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Mike Gilmore, FIA

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## SID-001

### Standards Interpretation Document

# CLARIFICATION OF THE CURRENT REQUIREMENTS AND RECOMMENDATIONS CONCERNING THE SEGREGATION OF TELECOMMUNICATIONS AND POWER SUPPLY CABLING

The term "power supply" cabling is replacing "mains power" cabling in all primary standards referenced in this document. This is because the requirements of BS EN 50174-2:2010 are not restricted to mains power in the conventional sense (it also applies to DC power feeds). In order to provide clarification, within the amendment to EN 50174 series being published in 2010, "power supply cabling" is defined as "cabling whose primary purpose is the supply of electrical power" (this definition is intended to exclude Power over Ethernet).

## Foreword

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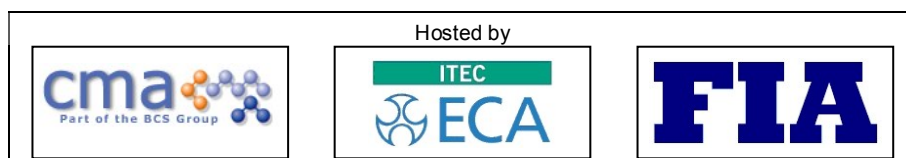
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## 75 1 Introduction

76 The segregation of power supply cabling and telecommunications cabling containing metallic structural and/or signalling  
77 elements requires the consideration of safety, protection and electromagnetic interference. These aspects are addressed  
78 by different national standards and this document seeks to consolidate the requirements and recommendations of those  
79 standards within a simple reference document.

80  
81 It is not uncommon for aspects of the segregation requirements to be in conflict with the needs of the building  
82 infrastructure due to lack of space or competing demands for the available space. As a result the installer of the  
83 telecommunications and/or power supply cabling is unable to comply with the published standards, despite those  
84 standards being a contractual and/or legal requirement.

85  
86 This Telecommunications Infrastructure Advisory Board SID contains interpretation of published standards covering the  
87 planning and installation of telecommunication cabling infrastructures, explains the consolidated requirements and  
88 recommendations in relation to segregation of telecommunications and mains power cabling and provides:

- 89 • users with guidance in relation to sizing of pathways and spaces and long-term management of cabling within them;
- 90 • consultants with guidance in relation to the location and construction of pathways and pathway (cable management)  
91 systems;
- 92 • installers with the ability to identify any potential or actual non-compliance with the published standards and act  
93 accordingly.

94  
95 The specific standards subject to interpretation within the document are BS 6701:2010 and BS EN 50174-2:2009  
96 together with electrical system standard HD 60364-4-444:2010 (which will form the basis of a future BS 7671 section  
97 444). Historic information is provided relating to BS 6701:2004, BS EN 50174-1:2001 and BS EN 50174-2:2001 in  
98 combination with BIP 0007 (published by BSI and available free-of-charge to FIA and ECA members).

99  
100 This document provides interpretation of published standards which is intended to be submitted to checking and  
101 endorsement by the BSI Technical Committee, or equivalent, responsible for the production of the standards that are  
102 subject to TIA-B interpretation.

## 104 2 Scope

105 This Telecommunications Infrastructure Advisory Board SID contains interpretation of the following published standards  
106 covering segregation of power supply cabling and telecommunications cabling containing metallic structural and/or  
107 signalling elements:

- 108 • BS 6701:2010;
- 109 • BS EN 50174-2:2009;
- 110 • HD 60364-4-444:2010.

111  
112 HD 60364-4-444 is the European Harmonisation Document that provides source material for a future clause 444 of BS  
113 7671 (17<sup>th</sup> Edition of the IEE Wiring Regulations).

114

## 115 3 References

116 The following referenced documents are indispensable for the application of this document. For dated references, only  
117 the edition cited applies. For undated references, the latest edition of the referenced document (including any  
118 amendments) applies.  
119  
120

BS 6701:2004	<i>Telecommunications equipment and telecommunications cabling – Specification for installation, operation and maintenance</i>
BS 6701:2010	<i>Telecommunications equipment and telecommunications cabling – Specification for installation, operation and maintenance</i>
BS EN 50174-1:2009	<i>Information technology – Cabling installation – Installation specification and quality assurance</i>
BS EN 50174-2:2009	<i>Information technology – Cabling installation – Installation planning and practices inside buildings</i>
CLC HD 60364-4-444	<i>Low-voltage electrical installations – Part 4-444: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances</i>
BS BIP 0007:2004	<i>Telecommunications cabling and equipment – A guide to requirements and responsibilities</i>
BS 7671:2008	<i>Requirements for electrical installations – IEE Wiring Regulations – Seventeenth edition</i>

121

## 122 4 Terms, definitions and abbreviations

### 123 4.1 Terms and definitions

124 For the purposes of this British Standard, the terms and definitions given in BS 6701 and BS EN 50174 (all parts) apply.  
125

### 126 4.2 Abbreviations

127 For the purposes of this British Standard, the terms and definitions given in BS 6701 and BS EN 50174 (all parts) apply.  
128

## 129 5 Background

130 The primary standard in the UK covering the installation and operation of both telecommunications cabling and  
131 equipment is BS 6701. This standard simultaneously requires conformance with BS 7671 and BS EN 50174 documents.

132  
133 The original editions of EN 50174-1 and EN 50174-2 have been substantially revised and were published as BS EN  
134 50174-1 and BS EN 50174-2 in 2009.

135 At the time of publication of this document:

- 136 • BS 6701:2004 (published after, and in response to, the introduction of the original editions of BS EN 50174-1 and  
137 BS EN 50174-2) is now being revised, without major technical change, as BS 6701:2010;
- 138 • EN 50174-1: 2009 and EN 50174-2:2009 are both subject to an amendment (for completion in 2010) – but the  
139 amendments have no impact of the technical requirements as explained in this document.

140  
141 At the same time, BS 7671 is being supplemented by a new section 444, which is based on, although not necessarily  
142 identical to, CLC HD 60364-4-444 (please note that neither of these two documents is the same as IEC 60364-4-444 -  
143 there are some radical differences and IEC 60364-4-444 is irrelevant for the purposes of this document). Much of the  
144 content of CLC HD 60364-4-444 is founded on the contents of EN 50174-2:2009.

145  
146

147 NOTE A CLC HD differs from a CLC EN in that an:

- 148 a) an EN has to be published by all CENELEC (CLC) member countries “as is” and is supposed to be identical in all countries  
149 (albeit potentially suffering from risk of translation);
- 150 b) a HD is the foundation of other national standards which, although not conflicting with the HD, may contain more stringent  
151 or additional requirements.

152

## 153 6 A history of segregation requirements and introduction to the structure of this 154 document

155 There are three reasons to provide segregation between power supply cabling and telecommunications cabling  
156 containing metallic structural or signalling elements:

- 157 • safety – covered by BS 7671;
- 158 • protection of telecommunications cabling and equipment from hazardous voltages - covered by BS 6701;
- 159 • electromagnetic interference in the telecommunications cabling from the power supply cabling - covered by BS EN  
160 50174-2.

161  
162 The requirements for segregation in relation to protection have not changed since the earliest editions of BS 6701  
163 produced in the late 1980's. Although BS 6701 underwent substantial change in 2004, including both a change in its  
164 status from a Code of Practice to a British Standard Specification and a title change, the requirements for segregation  
165 remained the same and are explained in clause 7.

166  
167 The requirements for segregation in relation to electromagnetic interference have undergone significant change as EN  
168 50174-2 has been developed. The requirements were introduced in the 1<sup>st</sup> edition of BS EN 50174-2 published in 2001.  
169 The documents in the EN 50174 series are written for the planner and installer of telecommunications cabling (as  
170 opposed to the electrical wiring installer). It was quickly recognised that the requirements were badly drafted and during  
171 the course of the development of BS 6701:2004, BIP 0007 was produced by BSI in order to provide some assistance in  
172 understanding those requirements. Fortunately, CENELEC recognised the problems and began to redevelop the entire  
173 EN 50174 series resulting in the publication of new, much clearer requirements and recommendations, published in the  
174 UK, as BS EN 50174-1:2009 and BS EN 50174-2:2009. These requirements are explained in clause 8.

175  
176 Almost simultaneously, the electrical wiring standards body in CLC began work on HD 60364-4-444, approved in 2009,  
177 which provides additional information, but supporting the requirements of EN 50174-2:2009, from the perspective of the  
178 electrical wiring installer. This represents the beginning of joined-up thinking between the telecommunications and  
179 electrical wiring standards bodies in Europe. These requirements are explained in clause 9.1. At the same time, BS  
180 7671 is being supplemented by a new section 444, which is based on, although not necessarily identical to, CLC HD  
181 60364-4-444. These requirements are explained in clause 9.2.

182  
183 The two different perspectives are that electrical power supply cabling is regarded as a both a potential source of  
184 electrical hazard and a source of electromagnetic interference on to metallic telecommunications cabling and the  
185 equipment connected to it. By comparison, the telecommunications cabling is not seen as a hazard to the electrical  
186 power supply systems and is not a substantive source of electromagnetic interference on to the electrical power supply  
187 cabling and into the equipment to which it is attached.

## 189 7 BS 6701:2004 and BS 6701:2010

### 190 7.1 Introduction

191 The only difference between the treatment of segregation in BS 6701:2004 and BS 6701:2010 is that the text appears in  
192 a different clause in the newer standard.

193  
194 **It should be noted that the requirements of BS 6701 override those of BS EN 50174-2 i.e. if the requirements of**  
195 **BS EN 50174-2 (see clause 8) are less than the relevant values of BS 6701, then the requirements of BS 6701**  
196 **apply. However, if the requirements of BS EN 50174-2 (see clause 8) are greater than the relevant values of BS**  
197 **6701, then the requirements of BS EN 50174-2 apply.**

198  
199 The introduction to clause 5.4.3 in BS 6701:2010 attempts to underline the above position by stating that the  
200 requirements for separation for the protection of telecommunications cabling and attached equipment always take  
201 precedence over the requirements for segregation for purposes of reduction of electromagnetic interference of EN 50174  
202 standards. However, the most stringent requirements shall be applied.

203  
204 It also points out that the protection requirements of BS 6701 represent the "local regulations for safety" defined in clause  
205 6.1 of EN 50174-2:2009.

## 207 7.2 The requirements

### 208 7.2.1 Basic segregation requirements of BS 6701

209 BS 6701 requires that segregation of cabling with regard to electromagnetic interference shall be in accordance with  
210 the BS EN 50174 series of standards (as explained in clause 8 of this document). Additionally:

- 211 • all cables shall be insulated in accordance with BS 7671 for the highest voltage present;
- 212 • telecommunications cabling shall not be installed in any compartment of a cable management system that contains  
213 electricity supply cabling with unshrouded terminals.

214 NOTE For consistency within this document, this clause uses the term “power supply” whereas BS 6701 uses the term “electricity  
215 supply”.

216  
217 BS 6701 requires that:

- 218 • for power supply cabling operating at nominal voltages exceeding 600 V a.c. (900 V d.c. to earth), the  
219 telecommunications cabling and power supply cabling shall be separated by either a distance of not less than 150  
220 mm or a distance of not less than 50 mm, effected by a partition as described in BS 7671 (this could be a non-  
221 conducting or an earthed conducting barrier);
- 222 • for power supply cabling installed inside buildings and operating at nominal voltages between 50 V a.c. and 600 V  
223 a.c. (120 V d.c. to 900 V d.c. to earth), the telecommunications cabling and power supply cabling shall be separated  
224 by 50 mm.

### 226 7.2.2 Zero segregation allowance

227 For power supply cabling installed inside buildings and operating at nominal voltages between 50 V a.c. and 600 V a.c.  
228 (120 V d.c. to 900 V d.c. to earth), no separation is required provided that one or more of the following conditions is met:

- 229 1. a partition as described in BS 7671 (this could non-conducting or an earthed conducting barrier) is installed  
230 between the two cable types
- 231 2. the power supply cables are enclosed in a separate conduit or trunking which, if metallic, is earthed in  
232 accordance with BS 7671;
- 233 3. the power supply cables are of a mineral-insulated type;
- 234 4. the power supply cables are of an earthed armoured construction;
- 235 5. the power supply cables are of a flexible double-insulated type (e.g. “kettle leads” supplying 240 V mains power  
236 to telecommunications equipment in cabinets).

237 NOTE Electrical 240 V “twin and earth type” cabling is not flexible double-insulated.

238 NOTE Only option 1 is allowed outside buildings.

239 BS 6701 requires that where telecommunications cables and the power supply cables cross and neither cable is  
240 armoured then additional insulation in accordance with BS 7671 shall be provided at the crossing point.  
241

## 242 8 BS EN 50174-2:2009

### 243 8.1 The basics: clause 6.1 of BS EN 50174-2:2009

244 BS EN 50174-2 relates to planning and installation practices inside buildings. No advice or guidance is provided for  
245 cabling between buildings (covered by BS EN 50174-3:2003) unless the applicable conditions applied are the same as  
246 detailed below. Further information in relation to typical conditions outside buildings may be provided in a future edition  
247 of BS EN 50174-3, expected in 2011.  
248

249 BS EN 50174-2:2009 contains requirements and recommendations for segregation between power supply cabling and  
250 telecommunications cabling containing metallic signalling elements which are based upon:

- 251 • the fundamental electromagnetic performance of the telecommunications cables;
- 252 • the construction of the power supply cables;
- 253 • the electromagnetic performance of any cable management systems which accommodates either, or both, the  
254 power supply cabling and telecommunications cabling;
- 255 • the current within the power supply cabling.  
256

257 Clearly, there has to be some definition of the power supply cabling in terms of the electromagnetic noise it is expected  
258 to radiate. This is handled by defining that the equipment connected to the power supply cabling is conformant with the  
259 relevant EMC standards (in the EN 61000-6 series of standards) and that the power supply is non-deformed but has high  
260 frequency content consistent with the switching and operation of such attached equipment. These two conditions also  
261 contribute to the assumption that the electromagnetic environment complies with the levels defined in the EN 61000-6  
262 series of standards for conducted and radiated disturbances.  
263

264 In addition, the type of telecommunications cabling has been considered. EN 50174-2 assumes that the cabling supports  
265 any (i.e. one or more) of the applications listed in EN 50173-1. The least demanding in transmission performance terms  
266 is basic voice circuits and therefore EN 50174-2 segregation requirements apply to cabling that can at least provide voice  
267 communications.  
268

269 Finally, and very importantly, EN 50174-2 reminds us that **safety has highest priority - but the more stringent**  
270 **requirement of safety and electromagnetic interference shall take precedence.** To be clear for the UK, irrelevant of  
271 the result of the analysis of clauses 8.2, the requirements of BS 6701 cannot be ignored ..... and of course where  
272 manufacturers' instructions require more stringent installation practices, these shall be followed.  
273

## 274 8.2 The requirements

### 275 8.2.1 Power circuit construction

276 The segregation requirements outlined in 8.2.4 assume that, where 230 V AC power is delivered, the live and neutral  
277 conductors may be separated i.e. not in close proximity. Special requirements that apply where the live and neutral  
278 conductors are in close proximity are detailed in 8.3 (but other conditions also have to be met).  
279

### 280 8.2.2 The electromagnetic performance of the telecommunications cables

281 The most critical aspect of the segregation requirements is the electromagnetic immunity performance of the  
282 telecommunications cables. This is not as simple as deciding on whether they are screened or unshielded – since a  
283 poorly screened cable may exhibit a lower immunity than a well designed unshielded one. Instead we have to use  
284 some of the newer parameters that are now considered as part of the arsenal of transmission parameters in EN 50173  
285 standards.  
286

287 For unshielded balanced cables we use the parameter “transverse conversion loss” (TCL). The latest unshielded  
288 cables of Category 5 and above have to meet specified requirements for TCL. For shielded balanced cables we use  
289 the parameter “coupling attenuation”. The latest shielded cables of Category 5 and above have to meet specified  
290 requirements for coupling attenuation.  
291

292 For coaxial or twin axial cables we use the parameter “screening attenuation”. The screening attenuation is specified for  
293 such cables.  
294

Information technology cable			Segregation Classification
Screened	Unshielded	Coaxial/twin axial	
<b>Coupling attenuation at 30 MHz to 100 MHz</b> dB	<b>TCL at 30 MHz to 100 MHz</b> dB	<b>Screening attenuation at 30 MHz to 100 MHz</b> dB	
≥ 80	≥ 70 – 10 × lg f	≥ 85	d
≥ 55	≥ 60 – 10 × lg f	≥ 55	c
≥ 40	≥ 50 – 10 × lg f <sup>c</sup>	≥ 40	b
< 40	< 50 – 10 × lg f	< 40	a

295



296 The table above defines a “Segregation Classification” based on these parameters and is supported by the following  
297 information:

- 298 • screened balanced cables meeting EN 50288-4-1 (EN 50173-1:2007, Category 7) meet Segregation Classification  
299 “d”.
- 300 • screened balanced cables meeting EN 50288-2-1 (EN 50173-1:2007, Category 5) and EN 50288-5-1  
301 (EN 50173-1:2007, Category 6) meet Segregation Classification “c”.

302 NOTE These cables may deliver performance of Segregation Classification “d” provided that the relevant coupling attenuation  
303 requirements are also met.

- 304 • unscreened balanced cables meeting EN 50288-3-1 (EN 50173-1:2007, Category 5) and EN 50288-6-1  
305 (EN 50173-1:2007, Category 6) meet Segregation Classification “b”.

306 NOTE These cables may deliver performance of Segregation Classification “c” or “d” provided that the relevant TCL requirements  
307 are also met.

- 308 • coaxial cables meeting EN 50117-4-1 (EN 50173-1:2007, Category BCT-C) meet Classification “d”.

309 The “Segregation Classification” is the primary factor in the calculation of subsequent segregation requirements.  
310

311 The lower the “segregation classification”, the more segregation is required. For example, separation requirements for  
312 segregation classification “a” shall be applied if:

- 313 • the mix of applications is unrestricted;
- 314 • the type of cabling to be installed is unrestricted;
- 315 • the relevant cable performance is unknown.

316

317

### 318 8.2.3 The screening effectiveness of cable management systems

319 The next step in determining the required segregation is the consideration of the screening provided by any cable  
320 management systems that are used to accommodate either the power supply cables or the telecommunications cables.  
321

322 Unfortunately, there is no standardised system of measuring the screening performance provided by any cable  
323 management systems. Such a system has been requested by the authors of EN 50174-2 but it takes a long time to  
324 develop such an approach, particularly when the manufacturers of cable management systems are unused to the  
325 concepts being promoted.  
326

327 In the interim, EN 50174-2 has defined four boundary conditions: two very simple to understand and two a little harder to  
328 quantify.  
329

330 The first boundary condition applies if the power supply cables and/or the telecommunications cables are housed in  
331 some form of “solid metallic containment” that has screening performance equivalent to that of a steel conduit of at least  
332 1.5 mm wall thickness. This dimension has been chosen since no electromagnetic interference would pass through such  
333 a barrier at the frequencies of interest (DC to 100 MHz). This boundary condition is also highlighted since people  
334 confuse armouring of screened power cables with their “screening” performance. Unless the armouring provided to such  
335 cables provides screening performance equivalent to that of a steel conduit of at least 1.5 mm wall thickness, then it fails  
336 to meet the boundary condition. The main value of this boundary condition is that it allows zero separation, irrelevant of  
337 the “Segregation Classification” of the telecommunications cables.  
338

339 The second, and very obvious, boundary condition applies if there is no electromagnetic barrier whatsoever, i.e. the  
340 power supply and telecommunications cables are segregated by physical distance alone whether or not they are  
341 contained within a cable management system.  
342

343 Between these two end-stops, two other boundary conditions have been established.  
344

345 The first of these is designated “perforated metallic containment” and is defined as screening performance  
346 (0 MHz to 100 MHz) equivalent to steel tray (trunking without cover) of at least 1,0 mm wall thickness and no  
347 more than 20 % equally distributed perforated area. This rather loose description is a result of the absence of a  
348 proper grading scheme for cable management systems. However, most installers will recognise the material  
349 being described. Any cable management system with screening performance less than that of “solid metallic  
350 containment” fall into this boundary condition, e.g. screened power cables with inadequate armouring coverage.

351 NOTE The underlined text in the paragraph above is to be included in EN 50174-1 Amendment 1:2010

352  
353 The second was introduced to provide limited support for basket and is termed “open metallic containment”.  
354 This boundary condition is based on screening performance (0 MHz to 100 MHz) equivalent to welded mesh  
355 steel basket of mesh size 50 mm x 100 mm (excluding ladders). This screening performance is also achieved  
356 with steel tray (trunking without cover) of less than 1,0 mm wall thickness and/or more than 20 % equally  
357 distributed perforated area.

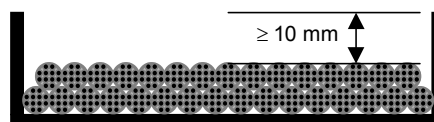
358 NOTE The underlined text in the paragraph above is to be included in EN 50174-1 Amendment 1:2010

#### 359 8.2.4 Basic segregation requirements of BS EN 50174-2

360 The basic segregation requirements of BS EN 50174-2 are based on a combination of the “Segregation Classification” of  
361 the telecommunication cables and the above boundary conditions as shown below.  
362

Segregation Classification	Separation without electromagnetic barrier	Containment applied to information technology or mains power cabling		
		Open metallic containment	Perforated metallic containment	Solid metallic containment
d	10 mm	8 mm	5 mm	0 mm
c	50 mm	38 mm	25 mm	0 mm
b	100 mm	75 mm	50 mm	0 mm
a	300 mm	225 mm	150 mm	0 mm

363  
364 It should be noted that the screening effectiveness of the open or perforated metallic containment is reduced if the  
365 cabling contained within it is installed above the side walls. In fact the requirements of EN 50174-2 state that the  
366 separations of the above table fro perforated metallic containment only apply if no cable lies within 10 mm of the top of  
367 the cable management system as shown below.  
368



369  
370 It is also advised that the greatest screening effectiveness will be provided to cables installed in the corners of the cable  
371 management system.  
372  
373

374 Segregation of cabling to support CATV systems is addressed in EN 60728 series (EN 50083 series) of standards.  
375  
376

#### 377 8.2.5 The impact of power supply current

378 The basic segregation requirements detailed above assume a total power supply cabling current of 300 A delivered as  
379 single phase, 230 V, circuits delivering up to 20 amps. A number of equivalences are given as follows:

- 380 • 3-phase cables shall be treated as 3 off 1-phase cables;
- 381 • more than 20 A shall be treated as multiples of 20 A;
- 382 • lower voltage AC or DC power supply cables shall be treated based upon the their installed current ratings, i.e. a  
383 100 A 50 V DC cable = 5 off 20 A cables.

384 NOTE The term “installed current rating” is intended to indicate that the design of the power supply cabling as installed, based on fused  
385 circuits, of a given current rating may be well below the current rating of the power supply cable. It is the “fused” value that is relevant  
386 here.

Quantity of circuits	Power cabling factor <i>P</i>
1 to 3	0,2
4 to 6	0,4
7 to 9	0,6
10 to 12	0,8
13 to 15	1,0

Quantity of circuits	Power cabling factor <i>P</i>
16 to 30	2
31 to 45	3
46 to 60	4
61 to 75	5
> 75	6

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The basic segregation requirements detailed in 8.2.4 are subject to reduction or increase based upon the power cabling factor shown in the table above (the grey shaded box identifying the basic requirement for the direct application of 8.2.4).

As an example, the required separation of a set of power supply cables limited to 100 A (equivalent to 5 circuits) is only 0.4 times that of the relevant box in the table shown in 8.2.4. So for an unscreened cable meeting the minimum TCL requirements of Category 5, the separation without any electromagnetic barrier would be 40 mm. Of course the requirements of BS 6701 would demand a minimum of 50 mm unless one or more of the conditions in 7.2.2 were applicable.

Irrelevant of the results of the above analysis, certain minimum requirement apply for specific sources of electromagnetic interference as detailed below.

Source of disturbance	Minimum separation (mm)
Fluorescent lamps	130 <sup>a</sup>
Neon lamps	130 <sup>a</sup>
Mercury vapour lamps	130 <sup>a</sup>
High-intensity discharge lamps	130 <sup>a</sup>
Arc welders	800 <sup>a</sup>
Frequency induction heating	1 000 <sup>a</sup>
Hospital equipment	b
Radio transmitter	b
Television transmitter	b
Radar	b

<sup>a</sup> The minimum separations may be reduced provided that appropriate cable management systems are used or product suppliers guarantees are provided.

<sup>b</sup> Where product suppliers guarantees do not exist, analysis shall be performed regarding possible disturbances. e.g. frequency range, harmonics, transients, bursts, transmitted power, etc.

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408

### 8.3 Zero segregation allowance

There are situations in which no segregation is required except that necessary under the requirements of BS 6701 (see clause 7).

The conditions under which zero segregation is allowed within BS EN 50174-2:2009 replaces the confusing and technically incorrect text regarding “the last 15 metres” in BS EN 50174-2:2001.

A number of issues had to be addressed in the development of a technically-based zero separation allowance:

- 409 • studies of electromagnetic interference into LAN transmission systems from power supply cabling show good  
410 system performance provided that transmitted signal is well balanced and the cabling has good immunity  
411 performance;
- 412 • these studies were generally based on power supply cabling in which the supply circuits were contained within a  
413 single cable construction which meant that the electromagnetic emissions from the power supply cables were  
414 reduced;
- 415 • certain types of telecommunications networks (.e.g. building controls systems) use a cable construction that  
416 combined power supply conductors and signal pairs - i.e. there is zero segregation.  
417

418 Moreover, it has to be recognised that users wish to use compact, aesthetically pleasing cable management systems  
419 where they are visible to the general public – and that such products are available and have been widely used without  
420 significant interference issues.  
421

422 The text of BS EN 50174-2:2001 was intended to allow the installation of power supply and telecommunications cabling  
423 in close proximity within the trunking and poles commonly found in office premises. BS EN 50174-2:2009 also targets  
424 this area but allows more freedom of implementation provided that specific technical conditions are met.  
425

#### 426 **The zero segregation allowance is not applicable:**

- 427 • within spaces containing distributors in accordance with EN 50173 series or equivalent concentrations of  
428 transmission equipment;
- 429 • where there are no specific sources of electromagnetic interference as detailed in 8.2.5.  
430

#### 431 **The zero segregation allowance is allowed provided that:**

- 432
- 433 1. the information technology cabling is application(s)-specific and the application(s) support(s) a zero segregation  
434 relaxation or all the following conditions are met:
  - 435 2. the power supply conductors comprising a circuit are maintained in close proximity (e. g. within an overall sheath or  
436 twisted, taped or bundled together) and form single phase circuits installed to limit to total current no greater than 32  
437 A;
  - 438 3. the environmental classification for the information technology cabling complies with E<sub>1</sub> of EN 50173-1:2007;
  - 439 4. the information technology cables meet the requirements of Segregation Classifications “b”, “c” or “d”  
440

441 Condition 1) allows hybrid telecommunications/power supply cables to be installed (provided that the telecommunications  
442 service operated over them is what they were designed for).  
443

444 Condition 2) recognises that power supply conductors that form a circuit and which are in close proximity radiate  
445 significantly less electromagnetic interference. The current limit, again based on the presence of fused capacity rather  
446 than the current carrying capacity of the power supply cabling, requires care in the design of the routing of the power  
447 supply cabling to trunking (or poles) but does not present an insurmountable obstacle.  
448

449 Condition 3) restricts this allowance to benign electromagnetic environments such as offices.  
450

451 Condition 3) restricts this allowance to cables of Category 5 (or above) and BCT-C screening performance.  
452

## 453 **8.4 The implementation of separation**

454 Future expansion of both the power supply cabling and information technology cabling shall be taken into account when  
455 determining the separation requirement and the selection of pathways and cable management systems to be used to  
456 provide the required separation. The application of minimal separation distances, and the selection cable management  
457 systems, based on elevated “Segregation Classifications” may restrict the type and use of cables to be installed in the  
458 future.  
459

460 The applicable minimum separation requirement is the minimum separation allowed at any point between fixing points or  
461 that is created by other restraints (physical or contractual) including barriers (or dividers) or created by gravity.  
462

463 The minimum separation requirement applies in three dimensions. However, where telecommunications cables and  
464 power supply cables are required to cross and required minimum separation cannot be maintained then the angle of their

465 crossing shall be maintained at 90 degrees on either side of the crossing for a distance no less than the applicable  
466 minimum separation requirement.  
467

468 Where power supply cables (other than single core cables operating at voltages exceeding AC 600 V) pass through a fire  
469 barrier it is possible to reduce the separation requirements provided that:

- 470 • the total distance over which the reduction in the separation occurs is not greater than the thickness of the fire  
471 segregation barrier plus 0,5 m on either side;
- 472 • the information technology cables and mains power cables are enclosed in separate trunking or conduit;
- 473 • local regulations concerning fire barriers are complied with;
- 474 • the HD 384.5 series is taken into account.  
475

## 476 8.5 The grouping of telecommunication circuits

477 From an EMI perspective, the future EN 50174-2 Amendment 1 considers circuits to be within the following groups:

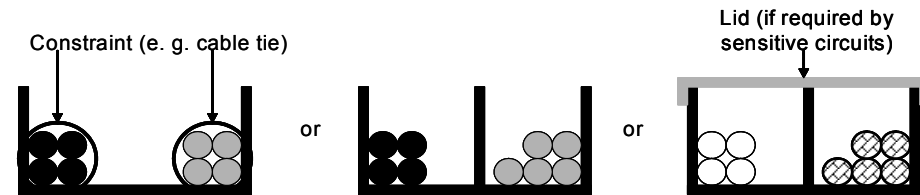
- 478 • Group 1: Power supply: e.g. AC and/or DC, high di/dt power circuits, speed drives, power converters etc, which  
479 disturb signals within Groups 2, 3 and 4;
- 480 • Group 2: Auxiliary: e.g. relay contactor, actuator, command and control, which disturb signals within Groups 3 and 4;
- 481 • Group 3: Information technology: which disturb signals within Group 4;
- 482 • Group 4: Sensitive circuits: e.g. analog signalling, low level sensors.  
483

484 Cables of different groups shall not be in the same bundle (see the figure below, where power supply and  
485 telecommunications segregation meets the requirement of this clause).  
486

a) non-conformant

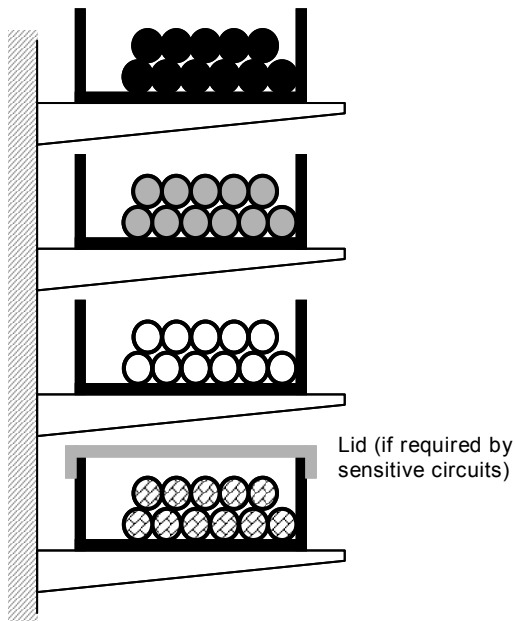


b) conformant



c) recommended

(order of compartments can be reversed)



- = mains power cabling
- = information technology cabling
- = auxiliary circuits (e.g fire alarm, door opener)
- ⊗ = sensitive circuits (e.g. measurement or instrumentation)

488 **9 Electrical wiring standards**

489 **9.1 CLC HD 60364-4-444**

490 For the purposes of consistency within this document, this clause uses the term “telecommunications” and “power  
491 supply” are used instead of “information technology” and “LV” as used in CLC HD 60364-4-444.

492  
493 Clause 444.6.2 of CLC HD 60364-4-444 states that where both the specification of the telecommunications cabling and  
494 its intended application is known, the requirements and recommendations of EN 50174-2 and EN 50174-3 shall apply.

495  
496 However, HD 60364-4-444 also provides guidance to the electrical wiring installer who has no knowledge of the  
497 telecommunications that is, or is to be, installed adjacent to the power supply cabling. In such cases, HD 60364-4-444  
498 adopts a similar table with the same boundary conditions for the screening performance of cable management systems  
499 as BS EN 50174-2 and states the cable separation distance as illustrated in the following table.  
500

Separation without electromagnetic barrier	Containment applied to information technology or mains power cabling		
	Open metallic containment	Perforated metallic containment	Solid metallic containment
200 mm	150 mm	100 mm	0 mm

501  
502 This simplistic approach is in line with the requirements of BS EN 50174-2 under a wide range of conditions including:

- 503
- 504 • the total current in the power supply cables does not exceed 600 A;
  - 505 • balanced cables have electromagnetic immunity performance in accordance with Category 5 and above,
  - 506 • coaxial cables have electromagnetic immunity performance in accordance with Category BCT-C;
  - 507 • the applications supported by the cabling are designed to operate using the telecommunications cabling installed or to be installed

508  
509 Many of the other requirements of BS EN 50174-2 are effected in HD 60364-4-444.  
510

511 **9.2 Future section 444 of BS 7671**

512 The UK implementation of this text, forming part of a future section 444 of BS 7671, modifies the table of clause 9.1 as  
513 shown below. In this case the UK implementation of the HD provides no special conditions for open metallic containment  
514 (effectively assuming that it has no screening performance).  
515

Containment applied to information technology or mains power cabling		
Separation without electromagnetic barrier or open metallic containment	Perforated metallic containment	Solid metallic containment
200 mm	100 mm	0 mm

516  
517

## 518 10 Bibliography

519

- EN 50117-4-1 *Coaxial cables. Sectional specification for cables for BCT cabling in accordance with EN 50173. Indoor drop cables for systems operating at 5 MHz - 3000 MHz*
- EN 50288-2-1 *Multi-element metallic cables used in analogue and digital communication and control -- Part 2-1: Sectional specification for screened cables characterised up to 100 MHz - Horizontal and building backbone cables*
- EN 50288-2-2 *Multi-element metallic cables used in analogue and digital communication and control -- Part 2-2: Sectional specification for screened cables characterised up to 100 MHz - Work area and patch cord cables*
- EN 50288-3-1 *Multi-element metallic cables used in analogue and digital communication and control -- Part 3-1: Sectional specification for unscreened cables characterised up to 100 MHz - Horizontal and building backbone cables*
- EN 50288-3-2 *Multi-element metallic cables used in analogue and digital communication and control -- Part 3-2: Sectional specification for unscreened cables characterised up to 100 MHz - Work area and patch cord cables*
- EN 50288-4-1 *Multi-element metallic cables used in analogue and digital communication and control -- Part 4-1: Sectional specification for screened cables characterised up to 600 MHz - Horizontal and building backbone cables*
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- EN 61000-6-2 *Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments*
- EN 61000-6-3 *Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments*
- EN 61000-6-4 *Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments*

520