Consent Decree in

United States of America v.
Maynard Steel Casting Co. (E.D. Wis.)

Appendix C

Electric Arc Furnace – Outdoor Fugitive Emissions Opacity Monitoring Protocol

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1.0 Purpose

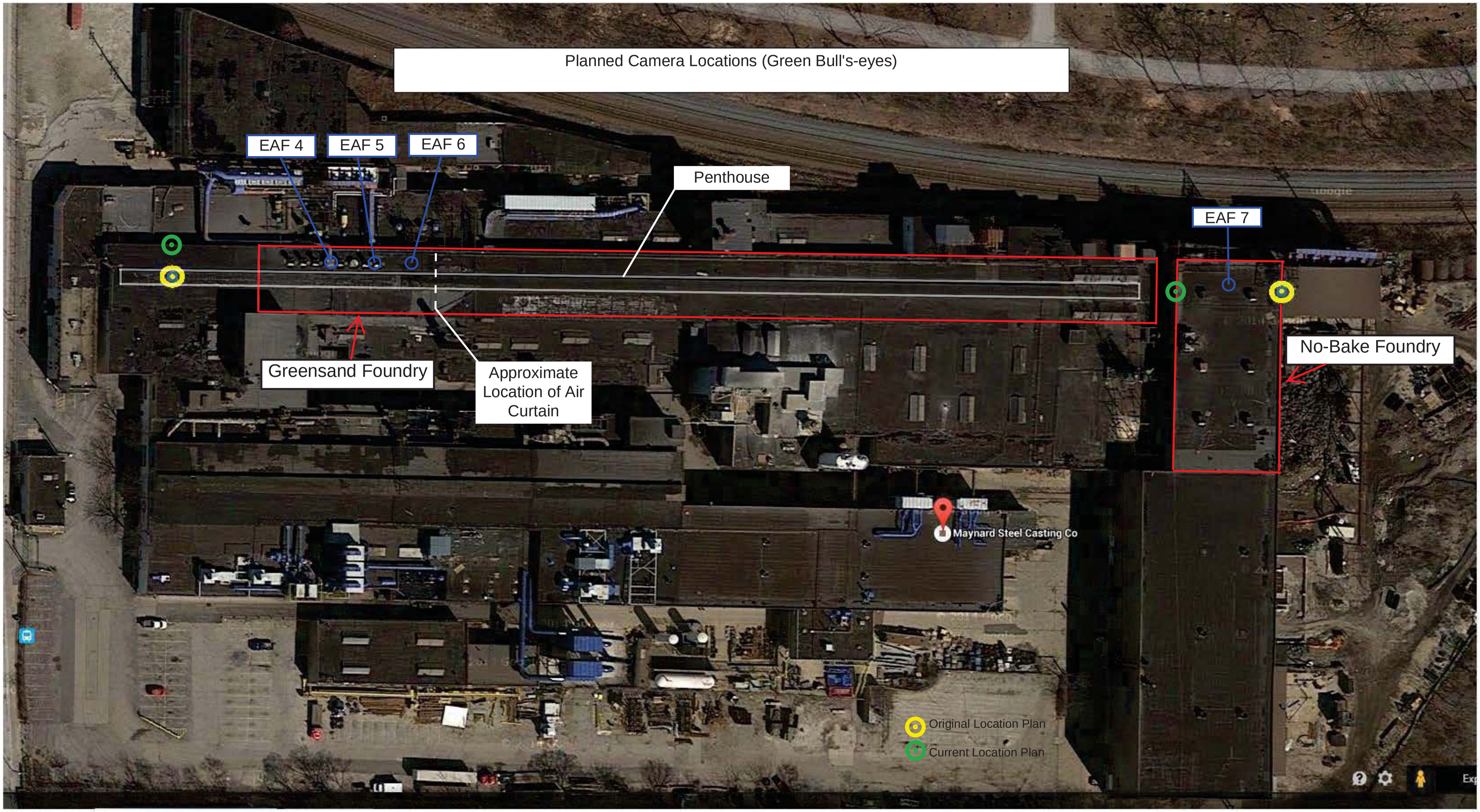
Uncaptured particulate matter ("PM") emissions from electric arc furnace ("EAF") charging, melting, refining, and tapping operations that are not directly or secondarily captured by an EAF Fume Collection System ("FCS"), generally may not be emitted to the atmosphere if they exhibit an opacity greater than 20 percent for a 6-minute interval, pursuant to s. NR 431.05, Wisconsin Administrative Code, and as specified under Paragraph 16 of the Consent Decree. This Protocol serves to detail the compliance monitoring approach that will be employed, when required, to measure the outdoor opacity associated with any fugitive emissions attributed to EAF operations that may emanate from the melt department of the Maynard Steel Casting Company ("Maynard") foundry and into the ambient atmosphere.

1.1 Background

Maynard currently has four EAFs, which are designated as EAF Nos. 4, 5, 6, and 7—each of which is equipped with a FCS that includes a shaker—type baghouse. Maynard's internal nomenclature refers to the foundry operations in the East End building (approximately the northern-most third of which physically houses EAF No. 7) as the "No-Bake Foundry" – See Figure 1. The portion of the facility that houses the balance of the foundry operations, including EAF Nos. 4, 5, and 6, is referred to as the "Greensand Foundry", which spans a continuous area along the north side of the facility that runs from west to east – See Figure 1. Although the "Greensand Foundry" ends at the East End building, there is no physical internal wall that separates the "Greensand Foundry" from the "No-Bake Foundry". While these names describe the majority of foundry operations that are typically performed in the respective areas, the descriptions are not to be interpreted as exclusive – *e.g.,* no-bake molds can be poured & cooled in the "Greensand Foundry".

EAF Nos. 4, 5, and 6 are located in the west portion of the "Greensand Foundry". These furnaces are arranged in order of increasing numeric identifier (4-5-6) from west to east. A north-south air curtain that bisects the bay is positioned to the immediate east of EAF No. 6, and is intended to retain the majority of the fugitive indoor emissions from these three furnaces in the west end of the "Greensand Foundry" to provide opportunities for secondary capture of such emissions via the local capture hoods of the associated FCSs. The approximate locations of the air curtain and of each of the EAFs are depicted on Figure 1.

The vertical temperature gradient within the foundry tends to increase from floor to ceiling, which contributes to a prevailing air movement from floor to ceiling due to the thermal buoyancy of the air. Ordinarily, the source of energy that causes air to rise above a hot process and expand into a thermal plume is caused by natural (*i.e.*, not forced) convective heat transfer off of hot surfaces. In the case of an EAF, natural convection is accompanied by another significant source of thermal energy that is not convective, namely the high thermal gradient between the furnace interior and the surrounding air, coupled with the



MAYNARD STEEL CASTING COMPANY
EAF Opacity Monitoring Protocol
Figure 1. General Layout [2015-09-21]

expansion of compressed air within the furnace, which pushes air upward via buoyant forces in a jet stream that exits the EAF through the annular spaces around the electrodes. Consequently, the velocity of the rising air within the foundry varies from area to area, depending on various factors, including ambient temperature, the nature of hot processes (*e.g.*, temperature, heated surface area, etc.), thermal energy inputs, and local exhaust hood capture efficiency, etc. In particular, the velocity is expected to be higher in areas immediately above an operating EAF due to the associated localized acute thermal energy.

The intensity of the thermal rise in air masses decreases as air cools and the thermal energy dissipates. Additionally, when the rising air mass contacts the underside of the roof, it tends to roll and, in so doing, loses energy and changes air flow direction; thereby providing opportunities for local capture hoods associated with powered FCSs to secondarily capture the air along with any entrained PM emissions. If the rising and/or rolling air mass encounters an opening in the building (*e.g.*, windows, pedestrian doors, vents, windows, etc.), then a portion of the air – along with any uncaptured PM contained therein – has the potential to migrate out of the building and into the atmosphere as fugitive emissions.

As detailed in a May 1, 2013, transmittal to the USEPA from Maynard, which is hereby incorporated by reference, there are limited areas in the roofs of the melt department of the foundry through which uncaptured emissions have the potential to migrate out of the building, to the extent that such areas are not otherwise closed or sealed. The areas include, but are not necessarily limited to gaps in steel panels on the roof, pedestrian doors, and rotary roof exhaust vents (non-operating). Notably, a penthouse runs along the approximate east-west centerline axis of the “Greensand Foundry”, as depicted on Figure 1, which is flanked on both the north and the south sides by hinged, 4’ x 8’ windowed panels. Natural draft openings associated with these panels are possible if they are not completely closed, or if windows are damaged or are otherwise misaligned. Such openings are reasonably anticipated to be the most likely path for concentrated fugitive emissions from EAF operations to exit the building (particularly in the area immediately above an operating EAF) due two primary factors:

1. <u>Proximity to the Source of PM Emissions</u>: Uncaptured emissions tend to dissipate the further they migrate from the source and as the plume expands; therefore, fugitive emissions may reasonably be more concentrated when leaving the building via openings that are closest to the EAF.

2. <u>Intensity & Redirection of Air Mass</u>: The intensity of the thermal rise tends to decrease as thermal energy dissipates with increasing distance from the source of the thermal energy. The higher the intensity, the greater the likelihood for uncaptured PM emissions entrained in the air mass to more forcibly exit the building via available openings. Moreover, as the rising air mass encounters the underside of the penthouse roof, it begins to roll, thereby changing direction from vertical to horizontal and then down again. Within the penthouse, the roll initially redirects the air mass towards the windowed panels on the north and south sides of the foundry.

2.0 Methods and Approach

The EAF melting operations normally take place during off-peak hours, between 8:00 p.m. and 8:00 a.m. Understanding that the majority of the EAF operations take place after sunset and before sunrise, compliance with the applicable opacity requirement must be demonstrated using methods that use available natural or artificial lighting. The primary method that will be used for opacity monitoring during both nighttime and daytime hours is discussed under Section 2.1, while alternate methods for nighttime and daytime monitoring are discussed in Sections 2.2 and 2.3, respectively.

2.1 Opacity Monitoring – Primary Approach

The primary method that Maynard will use to measure opacity from its EAF operations during both nighttime and daytime hours is EPA Alternate Method 082 (ASTM D7520) - *Standard Test Method for Determining the Opacity of a Plume in the Outdoor Ambient Atmosphere*[1]. In accordance with this method, digital imagery and associated hardware and software are used to determine the opacity of a plume. Opacity is determined by applying a Digital Camera Opacity Technique ("DCOT") that consists of a digital still camera, analysis software, and the output functions[2] content to obtain and interpret digital images of a plume.

This method uses a digital camera to capture a set of images against a contrasting background. Then analysis software is used to determine the plume opacity of each image by comparing a selected portion of the plume image where opacity is being measured to the background providing the contrasting values. The analysis software averages the opacities from a series of digital images taken over a fixed period of time.

2.1.1 Digital Still Camera

Maynard has purchased two VIVOTEK SD8363E Speed Dome Network Cameras with 1080p full HD resolution and a 20x optical zoom lens (specifications provided in Attachment 1). Each camera is enclosed in a IP66- and NEMA 4X-rated housing that protects the camera body against rain, dust, and corrosion within a wide temperature range of between -40°C to 55°C. According to the manufacturer (VIVOTEK Inc.), this camera is especially suited for monitoring wide open outdoor spaces such as airports, highways, and parking lots where high-level reliability and precision are required. This camera model is equipped with a pan/tilt mechanism that provides precise movement with continuous 360-degree pan and 220-degree tilt. The lens position can be controlled via a mouse or a joystick to track an object of interest, and to set up to 256 preset positions. This camera model was DCOT certified in accordance with Section 9, ASTM D7520, by Virtual Technology, LLC on June 22, 2015, and June 25, 2015, to capture daytime and nighttime images, respectively.

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[1] Although Section 6.2 of ASTM D7520-13 states that this method shall only be used during daytime conditions, USEPA Region 5, during a January 27, 2015, meeting with Maynard, specifically identified this method as being acceptable for use in nighttime opacity monitoring. Virtual Technology, LLC affirmed the acceptability of this method by USEPA Region 5 for nighttime opacity monitoring during a meeting with Maynard on February 23, 2015.

[2] Defined under Section 3.2.9 of ASTM D7520-13 as "human readable information documenting the image being analyzed and configuration of the Analysis Software used, the opacity measurement and the other required environment variables defined (for example, view angle, wind direction)."

These digital cameras are capable of continuous digital motion image recording from which digital still images can be extracted for analysis. Such images are in JPEG format that adheres to the Exchangeable Image File (EXIF) 2.1 (or higher) format standard required under Section 4.2.1, ASTM D7520. Images captured for analysis are required to use the camera's auto-focus and auto-exposure settings, and may use the optical zoom feature. However, any flash, optical filters, digital zoom, and image stabilization of the camera may not be used when recording digital images of the plumes.

This Protocol has been developed to include two stationary, roof-mounted cameras for redundancy, and to provide flexibility in selecting an appropriate camera position for use in obtaining images for analysis (*e.g*., considering factors such as prevailing air flow direction). The approximate locations for the two cameras are planned for opposite ends of the melt department along its east-west axis, as illustrated on Figure 1. At each location, the camera will be mounted above the roof surface. The west location will be positioned so that is can look east from atop the north wall of the Greensand Foundry (*i.e*., above the crane level windows), thereby providing views of fugitive emissions from north-facing openings along the melt department in the immediate vicinity of EAFs 4, 5, and 6 (*i.e*., looking down along the crane level windows, and along the north-facing penthouse windows). This position is also intended to provide a view of fugitive emissions from EAF 7 that may emanate from the roof of the East End Building. For the east end location, the camera will be positioned atop the west side of the roof of the East End building so that it can look east across the roof of the East End building, and also rotate to look west along the approximate east-west centerline of the penthouse of the Greensand Foundry. From this vantage point, fugitive emissions can be monitored from the roof of the East End building and along the length of the Greensand Foundry.

The cameras will be initially located at the planned locations described above to obtain test images that will be submitted to Virtual Technology, LLC. These test images will be used to determine if the locations and relative positioning of the cameras yield adequate images for opacity determination via its analysis software, which is discussed in Section 2.1.3 of this Protocol. If so, then the camera locations will be established as describe above. Otherwise, alternate locations will be investigated as directed by Virtual Technology, LLC in consultation with appropriate Maynard representatives with appropriate knowledge related to the technical feasibility associated with potential alternate locations (*e.g.*, in due consideration of access to power, obstructions, etc.).

2.1.2 Ambient Lighting

A plume is most visible and presents the greatest apparent opacity when it is viewed against a contrasting background. In accordance with Section 4.2.4 of ASTM D7520, ambient light must be sufficient to show a clear contrast between the plume and its background. According to Mr. Shawn Dolan, President - Virtual Technology, LLC (*i.e.*, the company that certified the above-noted camera), the nighttime certification of the camera model discussed in Section 2.1.1 (above) was completed with a clear sky and approximately half a moon without any supplemental backlighting. Based on a September 2015, review by Virtual Technology of test nighttime images with overcast skies, supplemental backlighting is expected to be necessary for nighttime opacity monitoring. To do this, supplemental artificial lighting will be provided to wash the roof-top areas in the immediate vicinity of the EAFs with sufficient artificial lighting to provide an adequate contrasting background against which opacity will be measured. Maynard will provide USEPA, for review and approval, site-specific lighting plans for: (1) conducting nighttime opacity observations with a certified observer; and (2) conducting nighttime opacity readings using a certified camera, in accordance with Paragraph 48 of the Consent Decree.

If opacity monitoring is conducted during daylight hours (*i.e.*, after sunrise and before sunset), then natural lighting will serve as the ambient lighting in lieu of the artificial lighting described above.

2.1.3 Analysis Software

The opacity from the digital images captured via the cameras, which are digitally time and date stamped, will be evaluated using Digital Optical Compliance System II (DOCS II) software, which is commercially available only from Virtual Technology, LLC. Meteorological information (*e.g.*, wind speed & direction) used in the assessment is obtained via National Oceanic and Atmospheric Administration (NOAA) resources that are representative of Maynard's location. The portion of the plume selected for opacity determination will represent the part of the plume with the highest apparent opacity, excluding water vapor, as determined by the DCOT operator[3], and will be centered in the digital image (Sections 4.2.5 through 4.2.8, ASTM D7520).

In brief, the software compares selected "in the plume" areas to selected "background" areas adjacent to the plume. The difference between "in the plume" values and "out of the plume" values is correlated to opacity by the DOCS II software. This software is capable of assessing images in either simple or complex analysis modes. The simple mode may be used for homogenous (but not gray) backgrounds, such as black or white smoke on a blue background. In this mode, "in plume" and "out of plume" sticks (boxes) are positioned on corresponding areas of the image, as illustrated in Figure 2. The software then estimates the opacity between the two selected image areas.

The complex mode may be used on heterogeneous backgrounds (*e.g.*, wooded area) and gray backgrounds. When using the complex mode, a zero opacity image, which is effectively a duplicate of the image to be assessed before emissions are generated, typically needs to be selected for use as the background. "In plume" and "out of plume" sticks (boxes) are iteratively positioned on the background image until obtaining a green or yellow light to proceed (see Figure 3). The software is then used to superimpose the zero opacity/background image on each image to be analyzed before proceeding to determine the opacity measurement.

Maynard will obtain and use the software to analyze the opacity assessments, or electronically submit the images to be analyzed to Virtual Technology, LLC for assessment as part of its Software as a Service ("SaaS") service offering.

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[3] *DCOT operator* is defined as the individual operating the DCOT system that records the digital still images with the Digital Still Camera and then determines plume opacity with the analysis software.

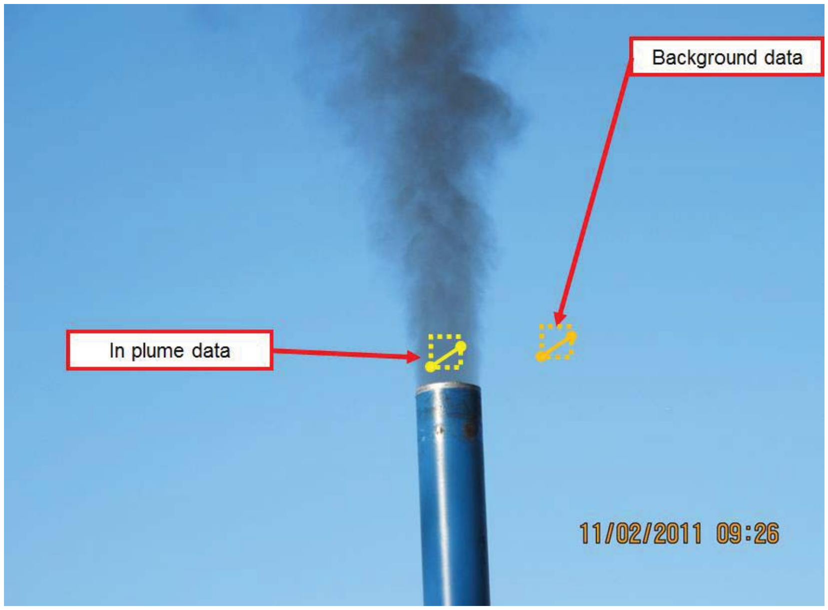


Figure 2. Simple Mode Example Image
[Source: "An Evaluation of a Digital Camera System for Measuring Smoke Plume Opacity", presented by Mr. Bill Gillespie, Virginia Department of Environmental Quality, at the *EPA Measurement Technology Workshop*, January 29, 2013]

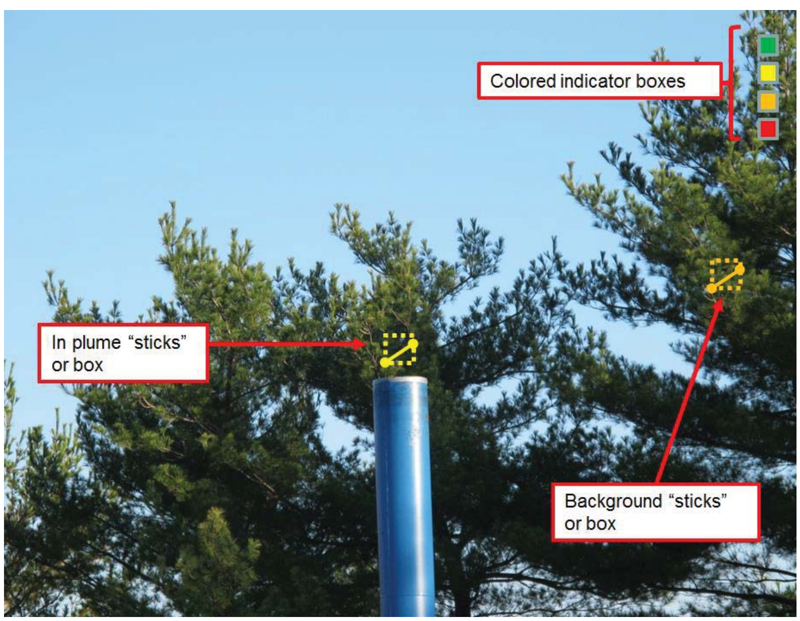


Figure 3. Complex Mode Example Image
[Source: "An Evaluation of a Digital Camera System for Measuring Smoke Plume Opacity", presented by Mr. Bill Gillespie, Virginia Department of Environmental Quality, at the *EPA Measurement Technology Workshop*, January 29, 2013]

2.1.4 Operator Training

Implementing this Protocol relies, in part, on the DCOT operator and the Digital Still Camera operator. Although these operators may be one and the same person, the functions of each job are different – each with its own competency requirements. In addition to meeting the following requirements, the DCOT operator is required to be certified as a Digital Still Camera Operator in accordance with ASTM D7520, Annex A1.10, as described below:

1. To acquire digital images from the Digital Still Camera to determine plume opacity by meeting the requirements specified by the training course for the specified DCOT system.

2. To use and be knowledgeable of the content described in "Principles of Visual Emissions Measurements and Procedures to Evaluate those Emissions Using Digital Camera Optical Technique (DCOT)", as provided in Annex A1, ASTM D7520-13.

3. To perform analysis with the DCOT system by attending a smoke school, acquiring images, and successfully performing analysis on smoke school imagery with the DCOT system.

   NOTE: Maynard personnel will only be required to obtain this certification if Maynard elects not to have Virtual Technology, LLC assess the opacity of the images as part of its SaaS service offering.

As part of its contract with Virtual Technology, LLC, Maynard shall ensure that items 1 and 2 are included in the DCOT system training that is required to be provided by Virtual Technology, which is its DCOT vendor.

The DCOT operator and any other individual that is designated to operate the Digital Still Camera for the purpose of obtaining images for opacity assessment, need to be certified to capture plume and related field data in accordance with Annex A-1.10, ASTM D7520-13, which requires that the candidate demonstrate a mastery of the following:

1. Rules associated with the operation of a Digital Still Camera;
2. Rules associated with plume observations;
3. Required field data supportive of a valid defensible observation; and
4. Expertise in utilizing field equipment.

The required certification will be obtained by successfully completing the respective training offered by Virtual Technology, LLC. The Digital Still Camera operator certification will last no longer than 3.5 years. At or before the expiration of the certification, the operator(s) will be retrained and recertified.

2.2 Night-time Opacity Monitoring – Alternate Approach

Rather than use the primary approach for nighttime opacity monitoring, as detailed in Section 2.1 of this Protocol, Maynard may elect to use an observer who has a then-current certification from the California Air Resources Board for nighttime visible emission evaluation as a contingency in the event that the primary approach is not functioning properly (*e.g.*, due to related hardware and/or software issues, backlighting issues and/or other unforeseen inhibiting factors). This method relies on direct visual observation by a human observer. The observer may either be Maynard personnel or an outside contractor that is properly trained and certified by the California Air Resources Board in conducting nighttime opacity monitoring.

2.3 Day-time Opacity Monitoring – Alternate Approach

Rather than use the primary approach for daytime opacity monitoring, as detailed in Section 2.1 of this Protocol, Maynard may use EPA Method 9 (40 CFR 60, Appendix A-4), which relies on direct visual observation by a qualified observer.

3.0 Modification of Protocol

This Protocol may be modified as a non-material change by written agreement between Maynard and the EPA, as provided under Paragraph 129 of the Consent Decree.

ATTACHMENT 1
DIGITAL CAMERA SPECIFICATIONS

SD8363E/63E-M

Speed Dome Network Camera

1080p Full HD • 20x Zoom • NEMA 4X • IP66 • Extreme Weatherproof • PoE Plus

VIVOTEK SD8363E is part of the SUPREME series product line offering 1080p Full HD resolution with superb image quality. Adopting a 20x optical zoom lens, the SD8363E is able to capture details at top-notch quality. The IP66- and NEMA 4X-rated housing protects the camera body against rain, dust, and corrosion within a wide temperature range of between -40°C to 55°C. This feature ensures operation under extreme weather conditions and hazardous environments. It is especially suitable for monitoring wide open indoor/outdoor spaces such as airports, highways and parking lots where high-level reliability and precision are always required.

The SD8363E supports high-performance H.264/MPEG-4/MJPEG compression technology and offers extra smooth video quality with resolution up to 30 fps @ 1080p. Boasting WDR Pro technology, the SD8363E can also cope with challenging lighting conditions and generate image quality close to the capabilities of the human eye. With a sophisticated pan/tilt mechanism, the camera provides fast, precise movement with continuous 360-degree pan and 220-degree tilt. Users can also easily control the lens position via a mouse or a joystick to track the object of interest and set up to 256 preset positions. With the built-in auto tracking feature, the SD8363E provides instantaneous reaction to suspicious moving objects in wide area locations before operators are aware of activity.

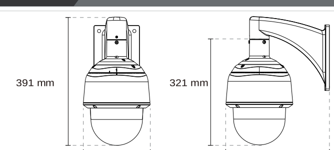
As with all VIVOTEK true day/night cameras, the SD8363E features a removable IR-cut filter, maintaining clear images 24 hours a day. With audio detection, by recognizing increases or decreases in sound volume, an additional layer of intrusion detection is ensured. Zoom enhancement provides 60x optical zoom at 640x360 resolution by which VGA-level bandwidth is used to obtain image details as high as 1080p resolution. With other advanced features such as SD/SDHC/SDXC card slot, 802.3at compliant PoE Plus and 60 fps high quality video, the SD8363E is the best choice for the most demanding outdoor surveillance applications.

SUPREME

Technical Specifications

Models	SD8363E SD8363E-M (electronic dehumidifier)
System Information	
CPU	Multimedia SoC (System-on-Chip)
Flash	128 MB
RAM	256 MB
Camera Features	
Image Sensor	1/2.8" Progressive CMOS
Maximum Resolution	1920x1080
Lens Type	20x optical zoom, auto focus
Focal Length	f = 4.7 ~ 94 mm
Aperture	F1.6 (wide) ~ F3.5 (tele)
Auto-iris	DC-iris
Field of View	3° ~ 55° (horizontal) 2° ~ 32° (vertical) 3° ~ 64° (diagonal)
Shutter Time	1/1 sec. to 1/10,000 sec.
WDR Technology	WDR Pro
Day/Night	Removable IR-cut filter for day & night function
Minimum Illumination	0.02 Lux @ F1.6, 50 IRE (Color) 0.001 Lux @ F1.6, 50 IRE (B/W)
Pan Speed	0.05° ~ 450° / sec.
Pan Range	360 endless
Tilt Speed	0.05° ~ 450° / sec.
Tilt Range	220° (-110° ~ +110°)
Preset Locations	256 preset locations, 40 presets per tour
Pan/tilt/zoom Functionalities	48x digital zoom (4x on IE plug-in, 12x built-in) Auto pan mode Auto patrol mode
On-board Storage	SD/SDHC/SDXC card slot
Video	
Compression	H.264, MJPEG & MPEG-4
Maximum Frame Rate	H.264: 30 fps @ 1920x1080 60 fps @ 1280x720 MPEG-4: 30 fps @ 1920x1080 60 fps @ 1280x720 MJPEG: 30 fps @ 1920x1080 60 fps @ 1280x720 (Up to 30/15 fps in WDR mode)
Maximum Streams	4 simultaneous streams
S/N Ratio	Above 60 dB
Dynamic Range	108 dB
Video Streaming	Adjustable resolution, quality and bitrate Zoom enhancement for better image quality under limited bandwidth
Image Settings	Adjustable image size, quality and bit rate Time stamp, text overlay, flip & mirror Configurable brightness, contrast, saturation, sharpness, white balance, exposure control, gain, backlight compensation, privacy masks (Up to 24) Scheduled profile settings
Audio	
Audio Capability	Audio input/output (full duplex)
Compression	GSM-AMR, AAC, G.711, G.726
Interface	External microphone input External line output
Network	
Users	Live viewing for up to 10 clients
Protocols	IPv4, IPv6, TCP/IP, HTTP, HTTPS, UPnP, RTSP/RTP/RTCP, IGMP, SMTP, FTP, DHCP, NTP, DNS, DDNS, PPPoE, CoS, QoS, SNMP, 802.1X, UDP, ICMP
Interface	10Base-T/100 BaseTX Ethernet (RJ-45)
ONVIF	Supported, specification available at www.onvif.org
Intelligent Video	
Video Motion Detection	Triple-window video motion detection
Auto-Tracking	Auto-tracking on moving object
Alarm and Event	
Alarm Triggers	Video motion detection, manual trigger, periodical trigger, system boot, recording notification, audio detection
Alarm Events	Event notification using digital output, HTTP, SMTP, FTP and NAS server File upload via HTTP, SMTP, FTP and NAS server
General	
Connectors	RJ-45 cable connector for Network/PoE connection Audio input Audio output AC 24V power input Digital input*4 Digital output*2 RS-485 for PTZ control (PelcoD protocol, Baud rate 2400)
LED Indicator	System power and status indicator
Power Input	PoE plus (IEEE 802.3at compliant) High Power PoE AC 24V
Power Consumption	PoE plus: Max. 19W AC 24V: Max. 48W (heater on) Max. 19W (heater off) High Power PoE: Max. 48W (heater on) Max. 19W (heater off)
Dimensions	Ø: 205 mm x 321 mm
Weight	Net: 3,660 g
Casing	Weather-proof IP66- and NEMA 4X-rated metal housing Built-in electrical dehumidifier device (SD8363E-M)
Safety Certifications	CE, FCC Class A, VCCI, C-Tick, NEMA 4X
Operating Temperature	-5°C ~ 55°C (PoE Plus) -40°C ~ 55°C (AC 24V / High Power PoE)
Warranty	36 months
System Requirements	
Operating System	Microsoft Windows 7/Vista/XP/2000
Web Browser	Mozilla Firefox 7~10 (Streaming only) Internet Explorer 7.x or 8.x
Other Players	VLC: 1.1.11 or above Quicktime: 7 or above
Included Accessories	
CD	User's manual, quick installation guide, Installation Wizard 2, ST7501 32-channel recording software
Others	Wall mount bracket, screws, waterproof connectors, terminal blocks, RJ45 coupler, ethernet cable, quick installation guide, warranty card, alignment sticker, T25 stardriver, seal ring, software CD

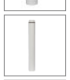
Dimensions



Compatible Accessories

Mounting Kits


AM-116 20 cm pendant pipe


AM-117 40 cm pendant pipe


AM-118 Indoor pendant head


AM-231 Parapet mounting kit


AM-221 Goose neck mounting kit


AM-103 Recessed kit


AM-519 1.5" PT adapter

PoE Kits


AP3001 PoE plus injector


AP-331 High power PoE injector

Power Adapter


AA-341 AC 24V power adapter

Others


AC-212 Smoked cover


AC-111 Vandal-proof transparent cover


AO-001 Combo cable

Distributed by:

Ver 1.5

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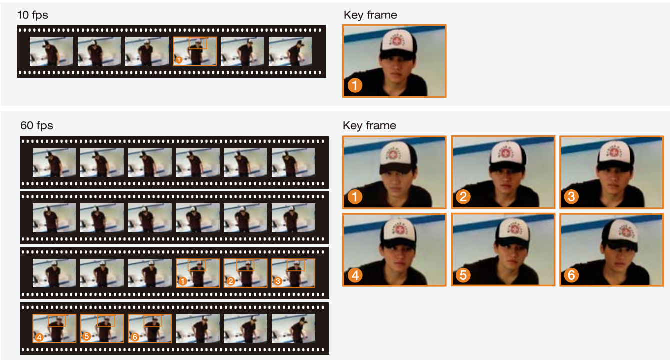
60 fps Raises Recognition Accuracy

The VIVOTEK SD8363E is able to transmit 60 fps @ 720p resolution with H.264 compression, whereas a conventional megapixel camera can generally only achieve 10 to 15 fps due to hardware limitations. 60 fps provides a significant advantage as it enables viewing and recording footage at an exceptional frame rate. This feature provides a more complete record of an event and ensures accurate target identification. The more images or frames that can be captured and delivered to a facial recognition database, the more forensic evidence is available for biometric pairing, significantly increasing the level of accuracy.

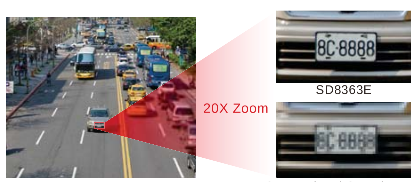


Advanced Mechanism

SD8363E has a pan range of 360° and tilt range of 220°. With the additional 20° tilt range, the SD8363E is able to expand the viewing range to the field above the normal horizontal view. Additionally, the SD8363E is built with QuickPan technology, allowing for 360° endless panning at a speed of 450° per second.
This allows users to quickly direct the camera lens to catch any object of interest in the field of view surrounding the camera.

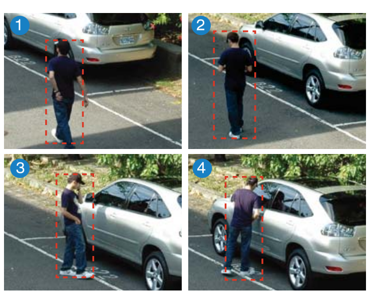
Zoom Enhancement

Utilizing a 20x optical zoom lens, the SD8363E provides close-up images with 1080p detail and effectively extends the user's viewing distance. Even under limited bandwidth environments, users can take advantage of the VIVOTEK Zoom enhancement feature to obtain image detail as high as 1080p resolution using VGA-level bandwidth.



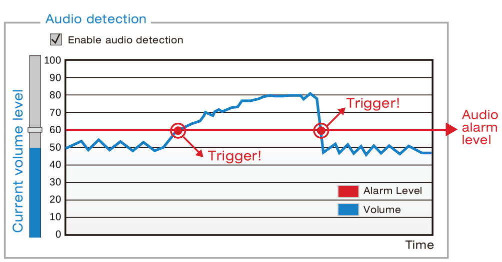
Auto Tracking for Moving Objects

The auto tracking feature provides instantaneous reaction to suspicious moving objects over a wide area before an operator may be aware of activity. Users are able to define the target object size in order to render auto tracking more effectively.



Audio Detection for Instant Alerts

The audio detection feature enables an event trigger when a sudden, unexpected increase or decrease in sound volume occurs so as to alert users of a possible emergency situation.

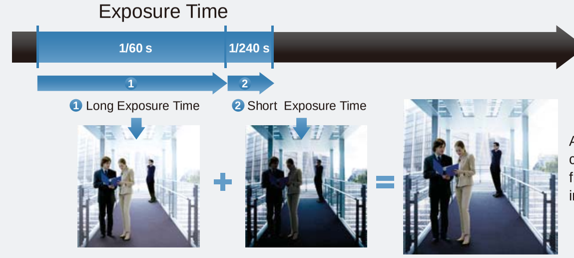


Unparalleled Visibility in High Contrast Environments

When a camera is used in a high contrast, backlight, glare or light reflective environment, such as a building entrance, ATM or window, an object may appear dark and unrecognizable. WDR (Wide Dynamic Range) technology compensates for the unbalanced lighting, restoring the details throughout the field of view. With this feature, the SD8363E is able to maintain image quality even under challenging light conditions.

• WDR Pro

WDR Pro works by capturing alternate frames using different exposure times. An image signal processor (ISP) then uses a sophisticated algorithm to seamlessly combine the optimal portions of these two complementary frames to create a composite frame that retains details in both the dark and bright areas of the field of view.



A single high-contrast frame is created by combining the two frames using an advanced image signal processor.

(Note: Frame rate drops by half when using WDR Pro.)

Extreme Weatherproof

• Wide Temperature Range

The wide temperature range (-40°C ~ 55°C) enhances the SD8363E's performance and reliability under extremely harsh weather conditions.

• IP66-rated and NEMA 4X Housing

The weather-proof IP66- and NEMA 4X-rated housing protects the SD8363E from rain, dust, and corrosion, allowing the device to operate outdoors under a multitude of weather conditions.

SD8363E/63E-M | Speed Dome Network Camera

- 1080p Full HD SONY CMOS Sensor
- 30 fps @ 1080p Full HD
  60 fps @ 720p HD
- 20x Zoom Lens
- Removable IR-cut Filter for Day & Night Function
- 360° Continuous Pan and 220° Tilt
- Real-time H.264, MPEG-4 and MJPEG Compression (Triple Codec)
- WDR Pro for Unparalleled Visibility in High Contrast Environments
- Weather-proof IP66-rated and NEMA 4X Housing
- -40°C ~ 55°C Wide Temperature Range for Extreme Weather Conditions
- Audio Detection for Instant Alerts
- Auto Tracking for Moving Objects
- Built-in 802.3at Compliant PoE Plus
- 3D Privacy Masks for Additional Protection
- Built-in SD/SDHC/SDXC Card Slot for On-board Storage

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