# SURVEILLANCE SYSTEM IN NALCO SMELTER PLANT

INTRODUCTION:

CCTV systems provide surveillance capabilities used in the protection of people, assets, and systems. A CCTV system serves mainly as a security force multiplier, providing surveillance for a larger area, more of the time, than would be feasible with security personnel alone. CCTV systems are often used to support comprehensive security systems by incorporating video coverage and security alarms for barriers, intrusion detection, and access control. For example, a CCTV system can provide the means to assess an alarm generated by an intrusion detection system and record the event. A CCTV system links a camera to a video monitor using a direct transmission system. This differs from broadcast television where the signal is transmitted over the air and viewed with a television. New approaches within the CCTV industry are moving towards more open architecture and transmission methods versus the closed circuit, hard-wired connection systems of the past. CCTV systems have many components with a variety of functions, features, and specifications. Key components include cameras, lenses, data distribution, power, and lighting, among others. CCTV technologies continuously undergo feature refinements to improve performance in areas such as digital equipment options, data storage, component miniaturization, wireless communications, and automated image analysis. The components, configuration options, and features available in today's CCTV market create a complex set of purchasing options. It is the intent of this handbook to provide information on the capabilities and limitations of CCTV components that will aid an agency procuring a new CCTV system or upgrading an existing one.
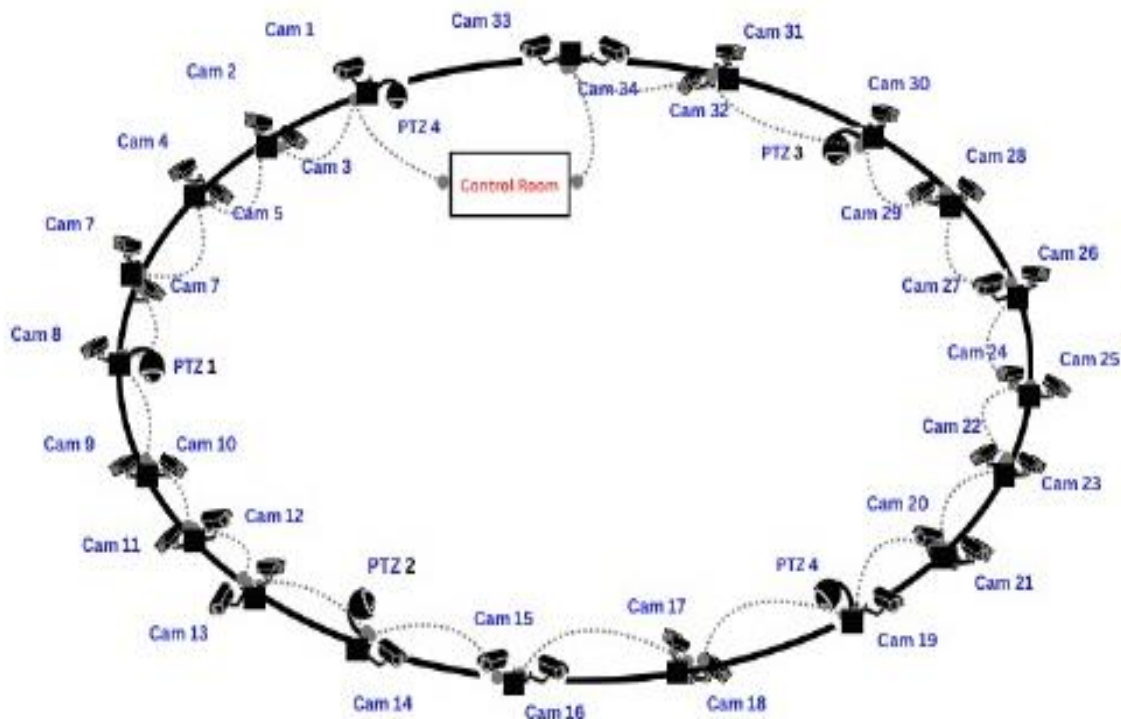
OBJECTIVE:

Strengthen security and safety protocols in the smelter plant by integrating additional CCTV cameras into the existing surveillance network. This expansion aims to deter theft, ensure the safety of employees, and enable continuous monitoring of critical operations, thus enhancing overall operational efficiency and security compliance.

TYPES OF CCTVS INSTALLED:

There are many types of cameras designed to perform under specific environmental conditions but cameras can be grouped into two primary categories: fixed and pan-tilt-zoom (PTZ). Fixed cameras are intended to constantly view a single scene, while PTZ cameras are motor driven and can pan left or right, tilt up or down, and zoom in or out to instantly customize the view as needed. A combination of fixed and PTZ cameras are often used to provide the required surveillance coverage.

Fixed Cameras:

Fixed cameras are mounted in a stationary position and are focused on a single FOV, typically one particular area of interest. These cameras can be used indoors or outdoors and can be installed overtly or covertly. Fixed cameras vary in size and can be mounted in a wide range of locations (e.g., inside cabinets or control panels, or on poles, fence lines, or roofs).

PTZ Cameras:

PTZ cameras come in a variety of sizes and shapes for interior and exterior uses. Typically, a PTZ camera can be turned and tilted on two axes to provide pan and tilt capabilities and the focal length of the lens can be varied to change the FOV. This enables PTZ cameras to offer more flexibility for viewing and capturing images in real time than fixed cameras. In manual mode, the operator can control the direction of the camera depending on situational needs and zoom in on an object (e.g., a suspicious bag, a person's facial features, or a license plate) to capture specific details of interest.

DIFFERENCE BETWEEN IP AND ANALOG CAMERAS:

CCTV cameras may employ one of two types of data transmission:

Network Cameras–Network cameras connect to IP-based networks, including the Internet, and provide remote viewing and recording. Network cameras are also available in high definition (HD) which can provide greater image detail.
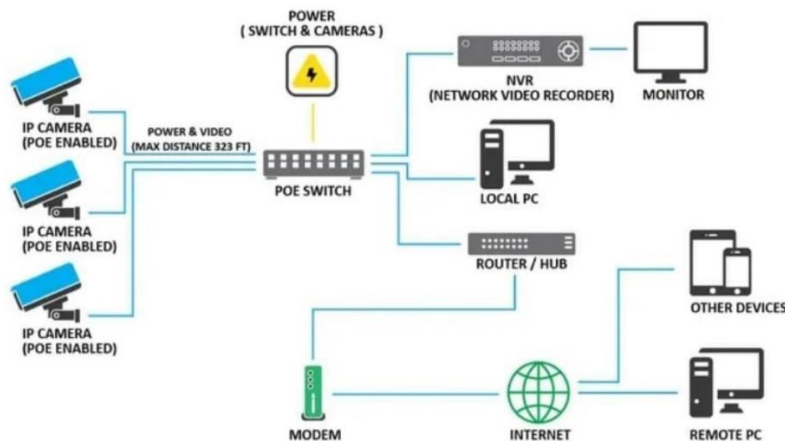
Analog Cameras–Despite increasing use of digital network cameras, a market for analog cameras still exists. This may be due to the cost involved in upgrading and converting to a new transmission process. Analog cameras have options for high resolution, making them applicable for various surveillance needs. These cameras also have some cyber security advantages because the coaxial cable they are connected with would require physical access to breach.

How the video signal is processed and transmitted from the analog CCTV camera to the monitor:

Analog CCTV cameras transmit video using coaxial cables. Here's a step-by-step breakdown of how the video signal is processed and transmitted from the camera to the monitor:

1. Video Capture:
- The analog CCTV camera captures the video footage using its image sensor (CCD or CMOS).
- The camera converts the captured light into an analog video signal.

2. Transmission to DVR (Digital Video Recorder):
- The analog video signal is transmitted via a coaxial cable (such as RG59 or RG6) from the camera to the DVR.
- Coaxial cables are preferred for analog CCTV systems because they can carry video signals over long distances with minimal loss of quality.

3. Recording and Processing in DVR:
- The DVR receives the analog video signals from multiple cameras.
- The DVR digitizes these analog signals, compresses the digital video, and stores it on a hard drive or other storage media.
- The DVR can also perform additional processing, such as motion detection, video analytics, and remote access.
-The output DVR connected to a monitor for display live video and playback history

How the video signal is processed and transmitted from the IP CCTV camera to the monitor:

IP CCTV cameras operate differently from analog cameras by utilizing digital technology for video transmission. Here's how the process works:

1. Video Capture:
- The IP camera captures video footage using its image sensor (CCD or CMOS).
- The camera converts the captured light into digital video data.

2. Transmission to Network Video Recorder (NVR) Vedeo Management server:
- The digital video data is transmitted from the IP camera to the NVR/server over an IP network.
- This is typically done using CAT 5e or CAT 6 Ethernet cables, OFC cable for long distance, but wireless transmission over Wi-Fi is also possible.
- The data is transmitted in a compressed format using codecs such as H.264 or H.265 to reduce bandwidth usage.
3. Recording and Processing in NVR/server:
- The NVR/server receives the digital video streams from multiple IP cameras over the network.
- The NVR/server records and stores the video footage on hard drives or other storage media.
- The NVR/server can also perform additional processing, such as motion detection, video analytics, and remote access.
4. Output to NVR/Server:

- The NVR/server outputs the processed video streams through its video output ports.
- These streams can be sent to a IP network to distribute the video signals to multiple devices or locations.
6. Display on Monitor:
- The video streams are received from NVR/Server can be viewed by multiple client PC over IP network.

Junction Box Camera:

A junction box in an IP camera system serves as a point for connecting and organizing various cables and devices. It helps in managing power and network connections efficiently, ensuring a clean and reliable installation.

Components of a Junction Box

1.Line Termination Unit (LIU)
Purpose: An LIU is used to terminate network OFC cables. It typically includes connectors for OFC cables and can provide surge protection and noise filtering.
Function: It helps in maintaining signal integrity and ensures proper termination of network cables, reducing signal loss and interference.

2.Media Converter

Purpose: A media converter is used to convert network signals from one type of media to another, such as from copper (Ethernet) to fiber optics.
Types: Common types include Ethernet-to-fiber converters, which are used to extend network connections over longer distances.
Function: It allows IP cameras to connect to the network over longer distances using fiber optic cables, which provide better signal quality and immunity to electromagnetic interference.

3.Power Supply and PoE Injectors

Purpose: These components provide power to IP cameras, especially in setups where Power over Ethernet (PoE) is used.
Function: PoE injectors supply power through the same Ethernet cable used for data transmission, simplifying the installation by eliminating the need for separate power cables.

4.Network Switch

Purpose: A network switch connects multiple devices on a local area network (LAN) and allows them to communicate with each other.
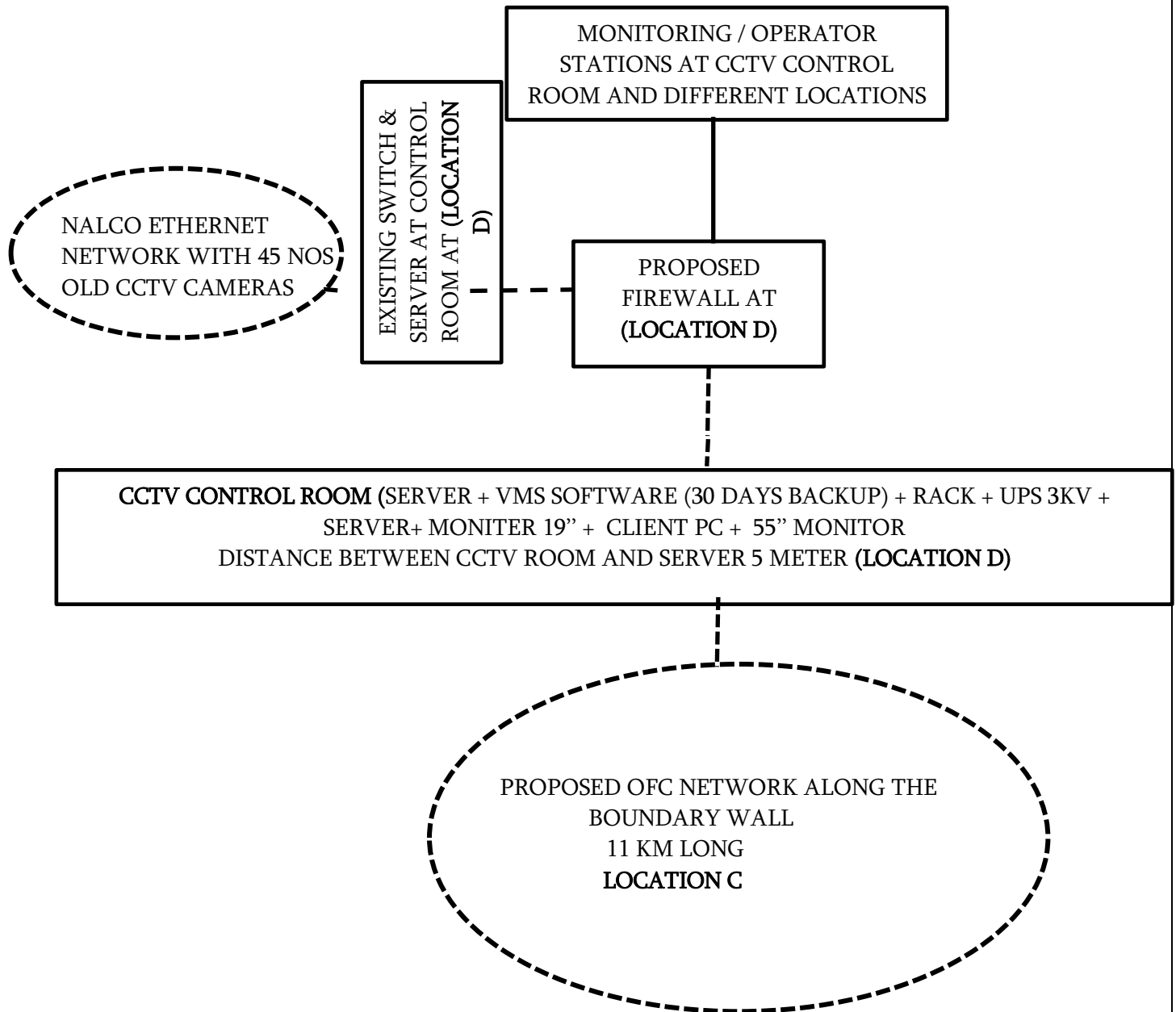Function: In an IP camera system, a PoE switch can power multiple cameras and transmit their data to the NVR or other network devices.

5.Surge Protectors and Grounding

Purpose: These components protect the system from electrical surges and provide proper grounding.
Function: They ensure the safety and reliability of the IP camera system by preventing damage from power surges and lightning strikes.

The Detailed field survey report of location of installation proposed new camera system.

MONITORING / OPERATOR STATIONS AT CCTV CONTROL ROOM AND DIFFERENT LOCATIONS

EXISTING SWITCH & SERVER AT CONTROL ROOM AT (LOCATION D)

NALCO ETHERNET NETWORK WITH 45 NOS OLD CCTV CAMERAS

PROPOSED FIREWALL AT (LOCATION D)

CCTV CONTROL ROOM (SERVER + VMS SOFTWARE (30 DAYS BACKUP) + RACK + UPS 3KV + SERVER+ MONITER 19" + CLIENT PC + 55" MONITOR
DISTANCE BETWEEN CCTV ROOM AND SERVER 5 METER (LOCATION D)

PROPOSED OFC NETWORK ALONG THE BOUNDARY WALL
11 KM LONG
LOCATION C

OLD NETWORK:

Cam 1, Cam 2, Cam 4, Cam 7, Cam 8, Cam 9, Cam 11, Cam 13, Cam 14, Cam 16, Cam 18, Cam 19, Cam 21, Cam 23, Cam 25, Cam 26, Cam 28, Cam 30, Cam 31, Cam 33, Cam 34, Cam 32, Cam 29, Cam 27, Cam 24, Cam 22, Cam 20, Cam 17, Cam 15, Cam 12, Cam 10, Cam 3, Cam 5, Cam 7

PTZ 1, PTZ 2, PTZ 3, PTZ 4, PTZ 4

Control Room

- ■ OUTDOOR JUNCTION BOX
- FIX BULLET CAMERA
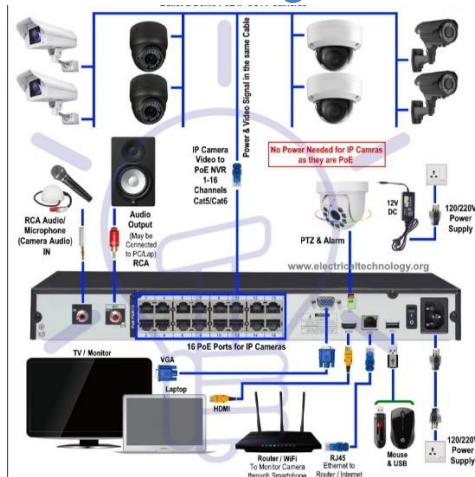- PTZ CAMERA
- – – – – OFC & POWER CABLE
- ▬▬▬ BOUNDARY WALL

Surveillance Camera Installation Using CCTV Camera Connection Diagram:

CONNECTION OF OLD CCTV TO NEW NETWORK:

To connect old CCTV cameras to a new surveillance network, you need to ensure compatibility and seamless integration between the existing system and new cameras. Here are the steps to achieve this:

1. Assess Existing System
- Identify Camera Types:Determine whether the existing cameras are analog or IP (digital).
- Check the DVR/NVR:Verify the type and capabilities of the existing Digital Video Recorder (DVR) or Network Video Recorder (NVR).

2. Select Compatible New Cameras
- Analog Cameras: If you have an analog system, select analog cameras compatible with the existing DVR.
- IP Cameras: If you have an IP system, ensure new IP cameras are compatible with the existing NVR and network infrastructure.
- Hybrid Systems:Consider using hybrid DVRs/NVRs that can handle both analog and IP cameras if you have a mix of both.

3. Upgrade Infrastructure if Necessary
- Cabling: Use coaxial cables for analog cameras and Ethernet cables (Cat5e/Cat6) for IP cameras. Ensure existing cables are in good condition or replace them if necessary.
- Network Equipment: For IP cameras, ensure you have enough network switches and bandwidth to handle additional cameras.

4. Configure and Integrate New Cameras
- Analog Cameras:
1. Connect the new analog cameras to the DVR using coaxial cables.
2. Power the cameras using the existing power supply or a new power adapter.
3. Configure the DVR to recognize the new cameras.

- IP Cameras:
1. Connect the new IP cameras to the network using Ethernet cables.
2. Assign IP addresses to the new cameras (either manually or via DHCP).
3. Add the new cameras to the NVR by accessing the NVR's configuration interface and inputting the

cameras' IP addresses.
4. Ensure the cameras are powered via Power over Ethernet (PoE) switches or separate power adapters.


5. Configure Software and Monitoring
- Update Firmware:Ensure that all cameras and recording devices have the latest firmware installed.
- Configure Recording Settings:Adjust recording settings such as resolution, frame rate, and motion detection to optimize performance and storage.
- Test the System: Check the feed from all cameras, ensure proper recording, and adjust settings as necessary.

6. Maintain and Monitor
- Regular Maintenance:Schedule regular checks and maintenance for all cameras and recording devices.
- Monitor Continuously: Ensure that the system is monitored continuously to detect and address any issues promptly.

By following these steps, you can effectively integrate new CCTV cameras into your existing surveillance network, enhancing the overall security and monitoring capabilities of the smelter plant.
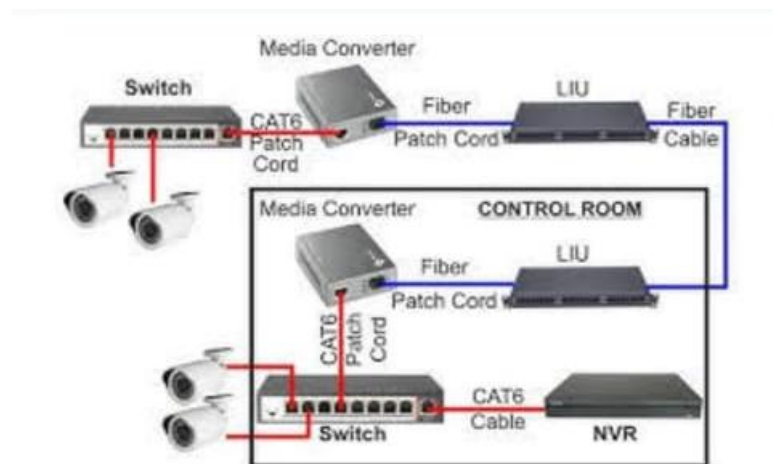
DETAILED SITE SURVEY FOR HARDWARE REQUIREMENT OF WATCH TOWERS (LOCATION C)

Location No	Details of Location	Camera Type	Pole
1	WT 1	1 PTZ	X
2	ON WT 2	1 FIX	X
3	ON WT 3	2 FIX	1
4	ON 4	1 FIX	X
5	Between WT6and WT7	2 FIX	X
6	Between WT7and WT8	2 FIX	1
7	Between WT8and WT9	2 FIX	1
8	RPU Operation building	1 PTZ	1
9	Near WT 11 On Electrical Light tower	2 FIX	X
10	WT 12	1 PTZ	X
11	WT 13	2 FIX	X
12	Between WT14and WT15	2 FIX	1
13	Between WT15and WT16	2 FIX	1
14	IN WT 16 NEAR GAP MECHANICAL	2 FIX	2
15	IN WT 17	1 FIX	X

16	AT WT 17	1 PTZ	1
17	AT WT 19 GOMTY	2 FIX	X
18	Between WT21and WT22	2 FIX	1
19	Between WT22and WT23	2 FIX	1
20	Between WT22and WT23(DROSS UL)	2 FIX	1
21	Between WT23 and WT24 NEAR DRAIN ON ELECT POLE	2 FIX	1
22	BETWEEN WT24and WT25	2 FIX	1
23	ON WT23	1 FIX	1
24	ON WT 25 GOMTY	1 PTZ	1
25	ON WT24	2 FIX	X
26	SPARE	2 FIX	1
27	SPARE	2 FIX	1
28	MAIN GATE PASS SECTION	1 FIX	
		41 FIX + 5 PTZ(46 No's)	18 POLES

TOTAL 28 LACATION
- 41 NO'S 5MP FIX BULLET CAMERA & 5 PTZ CAMERA
- 28 NO'S OF JB WITH 28 X (ONE POE 4 PORT SWITCH WITH 2SFP MODULE),28 LIU
- 28 UPS + CIRCUIT BREAKER + SURGE PRTOCTION DEVICE+ POWER DISTRIUBUTER+ CAMERA LAN PROTECTOR.
- CONTROL ROOM RACK + SERVER + LIU + 3 KAVA UPS + OPERATAOR STATION WITH 53 INCH MONITOR AND EARTING.
- OFC CABEL 12000 METER
- 4C 16 SQ MM ALUMINIUM ARMOURED XLPE POWER CABLE: 12000 METER
- OFC & POWER CABLE SADLING 10KM, OFC & POWER CABLE UNDER GROUND 2000 METER (approximate).
- 18 CCTV POLE.
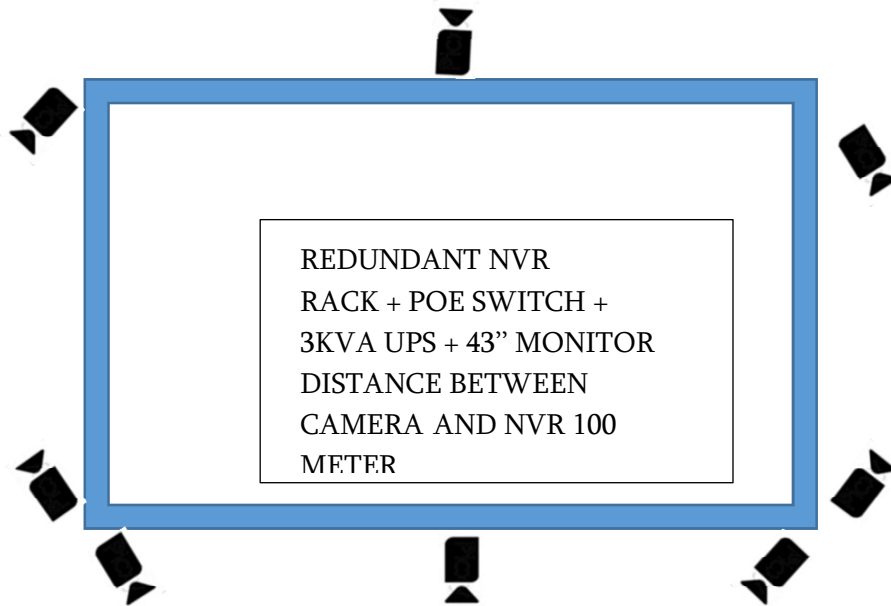- 28 NO'S OUT DOOR 230 VAC POWER SUPPLY JB.

DETAILED SITE SURVEY FOR HARDWARE REQUIREMENT OF GATES AND GATE TO NH ROAD (LOCATION B)

Location No	Details of Location	Camera Type	Pole	Approximate Nearest Cable distance(meter)
1	NH GATE	**2 FIX**	X	0
2	TRAINING CENTER GATE	2 FIX	X	250 UG
3	STEEL YARD	1 PTZ	X	250 UG + 40 FT ROAD CROSS
4	DPS SCHOOL ROAD	1 FIX	1	250 UG
5	ADMIN GATE IN & OUT	2 FIX	2	500 + 40 FT ROAD CROSS
6	FIRE STATION SQUARE	3 FIX		500 UG
7	MAIN GATE FRONT	1 PTZ		300 UG
8	MAIN GATE BACK	1 PTZ		100 CAT 6
9	MATERIAL GATE IN & OUT	2 FIX		100 CAT 6

10	LABOUR GATE IN AND OUT	2 FIX		100 CAT 6
11	EMPLOYEE GATE IN AND OUT	2 FIX		100 CAT 6
12	ALUMINIUM GATE IN AND OUT	2 FIX		400 SADLING
13	CISF COLONY GATE IN AND OUT	2 FIX		300 SADLING
		20 FIX 3PTZ		

- 20 NO'S 8MP FIX CAMERA & 3 PTZ CAMERA
- 12 X (ONE POE 4 PORT SWITCH WITH 2SFP MODULE),13 LIU
- 12 UPS + CIRCUIT BREAKER + SURGE PRTECTION DIVICE+ POWER DISTRUBUTER+ CAMERA LAN PROTECTOR.
- OFC CABEL 2750 METER, CAT 6 CABLE 400
- 4C 16 SQ MM ALUMINIUM ARMOURED XLPE POWER CABLE: 3000 METER
- OFC & POWER CABLE UNDER GROUND 1750 METER, OFC & POWER CABLE SADLING 1000 METER AND 400 CAT6 SADLING.
- 3 POLE

CISF QUARTER GUARD (ISOLATED PLACE)
LOCATION A

REDUNDANT NVR
RACK + POE SWITCH +
3KVA UPS + 43" MONITOR
DISTANCE BETWEEN
CAMERA AND NVR 100
METER

- 8(Eight) 8 MP Fix Camera
- Two 8 channel NVR (two NVR consider for redundant purpose)
- 1 wall mounting rack
- one 16 Chanel POE switch
- 3 KVA UPS
- 43 inch Monitor
- 800 meter cat 6 Cable

S. N.	Description	UOM	Qty.
	DETAILS OF		
1	**5MP IP IR Bullet Camera (Long range) with 7.0 – 22.0 mm motorized lens; 70 Mtr IR Distance or better; IP67 & IK10; as per technical specifications.(Location C)**	No's	41
2	**8MP IP IR Bullet Camera (Short range) with 2.8 – 12.0 mm motorized lens; 50 Mtr IR Distance or better; IP67 & IK10; as per technical specifications(Location A & Location B)**	No's	28
3	**5MP IP IR 30X PTZ Camera with quad video streams, 200 Mtr IR distance, IP67 & IK10, including pole mount bracket and power supply; as per technical specifications(Location B & Location C)**	No's	8
4	*16 Channel Network Video Recorder with minimum 2 nos. SATA Ports or better and loaded with 2 nos. 20TB Surveillance Grade Hard Disk Drives; as per technical specifications*(**Location A**)	No's	2
5	*VMS Management Server : Rack Mount Server with Intel Xeon Gold 5317 3G, 12C/24T, 11.2GT/s, 18M Cache; 2 x 16GB RDIMM, 2 x 1.2TB Hard Drive SAS ISE 12Gbps 10k 512n 2.5in with 3.5in HYB CARR; Fully Redundant Power Supply (1+1), Windows Server 2019 Standard (12Core); Keyboard; 19" Monitor ; Mouse; as per technical specification. (* **Location D**)	No's	2
7	*Video Management System software – Corporate Base License; as per technical specifications* (**Location D**)	No's	1

8	*Monitoring Workstation : 11ᵗʰ Generation Intel Core i7-11700, 8 Core, RAM 16GB DDR4 , 1TB Hard Disk, Nvidia T1000 8GB Graphics, Win 10 Pro 64 OS, Keyboard & Mouse; as per technical specifications (* **Location D** *)*	*No's*	*2*
9	*55"/139 cm 4K UHD Display : 24x7 operation; with wall mounting bracket and 5 Mtr HDMI Cable; as per technical specifications(* **Location D** *)*	*No's*	*2*
10	*43"/109 cm 4K UHD Display ; 24x7 operation; with wall mounting bracket and 5 Mtr HDMI Cable; as per technical specifications(* **Location A** *)*	*No's*	*1*
11	*4 Port L2 PoE Switch with 2 SFP Module; Industrial grade ; as per technical specifications (* **Location B & Location C** *)*	*No's*	*40*
12	*12 Port LIU fully loaded; as per technical specifications (* **Location B & Location C** *)*	*No's*	*40*
13	*6 Core SM Armored Fiber Optic Cable; as per technical specification(Location A,B,C,D)*	*Meter*	*14000*
14	*Cat6 UTP Outdoor Double Jacket, Anti Rodent ; as per technical specifications(Location A,B,C,D)*	*Meter*	*2400*
15	*4C 16 SQ MM ALUMINIUM ARMOURED XLPE POWER CABLE; as per technical specifications(Location ,B,C)*	*Meter*	*14000*
16	*25 mm HDPE Pipe, Medium standard, Telecom/ISI standard(Location B,C,)*	*Meter*	*14000*
17	*9U Outdoor Rack : 9U, IP55 Rated Outdoor Rack – 550mm Width & 600mm Depth ; as per technical specifications(Location B,C)*	*No's*	*40*
18	*Floor Mount Rack : 32U 1000 X 800, Floor standing Rack; as per technical specifications(Location D)*	*No's*	*1*
19	*12U 800 X 600 wall-mount Rack; as per technical specifications(Location A)*	*No's*	*1*
20	*7 Meter Cylindrical G.I. Pole with 6" base accessories (Location B,C,)*	*No's*	*21*
21	*Fire Wall for integration of network with existing network*	*No's*	*01*
22	*Supply of fiber optic passive component, Electrical accessories, camera mounting brackets & fixtures, PVC Indoor & Outdoor Box as per requirement, cable laying accessories etc. to complete the project(Location A,B,C,D)*	*Lot*	*1*

TECHNICAL SPECIFICATIONS:-

S N	Parameter	Specifications
1	Image Sensor	1/2.8" progressive scan CMOS or better
2	Lens Configuration	Motorized autofocus zoom lens, F1.6, f= 2.8-12 mm or better
3	Resolution	5MP/2560 X 1920 or better
4	Frame Rate	25 fps or better
5	Night Vision Distance	Min 50m
6	S/N Ratio	50dB or better
7	Sensitivity	Color mode: 0.005lux (IR OFF) 0 Lux IR ON or better
		B/W mode: 0.0005lux (IR OFF) or better
8	WDR	Min 120dB
9	Image Enhancer	BLC, HLC, 2D/3D DNR
10	Video Compression	H.265, H.264 and M-JPEG
11	Open Protocol	Should Support ONVIF Profile S,G,
12	Network	TCP/IP, HTTP, HTTPS, DHCP, DNS, RTP, RTSP, NTP, SMTP, 802.1X, QoS, IPv4, IPv6, UDP.
13	Maximum user access	10 User

SN	Parameter	Specifications
14	Power Supply	PoE 12VDC/24VAC
15	Operating Temperature	0°C ~ 55°C or better

SN	Parameter	Specifications
1	Image Sensor	1/1.8 " progressive scan CMOS or better
2	Lens Configuration	Motorized zoom lens f=3.6-11mm or better
3	Resolution	8MP(3840X2160)
4	Night Vision Distance	IR illuminators up to 50 meters night vision distance or more
5	Day/Night Switching	Auto IR
6	Shutter	Auto/Manual (adjustment range 1/1s~1/30000s) or better
7	S/N Ratio	>50db
8	Audio Port	1 linear input, 1 linear output
9	Smart Functions	Motion detection, wire crossing detection, intrusion detection, object abandoned detection, object lost detection, camera tampering.
10	Network Protocols	IPv4/IPv6, TCP, UDP, IGMP, ICMP, DHCP, SMTP, NTP, RTC, RTP, RTSP, RTCP, HTTP, HTTPS, 802.1x, QoS, DNS, DDNS, ARP, TLS, Multicast
11	WDR	Min 120dB
12	Image Enhancer	BLC, HLC, 2D/3D DNR
13	Video Compression	H.265, H.264 and M-JPEG
14	Open Protocol	Should Support ONVIF Profile S,G,

SN	Parameter	Specifications
1	Optical Zoom	30X
2	Image Sensor	1/1.8" or 1/1.9" or 1/2.8 " Progressive scanning CMOS sensor or better
	Resolution	5MP
3	Focal Length	f=6~140mm or better
4	Shutter	Auto, Manual (adjustment range: 1/1s-1/30000s) or better
5	IR Day/Night Switch	Automatic
6	Sensitivity	Color mode: 0.05 lux or better
7	S/N Ratio	>50dB or better
8	IR Distance	150m or better
9	Network Port	1*RJ45 10/100M

10	Network Protocol	IPv4/IPv6, TCP, UDP, IGMP, ICMP, DHCP, SMTP, NTP, RTP, RTSP, RTCP, HTTP, HTTPS, 802.1x, QoS, DNS, DDNS, ARP, UPnP, IP Filter, TLS, Multicast.
11	WDR	Min 120dB
12	Image Enhancer	BLC, HLC, 2D/3D DNR
13	Video Compression	H.265, H.264 and M-JPEG
14	Open Protocol	Should Support ONVIF Profile S,G,

16 Channel Network Video Recorder

SN	Parameter	Specifications
1	Image Decoding Standard	H.264, H.265
2	Network Video Input	16 channels or more
3	Network Video Bandwidth/Throughput	Incoming 129 Mbps; Outgoing 64Mbps/Throughput 128Mbps or better
4	Recording Resolution	8MP/6MP/5MP/4MP/3MP/1080P/UXGA/720P/ VGA/4CIF
5	Storage Capacity	20 TB Surveillance grade hard disk.
6	Network Port	1 * RJ45- 10/100/1000M self-adaptive Ethernet port
7	USB Port	2 * USB2.0
8	Alarm I/O	4-ch input, 1-ch output
9	Network Protocol	IPV4, IPV6, DHCP, PPPoE, DDNS, FTP, NTP, HTTP, SMTP, SNMP, TCP, UDP, MULTICAST, RTSP
10	Power Supply	12V DC
11	Operating Temperature	0°C ~ 55°C

Video Management Server		
SN	Parameter	Specifications
1	Type / Form Factor	2U Rack Server
2	Processor	Intel Xeon Gold 5317 3G, 12C/24T (Dual Processors) or better.
3	RAM	32GB
4	Hard Disk Drive capacity	up to 8x3.5" SAS/SATA
5	Hard Disk Drive	2x600GB Hard Drive SAS ISE 12Gbps 10k Hot-Plug
6	USB Ports	USB 3.0 Ports and USB 2.0 Ports

Monitoring Workstation

Sr. No.	Parameter	Specifications
1	Processor	12th Generation Intel Core i7-12700 (12 core) or better
2	Processor Base Frequency	2.50 GHz ; Max Turbo Frequency : 4.90 GHz
3	RAM	16GB (2x8 GB)
4	Graphics	Nvidia T1000 8GB with 2 nos. HDMI/Video ports
5	Hard Disk drive	1TB SAS Hard Disk Drive/PCIe NVMe SSD on motherboard

| | Video Monitoring, Recording & Management Software
The existing VMS is Milestone X protect, for easy integration with the old camera and server Milestone Xprotect will be preferred for easy integration. | |
|---|---|---|
| SN | Parameter | Specifications |
| 1 | | The existing VMS is Milestone X protect is used for old CCTV cameras smelter plant. Vendor has to supply Video Monitoring, Recording & Management Software for their system which should be compatible to old system as all old and new will be displayed on new system. However new camera recording will be stored in the new VMS. |
| 2 | General | The Video Management System shall be a fully distributed solution, designed for limitless multi-site and multiple server installations requiring 24/7 surveillance with support for devices from different vendors. The Video Management System shall offer centralized management of all devices, servers and users and must empower a flexible rule-based system driven by schedules and events.
• Unrestricted devices & multiple sites
• Fail over and redundancy |
| 3 | | VMS shall support IP cameras (all the features & functionalities) from at least thirty (30) major camera brands. Documentary evidence having make detail should be mandatorily submitted. |
| 4 | Features | The Video Monitoring System Shall be an Integrated System with IP Network Centric functional and Management architecture aimed at providing high-Speed manual/automatic operation for best performance. |
| 6 | | The system should facilitate viewing of live and recorded images and controlling of all cameras by the authorized users. |

7		The system shall use video signals from various indoor/outdoor CCD/CMOS cameras installed at different locations, process them for viewing and simultaneously record all the cameras after compression using H264/H265/MPEG4 or better standard. Mouse/Joystick- keyboard controllers shall be used for pan, Tilt, Zoom and other functions of desired cameras.	
		The Video display should be intelligent enough so that it can –	
8		i) Event based play back such as motion started/stopped, video analytic, camera digital input contact closed/opened.	
9		ii) Display map with all camera health status	
10		iii) Device states shown , including network connection loss, video loss etc.	

Enterprise grade 16 Port PoE Switch

SN	Parameter	Specifications	
1	Port Density	Enterprise grade Switch should have minimum 12 or 16x10/100/1000 Base-T PoE+ ports and 2x1G SFP ports. Min PoE budget 140Watt.	
2	Switch architecture & Performance	The Switch should support a minimum of 32Gbps of Switching Fabric Capacity. The Switch should support a minimum of 23Mpps of forwarding capacity and 8K MAC address or better. Should have IPv6 Ready Logo from Day 1.	
3	Operating Temperature	0°C to 50°C	

Enterprise grade 24 Port PoE Switch

SN	Parameter	Specifications	
1	Port Density	Enterprise grade Switch should have minimum 24x10/100/1000 Base-T PoE+ ports and 4x1G SFP ports. Min PoE budget 370watt.	
2	Switch architecture & Performance	The Switch should support a minimum of 56Gbps of Switching Fabric Capacity. The Switch should support a minimum of 41Mpps of forwarding capacity and 16K MAC address or better. Should have IPv6 Ready Logo from Day 1.	

CAT-6 Shielded AWG23 double jacket Cable

SN.	Specifications	
1	Category Cat.6	

2	Number of conductors 8	
4	Cable outer jacket material PE- LSZH /Rodent free	
5	Cable inner jacket material Colour strip -LSZH	
6	Inner jacket characteristics Shielded & foiled	
7	Cable jacket characteristics zero-halogen	
8	Cable jacket characteristics flame-retardant	
9	Cable protection Shielded & Rodent free	
11	Temperature -20° C to +70° C	

CAT-6 UTP Outdoor Double Jacket, Anti Rodent

SN	Specifications	
1	Cable Type : Cat.6, UTP, AWG23 Outdoor double jacket anti rodent cable	
2	Cable inner jacket characteristics : zero-halogen	
3	Cable must have RIP Cord inside	
4	Cable outer jacket characteristics : flame-retardant, anti-rodent	
6	conductor diameter : AWG23	
7	Color : Black	
8	Temperature : -20° C to +60° C	
9	CONDUCTOR RESISTANCE (DC): ≤ 9.38 OHMS/100MTR@20 Degree C. MAX.	
10	RESISTANCE UNBALANCE : 5%MAX	
11	MUTUAL CAPACITANCE: 5.6 nF/100 mtrs Max.	
12	CAPACITANCE UNBALANCE PAIR/GROUND: 330PF/100M MAX	
13	Normal Velocity of Propagation: 69%	
14	IMPEDANCE: 100±15%OHMS	
15	Delay skew : 45ns/100m	

9U IP55 Outdoor Rack

SN	Specifications	
1	9U, IP55 Rated Outdoor Pole Rack - 550mm Width & 600mm Depth	
2	Construction of Material- 1.2/1.5mm Thick CRCA/Steel sheet	
3	Powder Coated Surface	
4	6 Socket PDU 5 Amp - 1 No.	

32U Floor-mount Rack

SN	Specifications	

1	Structure : Rack manufactured out of steel sheet punched, formed, welded and Powder coated	
2	Rack should be from ISO 14001 ,27000 Certified Company	
3	Standard for Racks configuration will be welded frame with side panel and vented top cover	
4	should have Front Toughened Glass door and Metal door at Rear	

12U Wall-mount Rack
Quoted Make: **Model :**

SN	Parameter	Specifications	
1	Rack Height	12U Rack (Width 600 mm and depth 600mm)	
2	General Characteristics	The 19" Wall Mount cabinets should be equipped with rear cover for better sealing of the cabinets and accessories for thermal and cable management such a cantilever tray, cooling fan, PDU	
3	Degree of Protection	IP20	
4	Power Distribution Unit	Standing cabinets should be equipped with PDU which can be mounted horizontally / vertically with min. 6 nos. 3 pin 6A socket.	
5	Cooling	Minimum with 1 no. FAN	

Self-supporting CCTV Pole

| SN	Specification	Description	
1	Parameter	Minimum Required Specifications	
2	Height	7 meter above ground surface Bottom section: 3 meter Middle Section: 2 meter Top Section: 2 meter	
3	Foundation	Minimum 1X1X1m (on vendor scope)	
4	Pole Diameter (Outer)	Bottom section: 139.7mm Middle Section: 114.3mm Top Section: 88.9mm	
5	Bottom Base Plate	300mm x 300mm x 6mm	
6	Cantilevers	The pole should support 1 number of cantilevers of varying length from 3 - 5 meters as per site requirement.(where ever necessary)	
7	Mounting Facility for	CCTV Camera, Junction Box	

1. ## Armoured Power Cable

SN	Specification	Description	
1	Category	4 Core 16 sqmm Aluminium XLPE Armoured cable	
	Compliance	As per IS 7098 Part-1	

|	Test Certificate	The vendor has submit test reports along with the bid of the offered cable for technical evaluation.	
		Laying of the cable, termination of the cable inside the junction box along with supply of lugs, etc and fixing of the Junction box has to be done by the turnkey vendor. All the jobs shall be carried out in accordance to the instructions of EIC/MIC.	

Features of Lenses:

A lens has certain components and characteristics that further determine its capabilities. These include the focal length, type of aperture and focus control, wavelength of light or energy the lens is optimized to transmit, and image sensor size the lens is designed for. Additionally, a camera's resolution and the impact of noise on the image being captured are critical to the overall performance of a CCTV system.

- **Focal Length and Imager Format The** focal length and size of the image sensor determine the angle from which the lens accepts light to focus on the image sensor. Different lenses of the same focal length are designed to create a focused image on sensors of different sizes. For example, surveillance cameras are built with image sensor formats of ¼, ⅓, ½, ⅔, or 1 inch. These measures refer to the approximate diagonal measurement of the image sensor.

- **Field of View** The image sensor size and the focal length can be used to determine the FOV. As shown in Figure 3-5, the FOV is the area seen by the camera and lens. This area is commonly calculated by a tool known as a lens calculator
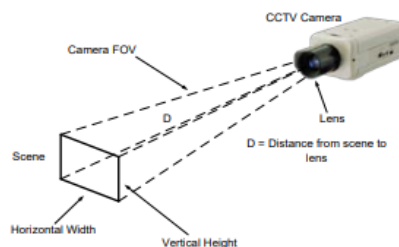
Figure 3-5. Calculating FOV

- **Back Focus** To be useful, the image transmitted through a lens must be focused properly on the camera's image sensor. This camera adjustment is called back focusing. Cameras differ in their method to vary the distance between the imager surface and the lens's mounting surface. Most cameras have a method of moving the image sensor forward and backward. Some have a wheel that is rotated to move the image sensor; others have a screw that moves an internal mechanism. Some lenses incorporate a back focus adjustment as well. Back focus is primarily an issue with zoom lenses
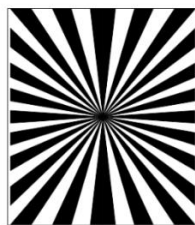
Figure 3-6. Focus Chart Example

- **Resolution** The resolution of a camera is an indicator of its ability to resolve detail in an image. The horizontal resolution of a camera can be measured using a resolution chart

CONCLUSION:

1. Connecting Cameras:
- Analog Cameras:
- Connected new analog cameras to existing Digital Video Recorders (DVRs) using coaxial cables.
- Ensured connections were secure and cables were properly routed to avoid damage or interference.
- IP Cameras:
- Connected new IP cameras to Network Video Recorders (NVRs) using Ethernet cables (Cat5e/Cat6).
- Utilized network switches to manage multiple camera connections, ensuring adequate network capacity.

2. Assigning IP Addresses:
- Static IP Addresses:
- Manually assigned static IP addresses to each new IP camera for consistent network identification.
- Configured IP settings on the cameras via their web interface or configuration tool.
- Dynamic IP Addresses:
- Alternatively, used Dynamic Host Configuration Protocol (DHCP) to automatically assign IP addresses.
- Ensured NVR recognized and listed the dynamically assigned IPs.

3. Configuring DVR/NVR Settings:
- DVR Configuration:
- Added new analog cameras to the DVR system through its interface, assigning specific channels to each camera.
- Adjusted recording settings like resolution, frame rate, and motion detection zones for optimal performance.
- NVR Configuration:
- Accessed the NVR's interface to add and configure new IP cameras.
- Inputted the assigned IP addresses and authenticated each camera.
- Set recording parameters such as continuous recording, motion-triggered recording, and storage duration.

4. Power Supply:
- Power over Ethernet (PoE):
- For IP cameras, utilized PoE switches to provide both data and power through a single Ethernet cable, simplifying installation and reducing the need for additional power adapters.
- Ensured the switches were PoE-enabled and had sufficient power output for all connected cameras.
- Power Adapters:
- For analog cameras or non-PoE IP cameras, used dedicated power adapters or power distribution units (PDUs).
- Verified that each camera received adequate and stable power to function reliably.

By meticulously following these steps, the installation and configuration of new cameras in the existing CCTV network can be completed efficiently, ensuring reliable operation and enhanced surveillance capabilities.