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Rules or Handbooks or Guidelines

EDH Part 2: Terminology & Acronyms

Part 2 of the ITER Electrical Design Handbook - Terminology & Acronyms

The ITER Electrical Design Handbook (EDH) compiles the technical requirements to be satisfied by all electrical components to be used or installed in the ITER Facility. In particular the codes and standards to follow, specific requirements for earthing and Electromagnetic Compatibility and other applicable requirements depending on which ITER electrical power supply system to be used.

Note * - The EDH is addressed primarily to specifiers, designers and users of all ITER systems comprising electrical components. In addition, the specifiers, designers and users of ITER electrical power supply systems shall comply with many other standards, instructions and industrial practices that are beyond the scope of the EDH.

Approval Process			
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Change Log			
EDH Part 2: Terminology & Acronyms (2E8QVA)			
Version	***Latest Status***	***Issue Date***	***Description of Change***
v1.0	In Work	16 May 2008	Part 2 of the revised ITER Cadarache relevant Electrical Design Handbook
v1.1	Signed	02 Sep 2008	Part 2 of the revised ITER Cadarache relevant Electrical Design Handbook
v1.2	Signed	29 Jul 2009	New IDM document template and additional content
v1.3	Signed	31 Jul 2009	Added further terminology from DWO
v1.4	Approved	15 Sep 2009	This is an initial version of this document that has been reviewed in accordance with the ITER MQP. Review comments have in part been addressed and others will be considered in detail and addressed at the next revision.
v1.5	Approved	25 Jul 2025	Minor modification to add the definition for "Electrical Enclosures"

Contents

1 Terminology

This part of EDH outlines the terminology adopted by the ITER Organization for specific electrical components, devices or systems.

For components, devices and systems not covered by this document, the following references shall be considered to identify the proper terminology:

1. IEC dictionaries and glossaries (http://www.electropedia.org)

2. Electrical Installations Handbook, Executive Editor: Gunter G. Seip, John Wiley and Sons, ISBN 0-471-40435-6

In case of inconsistency between the above documents, requests for clarification shall be submitted to the ITER Electrical Engineering Division.

The ITER Organization has adopted the International System of Units, universally known as the **SI** (from the French *Système International d'Unités*), see http://www.bipm.org/en/si/si_brochure. The SI prefixes are given in the table below:

Factor	Name	Symbol		Factor	Name	Symbol
10^{1}	deca	da		10^{-1}	deci	d
10^{2}	hecto	h		10^{-2}	centi	c
10^{3}	kilo	k		10^{-3}	milli	m
10^{6}	mega	M		10^{-6}	micro	μ
10^{9}	giga	G		10^{-9}	nano	n
10^{12}	tera	T		10^{-12}	pico	p
10^{15}	peta	P		10^{-15}	femto	f
10^{18}	exa	E		10^{-18}	atto	a
10^{21}	zetta	Z		10^{-21}	zepto	z
10^{24}	yotta	Y		10^{-24}	yocto	y

Table 1.1 SI Prefixes

1.1 Main Definitions from IEC Standards

1.1.1 Nominal System Voltage

The voltage by which a system is designated.

1.1.2 Rated Voltage/Current of Equipment

The voltage/current assigned generally by a manufacturer, for a specified operating condition of a component, device or equipment.

1.1.3 Highest System Voltage

The highest value of voltage which occurs under normal operating conditions at any time and any point on the system. It excludes voltage transients, such as those due to system switching, and temporary voltage variations.

1.1.4 Highest Voltage for Equipment

The highest rms value of phase-to-phase voltage for which the equipment is designed in respect of its insulation as well as other characteristics which relate to this voltage in the relevant equipment standards.

The highest voltage for equipment is the maximum value of the "highest system voltage" (see above) for which the equipment may be used.

1.1.5 Insulation Coordination

The selection of the dielectric strength of equipment in relation to the voltages which can appear on the system for which the equipment is intended and taking into account the service environment and the characteristics of the available protective devices. The process is determined from the known characteristics of voltage surges and the characteristics of surge arresters.

1.1.6 The Standard Short-Duration Power Frequency Voltage

A sinusoidal voltage with frequency between 48 Hz and 52 Hz, and duration of 60 s. The voltage level is determined for specific tests.

1.1.7 The Lightning Impulse Voltage

An impulse voltage having a front time of 12 μs and a time to half-value of 50 μs. The voltage level is determined for specific tests.

2 Common Definitions Adopted for ITER

2.1.1 AC/DC Charger

A battery charger converting alternating current (AC) power into DC power, being the converter section of a UPS which charges batteries and supplies DC to the inverter.

2.1.2 Batteries

One or more cells fitted with devices necessary for use, for example case, terminals, marking and protective devices. A battery stores and supplies electrical energy to an electrical circuit when the normal power supply of that electrical circuit is interrupted.

2.1.3 Busbar

Conductors fabricated from thick strips of copper or aluminium to conduct electricity within a switchboard, distribution board, substation, or other electrical apparatus.

2.1.4 Bus Coupler

Inbuilt mechanical interlocking which connects busbar systems, where position change is via the OFF position, ensuring downstream distribution in case of failure of upstream lines. In a substation a circuit-breaker located between two busbars and which permits the busbars to be coupled; it may be associated with selectors in case of more than two busbars

2.1.5 Cable

Assembly of one or more conductors and/or optical fibres, with a protective covering and possibly filling, insulating and protective material

2.1.6 Cable Tray

a unit or assembly of units or sections and associated fittings forming a rigid structural system used to securely fasten or support cables and raceways. Cable trays are used to support and distribute cables.

2.1.7 Circuit Breaker

A switching device, capable of making, carrying and breaking currents under normal circuit conditions and also making, carrying for a specified time and carrying for a specified time during abnormal circuit conditions such as a short circuit.

2.1.8 Converter

A functional unit which changes the representation of information. Examples of converters are: analog-digital converter, digital-analog converter, code converter, parallel-serial converter, serial-parallel converter.

2.1.9 Current Transformer

A device that reduces current values at a point in a network where they are connected, to proportional and manageable values, whilst separating measuring instruments, meters, relays, etc. from the medium or low voltage circuit.

2.1.10 Diesel Generator

A diesel generator is the combination of a diesel engine with an electrical generator (often called an alternator) to generate electrical energy. Diesel generating sets are used as emergency power-supply if the grid fails. There are four 6.6kV diesel generator sets, two seismic qualified to feed SR loads and two non-seismic qualified for IP loads.

2.1.11 Disconnector

A mechanical switching device which provides, in the open position, an isolating distance in accordance with specified requirements. A Mechanical switching device which, in the open position, disconnects all the poles of an electrical circuit and is equipped with a reliable contact position indicator. A closed disconnector is capable of carrying currents under normal circuit conditions and carrying for a specified time currents under abnormal conditions such as those of short circuit.

2.1.12 Earth Switch

Mechanical switching device for earthing parts of an electrical circuit, capable of withstanding for a specified duration, electric currents under abnormal conditions such as those of a short-circuit, but not required to carry electric current under normal conditions of the electrical circuit

2.1.13 Electrical Enclosure

At ITER, the term "Electrical Enclosures" gathers the main active electrical/I&C components (i.e. components that require power supply) and protective housings listed below, it corresponds to the components for which TTT codes are the following:

- BP: Board distribution
- BP : Distribution panel
- CMC: Control Motor Cubicle
- CNP: Central I&C Network Panel
- CR: I&C Cabinet box (wall mounted)
- CU: I&C Cubicle (floor mounted)
- VFD: Variable frequency Drive
- PSU: Power supply unit

2.1.14 Electrical Enclosure for centralized control/power

The electrical enclosures for centralized control/power are the components defined in section 2.1.13 which are used to provide electrical power or I&C services to multiple PBSs. Such electrical enclosures belong in the ITER project to PBS 43 (Steady State Electrical Network) and PBS 48 (Central Safety System)

2.1.15 Electrical Interlock

Type of circuit in which the auxiliary contacts of various devices are switched in such a ways that the circuit states are interdependent. This makes it impossible to switch on one switching device if another is already switched on.

2.1.16 Insulators

A device designed to support and insulate a conductive element. A device intended for electrical insulation and mechanical fixing of equipment or conductors which are subject to potential differences.

2.1.17 Inverter

Electrical energy converter that changes direct current to single-phase or polyphase alternating current

2.1.18 Load Centre

The load voltage load centres are connected to the secondary 22 kV distribution switchgear through the MV/LV transformers.

They are mainly used at the load level. They are used for:

- Protecting persons and property
- Protecting electrical loads
- Protecting cables and electric lines
- Overvoltage protection
- Safety disconnection
- Monitoring and signalling
- Open and closed-loop control
- Metering, measuring and display purposes

This load centres are composed of:

- Incoming circuit breakers and coupler circuit breaker (interlocked function)
- 400V copper strip semi-busbars.
- Outgoing draw-out circuit breakers to the Local Panels and MCC.

2.1.19 Load Tap Changer

The on-load tap changer is used to change the tapping connection of the transformer winding while the transformer is energized. A connection made at some intermediate point in a winding. It is used to control the voltage over the SSEN

2.1.20 Main Busbar

The busbar is an assembly necessary to make a common connection for several circuits. A low-impedance conductor, to which several electric circuits can be connected

2.1.21 Main Distribution Board

Assembly containing different types of switchgear and control gear associated with one or more outgoing electric circuits fed from one or more incoming electric circuits, together with terminals for the neutral and protective conductors.

They are used for up 6300 A. They are used first and foremost for:

- Safety disconnection
- Coupling busbar sections
- Protecting busbars
- Selectivity vis-à-vis upstream protection equipment

They are primarily equipped with:

- Circuit-breakers and non-automatic circuit-breakers
- Tie circuit-breakers
- Fuses

2.1.22 Motor Control Centre

MCC is a low-voltage withdrawable-unit-type switchgear station for motor feeders with a main switch and door interlock. The MCC will consist of individual cubicles housed in the correspondent switchgear placed as close as possible of the LV motors zone. The MCC shall include:

- Motor protection systems.
- Monitoring & Control devices.
- Starter devices if applicable.

2.1.23 Outlet/Connector

Device which provides connection and disconnection to a suitable mating component. Conductor of electricity used for carrying current between components in an electric circuit

2.1.24 Penetration

A cable transit assembly designed to implement safely the passage of cables lines through walls , floors or ceilings of areas with various environmental conditions, maintaining their integrity

2.1.25 Soft Starters

The combination of the switching means necessary to start and stop a motor in combination with suitable overload protection.

2.1.26 Raceway

An enclosed channel of metallic or non-metallic materials designed expressly for holding wires, cables or busbars. Examples are electrical metallic tubing (EMT), flexible metallic tubing and non-metallic rigid conduit.

2.1.27 Relay

Switching device which brings about sudden predetermined changes in one or more electric output circuits when specific conditions that control the device arise in the electric input circuit.

2.1.28 Sockets

Connector attached to an apparatus or to a constructional element or the like. Contact members of a socket may be socket contacts, pin contacts or both.

2.1.29 Static Transfer Switch

Device which transfers load automatically and without disturbance between inverter and utility power

2.1.30 Sub-Distribution Board

Part of an electrical installation for distributing energy to downstream loads or groups of loads

They are used up for 2500 A. They are used for:

- Safety disconnection
- Switching electrical loads, e.g. lighting systems and motors
- Protecting cables, electric lines and loads
- Back-up protection and selectivity vis-à-vis upstream and downstream protection equipment
- Overvoltage protection
- Control, metering and measuring purposes

The following devices are integrated in order to carry out these functions:

- Circuit-breakers, switch-disconnectors and fuse switch-disconnectors.
- Miniature circuit-breakers
- Fuses
- Modular built-in equipment for control, metering and measuring purposes

2.1.31 Surge Arrester

A protective device designed primarily for connection between a conductor of an electrical system and earth to limit the magnitude of transient overvoltages on equipment.

2.1.32 Switchgear

Electrical equipment switching devices for the purpose of carrying out one or more of the following functions: protection, control, isolation, switching and their combination with associated control, measuring, protective and regulating equipment Also assemblies of such devices and equipment with associated interconnections, accessories, enclosures and supporting structures, intended in principle for use in connection with generation, transmission, distribution and conversion of electric energy.

2.1.33 Transformers

A device that is used to change the voltage in an alternating current (AC) circuit. Three kinds of transformers are identified taking into account the voltage level: The four main step down transformers which transform from HV (400 kV) to MV (22 kV) Oil transformers, which transform from MV (22 kV) to MV (6.6 kV) and located outside of buildings and dry transformers which transform from MV (6.6 kV) to LV (0.4 kV) and located inside buildings.

2.1.34 UPS

An uninterruptible power supply (UPS) system is designed to provide conditioned power which offsets the effects of adverse normal power. A static UPS consists of:

- a battery to provide continuous source of electrical power;
- a rectifier/charger to maintain battery charge and to provide input to inverter when utility power is available;
- an inverter to provide power to load during normal operation;
- a static switch ,to transfer load automatically and without disturbance between inverter and utility power,
- a manual switch to bypass the static switch for maintenance;
- input and output isolation transformers and filters to provide appropriate isolation and disturbance attenuation; and monitors, sensors, and control circuits.

2.1.35 Voltage Transformers

These reduce the voltage values from the point in the network where they are connected to proportional and manageable values, whilst separating measuring instruments, meters, relays etc. from the medium or low voltage circuit.

3 Acronyms

A complete list of Acronyms used within ITER Organization is available at ITER Abbreviations (ITER_D_2MU6W5), here follows a list of those frequently used in EDH:

AC	Alternating Current
BO	Blackout
CB	Circuit Breaker
CC	Control Cubicle
CD	Current Drive
CMF	Common Mode Failure
CT	Current Transformer
CWS	Cooling Water System
D/G	Diesel Generator
DC	Direct Current
DDD	Design Description Document
DP	Distribution Panel for 400 V loads located within buildings
EDG	Emergency Diesel Motor Generator
EHV	Extra High Voltage, > 275 kV, not used at ITER
ELV	Extra Low Voltage, <50 V_{rms} or < 120 V DC (IEC Definition)
EM	Electromagnetic
EPS	Emergency Power Supply
EPSS	Emergency Power Supply System
FDS	Fire Detection and alarm System
FFS	Fire Fighting System

FO	Fibre Optic
FPS	Fire Protection System
FSS	Fire Suppression System
H&CD	Heating & Current Drive
HV	High Voltage, > 1000 V_{rms} or > 1500 V (IEC Definition), 400 kV level on ITER
HVAC	Heating, Ventilation and Air Conditioning
HVDC	High Voltage Direct Current
I&C	Instrumentation and Control
IAEA	International Atomic Energy Agency
ICD	Interface Control Document
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IET	Institution of Engineering and Technology
IO	ITER Organization
IP	Investment Protection
IPEG	Integrated Plant Earth Grid
IV	Intermediate Voltage, 66 kV level on ITER
LC	Load Centre
LCC	Local Control Cubicle
LEP	Local Electrical Panel
LOSP	Loss of Off-Site Power
LTM	Construction/Long Term Maintenance
LV	Low Voltage, 5 – 1000 V_{rms} or 120 – 1500 V DC, 400 V level on ITER
MCC	Motor Control Centre
MP	Main 400V Distribution Panel located in LC
MPCB	Magnet Power Conversion Building
MPSSN	Magnet Power Supply Switching Network
MV	Medium Voltage, 6.6 kV and 22 kV levels on ITER
NBI	Neutral Beam Injection
NBPS	Neutral Beam Power Supply
OL	Ordinary Load
P&ID	Process and Instrumentation Diagram
PA	Procurement Arrangement
PBS	Plant Breakdown Structure
PEC	Prefabricated Electric Centre
PF	Power Factor
PHTS	Primary Heat Transport System
PID	Proportional, Integral and Differential Control

PID	Project Integration Document
PINI	Positive Ion Neutral Injector
PLC	Programmable Logic Controller
POS	Pulse Operation State
PP	Procurement Package
PPEN	Pulsed Power Electrical Network
PS	Power Supply
PSH	Plant System Host
QA	Quality Assurance
RCC-E	Règles de Conception et de Construction des matériels Electriques des îlots nucléaires
RF	Radio Frequency
RPC	Reactive Power Compensation
RPC&HF	Reactive Power Compensation and Harmonic Filtering system
RTE	Réseau de Transport d'Electricité (French Transmission Grid Operator)
SCADA	Supervisory Control And Data Acquisition
SCS	Supervisory Control System
SF6	Sulphur Hexafluoride
SIC	Safety Important Component
SIC	Safety Important Classification
S-ICD	System Interface Control Document
SR	Safety Relevant
SRD	System Requirements Document
SSEN	Steady State Electrical Network
SSPD	Steady State Power Distribution
SSS	Steady State 400 kV Substation
STM	Short term Maintenance
STS	Short Term Standby
TBC	To Be Confirmed
TBD	To Be Defined
TCR	Thyristor Controlled Reactor
TCS	Test and Conditioning State
UPS	Uninterruptible Power Supply
VT	Voltage Transformer
WBS	Work Breakdown Structure

4 Reference and Bibliography

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