# IEC 61340-6-1

Edition 1.0 2018-09

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

## Electrostatics –
## Part 6-1: Electrostatic control for healthcare – General requirements for facilities

## Électrostatique –
## Partie 6-1: Contrôle électrostatique dans le domaine de la santé – Exigences générales relatives aux établissements

IEC 61340-6-1:2018-09(en-fr)

Documents
Document Sharing Hub
Full document details: IEC 61340-6-1 2018

**THIS PUBLICATION IS COPYRIGHT PROTECTED**
**Copyright © 2018 IEC, Geneva, Switzerland**

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

**About the IEC**
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

**About IEC publications**
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

**IEC Catalogue - webstore.iec.ch/catalogue**
The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

**IEC publications search - webstore.iec.ch/advsearchform**
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, replaced and withdrawn publications.

**IEC Just Published - webstore.iec.ch/justpublished**
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

**Electropedia - www.electropedia.org**
The world's leading online dictionary of electronic and electrical terms containing 21 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

**IEC Glossary - std.iec.ch/glossary**
67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

**IEC Customer Service Centre - webstore.iec.ch/csc**
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

---

**A propos de l'IEC**
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

**A propos des publications IEC**
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

**Catalogue IEC - webstore.iec.ch/catalogue**
Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

**Recherche de publications IEC - webstore.iec.ch/advsearchform**

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,…). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

**IEC Just Published - webstore.iec.ch/justpublished**

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

**Electropedia - www.electropedia.org**

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 21 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

**Glossaire IEC - std.iec.ch/glossary**
67 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

**Service Clients - webstore.iec.ch/csc**

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

Documents
Document Sharing Hub

Full document details: IEC 61340-6-1 2018

# IEC 61340-6-1

Edition 1.0 2018-09

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

## Electrostatics –
## Part 6-1: Electrostatic control for healthcare – General requirements for facilities

## Électrostatique –
## Partie 6-1: Contrôle électrostatique dans le domaine de la santé – Exigences générales relatives aux établissements

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 11.020.99; 17.220.99; 29.020

ISBN 978-2-8322-6036-4

**Warning! Make sure that you obtained this publication from an authorized distributor.**
**Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

® Registered trademark of the International Electrotechnical Commission
Marque déposée de la Commission Electrotechnique Internationale

Documents
Document Sharing Hub

Full document details: IEC 61340-6-1 2018

CONTENTS

FOREWORD ..... 3
INTRODUCTION ..... 5
1 Scope ..... 6
2 Normative references ..... 6
3 Terms and definitions ..... 7
4 Electrostatic hazards ..... 8
4.1 General ..... 8
4.2 ESD effects on equipment ..... 9
4.3 Contamination caused by ESA ..... 9
4.4 Ignition of flammable substances ..... 10
4.5 Electrostatic shock to people ..... 10
5 Electrostatic control requirements ..... 10
5.1 General ..... 10
5.2 Medical procedures ..... 10
5.3 Medical locations ..... 10
5.3.1 Classification by groups ..... 10
5.3.2 Unclassified rooms ..... 11
5.3.3 Group 0 – Electrostatic control recommended ..... 11
5.3.4 Group 1 – Electrostatic control recommended ..... 11
5.3.5 Group 2 – Electrostatic control required ..... 11
5.4 Service and maintenance ..... 12
5.5 Administrative requirements and recommendations ..... 12
5.5.1 Designing facilities ..... 12
5.5.2 Operational responsibility ..... 12
5.5.3 Qualification and verification ..... 12
5.6 Technical requirements ..... 12
5.6.1 Electrical safety ..... 12
5.6.2 Material classification ..... 12
5.6.3 Selection of materials for static control ..... 14
5.7 Packaging, containers and other control items ..... 16
Annex A (normative) Test methods for low charging textiles ..... 17
A.1 Test methods for clothing and upholstery ..... 17
A.2 Test methods for bedding, curtains, and surgical drapes ..... 17
Annex B (informative) Ionization and other considerations ..... 21
Bibliography ..... 22

Figure A.1 – Example of test equipment set up for measuring body voltage when removing item of bedding or surgical drape from person wearing reference clothing ..... 18
Figure A.2 – Example of test equipment set up for measuring body voltage when removing item of bedding or surgical drape from bed or examination/operating table ..... 19
Figure A.3 – Example of test equipment set up for measuring body voltage on two people when removing item of bedding or surgical drape ..... 20

Table 1 – Summary of electrostatic control methods for specified locations ..... 11

Documents
Document Sharing Hub
Full document details: IEC 61340-6-1 2018

INTERNATIONAL ELECTROTECHNICAL COMMISSION

# ELECTROSTATICS –

## Part 6-1: Electrostatic control for healthcare – General requirements for facilities

## FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61340-6-1 has been prepared by IEC technical committee 101: Electrostatics.

The text of this International Standard is based on the following documents:

| FDIS | Report on voting |
|---|---|
| 101/566/FDIS | 101/570/RVD |

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61340 series, published under the general title *Electrostatics*, can be found on the IEC website.

AVA Documents
Document Sharing Hub

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

Documents
Document Sharing Hub

Full document details: IEC 61340-6-1 2018

# INTRODUCTION

Static electricity can be the source of several hazards to patients, staff and equipment in healthcare facilities. Such hazards include:

- electromagnetic disturbance or electrostatic discharge (ESD) disruption or damage to medical instrumentation and data processing equipment;
- damage to ESD susceptible electronic components and assemblies during service and maintenance;
- electrostatic attraction (ESA) and contamination;
- ignition of flammable gases, liquids and other materials, and
- electrostatic shocks to people.

Adequate electrostatic control can eliminate these hazards, or at least reduce residual risk to tolerable levels.

Documents
Document Sharing Hub

Full document details: IEC 61340-6-1 2018

# ELECTROSTATICS –

## Part 6-1: Electrostatic control for healthcare – General requirements for facilities

## 1 Scope

This part of IEC 61340 applies to facilities that provide healthcare including hospitals, care centres and clinics.

This document provides technical requirements and recommendations for controlling electrostatic phenomena in healthcare facilities, which includes requirements for equipment, materials, and products used to control static electricity.

The requirements of this document do not apply to medical electrical equipment specified in IEC 60601-1 [1] [1] and in vitro diagnostic (IVD) medical equipment specified in IEC 61010-2-101 [2].

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60364-7-710, *Electrical installations of buildings – Part 7-710: Requirements for special installations or locations – Medical locations*

IEC TR 61340-1, *Electrostatics – Part 1: Electrostatic phenomena – Principles and measurements*

IEC 61340-2-1, *Electrostatics – Part 2-1: Measurement methods – Ability of materials and products to dissipate static electric charge*

IEC 61340-2-3, *Electrostatics – Part 2-3: Methods of test for determining the resistance and resistivity of solid materials used to avoid electrostatic charge accumulation*

IEC 61340-4-1, *Electrostatics – Part 4-1: Standard test methods for specific applications – Electrical resistance of floor coverings and installed floors*

IEC TS 61340-4-2:2013, *Electrostatics – Part 4-2: Standard test methods for specific applications – Electrostatic properties of garments*

IEC 61340-4-3, *Electrostatics – Part 4-3: Standard test methods for specific applications – Footwear*

IEC 61340-4-5, *Electrostatics – Part 4-5: Standard test methods for specific applications – Methods for characterizing the electrostatic protection of footwear and flooring in combination with a person*

[1] Numbers in square brackets refer to the bibliography.

Documents
Document Sharing Hub

Full document details: IEC 61340-6-1 2018

IEC 61340-5-1, *Electrostatics – Part 5-1: Protection of electronic devices from electrostatic phenomena – General requirements*

ISO 18080-2, *Textiles – Test methods for evaluating the electrostatic propensity of fabrics – Part 2: Test method using rotary mechanical friction*

ISO 18080-3, *Textiles – Test methods for evaluating the electrostatic propensity of fabrics – Part 3: Test method using manual friction*

ISO 18080-4, *Textiles – Test methods for evaluating the electrostatic propensity of fabrics – Part 4: Test method using horizontal mechanical friction*

ISO 20344, *Personal protective equipment – Test methods for footwear*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC TR 61340-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

**3.1**
**acceptance test**
test used to determine if systems or products meet specified requirements prior to installation or first use

Note 1 to entry: Acceptance tests may be the same as those used for qualification, or can be simpler tests more appropriate for use in a facility rather than a controlled test laboratory.

**3.2**
**electrostatic attraction**
**ESA**
force between two or more oppositely charged objects resulting in an increased deposition rate of particles onto charged surfaces or movement of charged particles

Note 1 to entry: This note applies to the French language only.

**3.3**
**electrostatic discharge**
**ESD**
transfer of electric charge between bodies of different electric potential in proximity or through direct contact

**3.4**
**electrostatic discharge sensitive device**
**ESDS**
sensitive devices, integrated circuit or assembly that can be damaged by electrostatic fields or electrostatic discharge

Note 1 to entry: This note applies to the French language only.

Documents
Document Sharing Hub

Full document details: IEC 61340-6-1 2018

**3.5**
**ESD protected area**
**EPA**
area in which an ESDS can be handled with acceptable risk of damage as a result of electrostatic discharge or fields

Note 1 to entry: This note applies to the French language only.

**3.6**
**electromagnetic compatibility**
**EMC**
ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment

**3.7**
**functional ground**
terminal used to connect parts to ground for reasons other than safety

Note 1 to entry: A functional ground can be a ground rod, stake or a separate wiring system that is bonded to the AC ground at the main service panel.

Note 2 to entry: In the absence of a dedicated functional ground, a protective earth can be used as a functional ground.

**3.8**
**isolated conductors**
non-grounded conductors

**3.9**
**low charging material**
materials with a tendency to minimize charge generation when contacting and rubbing against other materials

Note 1 to entry: As contact electrification and triboelectric charging are dependent on the nature of both contacting surfaces and the local environment, materials qualified as low charging under specific test conditions are not necessarily low charging under all possible conditions.

**3.10**
**protective earth**
terminal used to connect parts to earth for safety reasons

Note 1 to entry: Protective earth is also known as equipment grounding conductor.

**3.11**
**qualification**
process of evaluating test data or system/product data sheets to ensure that systems, materials or finished products meet specified requirements

## 4 Electrostatic hazards

### 4.1 General

Four different hazards of static electricity are generally recognized: ESD damaging or disrupting electrical equipment, contamination caused by ESA, ignition of flammable substances and electrostatic shock to people.

Documents
Document Sharing Hub
Full document details: IEC 61340-6-1 2018

### 4.2 ESD effects on equipment

Electrostatic discharges can cause losses of the functions of instrumentation during patient care increasing the risks to human safety. Insufficient electrostatic control may also cause unnecessary repair costs of medical equipment, as well as corruption of data affecting the quality and reliability of medical operation.

Electrical installation requirements for medical equipment and locations are provided in the electrical safety rules specified in IEC 60364 (all parts) [3]. It is essential to recognize that electrical safety does not necessarily provide precautions for prevention of the risks of static electricity and electrostatic discharge (ESD). Local safety regulations shall be taken into account.

ESD immunity testing does not cover all the real discharge scenarios, such as those where metal parts having different electric potentials are touched together. A current limiting resistor used in the ESD testing specified in IEC 61000-4-2 [4] does not necessarily exist in such situations, resulting in higher discharge power in equipment under real stress. Charge accumulation in a mobile metal object can also result in high energies in uncontrolled environments. Especially in low humidity, discharge energies can exceed the stress levels used in IEC 61000-4-2 [4].

A completely integrated system in medical care is not necessarily tested against transients caused by ESD, although individual parts of the system have passed EMC qualification. Therefore, it does not always take into account all the realistic coupling and failure scenarios of the whole system.

Discharges from isolated conductors or from a human body can be prevented with grounding. Conductive parts of patient beds, intravenous stands, trolleys, delivery carts, over-bed tables, chairs, and other mobile metal objects are not normally connected to the protective earth. Therefore, grounding all conductive parts of every item through the flooring or with direct electrical connection to a functional ground becomes essential for static control.

The probability of ESD can efficiently be reduced by optimization of humidity levels, bipolar ionization, adequate material selection, personnel grounding, and grounding of mobile metal objects. In general, the prevention of static charge generation and ESD is preferable compared to enhancing medical equipment EMC immunity.

If a functional ground is used for electrostatic control purposes, it should be electrically bonded to protective earth where possible so as to avoid potential differences between the two systems.

### 4.3 Contamination caused by ESA

Electrostatically charged surfaces attract airborne particles. Increased deposition of microorganisms onto charged surfaces, including the airways, human skin, and open wounds, can contribute to the incidence of hospital infections. Electrostatic sources of contamination and nosocomial infection can be healthcare personnel, patients, or the environment. All objects that come into contact with patients can be considered as potentially contaminated.

Cleaning, disinfection and sterilizing can prevent transmission of infective agents. However, because of the human factor, complete certainty in cleanliness cannot be achieved without adequate control of the environment. Avoidance of electrostatic attraction (ESA) decreases airborne microbe contamination and improves overall cleanliness in healthcare. The reduction in charge carried by airborne submicron contaminants will additionally reduce the deposition of such contaminants in the airways, thereby reducing the load placed on the body's immune system. Charge accumulation and high surface charge densities can be reduced to tolerable levels by grounding of personnel and other conductors, and by correct selection of materials.

Documents
Document Sharing Hub
Full document details: IEC 61340-6-1 2018

### 4.4 Ignition of flammable substances

The use of flammable substances in healthcare facilities has decreased, but the risk of fires and explosions can still occur especially in laboratories, intensive care units and operating rooms. For example, using alcohol based sterilizing substances has caused fires due to electrostatic discharge. ESD can be an ignition source in hyperbaric oxygen facilities and other locations where the oxygen concentration exceeds 23,5 % by volume.

The risk of incendiary ESD can be reduced to tolerable levels by grounding of personnel and other conductors, and by correct selection of materials.

### 4.5 Electrostatic shock to people

The incidence of unpleasant electrostatic shocks to people has increased due to the increased use of highly insulating materials such as plastics. An electrostatic discharge occurs when a human body approaches close enough to an object with different electric potential to exceed the electric breakdown field strength. ESD energy can be high enough to cause painful sensations to patients and healthcare personnel, resulting in involuntary movements, which can lead to accidents.

The risk of electrostatic shock can be reduced to tolerable levels by grounding of personnel and other conductors, and by correct selection of materials.

## 5 Electrostatic control requirements

### 5.1 General

Electrostatic control requirements in healthcare depend on the medical procedures, locations and activities such as service and maintenance of medical equipment.

### 5.2 Medical procedures

To ensure safety of patients from electrostatic hazards, protective measures shall be applied during medical examination and treatment.

Medical procedures can require specific electrostatic control actions that are dependent on the particular requirements of instrumentation, electric equipment or cleanliness. When protective measures have not otherwise been specified, the requirements in 5.3 to 5.7 shall be applied. Consideration shall also be given to applying the recommendations in 5.3 to 5.7 and Annex B.

### 5.3 Medical locations

#### 5.3.1 Classification by groups

Locations that are intended for purposes of diagnosis, treatment, monitoring and care of patients shall be classified in the following groups, as defined in IEC 60364-7-710: unclassified, G0, G1 and G2.

Selection of materials to reduce residual charge levels is recommended in all locations. Grounding of personnel and other conductors is recommended in G0 and G1 locations, and is required in G2 locations. Electrostatic control methods for each location are summarised in Table 1.

Documents
Document Sharing Hub
Full document details: IEC 61340-6-1 2018

**Table 1 – Summary of electrostatic control methods for specified locations**

| Location | Control method | | | |
|---|---|---|---|---|
| | Ground personnel via footwear and flooring | Ground other conductors via flooring or direct connection | Use of conductive or dissipative materials | Use of low charging materials |
| Unclassified | Not mandatory | Not mandatory | Not mandatory | Recommended |
| G0 | Recommended | Recommended | Recommended[a] | Recommended |
| G1 | Recommended | Recommended | Recommended[a] | Recommended |
| G2 | Required | Required | Recommended[a] | Recommended |
| [a] Conductive and dissipative materials should only be used if grounding is provided. | | | | |

### 5.3.2 Unclassified rooms

Waiting rooms, office areas, and corridors are not necessarily classified medical locations. It is recommended to use flooring and upholstery materials that limit human body voltage to below 2 000 V, thereby limiting occurrence of unpleasant electrostatic shocks, contaminant deposition, and errors in data processing. Temporary use of medical equipment shall be taken into account.

NOTE As an example, EN 1307 [5] specifies textile floor coverings with antistatic behaviour as being those giving rise to a body voltage of less than 2 000 V measured according to ISO 6356 [6] at 25 % RH.

### 5.3.3 Group 0 – Electrostatic control recommended

Typical locations are consulting rooms and inpatient wards.

Electrostatic control methods are recommended in G0 locations to reduce the risk of ESA based contamination, ignition accidents, unpleasant electrostatic shocks and ESD induced errors in data processing to tolerable levels.

### 5.3.4 Group 1 – Electrostatic control recommended

Typical locations are endoscopic examination rooms, electrocardiogram (ECG), electroencephalogram (EEG) and electrohysterogram (EHG) rooms, computed tomography rooms, special care baby units, urology units and nuclear medicine rooms.

Electrostatic control methods are recommended in G1 locations to reduce the risk of ESA based contamination, ignition accidents, unpleasant electrostatic shocks and ESD induced errors in data processing to tolerable levels.

### 5.3.5 Group 2 – Electrostatic control required

Typical locations are operating theatre suites, operating preparation rooms, operating plaster rooms, operating recovery rooms, cardiac catheterization rooms, coronary care units and intensive care units.

Electrostatic control methods are required in G2 locations, where temporary losses of functions of medical equipment pose a significant risk to the life of patients and cannot, therefore, be tolerated. Control methods can also be required in other medical locations depending on medical treatment or on manufacturer's specifications of medical equipment.

AVA Documents
Document Sharing Hub

Full document details: IEC 61340-6-1 2018

### 5.4 Service and maintenance

Unprotected ESD sensitive devices (ESDS) shall not be handled without an adequate ESD control programme. When unprotected ESDS are handled, the requirements of IEC 61340-5-1 shall be applied.

### 5.5 Administrative requirements and recommendations

#### 5.5.1 Designing facilities

Precautions against electrostatic hazards in healthcare facilities are mainly based on passive control methods such as material selections and ground connections. Therefore, it is essential to take recommendations and requirements of this document into account in designing new facilities or refurbishing existing facilities. Active control measures such as optimizing dew point temperature, introducing bipolar ionization and optimizing room layouts and equipment locations as means to reduce individuals' exposures to excess charge and charged contaminants within the micro-environments they typically occupy should also be considered.

#### 5.5.2 Operational responsibility

Organizations operating healthcare facilities are responsible for maintaining documentation and verification of the precautions against electrostatic hazards as well as considering any related training needs.

#### 5.5.3 Qualification and verification

All new installations and materials used for electrostatic control shall be qualified before procurement. In addition, sample based acceptance testing at minimum is required for floorings and other installations. Periodic verifications or random checks of control items are recommended.

Unless otherwise agreed, the atmosphere for conditioning and testing for qualification purposes shall be (23 ± 2) °C and (12 ± 3) % relative humidity, and the conditioning time prior to testing shall be at least 48 h. Verification testing shall be done under the range of ambient temperature and humidity conditions within the facility. For assessing the worst-case conditions humidity and temperature shall be measured at different times of the year when different humidity conditions can be experienced.

### 5.6 Technical requirements

#### 5.6.1 Electrical safety

This document includes technical requirements for electrostatic control. These requirements shall not replace or supersede any requirements for personnel safety.

#### 5.6.2 Material classification

##### 5.6.2.1 General requirements for material classification

Materials for electrostatic control shall: limit the generation of electrostatic charge; quickly dissipate electrostatic charge; suppress or attenuate electrostatic field or electrostatic potential associated with residual electrostatic charge. To a certain extent, these functions are related. For example, a material that is able to dissipate charge faster than it is generated will appear to be one that limits the generation of charge. However, in some cases, the functions can be independent. Some materials that do not dissipate charge quickly, can show limited accumulation of charge or low measured surface potential.

AVA Documents
Document Sharing Hub

Full document details: IEC 61340-6-1 2018

Surface and volume resistance measurements (see 5.6.2.2) are one way to classify a material's ability to dissipate electrostatic charge and, in many cases, to limit electrostatic charge generation. If materials are to be used in the ground path for grounding personnel and other conductors, resistance measurements are essential. Nevertheless, there are materials that can be used for electrostatic control for which resistance measurements are not appropriate. Alternative test methods (see 5.6.2.3) shall be used for such materials.

Another option is for healthcare facilities to specify their own test methods and classification requirements, either based on other standards, or defined within their own facility specifications. Guidance on electrostatic test methods can be found in IEC TR 61340-1, IEC TR 61340-2-2 [7] and IEC 60079-32-2 [8].

Clothing worn by personnel that is intended to protect the wearer from hazards such as chemicals, heat or cold, impact, ignition of flammable atmospheres, etc. is classified as personal protective equipment (PPE) and is commonly subject to specific regulations. For example, in Europe, PPE must comply with the PPE Directive (PPE Regulation from 2018), and clothing materials for use in flammable atmospheres are normally tested and evaluated using the EN 1149 series of standards [9].

NOTE Guidance on the selection, use, care and maintenance of PPE for preventing electrostatic risks in hazardous areas is given in CEN TR 16832 [10].

#### 5.6.2.2 Material classification based on resistive properties

##### 5.6.2.2.1 Resistance measurements

Surface and volume resistance measurements shall be made according to IEC 61340-2-3.

##### 5.6.2.2.2 Electrostatic conductive materials

Conductive materials may be surface conductive, volume conductive or both. A surface conductive material shall have a surface resistance < $1 \times 10^4$ Ω. Volume conductive materials shall have a volume resistance < $1 \times 10^4$ Ω. ESD-control items can have different limits depending on the standard.

##### 5.6.2.2.3 Electrostatic dissipative materials

Dissipative materials may be surface dissipative, volume dissipative or both. Surface dissipative materials shall have a surface resistance ≥ $1 \times 10^4$ Ω and < $1 \times 10^{11}$ Ω. Volume dissipative materials shall have a volume resistance ≥ $1 \times 10^4$ Ω and < $1 \times 10^{11}$ Ω. ESD-control items can have different limits depending on the standard.

##### 5.6.2.2.4 Electrostatic insulating materials

Electrostatic insulating materials may be surface insulating, volume insulating or both. Surface insulating materials have a surface resistance ≥ $1 \times 10^{11}$ Ω. Volume insulating materials have a volume resistance ≥ $1 \times 10^{11}$ Ω. ESD-control items can have different limits depending on the standard.

#### 5.6.2.3 Material classification based on charge decay time and triboelectric charging

##### 5.6.2.3.1 Charge decay time measurements

Charge decay time measurements shall be made according to IEC 61340-2-1.

##### 5.6.2.3.2 Electrostatic dissipative materials

Electrostatic dissipative materials shall have a charge decay time of ≤ 2 s from an initial value between (200 ± 10) V and (1 000 ± 50) V to (100 ± 5) V. A material is also classified as electrostatic dissipative if on application of a corona voltage of at least 7 kV the maximum surface voltage is less than 190 V.

AVA Documents
Document Sharing Hub

Full document details: IEC 61340-6-1 2018