Raising the Standard
Introduction to BS 5839-1:2013

An Overview of the BS 5839 –1:2013 for professionals who are responsible for the provision of fire detection and alarm systems for buildings
Agenda

Introduction to the 2013 Standard

- Section 1 - general
- Section 2 - design considerations
- Section 3 - limitation of false alarms
- Section 4 & 5 - installation & commissioning/handover
- Section 6 & 7 - maintenance & user’s responsibilities
  - Annexes
  - List of figures
  - List of tables

Third party accreditation QA schemes

- summary

Publication history
First published as CP 327.404/492.501, September 1951
First revision as CP 1019, May 1972
Second revision as BS 5839-1 January 1980
Third revision May 1988
Fourth revision October 2002
Fifth revision March 2013
Introduction – why change?

Principal changes resulted from:

- Rose Park Care Home fire findings
- BRE High ceiling detection research project
- Updated references and legislation

Principal changes include:

- Terminology “responsible person” changed
- Zone plan requirements – absence is a non conformance
- Agreed variations recorded in log books for future reference
- Automatic Transmissions and Part 23 visual alarm devices (VAD’s)
- Width and ceiling heights covered by optical beam detectors and ASD
- Routine servicing of a fire detection system is not a review of the design
Introduction - Structure

- Section One - General
- Section Two - Design Considerations
- Section Three - Limitation of False Alarms
- Section Four - Installation
- Section Five - Commissioning and Handover
- Section Six - Maintenance
- Section Seven - User Responsibilities
Section 1 - General

1. Scope
2. Normative references
3. Terms & definitions
4. Need for a fire detection and fire alarm system and type of systems
5. Categories of system
6. Exchange of information and definition of responsibilities
7. Variations from the recommendations of this standard
System Categories

- ‘Category’ not ‘Type’
- Clarification of L3 category (2002 revision)
- New categories L4 & L5 (2002 revision)
- Annex to assist correct choice
- Responsibility for choice with Purchaser or Designer
- Design certificate must state category
Designers guide to level of protection

- M = Manual call points only
- L3 = Escape Routes + Rooms Adjacent
- L5 = Engineered Solution
- L2 = L3 + High Risk Areas
- L4 = Escape Routes
- L1 = Throughout the building
Section 1 - General

1. Scope
2. Normative references
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5. Categories of system
6. Exchange of information and definition of responsibilities
7. Variations from the recommendations of this standard
Variations

• Recognises engineering, application practicalities

• Takes into account separate risk

• Variations can arise from the risk assessment

• Agreed variations must now be recorded in the Log book

Note: Neither the Installer or Commissioning Engineer are expected to take responsibility for the design or verification of the system
Section 2 – Design Consideration

- Largest section - key points only
- Full training available from Gent or Fire Industry Association (FIA)

BE AWARE

- Responsibility of Designer to ‘sign off’ design
- A Designer can be a recognised ‘expert’ under the BAFE accreditation scheme
### Design considerations - sub sections

**Categories**
- Actuation of other fire protection systems
- Explosive atmospheres
- System components
- Monitoring - Integrity

**System components**
- Detection zones
- Alarm zones
- Fire station links
- Audible alarms
- Visual alarms

**Alarms for deaf**
- Staged alarms
- Manual call points
- Detectors
- Control equipment
- Networked systems
- Power supplies
- Cable & wiring
- Radio systems
- EMC
- Electrical safety
Detection Zones

- Floor area < 300m² - treat as one zone
- Floor area > 300m² - zone restricted to one floor
- Voids in same fire compartment are treated as same zone
- Maximum floor area of a zone is 2000m² (except for open areas with manual call points only, these can be extended to 10,000m²)
- Search distance increased from 30m to 60m (under certain circumstances)
**Detection Zones**

- Manual call points located on landings should be included within floor zone

- Detectors however, would be treated as a separate zone
**Alarm Zones**

- **Categories**
  - Actuation of other fire protection systems
  - Explosive atmospheres
  - System components
  - Monitoring - Integrity
  - Detection zones

- **Alarm zones**
  - Alarms for deaf
  - Staged alarms
  - Manual call points
  - Detectors
  - Control equipment
  - Networked systems
  - Power supplies
  - Cable & wiring
  - Radio systems
  - EMC
  - Electrical safety
**Alarm Zones**

- Used for phased evacuation
- Boundaries must be fire resistant
- May include more than one detector zone but detector zone should not cover more than one alarm zone

<table>
<thead>
<tr>
<th>Alarm Zone 1</th>
<th>Alarm Zone 2</th>
<th>Alarm Zone 3</th>
<th>Alarm Zone 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection Zone 3</td>
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<td>Detection Zone 11</td>
</tr>
<tr>
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<td>Detection Zone 4</td>
<td>Detection Zone 7</td>
<td>Detection Zone 10</td>
</tr>
</tbody>
</table>

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*Image and text from Honeywell.*
Design considerations - sub sections

- Categories
- Actuation of other fire protection systems
- Explosive atmospheres

- Components
- Monitoring ~ Integrity
- Detection zones
- Alarm zones
- Fire station links

- Audible alarms
- Visual alarms

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- Radio systems
- EMC
- Electrical safety
Audible Alarms

- 65 dB(A) or 5 dB(A) above ambient noise levels
- 60 dB(A) acceptable in certain situations
- 75 dB(A) to wake sleeping persons
- Maximum 120 dB(A)
- Frequency between 500 & 1000 hz
- One sounder in each fire compartment
- Common tone throughout building
Audible Alarms

Figures are minimum levels in decibels - dB(A)

Enclosure of less than 60 square metres minimum of 60dB(A)

Areas of less than one square metre of habitable space.
No minimum

Specific point of limited extent may be 60dB(A)

Shaded area 500mm from boundary.
No measurements needed.
Design considerations - sub sections

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Visual Alarms

- Ambient noise level exceeds 90 dB(A)
- Persons with impaired hearing
- Flash rate 30 - 130 per minute
- Red or white in colour
- Sufficient intensity
- Minimum mounting height 2.1m
EN54 Part 23 – Visual Alarm Devices

Purpose:

• Standardisation of test methods, output performance and specification
  - Visual alarm devices should conform to BS EN 54-23

Effective:

• Came into force on 1st January 2014

Compliance:

• Minimum illumination of 0.4 lux over the entire area of coverage
• Stated coverage volume
• Standardised measurement

• Annex F
  - VAD illumination characteristics

Applicable where a strobe is the PRIMARY means of evacuation
## Lux Light Level Chart

<table>
<thead>
<tr>
<th>LUX</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>50,000</td>
<td>British summer sunshine</td>
</tr>
<tr>
<td>5,000</td>
<td>Overcast sky</td>
</tr>
<tr>
<td>500</td>
<td>Well-lit office</td>
</tr>
<tr>
<td>300</td>
<td>Minimum for easy reading</td>
</tr>
<tr>
<td>50</td>
<td>Passageway/outside working area</td>
</tr>
<tr>
<td>15</td>
<td>Good main road lighting</td>
</tr>
<tr>
<td>10</td>
<td>Sunset</td>
</tr>
<tr>
<td>5</td>
<td>Typical side road lighting</td>
</tr>
<tr>
<td>2</td>
<td>Minimum security risk lighting</td>
</tr>
<tr>
<td>1</td>
<td>Twilight</td>
</tr>
<tr>
<td>0.3</td>
<td>Clear full moon</td>
</tr>
<tr>
<td>0.1</td>
<td>Typical moonlight/cloudy sky</td>
</tr>
<tr>
<td>0.001</td>
<td>Typical starlight</td>
</tr>
<tr>
<td>0.0001</td>
<td>Poor starlight</td>
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</table>
EN54 Part 23 - Classes

VADs will be classified based on their intended application:

- Ceiling (C)
- Wall (W)
- Open (O)

- Ceiling and Wall devices have an installation height and area coverage defined by the standard

- Open Class
  - the coverage volume is specified by the manufacturer and approved by the third party agency
Example of Wall Mounted Coverage Measurement

Example: W-2.4-8 denotes a wall mounted device that may be mounted at 2.4 m from the floor and is good for a volume of 2.4 m x 8 m x 8 m.

W-x-y : Wall device

- W : Wall
- x : Maximum height in metres that the device can be mounted on the wall. The minimum allowable height is 2.4 m.
- y : The width of a square room within which the product is deemed to comply.
- W x y : Wall device
Example of Wall Mounted Coverage Measurement

Ym (e.g. 8m)
Example of Ceiling Mounted Coverage Measurement

• C-x-y : Ceiling device

  • C : Ceiling

  • x : 3, 6 or 9 and represents the maximum height in metres that the product may be mounted.

  • y : The diameter in metres of a cylinder within which the product is deemed to comply

• Example: C-6-6 denotes a ceiling device that is good for a 6m coverage cylinder when mounted at a height no more than 6m from the ground
Example of Ceiling Mounted Coverage Measurement

$X_m$ (e.g. 6m)

$Y_m$ (e.g. 6m)
O Class Device

Category “O” for VADs

The coverage volume of which is fully specified by the manufacturer including:

- The recommended mounting position for the device
- Any specific requirement for mounting the device in a particular orientation, and how this orientation can be identified on the device
- Any restrictions on the minimum and maximum allowable mounted height
- The shape of the coverage volume in which the required illumination of 0.4 lux is achieved, its dimensions and how it is geometrically related to the device
Key Drivers

The risk assessment

Fire safety legislation

Evacuation strategy

Typically:

- Public areas
- Toilets
- Equalities Act requirements
- Areas of high ambient noise
- Broadcasting studios and operating theatres

Ensuring no-one is left behind
## Design considerations - sub sections

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Alarms - People with impaired hearing

- Fixed devices - Visual Alarms
- Tactile moveable devices - Vibrating Pads
- Portable devices - Pagers or Radio Equipment
- Operating period of 5 to 60 seconds
- Repeated with 10 second intervals until reset
- Fault monitored
Staged Alarms

- Prior agreement between all parties

Staff Alarms
- Staff need to be available at all times
- Normally respond to detectors not call points
- Maximum 6 minute for investigation

Alert
- Intermittent 1 second on 1 second off
- Synchronised sounders to prevent confusion
Design considerations - sub sections

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  - Radio systems
  - EMC
  - Electrical safety
Manual call points

- Maximum 3 second delay to operate local alarm (*differs from EN54: Part 2*)

- Travel distance to manual call point - 45m

- Travel distance for unknown layouts – 30m or 25m and 16m for high risks

- Mounting height 1.4m (minor difference/-300mm allowed)
Design considerations - sub sections

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Types of Detector

• Heat
  • Point or line detectors – BSEN54-5

• Smoke
  • Point detectors: Optical, Ionisation or CO gas
  • Beam & Aspiration detection

• Other types
  • Multi-sensor using combined techniques
  • Flame detectors: Infrared & Ultraviolet
  • Video smoke detection
### Choice of Detector

**Considerations**

- Speed of response
- Need to minimise false alarms
- Nature of hazard
- Cost
- Suitability for the environment
- Maintenance
Ceiling height limits & width regarding ASD and Beam detection

18.75 m width covered by one optical beam detector within 600 mm vertically of the apex, using the extra coverage of 25% given by the roof angle of 25 degrees.

Detector Type | Column 1 General applicable maximum mounting height (m) | Column 2 Max ceiling height for 10% of ceiling area (m)
--- | --- | ---
Heat detectors (BS EN 54-5) | | |
Class A1 | 9.0 | 10.5 |
Other Classes | 7.5 | 10.5 |
Point smoke detectors (BS EN 54-7) | 10.5 | 12.5 |
Carbon monoxide detectors (BS EN 54-26) | 10.5 | 12.5 |
Optical beam smoke detectors (BS EN 54-12) | | |
Normal sensitivity | 25.0 | 28.0 |
Enhanced sensitivity (alarm at 35% attenuation or less) | 40.0 (see Note 1) | 43.0 (see Note 1) |
Aspirating smoke detection systems (BS EN 54-20) | | |
General limit | 10.5 | 12.5 |
Class C with at least 5 holes | 15.0 | 18.0 |
Class C with at least 15 holes | 25.0 | 28.0 |
Class B with at least 15 holes | 40.0 (see Note 2) | 43.0 (see Note 2) |
Other fire detectors | As specified by the manufacturer | |

NOTE 1 The use of supplemental detection is recommended [see 22.5d] unless the risk (i.e. probability x consequence) of stratification is minimal.

NOTE 2 The use of multilevel sampling is recommended [see 22.7c] unless the (i.e. probability x consequence) of stratification is minimal.
Choice and siting of detectors

- See section 21 for more specific advice on choice of detector

- See Section 22 for spacing and siting of detectors.

- Alternatively - Attend training with FIA or Gent CPD seminar entitled “Watching the Detector”
### Design considerations - sub sections

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Cables and wiring

• Fire resistant - all cables including mains

• Two classification of cable
  - standard
  - enhanced
Covered by BS8434-1 & BS8434-2

• Enhanced cables used on higher risk applications e.g. no sprinklers, phased evacuation or network sites
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### Components

- Networked systems
- Power supplies
- Cable & wiring
- Radio systems
- EMC
- Electrical safety
Design certificate

- Designer would prepare specification, drawings and fire plan, after consulting all interested parties

- Designer signs certificate to confirm:
  - System conformity
  - Category
  - Variations
  - Areas covered
Section 3 – Limitation of false alarms

• Objective - reduce unwanted alarms

• Provides definitions

• Provides measures to limit false alarms

• Criteria for further investigation

• Process of corrective action
Categories of false alarms

- Malicious false alarms
- False alarms with good intent
- Equipment false alarms
- Unwanted alarms

When false alarms are recorded by the user, the category of false alarm (if known) should also be recorded. Where any doubt exists, the cause should be recorded as “unknown.”
Responsibility for limiting false alarms

- Designer - consider and include detail on design certificate

- Installer - inform designer of any false alarm issue

- Commission Engineer - check any potential cause

- Service Provider - check false alarm level at each service visit and report to user

- User - record incidents and take corrective action
  1) date and time
  2) identity and location of device (if known)
  3) category of false alarm (if known)
  4) reason for false alarm (if known)
  5) activity in the area (if the reason for the false alarm is unknown)
  6) action taken
  7) the person responsible for recording the information
Acceptable rate of false Alarms

• More than 1 false alarm per 20 detectors in a rolling 12 month period for systems with more than 40 detectors

• More than 2 false alarms in a rolling 12 month period for systems with less than 40 detectors

• Your service provider should carry out these checks during the maintenance visits

The user has a duty to mitigate all instances of false alarm
Section 4 - Installation

- Defines responsibilities of the installer
- Installation practices and workmanship follow those laid out in BS 7671
- Testing and wiring
- Generally NOT responsible for system design or verification
- IS responsible for ensuring all components are installed in accordance with the code
- Identify and agree any variations with the Designer

Note; the Installer DOES NOT sign off or verify the design
Installation Certificate

- Installer signs certificate to confirm:
  - Extent of work
  - Specification used
  - Variations
  - Wiring tested

Note; the Installer DOES NOT sign off or verify the Design
Section 5 – Commissioning & Handover

• Identifies level of competence required

• Defines responsibilities:
  • Verify functions & siting of system components
  • Check sound pressure levels
  • Check power supplies are adequate
  • Check any remote connections
  • Ensure radio based equipment is operational
  • Check “Fire Plan” or “Cause & Effect Matrix”
  • Ensure documentation and records are complete
  • Record any variations in the log book—New Requirement
Commissioning Certificate

- Engineers signs certificate covering:
  - Extent of system
  - Variations
  - Equipment tested
  - Installation & performance
  - Documentation

Note; the Commissioning engineer DOES NOT sign off or verify the design
Documentation

- Certificates for design, installation & commissioning
- Cable & insulation test records
- Installers ‘as fitted’ drawings
- Zonal Diagram (Non conformance)
- All product manuals
- Major non-compliances and variations should be clearly recorded in the logbook
- Fire Plan, specification & drawings and list of agreed variations
Certification

- Three separate certificates are provided identifying the organisation and individual responsible for parts of the process.
- Ensure User formally accepts the system and a 4th certificate is completed.
Section 6 - Maintenance

• Routine testing
  - Weekly & monthly tests by the user

• Inspection & servicing
  - Periodic Inspection every six months
    (Subject to Risk Assessment)

• Non-routine attention
  - Repairs
  - Modifications
  - False alarms
  - Actions following a fire

WARNING
If these checks are not carried out, the System is considered non compliant to BS 5839-1: 2013
Inspection & Servicing

- Check log book is maintained
- Visual inspection of structural or occupancy changes
- Routine servicing of a fire detection and fire alarm system does not constitute a fresh review of system design
- Control and indicating equipment functions
- Inspection & testing over a 12 month period
  - Every manual call point
  - Detectors for damage and acceptability of smoke
  - Functional test of automatic detection devices
- Check Fire Plan or Cause & Effect Matrix
  - Verify standby power supply capacity
Servicing & Modification Certificate

- To be completed by the Service provider’s representative
- Completed on each visit
- Should be kept with Logbook
- Signed by Service provider’s representative
Section 7 – Users Responsibilities

• Defines responsibilities of End User

• Appoint a responsible person to:
  - Check system is operating on a daily basis
  - Ensure testing and maintenance
  - Maintain records
  - All occupants are aware of what to do
  - Spares are available on site
  - Changes to building are taken into account

• Weekly
  - Test a different manual call point on a rotation basis
Verification Certificate (optional)

- Objective - ensure system complies with design specification and any changes to the building have been taken into account

- This process can be undertaken by any parties involved or a third party, as long as the individual has proven competency such as BAFE accreditation
Third Party Accreditation

- LPS 1014
  - Covers all disciplines
  - Suited to larger ‘turn key’ projects

- BAFE
  - Modular
  - Separate assessment for Designers, Installers, Commissioning and Service engineers
Competent Person & How do you Prove

Competency how do we measure or recognise it?
Why Third Party Certificated schemes

Third party certification schemes for fire protection products and related services are an effective means of providing the fullest possible assurances, offering a level of quality, reliability and safety that non-certificated products may lack. This does not mean goods and services that are not third party approved are less reliable, but there is no obvious way in which this can be demonstrated. Third party quality assurance can provide confidence, both as a means of satisfying you that the goods and services you have purchased are fit for purpose, and as a means of demonstrating that you have complied with the law.
Summary

- Introduction to BS 5839-1: 2013
  - Section 1 - general
  - Section 2 - design considerations
  - Section 3 - false alarms & how we can improve
  - Sections 4 & 5 - installation & commissioning
  - Sections 6 & 7 - maintenance & user responsibilities

- Principal changes to this edition of the standard

- Third party accreditation QA schemes

- Make sure you take a copy of Design Guide
  or request / download a copy from:

  www.gent.co.uk
Any Questions?