



Technical Standard

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Mondi AG.
Mondi Standard Harmonization
BUILDING ELECTRIFICATION AND LIGHTING

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Distribution

Mondi, AFRY

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ABBREVIATIONS

AC	Alternative Current
ANSI/ISA	American National Standards Institute / International Society of Automation
ATEX	ATmosphères EXplosibles, explosive atmospheres
CE	Conformité Européenne, European conformity
CRI	Color Rendering Index
CENELEC	European Committee for Electrotechnical Standardization
DALI	Digital Adressable Lighting Interface
DIN	Deutsches Institut für Normung, German Institute for Standardization
dwg	AutoCAD format
EB	Equipotential bonding bars
e.g.	exempli gratia, for example
EC	European Commission
EIA	Electrical, Instrumentation and Automation
EMC	Electromagnetic Compatibility
EN	European Standard
etc.	et cetera, and other similar things
EU	European Union
EU-MEPS	European Minimum Energy Performance Standard
Ex-area	Explosive area
FE	Functional Earth
HMI	Human-Machine Interface
HV	High Voltage
i.e.	id est, that is
IEC	International Electrotechnical Commission
IP	Ingress Protection
ISO	International Organization for Standardization
LED	Light-Emitting Diode
LV	Low Voltage
MCC	Motor Control Center
MCS	Machine Control System

MEB	Main equipotential bonding bars
MV	Medium Voltage
PE	Protective Earth
PED	Pressure Equipment Directive
PLC	Programmable logic controller
PWM	Pulse Width Modulation
SWG	Switchgear
TN-S	Terra Neutral Separate
UPS	Uninterruptible Power Supply
VAC	Volts Alternative Current
VDC	Volts Direct Current
VFD	Variable-Frequency Drive
VSD	Variable Speed Drive

1 GENERAL

The purpose of this standard is to specify to the Machine Supplier, Engineering Company, Electrical Supplier and Electrical Installation Contractor the general principles of lighting. Deviations from these instructions are permitted only by separate agreement.

2 NORMS AND STANDARDS

2.1 General

The Electrical Contractor (Supplier) shall carry out the lighting Installation in each mill area/department, based on the quantities of material and equipment, as listed and described in detail in separate installation enquiries.

The Supplier can propose alternative equipment and systems deviating from this standard if technically and/or economically justified.

However, the deviations shall be clearly specified, and they will not be accepted without Purchaser's written approval.

The Purchaser reserves the right to select the manufacturer of installation material.

Related, project and mill -specific standards are:

- Numbering and Identification System for Electrification and Automation
- Cabling and Marking Instruction for Electrification and Automation

The installation and equipment must comply with the requirements of current local laws, regulations and safety instructions.

The installation and equipment shall comply with the Project Electric, Automation and Instrumentation Standards.

The electrical equipment shall conform to applicable IEC standards. Any deviations shall be mentioned in the tender.

The Supplier shall carry out any modifications requested by authorities, free of charge.

The equipment shall fulfil the requirements of the PED (Pressure Equipment Directive (2014/68/EU)).

The equipment which is installed to ATEX area shall fulfil the requirements of the standard IEC 60079-14:2013 (Explosive atmospheres - Part 14: Electrical installations design, selection and erection).

2.2 Codes and Regulations

The equipment and installation shall comply with the following standards, regulations and instructions:

- Local authorities' regulations and recommendations
- Laws and regulations currently in force in the current country, especially:
 - 250/2021 Sb. „Zákon o bezpečnosti práce v souvislosti s provozem vyhrazeným technických zařízení a o změně souvisejících zákonů“
 - NV 190/2022 Sb. „Nařízení vlády o vyhrazených technických elektrických zařízeních a požadavcích na zajištění jejich bezpečnosti“
 - NV 194/2022 Sb. „Nařízení vlády o požadavcích na odbornou způsobilost k výkonu činnosti na elektrických zařízeních a na odbornou způsobilost v elektrotechnice“
- EU norms and directives (Machine, PED, EMC, Low Voltage, ATEX, etc.)
- Project instructions
- Mondi standards
- Mill instructions
- IEC recommendations
- Mondi OT Security Policy

Mondi standards:

- MG0001 General Mill Specifications Summary
- MEIA0001 Electrical, Automation and Instrumentation Instructions for Equipment and Machinery Suppliers
- MEIA0002 Recommended Manufacturers for Electrical and Instrument Equipment

- MEIA0003 Design Criteria For Instrumentation and Automation
- MEIA0004 Electrical Design Criteria
- MEIA0005 Cable standard
- MEIA0006 Implementation Procedure for Safety Related Systems (SRS)
- MEIA0007 Instrument and Automation Installation Standard
- MEIA0008 Electrical Installation Standard
- MEIA0009 Implementation Procedure for Control Systems (DCS, MCS) and FAT
- MEIA0010 Implementation Procedure for Quality Systems (QCS, Web Break System, Web Inspection System, Vibration Monitoring System)
- MEIA0011 Control Systems Process Interfacing Standard
- MEIA0012 DCS and MCS programming standard
- MEIA0013 Earthing and Lightning Protection Standard
- MEIA0014 Building Electrification and Lighting
- MEIA0015 Operational Technology Information and Communication Technology (ICT) standard
- MEIA0016 Implementation Procedure for electrification, automation and instrumentation checkouts and cold commissioning
- MM0002 Piping Standard (Process connections for instrumentation)

3 PRINCIPLE OF DISTRIBUTION

3.1 General

The normal 400V, standby and UPS power distribution will be specified on a single line diagram.

3.2 Power Distribution

Voltage system:

- Lighting TN-S, 400/230 V, 50 Hz, solidly earthed
- Lighting control, 230 V AC
- Standby lighting TN-S, 400/230 V, 50 Hz, solidly earthed
- Maintenance outlets TN-S, 400/230 V, 50 Hz, solidly earthed

3.3 Lighting and Maintenance Panels

They shall be of wall mounting metal enclosed type or plastic thermosetting, suitable for back-to-wall mounting or floor or plinth / foundation. Wire ways shall be provided between sections. Cables shall enter from the bottom unless otherwise indicated. Enclosure class shall be as specified.

The internal construction shall be of modular type with the components mounted on a plate for easy replacement.

A general example of a lighting panel can be found in appendix III. Their locations are shown on the layout drawings.

Technical Data for Lighting Panels

Rated voltage	V	400/230 V
Rated frequency	Hz	50
Bus bar amps horizontal	A	630, 400, 250, 125, 63, 40
Short circuits strength – peak withstand current	kA	10.5-40 kA
Earthing system	solidly earthed	

Short circuit current: there are only typical values, the sort circuit current must minimum correspond to the calculated value.

Lighting sub-boards shall have 20 % equipped spares and 15 % empty reserve space.

3.4 Lighting Groups

For process areas each fixture shall be provided with a plug, socket outlet/connector and junction box supplied by the cable. The fixture shall be supplied with $3 \times 2.5 \text{ mm}^2$ flexible cable, from this junction box to a socket outlet/connector. Plugs shall not be used with emergency lighting fixtures.

The lighting groups will be fed from sub-boards located in electrical rooms or process areas.

Sub-boards will be fed normally with 40 A to 630 A feeders from the main lighting boards.

4 LIGHTING LEVELS

Sufficient lighting will be provided to enable operators to circulate freely and safely within the accessible areas. The lighting provisions will be generally as below and when measured 1 meter from the floor or on the floor as appropriate, the average illumination will not vary by more than minus 25% or plus 60%.

The requested values if not overruled by local regulations over the lamp life are (after 2 years):

- Offices	500 lx
- Control rooms	500 lx
- Process areas, operation activates	300 lx
- Paper machine operation floor in general	500 lx
- Operating floor	500 lx
- Process areas, passage	200 lx
- General access and stairs	150 lx
- Workshops	600 lx
- Storages	300 lx
- Chemical off-loading	200 lx
- Compressed air centres	300 lx
- Conveyours and conveyours tunnels	200 lx
- Electrical and automation rooms	350 lx
- Instruments and panel areas	500 lx

- Cable rooms, transformer bays	200 lx
- Ventilation rooms	200 lx
- Locker rooms, etc	300 lx
- Mill site general	20 lx
- Mill site roads	10-35 lx
- Outdoors operational areas	150 lx
- Tanks and walk ways	50 lx
- Emergency lighting: escape route lighting	min. 1 lx
- Emergency lighting: emphasized areas (eq. emergency exit, fire, etc.)	min. 5 lx

Color temperature (Kelvin) level shall be 4000K-6000K and color rendering index (CRI) level shall be >80.

Lighting shall be designed to be suitable for video surveillance system.

More detail minimum illumination levels and illuminance uniformity are in according with standards EN12464.

These figures shall be valid after two years of operation. Due to the deteriorating nature of luminaries, the measured lighting levels shall be essential higher in the beginning.

In some cases, supplementary localized lighting may be necessary. If necessary, it is possible to use higher lighting levels for the working places (localized lighting).

The areas, where it is necessary to use other values than those recommended, will be handled separately.

5 INSTALLATION INSTRUCTIONS

5.1 General

The Purchaser's intention is to install the lighting as soon as structural and civil construction conditions allow.

The purpose of this section is not to specify in detail but to describe generally the equipment and material to be installed.

5.2 Lighting in Separate Rooms

LED lighting fixtures will be used for special rooms such as electrical rooms, offices and control rooms.

Emergency (Exit lights) lighting by the exit doors will be lit with emergency lighting system.

Sub-boards will be fed normally with 63A feeders from the main lighting boards.

The lighting groups will be fed from sub-boards located at operating floors or in electrical rooms.

5.2.1 Lighting in Electrical Rooms and Socket Outlets

Lighting in the electrical rooms shall be made by using LED lighting fixtures. These fixtures shall be installed on the lower surface of the light trunk. There shall be pushbuttons and socket outlets next to the entrance doors.

5.2.2 Lighting in Cable Rooms and Socket Outlets

Lighting in the cable rooms shall be made by using LED lighting fixtures. These fixtures shall be installed directly to the surface of the concrete. Cable rooms shall be equipped with the timer (stair light) or motion detector. Socket outlets shall be installed next to the entrance doors or other places suitable for installation. doors.

5.2.3 Lighting in Rack Rooms and Socket Outlets

Lighting in the rack rooms shall be made by using LED lighting fixtures. These fixtures shall be installed on the lower surface of the light trunk. There shall be pushbuttons and socket outlets next to the entrance doors.

5.2.4 Lighting in Control Rooms and Socket Outlets

Lighting in the control rooms shall be made by using flush mounted LED lighting fixtures. The lighting in the control room shall be equipped with dimming. The special attention shall be paid to avoid glaring. Electrical and data socket outlets shall be installed in wall trunk and /or floor boxes. Emergency and UPS power will be used to supply electricity to the socket outlet groups in the control rooms.

5.2.5 Lighting in Office Rooms and Socket Outlets

Lighting in the office rooms shall be made by using flush mounted LED lighting fixtures. The special attention shall be paid to avoid glaring. Electrical and data socket outlets shall be installed in wall trunk and /or floor boxes.

5.2.6 Lighting in Ventilation and Hydraulic Rooms

Lighting in the ventilation and hydraulic rooms shall be made by using LED lighting fixtures. These fixtures shall be installed on the lower surface of the light trunk. There shall be pushbuttons and socket outlets next to the entrance doors.

5.2.7 Lighting in Process Areas

High bay lighting fixtures (LED) shall be installed by attaching them to pre cast hollow core slabs where applicable. The fixtures shall be installed while the slab is on the ground, and the complete slab shall then be hoisted into place. See Appendix I.

Low bay lighting (LED) installation works shall be done by using chains of 5 m length. During the mechanical erection period (piping etc.) the fixtures are lifted up

just under the ceiling. Afterwards they will be sunk to a position below the pipes. During that period the lighting groups shall be fed with temporary homerun (from the nearest temporary distribution panel). The work will be done by using “sky lifts”.

The lighting groups shall be provided with DALI lighting system, using motion detectors and daylight sensors.

In process areas with camera surveillance, the lighting level can hardly be reduced. This must be taken into account in the Dali system.

5.3 Road Lighting

The main and secondary roads will be provided with standard pole mounted road lights on elevated concrete foundations. The fixture itself shall be LED lighting fixtures, enclosure IP54 and the pole shall be 10m high, steel poles for permanent installation. Every pole shall have its own fuse (switch breaker B6A for one lamp acceptable) and terminals for supply cables minimum 10mm² if not other size stated with network calculation.

The cabling between the poles will be min. 10mm² for CU or 16 mm² for Al (due to voltage drop and fault protection*) and during the construction period the supplies shall be taken from the nearest lighting boards in mill departments.

The local lighting panels can be also used if there is a long distance between panel and the first pole. The control of outdoor lighting shall be taken from the photocell-units (connected to PLC) or astronomical clocks. The controls should be switchable remotely / locally.

The concrete prefabricated foundations for lighting pole, installation of foundation, cabling and warning tapes shall be included in the scope of electrical Supplier. The plastic tubes and digging of cable canals shall be included in electric or civil works. It has to be find out by the customer whether the plastic tubes and digging of cable channels shall be included in electric or civil works.

In general the luminaires shall be fixed to ceilings, walls, columns, steel structures and lighting rails.

Outdoor lighting and road lighting as a whole shall be controlled by photocell-units (connected to PLC) or astronomical clocks, movement sensors and by manual override switch.

5.4 Lighting Towers

Large areas will be provided with floodlights mounted towers. The lighting tower shall be 30 m or 36 m high hot dip galvanized steel with LED luminaires, enclosure IP54 floodlights.

Each tower shall have its own panel located on the bottom of tower. The cables from panel to the floodlights shall be installed by using cable ladder (min. 1x150) from the

bottom to the top of tower. The supply cable and fibre optic cable installed in plastic tube shall be connected into the each towers. There shall be six towers in the same supply. During construction time these towers shall be supplied from construction power distribution boards and the final supplies will be taken from the nearest lighting boards.

The electrical supplier shall supply towers, panels, fixtures, cables and cable ladders. The concrete foundation, plastic pipes and digging of cable canals for supply cables shall be included in electric or civil works. It has to be clarified by the customer whether the concrete foundation, plastic pipes and digging of cable channels for supply cables shall be included in civil or electric works.

5.5 Floodlights on the Bridge and Roofs

Large areas such as the effluent treatment will be illuminated by using the floodlights. The floodlight shall be LED luminaires, enclosure IP54 (wide beam). These floodlights shall be installed after the mechanical installation of pipe bridges is finished. The final supply shall be taken from nearest lighting boards.

The loading areas and yards shall be illuminated by using the floodlights installed on the roof or wall of buildings. The final supply cables shall take from the nearest lighting boards.

5.6 Emergency Lighting

Exit doors and escape routes will be lit with emergency lighting system. Back-up power with fire resistant cables will be included. Certified centralized battery system will be used with LED fixtures. Emergency lighting will be installed depending on requirements stated in local fire protection report.

Emergency lighting will fulfil requirements mentioned in emergency lighting standards. The design, installation and minimum illumination Emergency and maintained light fittings will be labelled to identify their function.

The standards EN 1838 (Lighting applications. Emergency lighting) and EN 50172 (Emergency escape lighting systems), and also the national requirements/ exemptions shall be followed.

5.7 Fire alarm system

Fire alarm system shall be installed in all process and non-process buildings in the Site area. The fire-fighting equipment follows the provisions and regulations of the local authorities as well as with the national and EU laws, stipulations and guidelines. Fire alarm system will be installed depending on requirements stated in local fire protection report (“Fire safety solution of the building”).

An automatic fire detection and alarm system shall be provided according to separate fire report accepted by authorities. The fire detection system shall be designed according national standard.

The fire detection system consists of fire alarm central, which collects fire alarm information from smoke, line etc. detectors and gives visual, acoustic and remote alarms. The fire alarm system is also used to control fire dampers and it gives interlockings to ventilation motors and unlocks the emergency doors if they have an access control system.

5.8 Access control system

Access readers shall be provided at selected doors/gates. Access control system shall have possibility for time terminal. Bus controllers shall be installed in electrical or in automation rooms or in other suitable rooms. Access points the bus controllers shall be installed in field boxes IP 54 or higher if necessary, depending on location. In addition the new plant shall be connected to graphic system.

5.10 Maintenance Outlets

Maintenance outlet panels will be installed at 30 m intervals in process areas. In some specific process areas maintenance outlet panels can be located more frequently than every 30 m. It is proposed to power the service sockets from two independent power sources.

Maintenance power socket panels with minimum the following equipment shall be included:

- 1 piece 32 A, 3 phase, 5 pole socket with RDC=300 mA
- 1 piece 16 A, 3 phase, 5 pole socket with RDC=30 mA
- 3 pieces 16 A, 1 phase, 3 pole socket with RDC=30 mA
- Mechanical interlocking according to local requirements.

Local requirements for equipment may apply.

Maintenance power socket panels must be accepted by purchaser.

5.11 Electrical Material

All material shall be of current design. Equal items shall be all of the same manufacture and type or as requested by the customer.

Before ordering main material, the Supplier shall submit for Purchaser's approval a list of all materials to be supplied, stating type, manufacturer and catalogue numbers.

Catalogues, datasheet, shop drawings or samples shall be submitted if requested.

5.12 Cable Ladder Installation

Feeder cables for lighting panels are laid on mill general cable trays.

The material for cable trays (and supports) and ladder racks shall be hot dip galvanized, aluminium or acid-proof steel (EN 1.4401), according to the process area specification. Acid-proof steel (EN 1.4401), shall be used in paper machine wet end

and other areas, where aggressive chemicals are present. The material of the cable tray must be accepted by purchaser.

The material for protection tubes in process areas shall be of acid-proof steel (EN 1.4401), and in the remaining areas stainless steel (EN 1.4301) or aluminium. The tubes shall be fixed with acid-proof steel (EN 1.4401), heavy duty pipe clamps.

Cable ladders are marked on drawings and their exact location shall be determined on site.

For fire resistant cable routing and cabling, shall be followed the standard EN 13501-2.

Cable ladders, curves and necessary shall be prefabricated.

See Cable ladder installation: MEIA0008 Electrical Installation Standard.

5.13 Cables Installation

The installation of all cables shall be performed carefully by the Supplier to ensure an installation, which is neat and workmanlike. Any work that shows improper installation will be ordered to be removed and this work shall be replaced in a workmanlike manner, without additional expense.

The cable routes shall be ladder system and for emergency system such as emergency lighting, smoke exhaust systems, etc. shall be provided cable routes with fire resistant. All cable trays shall be marked with shields the purpose of system according to voltage level. In addition fire resistant cable routes shall be marked with shields and the standard EN 135012 applies.

Where cables are exposed to mechanical damage, sheet steel guards (or equivalent) shall be provided to protect cables.

Cable trays and pipes shall be protected end caps and also the sharp edges with edge protection strips.

Cable marking instructions are given in document MEIA0008 Electrical Installation Standard.

Cables shall be according to standard MEIA0005.

5.14 Earthing and lightning protection

5.14.1 Earthing

All equipment required to be earthed by the regulations governing electrical installation shall be earthed whether specifically mentioned on the drawings or not.

Earthing connections shall be made to equipment frames only after the surface is thoroughly cleaned of paint and dirt.

Earthing and lightning protection shall be according to standard MEIA0013.

5.14.2 Lightning protection system

In the beginning of design phase shall be made lightning protection risk assessment according to standard EN 62305-2. According the result will be determined the lightning protection level.

Lightning protection system shall be used in roof rods, which will be connected to columns of building to be used as down conductor and connected to earthing system. Lightning protection system shall be carried out according to standard EN 62305-3.

Internal lightning protection system shall be provided according to lightning protection level. In distribution boards surge device protection shall have indication which will be connected to PLC.

Earthing and lightning protection shall be according to standard MEIA0013.

5.15 Testing

The Supplier shall carry out the testing and all other services necessary to put the electrical system in condition ready for service.

Final acceptance of the completed installations shall be made by the authorized firm, or under the authorized firm's control. The authorized firm shall approved by the Purchaser, and the costs must be included in the installation price.

The Supplier shall provide all tools, instruments and equipment, and the necessary personnel, for testing the electrical installation. The Supplier shall also ensure that such equipment and personnel are available during final testing of the process system, as considered necessary by the Purchaser, to make promptly any adjustments required.

Programming of DALI lighting system is in delivery of the Supplier.

Each department layouts with luminaires and other DALI system equipment shall be provided for PC's, which able to monitor and controlling the system. In each department DALI system shall be equipped with a touch panel type HMI operator interface located in the door of main lighting panel. In addition to this there shall be possibility to access and control the DALI system from office PC's with remote desktop connection. The system shall be provided with binary input devices or relay units, which allows overriding the settings (for example daylight dimming or time program, etc.).