HEALTH TECHNICAL MEMORANDUM 06

An overview seminar 13th MAY 2010 - presented by STEPHEN WILSON CENG FIHEEM FCIBSE MIET

IHEEM

CIBSE HEALTHCARE GROUP
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A BRIEF HISTORY
THE HTM HIERARCHY

HEALTH SPECIFIC DOCUMENTS

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13th May 2010
Electrical services
Health Technical Memorandum 06-01: Electrical services supply and distribution

Part A: Design considerations
The design should satisfy current standards

- Comply with British and relevant European standards
- Be appropriate for the location
- Be electrically safe
- Have sufficient capacity for the design load +
- Have appropriate resilience
- Control all unwanted interruptions / failures

The installation should

- Satisfy all relevant health technical memorandum
- Satisfy all relevant health building notes
- Satisfy all relevant health guidance notes etc
- Provide a safe means for operational maintenance
- Provide an environment for continuous clinical functions
- Provide an environment for continuous business delivery
# NON CLINICAL AND BUSINESS CONTINUITY RISK CATEGORY

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<td>BUILDING SERVICES ENVIRONMENTAL CONTROL</td>
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# PATIENT CLINICAL RISK CATEGORY

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### Risk of Electrical Failure by Infrastructure

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<td>MODERATE</td>
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<td>Special Medical Location</td>
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<td>SIGNIFICANT</td>
<td>MODERATE</td>
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<td>LOW</td>
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<td>Emergency Care and Diagnostics</td>
<td>MODERATE</td>
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<td>MODERATE</td>
<td>LOW</td>
<td>RESIDUAL</td>
</tr>
<tr>
<td>Ambulatory Care and Diagnostics</td>
<td>MODERATE</td>
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<td>LOW</td>
<td>RESIDUAL</td>
</tr>
<tr>
<td>Support Services Circulation</td>
<td>LOW</td>
<td>LOW</td>
<td>RESIDUAL</td>
<td>RESIDUAL</td>
<td>RESIDUAL</td>
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Electrical services
Health Technical Memorandum
06-01: Electrical services supply and distribution

Part A: Design considerations
The PES will be connected to the Primary Source Intake Sub Station at 400V 3ph 50hz / 230V 1ph 50Hz

Health Care Premises such as large off site clinics, off site administration, stores and or decontamination centres will have a 3ph connection. GP and dental practices and or small off site clinics (less than say 300m² GIFA) will require a 1ph connection.

There may be an internal primary low voltage ring distribution or a network of low voltage radial circuits.

The low voltage primary distribution should provide suitable circuits to reflect the patient clinical risk areas and business continuity risk areas.

The PES will be connected to the Primary Source Intake Sub Station at 11kV 3ph 50hz. The I.S.S may be owned and operated by the DNO or by the Trust

There may be an internal primary high voltage ring distribution or a network of high voltage radial circuits. Where the Health Care Premises is between say 5500m² and 8500m² a single 11kV substation would be appropriate. Where the premises are greater than 8500m² GIFA an internal high voltage network may be required.

The high voltage primary distribution should provide suitable circuits to support the low voltage network.
SECONDARY SUPPLY

SECONDARY SUPPLY SCHEMATIC

SECONDARY SUPPLY

LOW VOLTAGE (0.4kV) RESILIENT CONNECTION

Secondary Sources of Supply are typically at low voltage where they may include

- Generators
- Uninterruptable Power Supplies
- PV Cells
- Wind Turbines
- A combination of the above

The secondary Source of Supply may require resilience taken cognisance of the risk categories

- Risk Category <= 3  Resilience = N or N + 1 based on plant size
- Risk Category > 3    Resilience = N + N based on plant capacity i.e. 3 units at 50% full duty

HIGH VOLTAGE (11kV) RESILIENT CONNECTION

Secondary Sources of Supply may be at high voltage where they may include

- Generators
- Uninterruptable Power Supplies
- Multiple PES connections for a Trust’s common network
- A combination of the above

Where the Secondary Source of supply is another PES connection, such connections could be

- Dual Dedicated Connection
- Dual Shared Connection
- One Dedicated and one Shared Connection

The Trust will have greater authority / control with embedded secondary sources of supply.

The secondary Source of Supply may require resilience taken cognisance of the risk categories as described in the low voltage section above.
DISTRIBUTION NETWORKS TO REDUCE RISKS
The HV network here, consists of a single radial circuit to three sub stations. The network may be appropriate for a hospital with many buildings on one site. Most likely to be a large hospital site where the risk categories are <= 3, for example a mental health / mental illness Hospital. An appropriate Secondary Source of Supply, if required, may be local low voltage generators connected at the low voltage switchboard of any sub station.

The HV network here, consists of three separate radial circuits each with one sub station. The network may be appropriate for a large general acute hospital. Most likely to be a large hospital site where the risk categories are 3 / 4. An appropriate Secondary Source of Supply, may be local low voltage resilient generators connected at the low voltage switchboard of any sub station. In the case of sub station 2, the generators may be connected on both sides of the bus coupler.
FINAL SUB CIRCUITS TO REDUCE RISKS
1 Support Services

The electrical services will in general, be general sockets, cleaners sockets safety and security items. Resilient circuits may not be required as these areas are not intended as patients therapy areas. Hence a unified distribution and single final sub circuits would be appropriate and give a low risk to the patient environment. Secondary sources of supply (HV or LV) would only be advantageous if the area is adjacent to areas of clinical risk category 3 or above, which would then reduce the clinical risk to a residual risk.
2 Ambulant Care and Diagnostics

The electrical services will in general be general sockets, cleaners sockets safety and security items. There may be some medical equipment used to understand patients wellbeing such as ultrasound. Resilient circuits and interleaved final sub circuits may be beneficial where the areas include patient environments with medical equipment connected to (or in) the patients body. In such cases the clinical risk would be moderate. Secondary sources of supply (HV or LV) may be advantageous, particularly if the area is adjacent to areas of clinical risk category 3 or above which would then reduce the clinical risk to a residual risk.
3 Emergency Care and Diagnostics
The electrical services will in general be general sockets, cleaners sockets safety and security items. There will be some medical equipment used to understand patients wellbeing such as fluoroscopy PET scanners. Resilient circuits and interleaved final sub circuits will be beneficial where the areas include patient environments with medical equipment connected to (or in) the patients body. Any interruption of the electrical supply should be limited to 15 seconds. Consequently secondary sources of supply (HV or LV) should be provided. The Normal Supply and Secondary Supply may both be unified sub mains or dual sub mains Final sub circuits for equipment may be derived from different switchboards providing resilient equipment supplies. The clinical risk would then be moderate to low. Having resilient secondary power supply plant – due to other department requirements, may reduce the clinical risk to residual
4 Special Medical Locations
The electrical services will in general be general sockets, cleaners sockets safety and security items. Resilient circuits may not be required as these area are not intended as patients therapy areas These areas will relate to Patient Environment **Group 1** under Ch 10 in IEE Guidance Note 7. Patients may have electro-medical equipment electro-medical monitoring or medical test equipment connected to the patients body for a prolonged period. Clinical treatment and patient safety may be compromised but not endangered) by an interruption of electrical supply. Any interruption of the electrical supply should be limited to 15 seconds and possible 0.5 seconds in some patient environments. Consequently secondary sources of supply (HV or LV) should be provided and supported by tertiary supplies in certain areas. The Normal Supply and Secondary Supply may be dual sub mains. Final sub circuits for equipment may be derived from different switchboards providing resilient equipment supplies. Two ring circuits would be appropriate in each patient location. This will provide a residual clinical risk.

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5 Life Support and Complex Surgery
The electrical services will in general be general sockets, cleaners sockets safety and security items. Resilient circuits may not be required as these area are not intended as patients therapy areas These areas will relate to Patient Environment Group 2 under Ch 10 in IEE Guidance Note 7 Patients may have electro-medical equipment electro-medical monitoring or medical test equipment connected to the patients body for a prolonged period. Clinical treatment and patient safety may be compromised but not endangered) by an interruption of electrical supply. Any interruption of the electrical supply should be limited to 0.5 seconds in some patient environments and 15 seconds to other patient areas. Consequently secondary sources of supply (HV or LV) should be provided and supported by tertiary supplies in certain areas. Final sub circuits for equipment may be derived from different switchboards providing resilient equipment supplies. Patient environments requiring IPS circuits should have two independent circuits to each bed head. This will provide a residual clinical risk.
IPS/UPS high-security supply arrangements

Secondary power source (SPS) Primary power source (PPS)

UPS

Medical isolation transformer
IEC61558-2, 15, IEC60364-7-710 typically 8 kVA

ICU remote alarm
IEC60964-7-710

Typical clinical risk area category 5 medical IT system to IEC60364-7-710

Protective earth Link

Supplementary equipotential earth bar

B20 double pole MCBs

Medical IT system radial 13 Amp socket-outlet sub-circuit distribution max 24 sockets per sub-circuit

Bed 1 13A sockets (50%)
Bed 2 13A sockets (50%)
Bed 3 13A sockets (50%)
Bed 4 13A sockets (50%)
Bed 5 13A sockets (50%)

Bed 1 13A sockets (50%)
Bed 2 13A sockets (50%)
Bed 3 13A sockets (50%)
Bed 4 13A sockets (50%)
Bed 5 13A sockets (50%)

Medical IT system socket-outlet circuit PE connections

Pendant 1
Pendant 2
Pendant 3
Pendant 4
Pendant 5
Pendant 6

Bed 1 13A sockets
Bed 2 13A sockets
Bed 3 13A sockets

TN-S system socket-outlet circuit PE connections

Standard TN-S 13A socket-outlet sub-circuits

Extraneous metalwork
Taps & pipes

Protective earth

PE

Socket-outlet distribution circuits for the supply of medical electrical equipment, medical systems intended for life support, complex surgical applications and patient monitoring and other electrical equipment in the patient environment, excluding that listed under TN-S socket-outlet circuits

Socket-outlets for X-ray, electric bed and all other non-critical electrical equipment (non-life support)

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GOODBYE!