Hanwha Techwin is a global leading supplier of solutions for IP and analog video surveillance. Building on the company's history of innovation, Hanwha Techwin is dedicated to providing systems solutions with the highest levels of performance, reliability and cost-effectiveness. Hanwha Techwin is committed to the continued development of innovative systems products for professional security applications.

For additional information, visit http://www.hanwha-security.com/

**2MP NETWORK AI IR DOME CAMERA**

**DIVISION 28 – ELECTRONIC SAFETY AND SECURITY**

**Notes to Specifier:**

1. Where several alternative parameters or specifications exist, or where, the specifier has the option of inserting text, such choices are presented in **<bold text>.**

2. Explanatory notes and comments are presented in **colored** text.

**Important: See further notes on the following page.**

**Important Note to Security Systems Specifiers**

CSI MasterFormat 2016 incorporates numerous significant changes affecting electronic safety and security. This document is written to provide flexibility in using either format, although adoption of MasterFormat 2016 is encouraged. The following is a guide to the MasterFormat numbers relevant to the product referenced in this specification.

**Primary Specification Area:**

MasterFormat 2014:

28 20 00 Electronic Surveillance

28 23 00 Video Surveillance

 28 23 29 Video Surveillance Remote Devices and Sensors

MasterFormat 2016:

 28 20 00 Video Surveillance

 28 2x xx Surveillance Cameras

 28 2x xx IP Cameras

**Related Requirements:**

MasterFormat 2014:

 27 20 00 Data Communications

 28 23 13 Video Surveillance Control and Management Systems

 28 23 16 Video Surveillance Monitoring and Supervisory Interfaces

 28 23 19 Digital Video Recorders and Analog Recording Devices

 28 23 23 Video Surveillance Systems Infrastructure

MasterFormat 2016

 27 15 01.xx Video Surveillance Communications Conductors and Cables

 27 20 00 Data Communications

 28 05 xx.xx PoE Power Sources for Electronic Safety and Security

 28 05 xx Storage Appliances for Electronic Safety and Security

 28 05 xx.xx Network Video Recorders

 28 05 xx Cyber Requirements for Electronic Safety and Security

 28 05 xx Safety and Security Network Communications Equipment

 28 2x 00 Video Management System

**2MP NETWORK AI IR DOME CAMERA**

1. **GENERAL**
	1. **SUMMARY**
		1. Section includes a 2MP IP video camera
		2. Product - A 2MP AI IP video camera with multi-streaming (H.265, H.264 and MJPEG) capability in a dome type with IR illuminator.

## Related Requirements

**Refer to MasterFormat notes at the beginning of this document to select requirements specific to the MasterFormat version being used in the specification.**

* 1. **REFERENCES**
		1. Abbreviations
			1. AGC Auto Gain Control
			2. AES Advanced Encryption Standard
			3. AI Artificial Intelligence
			4. API Application Programming Interface
			5. ARP Address Resolution Protocol
			6. AWB Auto White Balance
			7. BLC Back light compensation
			8. CBR Constant Bit Rate
			9. CVBS Composite Video Blanking and Sync
			10. DHCP Dynamic Host Configuration Protocol
			11. DNR Digital Noise Reduction
			12. DNS Domain Name Server
			13. DDNS Dynamic Domain Name Server
			14. DSCP Differentiated Services Code Point
			15. fps frames per second
			16. FTP File Transfer Protocol
			17. GOV Group of Video
			18. GUI Graphical User Interface
			19. HD High Definition
			20. HTTP Hypertext Transfer Protocol
			21. HTTPS Secure HTTP
			22. ICMP Internet Control Message Protocol
			23. IGMP Internet Group Management Protocol
			24. IP Internet Protocol
			25. IR Infrared
			26. JPEG Joint Photographic Experts Group
			27. LAN Local Area Network
			28. LED Light Emitting Diode
			29. LDC Lens Distortion Correction
			30. LLDP Link Layer Discovery Protocol
			31. LPR License Plate Recognition
			32. MJPEG Motion JPEG
			33. MP Megapixel
			34. MPEG Moving Pictures Experts Group
			35. NAS Network Attached Storage
			36. NTP Network Time Protocol
			37. NVR Network Video Recorder
			38. PIM-SM Protocol Independent Multicast-Sparse Mode
			39. PoE Power over Ethernet
			40. PPPoE Point to Point Protocol over Ethernet
			41. QoS Quality of Service
			42. RTP Real-Time Transport Protocol
			43. RTCP Real-Time Control Protocol
			44. RTSP Real-Time Streaming Protocol
			45. SDK Software Development Kit
			46. SFP Small Form factor Pluggable
			47. SMTP Simple Mail Transfer Protocol
			48. SNMP Simple Network Management Protocol
			49. SSDR Super Smart Dynamic Range
			50. SSNR Super Smart Noise Reduction
			51. SSL Secure Sockets Layer
			52. TCP Transmission Control Protocol
			53. UDP User Datagram Protocol
			54. UPnP Universal Plug and Play
			55. VBR Variable Bit Rate
			56. VMS Video Management System
			57. WDR Wide Dynamic Range
		2. Reference Standards
			1. Network - IEEE
				1. 802.3 Ethernet Standards
				2. 802.1x Port-based Network Access Control
				3. IPv4 IP addressing version 4
				4. IPv6 IP addressing version 6
				5. QoS Quality of Service
			2. Video
				1. ISO / IEC 23008-2:2013, MPEG-H Part2 (ITU H.265, HEVC)
				2. ISO / IEC 14496–10, MPEG-4 Part 10 ( ITU H.264)
				3. ISO / IEC 10918 – JPEG
				4. ONVIF – Profile S / G / T
			3. EMC & Safety
				1. FCC 47 CFR Part 15 Subpart B

ANSI C63.4-2014 Class A

* + - * 1. IC Regulation ICES-003:2016

ANSI C63.4-2014 Class A

* + - * 1. CE EMC-Directive 2014/30/EU

EN 55032:2015 Class A

EN 50130-4:2011+A1:2014

* + - * 1. VCCI-CISPR 32: Class A
				2. AS/NZS CISPR32:2015 Class A
				3. UL listed
				4. CE EN 50581:2012 (hazardous substances)
			1. Ingress Protection and Vandal Resistance :
				1. IEC 60529:2006 – Degrees of Protection Provided by Enclosures – IP52
				2. IEC EN 62262:2005 - Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts : IK10
				3. Plenum rate
		1. Definitions
			1. GOV (Group of Video object planes) – A set of video frames for H.264 and H.265 compression, indicating a collection of frames from the initial I-Frame (key frame) to the next I-Frame. GOV consists of two kinds of frames in video surveillance setup: I-Frame and P-Frame.
			2. Dynamic GOV – Dynamic assignment of GOV length based on the complexity of the scene to efficiently manage bitrate of the video stream and reduce the storage required.
			3. Multi-exposure wide dynamic range – Operation which automatically adjusts shutter speed to provide a wide range between dark and light areas visible at the same time, preventing backlighting issues. Long exposure is used for dark areas and a short exposure is used in bright areas.
			4. Dynamic fps – Dynamic assignment of fps (frames per seconds) based on the movement of object(s) in the scene to efficiently manage bitrate of the video stream and reduce the storage required.
			5. WiseStream – Technology that controls quantization parameter, fps, and GOV length in H.265 and H.264 to efficiently manage bitrate of the video stream and reduce the storage required.
			6. DORI (Detect, Observe, Recognize, Identify) – A standard system (EN-62676-4) for defining the ability of a camera to distinguish persons or objects within a covered area.
				1. Detect: 25PPM / 8PPF
				2. Observe: 63PPM / 19PPF
				3. Recognize: 125PPM / 38PPF
				4. Identify: 250PPM / 76PPF
	1. **SUBMITTALS**
		1. Product Data
			1. Manufacturer’s printed or electronic data sheets
			2. Manufacturer’s installation and operation manuals
			3. Warranty documentation
	2. **QUALIFICATIONS**
		1. Manufacturer shall have a minimum of five years’ experience in producing IP video equipment.
		2. Installers shall be trained and authorized by the Manufacturer to install, integrate.
	3. **DELIVERY, STORAGE AND HANDLING**
		1. Deliver the camera in the manufacturer’s original, unopened, undamaged container with identification labels intact.
		2. Store the camera in a temperature environment specified in section 2.04 Detailed Specification, protected from mechanical and environmental conditions as designated by the manufacturer.
	4. **WARRANTY, LICENSING AND SUPPORT**
		1. Manufacturer shall provide at least a limited 3 year warranty for the product to be free of defects in material and workmanship.
		2. Manufacturer shall provide embedded camera video analytics free of license charges.

END OF SECTION

1. **PRODUCTS**
	1. **EQUIPMENT**
		1. Manufacturer: Hanwha Techwin

http://www.hanwha-security.com/

* + 1. Model PND-A6081RF
		2. Alternates: None
	1. **GENERAL DESCRIPTION**
		1. Video Compression and Transmission – The camera shall have the following properties relating to the video signals it produces.
			1. H.265, H.264 and MJPEG compression, each derived from a dedicated encoder and capable of being streamed independently and simultaneously.
				1. H.265 and H.264 – Max. 60/50fps (60Hz/50Hz, AI analytics on),
				Max. 120/100fps (60Hz/50Hz, AI analytics off) at all resolution
				2. MJPEG – Max. 30/25fps
			2. The camera shall be able to configure up to 10 independent video stream profiles with differing encoding, quality, frame rate, resolution, and bit rate settings.
			3. The camera shall be able to configure various resolution selections.
				1. 16:9 aspect ratio : 1920 x 1080, 1280 x 720, 800 x 448, 640 x 360
				2. 4:3 aspect ratio : 1280 x 960, 1024 x 768, 800 x 600, 640 x 480
				3. 5:4 aspect ratio : 1280 x 1024, 720 x 576
				4. 3:2 aspect ratio : 720 x 480
			4. The camera shall support unicast video streaming up to 6 users.
			5. The camera shall support multicast video streaming.
			6. The camera shall support multiple video streaming up to 5 profiles
			7. The camera shall be able to configure Dynamic DNS (DDNS). DDNS shall be provided with no additional cost by the manufacturer.
			8. The camera shall provide WiseStreamⅡ, WiseStreamⅢ(using AI engine), Dynamic GOV and Dynamic FPS to efficiently manage bit rate of the video stream and reduce storage.
		2. Camera – The camera device shall have the following physical and performance properties:
			1. IK10 rated for protection against impacts.
			2. True day/night operation with removable IR cut filter
				1. Low light level operation to 0.007 lux at F1.3 in color mode and 0.0007 lux at F1.3 in black and white mode.
				2. Black and White mode operation to 0 lux with IR LED on.
			3. The camera shall be able to produce clear images in highly contrast scenes with multi-exposure wide dynamic range up to 120dB.
			4. The camera shall support WiseNR II to reduce digital noise using AI engine and both 2D and 3D noise reduction technology.
			5. The camera shall be able to configure 6 privacy masking areas with rectangle.
			6. The camera shall provide video display on smart phone (iPhone, Android) to adjust viewing angle, rotation and focus.
		3. Intelligence and Analytics – The camera shall have a suite of intelligent analytic functions.
			1. Motion detection with 8 definable detection areas with 8 points polygonal zones, and minimum/maximum object size.
			2. Detection of logical events of specified conditions from the camera’s video
				1. Classified object type : Person/Face/Vehicle/License plate with attributes,

BestShot per object

* + - * 1. Analytics events based on AI engine : Object detection, Face Mask detection,

Directional detection, Virtual line

Enter/Exit, Loitering, Digital auto tracking,

Social distancing detection

* + - * 1. Analytics events : Defocus detection, Motion detection, Appear/Disappear, Tampering,

Audio detection, Sound classification, Shock detection

* + - 1. Business Intelligence features based on AI engine
				1. Classified object type : People counting, Queue management, Heatmap based on AI engine
			2. Attributes
				1. Person Gender Female / Male

Upper/Lower (color) Black / Gray / White / Red / Orange / Yellow /

 Green / Blue / Purple (up to 2 color at same time)

Bag Wear Bag or Not

* + - * 1. Vehicle Type Car(sedan/SUV/Van) / Bus / Truck / Motorcycle / Bicycle

Color Black / Gray / White / Red / Orange / Yellow /

 Green / Blue / Purple (up to 2 color at same time)

* + - * 1. Face Gender Female / Male

Age Child / Young / Middle / Old

Glasses Wear Glasses or Not

* + - * 1. License plate
			1. Detection and classification of the following sound.
				1. Scream
				2. Gunshot
				3. Explosion
				4. Crashing glass
		1. Interoperability – The camera shall be ONVIF Profile S / G and T compliant.
		2. The camera shall possess the following further characteristics:
			1. Built-in web server, accessed via non-plugin browsers including Google Chrome, MS Edge, Mozilla Firefox and Apple Safari.
			2. Micro SD/SDHC/SDXC memory card with configurable pre-alarm and post-alarm recording intervals
			3. NAS recording option with configurable pre-alarm and post-alarm recording intervals
			4. Alarms and notifications
				1. alarm notification triggers:

Alarm input

Analytics

Network disconnect

* + - * 1. available notification means upon trigger:

File Upload via FTP and E-mail

Notification via E-mail

Local storage (SD / SDHC / SDXC) or NAS recording at event triggers

Alarm output

Handover

Audio playback

* + - 1. Pixel Counter available in the web viewer.
			2. IP52, IK10, Plenum rate
			3. This device has been verified using STP cable. The use of appropriate GND grounding and STP cable is recommended to effectively protect your product and property from transient voltage, thunderstroke, communication interruption.
	1. **CAMERA SOFTWARE**
		1. The camera shall have a built in web server which supports non-plugin browsers including Google Chrome, IE11, MS Edge, Mozilla Firefox and Apple Safari from a PC or Mac.
		2. The web viewer shall provide a monitoring screen which displays live camera video and simultaneously provides same-screen access to the following functions:
			1. Live view window size
			2. Resolution setting
			3. Image (snapshot) capture
			4. Manual recording to SD or NAS
			5. Audio/microphone control
			6. Access recorded data playback and camera configuration menus
			7. Digital PTZ
			8. Display the Bestshot based on AI engine
		3. The web viewer shall provide a playback screen which provides access to the following functions:
			1. Recorded data search using date and time range
			2. Recorded data search using event type
			3. Play a recorded video by event triggering
			4. Set playback speed
			5. Play audio if present
			6. Generate a backup copy of saved video data
		4. The web viewer shall provide a setup screen which provides access to the following configuration settings and functions in the camera:
			1. Digital video profile to include compression type, maximum or target bit rate, frame rate, multicast parameters, and crop encoding area
			2. User profile to include password, access level, authentication
			3. Date and time
			4. Network settings and IP version
				1. DDNS
				2. IP filtering
				3. SSL, including certificate management
				4. 802.1x authentication
				5. Quality of Service settings
				6. SNMP to include version selection and settings
				7. Auto IP configuration
			5. Video setup
				1. Flip / mirror mode
				2. Video output type for installation
				3. Privacy zone
			6. Audio setup to include source, audio codec type, gain and bit rate.
			7. Camera settings to configure image preset, sensor frame capture speed, dynamic range, white balance, back light, exposure, day/night operation, on-screen display, sharpness, contrast, color level and lens distortion correction.
			8. Event detection setup to configure notification parameters, recording rules, time schedule, tamper protection, motion detection and event triggers
			9. System function to control reboot, upgrade, check system and event logs and application (SDK) management
			10. View profile information
		5. Client requirements
			1. Recommend Browser : Chrome
			2. Acceptable Browser : Chrome, Safari, Firefox, MS Edge(chromium based)
			3. Acceptable Operating Systems: Windows, MAC, Android, iOS, Chrome
			4. Verified Environment:
				1. Windows 10 : Google chrome version 80 above, Firefox version 72 above,
				 MS Edge version 83 above
				2. Mac 10.13/14 : Safari version 11.0.1 above
* Decoding performance in web viewer depends on CPU/GPU performance of user
	1. **DETAILED SPECIFICATIONS**
		1. Video
			1. Imaging device 1/2" CMOS
			2. Minimum Illumination Color: 0.007Lux(F1.3, 1/30sec, 30IRE) 30/25fps

B/W : 0.0007Lux(F1.3, 1/30sec, 30IRE) 30/25fps

Color: 0.014Lux(F1.3, 1/60sec, 30IRE) 60/50fps

B/W : 0.0014Lux(F1.3, 1/60sec, 30IRE) 60/50fps

Color: 0.028Lux(F1.3, 1/120sec,30IRE) 120/100fps

B/W : 0.0028Lux(F1.3, 1/120sec, 30IRE) 120/100fps

0Lux(IR LED on)

* + 1. Lens:
			1. Focal length 4.38~9.33mm(2.13x) motorized varifocal
			2. Max. Aperture Ratio F1.3(Wide)~2.15(Tele)
			3. Field of View [Wide] H: 103.1˚, V: 54.2°, D: 124°

[Tele] H: 44.5˚, V: 24.9°, D: 51.1°

* + - 1. Min. Object Distance 0.5m (1.64ft)
			2. Focus Control Simple focus
			3. Lens Type P-Iris
		1. Pan & Tilt & Rotate
			1. Range 0˚~360˚ / -45˚~85˚ / 0˚~355˚
		2. IR Viewable Length 40m (131.23ft), Wise IR
		3. Operational Functions
			1. Camera Title Off / On (Displayed up to 85 characters)
			2. Day/Night Setting Auto (ICR) / Color / B/W / External / Schedule
			3. Backlight Compensation Off / BLC / WDR / SSDR
			4. WDR 120dB
			5. Contrast Enhancement Off / On (SSDR)
			6. Digital Noise Reduction Off / On (SSNR, WiseNR II (using AI engine))
			7. Digital Image Stabilization Off / On (built-in Gyro sensor)
			8. Motion Detection Off / On (8ea, 8-point polygonal)
			9. Privacy Masking Off / On (6 zones, rectangle)

- Color: Grey / Green / Red / Blue / Black / White

* + - 1. Gain Control Off / Low / Middle / High
			2. White Balance ATW / AWC / Manual / Indoor / Outdoor
			3. Electronic Shutter Speed Min / Max / Anti-flicker (1/5 ~ 1/12,000sec)

Auto prefer shutter control based on AI engine

* + - 1. Digital PTZ Support (Preset, Group)
			2. Image Rotation Flip: Off / On

Mirror: Off / On

Hallway view: 0˚ / 90˚ / 270˚

* + - 1. Alarm I/O Input 1ea / Output 1ea / DC 12V Power(Max. 50mA) 1ea
			2. Alarm Triggers Alarm Input, Analytics, Network Disconnection
			3. Alarm Events File Upload via FTP and E-mail, Notification via E-mail,

SD/SDHC/SDXC or NAS recording at event triggers,

Alarm output, Handover, Audio playback

* + - 1. Pixel Counter Support
			2. Storage Micro SD/SDHC/SDXC 512GB (256GB x 2 slots)
			3. Intelligent Analytics with AI Object detection(Person/Face/Vehicle/License plate with

attributes, BestShot per object),

Face Mask detection, Directional detection, Digital auto tracking, Enter/Exit, Loitering, Virtual line, Social distancing detection

* + - 1. Business Intelligence with AI People counting, Queue management,

Heatmap based on AI engine

* + - 1. Intelligent Analytics Defocus detection, Motion detection, Appear/Disappear,

 Tampering, Audio detection, Sound classification,

Shock detection

* + - 1. Video Out (Installation) CVBS: 1.0 Vp-p / 75Ω composite, 720x480(N), 720x576(P)

USB: Micro USB type B, 1280 x 720

* + - 1. Memory 4096MB RAM, 512MB Flash
		1. Video Streams
			1. Video compression H.265, H.264, MJPEG
			2. Resolution 1920x1080, 1280x1024, 1280x960, 1280x720, 1024x768,

800x600, 800x448, 720x576, 720x480, 640x480, 640x360

* + - 1. Maximum Framerate
				1. H.265 / H.264 Max. 60/50fps(60Hz/50Hz, AI analytics on) at all resolutions

Max. 120/100fps(60Hz/50Hz, AI analytics off) at all resolutions

* + - * 1. MJPEG Max. 30/25fps
			1. Smart Codec Manual Mode (area-based : 5EA)
			2. WiseStream WiseStreamⅡ, WiseStreamⅢ(using AI engine)
			3. Bitrate Control Method H.265 / H.264: CBR or VBR

MJPEG: VBR

* + - 1. Streaming Capability Multiple streaming (Up to 5 profiles)
			2. Streaming method Unicast / Multicast
			3. Simultaneous Users 6 maximum (Unicast)
			4. Interoperability ONVIF Profile S / G / T, SUNAPI(HTTP API), Open Platform
		1. Audio
			1. Audio In Mic-in / Line-in

Supply voltage: 2.5V DC(4mA), Input impedance: 2K Ohm

* + - 1. Audio Out Line out, Max. output level 1Vrms
			2. Audio Compression G.711 u-law /G.726 Selectable

G.726(ADPCM) 8KHz, G.711 8KHz

G.726: 16Kbps, 24Kbps, 32Kbps, 40Kbps

AAC-LC: 48Kbps at 16KHz

* + 1. Network
			1. Connectivity – Metal Shield RJ-45(10/100/1000BASE-T)
			2. Protocol
				1. IP v4 / v6, TCP, UDP
				2. Configuration: DHCP, LLDP
				3. Web service: HTTP, HTTPS
				4. Network Service: ARP, Bonjour, DNS, ICMP, NTP, PIM-SM, SNMP v1/2c/3 – MIB-2, UPnP
				5. Media: RTP, RTCP, RTSP
				6. Multicast: IGMP
				7. Notifications: FTP, SMTP
			3. DDNS – The camera shall support DDNS services offered by the manufacturer and others publicly available service offerings
			4. QoS – Layer 3 DSCP
			5. Security Feature
				1. User password protection
				2. The device shall not provide a manufacture default password. Default password change shall be required to access the camera.
				3. A minimal level of password complexity shall be required by the camera.
				4. The camera shall not have a manufacture back-door password.
				5. The manufacturer shall provide a tool that provides the ability to make password changes to multiple cameras at the same time.
				6. HTTPS(SSL) Login Authentication
				7. Digest Login Authentication
				8. IP Address Filtering
				9. User access log
				10. 802.1X Authentication(EAP-TLS, EAP-LEAP)
				11. Device Certificate(Hanwha Techwin Root CA)
				12. TPM with FIPS 140-2 level2
				13. Secure boot, Verify firmware forgery
			6. Discovery – The manufacturer shall offer a discovery program to identify all devices of them on the network.
			7. Configuration – The manufacturer shall offer a configuration program that remotely allows users to change settings on multiple cameras simultaneously.
			8. Firmware upgrade – The manufacturer shall offer a program capable of upgrading multiple cameras at the same time (not requiring access to individual cameras).
			9. Camera backup setting – The manufacturer shall provide a program that provides the ability to save multiple camera settings to a file and restore these camera settings if needed.
			10. Reporting – The manufacturer shall provide a tool that can generate a report including thumbnail view, MAC address, IP address, serial number and other camera settings.
		2. Electrical
			1. Power
				1. Input Voltage / Current PoE+ (IEEE 802.3at), DC 12V
				2. Power Consumption PoE+: Max 19.50W, typical 16.00W

12VDC: Max 17.00W, typical 13.50W

* + 1. Mechanical And Environmental
			1. Color/Material White / Aluminum, Hard-coated dome bubble
			2. RAL code RAL9003
			3. Dimensions (W x H) Ø205 x 163mm (8.07" x 4.92")
			4. Weight 1.95kg (4.30lb)
			5. Temperature
				1. Operating -25°C ~ +50°C (-13°F ~ +122°F)
				2. Storage -50°C ~ +60°C (-58°F ~ +140°F)
			6. Humidity Less than 90% RH
			7. Ingression Protection IP52, , Plenum rate(UL2820)
			8. Vandal Resistance IK10
		2. DORI (EN62676-4 standard)
			1. Detect Wide: 30.5m(100.03ft) / Tele: 93.9m(307.95ft)
			2. Observe Wide: 12.2m(40.01ft) / Tele: 37.5m(123.18ft)
			3. Recognize Wide: 6.1m(20.01ft) / Tele: 18.8m(61.59ft)
			4. Identify Wide: 3.0m(10.00ft) / Tele: 9.4m(30.79ft)

END OF SECTION

1. **EXECUTION**
	1. **INSTALLERS**

Contractor personnel shall comply with all applicable state and local licensing requirements.

* 1. **PREPARATION**

The network design and configuration shall be verified for compatibility and performance with the camera(s).

Network configuration shall be tested and qualified by the Contractor prior to camera installation.

All firmware found in products shall be the latest and the most up-to-date provided by the manufacturer, or of a version as specified by the provider of the VMS or NVR.

All equipment requiring users to log on using a password shall be configured with user/site-specific password/passwords. No system/product default passwords shall be allowed.

* 1. **INSTALLATION**

The contractor shall carefully follow instructions in documentation provided by the manufacturer to insure all steps have been taken to provide a reliable, easy-to-operate system.

All equipment shall be tested and configured in accordance with instructions provided by the manufacturer prior to installation.

Before permanent installation of the system, the contractor shall test the system in conditions simulating the final installed environment.

* 1. **STORAGE**

The hardware shall be stored in an environment where temperature and humidity are in the range specified by the manufacturer.

END OF SECTION