# SECTION 28 23 29

# THERMAL VIDEO DETECTION AND SURVEILLANCE SYSTEM

**SightLogix Thermal SightSensor NS 640**

**DIVISION 28 – ELECTRONIC SAFETY AND SECURITY**

**28 20 00 ELECTRONIC SURVEILLANCE**

**28 23 00 Video Surveillance**

**28 23 29 Video Surveillance Remote Devices and Sensors**

*Note: The specifier may wish to incorporate these specifications under*

*Sections 28 16 00 Intrusion Detection*

*28 16 33 Intrusion Detection Interfaces*

*28 16 33.33 Intrusion Detection Interfaces to Video Surveillance*

# SECTION 28 23 29

# THERMAL VIDEO DETECTION AND SURVEILLANCE SYSTEM

**PART 1 – GENERAL**

* 1. **SUMMARY**
     1. Section Includes
        1. A thermal video detection system that uses LWIR thermal to detect objects that violate a site’s alarm policies, to provide clear, detailed thermal images, and to provide wide-area automated outdoor perimeter and buffer zone protection, operating in all weather conditions and geographical locations and minimizing false and nuisance alarm rates.

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## Product

* + - 1. A thermal video detection system consisting of intelligent surveillance cameras which receive long wavelength infrared (LWIR) radiated energy and integrate camera control, image stabilization, advanced image processing, geo-spatial based object tracking, and image contrast enhancement technology for crisp, clear image detail 24 hours/day.
    1. Related Requirements

# 26 00 00 – Electrical (Division 26)

# 26 05 00 – Common Work Results for Electrical

# 26 06 00 – Schedules for Electrical

# 26 08 00 – Commissioning of Electrical Systems

# 25 20 00 – Low Voltage Electrical Distribution

# 26 40 00 – Electrical and Cathodic Protection

# 27 00 00 – Communications (Division 27)

# 27 05 00 – Common Work Results for Communications

# 27 06 00 – Schedules for Communications

# 26 08 00 – Commissioning of Communications

# 27 10 00 – Structured Cabling

# 27 21 00 – Data Communications Network Equipment

# 27 21 00 – Data Communications Hardware

# 27 21 00 – Data Communications Network Equipment

# 28 00 00 – Electronic Safety and Security (Division 28)

# 28 0500 – Common Work Results for Electronic Safety and Security

# 26 06 00 – Schedules for Electronic Safety and Security

# 26 08 00 – Commissioning of Electronic Safety and Security

# 28 13 33 – Access Control Interfaces

# 28 16 00 – Intrusion Detection

# 28 23 13 – Video Surveillance Control and Management Systems

# 28 23 16 – Video Surveillance Monitoring and Supervisory Interfaces

# 28 23 23 – Video Surveillance Systems Infrastructure

# 33 80 00 –Communications Utilities (Division 33)

* 1. **REFERENCES**
     1. Abbreviations and Acronyms
        1. IR – Infrared
        2. LWIR – Long Wavelength Infrared
        3. MPEG - Moving Pictures Experts Group
        4. NETD - Noise Equivalent Temperature Difference
        5. FOV – Field of View
     2. Reference Standards
        1. Federal Communications Commission (FCC), Code of Federal Regulations, Title 47, Part 15 Class A
        2. EN 55024:1998+A1:2001+A2:2003 Information Technology Equipment (ITE) Immunity
        3. International Electrotechnical Commission (IEC) - Ingress Protection Rating IP66
        4. National Electrical Manufacturers Association (NEMA) - 4X Enclosure Rating
        5. Institute of Electronic and Electrical Engineers (IEEE) 802.3 standard
        6. ISO/IEC 14496-2:1999 MPEG-4 video compression standard
        7. ISO/IEC 14496-10:2012 H.264 video compression standard
        8. Open Network Video Interface Forum (ONVIF)
  2. **SUBMITTALS**
     1. Product Data
        1. Manufacturer’s printed or electronic data sheets
        2. Manufacturer’s installation and operation manuals
        3. Warranty documentation
     2. Maintenance Materials Submittals
        1. Spare parts schedule: type and quantity of recommended spare parts
        2. Tools: Schedule of special tools or instruments required to install and calibrate system
     3. Shop Drawings and Schematics
        1. The thermal video detection system shall be depicted in final proposed “as built” configuration, including equipment interconnections.
  3. **QUALITY ASSURANCE**
     1. Qualifications
        1. Manufacturer of system shall have a minimum of five years experience of successful manufacture and installation of systems equivalent in function to the system proposed herein.
        2. Installation contractor shall be factory authorized to install, service and maintain the system by the system manufacturer.
  4. **DELIVERY, STORAGE AND HANDLING**
     1. Delivery, storage, and handling of the thermal video detection system shall be in accordance with the manufacturer’s recommendations.
     2. The manufacturer’s ordering instructions and lead-time requirements shall be followed to avoid delivery and installation delays.
     3. The thermal video detection system shall be delivered in the manufacturer’s original, unopened, undamaged container with identification labels intact.
     4. Storage and Handling Requirements
        1. The thermal video detection system shall be stored in a temperature environment of -40° to +80°C (-40° to 176°F) and protected from mechanical and environmental conditions as designated by the manufacturer.
  5. **WARRANTY**
     1. Manufacturer shall warrant the thermal video detection system to be free from defects in material or workmanship for a period of at least three years.
     2. Maintenance releases for embedded firmware shall be supported for a minimum of three years

1. **- PRODUCTS**
   1. **EQUIPMENT**
2. Manufacturer: SightLogix, Inc.

745 Alexander Road

Princeton, NJ 08540

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Fax +1 609.951.0024

www.sightlogix.com

1. Substitutions: Not Permitted
2. All units shall be supplied from a single manufacturer
3. **DESCRIPTION**
   * 1. The thermal video detection system consists of an imager complete with lens optics, built-in video analytics processing, embedded software, and IP66 environmental housing. The system detects targets that violate security rules and specifies their GPS position, provides clear image details, allowing synchronization with other system elements, including pan-tilt-zoom (PTZ) surveillance cameras and video management and situational awareness software packages.
     2. The system provides wide-area automated outdoor perimeter and buffer zone protection, operating in all weather conditions and geographical locations. The system integrates camera control, image stabilization, advanced image processing, image contrast enhancement technology for crisp, clear image detail 24 hours/day, in all seasons, and geo-spatial based object tracking to minimize false and nuisance alarm rates. Direct processing of video at the imager level analyzes video and provides access to the full dynamic range of the camera core, increasing the amount of image data available for processing and providing enhanced sensitivity and image quality.
     3. The system shall receive infrared energy in the wavelength of 8 – 14 micron emanating from potential objects of interest within the detection zone of the camera via an un-cooled VOx microbolometer detector.
     4. The system shall process the full dynamic range, 14-bit or more, of digital video from the thermal imager. The system shall have processing power to perform multi-region image contrast enhancement at 25 frames per second.
     5. The system shall automatically adapt to varying outdoor thermal conditions to provide discriminating image detail throughout the field of view, both at night and during the day.
     6. The system shall use image processing to provide the most detailed thermal image possible, 24-hours per day, including conditions of rain, snow, fog, wind, or humidity.
     7. The system shall not require illumination or image intensifier to “see” i.e. produce images. The system shall be passive and not produce any energy or emit light in any bandwidth. The system shall allow the user to clearly identify images in the total absence of light and produce useful security images during the day that are natural to the eye.
     8. The system shall allow the user to discern images through smoke and light fog and to view the thermal patterns and contrast in the scene.

The system shall utilize Vanadium Oxide (VOx) microbolometer detector technology, and shall not be susceptible to permanent damage after viewing the sun. The system shall not utilize blinders to prevent damage from the sun, but rather the system shall provide uninterrupted video which shall be required for security installations.

* + 1. The system shall not utilize automatic apertures to protect the image sensor because these mechanisms reduce sensitivity for an extended period of time, thus reducing the system performance which shall not be acceptable for security installations.
    2. The system shall provide built in gyro-based motion stabilization to negate the effects of wind and vibration and allow undiminished operation of the video processor
    3. The system shall provide athermal optics that automatically adapt to ambient temperature changes, and do not require refocusing.
    4. The system shall not be susceptible to “thermal whiteout” during the day or “image blooming” caused by bright lights as are image intensifiers and visible spectrum cameras.
    5. The system shall electronically factor out the effects of motion in a background environment of land, sky, or water in order to allow detection of foreign objects.
    6. The system shall provide discrimination of small objects in a background of scene clutter by requiring no more than twenty-two (22) scene pixels for automatic object detection.
    7. Data security: The system shall be capable of providing data security through AES encryption of system metadata and control information; authentication (basic and digest log-in); and system tamper alarms. SSL protocol shall be used for trusted external communications to other system devices.
    8. GPS Registration: The system shall use a geo-registration technique to capture the GPS location of detected objects, and provide for communication of this information to other system elements providing tracking and display capability.
    9. The system shall provide the following analytic capabilities:
       1. Modes: motion zone, multi-mode tripwire, directional zone violation, loitering, to and from zone
       2. Target information: height, width, speed, direction, aspect-ratio and absolute GPS position.
    10. Zone configuration and requirements
        1. The system’s field of view shall be able to be divided into a collection of independent zones or regions, each with the ability to specify different alert criteria. Zones shall be capable of being designated as Alarm, Mask, or Ignore types.
        2. Each alarm type zone shall be able to be associated with a set of rules that specify more precisely the conditions under which alarms are generated. These rules must allow restricting alarms by time, by tripwire, by previous path, or by target attributes such as the target’s size, speed, direction, and shape (aspect ratio).
    11. Zone alarm triggers:
        1. Object moving within zone (default)
        2. Configuration for response to analytic capabilities described in paragraph 2.02G
        3. Multiple trigger per zone capability
        4. Shock alarm, when the camera is moved by more than 3% of the total field of view
    12. Video Compression: The system shall support H.264, MPEG-4 (Simple Profile) and MJPEG compression, dual streaming, up to 25 frames per second.
    13. Data Rate
        1. The system shall have the ability for the data to stream at Variable Bit-Rate (VBR) with independent bit-rate settings for detection and non-detection conditions.
        2. The system shall allow for configurable bandwidth from 64 kbps to 8 Mbps, supporting satellite, cellular, wireless, and full broadband communication
    14. Ethernet Interface: The system will provide a standard 10/100 Ethernet interface.
    15. Enclosure: The system shall be housed in an IP66 environmental enclosure.
    16. Lenses: The system shall be available with multiple lens combinations providing acceptable trade-offs of field of view versus detection distance.
    17. The system shall provide an IP network video output and optional analog video output.
    18. The system shall provide the ability to upgrade encrypted firmware to the camera over the network.
  1. **PERFORMANCE**
     1. Detection Reliability: The system shall reliably detect up to 64 human pedestrian targets in under one second, with each target occupying as few as 22 pixels, anywhere in the field of view, while simultaneously enduring a total physical imager movement of less than 100 pixels (shake from wind gusts, etc.) at a frequency of up to one hertz.
     2. Object Tracking: The system shall be able to reliably track 64 objects simultaneously.
     3. Image Quality
        1. Algorithm - The system shall use multi-region image contrast enhancement technology to negate the thermal effects that conceal targets that are close to the same temperature as the background scene and to display images as clearly defined discernible shapes throughout the image. The number of regions shall be greater than 10 over the entire image
        2. Processing- The system shall process the full dynamic range, 14-bit or more, of digital video from the thermal imager. The system shall have processing power to perform multi-region image contrast enhancement at 25 frames per second.
     4. An online site security planning tool shall be available to assist the user in selecting the correct cameras and placement for designing a video surveillance system. The tool shall utilize Google Earth maps saved as jpeg images to allow the user to place cameras on the site / buildings and indicate the actual field of view of any camera to visually see the difference between each camera / lens combination for detection, recognition and identification. The tool shall be available at www.sightlogix.com/sightsurvey\_registration.html.
     5. SightSurvey will be used as a way to help determine proper FOV/Range/coverage area needed.
     6. The Noise Equivalent Temperature Difference (NETD) is the measure of the smallest object temperature that can be detected by the thermal image imager relative to the system noise. The measurement is usually quantified as a mK value. This is the most common Figure of Merit of a thermal imaging system and a true measurement of the thermal camera’s sensitivity. The image sensor shall provide a NETD of <50mK f/1.0 or lower.
     7. Operating temperature range: The system shall operate in an environment with an ambient temperature range of -40° to +60°C (-40° to 140°F).
  2. **SPECIFICATIONS**

1. Imaging System
   * + 1. Detector: Un-cooled VOx Microbolometer
          1. Spectral Response 17 micron (or smaller)
       2. Picture Elements: 640 (H) x 480 (V)
       3. Lens
          1. Available fields of view: Athermalized with a number of different FOV as determined using the SightSurvey tool or alternate means of coverage range and area calculation
       4. Focus Adjustment: fixed focus
       5. Dynamic Range: 14 bit digital sensor interface
       6. Thermal Sensitivity: <50 mK f/1.0
     1. Onboard Video Storage System
        1. SD Card Slot: Supports High Endurance microSD card   
            Stores both thermal and visible video  
            Searchable by time and event  
            Video is viewable in browser or downloaded via .MP4 export
     2. Network
        1. Ethernet Compliance
           1. Wired: IEEE 802.3, 802.3i, 802.3u
        2. Interfaces
           1. Wired: RJ45
        3. Data Rate: 64 kbps to 8 Mbps
        4. Operating Mode: Full-duplex
        5. Network Protocols: Open Network Video Interface Forum (ONVIF), Internet Protocol (IP), User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Dynamic Host Control Protocol (DHCP), Address Resolution Protocol (ARP), Interior Gateway Management Protocol (IGMP) 3.0, Domain Naming System (DNS), Hypertext Transfer Protocol (HTTP and HTTPS), Real-Time Transport Protocol (RTP), Real-Time Streaming Protocol (RTSP), Network Time Protocol (NTP), Secure Shell (SSH), Secure Socket Layer/Transport Layer Security (SSL/TLS),Service Location Protocol (SLP)

* + 1. Video Output
       1. Compression Types
          1. H.264– ISO/IEC 14496-10:2012
          2. MPEG-4– ISO/IEC 14496-2:1999 (Simple Profile)
          3. MJPEG
       2. Bit Rate Profiles: Variable bit rate (VBR)
       3. Resolution: 640x480
       4. Frame Rate (frames/second): 1 to 25

* + 1. Electrical
       1. Power Requirements:
          1. Without Window Heater: 12W 24VAC +/- 10% or PoE IEEE 802.3af
          2. With Window Heater: 32W 24VAC (1.5 amps)
       2. Connector (power & data):
          1. Data (Ethernet) RJ45
          2. Power Screw down terminal block
          3. Control leads Screw down terminal block
    2. Mechanical
       1. Weight: 2.1 kg (4.6 lbs.)
       2. Dimensions: 30.7 cm L x 14.7 cm W x 14.0 cm H

(12.1” x 5.8” x 5.5”)

* + - 1. Enclosure: NEMA 4X (IP66 compliant)
      2. Mounting: 3 x ¼-20 UNC bolts
    1. Environmental
       1. Operating Temperature: -40° to +60°C (-40° to 140°F)
       2. Storage Temperature: -40° to +80°C (-40° to 176°F)
       3. Relative Humidity: 0 to 100%
       4. Emissions: FCC Part 15, Class A, CE
  1. **COMPATIBLE SYSTEM ELEMENTS**

1. Tracking System
   1. The system shall be capable of communicating with a tracking system, providing target GPS coordinates to allow PTZ camera positioning unit and continual target tracking.
   2. Communication shall be via industry standard XML over a HTTP/HTTPS interface and include real time reports of objects tracked, camera name, serial number, firmware version, GPS position, bearing, and vital operating information.
   3. Tracked object parameters shall include current time, alarm state, creation time, GPS position, size, heading, speed, aspect ratio, and alarm zone.
2. Display System:
   1. Display system shall optionally display topological position and field of view of all video detection system units, overlaid on a geo-positioned aerial image of the surveillance area. This aerial image can be in standard image formats (e.g. JPEG)
   2. Display system shall optionally plot GPS locations of all security violations overlaid on a geo-located aerial image of the surveillance area in real time via red dot markings.

**2.06 ACCESSORIES**

A. System Software: Web-based configuration GUI.

B. Optional GPS target mapping, system configuration and target location display software, either Windows or Java-based, shall be available for use with geo-positioned aerial images to display real-time target data.

C. Mounts and Brackets: Manufacturer shall make available a family of adjustable mounting arm.

**2.07 SOURCE QUALITY CONTROL**

* + 1. Tests and Inspections
       1. A test report shall be submitted to indicate that every device was tested successfully in a factory system test to meet manufacturer’s published specifications.

**PART 3 - EXECUTION**

1. **INSTALLERS**
   * 1. Installation should be performed by qualified service personnel only in accordance with the National Electrical Code or applicable local codes.
     2. The Contractor’s installers and technicians shall be factory trained and certified to install, service and maintain the system.
   1. **PREPARATION**
      1. Web-based calibration process shall be used which employs internal sensors to determine the camera’s tilt and yaw for analytic accuracy after the user enters the camera’s height off the ground [WebConfig].
      2. Alternatively, geo-referenced images shall be downloaded from a provider such as Google Earth or equivalent to allow tracking of detected targets overlaid on a topology map of the site under security management (via SightMonitor II software).
   2. **INSTALLATION**
      1. Before permanent installation of the system, the system and interconnected components and cables shall be staged on-site to verify that all are in good working order.
      2. The camera system, when installed, shall be pointed low enough to detect maximum height of the most distant target anticipated and no higher.
      3. Once the camera is in place, it shall be adjusted as necessary to capture the area to be monitored. Fixed cameras shall be manually adjusted, and PTZ and dome cameras [SightTracker] shall adjusted from the Video Management System.

END OF SECTION