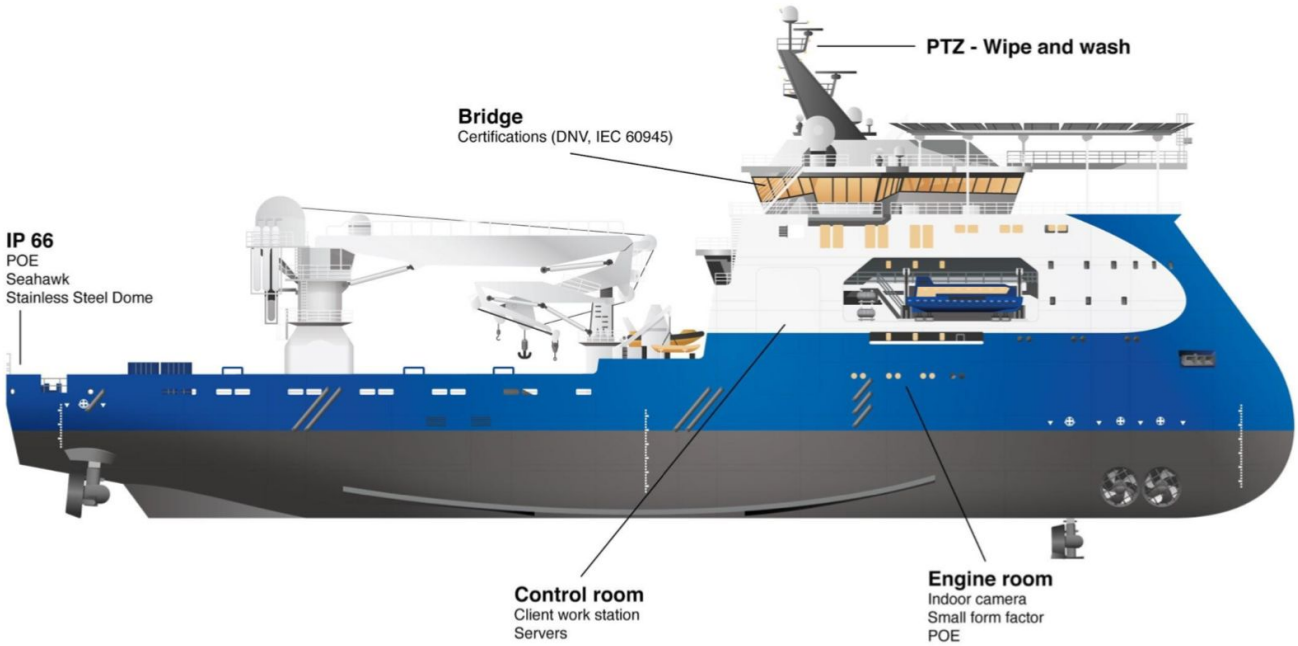
PoE is one of the major benefits of modern IP cameras, as opposed to the older analog cameras, and allows for supplying both power and network connectivity through one single cable.

If you have a camera located 90 meters away from your server the cost benefits of only having to draw one single cable, rather than separate cables for electricity and connectivity, is the far more cost-effective choice. Alternatively, you may use a PoE extender for networks stretching out across long distances.

Note that this option is not available for larger PTZ cameras in stainless steel, as these require power supplied through a CAT6 cable.

In section 6 we will show you an example of a complete CCTV solution.

Example of a complete CCTV solution



Conclusion

The main goal of this guide is to demonstrate the importance of considering the purpose and needs of each specific location individually when drawing up a CCTV solution for ships and other marine vessels.

Your choice of equipment may significantly affect installation costs, and thus, by choosing the right type of camera and material for each separate location you will be able to optimize your CCTV system in terms of both quality and cost-efficiency.

Reducing the costs associated with your CCTV solution is beneficial for all parties involved:

- Installers may get an edge on their competitors by offering a better and more cost-efficient solution without sacrificing quality.
- Consulting companies may dedicate resources saved through optimizing the CCTV system to other important areas of the ship.
- The shipyard and end user will receive a superior solution and final product.

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Thank you for reading!

Contact us and learn how we can help

Hatteland technology is a provider of advanced technology solutions within industrial computing, security & surveillance and industrial networking ranging from standard off-the-shelf products to customized solutions and services. With in-depth industry knowledge of the segments we operate in, we offer specialized, tailored solutions in the design, engineering and manufacture of precision technology, built for tough conditions.

We hope this guide has been beneficial and encourage your feedback. If you wish to discuss your CCTV needs for an upcoming project, feel free to contact one of our experienced consultants:


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