

Workplace Safety and Health Guide

Video Surveillance Systems

Draft for Public Consultation

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This is a draft document which is subject to change. Members of the public are invited to submit comments using the consultation form provided.

This draft should NOT be regarded or used as a final guidance document issued by WSH Council. Feedback will be incorporated and copy-editing/ visual layout will be undertaken prior to publication.

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1. Introduction

1.1 Scope and Objective

Technology can make workplaces safer by providing real-time monitoring of work activities, allowing for quick intervention and prevention of accidents. The use of technology can transform Workplace Safety and Health (WSH) practices, enabling companies to proactively identify and address WSH challenges before they become serious accidents. The adoption of technology-enabled WSH is one of Singapore's key strategies to achieve WSH 2028 goals.

Harnessing the transformative potential of technology enables companies to create safer work environments, reduce accident rates, and cultivate a culture of accident prevention in workplaces throughout Singapore.

Video Surveillance Systems (VSS) is one way that companies can deploy technology to monitor operations and better manage WSH risks.

This guide serves as an introduction to VSS and how VSS can be deployed to enable employers to improve WSH oversight. Specifically, this guide covers the VSS recommendations to be considered before installation and provides examples of where and how VSS may be installed.

1.2 WSH Legislation on VSS

WSH Regulations will state the specific industries and conditions where the deployment of VSS will be mandatory.

This Guide supplements the upcoming Regulations by providing guidance to companies on VSS deployment.

1.3 Using VSS to Improve WSH

VSS is a tool companies can use to manage WSH risks and improve WSH in several ways:

1. **Monitoring:** Surveillance cameras can provide real-time monitoring of the workplace, allowing occupiers/ employers/ principals to identify risks, potentially unsafe situations, and act on any lapses observed before an incident occurs.
2. **Deterrence:** The presence of cameras can act as a deterrent for unsafe behaviours if all persons onsite (including contractors and visitors) know the workplace is being monitored, and work activities captured, even if it is not in real-time. This improves compliance with WSH practices and can help prevent WSH incidents.

3. Training: Surveillance recordings can also be used for training as it provides examples of both safe and unsafe behaviors at the workplace. This can be used to reinforce the WSH policy, safe work procedures, and train employees on the risks associated with the work activity.
4. Insight: In the event of a WSH incident (e.g. a near miss, dangerous occurrence or accident), surveillance recordings can be analysed to provide valuable insight for investigations. Through the video footage, important lessons can be identified, and additional measures introduced to prevent similar incident recurrence.

The use of VSS should complement, rather than replace, established WSH management tools and on-the-ground practices such as conducting RAs, communicating safe work procedures, and checking the effectiveness of risk controls.

Management, supervisors, and WSH personnel should use VSS as an additional tool to verify compliance with the company's WSH standards. In particular, higher-risk work activities need greater attention and the use of VSS enables remote monitoring to ensure these activities are carried out safely, regardless of one's physical location. This real-time oversight contributes to a proactive approach to workplace risk management.

Using video footage, observed lapses and lessons learnt can also be shared with workers during safety briefings, toolbox meetings and/ or training sessions. Where unsafe conditions or unsafe acts are detected through the video footage, the unsafe conditions and identified risks can be communicated to workers (e.g. through internal alerts or instant messaging) to advise workers to keep away from danger areas or avoid performing such unsafe acts.

As part of self-audit, records of lapses found and corrective actions taken may also be used to demonstrate that actions were taken to intervene and prevent workplace accidents.

2. VSS Recommendations

A VSS comprises a network of cameras, monitors or display units, transmission systems, recording equipment and storage devices. VSS may be used to monitor and record activities within specific work areas.

VSS can be installed by vendors or self-installed (for smaller or simpler set-ups).

Companies are advised to conduct an RA for VSS installation to ensure that the VSS can be installed safely and poses no risk to surrounding work activities.

2.1 Video surveillance system

This section covers VSS recommendations on basic camera specifications, area coverage recommendations and VSS power supply.

2.1.1 Basic camera specifications

Cameras are the most important component of a VSS. They can be mounted in a variety of locations and can capture video footage in different formats and resolutions.

Camera type and features

The two common camera types and their typical use cases are:

Type	Benefits	Typical Use Cases
Dome Camera (circular in shape)	<ul style="list-style-type: none"> Discrete appearance (blends in with surroundings) Unclear where the camera is pointing Tamper resistant as lens is protected 	Indoor or outdoor use Shorter range surveillance
Bullet Camera (cylindrical in shape)	<ul style="list-style-type: none"> Highly visible (deterrent effect) Accommodates larger lenses Small lip at the tip of the camera protects against glare and weather 	Indoor or outdoor use Longer range surveillance

Companies may decide on dome or bullet cameras (or other suitable alternatives) to suit the needs of the workplace to be monitored.

Companies may choose to acquire cameras with the pan, tilt and zoom function which features a movable lens (for wider range of coverage) and a zoom lens (to enable a closer look at specific areas).

Night vision capability is necessary for work activities carried out in low light conditions.

For future-proofing, companies may wish to consider VSS that allows for third party systems integration and tapping on live video feeds for analysis.

Camera robustness, portability and resolution

The selected camera should be sufficiently robust for the work environment where the camera will be located. In outdoor locations, the cameras should be able to withstand environmental challenges like rain, dust and temperature change. Hence, the selection of weather-proof and dust-proof cameras is recommended.

Fixed or portable VSS (or a combination of both) may be deployed depending on site conditions and availability of power supply.

The video resolution of the VSS should be dependent on how far the cameras are placed from the work area(s) being monitored. Higher resolution cameras are recommended for wide area coverage and long-distance monitoring to ensure clear visual output. The minimum camera resolution recommended is 1080p (1920x1080 progressively displayed pixels).

Wearable cameras (e.g. body worn or helmet mounted cameras) can be used to supplement the overall video surveillance system at the workplace. Such cameras allow for close footage of work processes to be captured, complementing the overall coverage captured by fixed cameras. Wearable cameras, however, should not be used as a substitute for fixed cameras, as the viewpoints of wearable cameras are limited by the workers' location and facing. Wearable camera batteries are also not likely to last the entire day.

2.1.2 Area coverage recommendations

The VSS should cover all higher-risk work activities in the table below. Companies may choose to extend coverage to other locations deemed necessary or include additional work activities for monitoring based on Risk Assessment (RA).

Area coverage recommendations

Examples of higher-risk work activities and locations to be covered by VSS monitoring at a construction site

Higher-risk work activities

- Working at height activities where a worker may fall a distance ≥ 2 metres (e.g. working on roofs, scaffolds, formwork, places where there are open sides)
- Working near the construction of support structures and scaffolds
- Working near excavation and shoring works
- Working near lifting operations (e.g. operation of cranes and lifting appliances, lifting activities where a permit-to-work is required)
- Working in any confined space where VSS deployment does not pose a hazard

Locations

- At every floor of a building under construction where higher-risk works are in progress
- At worksites where heavy/ industrial machinery or equipment (e.g. cranes, excavators, mobile elevated working platforms, any machine with moving parts that can cause injury) are in use
- Areas with high vehicular and human traffic (e.g. where forklifts or reach trucks are used)
- Loading/ unloading areas

Note: Installation of VSS will not be required for temporary buildings or structures built for the purpose of short-term events.

The number, location(s) and exact positioning of cameras is based on how large the worksite is, the range of each camera, and the number of such cameras needed to fully cover the activities taking place in the worksite.

The placement of each camera should be such that it has an unobstructed view and a clear line of sight to the work activities being carried out. It is recommended for cameras to be mounted at high vantage points to better capture work in progress. Suitable means should be implemented to minimise unnecessary video recording of neighbourhood premises. Suggested methods include setting up physical barriers to limit the range of video capture, shifting the camera position, or digitally via the set-up of virtual privacy zones.

The VSS should be switched on and recording so long as work activities are being carried out.

In the course of work, if any of the cameras need to be relocated (e.g. due to obstructed view), the relocation should be done such that coverage of the ongoing works from the remaining cameras will not be disrupted.

In isolated locations where occupiers and owners assess that the installation of VSS may give rise to intellectual property, privacy, or security issues, occupiers and owners should ensure that there are valid reasons supporting any decision leading to non-installation of VSS at the said locations. Such decisions should be properly documented at the time the decision is made to ensure that there is accountability and that the grounds leading to the decision has been captured.

2.1.3 VSS power supply

In a built-up environment (e.g. a completed building), power supply is usually a non-issue as it is readily available or it can be tapped from existing power lines.

At a construction worksite, power supply may not be available as it depends on the work location to be monitored and stage of construction.

In areas where power supply is not available, the use of high-capacity rechargeable battery packs is recommended. The battery technology chosen should be non-flammable and does not generate harmful vapours when in use.

For VSS operated outdoors in the daytime, solar power may be harnessed to supplement battery use.

VSS may also be mounted on a building, vehicle (e.g. a van) or industrial machinery (e.g. a tower crane) and draw power from the building, vehicle or machinery.



Source: Ailytics

Figure 1: Example of a portable camera powered by battery and supplemented with solar power

Companies may choose to install an Uninterruptible Power Supply (UPS) to ensure continuous VSS operation in the event of power disruption or battery run out.

2.2 Transmission and storage

Digital video file sizes can be large depending on the video bitrate, duration of recording, and extent of video compression.

Video files require plenty of storage capacity to store video footage. This can be achieved either through local storage devices (e.g. SD cards, thumb drives), network-based drives or cloud-based storage solutions.

Transmission mode for video data can be via network cables or wirelessly via Bluetooth, Wi-Fi, or SIM card/ mobile data.

Storage recommendations

- Storage system should be selected to operate reliably for the working environment (e.g. outdoors)
- Video files may be in any open-source container format or common multi-media container format such as *.avi (Microsoft), *.mov (Apple QuickTime) and *.mp4 (MPEG).
- Sufficient capacity to store 30 days of recorded footage (if no WSH incident)
- For WSH incident, video footage archived for 180 days from the date of incident. No overwriting or deletion of footage showing the WSH incident.
- All video recordings to feature camera identification, location/ area of recording, and date/ time stamp which cannot be altered. The date and time for all cameras to be synchronised from a single source.

The selected VSS to include backup facilities and ability to export video footage to external storage devices such as thumb drives and portable hard disks.

2.3 Viewing and access

Companies may select a suitable Video Management System (VMS) software that allows the video files to be easily stored, managed, and viewed. The VMS software also typically allows users to toggle between live footage and recorded footage, and perform other remote functions like camera pan, tilt or zoom and/ or footage edit.

Companies should consider whether to have real-time monitoring of high-risk works that are underway, as an added layer of surveillance. This can be especially useful if the cameras provide a vantage that cannot be obtained by in-person monitoring.

Companies are fully accountable for the VSS security and access given to users.

Access recommendations

- VMS allows real-time monitoring of live footage.
- VMS enables retrieval of recorded footage for any date and time interval.
- VMS able to export desired portion of video footage onto external storage devices.

Project managers, supervisors, WSH officers, WSH Coordinators or assigned personnel should regularly monitor VSS footage (either in real-time or for later review), identify unsafe work practices, and put in place suitable accident prevention measures.

Companies are also advised to review VSS footage as part of incident self-investigation. Selected clips can be used to train workers on safe versus unsafe practices.

2.4 Other operational considerations

Companies will need to establish a set of procedures for the effective use and security of the VSS.

Some key operational considerations are highlighted below:

2.4.1 Lighting

Lighting should be provided for the areas covered by VSS cameras. Adequate lighting not only allows work activities to be carried out safely, but it also ensures quality video can be captured.

2.4.2 Tamper protection

Select VSS cameras with vandal-resistant and tamper-proof enclosures. Mounting VSS cameras at higher locations not only provides better vantage for monitoring of work activities but also makes the cameras more difficult to tamper with.

Any camera found damaged should be replaced as soon as possible so that coverage of the ongoing works is not disrupted.

2.4.3 Signages

Sufficient signages should be put up to inform all persons at the workplace of the VSS monitoring. Signages may be strategically placed at prominent locations and points of entry to the workplace to inform that a VSS is in operation.

Storage and use of footage captured by VSS systems may be subjected to Personal Data Protection Act (PDPA). For further information, you can refer to the *Guide to Notification* published by Personal Data Privacy Commission of Singapore.

2.4.4 Training

Send VSS operators for training on how to operate the VSS, what to look out for, and how to respond when a near miss or WSH incident occurs.

Set up VSS Standard Operating Procedures (SOPs) and conduct refreshers to ensure that VSS operators are familiar with the SOPs.

2.4.5 Cyber security

Workplace occupiers, principals and employers should consider engaging the services of a cybersecurity specialist to understand the potential cybersecurity risks and measures that can be put in place to prevent unauthorised access, interference, or remote disabling of the VSS.

For more information, refer to Infocomm Media Development Authority's (IMDA's) Internet of Things (IoT) Cyber Security Guide. For internet enabled VSS, refer to the General Cybersecurity Guidelines for Internet Protocol (IP) Video Surveillance Systems in Annex B of Singapore Police Force's (SPF's) Video Surveillance System Standard for Buildings for recommendations on how a VSS may be safeguarded.

2.5 System maintenance

Maintenance is necessary to ensure that the VSS remains operational with minimal downtime. Preventive maintenance (e.g. checking and cleaning of the camera lens, replacement of mechanical parts showing signs of wear and tear) can help prevent sudden equipment failure and prolong the lifespan of the equipment. Regular and proper maintenance, therefore, helps to keep the VSS running smoothly, reduce servicing and repair costs, and protect your investment.

Reactive (breakdown) maintenance is also necessary in the event of a component fault. Specific camera, system or software faults should be rectified within a reasonable time frame such that VSS downtime is minimised.

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3. Examples of VSS Installation

This section provides visual examples of how and where VSS cameras may be installed along with video stills of work areas that can be monitored.

3.1 Examples of camera type and mounting location



Figure 2: Dome camera mounted on an indoor ceiling



Figure 3: Bullet camera mounted on an exterior wall



Figure 4: Bullet camera mounted on a specially erected support at a site under construction

3.2 Examples of areas monitored

Based on work activity:



Figure 5: Working at height activity



Figure 6: Working near the construction of support structure

Based on location:



Figure 7: At a floor of a building under construction

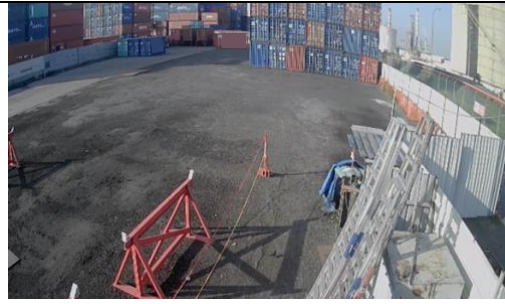


Figure 8: Loading/ unloading area

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References

- Workplace Safety and Health Act
- WSH (General Provisions) Regulations
- WSH (Risk Management) Regulations
- WSH (Approved Codes of Practice) Notification 2022
- Personal Data Protection Act
- Approved Code of Practice on WSH Risk Management
- Approved Code of Practice for Working Safely at Heights
- Approved Code of Practice on Safe Lifting Operations in the Workplaces
- WSH 2028 Strategy Booklet
- Start Guide for Small and Medium-sized Enterprises (SMEs)
- IMDA's Internet of Things (IoT) Cyber Security Guide
- PDPC's Guide to Notification
- SPF's Video Surveillance System Standard for Buildings
- WSH Guidelines published by WSH Council
- WSH Council's Case Studies on Accidents Involving Working at Heights
- WSH Council's Case Studies for Construction Industry

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Abbreviations Used

IMDA	Infocomm Media Development Authority
IoT	Internet of Things
IP	Internet Protocol
PDPA	Personal Data Protection Act
RA	Risk Assessment
SOP	Standard Operating Procedure
SPF	Singapore Police Force
UPS	Uninterruptible Power Supply
VMS	Video Management System
VSS	Video Surveillance System
WSH	Workplace Safety and Health

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Annex A: Summary of VSS Recommendations

	VSS Recommendation
Basic Camera Specifications	
1. Camera type	Dome, bullet or suitable alternative
2. Video resolution	Minimum resolution: 1080p Higher resolution recommended
3. Pan, tilt and/ or zoom function	Optional
4. Cameras with Artificial Intelligence (AI)	Optional
5. Video analytics capability	Optional
4. Night vision capability	Optional
5. Weather-proof	Recommended
6. Dust-proof	Recommended
7. Portability	Fixed or portable
Area Coverage Recommendations	
See Annex B for a sample checklist of activities and locations to be covered	
8. Cameras switched on and recording so long as there is work activity	Necessary
9. Camera has clear line of sight to the work activity	Necessary
10. Mounted at high vantage point	Recommended
11. Neighbouring premises not recorded	Recommended
VSS Power Supply	
12. Power source	Power line or battery pack
13. Backup power	Recommended
Transmission and Storage	
14. Storage medium	Local storage device (e.g. SD card), network-based drive or cloud-based solution
15. Transmission mode	Optional (via wired or wireless transmission)
16. Storage capacity	30 days of recorded footage (if no WSH incident)
17. Archival capacity	180 days from the date of WSH incident
18. Video recordings to have camera identification, location/ area of recording, and date/ time stamp.	Necessary
19. Date and time for all cameras to be synchronised from a single source	Necessary
20. Able to export video footage to external storage devices	Necessary
Viewing and Access	
21. VMS software that allows video files to be easily managed and viewed	Recommended
22. Real-time monitoring capability	Necessary
23. Able to retrieve recorded footage for any date and time interval	Necessary
Other Operational Considerations	
24. Adequate lighting for areas covered	Necessary

25. Tamper-proof	Recommended
Other Operational Considerations	
26. Signages put up to inform a VSS is in operation	Necessary
27. VSS operator(s) completed the necessary training	Necessary
28. Set up VSS Standard Operating Procedures	Necessary
29. Cyber security measures in place	Necessary
System Maintenance	
30. Preventive maintenance regime	Necessary
31. Breakdown maintenance plan	Necessary

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Annex B: Sample checklist of activities and locations to be covered by VSS Monitoring

Determine the higher-risk work activities/ locations for your workplace based on Risk Assessment.

Below is a sample checklist for construction sites:

Higher-risk work activities at a construction site		VSS Monitored? (Y / N)
1	Working at height activities where a worker may fall a distance ≥ 2 metres	
2	Working near the construction of support structures and scaffolds	
3	Working near excavation and shoring works	
4	Working near lifting operations	
5	Working in any confined space where VSS deployment does not pose a hazard	
	{to insert additional higher-risk activities taking place at your site}	

Higher-risk locations at a construction site		VSS Monitored? (Y / N)
1	At every floor of a building under construction where works are in progress	
2	At worksites where heavy/ industrial machinery or equipment are in use	
3	Areas with high vehicular and human traffic	
4	Loading/ unloading areas	
	{to insert additional higher-risk locations at your site}	

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