ACTIVE VEHICLE SECURITY BARRIERS

CONTROL PANEL DESIGN

An active Vehicle Security Barrier (VSB) system is a vital part of a Vehicle Access Control Point (VACP), the design of which should be based on a thorough Operational Requirement (OR) assessment undertaken by the site owner or operator. The ability for guard-forces to react appropriately to vehicle-borne security threats and provide safe access will be affected by the design of the controls provided to operate an active VSB.

Poor design of these controls could lead to accidental misuse by the operator, resulting in the compromise of site security and/or the safety of VACP users.

It is recommended that the specification and design of active VSB controls be included as part of the OR process prior to implementation and commissioning.

This document focuses on the design aspects of VSB controls; it does <u>NOT</u> include guidance on management or training.

Active VSB systems

An active VSB system, such as a retractable road blocker or sliding gate, is moved to provide vehicle access through a secure perimeter. This movement is often initiated by a dedicated guard-force operating the VSB system via an associated control panel. The controls may be placed on or near the associated VSB, but could be a remote physical control panel or a computer based system.

Figure 1: A typical VACP including active VSBs (left); control panel for an active VSB (right).

Design principles

Placement

The user should have direct line of sight from the control position to the VSB being operated. If this is not possible the operator should be provided with oversight of the VSB via CCTV.

Ease of use

Controls should be easily accessible, clearly labelled, logical, relate to the physical environment/equipment under control, and be optimised to facilitate both frequent tasks and the expedient response in the event of a security threat.

Consistency

Applying a consistent layout to VSB controls, especially for users that operate across multiple locations or where a large site includes a number of the same or similar VSB systems, will improve clarity and user confidence when adjusting to managing multiple locations.

Visibility

The most important control systems should be placed in clear view. Avoid the potential for controls or monitors to be obscured, including consideration to glare or reflections.

Control mapping

Movement of controls that match the movement of the associated VSB will help user understanding and relate the operation of controls to actual VSB movement; for example, using a sliding switch to control the movement of a sliding gate.

Spacing

Controls for a specific VSB should be grouped together but spaced for clarity and to avoid accidental activation. Advice for suitable spacing, based on control size and mode of operation, is typically provided in literature covering ergonomic design principles.

Labels

Labelling is the minimum coding requirement for any control, with labels being located above the control button, <u>NOT</u> below. Consider whether text or symbols should be used and avoid using ambiguous descriptors (e.g. "raise", "lower"). Labels must use clear and consistent phrases, such as "OPEN" and "CLOSE".

Colour

Use meaningful colours to help the user to quickly identify and initiate a control (e.g. red colouring for emergency controls).

Shape and Size

Use of symbolic shapes will help to distinguish individual controls and can also be used to clarify associated VSB actions. Using different size buttons will also help to differentiate between controls. Emergency controls should be larger to help identify them from standard controls.

Control room example

The image below shows an example of a typical VSB system control room, indicating the **GOOD** and **POOR** aspects of its design.
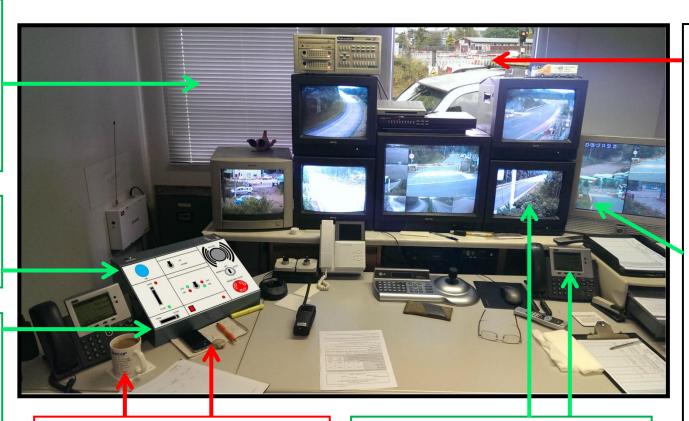
ENVIRONMENTAL CONDITIONS
Ensure that factors such as glare, dust, moisture, temperature and background noise are considered as these can affect visibility and usability of controls.

INTEGRATION
A VSB control panel should be clearly identifiable and separate from other controls.

GEOGRAPHICAL MAPPING
VSB controls should replicate the physical layout of the VACP. The user can be provided with supplementary information such as a labelled diagram of the VACP including the position of all active VSB systems controlled from that location.

CLUTTER
Controls should not be placed in an environment that may subject the user to distraction. Visual and physical clutter in the surrounding environment (e.g. mobile phones, stationary and beverages) should be avoided.

LINE OF SIGHT
Wherever possible the user should have direct line of sight to the VSB being operated. Here the view is partially obscured by a parked car and video monitors; the window frame is also restrictive.

If this is not possible the operator should be provided with oversight of the VSB via CCTV.

Ensure that the video monitor is clearly visible and the camera view outside the control room is kept clear of obstruction.

VISIBILITY
Avoid obscuring or obstructing controls as this could cause delays to security response. CCTV monitors, phones or other control systems should be placed clear of VSB controls.
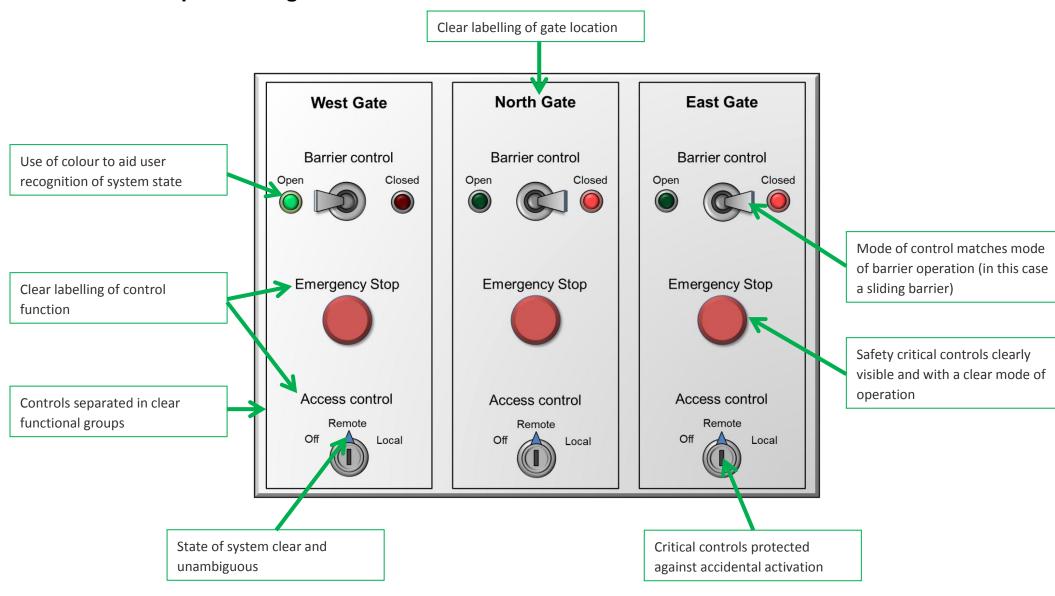
Good control panel design
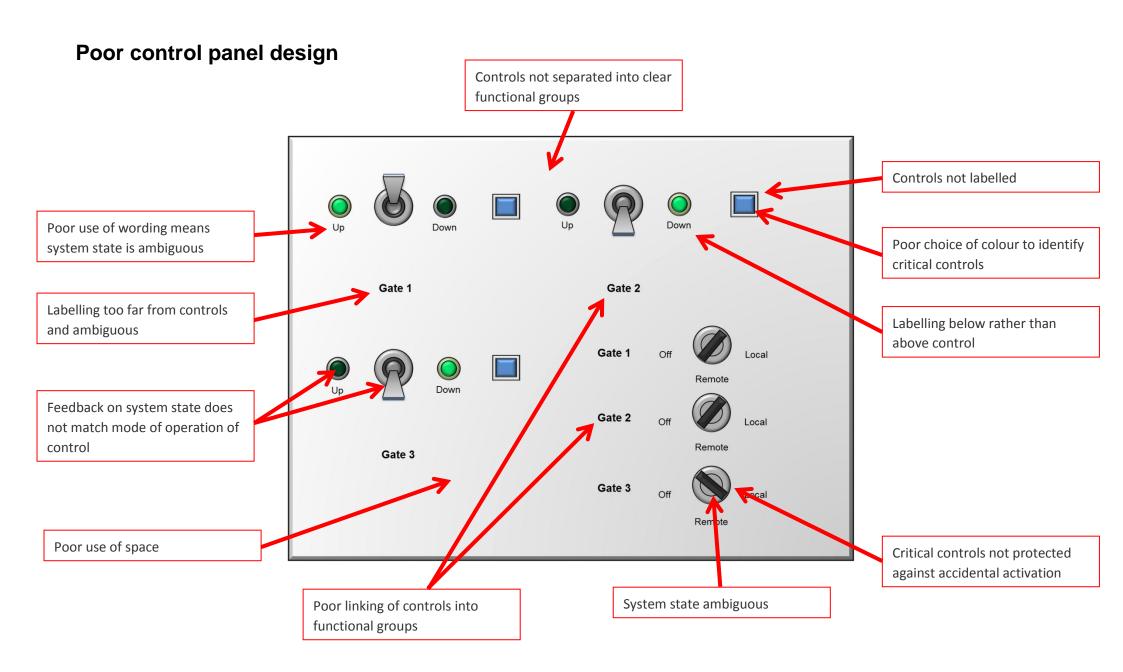
Clear labelling of gate location

Use of colour to aid user recognition of system state

Clear labelling of control function

Controls separated in clear functional groups

West Gate

Barrier control

Open   Closed

Emergency Stop

Access control

Remote
Off   Local

North Gate

Barrier control

Open   Closed

Emergency Stop

Access control

Remote
Off   Local

East Gate

Barrier control

Open   Closed

Emergency Stop

Access control

Remote
Off   Local

Mode of control matches mode of barrier operation (in this case a sliding barrier)

Safety critical controls clearly visible and with a clear mode of operation

State of system clear and unambiguous

Critical controls protected against accidental activation

Poor control panel design

Controls not separated into clear functional groups

Controls not labelled

Poor choice of colour to identify critical controls

Poor use of wording means system state is ambiguous

Up

Down

Up

Down

Gate 1

Gate 2

Labelling too far from controls and ambiguous

Labelling below rather than above control

Gate 1   Off   Local
          Remote

Up

Down

Gate 2   Off   Local
          Remote

Feedback on system state does not match mode of operation of control

Gate 3

Gate 3   Off   Local
          Remote

Poor use of space

Critical controls not protected against accidental activation

Poor linking of controls into functional groups

System state ambiguous

VSB controls design process

Designers of the controls for active VSB systems should follow a product design methodology to ensure that the VSB system is fit for purpose. Stages within a design methodology include:

(1) Operational requirement	This requires the designer to engage with the user to understand who will use the system, what they will require the system to do, what is important to them in terms of its functionality, and the context in which its use will occur. Practitioners should enlist the views of their guard-force operators to better understand the practicalities of controlling an active VSB system in accordance with site-specific security protocols. This should increase guard-force motivation, improve buy-in to the deployment of new equipment and highlight where security protocols and procedures could need updating.
(2) Specification	Translate the needs defined in (1) into a system specification e.g. clear width of opening, minimum opening speed, etc.
(3) Concept design	Bring together (1) and (2) into initial designs. Involve the end user to ensure their requirements are met. Developing more than one concept that meets the criteria for (1) and (2) can be useful. Use of physical mock-ups can help users to understand concepts. The concepts could be whole VSB control systems or individual parts designed to test new ideas.
(4) Prototype development	A prototype should be a usable version of the VSB system controls containing aspects of the concepts developed in (3) that meet the user requirements and are deemed necessary for the final product. This could be a working physical model or a computer simulation. The end user should give feedback and any fundamental issues with the design should become apparent at this stage. It may be necessary to repeat this development stage to resolve undesirable design issues.
(5) Testing	User Acceptance Testing (UAT) should be carried out once the previous stages have enabled a representative final design to be produced. End-users should be given scenarios under which to test the design (e.g. normal use or emergency closure) and their feedback taken on-board. Aspects of the design receiving negative feedback should be re-visited by repeating stages (4) and (5) until consistent positive feedback is gathered.
(6) Review	For a period after installation users' feedback should be gathered and usage of the system monitored for issues arising. This feedback should have no repercussions on the users. The feedback should highlight specific design or operational issues to be addressed and may require further design and development work to rectify.

Further guidance

IWA 14-2:2013 Vehicle security barriers – Part 2: Application. ISO (2013);

PAS 69:2013 Guidance for the selection, installation and use of vehicle security barriers. BSI (2013);

CWA 16221: Vehicle security barriers. Performance requirements, test methods and guidance on application. CEN (2010);

Guide to producing operational requirements for security measures. CPNI (2013);

Level 2 OR for HVM. CPNI (2010);

Vehicle security barrier scoping document. CPNI (2010);

Human Factors in Engineering and Design, seventh edition. Mark S. Sanders and Ernest J.McCormick, ISBN 0-07-054901-X;

Retractable VSBs – Maintaining road surface friction. CPNI.

More information can be found via the following websites:

Site safety: www.hse.gov.uk/workplacetransport/sitelayout

Contact us

Enquiries: www.cpni.gov.uk/contact-us

Website: www.cpni.gov.uk